

# MINNESOTA SCHOOL FIRE REPORT

Image courtesy of Minnesota Historical Society



Minnesota State Fire Marshal Division  
445 Minnesota St., Suite 145  
St. Paul, MN 55101-5145

## Table of Contents

Number of Schools in Minnesota .....	3
School Fires in Minnesota .....	4
School Fires by Month of Year .....	6
School Fires by Day of Week .....	6
School Fires by Time of Day.....	7
School Fire Causes .....	8
Where School Fires Start .....	8
Equipment Involved in the Fire’s Ignition .....	9
Intentionally Started School Fires .....	10
Property Dollar Loss in School Fires .....	12
Minnesota’s School Inspection Program.....	12
School Fires in the United States.....	14
School Fires – United States vs. Minnesota .....	15
School Fire Loss History in Minnesota.....	15
Indicators of Minnesota’s School Inspection Program Effectiveness .....	17
Summary.....	17

### Acknowledgements

The Minnesota State Fire Marshal acknowledges the countless hours of state and local fire officials’ time inspecting schools, identifying fire safety hazards, and ensuring their correction. We also acknowledge the cooperation of school officials throughout the state in willingly correcting these fire safety issues in a timely manner. This report made possible through the Minnesota State Fire Marshal Division’s data section.

### Cover Photo

Mankato Old Main School – before, during, and after a fire destroyed it in 1984 (during and after photos taken by Jon Nisja).



The thought of a school fire often strikes fear in a parent’s mind. Everyone wants a fire-safe environment for children attending school. Fortunately, school fires involving fatal injuries to multiple students have become a rare event. Nonetheless, school fires still represent a risk to communities, and fire safety must remain top-of-mind in order to prevent the types of school fire tragedies of decades past.

In this report, we will examine school fires in Minnesota and demonstrate how fire prevention and fire inspections have reduced the incidence and impact of Minnesota school fires.

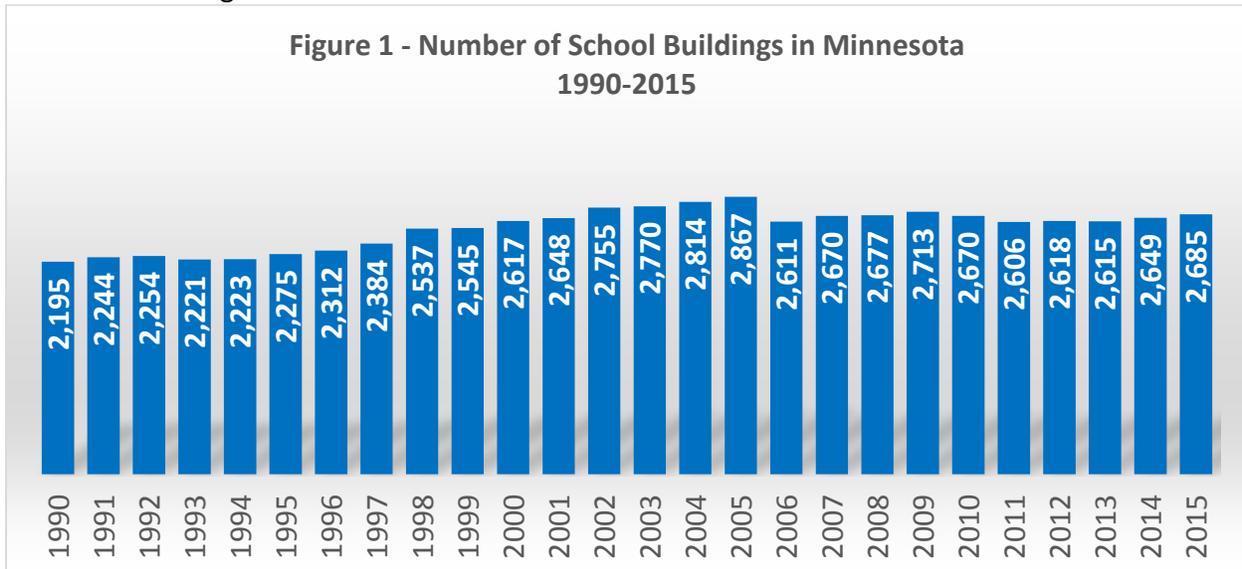
### Number of Schools in Minnesota

For the 2015-2016 school year, there were an estimated 2,685 school buildings in Minnesota<sup>1</sup>. For purposes of this report, we will be focusing on schools housing students from preschool through 12th grade. Even though colleges, universities and other adult educational buildings are considered “schools” by many, those buildings are not included in this report. Public schools represent the highest number of schools. Schools types are listed in the following table:

**Table 1 – Type of Schools**

Type of School	Number	Percentage
Public Schools	2,048	76%
Charter Schools	165	6%
Non-Public Schools	472	18%
TOTAL SCHOOLS	2,685	100%

The number of school buildings has increased by about 20 percent since 1990, the date that the State Fire Marshal Public School Inspection legislation was enacted. Figure 1 shows the number of school buildings from 1990-2015 in Minnesota<sup>2</sup>.



