

**GEOGRAPHIC INFORMATION SYSTEM
(GIS)
FIRE SUPPRESSION AND
EMERGENCY MEDICAL SERVICES
RESPONSE CAPABILITIES ANALYSIS**



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**SYLVANIA TOWNSHIP FIRE
DEPARTMENT
SYLVANIA, OHIO**

APRIL 3, 2006

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ABSTRACT

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In January of 2006, the International Association of Fire Fighters (IAFF) was contacted by the Sylvania Township Fire Fighter's IAFF Local 2243, to perform a Geographic Information System (GIS) analysis of the Sylvania Township Fire Department (STFD). Local 2243 requested that the GIS study evaluate the 4- and 8-minute response capabilities of fire department units deploying from existing and proposed fire station locations, as well as examine prevailing staffing conditions. The Sylvania Township Fire Fighter's requested that the results of the GIS mapping be assessed against existing National Fire Protection Association (NFPA) professional standards and Occupational Safety & Health Administration (OSHA) safety regulations, including compliance with NFPA 1710 staffing performance objectives and the OSHA "2 In/2 Out" regulation. The procedures involved in this analysis consisted of the generation of GIS mapping response scenarios under the existing and proposed staffing and deployment configuration, a statistical analysis of fire department call volume and response capabilities, and an evaluation of GIS outcomes measured against NFPA standards and OSHA regulations.

Findings – Staffing and Personnel

Analysis of the Sylvania Township Fire Department reveals that **engine companies currently deploy with fewer than four fire fighters, out of compliance with professional standards.** NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*, each recommend a crew of at least four fire fighters to accomplish safe and effective fire suppression and victim rescue, and to deliver the range of emergency services.

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In addition, the Sylvania Township Fire Department's **chief officers do not deploy with sufficient resources to perform incident oversight in the most efficient manner.** Currently, the chief officer's deploy Monday thru Friday, between 0800-1630, without the assistance of a Chief's Aide. Chief's aides play a critical role in maintaining emergency incident oversight and ensuring fire fighter accountability, and their absence contributes to the likelihood of fire fighter and civilian casualties. For these reasons it is recommended that a chief officer and chiefs aide be deployed at all times.

The practice of cross-staffing emergency response units further compounds existing staffing deficiencies. Cross-staffing is a practice whereby emergency responders staff

several types of emergency response vehicles simultaneously in a work period. The type and scope of an emergency (e.g., structure fire, vehicle accident) dictate which type of emergency response vehicle (e.g., engine, truck or rescue) the emergency responders staff for an incident. Thus, in order to effect a response of the secondary unit(s), engine company personnel are required to abandon their primary (frontline) engines, and deploy the cross-staffed unit(s).

The benefit of this arrangement is that it provides the department the ability to respond with apparatus that best matches the needs of the incident. The drawback, however, is that such a staffing arrangement depletes the number of firefighters available to respond to simultaneously occurring emergencies.

The only emergency unit currently staffed in compliance with internationally-recognized NFPA standards is the fire department's ambulance. This unit is staffed with two firefighter/EMT-Paramedics, in accordance with NFPA company staffing objectives for the safe and effective delivery of fire suppression and rescue services.

Findings – Deployment

This analysis predicts that Sylvania is not provided with fire and emergency services in compliance with NFPA 1710. Due to inadequate deployment and staffing deficiencies, the fire department is incapable of providing sufficient resources, within critical time frames, to significant portions of the individual response jurisdictions. Station closures, the decommissioning of emergency response units, and staffing reductions would further negatively impact the ability of the fire department to respond to and safely and effectively mitigate emergencies in Sylvania.¹

General Recommendations

Staffing and deployment deficiencies in the Sylvania Township Fire Department contribute to response inadequacies. It is the general recommendation of this analysis that the fire department staff all engine and truck companies with *at least* four firefighters, in compliance with NFPA 1710 and NFPA 1500.

The practice of cross-staffing the secondary units with engine company personnel should be examined in further detail to determine if there is a detrimental effect on engine company availability and response times. If it is determined that cross-staffing these units compromises engine company availability and results in extended response times for the next due engine company, consideration should be given to providing dedicated staffing for these units.

Additionally, chiefs' aides should be assigned to accompany and assist the chief officers in providing firefighter accountability and incident oversight. Consideration should also be given to pursuing efforts to enhance EMS capabilities by ensuring that, on all engine companies staffed with four fire fighters, at least two fire fighters are trained to the "Paramedic" level of Emergency Medical Technician (EMT-P). Studies indicate that

¹ "Sylvania" will be used to refer to the areas of Sylvania City as well as Sylvania Township.

basic medical intervention, in conjunction with advanced life support provided by fire department personnel, contributes significantly to positive patient outcomes.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report summarizes the results of a station location, staffing, and emergency vehicle response time analysis for the Sylvania Township Fire Department and IAFF Local 2243. This computer-based analytical study examines predicted response times and geographic coverage areas for Sylvania Township Fire Department emergency response units deployed from existing fire stations in Sylvania Township, Ohio.

The Sylvania Township Fire Department is the primary provider of fire, rescue, and disaster and emergency services in Sylvania Township, Ohio. Currently, **fire department engine or truck companies do not comply with the company staffing objectives of national industry standards**, which require all fire suppression companies to deploy as four-person crews. The practice of staffing fire companies with *fewer than* four fire fighters puts public safety at a greater risk for the loss of life and property. Assessment of the critical tasks required for an interior fire attack establishes the impact that reduced staffing has on the effectiveness of fireground operations involving a single-family residential structure.

TABLE 1:

IMPACT OF CREW SIZE ON FIRE ATTACK IN A RESIDENTIAL STRUCTURE² (First Alarm Assignment)							
Apparatus	1 st Engine Company		2 nd Engine Company		Ladder Company		
Fireground Tasks	Charge Initial Interior Line and Advance	Locate and Rescue Victim	Charge Interior Support Line and Advance	Charge Exterior Line and Advance	Roof Ventilation	Search & Rescue	Check Exposures for Fire Extension
5 Firefighters	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
4 Firefighters	84.7%	96.1%	77.9%	72.9%	79.0%	90.3%	80.2%
3 Firefighters	71.3%	82.8%	0.0%	0.0%	0.0%	79.6%	0.0%

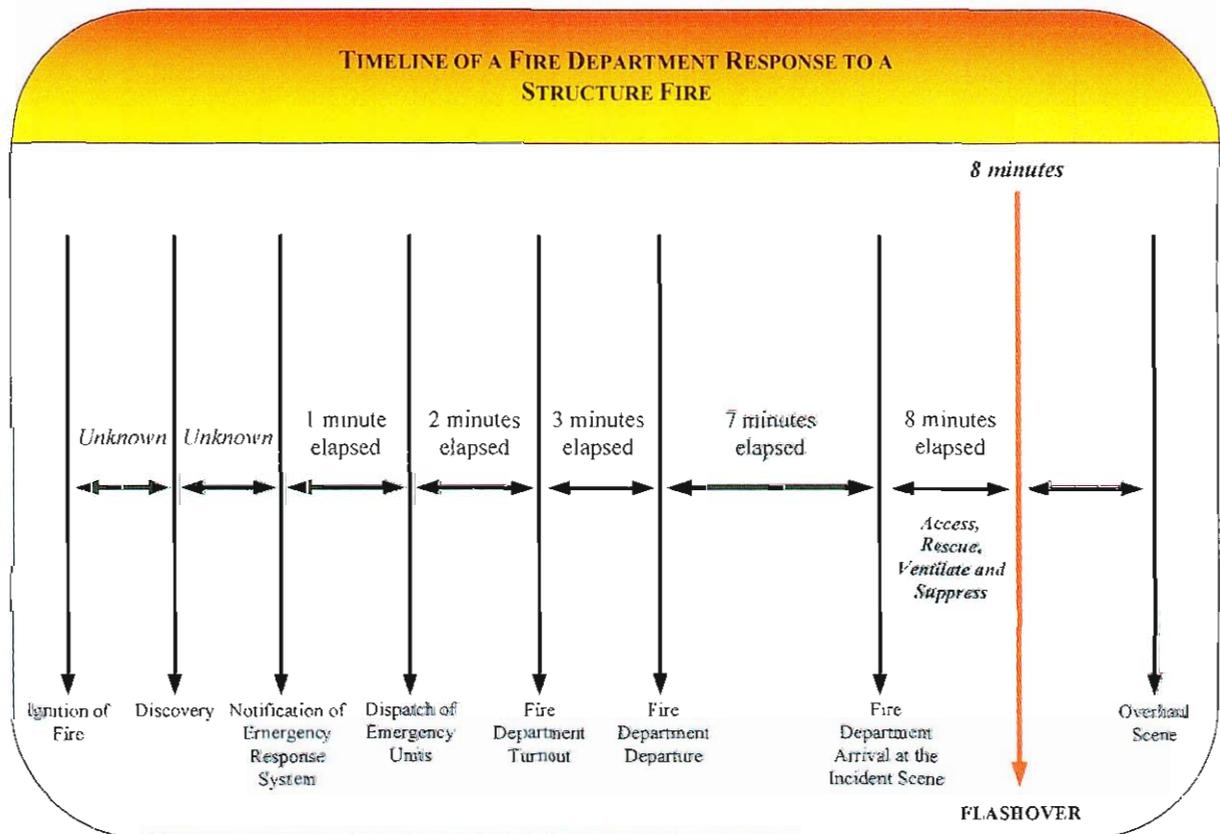
“First-arriving” engine companies that consist of three firefighters are only 71% efficient in initiating an interior fire attack, and 83% efficient in locating and rescuing a fire victim. “Second-in” companies also staffed with three firefighters are unable to initiate additional interior or exterior operations because they must support the understaffed operations of the first-in company. With four person staffing, the effectiveness of first-arriving company operations *increases* by 14%, to 85% efficiency. The efficacy of engine company victim search and rescue operations also *increases* by 13% with four-person staffing. Moreover, because the first-in unit is staffed with a sufficient number of personnel to accomplish its assigned duties, the second-in company does not need to support first-in operations, and is therefore capable of performing second-in duties, as opposed to supporting an under-staffed first-in unit.

² McManis Associates and John T. O'Hagan & Associates, Dallas Fire Department Staffing Level Study, (June 1984); pp. 1-2 and II-1 through II-7; Richard C. Morrison, Manning Levels for Engine and Ladder Companies in Small Fire Departments, (1990)

As is indicated, staffing deficiencies negatively impact the ability of the fire department to safely and effectively mitigate emergencies and correlate directly with an increase in expected life, property, and economic losses. Fire growth- the rate of spread and the intensity of the fire- is directly linked to the time it takes to initiate fire suppression operations. As is indicated in Table 1, companies staffed with four firefighters are capable of initiating critical fireground tasks more efficiently than those staffed below national standards.

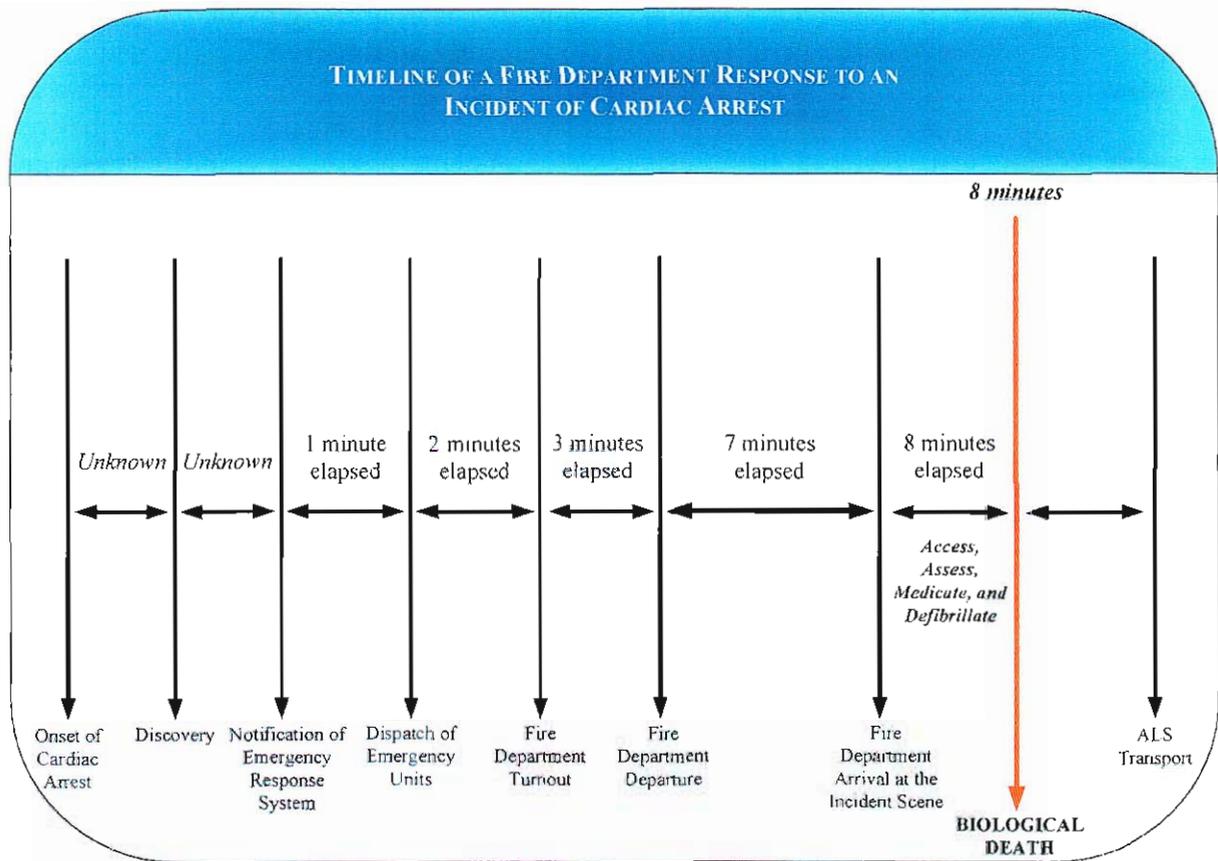
As rule, a fire doubles in size for every minute that passes without the application of aggressive fire suppression measures. In less than 30 seconds a small flame can rage completely out of control and turn into a major fire. During fire growth, the temperature of a fire rises to 1,000° to 1,200° F. It is generally accepted in the fire service that flashover- the very rapid spreading of the fire due to super heating of room contents and other combustibles- occurs in less than 10 minutes. As there is a potential delay between fire ignition, discovery, and the transmission of an alarm it may be said that flashover is likely to occur within 8 minutes of firefighters receiving the alarm. However, it is worth noting that flashover at 1,100° to 1,200° F. may occur in a burning room within four minutes, depending upon its contents. At the point of flashover, the odds of survival for individuals inside the structure- both victim and rescuer- are virtually non-existent. The rapid response of an appropriate number of firefighters is therefore essential in initiating fire suppression and rescue operations.

FIGURE 1:



The response to medical emergencies such as a cardiac arrest (one of the most common types of medical emergencies) mirrors the time-temperature curve for fire growth. Cardiac arrest is one of the most time-critical medical emergencies that can be treated in the field. The highest hospital discharge rate has been achieved in patients in whom CPR was initiated within 4 minutes of arrest and advanced cardiac life support within 8 minutes. Fast emergency medical response is therefore essential not only in initiating fire suppression and rescue operations, but in improving survival rates of medical emergencies, as well.

FIGURE 2:



Human Resources vs. Mobile Resources

Units staffed with less than four firefighters also drain limited fire department resources, as an increased number of emergency units are required to be allocated to an incident in an effort to achieve appropriate on-scene staffing. The allocation of a greater number of mobile resources (i.e., fire engines and ladder trucks) to an incident in an effort to assemble an appropriate number of human resources (i.e., firefighters) stresses the emergency response system. This condition, a direct result of inadequate staffing, is exacerbated by current cross-staffing practices, and could be further compounded by response delays due to unit unavailability.

Innumerable studies validate similar findings: adequately staffed fire suppression companies responding in a timely fashion are able to initiate and perform emergency scene operations more safely, more effectively, and with greater success than under-staffed companies. And, as will be demonstrated throughout this analysis, adequately-staffed emergency units ensure the overall integrity of the response system by ensuring that sufficient resources, both mobile and human, are available to respond to multiple incidents occurring simultaneously. Insufficient resources, as exist currently in the Sylvania Township Fire Department, result in rapid resource depletion, stressing the emergency response system and increasing the risk of the loss of life and property.

The primary conclusion drawn from analysis of the Sylvania Township Fire Department's staffing and deployment arrangement is that the fire department does not fully meet compliance with existing national standards. Consequently, fire fighters and the community they protect are at an increased risk for the loss of life and property. Policies which seek to reduce staffing from existing levels would result in further non-compliance with professional standards, and would negatively impact the ability of emergency personnel to provide the safe and effective delivery of fire suppression and rescue services, increasing the risk posed to firefighters and civilians.

Specific recommendations begin on Page 15 of this report.

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RECOMMENDATIONS

RECOMMENDATIONS

Based on the findings discussed in this document, the following general recommendations are made:

- **It is the recommendation of this analysis that the Sylvania Township Fire Department staff all engine companies on a 24-hour basis with *at least four multi-role fire fighters cross-trained as emergency medical service (EMS) providers.***³ NFPA Standard 1710 recommends “fire companies, whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue... shall be staffed with a minimum of four on-duty personnel.”⁴ Recent studies indicate that four fire fighters are capable of performing engine company tasks 80% faster than a crew of three fire fighters.
- **It is the recommendation of this analysis that the Sylvania Township Fire Department staff at least one truck company on a 24-hour basis with *at least four multi-role fire fighters cross-trained as emergency medical service (EMS) providers.***⁵ NFPA Standard 1710 recommends “fire companies whose primary functions are to perform the variety of services associated with truck work, such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul and salvage work... shall [also] be staffed with a minimum of four on-duty personnel.”⁶ Recent studies indicate that four fire fighters are capable of performing truck company tasks 80% faster than a crew of three fire fighters.
- **It is the recommendation of this study that the practice of cross-staffing secondary units with engine company personnel be further examined to determine if there is a negative impact on operations.** Each STFD unit should deploy with a dedicated number of personnel, sufficient to support the safe and effective provision of fire suppression and rescue operations, disaster incident mitigation, and emergency medical interventions.

³ NFPA Standard 1710, §5.2.2.1.2 and §5.2.2.2.2, recommends that, “In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, these companies shall be staffed with a minimum of five or six on-duty members.”

⁴ NFPA 1710, §5.2.2.1 and §5.2.2.1.1

⁵ NFPA Standard 1710, §5.2.2.1.2 and §5.2.2.2.2, recommends that, “In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, these companies shall be staffed with a minimum of five or six on-duty members.”

⁶ NFPA 1710, §5.2.2.2 and §5.2.2.2.1

- **It is the recommendation of this study that a supervisory chief officer with a chief's aide deploy at all times.** NFPA Standard 1710, Section 5.2.1.2.5, states that, "supervisory chief officers shall have staff aides deployed to them for purposes of incident management and accountability at emergency incidents."
- **The Sylvania Township Fire Department should pursue efforts to enhance existing EMS capabilities by staffing all fire suppression apparatus with four multi-role fire fighters, at least two of which are certified in the delivery of Advanced Cardiac Life Support (ACLS).** Most experts agree that four responders- at least two trained in ACLS and two trained in basic life support- are the minimum required to provide ACLS to cardiac arrest victims. Recognizing this, the NFPA states that advanced life support (ALS) emergency response deployments "shall include a minimum of two members trained at the emergency medical technician- paramedic (EMT-P) level and two members trained at the emergency medical technician- basic (EMT-B) level arriving on scene within the established response time."⁷

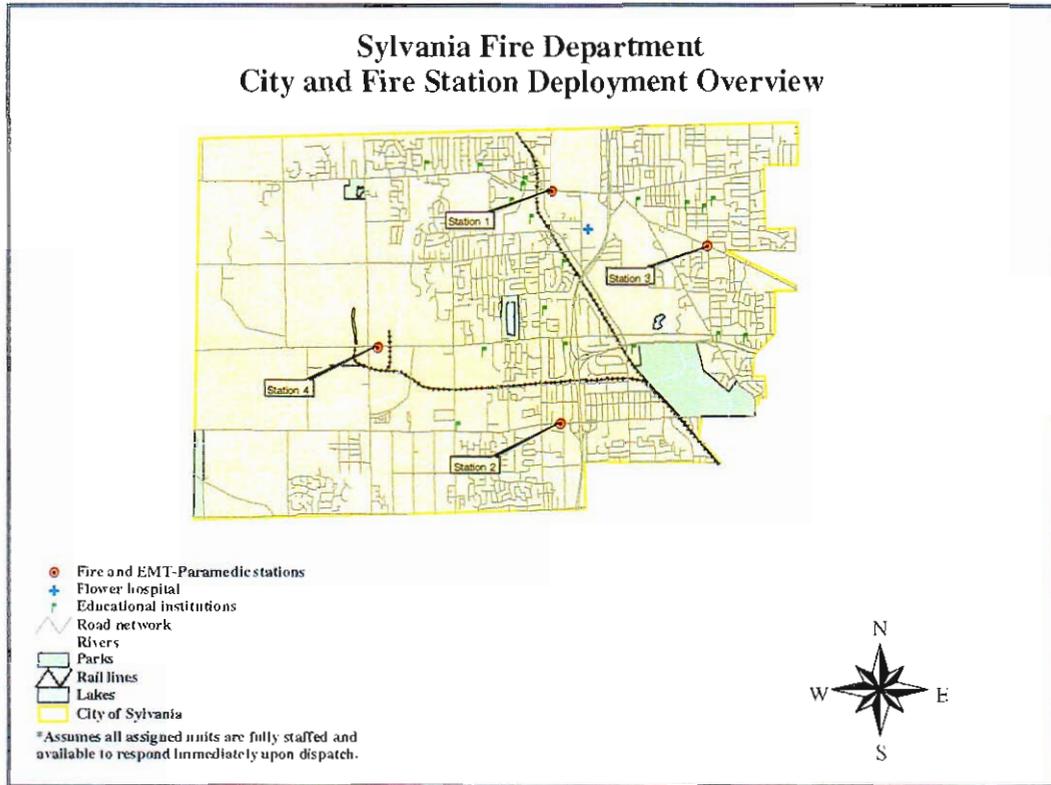
These measures will work to ensure that the Sylvania Township Fire Department evolves into compliance with established OSHA regulations and NFPA industry standards. Moreover, it promotes safer and more effective fire suppression and disaster incident mitigation, while expediting the delivery of essential emergency medical services to those residing in and visiting Sylvania Township.