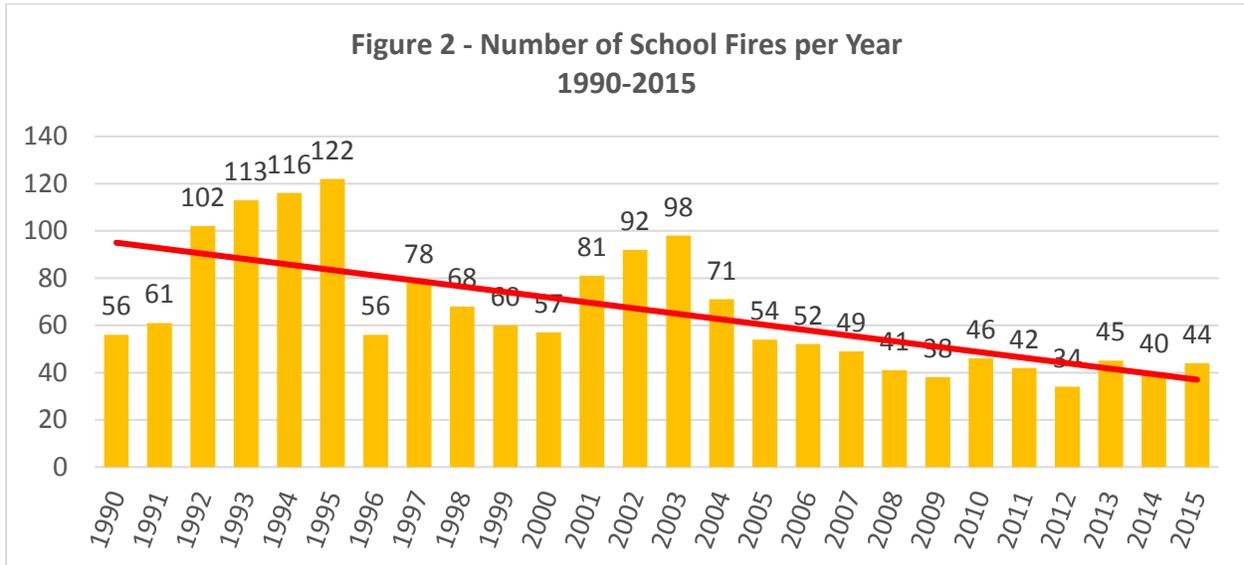
<sup>1</sup> Minnesota Department of Education website. <http://w20.education.state.mn.us/MDEAnalytics/Data.jsp>

<sup>2</sup> Minnesota Department of Education website. <http://w20.education.state.mn.us/MDEAnalytics/Data.jsp>



### School Fires in Minnesota

When speaking of school fires in this report, we are only dealing with fires that affect school buildings themselves. We are not including car fires on school property, playground equipment fires, exterior trash fires, or grass/vegetation fires. The number of school fires in Minnesota appears to be decreasing. Figure 2 shows the number of reported school fires from 1990 through 2015. The red line shows a downward trend in school fires during this time.



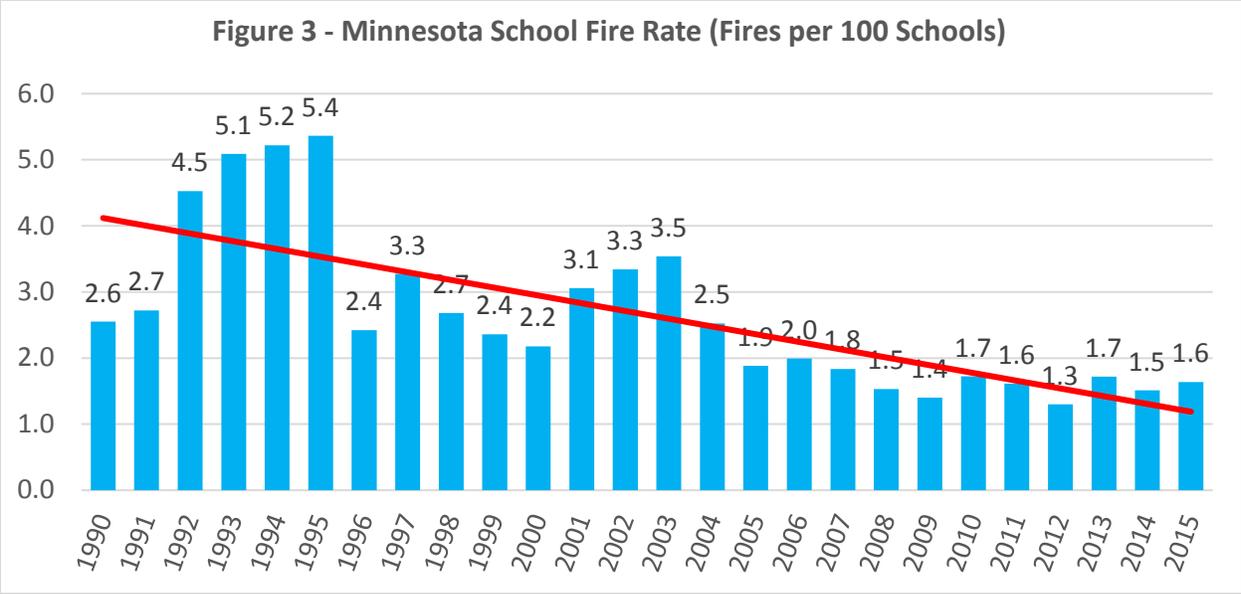
The number of Minnesota school fires decreased 54 percent from the five-year period of 1990-1994 until the five-year period of 2010-2014. Table 2 shows the average number of school fires for five-year periods of time since 1990.

**Table 2 – Average Number of School Fires per Year**

1990-1994	90
1995-1999	77
2000-2004	80
2005-2009	47
2010-2014	41

Because the number of schools has increased by 20 percent since 1990, a more realistic comparison is by rate: the number of school fires per 100 schools. Figure 3 shows the number of fires per year for each 100 school buildings. Again, the red line shows a downward trend in the school fire rate from 1990-2015.

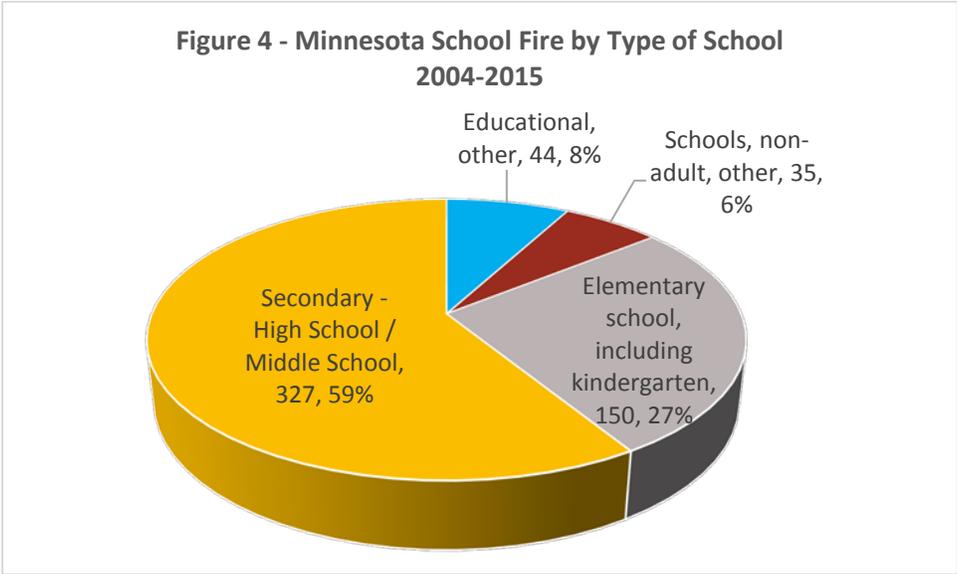




From 2004 through 2015, there were 556 fires reported in school buildings. Even though there are far more elementary schools than secondary schools in Minnesota, secondary schools experienced twice as many fires. There are probably a number of reasons for this, including the following:

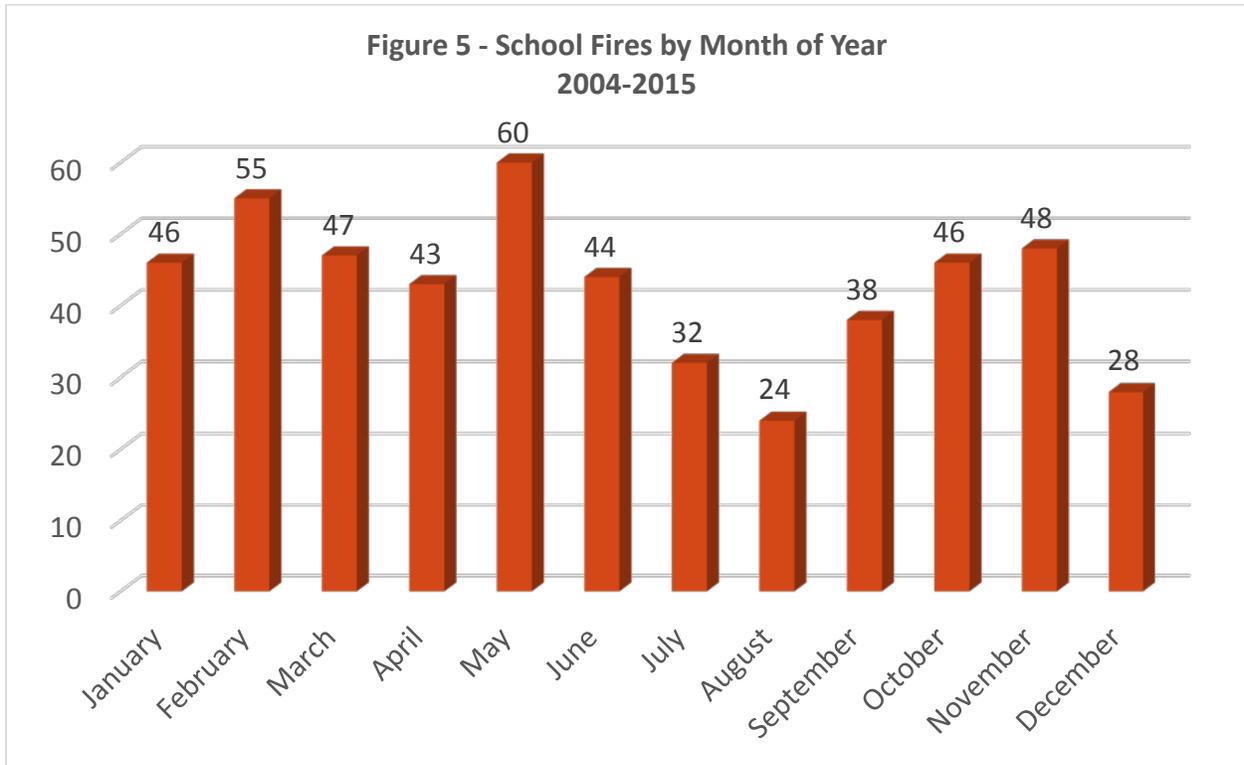
- Secondary schools tend to be larger.
- Secondary school-age children are more likely to start fires.
- Secondary schools engage in more hazardous operations from a fire safety standpoint, such as vocational shops, chemistry labs, cooking operations, etc.

Figure 4 shows a breakdown of the fires by the type of school that experienced a fire from 2004-2015.



### School Fires by Month of Year

The months of July, August and December experienced the fewest number of school fires from 2004-2015. A high percentage of school fires are started by students, and students are rarely present in school during July and August, which likely accounts for the low number of fires during these months. December tends to be a month of transition for many students with holidays and school breaks, which may account for the decrease in school fires during that month. Figure 5 shows the number of school fires by month.



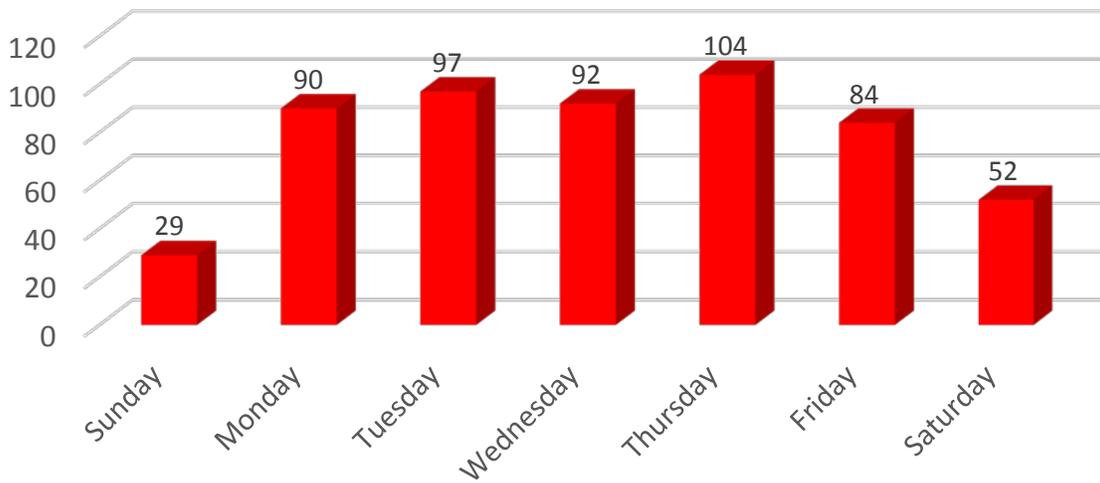
The months of February and May tend to have the highest number of school fires. The higher number of fires in February may be attributable to Minnesota’s cold climate winter months. The spike in school fires in May correlates to the point in the school year that students are getting anxious and restless for their summer break to begin, at which point some of the fires may be set intentionally (see Figure 12 for more information on intentionally set fires).