⁷ NFPA 1710, §5.3.3.4.4

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FIRE DISTRICT OVERVIEW

MAP 1



BACKGROUND⁸

Sylvania is located in northwest Ohio, approximately 10 miles west of Toledo and 60 miles south of Detroit, Michigan. As of the 2000 census, Sylvania had a total population of approximately 48,000.

⁸ http://en.wikipedia.org/wiki/Sylvania%2C_Ohio

FIRE DEPARTMENT OVERVIEW

OVERVIEW OF FIRE DEPARTMENT OPERATIONS

The fire stations are staffed with a minimum number of personnel who respond on appropriate apparatus, determined by the type of call received. Station 1 is staffed with a minimum of five personnel, Station 2 is staffed with a minimum of four personnel, Station 3 is staffed with a minimum of two personnel, and Station 4 is staffed with a minimum of four personnel (two of whom staff the ambulance). Total shift staffing for fire suppression personnel is 15 personnel.

The fire service's wide range of capabilities enables fire department personnel to respond effectively to diverse incidents, including victim search and rescue, extrication, hazardous materials releases, and natural disasters, as well as patient stabilization and transport. Fire fighters are uniquely trained and equipped to effectively handle the most time critical emergency on scene. The members of the Sylvania Township Fire Department who staff these emergency response units provide fire suppression, disaster incident mitigation, technical rescue and essential emergency medical services to the community of Sylvania Township 24 hours a day, 7 days a week.

The primary emergency services provided by the Sylvania Township Fire Department include:

1. Fire Suppression
2. Fire Prevention & Fire Investigation
3. Emergency Medical Services
4. Hazardous Materials Response

Each operational program, as described below, has unique responsibilities that support the overall function of the Sylvania Township Fire Department.

FIRE SUPPRESSION

According to the U.S. Fire Administration, on average, fire departments in the United States respond to 2 million fire calls each year. On a per capita basis, the American fire problem is one of the worst in the industrial world. Each year, thousands of Americans die, tens of thousands more are injured, and property losses reach into the billions of dollars. The indirect costs of fire are equally as significant, and include temporary lodging, lost business, ~~medical~~ expenses, psychological damage, and more. The USFA puts this into context by **noting** that **"the annual losses from floods, hurricanes, tornadoes, earthquakes, and other natural disasters combined in the United States average just a fraction of the casualties from fires."**⁹

⁹ U.S. Fire Administration, Fire in the United States: 1992-2001, 13th Ed. (Washington, D.C.: October 2004)

< <http://www.usfa.fema.gov/downloads/pdf/publications/fa-286.pdf> >

TABLE 2:
 "THE U.S. FIRE PROBLEM"¹⁰

YEAR	TOTAL FIRES	CIVILIAN DEATHS	CIVILIAN INJURIES	FIREFIGHTER DEATHS	FIREFIGHTER INJURIES	DIRECT PROPERTY DAMAGE ¹¹
1980	2,988,000	6,505	30,200	138	98,070	\$6,254,000,000
1981	2,893,500	6,700	30,450	136	103,340	\$6,676,000,000
1982	2,538,000	6,020	30,525	127	98,150	\$6,432,000,000
1983	2,326,500	5,920	31,275	113	103,150	\$6,598,000,000
1984	2,343,000	5,240	28,125	119	102,300	\$6,707,000,000
1985	2,371,000	6,185	28,425	128	100,900	\$7,324,000,000
1986	2,271,500	5,850	26,825	120	96,450	\$6,709,000,000
1987	2,330,000	5,810	28,215	131	102,600	\$7,159,000,000
1988	2,436,500	6,215	30,800	136	102,900	\$8,352,000,000
1989	2,115,000	5,410	28,250	118	100,700	\$8,655,000,000
1990	2,019,000	5,195	28,600	107	100,300	\$7,818,000,000
1991	2,041,500	4,465	29,375	108	103,300	\$9,467,000,000
1992	1,964,500	4,730	28,700	75	97,700	\$8,295,000,000
1993	1,952,500	4,635	30,475	79	101,500	\$8,546,000,000
1994	2,054,500	4,275	27,250	104	95,400	\$8,151,000,000
1995	1,965,500	4,585	25,775	102	94,500	\$8,918,000,000
1996	1,975,000	4,990	25,550	99	87,150	\$9,406,000,000
1997	1,795,000	4,050	23,750	100	85,400	\$8,525,000,000
1998	1,755,500	4,035	23,100	93	87,500	\$8,629,000,000
1999	1,823,000	3,570	21,875	113	88,500	\$10,024,000,000
2000	1,708,000	4,045	22,350	103	84,550	\$11,207,000,000
2001	1,734,500	6,196 ¹²	21,100 ¹³	443 ¹⁴	82,250	\$44,023,000,000
2002	1,687,500	3,380	18,425	101	80,719	\$10,337,000,000
2003	1,584,500	3,925	18,125	112	78,750	\$12,327,000,000
2004	1,550,500	3,900	17,785	117 ¹⁵	N/A	\$9,794,000,000

In 2004, the latest year for which complete statistics are available, fires injured more than 17,700 people, and almost 4,000 Americans died in building fires. According to the NFPA statistics, "Every 33 seconds, a fire department responds to a fire somewhere in the nation. A fire occurs in a structure at the rate of one every 61 seconds, and in

¹⁰ NFPA survey, NFPA's Fire Incident Data Organization (FIDO).

¹¹ Direct property damage figures do not include indirect losses, like business interruption, and have not been adjusted for inflation.

¹² This includes 2,451 civilian deaths that occurred from the events of 9/11/01.

¹³ This includes 800 civilian injuries that occurred from the events of 9/11/01.

¹⁴ Includes 340 firefighters at the World Trade Center, September 11, 2001.

¹⁵ The Hometown Heroes Survivors Benefit Act of 2003 has resulted in an approximate 10% increase to the total number of firefighter fatalities counted for the annual USFA report, beginning with CY2004.

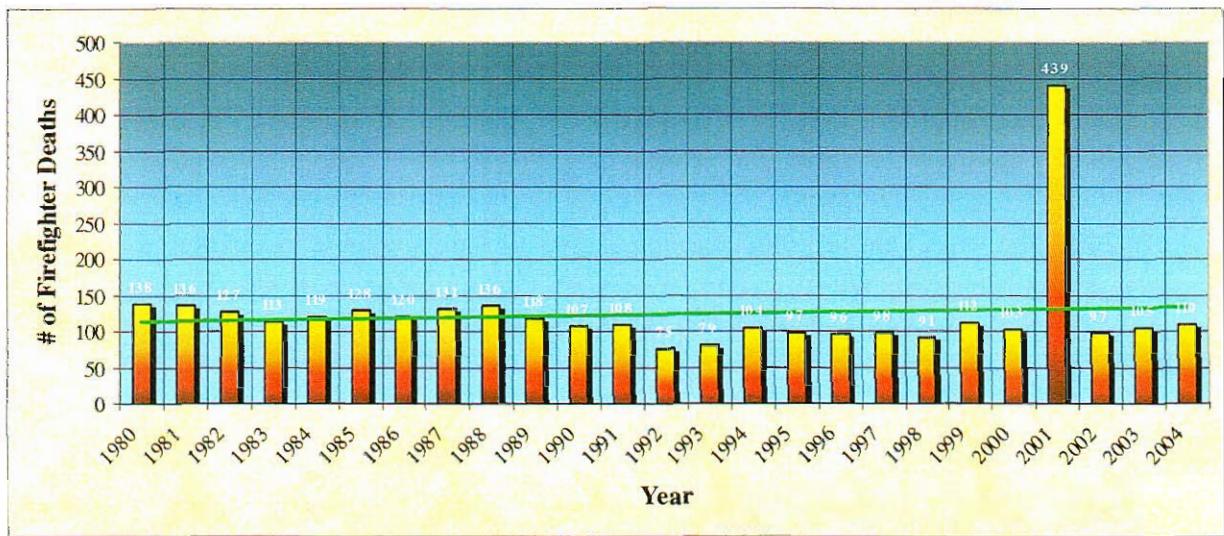
particular a residential fire occurs every 79 seconds. Fires occur in vehicles at the rate of 1 every 101 seconds, and there's a fire in an outside property every 42 seconds.”¹⁶

There occurred 17,785 civilian fire injuries in 2004, a decrease of 1.9% from the previous year. It should be noted, however, that this only an estimation. According to the NFPA, the figure for civilian injuries is on the low side due to under-reporting of civilian injuries to the fire service. Of these injuries, 14,175 occurred in residential properties, while 1,350 occurred in nonresidential structure fires. **Nationwide, there was a civilian fire injury every 37 minutes.**¹⁷ There occurred 3,900 civilian fire deaths in 2004, a decrease of .6% from a year ago. Of these, 3,225 (about 83% of all fire deaths) occurred in the home. An additional 80 civilians died in nonresidential structure fires. **Nationwide, there was a civilian fire death every 134 minutes.**¹⁸

Furthermore, each year in the United States and its protectorates, approximately 100 firefighters are killed while on-duty, and tens of thousands more are injured. According to the Federal Emergency Management Agency:

Despite a downward dip in the early 1990s, the level of firefighter fatalities is back up to the same levels experienced in the 1980s. If the firefighter deaths at the World Trade Center are included in the 2001 data, the number rises to 23.1 firefighter fatalities per 100,000 fires.¹⁹

FIGURE 3:
“ON-DUTY FIRE FIGHTER FATALITIES”
(1980 – 2004)



¹⁶ Michael J. Karter Jr., Fire Loss in the United States During 2003, National Fire Protection Association (Quincy, MA: October 2004), i.

¹⁷ Michael J. Karter Jr., Fire Loss in the United States During 2003, National Fire Protection Association (Quincy, MA: October 2004), ii.

¹⁸ Ibid.

¹⁹ Firefighter Fatalities in the United States in 2002, Federal Emergency Management Agency (Washington, D.C.: July, 2003), 8.

The Sylvania Township Fire Department's Fire Suppression Division is responsible for emergency medical services (EMS), fire suppression, rescue, hazardous conditions, and all other emergency and non-emergency calls for service. Primary operations units deploy from four fire houses strategically located throughout Sylvania.

To effectively respond to all emergencies occurring in Sylvania, all firefighters are trained in the latest fire suppression techniques, hazardous material recognition, medical first response and basic rescue techniques. A firefighter's base of knowledge must cover the areas of building construction, hydraulics, medical treatment, fire sprinkler design, safe driving practices, vehicle extrication techniques, and more. Each one of these areas is continually changing with new research and technology utilized in the public and private sectors. Rigorous, comprehensive, and continuous training enables the fire department to deliver ice and heavy rescue services.

FIRE PREVENTION, CODE ENFORCEMENT, PUBLIC EDUCATION & FIRE INVESTIGATION

Fire prevention is an important component in all aspects of fire department operations, including education, training, fire cause investigation and determination, support for the preparation of litigation pertaining to arson, and victim assistance. As noted in a recent study, "Some of the greatest value delivered by the U.S. fire service comes in activities that prevent fire and other emergencies from occurring or that moderate their severity when they do occur."²⁰

Fire prevention encompasses the performance of mandatory inspections at hospitals, child/adult care facilities, correctional institutions, hotels and motels, foster homes, preschool facilities, health spas and any businesses that, by decree of state law, require inspection. The fire department inspects all new construction, major remodels, and fire protection system revisions to ensure compliance with existing fire codes, the set of fire-safety regulations relating to construction, maintenance of buildings and the use of premises.

Additional fire prevention efforts pursued by the Sylvania Township Fire Department are aimed at reducing the factors which contribute to the cause and spread of fire. These efforts include consultations with the public, the issuance of permits, and public education programs targeted towards schoolchildren and seniors.

The Value and Purpose of Fire Inspection & Prevention Programs

Fire prevention consists of three elements: codes and code enforcement, fire prevention inspections, and fire education. The American Insurance Association lists the value and purpose of fire department inspections and fire prevention programs as follows:

²⁰ National Fire Protection Association/U.S. Fire Administration, A Needs Assessment of the U.S. Fire Service: A Cooperative Study Authorized by U.S. Public Law 106-238, (Washington, D.C.: December 2002), 49.

1. *To obtain proper life safety conditions.* Life safety inspections call for attention to the adequacy of exits, obstructions to rapid and orderly egress at time of fire, the adequacy of building evacuation plans, and the determination of the number of occupants permitted in a place of public assembly.

2. *To keep fires from starting.* Fire inspectors are specifically trained to identify fire hazards and can point out hazardous conditions and explain their seriousness to those who work among materials or situations which are hazardous.

3. *To keep fires from spreading.* Most people have little appreciation of the value that structural features (stair and elevator enclosures, fire doors and fire partitions) have in preventing the spread of fire. Inspectors educate owners and occupants in the value of proper maintenance of such structural members and have additional features installed, when necessary.

4. *To determine the adequacy and maintenance of fire protection equipment.* Private fire protection equipment such as extinguishers, standpipes, hose systems, automatic sprinkler systems, private water supplies, and alarm systems are installed to alert and protect building occupants and to aid in fire department operations. Under normal conditions this equipment is seldom used. Frequent inspections therefore are necessary to insure that the equipment will always be in proper working order.

5. *To pre-plan fire fighting procedures.* The "pre-fire plan" of a particular building calls for a knowledge of the building's fire hazards, fire protection equipment, construction features affecting the spread of fire, exposures, and exit facilities. Pre-planning is necessary for the protection of fire fighters as well as the occupants, and aids in efficient extinguishment. Fire department personnel conduct inspections and incident pre-planning on specific residential properties, including triplexes and larger dwellings, in addition to all commercial businesses in the community. Personnel are responsible for checking business licenses in all commercial occupancies during the course of their regular building inspection tours, and for checking permits for hazardous processes, special occupancies and any activity that may produce conditions hazardous to life or property. Regular inspections and pre-planning provide for the systematic inspection of all commercial occupancies, and help to reduce the loss of life and property due to fire and other hazards.

6. *To stimulate cooperation between the fire department and owners and occupants.* Inspectors provide valuable advice on problems of fire protection and prevention. Such advice fosters cooperation between the community and the fire department, and serves to increase the standing of the department within the community.

7. To assure compliance with fire codes, laws, and regulations. Inspectors are trained to recognize and correct violations, and are empowered to enforce fire code regulations.²¹

Arson Investigation

According to the United States Fire Administration, arson is the leading cause of fire in the United States. The general public typically views arson as an insurance concern – primarily a “paper” crime of fraud mostly affecting insurance companies. Each year, an estimated 267,000 fires are attributed to arson, which result in \$1.4 billion in property loss.

Arsonists, however, injure and kill both civilians and firefighters, causing over 2,000 injuries and nearly 500 deaths per year.²² Increasingly, set fires motivated by spite and revenge are used as weapons. Such fires tend to be more deadly because they are targeted specifically to inflict personal harm. According to the USFA, “firefighters are 3 times more likely to be injured or killed while responding to arson versus a non-arson fire.”²³

The Sylvania Township Fire Department pursues investigations should the fire cause be “undetermined” or “suspicious in origin,” “incendiary in origin,” or result in serious injury or death. The fire department coordinates with local law enforcement agencies to aggressively prosecute individuals who commit the crime of arson.

Public Education

The Sylvania Township Fire Department realizes that the most effective way to reduce the tragedies due to fire is to provide the proper fire safety tools to the community. The fire department strives to achieve this by conducting station tours to different groups within the community and by targeting education programs to children in local schools, where educational programs that teach children what to do in a fire situation. In addition, educational programs for school age children address the risks involved in playing with fire and the dangers of playing with matches and lighters,²⁴ as children are naturally curious about fire. The U.S. Fire Administration characterizes the problem of juvenile fire setting as follows:

²¹ James F. Casey, ed., Fire Prevention, Fire Chief's Handbook, 4th ed., (Saddle Brook, N.J., 1987). 530-532.

²² John R. Hall, Jr., Intentional Fires and Arson, National Fire Protection Association (Quincy, MA: March 2005).

<<http://www.nfpa.org/catalog/services/customer/downloadmemberonlypdf.asp?pdfname=OS%2Earson%2Epdf&src=nfpa>>

²³ USFA Press Release, United States Fire Administration Announces Arson Awareness Week Theme for May 5-11, 2002, (Washington, D.C.: May 3, 2002). < <http://www.usfa.fema.gov/inside-usfa/media/2002releases/02-042.shtm> >

²⁴ These efforts re part of NFPA's *Risk Watch*® curriculum, which incorporates elements from the earlier *Learn Not to Burn*® Curriculum.

Some studies suggest that interest in fire develops even before age three.²⁵ However, whether a child actually sets fires depends on a variety of factors, including their exposure to fire and the availability of fire supplies. Although some children who set fires are unaware of the potentially tragic consequences of their actions and are simply curious, others are fully aware of the ramifications of their actions and purposely intend to cause damage. Regardless of the motivations underlying juvenile fire-setting, it is a widespread problem that affects not only those children and their families, but all of society.²⁶

According to the NFPA, "In 2002, an estimated 13,900 child-playing structure fires were reported in the U.S., with associated losses of 210 civilian deaths, 1,250 civilian injuries, and \$339 million in direct damage."²⁷ For the ninth straight year, juvenile fire-setters accounted for at least half (50%) of those arrested for arson in 2003 (the last year for which data is available). The percentage of arson arrestees under age 10 (3% in 2003) is much higher than for any other crime the FBI tracks.²⁸ These facts underline the importance of community fire prevention programs, especially in the community's younger population.

EMERGENCY MEDICAL SERVICES

The Sylvania Township Fire Department also provides the citizens of and visitors to Sylvania Township with high-quality pre-hospital emergency medical care. Each apparatus in the fire department is minimally equipped with basic life support equipment, including automatic external defibrillators (AEDs) and oxygen. All firefighters in the Sylvania Township Fire Department are minimally certified as "Basic" level emergency medical technicians (EMT-Bs). Many of the firefighters have pursued advanced certification at the EMT-Paramedic level. The distinction between the basic level provider and more advanced level of EMS provision (i.e., Paramedic) is that only Paramedics trained in the delivery of advanced life support (ALS) are certified to provide advanced levels of care, such as drug and intravenous (I.V.) therapy. Fire fighters trained as EMT-P's are also trained and certified in the delivery of automatic external defibrillation and advanced airway management.

Therefore, an ALS engine company is dispatched on all life-threatening calls, generally arriving before ALS-capable ambulances. More than seventy-five percent of the fire department's calls for emergency service are responses to medical emergencies.

²⁵ D.J. Kolko and A.E. Kazdin, "A Conceptualization of Fire-setting in Children and Adolescents," *Journal of Abnormal Child Psychology*, 14, (1), 49-61, 1999.

²⁶ U.S. Fire Administration, "Children and Fire," *Topical Fire Research Series*, vol. 1, issue 6 (Washington, D.C.: December, 2001).

²⁷ John R. Hall, Jr., *Children Playing with Fire*, National Fire Protection Association, (Quincy, MA: March 2005), i.

<http://www.nfpa.org/itemDetail.asp?categoryID=281&itemID=15271&URL=Research%20%20Reports/Fact%20sheets/Home%20safety/Children%20playing%20with%20fire&cookie%5Ftest=1>

²⁸ John R. Hall, Jr., *Intentional Fires and Arson*, National Fire Protection Association (Quincy, MA: March 2005).

HAZARDOUS MATERIALS (HAZMAT) RESPONSE

The fire department is assigned to respond to all hazardous materials incidents in the jurisdiction that threaten life, property and the environment. Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.²⁹

A hazardous materials incident involves the intentional or accidental release of toxic, combustible, illegal or dangerous nuclear, biological or chemical agents into the environment. Hazardous materials incidents are generalized under three categories: Intentional Releases, Accidental Releases, and Domestic Terrorism.

Intentional Releases

The intentional release of hazardous materials occurs when "individuals and/or companies knowingly and illegally emit or dump toxic waste into landfills, waterways, the atmosphere and the environment in general. An example of such a release would be the illegal 'cooking' of methamphetamine in clandestine drug labs."³⁰ Drug labs present a serious health and safety issue to a community. A significant amount of time and resources are required to safely dismantle drug labs, decontaminate the area, and mitigate the incident.

Accidental Releases

Accidental releases are the most common type of hazardous materials incident that fire departments respond to. "These incidents include the release of all types of spills and leaks of toxic agents resulting from collisions, container breakage or failure, fires, floods and simple human error."³¹

Domestic Terrorism

Domestic terrorism involving hazardous materials can be defined as the intentional and malicious release of deadly biological or chemical agents into the general population. Terrorist activities that have occurred in past years— the bombing of Murrah Federal Building in Oklahoma City, the release of a deadly nerve gas (sarin) in a Tokyo subway system, terrorist attacks in New York City and Washington, DC, anthrax attacks along the eastern seaboard, and, most recently, the delivery of ricin to the U.S. Capitol— have prompted the expansion of hazardous materials preparedness and response capabilities, both nationally and internationally.

²⁹ Federal Emergency Management Agency, Backgrounder: Hazardous Materials, <<http://www.fema.gov/hazards/hazardousmaterials/hazmat.shtm>> Site visited April 15, 2004.

³⁰ Seattle Fire Department website: <http://www.ci.seattle.wa.us/fire/text/firefighting/operations/t_hazMat.htm>; site visited September 2, 2004.

³¹ Ibid.

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**COMMUNITY
RISK ASSESSMENT
COMPONENTS**

COMMUNITY RISK ASSESSMENT COMPONENTS³²

I. GEOSPATIAL CHARACTERISTICS:

✓ **Urban Growth Boundary:** The boundaries of the Sylvania Township Fire Department's response jurisdiction are as follows:

TABLE 3:

“JURISDICTIONAL BOUNDARIES OF THE SYLVANIA TOWNSHIP FIRE DEPARTMENT”

Northern Boundary	State of Michigan
Eastern Boundary	City of Toledo
Western Boundary	Richfield Township
Southern Boundary	City of Toledo, Holland, Spencer Township

There exists a large amount of undeveloped land in the western portions of the township. Development of this area has expanded significantly and includes the construction of over 2,000 homes. A reciprocal automatic aid agreement with the surrounding jurisdictions requires that the Sylvania Township Fire Department provide emergency response, including hazardous materials and technical rescue response when necessary, *and when Sylvania Township Fire Department personnel and equipment are available to fulfill such obligations.* Although NFPA 1710 allows for mutual/automatic aid agreements to comply with the time requirements for fire suppression and EMS units, the standard states that the assistance shall be **reciprocal**, and “shall address such issues as liability..., authorization to respond, **staffing, and equipment,**” and that “**procedures and training of personnel for all fire departments in mutual aid, automatic aid, and fire protection agreement plans shall be comprehensive to produce an effective fire force and to ensure uniform operations.**”³³

✓ **Construction Limits:** Historically, construction and expansion in the area have been subject to environmental regulations. In recent years, however, many of these regulations have been renegotiated or lifted altogether, clearing the way for the continued growth and expansion that is expected.

✓ **Infrastructure Limits:** Sylvania Township has an extensive water system grid that combines elevated storage tanks, large feeder mains, intermediate mains, and secondary service mains. Multiple pump stations assist in pressure regulation throughout the region.

✓ **Planned communities:** Include “village type developments” that include small, winding roads that dead end in cul-de-sacs. Emergency response vehicles are impeded by winding roads, narrow lanes, and cul-de-sacs. Such impedances may contribute to increased fire department response times.

³² As derived from “Oregon Fire Resource Deployment Standard Process”

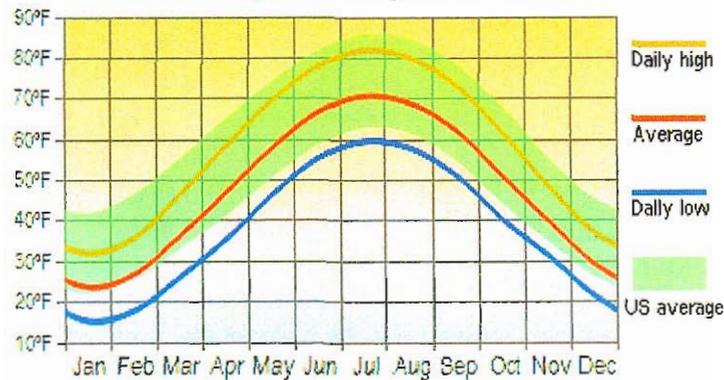
< <http://www.ofca.org/BestPractice/process.pdf> >

³³ NFPA 1710, §4.8.2

II. WEATHER

The following table illustrates average weather conditions in the Sylvania Township area.

TABLE 4:³⁴
"AVERAGE WEATHER CONDITIONS IN SYLVANIA TOWNSHIP"
Average Temperatures



- ✓ **Summer:** Sylvania Township frequently experiences high temperatures that can exceed 80° Fahrenheit.
- ✓ **Winter:** Winter weather will range between 15° and 20° Fahrenheit. Rain is limited to approximately 50 inches a year.
- ✓ **Challenges to typical response:** Fire fighters performing the strenuous activities associated with the range of emergency work are subject to weather conditions, which often exacerbate existing incident conditions. Extreme weather and related conditions affect the response capabilities of fire apparatus responding on emergency alarms, and have considerable physical impact on firefighters and equipment on the fireground. For example, elevated ambient temperatures are strongly correlated with elevated core temperatures in fire fighters, resulting in medical emergencies such as heat exhaustion, overexertion, and dehydration that incapacitate and increase the risk to fire fighters operating at the scene of an emergency.

The activities related to firefighting include extremely strenuous physical work. Analysis of the on-duty deaths of 110 firefighters across the United States in 2004 indicates that the largest cause category is stress or overexertion.

³⁴ Source: City-data.com website, < <http://www.city-data.com/city/Irvine-Ohio.html> > Site visited February 10, 2006.

TABLE 5:
 “FIREFIGHTER DEATHS BY CAUSE OF INJURY”^{35, 36}

CAUSE OF INJURY	DEATHS	PERCENTAGE
Stress/Overexertion	57	51.8%
Vehicle Collision	21	19.0%
Struck by	11	10.0%
Caught/Trapped	6	5.45%
Fall	5	4.54%
Collapse	5	4.54%
Lost	2	1.81%
Exposure	1	0.90%
Other	1	0.90%
Unknown	1	0.90%
Total	110	100% ³⁷

Stress continues to be the leading cause of fatal injury. Most firefighter deaths attributed to stress result from heart attacks. Of the 57 firefighter deaths in 2004, 52 were as a result of heart attack.

TABLE 6:
 “FIREFIGHTER DEATHS BY NATURE OF INJURY”^{38, 39}

NATURE OF INJURY	DEATHS	PERCENTAGE
Heart Attack	52	47.2%
Trauma	32	29.0%
Crushed	7	6.36%
Asphyxiation	5	4.54%
Burns	4	3.63%
CVA (stroke)	4	3.63%
Other	3	2.72%
Fall	1	0.90%
Drowning	1	0.90%
Unknown	1	0.90%
Total	110	100% ⁴⁰

³⁵ United States Fire Administration, “A Provisional Report: On-Duty Firefighter Fatalities in the United States – 01/01/2004 to 12/31/2004” < <http://www.usfa.fema.gov/downloads/pdf/04-fatality-summary.pdf> >.

³⁶ The term *cause* refers to the action, lack of action, or circumstances that resulted directly in the fatal injury.

³⁷ Totals do not equal 100% due to rounding.

³⁸ United States Fire Administration, “A Provisional Report: On-Duty Firefighter Fatalities in the United States – 01/01/2004 to 12/31/2004” < <http://www.usfa.fema.gov/downloads/pdf/04-fatality-summary.pdf> >.

³⁹ The term *nature* refers to the medical process by which death occurred and is often referred to as *cause of death* on death certificates and in autopsy reports.

⁴⁰ Totals do not equal 100% due to rounding.

IV. TRANSPORTATION NETWORKS⁴¹

✓ **Challenges:** The implications of impedances to response capabilities are significant, especially when fire growth and patient survivability are measured in seconds. The amount of train traffic on railways within the jurisdiction have important implications for the response of fire department units. For example, Sylvania's rail system may, at times, impede fire company response. Traffic congestion, however, remains the largest impediment to a swift response in Sylvania.

V. DEVELOPMENT AND POPULATION GROWTH

✓ **Current development and anticipated growth**

Sylvania Township population is relatively stable at 48,000 people. However, Sylvania is presently expanding and much of this growth will occur in the outlying areas that are underserved by fire and emergency services.

VI. RISK CATEGORIES:

URBAN RISK AREAS

This area is defined as the city/township areas and all commercial areas.

High-Risk Areas

The major factor used to determine a high-risk occupancy is the ability of the occupants to self-evacuate in an emergency. **High-risk, by definition for occupant safety, includes all hospitals, multi-story extended care facilities, and eldercare facilities as well as low income housing.** Another important, though often overlooked, factor is the construction of the building which, in most cases, is directly related to the age of the building. A third factor that places buildings in the high-risk category is their lack of fire protection systems, such as no sprinkler system or automatic alarms. Adding to the increased risk such conditions present, there is also the potential that many buildings that are designated as high risk have common walls and attics. Common openings are further cause to classify structures as high-risk as they increase the pathways fire is able to spread along. A fourth factor is the size of a structure and its use. Large structures may be classified as high risk due to the large number of people occupying the premises. Likewise, **major businesses within the jurisdiction may be classified as high risk due to the tax revenue they represent.** The loss of such a structure may have significant financial impact on a municipality's source of revenue.

High Risk Structures

High-risk structures are located throughout Sylvania Township. Occupancies in these "core areas" include low- and high-rise residential, business, light manufacturing, schools, and all high-rise office complexes. The older buildings pose a risk of structural failure as well as the risk of fire spread as described above.

⁴¹ Source: Wikipedia website <http://en.wikipedia.org/wiki/Orange_County,_Ohio#Transportation> Site visited February 10, 2006.

In terms of fire safety, a high rise building could be defined as a building taller than four stories or 75 feet, since fire department aerial ladders rarely reach any structures higher than that. Every year there are about 7,000 fires that break out in high rise office buildings causing deaths, injuries and millions of dollars in fire damage. The threat of high-rise fires is a fact of life in any metropolitan area. In 1986, a fire at the Alexis Nihon Plaza in Montreal, Canada, spread from the 10th floor to the 16th floor while more than 240 fire fighters worked 13 hours to bring the blaze under control.⁴² In 1988, it took 383 Los Angeles City fire fighters to control a fire that gutted 4 floors of the 62-story First Interstate Bank Building in 3½ hours.⁴³ And in 1991, 316 fire fighters participated in the suppression of a fire at One Meridian Plaza in Philadelphia, which destroyed 9 of the building's 38 floors over an 18-hour period before the fire was contained.⁴⁴ More recently, a fire at the 35-story Cook County Administration Building in Chicago on October 17, 2003, killed six office workers and injured eight others. According to the NFPA, "investigators are focusing on light fixtures in a 12th floor storage room as the cause of the blaze. Because the structure was built before 1975, the city's fire code does not require sprinklers above the ground floor."⁴⁵

In a high-rise building, fire fighters experience extreme difficulties in being able to control fire and smoke spread above the floor of fire origin. In such a structure, fire, smoke and hot gases spread rapidly to the floors above through the vertical elevator shafts, and horizontally through heating, ventilating, and air conditioning (HVAC) return ducts. As extreme fire conditions (e.g., flashover) develop, exterior windows would be expected to break out, allowing more air for combustion into the fire floor and creating a path for vertical, exterior flame spread.⁴⁶ In an environment such as this, it is difficult to deliver fire fighters and equipment to the upper floors as the products of combustion restrict fire fighters from advancing beyond the fire floor. In addition, fire fighters encounter myriad related conditions, including falling glass and debris, a lack of water, difficulty in ventilating the structure, and heavy smoke in the stairwells in which fire fighters are attempting to ascend while panicked occupants are attempting to evacuate.

High Risk Commercial/Industrial Conditions

The significant volumes of commercial goods and hazardous materials that are transported through the jurisdiction on both the railroads and the highways are also cause for high-risk designation. Certain businesses use and transport chemicals that if spilled or impinged upon with excessive heat can present a serious threat to community safety. An example of such chemicals includes chlorine and hydrogen sulfide for water treatment.

⁴² I. Stronach, "Montreal, \$100 Million High-Rise Blaze Thwarts Firefighters," Firehouse, Vol. 12, No. 6 (June 1987)

⁴³ T.J. Klem, "Three Major High-Rise Fires Reveal Protection Needs," NFPA Journal, Vol. 86, No. 5 (September/October 1992)

⁴⁴ Philadelphia Fire Department Incident Report, Philadelphia, PA (February 23, 1991)

⁴⁵ NFPA website, "High-rise building fires: Deadly Chicago office fire underscores need for evacuation training for occupants and building managers"

< <http://www.nfpa.org/Research/FireInvestigation/highrise/highrise.asp> > Site visited May 4, 2004.

⁴⁶ R.E. Sanders & D. Madzykowski, "Fire Service and Fire Science: A Winning Combination," NFPA Journal, Vol. 8, No.2 (March/April 1994)

Other high-risk facilities represent potential property loss with significant economic impact (directly and indirectly).

In addition to the high risk structures the major highways and freeways that support local, regional, and international commerce also warrant high risk classification. Millions of people travel these roadways every day, on which an untold number and type of hazardous materials are transported. The Chula Vista, CA fire department's website summarizes the risk posed by similar roads as follows:⁴⁷

Daily, large incidents occur where hazardous materials responders remove oil, acid or other hazardous materials that had been spilled on freeways. Transportation routes used to move commerce and people to and from work are temporarily closed. Such incidents can affect hundreds, if not thousands of people. The Seacliff train derailment in 1992 closed Highway 101, cutting off the main access from Ventura to Santa Barbara and forcing the evacuation of more than 300 residents of Seacliff, La Conchita, and Mussel Shores for six days. In February 1996, a five-car train carrying dangerous chemicals derailed in San Bernardino County's Cajon Pass and caught fire. About 100 patrons of two nearby gas stations, a motel and a restaurant were voluntarily evacuated.

High Risk Populations

Fire losses affect all groups and races, regardless of income, sex, or geographical location. But the severity of the problem is greater for some groups than it is for others. The U.S. Fire Administration summarizes the fire risk posed to specific groups as follows:

Individuals living in poverty face a greater risk of fire, death, and injury than the general population. African Americans and American Indians have significantly higher fire deaths per capita than the national average. African American victims also comprise a disproportionate share of total fire deaths (27%) although they comprise 13% of the total population. The risk of death in fire is higher among the very young (under age 15) and older adults (over 64). African Americans and American Indians in these age groups suffer extremely high loss rates. Older American Indians have a fire risk of over three times that of the general population. African American risk is six times higher.

In 1997, African American males under the age of 5 had a death rate of 68 per million population, and those over the age of 84 had a startling death rate of 434 per million population. Males suffer 50% more fatalities than women overall. Within the 20 to 50 age group, they are three times more likely to perish in a fire. It is believed that males in this age group are greater risk takers during fires, have a greater chance of being intoxicated, are greater users of flammable liquids, and are less safety conscious than women. Adults aged 20 to 44 are at highest risk of fire injuries.

⁴⁷ Sylvania Township Fire Department website, site visited September 7, 2004.

< http://www.chulavistaca.gov/City_Services/Public_Safety/Fire_Department/Safety/material_safety.asp >

At least 80 percent of all fire deaths occur in residences -- a fact which has important implications in Sylvania Township as residential construction continues to escalate. **Those at greatest risk are children under the age of 5 and senior citizens age 65 and older.**⁴⁸ **Nationally, children under the age of 10 account for an estimated 22 percent of all fire deaths.**⁴⁹ **The risk of fire death among seniors over 65 is more than double the average population. That risk triples for seniors over age 75, and is nearly 3½ times the average population for those over age 85.**⁵⁰

The Relationship Between Socioeconomics And the Incidence of Fire

Virtually every study of socioeconomic characteristics has shown that lower levels of income are either directly or indirectly tied to an increased risk of fire.⁵¹ To follow are some community characteristics that make low-income and poverty-stricken neighborhoods more vulnerable to the threat of fire than other neighborhoods.

Vacant & Abandoned Buildings

Vacant buildings and the hazards associated with them are a serious public safety issue, and represent a fire hazard for several reasons. First, they are more likely to experience severe fires than other types of buildings. **Studies have found that abandoned buildings are four times more likely than other structures to suffer the ravages of fire.**⁵² According to the International Association of Arson Investigators, three of every four fires in vacant buildings are officially classified as arson or suspicious. Second, fires in vacant structures often spread to occupied, insured properties either as a result of radiated heat or from floating embers. Third, the homeless and those seeking shelter from the elements or the public view may illegally access vacant buildings. The occupancy of abandoned or vacant buildings by the homeless during the winter months is especially dangerous because those seeking shelter often start indoor fires to keep warm, which may spread throughout the entire structure. A fire in an abandoned warehouse in 1987 killed one Detroit firefighter when it flashed over. The fire spread to an occupied paper and supply company, where two more firefighters died when a wall collapsed as they attempted to limit the fire's spread. Prior to the incident, the fire department had been called to extinguish several small fires in the vacant building, which had been started by vagrants for warmth.⁵³ To the extent that persons seeking refuge in abandoned buildings are under the influence of alcohol or drugs, there is an added risk that carelessness will result in fire.⁵⁴

⁴⁸ U.S. Fire Administration "Home Fire Safety" Fact Sheet
< <http://www.usfa.fema.gov/public/factsheets/facts.shtm> >; site visited March 23, 2004.

⁴⁹ Ibid.

⁵⁰ Ibid.

⁵¹ Socioeconomic Factors and the Incidence of Fire. Federal Emergency Management Agency, (Washington, D.C.: June 1997)

⁵² George Stemlied and Robert Burchell, "Fires in Abandoned Buildings," Fire Journal, vol. 67, no. 2 (1973), 28.

⁵³ International Association of Arson Investigators, "The National Vacant /Abandoned Building Fire Problem" factsheet < <http://www.interfire.org/pdf/ArsonFacts%202001.pdf> > Site visited May 5, 2004.

⁵⁴ Alison Norton, "Fire Risks of the Homeless." Fire Journal, vol. 83, no. 6, (November/December: 1989), 33.

NFPA statistics show that more fire fighters – in excess of 6,000 *per year* - are injured while operating at fires involving vacant or abandoned properties than in any other property classification. The injury rate per fire is 5.6 firefighter injuries per 100 special structure (including vacant buildings) fires compared to 1.9 injuries per fire at structure fires in general.⁵⁵ Firefighters are three times more likely to be injured fighting a fire in a vacant building than in an ordinary structure fire.⁵⁶ Uninhabited buildings that are not secure (open to unauthorized entry) have a very high probability of experiencing an intentionally set fire. Fires occurring in these buildings present a host of potentially life-threatening problems to fire fighters. Since the buildings are uninhabited, fires may develop for significant periods of time before they are detected and reported. The buildings may contain unprotected hazardous materials and fuel packages that would not be found in occupied buildings. The removal of equipment or structural components and deterioration due to age or weather can weaken the structure causing rapid failure early in a fire. Fire fighters may encounter open shafts, stairways, pits or holes in floors that would not be found in occupied structures. All of these factors contribute to the danger these structures pose to fire fighters operating in vacant or abandoned structures.⁵⁷

Neighborhood Decline

As noted by the U.S. Fire Administration, “building abandonment can become a self-fulfilling prophecy for a neighborhood. The presence of vacant buildings may discourage apartment building owners, who often do not live in the neighborhood, from investing in their buildings. The withdrawal of routine maintenance services soon seriously erodes the quality of the housing units in those buildings, increasing the risk of fire from inadequately maintained heating or electrical systems, for example. In the worst case scenario, an owner may use arson as a means to force tenants out of a building or to fraudulently collect on an insurance policy, thereby ‘cashing in’ his or her investment from the community. The end result is usually another vacant building in the neighborhood.”⁵⁸

Disinvestment from poor neighborhoods by private citizens is often followed by disinvestment by banks, mortgage companies, and insurance companies. Prior to legislation prohibiting “redlining,” many of these private firms could legally refuse home mortgages or home insurance to areas or neighborhoods deemed poor financial risks. This meant that property owners were discriminated against from gaining access to the capital necessary to invest in, maintain, and improve their properties. Building owners “were also discouraged from investing in their properties because, without a flow of mortgage money, they were unlikely to recover their investment through sale of the property. Thus, the lack of available credit has played an important role in the process of

⁵⁵ Donna B. Towerman and Thomas J. Towerman, Drug Related Fires in the United States – A Preliminary Report of Research on the Relationship between Drug Activity and Arson in Selected U.S. Cities, Virginia Commonwealth University, Department of Justice and Risk Administration (1993).

⁵⁶ Arson fact sheet < <http://www.interfire.org/pdf/PublicServiceAnnoc.%202001.pdf> > Site visited May 5, 2004.

⁵⁷ Interfire.org website < http://www.interfire.org/features/community_talk.asp > Site visited May 11, 2004.

⁵⁸ Socioeconomic Factors and the Incidence of Fire, Federal Emergency Management Agency, (Washington, D.C.: June 1997)

building abandonment and neighborhood decline in poor neighborhoods. Abandonment, in turn, increases the incidence of fires caused by arson or human carelessness in those neighborhoods.”⁵⁹

Arson

Arson is a significant cause of fires and fire casualties in many metropolitan areas. A 1981 article in the fire service industry magazine *Fire Journal* addressed the relevance of income for understanding how different neighborhoods are affected by arson.⁶⁰ The research indicated that the relationship between income and “incendiary” or “suspicious” fires was the most significant. Statistical (regression) analysis suggested that **those census tracts with the lowest median income experienced about 100 to 120 incendiary or suspicious fires per 100,000 population.** In contrast, census tracts with only a slightly higher median income experienced about 55 to 70 incendiary or suspicious fires per 100,000 population. **Comparison of the poorest group of census tracts to the group of census tracts with the highest median income indicated an “incendiary” or “suspicious” fire rate over 14 times that of the wealthier census tracts.**

Medium Risk

With the exception of occupancies that cater exclusively to the elderly and invalid, most apartment complexes and light commercial buildings are designated as medium risk because of the potential for victim rescue. Medium risk would also include smaller buildings, mainly one or two stories with adequate separation from adjacent buildings, or larger structures with adequate separation and fixed fire protection systems. Included in this category are the large commercial warehouses, such as Home Depot, Lowe’s, Costco, Wal-Mart, and strip malls, assuming they are fitted with sprinklers. **The strip malls located throughout Sylvania Township, and which are, for the most part, not fitted with fire sprinklers, are classified as high hazard occupancies.**

Low Risk

Due to hidden dangers, unpredictable conditions, and circumstances beyond human control, it is difficult to deem any building as low risk. However, residential construction is the least dangerous from a fire spread perspective. Therefore, low risk areas include residential areas within the response jurisdiction. Nonetheless, it is important to understand that, from a fire suppression perspective, the larger the home the larger the potential fuel load. The larger the fuel load, the larger the fire. The larger the fire, the more resources will be required to engage in safe and effective fire suppression operations. In addition, the increased number of rooms per household may be indicative of a greater number of occupants.

Although residential construction presents the lowest risk to firefighters from a fire spread perspective, large homes and the potential for them to be occupied by a number of occupants presents a challenge to emergency personnel. The fire department must be

⁵⁹ Ibid.

⁶⁰ Paul Gunther, “Fire-Cause Patterns for Different Socioeconomic Neighborhoods in Toledo, OH.” *Fire Journal*, vol. 75, no. 3 (May 1981): 54-58.

able to assemble an appropriate number of resources at the incident scene within critical time frames, before the fire spreads beyond the point of control, to initiate safe and effective fire suppression and rescue operations. The greater the intensity and size of the fire, the more resources will be required. Similarly, the larger the home, the greater the odds of multiple fire victims in need of rescue by fire department personnel. **Therefore, the fire department should be staffed and deploy with resources adequate to mitigate emergencies within its response jurisdiction, relative to the hazards posed.**

SUBURBAN RISK AREAS

This area is defined as the area beyond the urbanized area.