### School Fires by Day of Week

More school fires occur on Thursday than any other day of the week. Thursday is also the most common day for intentionally set fires to occur. Figure 6 shows the number of school fires by day of week.



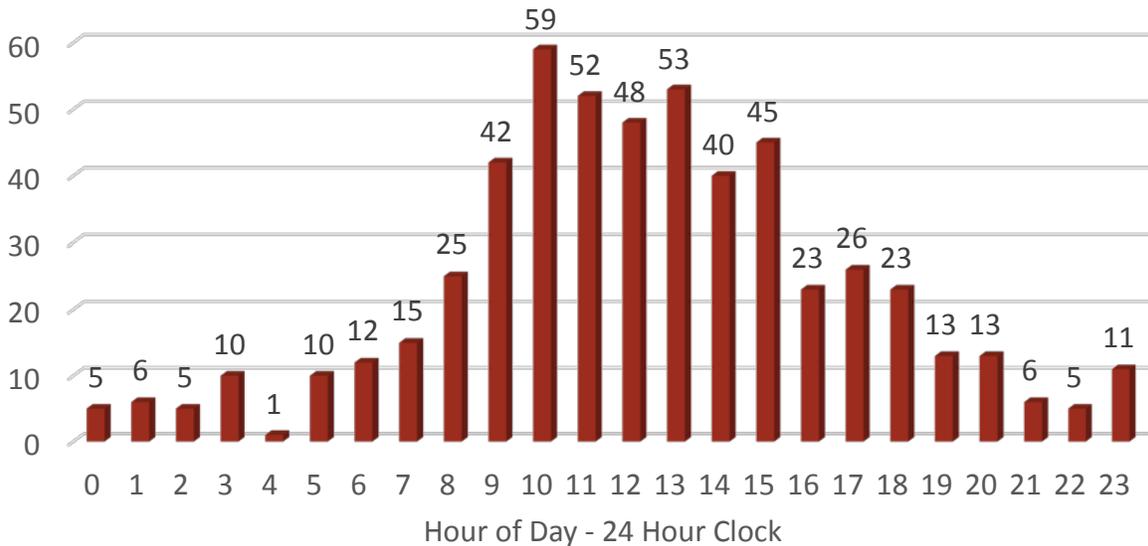
**Figure 6 - School Fires by Day of Week  
2004-2015**



**School Fires by Time of Day**

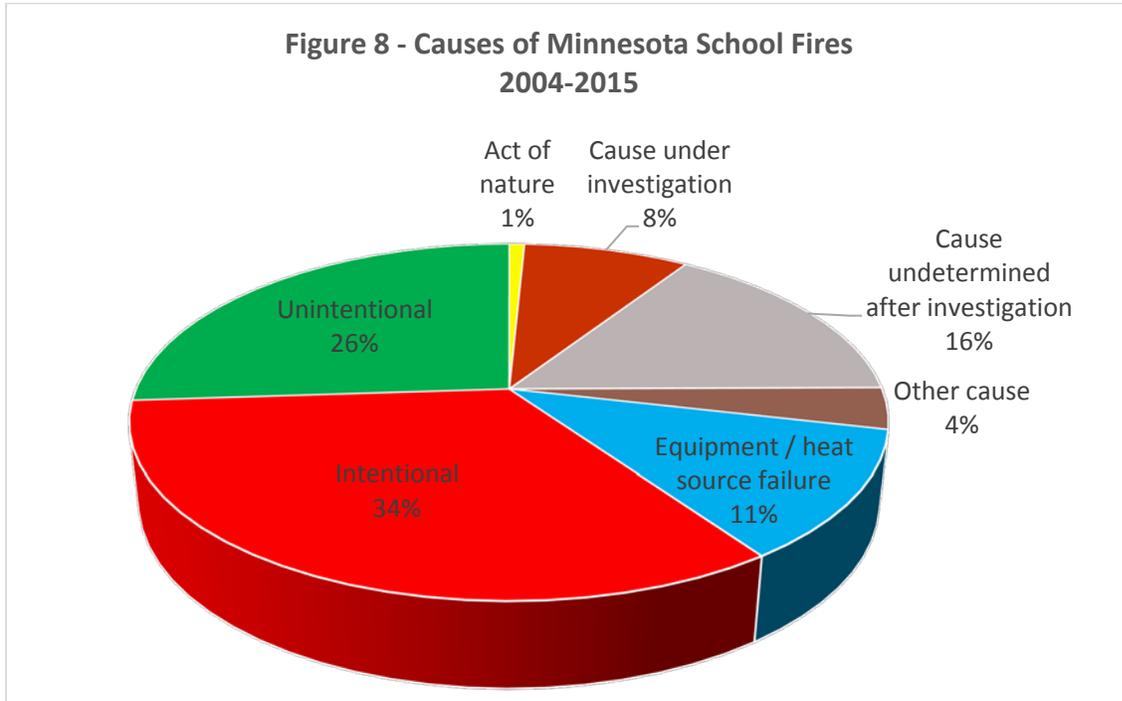
The vast majority of school fires occurred between 9 a.m. and 4 p.m. with a peak from 10 to 11 a.m. These are typically the hours when most schools are open and occupied. Figure 7 shows school fires by time of day.

**Figure 7 - School Fires by Time of Day  
2004-2015**



### School Fire Causes

A relatively high percentage of school fires are intentional in origin (as compared to fires in other occupancies). From 2004-2015, just over one-third of Minnesota’s school fires were intentionally started.