High-Risk Areas

High-risk areas in the suburban area are similar to the urban area. High-risk areas include numerous, large three-level condominiums, some of which consist of 200 or more units; and houses located on canyon ridges, in the wildland-urban interface.

Medium Risk

Medium risk areas include apartment buildings, mobile home parks, and grocery store strip malls with fixed sprinkler systems.

Low Risk

Low risk areas beyond the urbanized area are limited to residential properties.

FRONTIER RISK AREAS

This area is defined as the wildland areas in the State Responsibility Areas

Low Risk

Frontier risk areas include the unincorporated areas of Sylvania Township. These wildland areas would require automatic aide response, but have not historically had a large impact on Sylvania Township.

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GIS ANALYSIS METHODOLOGY

METHODOLOGY

OVERVIEW

Once the domain of cartographers, computer-assisted drawing technicians, mainframes, and workstations, geographic information systems (GIS) mapping has migrated to the desktop. With ArcView, a user can create intelligent, dynamic maps, using data from virtually any source and across most popular computing platforms to display information that has a geographic aspect. The ArcView GIS software, a product of ESRI, Inc., allows desktop users to work simultaneously with maps, database tables, charts, and graphics, and is an effective tool for conducting computerized system analysis and management.

Geographic information systems are used by government agencies, nonprofit organizations, and businesses to describe and analyze the physical world. Simply put, a GIS combines layers of information about a geographic region to give you a better understanding of that region. Layers of information can be combined depending on the purpose of the study, forming a computer model of a jurisdiction on which many types of analysis can be made. In the public safety sector, and for the purposes of this analysis, GIS software uses geography and computer-generated maps as an interface for integrating and accessing location-based information. For example, the location of fire stations can be layered on a jurisdiction's geography including the road network, water features, building footprints, or any other feature that has been digitized and assigned a location. In this manner, GIS allows public safety personnel to effectively plan for emergency response, determine mitigation priorities, analyze historical events, and predict future events. GIS can also be used to provide critical information to emergency responders upon dispatch or while en route to an incident to assist in tactical planning.

NFPA 1710 AND GIS ANALYSIS

While modern science has been well integrated into many areas of emergency response, it has been glaringly absent in the area of fire-rescue organization and deployment. Fire growth and behavior are scientifically measurable, as are the expected outcomes associated with untreated cardiac arrest, and the specific resource requirements to control fires, reduce fire-related injuries, and prevent deaths. Despite these facts, many communities maintain an *ad hoc* approach fire-rescue organization and deployment.

The Role of the National Fire Protection Association (NFPA)

The mission of the NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training, and education, and recommends that all fire departments establish a policy of providing and operating with "the highest possible levels of safety and health for all members."⁶¹

The recommendations and analysis contained in this study are guided by NFPA standards for two important reasons. First, NFPA standards provide fire departments with a measure of "interoperability." Interoperability enables fire service personnel in the chain

⁶¹ NFPA Mission Statement

of command to speak the same language and conform to the same operational guidelines. NFPA standards provide the fire service with a common language, common definitions, and common requirements that are meant to foster the *safe* and *effective* delivery of fire suppression, rescue, EMS, and special services to a given community. Second, NFPA standards are formulated via consensus development. Development of NFPA standards are the result of scientific research, empirical studies, and consensus among technical experts and the organizations they are affiliated with. Combined, these factors legitimate NFPA standards as the yardstick by which fire departments are measured internationally.

Examples of some NFPA standards include:

- NFPA 1404, *Standard for Fire Service Respiratory Protection Training*, which specifies the minimum requirements for a fire service respiratory protection program (NFPA 1989). This standard concentrates on the training component of a respiratory protection program, including the evolution of respiratory protection training, current equipment, and recent fire experience.⁶²
- NFPA 1561, *Standard on Fire Department Incident Management System*, which provides minimum criteria for emergency incident management. Such incident management systems are intended to provide structure, coordination, and effectiveness during emergency incidents to enhance safety and health of fire department members and other persons involved.
- NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, which specifies minimum requirements for the design, performance, testing, and certification of the elements of the protective ensemble including coats, trousers, helmets, gloves, footwear, and interface items for protection from the hazards of structural fire fighting operations.
- NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service*, which specifies minimum requirements for the design, performance, testing, and certification of self-contained breathing apparatus (SCBA) respirators used by the fire service. Requirements are in addition to U.S. OSHA respirator certification under 42 CFR 84.
- NFPA 1982, *Standard on Personal Alert Safety Systems*, which specifies minimum requirements for the design, performance, testing, and certification of personal alert safety systems (PASS) that monitor a fire fighter's motion and automatically emit an alarm if a fire fighter becomes incapacitated.

On account of their emphasis on safe and effective fire suppression and rescue operations, the two standards that will be referenced most often throughout this analysis are NFPA 1500 and NFPA 1710. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, specifies (1) the minimum requirements for a fire department's occupational safety and health program, and (2) the safety procedures

⁶² Reference NFPA 1500 for requirements concerning use of SCBA in fire fighting operations and NFPA 1852 for the selection, care, and maintenance of SCBA, and respiratory breathing air quality content

for members involved in rescue, fire suppression, and related activities. This standard addresses organization, training and education, vehicles, equipment, protective clothing, emergency operations, facilities, medical and physical criteria, and member assistance programs. NFPA 1500 recommends that a **“minimum acceptable fire company staffing level should be four members responding on or arriving with each engine and each ladder company responding to any type of fire.”**

The purpose of NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*, is “to specify the minimum criteria addressing the effectiveness and efficiency of the career public fire suppression operations, emergency medical service, and special operations delivery in protecting the public of the jurisdiction and the occupational safety and health of fire department employees.”⁶³ The standard recommends “fire companies, whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue... shall be staffed with a **minimum of four on-duty personnel**.⁶⁴ Fire companies whose primary functions are to perform the variety of services associated with truck work, such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul and salvage work... shall [also] be staffed with a **minimum of four on-duty personnel**.⁶⁵ In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, these companies shall be staffed with a minimum of five or six on-duty members.”⁶⁶

The NFPA 1710 Standard is important because it applies the documented and proven science of fire behavior and emergency medicine to the basic resource requirements for effective fire and emergency service deployment. Coupled with GIS analysis, this application allows a community to determine if the resources allocated for the different types of fires, emergencies, medical calls and other incidents are sufficient to effectively control the incident and protect lives and property. NFPA 1710 sets forth in concise terms the recommended resource requirements for fires, emergencies and other incidents. The standard requires, and GIS analysis facilitates, the emergency response organization to evaluate its performance and report it to the authority having jurisdiction. The approach embodied by NFPA 1710, and supported by GIS analysis, makes communities and fire fighters safer, and responders more effective efficient.

NFPA 1710 and the Law

NFPA standards protect communities against liability. In the United States, by law-specifically, the General Duties clause of the Occupational Safety and Health Administration Act- if Congress fails to pass legislation setting industry safety standards, municipal governments nationwide are mandated to follow standards promulgated by an industry-wide trade group, such as the NFPA. Many NFPA standards have been enacted

⁶³ NFPA 1710, § 1.2.1

⁶⁴ NFPA 1710, § 5.2.2.1 and § 5.2.2.1.1

⁶⁵ NFPA 1710, § 5.2.2.2 and § 5.2.2.2.1

⁶⁶ NFPA 1710, § 5.2.2.1.2 and § 5.2.2.2.2

into law at the federal, state, provincial and local levels. Although jurisdictions having authority are not required to automatically enact a particular NFPA standard, courts frequently rely upon NFPA standards to determine the "industry standard" for fire protection and safety measures. Judicial reliance on NFPA doctrines is most frequently found in common law negligence claims. To prevail in a common law negligence claim, the plaintiff must show that the defendant owed a duty of care to the plaintiff, that the defendant breached this duty of care and that this breach was the cause of the plaintiff's injury. Hence, the NFPA 1710 standard could be found highly relevant to the question of whether a jurisdiction has negligently failed to provide adequate fire or emergency medical protection to an individual harmed in a fire or medical emergency. Furthermore, any local government that fails to follow the NFPA 1710 Standard is subject to liability claims in the event of fire fighter injuries or death.

ARCVIEW 3.2a AND NETWORK ANALYST GEOGRAPHIC INFORMATION SYSTEMS

ArcView's Network Analyst is an extension, or software tool, that manipulates the network data incorporated into a GIS. Networks are interconnected line features, visually represented as roads, rivers, pipelines, or trails. From this data, it is possible to determine the best route between two spots or amongst several points, calculate travel cost in distance or time, find the closest facility to an address, or model service areas.

Travel speed is based on road type, as assigned by the U.S. Census Bureau. The ArcView 3.2a software Network Analyst extension uses the TeleAtlas Dynamap®/Transportation v7.2™ street database, which offers the most accurate and comprehensive U.S. street and address data available today.

ASSIGNED ROAD SPEEDS

A great deal of geographic street data originates from the US Census Bureau TIGER files. One of the attributes extracted from these files is the Census Feature Classification Code (CFCC), which describes street characteristics, among others. The CFCC is a three-character code: the first character is a letter describing the feature class; the second character is a number describing the major category; and the third character is a number describing the minor category. Based on the CFCC codes, a GIS user employing the ArcView Network Analyst extension is able to calculate the driving time for each line segment in a road network (i.e., the roads in a city, county, or other jurisdiction).

Primary Highways *With Limited Access* – 55 mph

Interstate highways and some toll highways are in this category (A1) and are distinguished by the presence of interchanges. These highways are accessed by way of ramps and have multiple lanes of traffic. The opposing traffic lanes are divided by a median strip.

- A11 Interstate highway, un-separated
- A12 Interstate highway, un-separated, in tunnel
- A13 Interstate highway, un-separated, under-passing
- A14 Interstate highway, un-separated, with rail line in center
- A15 Interstate highway, separated

- A16 Interstate highway, separated, in tunnel
- A17 Interstate highway, separated, under-passing
- A18 Interstate highway, separated, with rail line in center

Primary Roads *Without* Limited Access – 45 mph

This category (A2) includes nationally and regionally important highways that do not have limited access as required by category A1. It consists mainly of US highways, but may include some state highways and county highways that connect cities and larger towns. A road in this category must be hard-surface (concrete or asphalt). It has intersections with other roads, may be divided or undivided, and have multi-lane or single-lane characteristics.

- A21 US highways, un-separated
- A22 US highways, un-separated, in tunnel
- A23 US highways, un-separated, under-passing
- A24 US highways, un-separated, with rail line in center
- A25 US highways, separated
- A26 US highways, separated, in tunnel
- A27 US highways, separated, under-passing
- A28 US highways, separated, with rail line in center

Secondary and Connecting Roads – 35 mph

This category (A3) includes mostly state highways, but may include some county highways that connect smaller towns, subdivisions, and neighborhoods. The roads in this category generally are smaller than roads in Category A2, must be hard-surface, and are usually undivided with single-lane characteristics. These roads usually have a local name along with a route number and intersect with many other roads and driveways.

- A31 State highways, un-separated
- A32 State highways, un-separated, in tunnel
- A33 State highways, un-separated, under-passing
- A34 State highways, un-separated, with rail line in center
- A35 State highways, separated
- A36 State highways, separated, in tunnel
- A37 State and county highways, separated, under-passing
- A38 State and county highway, separated, with rail line in center

Local, Neighborhood, and Rural Roads – 25 mph

A road in this category (A4) is used for local traffic and usually has a single lane of traffic in each direction. In an urban area, this is a neighborhood road and street that is not a thoroughfare belonging in categories A2 or A3. In a rural area, this is a short-distance road connecting the smallest towns; the road may or may not have a state or county route number. Scenic park roads, unimproved or unpaved roads, and industrial roads are included in this category. Most roads in the Nation are classified as A4 roads.

- A41 Local street, un-separated
- A42 Local street, un-separated, in tunnel
- A43 Local street, un-separated, under-passing
- A44 Local street, un-separated, with rail line in center
- A45 Local street, separated
- A46 Local street, separated, in tunnel
- A47 Local street, separated, under-passing
- A48 Local street, separated, with rail line in center

Vehicular Trails – 1 mph

A road in this category (A5) is usable only by four-wheel drive vehicles, is usually a one-lane dirt trail, and is found almost exclusively in very rural areas. Sometimes the road is called a fire road or logging road and may include an abandoned railroad grade where the tracks have been removed. Minor, unpaved roads usable by ordinary cars and trucks belong in category A4, not A5.

- A51 Vehicular trail, 4WD only, un-separated
- A52 Vehicular trail, 4WD only, un-separated, in tunnel
- A53 Vehicular trail, 4WD only, un-separated, under-passing

Road with Special Characteristics – 20 mph (or less)*

This category (A6) includes roads, portions of a road, intersections of a road, or the ends of a road that are parts of the vehicular highway system and have separately identifiable characteristics.

- A61 Cul-de-sac
- A62 Traffic circle, roundabout
- A63 Access ramp
- A64* Service drive on highway (5 mph)

Road as Other Thoroughfare – 5 mph (or less)*

A road in this category (A7) is not part of the vehicular highway system. It is used by bicyclists or pedestrians, and is typically inaccessible to mainstream motor traffic except for private-owner and service vehicles. This category includes foot and hiking trails located on park and forestland, as well as stairs or walkways that follow a road right-of-way and have names similar to road names.

- A71* Walkway or trail for pedestrians (1 mph)
- A72* Stairway for pedestrians (1 mph)
- A73 Alley, road for service vehicles
- A74 Driveway, service, or access road, usually privately owned

ASSUMPTIONS

Several key assumptions must be addressed prior to drawing any conclusions from this analysis:

- Modeled travel speeds are based on reasonable and prudent road speeds, as defined by the U.S. Census Bureau. **Actual response speeds may be slower, and the associated travel times greater, with any traffic congestion or any other unpredictable impedances including, but not limited to:**

✓ **Traffic Incidents:** collisions and vehicle breakdowns causing lane blockages and driver distractions.

✓ **Work Zones:** construction and maintenance activity that can cause added travel time in locations and times where congestion is not normally present.

✓ *Weather*: reduced visibility, road surface problems and uncertain waiting conditions result in extra travel time and altered trip patterns.

✓ *Demand Changes*: traffic volume varies from hour-to-hour and day-to-day and this causes travel time, crowding and congestion patterns to disappear or to significantly worsen for no apparent reason in some locations.

✓ *Special Events*: an identifiable case of demand changes where the volume and pattern of the change can frequently be predicted or anticipated.

✓ *Traffic Control Devices*: poorly timed or inoperable traffic signals, drawbridges, railroad grade crossing signals or traveler information systems contribute to irregularities in travel time.

✓ *Inadequate Road or Transit Capacity*: the interaction of capacity problems with the aforementioned sources causes travel time to expand much faster than supply.⁶⁷

- In addition, it is reasonable to suggest that because larger emergency vehicles are generally more cumbersome and require greater skill to maneuver, their response may be also be negatively affected by their weight, size, and, in some cases, inability to travel narrow surface streets.
- **If any unit is unavailable for any reason (e.g., simultaneous emergencies, scheduled training, or as a result of mutual aid obligations) travel times will be greater as more distant apparatus will be required to respond to an emergency with potential delays.**
- **The time from arrival of the apparatus to the onset of interior fire suppression operations and/or initiation of critical emergency medical interventions by that crew (access interval) must be considered when analyzing response system capabilities.** In reality, the access interval is dependent upon factors including, but not limited to, distance from the apparatus to the task location and the elevation of the fire or EMS location (i.e., high rise structures). Locked doors or security bars which must be breached also act as impediments to access. Impediments like these may add to the delay between the discovery of a fire and implementation of an actual fire attack, and to the delay between the discovery of an individual in medical distress and the initiation of emergency medical care.
- Input information including station locations, apparatus deployment, incident data, and staffing minimums, were provided by the Sylvania Township Fire Fighter's Association, IAFF Local 2243. The report that

⁶⁷ David Schrank and Tim Lomax, The 2003 Urban Mobility Report, (Texas Transportation Institute, Texas A&M University: September 2003).

follows is a "best estimate" response time model of those roads expected to receive coverage by the Sylvania Township Fire Department.

- **The scenarios depicted herein assume all apparatus are staffed and available to respond from their assigned stations immediately upon dispatch, as indicated in the following tables.**

**Table 7:
"Existing Station Locations and Deployment Configuration"**

Station	Address	Apparatus	Staffing
Station 1	6633 Monroe St.	Engine 1 Rescue 1 Prevention 1 Chief 1 Deputy 1 Truck 1	3-Firefighters ⁶⁸ 2-FF/Paramedics Currently Vacant 1-Firefighter ⁶⁹ 2-Firefighters ⁷⁰ Paid-on-call
Station 2	6448 Central	Engine 2 Rescue 2	2-Firefighters 1-Officer 1-FF/Paramedic
Station 3	5501 Monroe St.	Rescue 3 (ALS) Quint 3	1-FF/Paramedic 1-FF/Shift Leader Not-staffed
Station 4	8210 Sylvania Ave.	Engine 4 Medic 4	1-Fire Officer 1 FF/Paramedic 2-FF/Paramedics
		Min/Max Staffing	15/18 Firefighter-EMT's/shift

⁶⁸ One of two personnel assigned to unit is assigned to fire prevention/inspections from 0900-1630 M-F.

⁶⁹ Daily M-F with rotating call on weekends.

⁷⁰ Daily M-F with rotating call on weekends.

**IDENTIFICATION OF
EXISTING EMERGENCY
RESOURCE RESPONSE
CAPABILITIES**

SUMMARY

The following series of maps indicate the existing response capabilities of Sylvania Township Fire Department emergency apparatus when responding from existing station locations (reference p. 52). **The indicated response capabilities for individual units, and the resources designated to respond as part of an alarm assignment, assume that all units and the personnel assigned to staff and respond these units are available to respond immediately upon dispatch.**

Understanding the several components of an emergency response is an important part of understanding how to interpret the following series of maps. To follow are some key terms that the reader should understand.

- **Alarm Time** is defined as “The point of receipt of the emergency alarm at the public safety answering point to the point where sufficient information is known to the dispatcher to deploy applicable units to the emergency.”⁷¹
- **Dispatch Time**, also referred to as *call processing time*, is “The point of receipt of the emergency alarm at the public safety answering point to the point where sufficient information is known to the dispatcher and applicable units are notified of the emergency.”⁷²
- **Turnout Time** is “The time beginning when units acknowledge notification of the emergency to the beginning point of response time.”⁷³ Per NFPA 1710, turnout time should not exceed one minute.⁷⁴
- **Response Time** is defined as “The time that begins when units are en route to the emergency incident and ends when units arrive at the scene.”⁷⁵

It is critical to understand that the response capabilities indicated in the following series of maps reflect **response time only**. That is to say, the following series of maps indicate how far an emergency vehicle traveling on the existing road network in Sylvania Township can travel within 4 and 8 minutes. **Dispatch time and turnout time are not considered as part of this analysis, and may add as much as two minutes to overall call-to-arrival time. Actual response speeds may be slower, and the associated travel times greater, with any traffic congestion or any other unpredictable impedances.**

⁷¹ NFPA 1710, §3.3.42.1

⁷² NFPA 1710, §3.3.42.3

⁷³ NFPA 1710, §3.3.42.5

⁷⁴ NFPA 1710, §4.1.2.1.1

⁷⁵ NFPA 1710, §3.3.42.4

If any unit is unavailable for any reason, travel times will be greater as more distant apparatus will be required to respond, with potential delays. Impediments to access may add to the delay between the discovery of a fire and implementation of an actual fire attack (resulting in *increased* fire growth), and to the delay between the discovery of an individual in medical distress and the initiation of emergency medical care (resulting in *decreased* patient survivability).

Additionally, the computer model is unable to accurately portray the response of "callback" (or volunteer) fire fighters responding in private vehicles from their residence or place of business to an incident scene. Inasmuch as "callback" personnel are not available on a regular basis to respond emergency units immediately upon dispatch- and it is impossible to quantify the amount of time it takes for those individuals to respond from their different locations to the station, staff an apparatus, and respond that unit to a given location- the GIS software is also unable to accurately display the predicted response capabilities of apparatus deploying from a fire station when staffed with "callback" or volunteer personnel. As such, the unpredictable response capabilities of units staffed by off-duty personnel responding as "callback" fire fighters, or those units staffed by volunteer fire fighters, are omitted from this analysis.

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SYLVANIA CITY/TOWNSHIP

IDENTIFICATION OF EXISTING EMERGENCY RESOURCE RESPONSE CAPABILITIES

MAP 2



Map 2 indicates existing 4-minute response capabilities for the STFD chief officers. Currently, the fire departments' chief officers are capable of responding to **35.1% of all roads located within the jurisdiction in 4 minutes or less**, assuming the units are available to respond immediately upon dispatch. The STFD staffs the chief officers' positions from Monday thru Friday, between the hours of 0800-1630. It is the recommendation of this report that a chief officer be deployed at all times to ensure proper incident oversight and management.

Fire department emergency operations are inherently dangerous. The early moments of a fire department's arrival at an emergency scene are often very confusing, increasing the potential for ineffective operations and increasing the risk to firefighters and civilians. In order to efficiently and effectively deliver emergency services, and to do so in a fashion that minimizes the threats posed to firefighters and civilians, actions must be coordinated by an incident commander (IC) not directly involved in the provision of emergency services. Firefighters arriving at the scene of an emergency from disparate locations, at different times, and trained to perform different emergency tasks require strong, proactive, and immediately-recognizable leadership.

During incidents involving multiple jurisdictions or agencies, the IC not only coordinates the efforts of many jurisdictions, but provides for and assures joint decisions on objectives, strategies, plans, priorities, and public communications. In short, a

standardized approach to emergency or fireground management, under a unified command, ensures a consistent approach to decision-making, incident priorities, and life-safety for responders and the public.