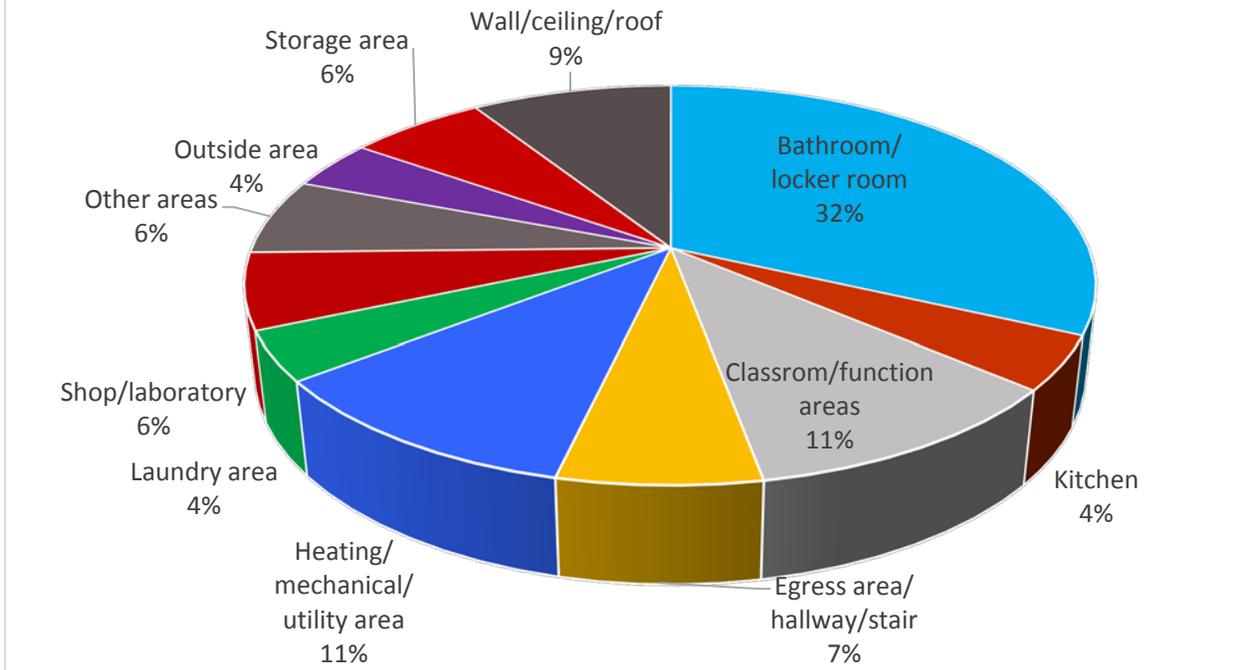


### Where School Fires Start

Fire departments often refer to where a fire starts as the “area of origin.” Because a high percentage of school fires are intentionally started, it follows that they are commonly started in normally unoccupied or unsupervised areas. Almost one-third of the school fires in Minnesota started in bathrooms or locker rooms. Other common areas included classrooms/function areas (11 percent), heating/mechanical areas (11 percent), walls/ceilings/roofs (9 percent), and hallways/stairs (7 percent). Figure 9 shows the most common areas where school fires started.



**Figure 9 - Common Areas of Fire Origin in Minnesota Schools  
2004-2015**



**Equipment Involved in the Fire’s Ignition**

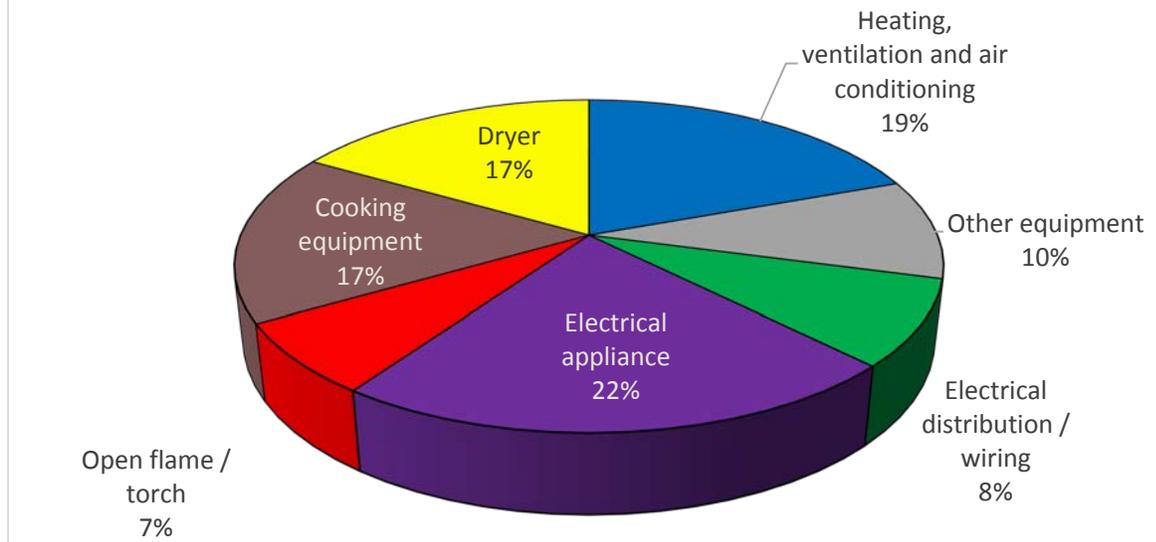
For accidental fires, the equipment involved can reveal information about common ignition sources and provide priorities for inspection activity to reduce or eliminate future fires.

From 2004-2015, electrical appliances were the items most often involved in starting fires (22 percent). These included lamps, fans, motors, shop tools, and electric welders (equipment that tends to produce heat). The next most common were fixed heating, ventilating and air conditioning (HVAC) equipment (19 percent), followed by cooking equipment and clothes dryers (both at 17 percent).

Figure 10 shows the common types of equipment involved in starting fires.



**Figure 10 - Equipment Involved in School Fires in Minnesota  
2004-2015**



### **Intentionally Started School Fires**

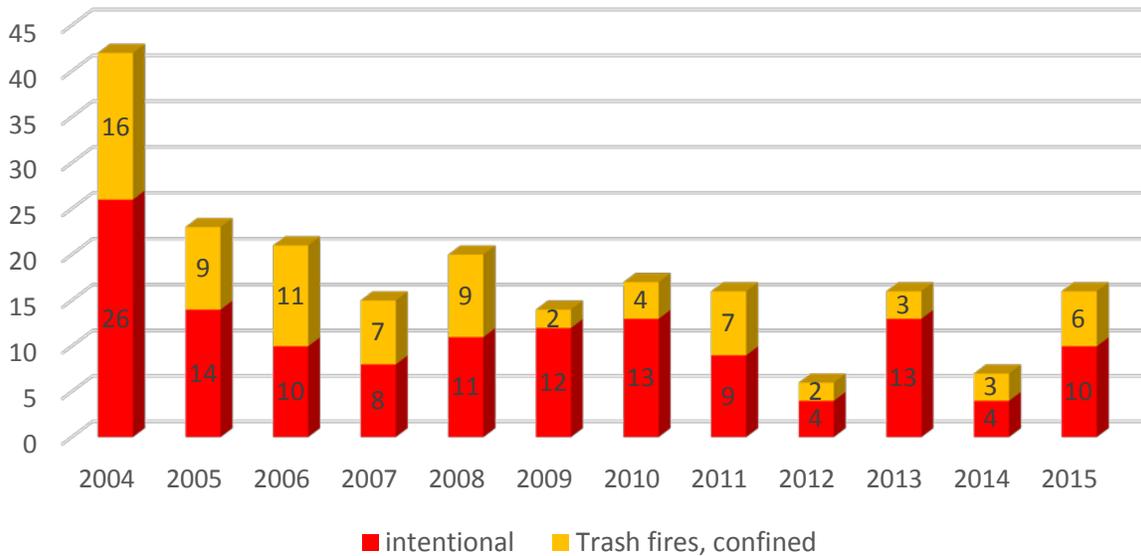
As indicated earlier, fires that were intentionally started accounted for over one-third of all the school fires in Minnesota from 2004-2015. Overall, the number of intentionally set fires in schools appears to be dropping (as is the number of school fires in general). There are some possible reasons for this:

- With the increase in school safety awareness, there are fewer opportunities for students to engage in firesetting activities.
- The availability of open flame devices (such as matches or lighters) has decreased over the past few decades, especially with fewer people smoking.
- Portable and handheld electronic devices (smartphones, tablets, etc.) occupy a much higher percentage of young people’s time and keeps them busy (some studies have tied firesetting activity to student boredom).

In the state’s fire incident reporting system, there were 79 reported fires where the fire involved confined or contained trash or rubbish fires, but no cause was listed (i.e. not identified as an intentional fire). It is believed that a high percentage of these fires were also intentionally started. Figure 11 shows the number of intentional and confined trash fires from 2004-2015 in Minnesota.

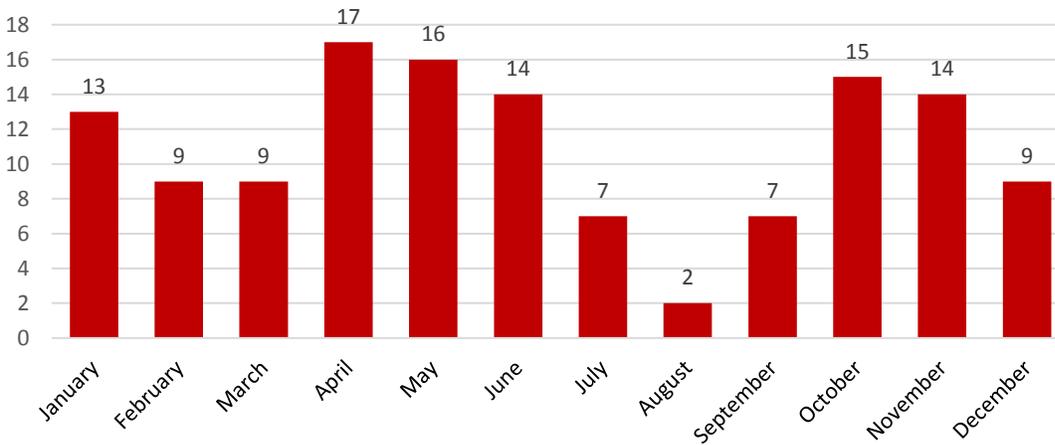


**Figure 11 - Intentional and Suspicious Origin Fires in Minnesota Schools - 2004-2015**



April and May are the most common months for intentionally started school fires, followed closely by October, November and June. The fewest number of intentionally set fires were in July, August and September (see Figure 12).

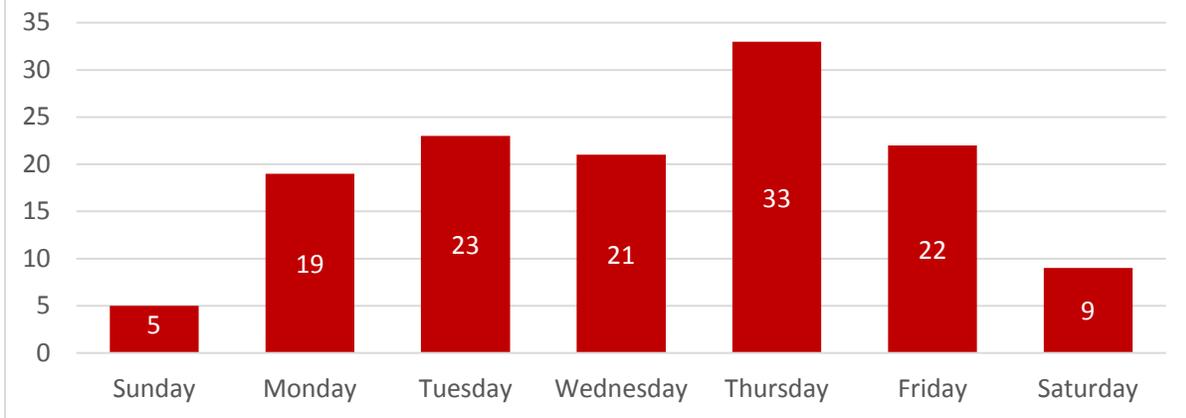
**Figure 12 - Intentional School Fires by Month - Minnesota 2004-2015**



The most common day of the week for intentionally set school fires is Thursday, followed by Tuesday and Friday. Intentionally set school fires drop off significantly for Saturday and Sunday (see Figure 13).



**Figure 13 - Intentional School Fires by Day of Week - Minnesota  
2004-2015**



**Property Dollar Loss in School Fires**

Property loss from school fires varies greatly from year to year. During most years the school fire loss is well under \$1 million. Because school fires are a relatively rare event (compared to house fires or apartment fires), and a single large-loss school fire can skew the average loss even if spread out over five years, this report will look at a 20-year history.

**Figure 14 - Minnesota School Fire Loss by Year 1996-2015**



Note: 2014 included a \$5 million fire loss at Roosevelt School in St. Cloud from lightning strike.