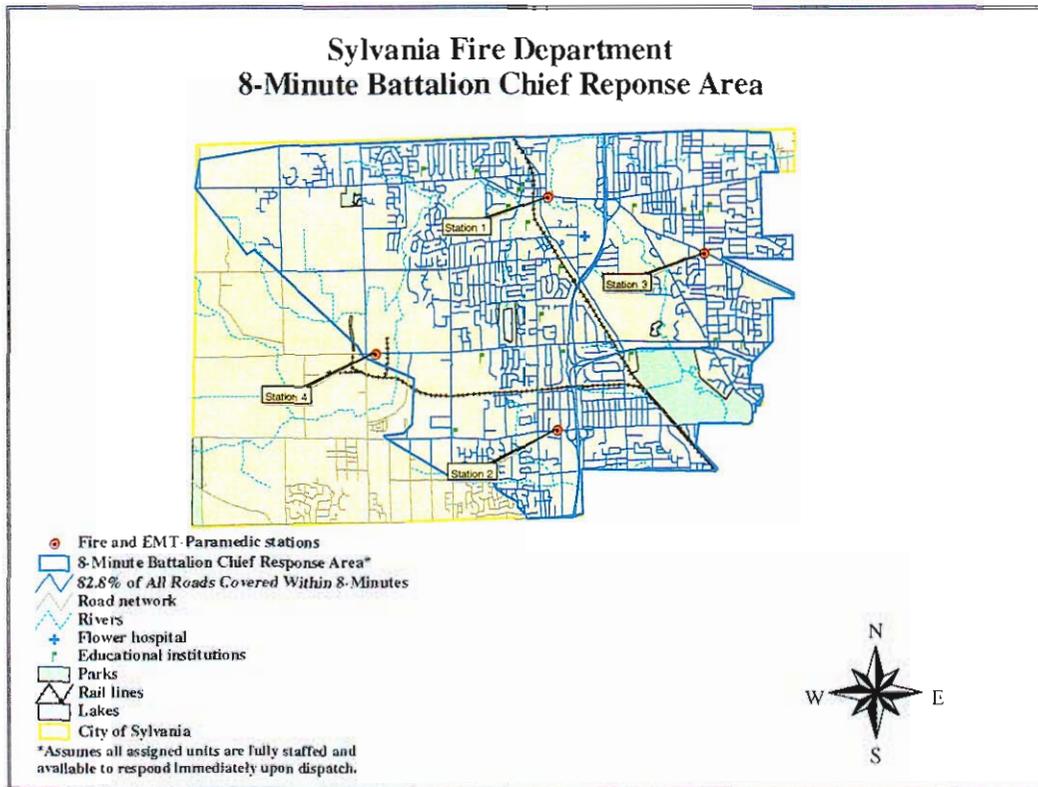
The importance of an Incident Commander (usually a supervisory officer) at an incident scene is reflected in NFPA 1710:

An incident management system shall be provided in accordance with NFPA 1561, *Standard on Emergency Services Incident Management System*, to form the basic structure of **all emergency operations of the fire department, regardless of the scale of the department or the emergency.**⁷⁶ An effective incident management system shall be designed to manage incidents of different types, including structure fires, wildland fires, hazardous materials incidents, emergency medical operations, and other types of emergency operations that could be handled by the department [*emphasis added*].⁷⁷

⁷⁶NFPA 1710, §6.2.1

⁷⁷ NFPA 1710, §6.2.2

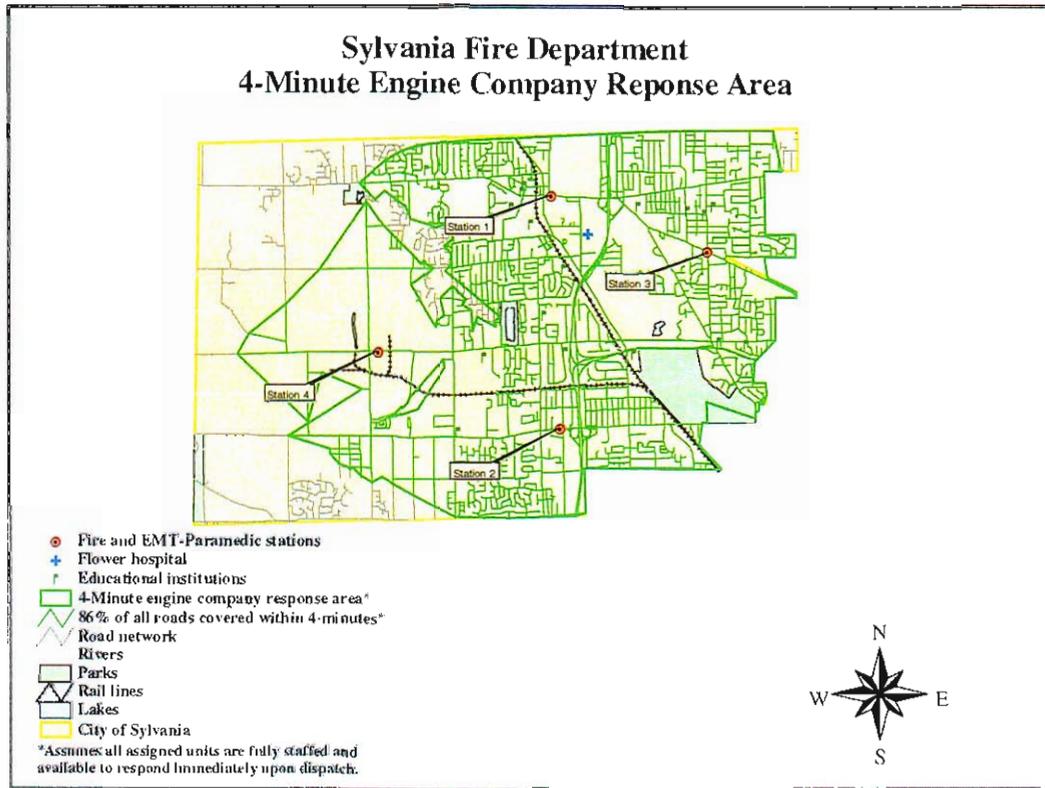
MAP 3



Map 3 indicates existing 8-minute response capabilities for the STFD chief officers. **Currently, the fire department's chief officers are capable of responding to 82.8% of all roads located within the jurisdiction in 8 minutes or less, assuming the units are available to respond immediately upon dispatch.**

NFPA 1710, Section 5.2.1.2.5, states that, "supervisory chief officers shall have staff aides deployed to them for purposes of incident management and accountability at emergency incidents." Section A.3.3.37 of the Standard defines the roles of the staff aide, stating, "this member is assigned to a supervisory chief officer who assists at incident scene operations, which can include personnel accountability, communications, and other logistical and administrative support. In addition, this member can assist in coordinating training activities, respond to citizen inquiries, coordinating staffing issues and sick leave follow-up, and resource allocations for facilities and apparatus under the supervisory chief officer's jurisdiction. Staff aides can be known as field incident technicians, staff assistants, battalion fire fighter, or battalion adjutant." **It is the recommendation of this report that the fire department provide a dedicated chief's aide to each chief officer.**

MAP 4



Map 4 indicates the existing 4-minute response capabilities for STFD engine companies responding from all existing fire stations. **Currently, engines that deploy from these stations are capable of responding to 86% of all roads located within the jurisdiction in 4 minutes or less, assuming all units are available to respond immediately upon dispatch.** The unavailability of an engine to respond to emergencies within its primary response district creates a gap in services to that area of the community, and a delay in fire department response. Any delay in response translates directly into a proportional increase in the expected loss of life and property.

The Importance of the 4-minute Engine Company Response In Structural Fire Fighting Operations:

Fire growth- the rate of spread and the intensity of the fire- is directly linked to the time it takes to initiate fire suppression operations. As rule, a fire doubles in size for every minute that passes without the application of aggressive fire suppression measures. In less than 30 seconds a small flame can rage completely out of control and turn into a major fire. During fire growth, the temperature of a fire rises to 1,000° to 1,200° F. Flashover (the very rapid spreading of the fire due to super heating of room contents and other combustibles) at 1,100° to 1,200° F. may occur in a burning room in as little as 4

minutes, depending upon its contents.⁷⁸ At flashover, the odds of survival for individuals inside the structure- both victim and rescuer- are virtually non-existent. The 4-minute goal for arriving fire suppression companies is therefore critical. Recognizing the criticality of a rapid fire department response, NFPA Standard 1710 states that a fire department shall establish the response time objective of **“4 minutes or less for the arrival of the first arriving engine company at a fire suppression incident.”**⁷⁹

The Importance of the 4-minute Engine Company Response In the Provision of Emergency Medical Services:

The Sylvania Township Fire Department responds to all emergencies in Sylvania necessitating the skills, capabilities, and resources of the fire department. Motor vehicle accidents, for example, often times require the fire department to stabilize the incident scene and gain access to the patient before emergency medical care can be rendered. While the extrication is being performed, the responsibility of emergency medical care and patient stabilization falls upon the fire department. Likewise, in addition to providing ALS care from the paramedic engine companies, Sylvania Township fire fighters oversee the medical care of patients requiring the technical rescue services that are provided exclusively by the fire department. To this extent, the Sylvania Township Fire Department plays a critical role in the provision of EMS to the citizens of Sylvania Township. In this context, it is easy to see that the fire department is truly an “all hazards” provider for Sylvania Township.

The prehospital care rendered by the fire department in such instances encompasses the full spectrum of prehospital care services. All firefighters are trained to the first responder level, which encompasses the “A.B.C.s” of basic emergency medical care – maintenance of the airway, ensuring the patient can continue breathing, and maintaining circulation. The bandaging of wounds, the realignment of broken limbs, when necessary, and protection of the spine are also priorities for the fire department in the prehospital setting.

Most firefighters are trained to the Emergency Medical Technician – Basic level (BLS). EMT-B personnel are trained to provide patient assessment, including basic airway management, oxygen therapy, stabilization of spinal, musculo-skeletal, soft tissue, and shock injuries; stabilization of bleeding; and stabilization and intervention for sudden illness, poisoning and heat/cold injuries, childbirth, CPR, and automatic external defibrillator (AED) capability. Many firefighters are trained beyond the EMT-Basic level to the EMT-Paramedic level and can provide Advanced Life Support (ALS) which includes the functional provisions of advanced airway management, including intubation, advanced cardiac monitoring, manual defibrillation, establishment and maintenance of intravenous access (I.V.'s), and drug administration. A rapid response to traumatic injury or related emergency is therefore critical to saving lives. To the extent that fire fighters are capable of stabilizing patients until delivering the patient to the appropriate medical facility, the fire department plays a critical role in the provision of EMS to the citizens of Sylvania Township.

⁷⁸ In general, however, flashover is most likely to occur within 10 minutes of fire ignition within a confined space, and with typical contents.

⁷⁹ NFPA 1710, § 4.1.3.1.1 (1)

The Sylvania Township Fire Department responds to cardiovascular accidents (stroke) and myocardial infarctions (heart attacks). The American Heart Association notes that, "Nearly 2,600 Americans die of cardiovascular disease each day, an average of 1 death every 34 seconds. Cardiovascular disease claims more lives each year than the next 5 leading causes of death combined, which are cancer, chronic lower respiratory diseases, accidents, diabetes mellitus, and influenza and pneumonia."⁸⁰ A stroke is a sudden loss of brain function. It is caused by the interruption of the flow of blood to the brain or the rupture of blood vessels in the brain. The interruption of the blood flow or the rupture of blood vessels causes brain cells in the affected area to die.

A heart attack occurs when the blood supply to part of the heart muscle itself is severely reduced or stopped. This happens when one of the arteries supplying blood to the heart muscle is blocked. If the blood supply to the heart muscle is cut off for longer than several minutes, muscle cells in the affected area suffer irreversible injury and die. According to the Occupational Safety & Health Administration, there are 300,000 – 400,000 deaths *per year* in the United States from cardiac arrest,⁸¹ making it one of the leading causes of death in the nation. Most cardiac arrest deaths occur outside the hospital, resulting in survival rates ranging between 1% and 5%. In spite of these statistics, cardiac arrest remains one of the most time-critical medical emergencies that can be treated in the field.

The fire service's wide range of capabilities enables fire department personnel to respond effectively to diverse incidents, including victim search and rescue, extrication, hazardous materials releases, and natural disasters, to name but a few. Fire fighters are uniquely trained and equipped to effectively handle the most time-critical emergency on scene. Owing to their strategic distribution throughout a given community, the responsibility to respond to medical emergencies is often delegated to multi-role fire fighters cross-trained as emergency medical technicians (EMT's).

Recognizing the importance of a rapid response to increased survivability rates from cardiac arrests and other medical emergencies, the 1710 Standard requires that a "fire department shall establish the response time objectives of **4 minutes or less for the arrival of a unit with first responder or higher capability at an emergency medical incident.**"⁸² While patient survivability from cardiac arrest depends upon a series of critical interventions, such as are provided by fire fighter/EMT's, "rapid defibrillation is the most important single factor in determining survival."⁸³ Abnormal heart rhythms, with ventricular fibrillation (VF) being the most common, cause cardiac arrest. The

⁸⁰ American Heart Association, "Heart Disease and Stroke Statistics – 2004 Update;" AHA website visited September 21, 2004

< <http://www.americanheart.org/downloadable/heart/1079736729696HDSStats2004UpdateREV3-19-04.pdf> >

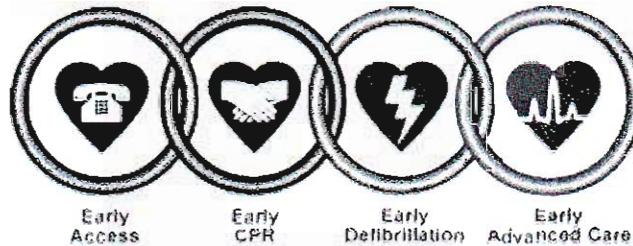
⁸¹ U.S. Occupational Safety and Health Administration, Technical Information Bulletin: Cardiac Arrest and Automated External Defibrillators (AEDs), < http://www.osha.gov/dts/tib/tib_data/tib20011217.html >

⁸² NFPA 1710, § 4.1.3.1.1(2)

⁸³ Emergency Cardiac Care Committee and Subcommittees of the American Heart Association, "Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care," Journal of the American Medical Association (October 28, 1992): 2289

highest hospital discharge rates have been achieved in cardiac arrest patients in whom CPR was initiated **within 4 minutes of arrest** and ACLS within 8 minutes. A rapid emergency medical response is therefore essential in improving survival rates.⁸⁴

FIGURE 4:⁸⁵
"THE CHAIN OF SURVIVAL"



The use of an automated external defibrillator (AED) by trained personnel is integral to the treatment and survival of cardiac arrest. Defibrillation within 2 minutes can produce cardiac arrest survival rates as high as 90%. **If fire fighters responding within 4 minutes of receiving an alarm initiate CPR, the probability of patient survival quadruples, from 4.6% to 18.2%. If those same fire fighters are equipped and trained to provide defibrillation, the expected survival rate is five times greater at 25.8%.⁸⁶ However, "if defibrillation is delayed more than 10 minutes, survival rates drop to less than 5%."⁸⁷**

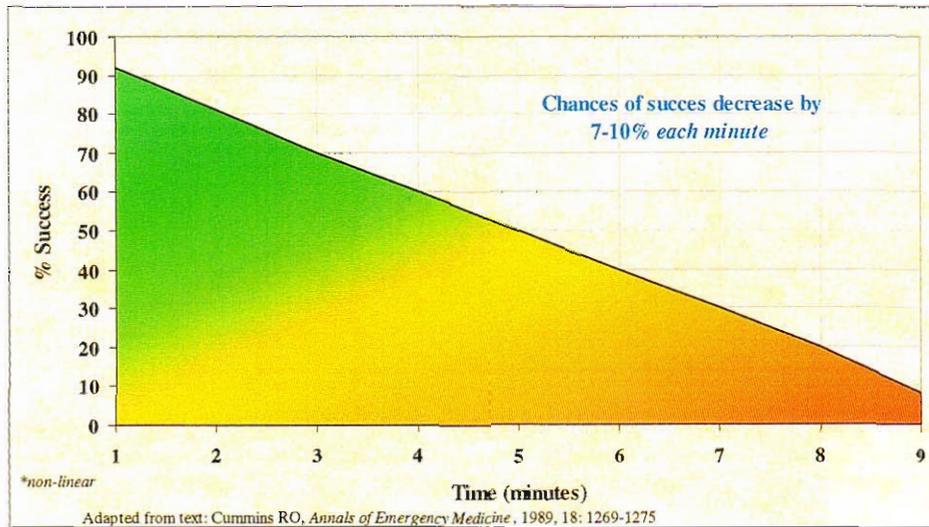
⁸⁴ Emergency Cardiac Care Committee and Subcommittees of the American Heart Association, "Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care," Journal of the American Medical Association (October 28, 1992): 2184.

⁸⁵ "Chain of Survival" diagram courtesy of "ChainofSurvival.com"
< http://www.chainofsurvival.com/cos/COSOverview_detail.asp >

⁸⁶ "Predicting Survival From Out-of-Hospital Cardiac Arrest: A Graphic Model," Annals of Emergency Medicine (November 1993)

⁸⁷ American Heart Association, Sudden Deaths from Cardiac Arrest Statistical Fact Sheet (2003)

FIGURE 5:
"CARDIAC ARREST SURVIVAL RATE"



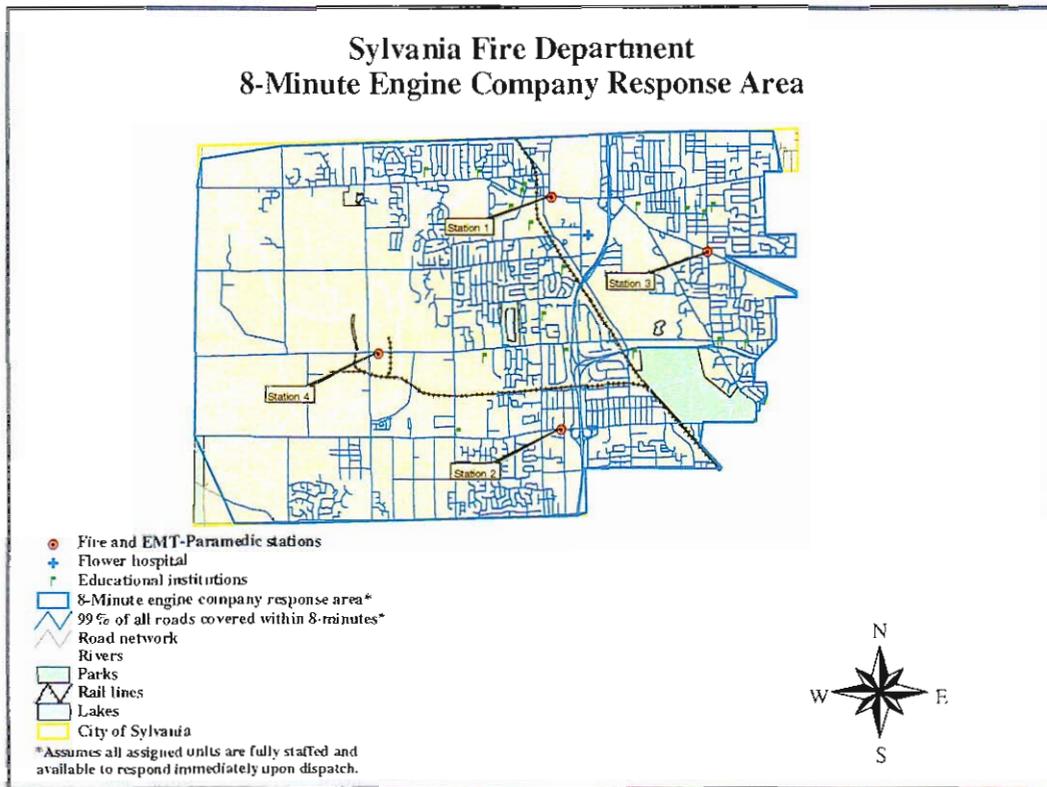
So effective is the use of an AED in increasing survivability of cardiac arrest patients, the International Association of Fire Chiefs has endorsed equipping every fire suppression unit in the United States with an automated external defibrillator.⁸⁸ Mirroring this recommendation, NFPA 1710 states, "the fire department... shall ensure [that] emergency medical response capability includes personnel, equipment, and resources to deploy at the first responder level with automatic external defibrillator (AED) or higher treatment level."⁸⁹ In accordance with NFPA Standard 1710, Section 4.3.2, the Sylvania Township Fire Department equips all of its apparatus with AED's and ensures all fire fighters are trained in their proper and effective operation.⁹⁰

⁸⁸ American Heart Association, Sudden Deaths from Cardiac Arrest Statistical Fact Sheet (2003).

⁸⁹ NFPA 1710, § 4.3.2 - "The fire department... shall ensure [that] emergency medical response capability includes personnel, equipment, and resources to deploy at the first responder level with automatic external defibrillator (AED) or higher treatment level."

⁹⁰ Ibid.

MAP 5

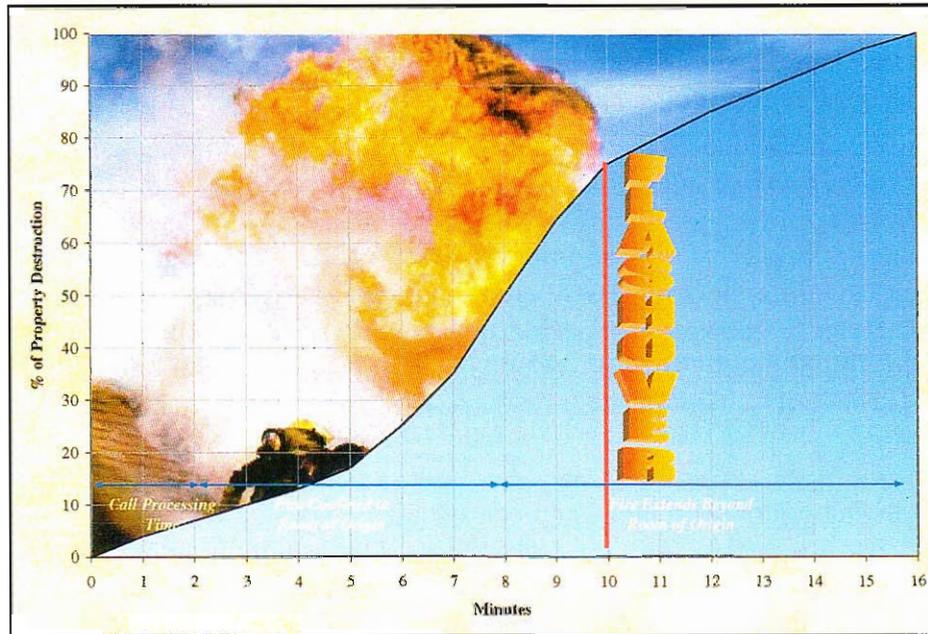


Map 5 indicates the existing 8-minute response areas for STFD engine companies responding from all existing fire stations. **Currently, engines that deploy from these stations are capable of responding to 99% of all roads located within the jurisdiction in 8 minutes or less, assuming all units are available to respond immediately upon dispatch.** The unavailability of an engine to respond to emergencies within its primary response district creates a gap in services to that area of the community, and a delay in fire department response. Any delay in response translates directly into a proportional increase in the expected loss of life and property.

The Importance of the 8-minute Engine Company Response In Structural Fire Fighting Operations:

The 8-minute goal for arriving companies is critical because the progression of a structural fire to the point of “flashover” (the very rapid spreading of the fire due to super heating of room contents and other combustibles) generally occurs in less than 10 minutes. As there is a potential delay between fire ignition, discovery, and the transmission of an alarm it may be said that flashover is likely to occur within 8 minutes of firefighters receiving the alarm.

FIGURE 6:
 "THE FIRE PROPAGATION CURVE"



Minimally, a crew of four is required to make a safe initial attack on a fire, with a crew of two working inside the burning structure and a backup crew of two standing by to assist as necessary. This is known as the "2 In/2 Out" regulation, and is codified as OSHA CFR 1910.134. Currently, the Sylvania Township Fire Department staffs engine companies with fewer than 4 personnel. Companies staffed with fewer than four personnel are not in compliance with OSHA or NFPA 1710 recommendations. On the scene of a fire the driver/operator of an engine must remain with the apparatus to operate the pump. If the engine company is staffed with three personnel, this leaves a crew of only two fire fighters from each engine company immediately available to initiate the attack or complete search and rescue activities. A fire attack initiated by a single fire company, then, would not be capable of effecting a safe and effective fire suppression and/or rescue operation in compliance with the "2 In/2 Out" regulation until a second company arrives with sufficient personnel to support the fire attack and/or rescue operation, and to assist the first company in the event of an unexpected emergency.^{91, 92, 93} For these reasons, it is the recommendation of this study that the Sylvania

⁹¹ As stated in NFPA 1500, "a rapid intervention team shall consist of at least two members and shall be available for rescue of a member or a team if the need arises. Once a second team is assigned or operating in the hazardous area, the incident shall no longer be considered in the 'initial stage,' and at least one rapid intervention crew shall be required."

⁹² An unexpected emergency may include, but is not limited to, extreme fire conditions such as flashover; localized, partial, or complete structural collapse; failure to implement the incident command system, resulting in "freelancing" and a breakdown in fire fighter accountability; flawed tactical strategies; fire fighter disorientation or entrapment; or an injury that incapacitates a fire fighter, from a strained muscle to severe trauma.

⁹³ Freelancing occurs when firefighters or companies deviate from their assigned duties. What makes freelancing so dangerous is that the IC may give orders to another company that endangers the freelancers,

Township Fire Department make efforts to enhance existing response capabilities by staffing all engine companies with *at least* four multi-role fire fighters.

The Importance of the 8-minute Engine Company and/or Paramedic Van Response in the Provision of Emergency Medical Services:

Sudden cardiac arrest- one of the leading causes of death in America- is also one of the most time-critical medical emergencies that can be treated in the field. The eight-minute benchmark is crucial because a rapid fire department response expedites the delivery of more advanced lifesaving interventions, such as defibrillation, advanced airway management, and drug therapy. Two-tiered EMS systems such as these, where the more widely-distributed fire department Basic Life Support (BLS) providers arrive in advance of Advanced Life Support (ALS) providers, have improved survival rates over one-tiered systems, particularly when the first responder provides automated external defibrillation.⁹⁴

According to the Journal of the American Medical Association, “two-tier systems in which the first responders are trained in early defibrillation are most effective in providing rapid Advanced Cardiac Life Support (ACLS).”⁹⁵ **Cardiac arrest victims have a 33% higher survival rate when Paramedics arrive within eight minutes,** according to the American Heart Association. After eight minutes, the prospects of recovery decreases rapidly.⁹⁶ Hence, by gaining access to the scene and ensuring patient stabilization by providing defibrillation and airway management, if necessary, Sylvania Township fire fighters set the stage for the arrival of secondary ALS units, the provision of ACLS, and the opportunity for increased patient survivability. A timeline of a typical emergency response to an incident of sudden cardiac arrest is provided in Appendix “A.”

The Eisenberg Model

A 1993 University of Washington study of 1,667 cardiac arrests linked survival of cardiac arrest to the time that elapsed before the initiation of three critical interventions: CPR, defibrillation and advanced cardiac life support. From this study, researchers produced a model for predicting cardiac arrest survival rates, known as the *Eisenberg Model*.⁹⁷ Because it clearly links response time to the probability of survival, the *Eisenberg Model* has become the standard of performance for measuring effectiveness in the delivery of pre-hospital emergency medical services.

or the freelancers may operate in a manner that endangers other firefighters. Training in ICS and operations may mitigate the occurrence of freelancing.

⁹⁴ Analysis of some systems with high survival rates for out-of-hospital cardiac arrest reveals common practices of (1) multi-tiered systems deployed by a 911 priority dispatch system, (2) aggressive use of fire department apparatus for first response and automated defibrillation, (3) intensive medical supervision, and (4) widespread citizen awareness and CPR training.

⁹⁵ The Journal of the American Medical Association (October 28, 1992): 2290.

⁹⁶ Matthew Cella, “Response Rate of EMS Declines,” The Washington Times, 1 April 2003

⁹⁷ M.P. Larsen, M.S. Eisenberg, et al., “Predicting Survival from Out-of-Hospital Cardiac Arrest: A Graphic Model,” Annals of Emergency Medicine 22, no. 11 (November 1993): 1652 – 8.

**FIGURE 7:
"THE EISENBERG FORMULA"**

Survival Rate = 67% (maximum percentage survival rate of out-of-hospital cardiac arrest patients if all three interventions were to occur upon collapse. This figure represents the assumption that only 2/3 of the population can be expected to survive an of out-of-hospital cardiac arrest. One minute is added to the observed response times to allow for dispatch and turnout. An additional minute is added for gaining access to the patient.)

- Less 2.3% per minute until CPR is started
- Less 1.1% per minute until defibrillation is provided
- Less 2.1% per minute until ACLS is initiated

Table 8 indicates predicted survivability rates for cardiac arrest patients, based upon the Eisenberg formula for predicting cardiac arrest survival rates, following the initiation of CPR, defibrillation, and advanced cardiac life support (ACLS) in 5, 6, and 7 minutes, respectively.

**TABLE 8:
"EFFECT OF EMERGENCY CARE RESPONSE TIMES ON
CARDIAC PATIENT SURVIVAL RATES"⁹⁸**

Fire Dep't. Response Time	Initiation of CPR 	Time to Defibrillation 	Time to Advanced Cardiac Life Support (ACLS) 	Predicted Survival Rate/ All Cardiac Arrest (percentages)
9 minutes	10 minutes	11 minutes	13 minutes	4.6%
4 minutes	F.D. EMT: 5 minutes	11 minutes	12 minutes	18.2%
4 minutes	F.D. EMT: 5 minutes	F.D. EMT-D: 6 minutes	11 minutes	25.8%
4 minutes	F.D. EMT: 5 minutes	F.D. EMT-D: 6 minutes	F.D. Paramedic: 7 minutes	34.3%

This scenario requires two fire fighters to provide CPR, one to prepare the AED and analyze the results of an electrocardiogram (ECG) report, and one to prepare for and initiate advanced cardiac life support measures, such as advanced airway management, I.V. therapy, and pharmacological interventions. This breakdown of the expected capabilities of a medical alarm assignment requires a minimum contingent of four EMS personnel to arrive at the scene of a cardiac arrest within 5 minutes of receiving an alarm.

⁹⁸ M.P. Larsen, M.S. Eisenberg, et al., "Predicting Survival from Out-of-Hospital Cardiac Arrest: A Graphic Model," *Annals of Emergency Medicine* 22, no. 11 (November 1993): 1652 – 8.

Most experts agree that four responders (at least two trained in ACLS and two trained in BLS) are the minimum required to provide ACLS to cardiac arrest victims⁹⁹ (see also “Appendix A,” *Timeline of a Typical Emergency Response to an Incident of Cardiac Arrest*).

As the table indicates, a 9-minute response time means that CPR is not initiated until at least 10 minutes have elapsed from the time of cardiac arrest; 11 minutes have elapsed before defibrillation; and 13 minutes have elapsed before ACLS care is initiated, resulting in an expected patient survival rate of only 4.6 percent. Conversely, a 4-minute fire department response – with CPR initiated in 5 minutes, defibrillation in 6 minutes, and ACLS in 7 minutes – results in patient survivability rates of over 34%.

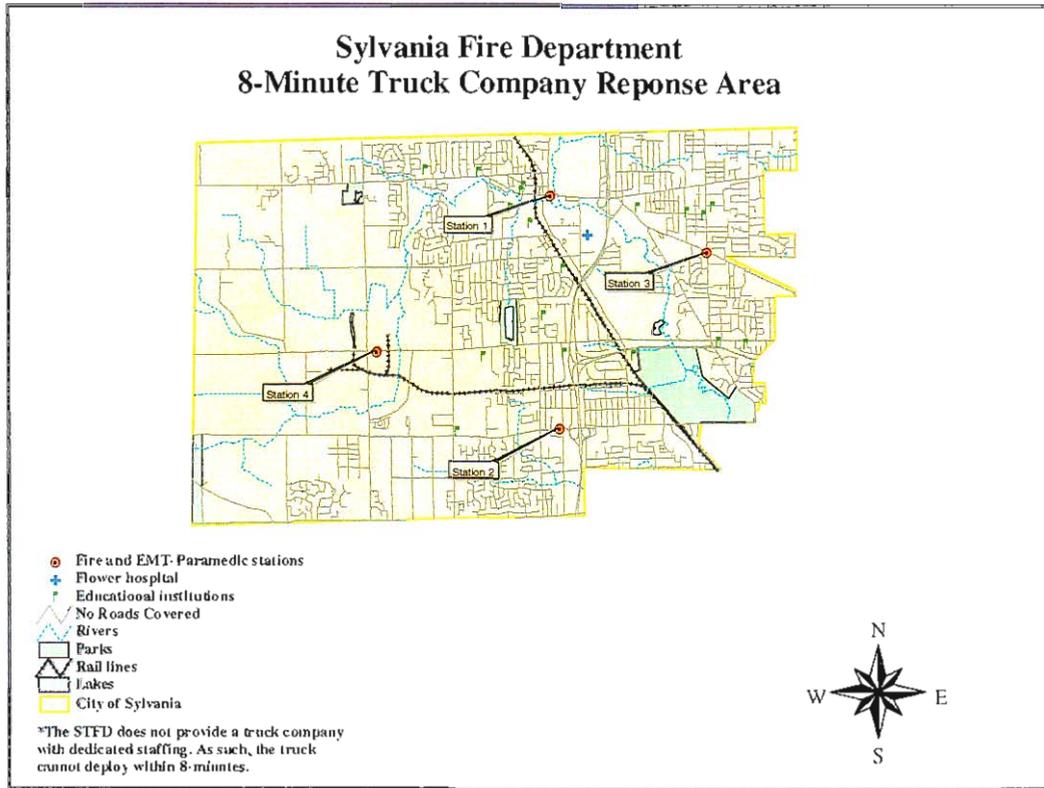
In other words, based on Eisenberg’s maximum percentage survival rate of 67%, a 9-minute initial arrival time prior to pre-hospital emergency medical intervention gives the patient only a 1 in 15 chance of survival. A 4-minute arrival by fire fighters increases the probability to 1 in 4. Fire fighters delivering defibrillation improve patient survivability to 1 in 3. And fire fighters trained as paramedics improve the odds of patient survival to 1 in 2. The simple reduction of 4 to 5 minutes in the response time through the use of cross-trained fire fighters has a substantial impact of increased patient survival, with improved patient outcomes for each increase in level of pre-hospital training that fire fighters receive. The Eisenberg Model supports the findings published in the *Journal of the American Medical Association*, which concluded that “two-tier systems in which the first responders are trained in early defibrillation are most effective in providing rapid Advanced Cardiac Life Support.”¹⁰⁰

It is clear that the quick arrival of an appropriate number of adequately trained personnel deploying with lifesaving medical resources is critical to increasing survivability from cardiac arrest and traumatic injury. For these reasons, **this analysis recommends every engine company be staffed with four full-time fire fighters, all of which are trained, at a minimum, to the level of EMT-B. Inasmuch as an increase in survivability correlates with the degree to which fire fighters are trained in emergency medicine, the fire department should pursue efforts to ensure that, of the four firefighters assigned to all engine companies, two fire fighters should certified as EMT-Paramedics (EMT-Ps).**

⁹⁹ The Journal of the American Medical Association (October 28, 1992): 2291.

¹⁰⁰ The Journal of the American Medical Association (October 28, 1992): 2290.

MAP 6



Map 6 indicates existing STFD truck company 8-minute response capabilities. Currently, the STFD does not provide a truck company with dedicated staffing. As such, **a truck company is incapable of responding on any roads located within the jurisdiction in 8 minutes or less, assuming all units are available to respond immediately upon dispatch.**

The unavailability of a truck company to respond to emergencies within its primary response **district creates** a gap in services to that area of the community, and a delay in fire department response. Secondary units responding from neighboring response districts will experience increased response times due to increased travel distances, which may be exacerbated by any number of impediments. Any delay in response translates directly into a proportional increase in the expected loss of life and property.

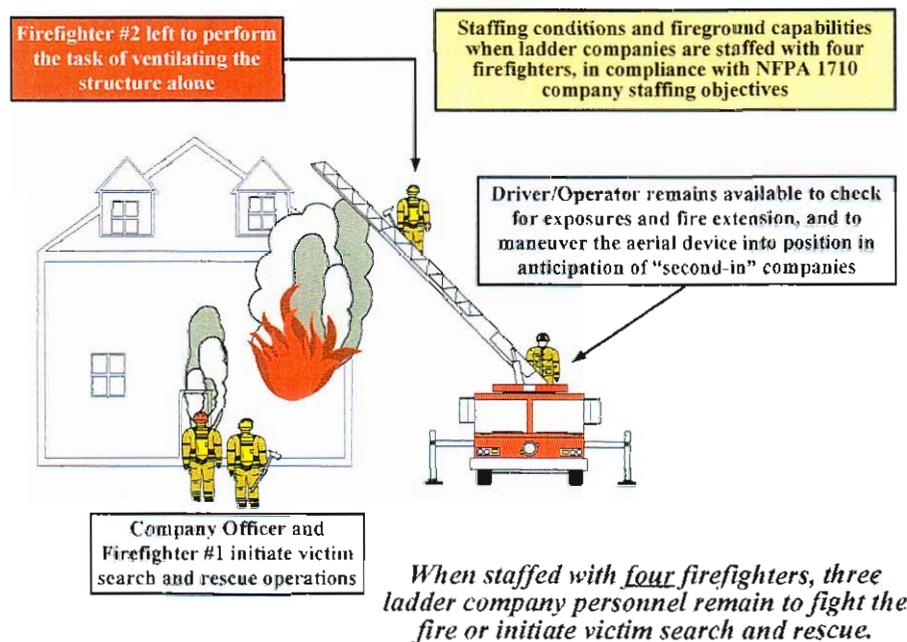
The Importance of the 8-minute Truck Company Response In Structural Fire Fighting Operations:

Truck companies play a vital role on the scene of a structure fire securing building access and overseeing the ventilation of dangerous, superheated products of combustion from the building. The importance of being able to ventilate a building efficiently, effectively, and *in coordination* with interior attack operations is key to supporting search and rescue operations. Once the superheated gases and **smoke** from the building have been ventilated, fire fighters conducting interior fire suppression and rescue operations are able to more clearly locate the seat of the fire and more effectively perform victim search and

rescue. The rapid extrication of victims from inside a burning structure is critical to saving lives: the quicker fire victims are removed from the structure, the quicker they can be treated by fire department and medical personnel for smoke inhalation, burns, and other injuries related to fire. Thus, the response of the ladder truck *in concert with* other fire suppression companies assigned to respond to a structure fire is critical to initiating *safe and effective* fire suppression and rescue operations. Any delay in response translates directly into a proportional *increase* in the expected loss of life and property.

To ensure the rapid extrication of fire victims, NFPA 1710 states that “Fire companies whose primary functions are to perform the variety of services associated with truck work, such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul and salvage work... shall [also] be staffed with a **minimum of four on-duty personnel.**”¹⁰¹ A crew of four is required to make a safe initial attack on a fire, with a crew of two working inside the burning structure and a backup crew of two standing by to assist as necessary. This is known as the “2 In/2 Out” regulation. On the scene of a fire, the operator of the ladder must remain with the apparatus to safely operate the aerial device, leaving a crew of only two to support the attack or complete search and rescue activities.

FIGURE 8:
“LADDER COMPANY FIREGROUND OPERATIONS WHEN STAFFED WITH *FOUR* FIREFIGHTERS”



When staffed with four firefighters, ladder companies are capable of ventilation of the structure, and can initiate fire suppression and rescue operations more *safely* and more *effectively* than ladder companies staffed with less than four firefighters. **When staffed**

¹⁰¹ NFPA 1710, Section 5.2.2.2 and 5.2.2.2.1

in compliance with industry standards, firefighters are 79% more efficient than three-person crews in ventilating the structure, 10.7% more effective in accomplishing victim search and rescue, and 80.2% more efficient in checking for exposures and fire extension.

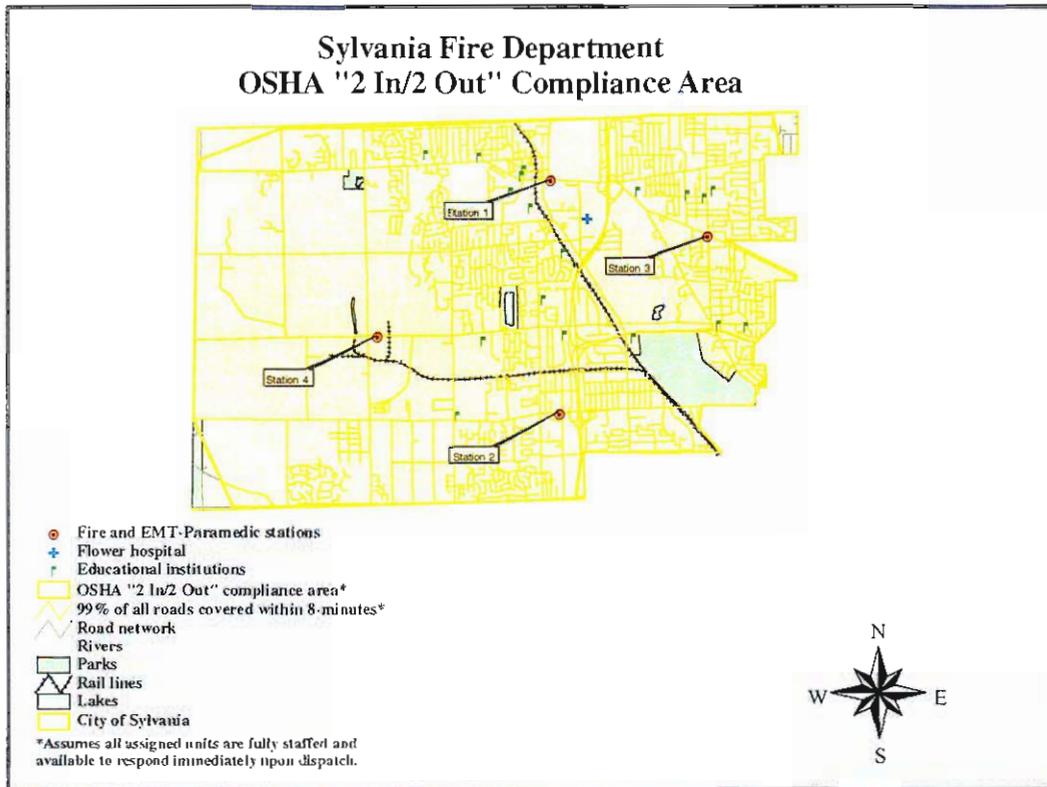
TABLE 9:
 “LADDER COMPANY EFFICIENCY: 3 FIREFIGHTERS VS. 4 FIREFIGHTERS”

NUMBER OF FIREFIGHTERS	ROOF VENTILATION	SEARCH & RESCUE	CHECK EXPOSURES FOR FIRE EXTENSION
5 Firefighters	100.0%	100.0%	100.0%
4 Firefighters	79.0%	90.3%	80.2%
3 Firefighters	0.0%	79.6%	0.0%

For these reasons, it is the recommendation of this study that the Sylvania Township Fire Department ensure the safe and effective delivery of emergency services by staffing all fire suppression apparatus, including truck companies, with *at least four* multi-role fire fighters cross-trained to the level of EMT-B.¹⁰²

¹⁰² NFPA 1710, §5.2.2.1.2 and §5.2.2.2.2 - “In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, these companies shall be staffed with a minimum of five or six on-duty members.”