**Minnesota’s School Inspection Program**

In 1990 the Minnesota State Legislature mandated that the State Fire Marshal conduct inspections of all public school buildings serving preschool- through high-school-aged students in the state. The initial legislation called for an inspection of each school at least once every three years. The legislation was passed as a result of concerns expressed by education officials, legislators, fire officials and the public regarding the condition of many of the school



buildings in the state. At the time of the legislation, 75 out of Minnesota’s 423 school districts had buildings constructed before 1910 (over 80 years old at the time of the legislation).

During the early years of the inspection program, many of the issues cited involved life safety concerns related to the construction of the building. This included items such as an insufficient number of exits, unprotected vertical openings that would allow smoke and heat to travel unchecked throughout a building, lack of fire-rated egress corridors to protect occupants during an evacuation, and lack of fire-rated separations around hazardous areas. Correcting these violations often involved significant expense.

Over time, these expensive, construction-related life safety violations decreased and were replaced with items more operational, housekeeping, or maintenance in nature. The following three tables show the most commonly cited violations for the initial period of school inspections (1991-1996), after the program had inspected all of the schools 2-3 times (2004-2006), and after the program had matured and schools had experienced multiple inspections (2012-2014).

<b>Table 3 – Most Common Fire Code Violations 1991-1996 (1,638 Schools)</b>		
<b>Violation</b>	<b>Times Cited</b>	<b>% of Schools</b>
Lack of fire-rated egress corridors	793	48%
Lack of hazardous area separation walls	787	48%
Lack of emergency lighting	772	47%
Fire doors not operational	761	46%
Exits, aisles, corridors obstructed	737	45%
Lack of EXIT signs	693	42%
Lack of panic hardware on egress doors	668	41%
Egress doors chained, locked, not openable from inside	609	37%
Fire alarm – detection missing	539	33%
Insufficient number of exits	527	32%



<b>Table 4 – Most Common Fire Code Violations 2004-2006 (1,863 Schools)</b>		
<b>Violation</b>	<b>Times Cited</b>	<b>% of Schools</b>
Improper use of extension cords	937	50%
Unlisted electrical appliances	696	37%
Excessive combustible storage	562	30%
Egress doors chained, locked, not openable from inside	484	26%
Signage – fire equipment rooms	462	25%
Lack of EXIT signs/signs not lit	455	24%
Storage not orderly/housekeeping	432	23%
Ceiling tile missing – fire protection system present	431	23%
Storage in mechanical rooms	402	22%
Improper electrical power tap use	317	17%

<b>Table 5 – Most Common Fire Code Violations 2012-2014 (2,042 Schools)</b>		
<b>Violation</b>	<b>Times Cited</b>	<b>% of Schools</b>
Improper use of extension cords	793	39%
Ceiling tile missing – fire protection system present	543	27%
Lack of fire and evacuation plans	508	25%
Improper electrical power tap use	492	24%
Improper sprinkler coverage	450	22%
Emergency illumination not provided/not working	430	21%
Lack of EXIT signs/signs not lit	360	18%
Fire protection systems not maintained	344	17%
Electrical hazards present	311	15%
Storage too close to sprinklers	306	15%

### **School Fires in the United States**

The National Center for Education Statistics (NCES) estimates that there are 131,890 schools in the United States for the 2013-2014 school year<sup>3</sup>; these break down as follows:

- Public elementary and secondary schools: 98,271.
- Private schools: 33,619.

In September 2013, the National Fire Protection Association (NFPA) released a report on “Structure Fires in Educational Properties.”<sup>4</sup> The NFPA report analyzed school fires for the five-year period from 2007-2011 and determined that there were an average of 4,060 fires annually doing about \$70 million in property damage in preschool-12 buildings.

Based on this NFPA report, the fire rate nationally would be 3.1 school fires per 100 buildings (4,060 school fires divided by 131,890 school buildings times 100).

<sup>3</sup> [http://nces.ed.gov/programs/digest/d15/tables/dt15\\_214.10.asp](http://nces.ed.gov/programs/digest/d15/tables/dt15_214.10.asp)

<sup>4</sup> Structure Fires in Educational Properties, Richard Campbell, September 2013



The annual fire loss for school fires is estimated at \$70 million per year. Divided by 50 states, the average fire loss for schools is \$1.4 million per state per year. The average property loss per school fire nationally is \$17,241 (\$70 million divided by 4,060 fires).

**School Fires – United States vs. Minnesota**

The following are some of the national school fire loss indices compared to Minnesota:

Indicator	United States	Minnesota	Comments
Number of Schools (public and private)	131,890	2,685	
Number of Schools per State (average for 50 states)	2,638	2,685	Minnesota has an average number of schools
School Fires (five year average – 2007-2011)	4,060	43	
School Fires (average per state per year – 2007-2011)	81/state	43	Minnesota is about 45% lower
School Fire Rate (fires per 100 schools)	3.1/100	2.2/100 (20 years)	Minnesota is about 30% lower
School Fire Loss (average per state per year)	\$1,400,000	\$567,572 (20 years)	Minnesota is about 60% lower
Average Loss per School Fire	\$17,241	\$11,737 (20 years)	Minnesota is about 35% lower

**School Fire Loss History in Minnesota**

Figure 15 shows the annual school fire loss in Minnesota for two 10-year periods of time:

- 1985 to 1994 (prior to and in the early stages of the state’s school inspection program)
- 2006 to 2015 (most recent 10-year period)

The average annual school fire loss for these two periods of time has dropped from almost \$2.4 million per year to just over \$634,000 per year. This represents a 73 percent decrease in annual fire loss (not adjusting for inflation, which would result in a higher percentage decrease).



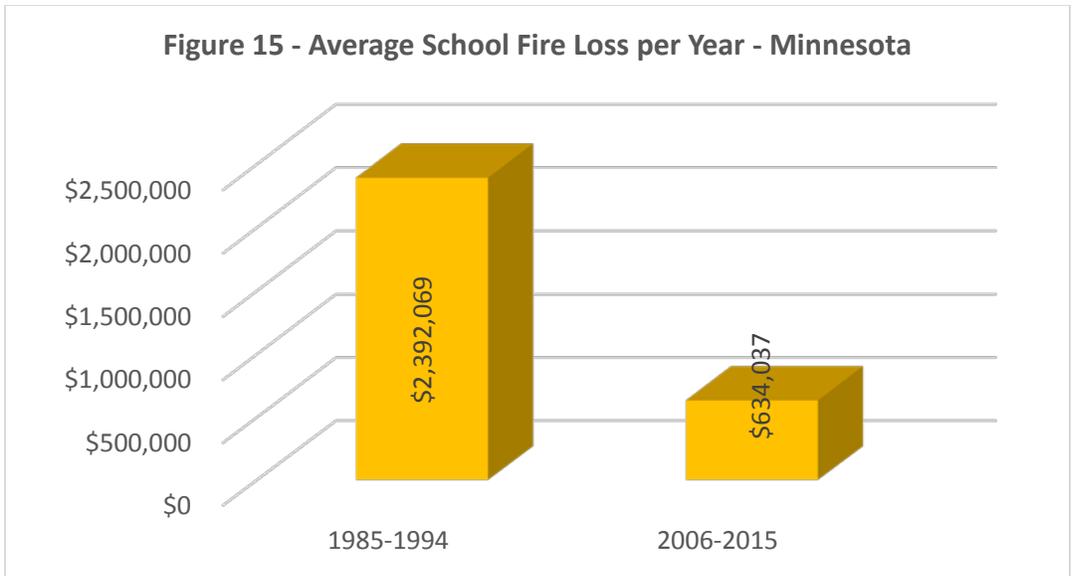
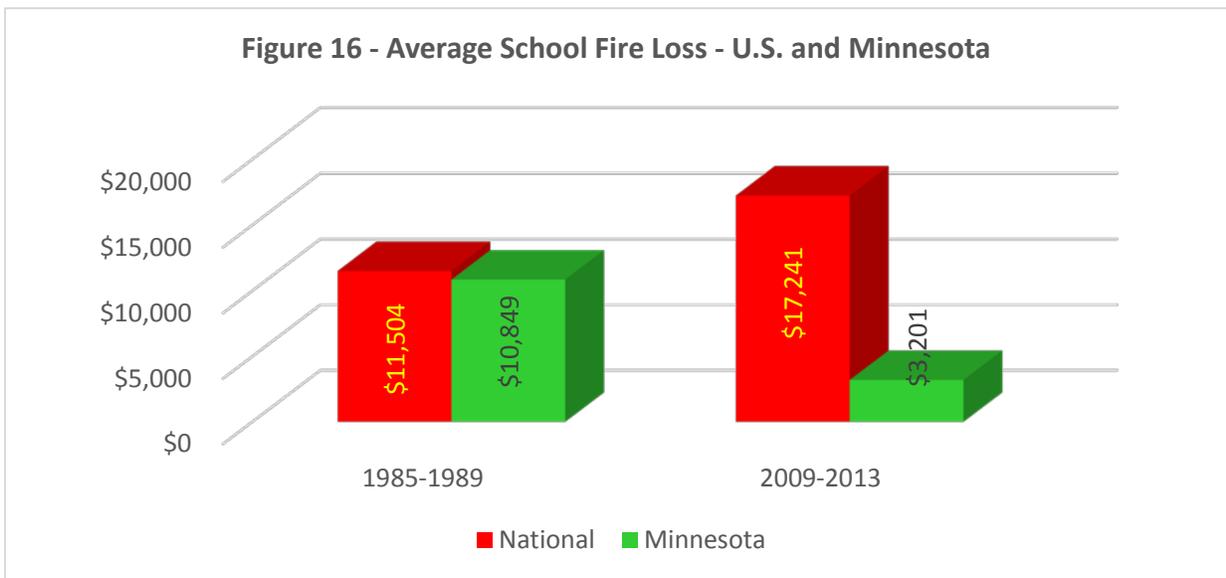


Figure 16 shows the average loss per school fire for the United States and Minnesota for five-year periods of time:

- 1985 to 1989 (prior to Minnesota’s school inspection program)
- 2009 to 2013 (most recent five-year period where national data is available)

This chart shows that Minnesota’s average loss per school fire was on par with the national fire loss data prior to the school inspection program. Since that time, the average school fire loss nationally has increased by about \$6,000 per fire (almost 50 percent) while Minnesota’s average loss has decreased by about \$7,000 (just over 70 percent).



## Indicators of Minnesota's School Inspection Program Effectiveness

The goal of any prevention-related initiative is to decrease the number and severity of tragic incidents. The following are indicators that Minnesota's School Inspection Program has been effective:

- The average number of school fires annually has decreased from 90 (in 1990-1994) to 41 (in 2010-2014). This represents a 54 percent decrease.
- The school fire rate nationally is 3.1 fires per 100 schools; in Minnesota it has averaged 2.2 per 100 schools over the past 20 years. Minnesota's school fire rate is 29 percent lower than the national rate.
- Minnesota is an average state in terms of land mass, population, and number of schools (total national land mass, population, and school data divided by 50 roughly equals the Minnesota data).
- With 4,060 school fires per year in the U.S., each state would average 81 school fires per year; Minnesota has averaged 43 school fires during the same years as the national data. This is about 47 percent lower than the average number of school fires annually per state.
- With \$70 million annually in school fire loss in the U.S., each state would average \$1.4 million per year; Minnesota has averaged \$567,572 in annual school fire loss over the past 20 years. This is about 60 percent lower than the national average.
- In the years before Minnesota's school inspection program, the average school fire loss roughly equaled the national average loss per fire. Although the national loss per school fire has gone up by about \$6,000 per fire, Minnesota's average loss per fire has gone down by over \$7,000 per fire. Minnesota's average loss per school fire is about 81 percent lower than the national average and about 70 percent less than it was prior to the school inspection program.

These indicators appear to point toward a successful fire inspection program. Although Minnesota's school inspection program is certainly not the sole factor in decreasing the frequency and severity of fires over the past 25 years, it has played a major role in providing school environments that are safer from fire.

### Summary

Although school fire loss has been dropping nationally, the reduction in the number and impact of school fires in Minnesota has been much greater than what has been experienced nationally. This report has looked at school fire loss (number, cause, time of day, month, day of week, property damage, etc.) along with the state's school inspection program. It has examined indicators that point to the effectiveness of the Minnesota School Inspection Program in reducing the number and severity of school fires.