MAP 7



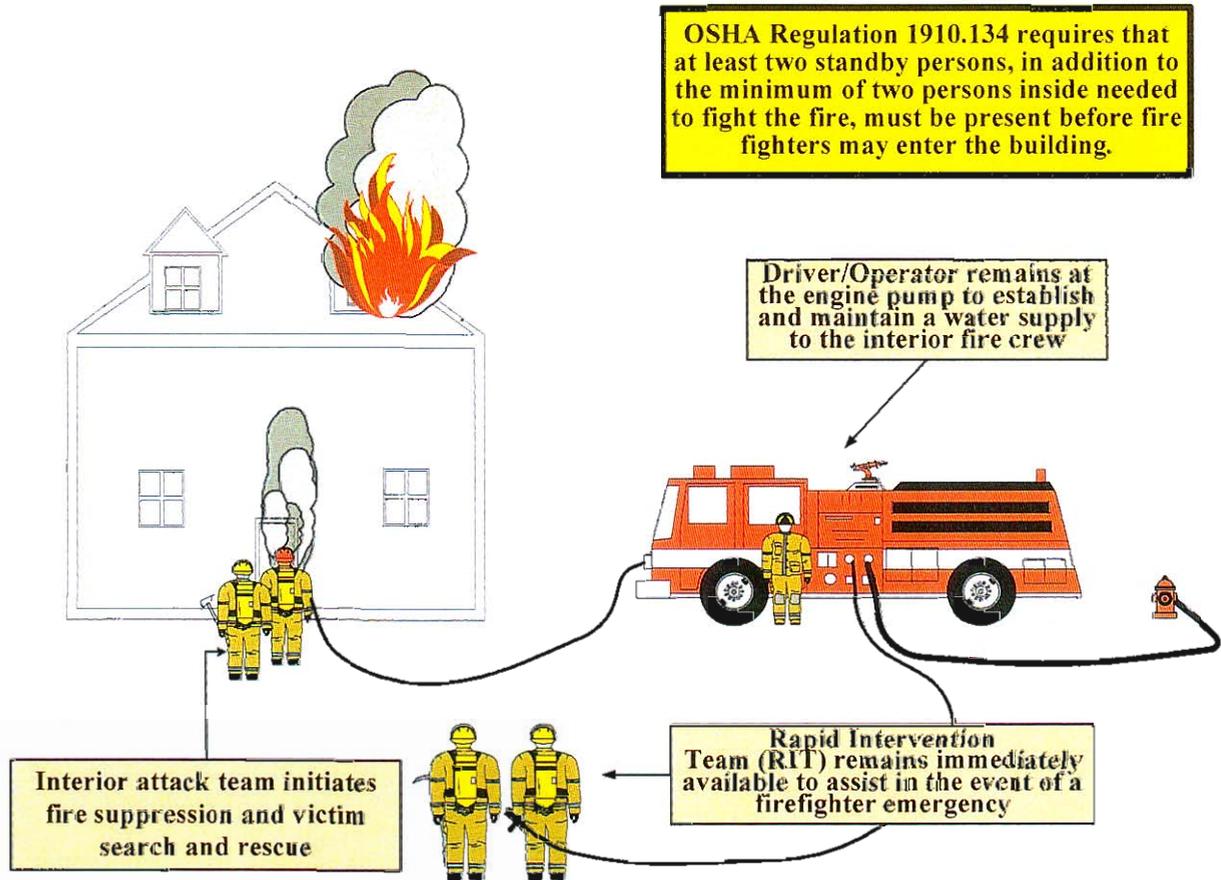
Map 7 indicates those areas where Sylvania Township Fire Department fire suppression units are currently capable of initiating *safe* and *effective* fire suppression and rescue operations, within 8 minutes, in accordance with the "2 In/2 Out" regulation. Under these conditions, when emergency units are responding from their assigned stations, it is predicted that **the Sylvania Township Fire Department is capable of initiating fire suppression and rescue operations in accordance with the "2 In/2 Out" regulation on 99% of all roads within 8 minutes, assuming all units are staffed at existing staffing levels and available to respond immediately upon dispatch.**

OSHA's "2 In/2 Out" Regulation

The "2 In/2 Out" policy is part of paragraph (g)(4) of OSHA's revised respiratory protection standard, 29 CFR 1910.134. The safety of fire fighters engaged in interior structural firefighting is the major focus of paragraph (g)(4) of the OSHA Respiratory Protection standard. OSHA's interpretation on requirements for the number of workers required being present when conducting operations in atmospheres that are immediately dangerous to life and health (IDLH) covers the number of persons who must be on the scene before firefighting personnel may initiate an interior attack on a structural fire. An interior structural fire (*an advanced fire that has spread inside of the building where high temperatures, "heat" and dense smoke are normally occurring*) would present an IDLH atmosphere and, therefore, require the use of respirators. In those cases, at least two standby persons, in addition to the minimum of two persons inside needed to fight the

fire, must be present before fire fighters may enter the building.^{103, 104} This requirement is mirrored in NFPA 1500, which states that “a rapid intervention team shall consist of at least two members and shall be available for rescue of a member or a team if the need arises. Once a second team is assigned or operating in the hazardous area, the incident shall no longer be considered in the ‘initial stage,’ and at least one rapid intervention crew shall be required.”

FIGURE 9:
“OSHA ‘2 IN/2 OUT’ ILLUSTRATED”



Two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of origin as possible, as well as rescue any trapped occupants and care for the injured. Several existing National Fire Protection Association standards address this time-critical issue. NFPA 1500 states, “while members can be assigned and arrive at the

¹⁰³ Under the NFPA standards relating to fire fighter safety and health, the incident commander may make exceptions to these rules if necessary to save lives. The Standard does not prohibit fire fighters from entering a burning structure to perform rescue operations when there is a “reasonable” belief that victims may be inside.

¹⁰⁴ Paula O. White, letter to Thomas N. Cooper, 1 November 1995 (OSHA)

scene of an incident in many different ways, it is strongly recommended that interior fire fighting operations not be conducted without an adequate number of qualified firefighters operating in companies under the supervision of company officers. **It is recommended that a minimum acceptable fire company staffing level should be four members responding on or arriving with each engine and each ladder company responding to any type of fire.**" NFPA Standard 1710 further recommends that "fire companies whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue... shall be staffed with a **minimum of four on-duty personnel,**"¹⁰⁵ while "fire companies whose primary functions are to perform the variety of services associated with truck work, such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul and salvage work... shall [also] be staffed with a **minimum of four on-duty personnel.**"¹⁰⁶ For either fire suppression company, NFPA 1710 states that "**in jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, these companies shall be staffed with a minimum of five or six on-duty members.**"¹⁰⁷

A number of incidents in which the failure to follow "2 In/2 Out" procedures have contributed to fire fighter casualties. For example, in Lexington, Kentucky, one fire fighter died and a second was severely injured following a fire where Kentucky OSHA later cited the fire fighters' employer for failing to utilize "2 In/2 Out" procedures. In a second case, two fire fighters died from smoke inhalation after being overcome by toxic fumes while fighting an accidental fire in Philadelphia, PA. Although two additional fire fighters were outside the home, both were engaged in support activities (hydrant hook-up and pump operation), and neither was fully accountable for monitoring the interior personnel.

There also exist a number of success stories following the adoption of "2 In/2 Out" procedures. In Pittsburgh, PA, the Fire Department implemented an accountability and rescue system following a fatal fire. In one instance, four fire fighters who were performing an interior attack on an apartment building fire became disoriented and were trapped in the building. The standby personnel were able to initiate rescue operations promptly and, although the four interior fire fighters and two of the rescuers were injured, all survived.¹⁰⁸

"2 In/2 Out," Flashover, & Fire Department Operations:

Only those structure fires located within the polygon, as depicted in Map 7, where a sufficient number of personnel arriving on appropriate apparatus can arrive at a common destination within 8 minutes, will receive the equipment and personnel required to initiate *safe* and *effective* fire suppression and rescue operations in accordance with the OSHA and NFPA guidelines outlined in this report. **As the progression of a structural fire to**

¹⁰⁵ NFPA 1710, § 5.2.2.1 and § 5.2.2.1.1

¹⁰⁶ NFPA 1710, § 5.2.2.2 and § 5.2.2.2.1

¹⁰⁷ NFPA 1710, § 5.2.2.1.2 and § 5.2.2.2.2

¹⁰⁸ John B. Miles, Jr., letter to J. Curtis Varone, Esq., 29 April 1998 (OSHA)

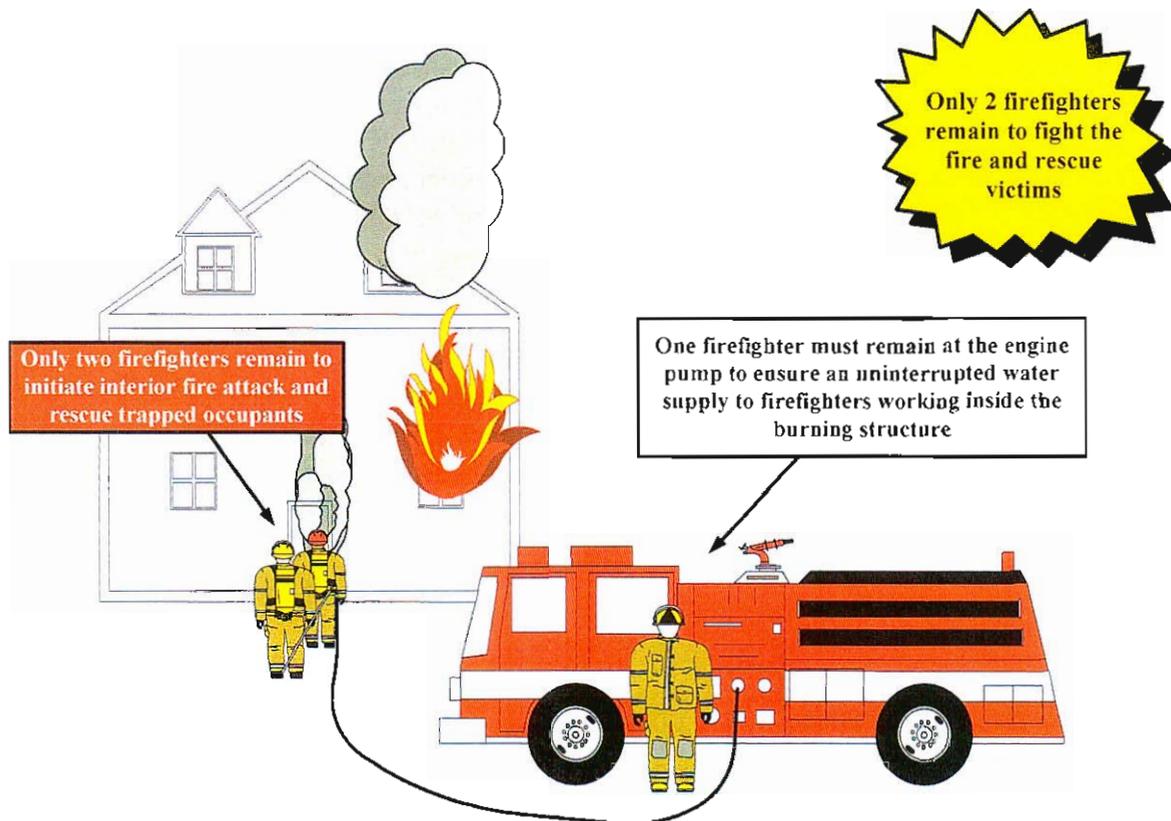
the point of flashover generally occurs within 10 minutes, it is predicted that those structure fires at the furthest reaches and beyond the extent of the 8-minute polygons indicated in Map 7 are more likely to continue to burn up to and beyond the point of flashover.

Flashover is a critical stage of fire growth for two reasons. First, no unprotected living thing in a room where flashover occurs will survive and the chance of saving lives drops dramatically. Second, flashover creates a huge jump in the rate of combustion, and a significantly greater amount of water is needed to reduce the burning material below its ignition temperature. A post-flashover fire burns hotter and moves faster, requires more resources for fire attack, and compounds the problems of search and rescue, exposure protection, and containment.¹⁰⁹

It is worth reiterating here that the ability of the fire department to assemble a sufficient number of firefighters to initiate “2 In/2 Out” fire suppression and rescue activities occurs *within* 8 minutes. It is very likely that the first-in company may arrive in significantly *less than* 8 minutes, and the second-in company may arrive closer to the 8-minute mark. **This lag time between the arrival of units is significant in that if staffed with less than four fire fighters, fire companies are *completely* unable to perform fire and rescue operations in accordance with the “2 In/2 Out” regulation.** Such is currently the case with some of the fire department’s engine and truck companies, which are staffed with only three firefighters. The incident commander may allow fire fighters to enter a burning structure to perform rescue operations when there is a “reasonable” belief that victims may be inside, but if fire companies that do so are staffed with *less than* four firefighters, they violate the “2 In/2 Out” regulation, increasing the risk of injury and death posed to themselves.

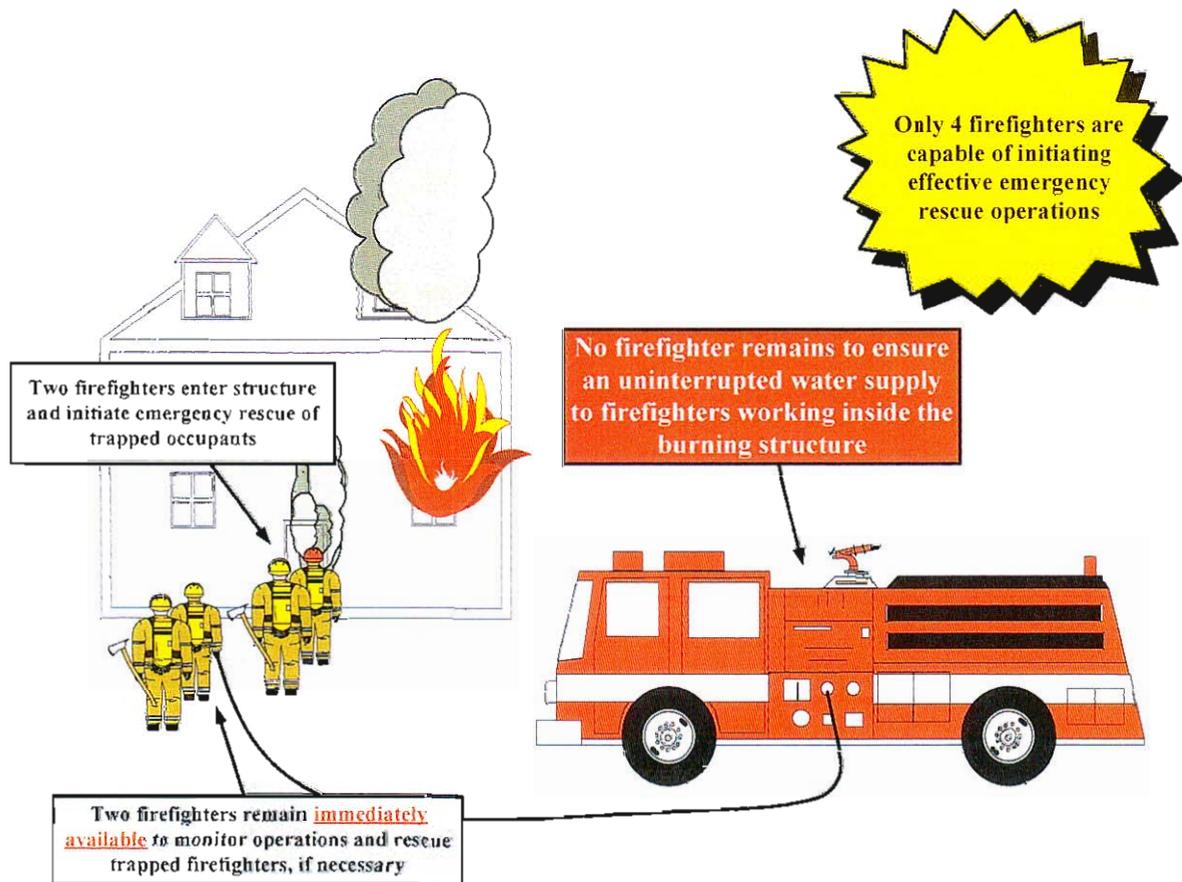
¹⁰⁹ The University of Ohio at Davis Fire Department website; site visited April 2, 2004.
<<http://fire.ucdavis.edu/ucdfire/UCDFDFiresuppression.htm>>

FIGURE 10:
“EXISTING FIRE SUPPRESSION OPERATIONS FOR ENGINES STAFFED WITH 3
FIREFIGHTERS”



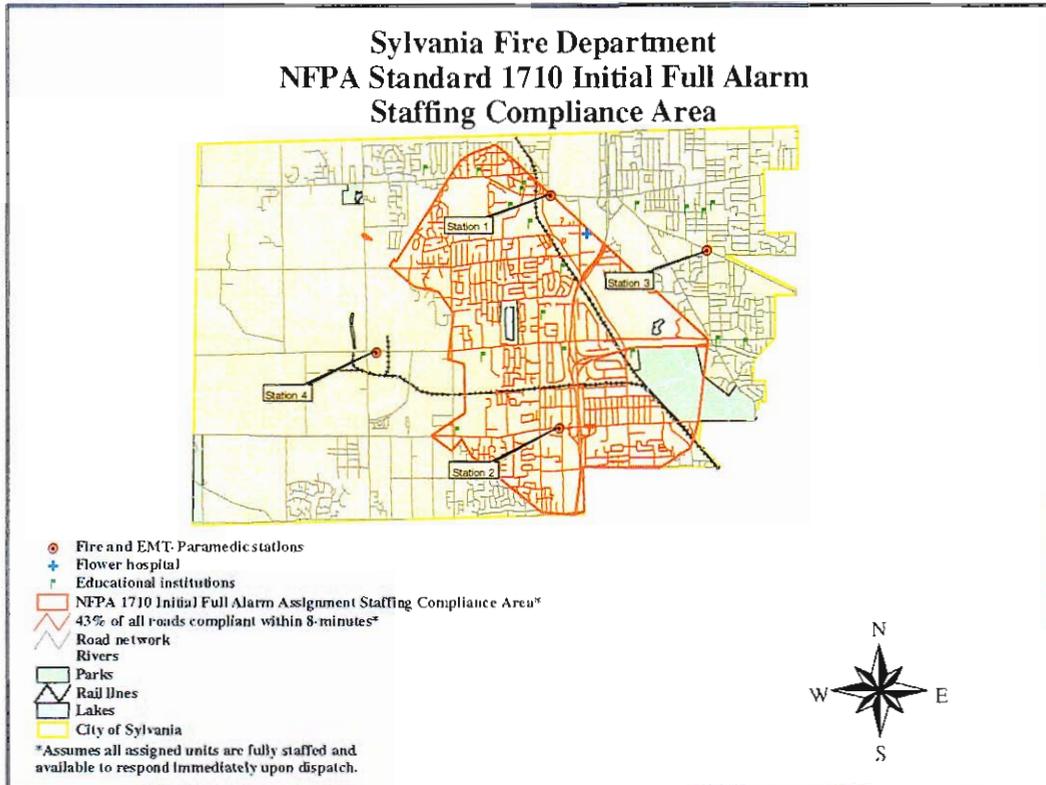
When confronted with occupants trapped in a burning structure and a single fire company is on scene, only a company staffed with four firefighters is able to initiate emergency search and rescue operations in compliance with “2 In/2 Out” operations. This would require the complete engagement of every fire fighter from the first-in fire company, staffed with four, to participate in the effort, and means that the driver-operator of the apparatus will not be able to tend to the pump to ensure the delivery of water to the fire fighters performing the initial attack and search and rescue operations.

FIGURE 11:
“EMERGENCY ‘2 IN/2 OUT’ OPERATIONS
WHEN FIRE COMPANIES ARE STAFFED WITH 4 FIREFIGHTERS”



Regardless, when there exists an immediate threat to life, only a company of four fire fighters can initiate fire suppression and rescue operations in compliance with the “2 In/2 Out” regulation, and in a manner that minimizes the threat of personal injury. In all other instances with a four-person fire company (i.e., when there is not an immediate threat to life), the first-in company must wait until the arrival of the second-in unit to initiate safe and effective fire suppression and rescue operations. This condition underlines the importance and desirability of fire companies to be staffed with four firefighters, and stresses the benefit of four-person companies and their ability to save lives without having to wait for the second-in company to arrive.

MAP 8

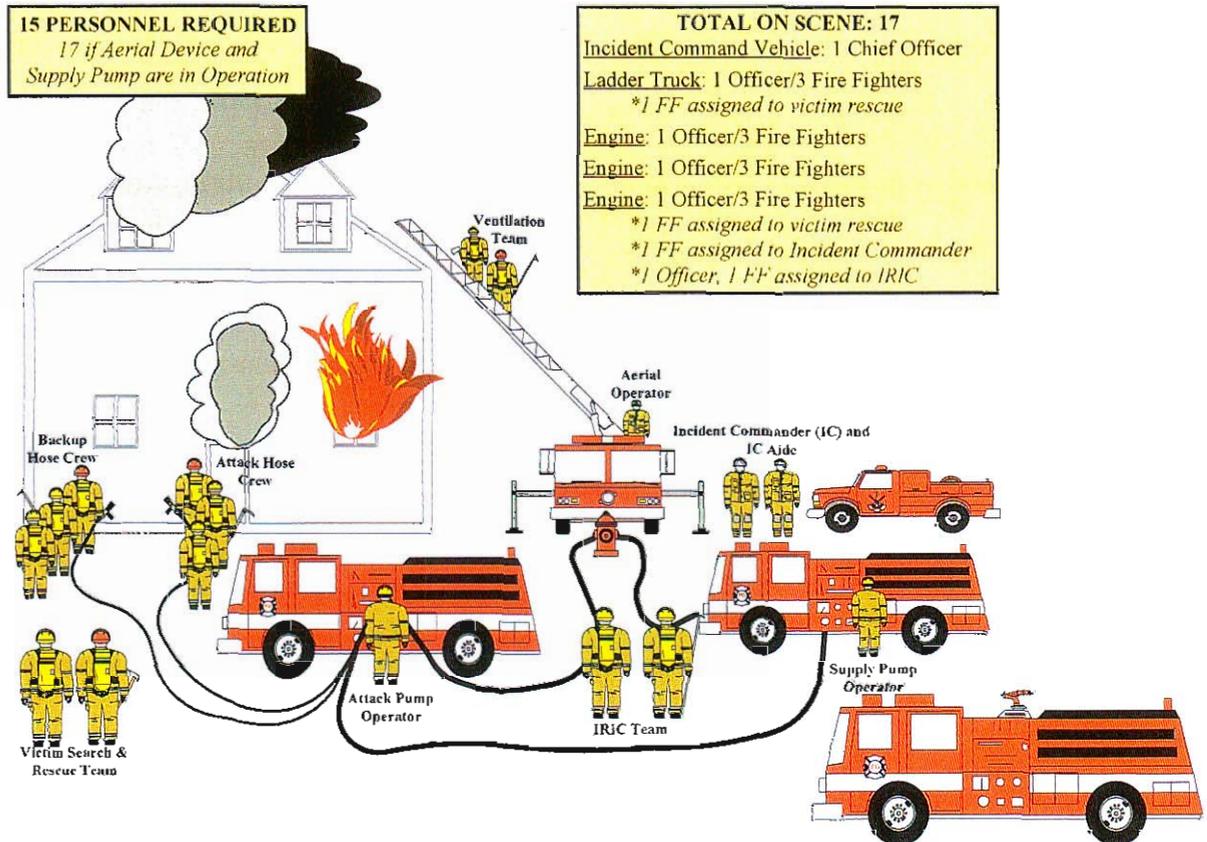


Initial Full Alarm Assignment Capability, as outlined in NFPA Standard 1710, recommends that the “fire department shall have the capability to deploy an initial full alarm assignment within an 8-minute response time to 90 percent of the incidents... [and that the] initial full alarm shall provide for the following: a minimum of one individual dedicated to establishing incident command outside of the hazard area, assisted by an aide; establishment of an uninterrupted water supply, which shall be maintained by an operator who shall ensure uninterrupted water flow application; establishment of attack and backup lines, operated by a minimum of two personnel each to effectively and safely maintain the line; provision of one support person for each attack and backup line to provide hydrant hookup, assist in line lays, utility control, and forcible entry; a minimum of one search and rescue team, consisting of two personnel; a minimum of one ventilation team, consisting of two personnel; and establishment of an Initial Rapid Intervention Crew (IRIC), consisting of a minimum of two properly equipped and trained personnel.”¹¹⁰ This breakdown of the expected capabilities of a full alarm assignment, in compliance with NFPA Standard 1710, requires a minimum contingent of fifteen fire

¹¹⁰ NFPA 1710, § 5.2.3.2.1 and § 5.2.3.2.2, (a) – (h)

suppression personnel, including the Incident Commander (IC) and the IC's aide¹¹¹, to arrive at the scene of a structure fire within 8 minutes of receiving the alarm.¹¹²

FIGURE 14:
NFPA 1710, SECTION 5.2.3.2.2:
INITIAL FULL ALARM ASSIGNMENT DEPLOYED WITHIN 8 MINUTES



Despite the NFPA recommendations, the STFD only responds two engine companies “Code 3” (an emergency response with lights and sirens) for structure fires. A third apparatus is dispatched “Code 2” (non-emergency). This practice is extremely dangerous and is only exacerbated by the lack of sufficient staffing to provide for interior firefighting once on-scene. As was mentioned previously, an interior attack **MUST** consist of at least 4 firefighters in order to comply with the OSHA “2 In/2 Out” regulation. However, none of the engine companies are staffed with four dedicated personnel. Therefore, the first arriving unit must wait for the second company to arrive before entering the building. The second company then assists the first due company and satisfies compliance with the OSHA “2 In/2 Out” standard. Referencing Table 1, p. 10, one can see this approach is neither safe nor

¹¹¹ NFPA 1710, § 5.2.1.2.5

¹¹² It should be noted that a minimum on-scene contingent of seventeen fire suppression personnel are required by NFPA Standard 1710 when a second pump and an aerial device are in operation at the incident scene.

effective for the victims or firefighters operating at the incident. STFD dispatch and staffing practices needlessly place residents' lives and property at undue risk and these inadequacies should be immediately corrected.

NFPA 1710 states that "the fire department's fire suppression resources shall be deployed to provide for the arrival of an engine company within a 4-minute response time and/or the initial full alarm assignment within an 8-minute response time to 90% of the incidents." Utilizing apparatus and personnel at all stations, it is predicted that **only 43% of all roads currently receive a sufficient number of fire suppression personnel within 8 minutes of receiving an alarm to comply with NFPA Standard 1710, assuming all units are fully staffed at existing staffing levels and available to respond immediately upon dispatch. Assembling 15 personnel also requires that the entire department respond with all frontline fire suppression units, thus leaving the remainder of the jurisdiction unprotected.** Due to the increased risk of flashover associated with fire propagation in the areas that lack adequate coverage, it is expected that fire suppression and rescue operations will be forced to shift from an offensive to defensive mode, thus increasing the likelihood of the loss of both life and property.

The 15 personnel satisfy NFPA 1710 recommendations when the second pump and aerial device are not in operation. For a small trashcan or "food on the stove" incident, this is typically the case. **However, for room and contents fires or incidents that necessitate the use of a second pump and aerial device, NFPA 1710 requires at least 17 personnel on-scene. The Sylvania Township Fire Department is unable to assemble 17 personnel on-scene as minimum daily staffing is only 15 personnel. These 15 personnel can only be assembled if the Lucas County ALS medic unit and its two personnel are available to respond to the structure fire. The Lucas County EMS system necessitates that this medic unit may respond to any part of the County, therefore, there is no guarantee that this unit will be available. Likewise, if any other STFD unit, including the ambulance, is responding to a concurrent incident, staffing will fall below industry standards.**

Fire Growth, Flashover, and the Importance of a Rapid Response to a Fire in a Residential Structure:

The Smoldering Phase

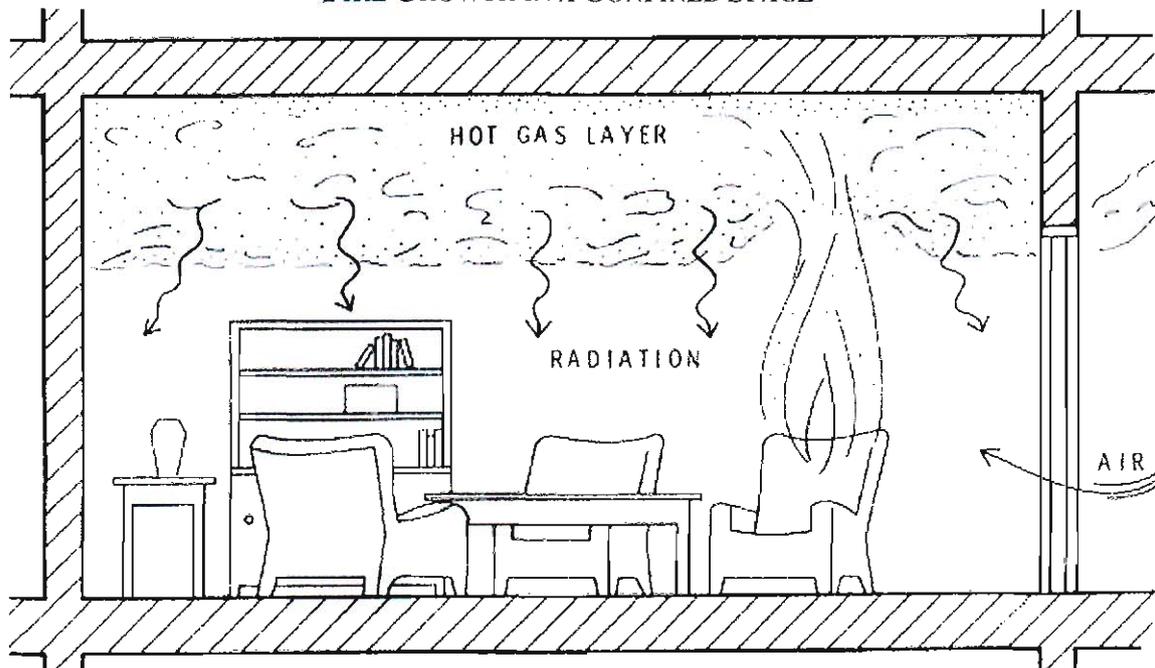
The first stage of any fire is the smoldering stage. When heat is applied to a combustible material, the heat oxidizes the material's surface into combustible gases. The oxidation process is exothermic, meaning that the oxidation process itself produces heat. The heat from oxidation raises the temperature of surrounding materials, which increases the rate of oxidation and begins a chemical chain reaction of heat release and burning. A fire can progress from the smoldering phase immediately or slowly, depending upon the fuel, nearby combustibles, and the availability of oxygen in the surrounding air.

The Free Burning Phase

The second stage of fire growth is the "free" or "open burning" stage. When the temperature of a fire gets high enough, visible flames can be seen. The visible burning at

this stage is still limited to the immediate area of origin. The combustible process continues to release more heat, which heats nearby objects to their ignition temperature, and they begin burning. In a wildland fire the surrounding growth will ignite and the flames will spread, quickly if wind and dry growth are present. A structure fire is different, because the gaseous products of combustion, most of which are flammable and lighter than air, rise and are contained in the upper levels of the structure. When this occurs, the structure fire is at a critical point: either the fire has insufficient oxygen available to burn and it progresses back to the smoldering stage, or it has sufficient oxygen available to move on to the next stage.

FIGURE 12:
"FIRE GROWTH IN A CONFINED SPACE"¹¹³



When an object in a room starts to burn (such as the armchair in Figure 12), for some time after ignition, it burns in much the same way as it would in the open. After a short period of time, however, confinement begins to influence fire development. The smoke produced by the burning object rises to form a hot gas layer below the ceiling; this layer heats the ceiling and upper walls of the room. Thermal radiation from the hot layer, ceiling, and upper walls begins to heat all objects in the lower part of the room and may augment both the rate of burning of the original object and the rate of flame spread over its surface.

At this point, the fire may go out if, for example, the first object burns completely before others start, or if sufficient oxygen cannot get into the room to keep the object burning. Sometimes, however, the heating of the other combustibles in the room continues to the point where they reach their ignition temperatures more or less simultaneously. If this occurs, flames suddenly sweep across the room, involving most combustibles in the fire.

¹¹³ Image courtesy of University of Ohio at Davis Fire Department

This transition from the burning of one or two objects to full room involvement is referred to as “flashover.”¹¹⁴

Flashover

The third stage of fire growth is called *flashover*. It is the most significant moment of any structure fire. As combustible gases are produced by the two previous stages they are not wholly consumed. They rise and form a superheated gas layer at the ceiling. As the volume of this gas layer increases, it begins to bank down to the floor, heating all combustible objects regardless of their proximity to the burning object. In a typical structure fire, the gas layer at the ceiling can quickly reach temperatures of 1,500 degrees Fahrenheit. If there is enough existing oxygen, usually near floor level, flashover occurs and everything in the room breaks out into open flame at once. The instantaneous eruption into flame generates a tremendous amount of heat, smoke, and pressure with enough force to push beyond the room of origin through doors and windows. Usually at the time of flashover, windows in the room will break, allowing for the entry of fresh air. The introduction of fresh air serves to further fuel the growth of the fire, increase the temperature of the fire, and aid in the spread of the fire beyond the room of origin. The combustion process then speeds up because it has an even greater amount of heat to move to unburned objects.

The ability of adequate fire suppression forces to greatly influence the outcome of a structural fire is undeniable and predictable. Data generated by the National Fire Protection Association provides empirical proof that rapid and aggressive interior attack can substantially reduce the human and property loss associated with structural fires. At each stage of a fire’s extension beyond the room of origin, the rate of civilian deaths, injuries, and property damage grows exponentially.

TABLE 10:¹¹⁵
“THE RELATIONSHIP BETWEEN FIRE EXTENSION AND FIRE LOSS”

RATE PER 1,000 FIRES			
Fire Extension in Residential Structures:	Civilian Deaths	Civilian Injuries	Average Property Damage
Confined to Room of Origin	2.07	24.30	\$1,505.00
Confined to Floor of Origin	18.60	80.44	\$12,134.00
Beyond Floor of Origin	27.23	55.37	\$21,343.00

The Importance of Adequate Staffing to Conduct Safe and Effective Fire Suppression and Rescue Operations:

A prime objective of fire service agencies is to maintain enough strategically located personnel and equipment so that the minimum acceptable response force can reach a

¹¹⁴ J.R. Mehaffey, Ph.D., Flammability of Building Materials and Fire Growth, Institute for Research in Construction (1987)

¹¹⁵ NFPA 1710, Table A.5.2.1.2.1, *Fire Extension in Residential Structures* (1994–1998).

reasonable number of fire scenes before flashover is likely.¹¹⁶ Two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of origin as possible, as well as rescue any trapped occupants and care for the injured. Rapid and aggressive interior attack of structure fires, as close as possible to the point of origin, can reduce human and property losses. Sub-optimal staffing of arriving units may delay such an attack, thus allowing the fire to progress to more dangerous conditions for fire fighters and civilians. "If the arriving units have adequate resources to handle the situation, then they will fight the fire aggressively and offensively. They will attack the problem head-on and, following department standards, will accomplish their objectives efficiently, effectively, and safely. If they do not have adequate resources to aggressively handle the situation, then they will have to fight the fire in a defensive mode of attack. This mode will continue until enough resources can be massed to then change to an aggressive, offensive attack."¹¹⁷

NFPA 1500 and 1710 both recommend that a minimum acceptable fire company staffing level should be **four members responding on or arriving with each engine and each ladder company responding to any type of fire.** As was mentioned earlier in this report, the Sylvania Township Fire Department staffs some engine and truck companies with only three fire fighters, out of compliance with professional standards for the provision of safe and effective fire suppression and rescue operations. At the scene of an emergency, the driver/operator of the engine must remain with the apparatus to operate the pump. Likewise, the driver/operator of the ladder truck must remain with the apparatus to safely operate the aerial device. Such activities, which help to ensure the safe and effective delivery of fire suppression and rescue services, leave a crew of only two firefighters from an engine company and/or ladder company to support the attack or complete search and rescue activities. A fire attack initiated by a single fire company would not be capable of effecting a safe and effective fire suppression and/or rescue operation in compliance with the "2 In/2 Out" regulation until a second company arrives with sufficient personnel to support the fire attack and/or rescue operation, and to assist the first company in the event of an unexpected emergency.¹¹⁸ Industry studies have confirmed that **four fire fighters are capable of performing the rescue of potential victims 80% faster than a crew of three fire fighters.**¹¹⁹

Any delay in the initiation of fire suppression and rescue operations translates directly into a proportional *increase* in expected property, life, and economic losses (reference "The Relationship between Fire Extension and Fire Loss," Table 10, p. 83). It warrants emphasizing that if a structure has no automatic suppression or detection system, a more

¹¹⁶ University of Ohio at Davis Fire Department website; site visited June 7, 2004.
< <http://fire.ucdavis.edu/ucdfire/UCDFDoperations.htm> >

¹¹⁷ National Institute for Occupational Safety and Health, High-Rise Apartment Fire Claims the Life of One Career Fire Fighter (Captain) and Injures Another Career Fire Fighter (Captain) – Texas, 13 October 2001

¹¹⁸ Recall that a four-person fire company may initiate emergency search and rescue operations at the order of the incident commander if there is a "reasonable" and immediate threat to life.

¹¹⁹ McManis Associates and John T. O'Hagan & Associates, Dallas Fire Department Staffing Level Study, (June 1984); pp. 1-2 and II-1 through II-7; Richard C. Morrison, Manning Levels for Engine and Ladder Companies in Small Fire Departments, (1990)

advanced fire may exist by the time the fire department is notified of the emergency and is able to respond. Fires of an extended duration weaken structural members, compromising the structural integrity of a building and forcing operations to shift from an offensive to defensive mode.¹²⁰ This mode will continue until enough resources can be amassed to then change to an aggressive, offensive attack. For these reasons, **it is the recommendation of this report that all fire suppression companies be staffed on a twenty-four hour basis with four EMS cross-trained, multi-role fire fighters, in compliance with NFPA 1500 and NFPA 1710.**

Fire Growth and the Importance of a Rapid Response To a Fire in a Commercial Structure:

Fires in industrial and commercial areas pose unique and significant risks to fire fighters operating on the fire ground, and are some of the most difficult fires to control. Modern warehouses and storage occupancies are especially subject to rapidly developing fires of great intensity because complex configurations of storage are conducive to rapid fire spread, presenting numerous obstacles to fire suppression efforts. Additionally, windows with iron shutters- or buildings with no windows at all- hamper a fire department's efforts to gain access to the building. If passageways are impassable, the fire can be reached only by streams operating through windows, and the opening of shutters may be a time-consuming operation.^{121, 122} The logistics of a commercial fire-fighting operation must not be underestimated. Even under ideal conditions, successfully fighting a fire requires large numbers of personnel and supplies. Physical demands on fire fighters due the building's sheer size requires regular rotation of personnel out of the fire area for rest and rehabilitation.¹²³

Other required supplies include air cylinders. Most self-contained breathing apparatus (SCBA) have only a 30-minute rating and probably last only half that long during strenuous fire-fighting operations. Fire fighters who must walk 300 feet into the building to the actual fire area may only be able to spend 5 to 7 minutes fighting the fire before they must replenish their air supply. Hence, pre-incident plans should contain provisions for assembling a large pool of trained personnel to assist in fire-fighting operations.¹²⁴

Rapid and aggressive interior attack of structure fires, as close as possible to the point of origin, can reduce human and property losses. If the arriving units have adequate resources to handle the situation, then they will fight the fire aggressively and offensively, and will accomplish their objectives efficiently, effectively, and safely. If they do not have adequate resources to aggressively handle the situation, then they will have to fight the fire in a defensive mode of attack.

¹²⁰ According to the NFPA, "it's important to realize that every 250 GPM stream applied to the building can add up to one ton per minute to the load the weakened structure is carrying."

¹²¹ Fire Chief's Handbook, 4th ed., "Advanced Fire Fighting," (Saddle Brook, N.J., 1987) 498.

¹²² National Fire Protection Association, Warehouse Operations, Fire Protection Handbook, 18th ed. (Quincy, MA: NFPA, 1997) § 9-110

¹²³ *Ibid.*; pp. 9-114

¹²⁴ *Ibid.*

The Importance of Adequate Staffing to Conduct Safe and Effective Fire Suppression and Rescue Operations:

A prime objective of fire service agencies is to maintain enough strategically located personnel and equipment so that the minimum acceptable response force can reach a reasonable number of fire scenes before flashover is likely.¹²⁵ Two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of origin as possible, as well as rescue any trapped occupants and care for the injured. Rapid and aggressive interior attack of structure fires, as close as possible to the point of origin, can reduce human and property losses. Sub-optimal staffing of arriving units may delay such an attack, thus allowing the fire to progress to more dangerous conditions for fire fighters and civilians. "If the arriving units have adequate resources to handle the situation, then they will fight the fire aggressively and offensively. They will attack the problem head-on and, following department standards, will accomplish their objectives efficiently, effectively, and safely. If they do not have adequate resources to aggressively handle the situation, then they will have to fight the fire in a defensive mode of attack. This mode will continue until enough resources can be massed to then change to an aggressive, offensive attack."¹²⁶

NFPA 1500 and 1710 both recommend that a minimum acceptable fire company staffing level should be **four members responding on or arriving with each engine and each ladder company responding to any type of fire.** Currently, the STFD does not staff all engine and truck companies with four fire fighters in compliance with professional standards for the provision of safe and effective fire suppression and rescue operations. As was mentioned, the driver/operator of the engine/truck must remain with the apparatus to operate the pump/ladder. Such activities, which help to ensure the safe and effective delivery of fire suppression and rescue activities, leave a crew of only three firefighters to support the attack or complete search and rescue activities. A fire attack initiated by a single fire company staffed with only 3 personnel, then, would not be capable of effecting a safe and effective fire suppression and/or rescue operation in compliance with the "2 In/2 Out" regulation until a second company arrives with sufficient personnel to support the fire attack and/or rescue operation, and to assist the first company in the event of an unexpected emergency.¹²⁷

Any delay in the initiation of fire suppression and rescue operations translates directly into a proportional *increase* in expected property, life, and economic losses. It warrants emphasizing that if a structure has no automatic suppression or detection system, a more advanced fire may exist by the time the fire department is notified of the emergency and is able to respond. Likewise, if an insufficient number of firefighters are present at the

¹²⁵ University of Ohio at Davis Fire Department website; visited February 4, 2004.

< <http://fire.ucdavis.edu/ucdfire/UCDFDoperations.htm> >

¹²⁶ National Institute for Occupational Safety and Health, High-Rise Apartment Fire Claims the Life of One Career Fire Fighter (Captain) and Injures Another Career Fire Fighter (Captain) - Texas, 13 October 2001

¹²⁷ Recall that a four-person fire company may initiate emergency search and rescue operations at the order of the incident commander if there is a "reasonable" and immediate threat to life.

incident scene, preventing interior fire attack, firefighters will be forced to fight the fire defensively, allowing for continued fire propagation. Fires of an extended duration weaken structural members, compromising the structural integrity of a building and forcing operations to shift from an offensive to defensive mode.¹²⁸ This mode will continue until enough resources can be amassed to then change to an aggressive, offensive attack. Depending upon how long the fire has been burning, however, saving the structure may not be possible. To ensure the rapid, safe, and effective initiation of fire and rescue operations, **it is recommended that all fire suppression companies be staffed on a twenty-four hour basis with at least four EMS cross-trained, multi-role fire fighters, in compliance with NFPA 1500 and NFPA 1710.**

¹²⁸ According to the NFPA, "it's important to realize that every 250 GPM stream applied to the building can add up to one ton per minute to the load the weakened structure is carrying."

CONCLUSIONS

This analysis reveals the extent of 4- and 8-minute coverage provided within Sylvania Township by the Sylvania Township Fire Department under existing and proposed staffing and deployment arrangements. Based on the output of the ArcView apparatus response model, the following conclusions can be reached (*note that the statements below pertain to a single incident only, and do not assume like performance in simultaneously occurring incidents*):

SUPERVISORY CHIEF OFFICERS

Existing Conditions

The Sylvania Township Fire Department's chief officers are currently able to respond on **35.1% of all roads within 4 minutes**, and **82.8% of all roads within 8 minutes**, assuming the unit is available to respond immediately upon dispatch.

ENGINE COMPANIES

Existing Conditions

Sylvania Township Fire Department engine companies are currently able to provide fire suppression, disaster incident mitigation, and essential emergency medical services on **86% of all roads within 4 minutes** and **99% of all roads within 8 minutes**, assuming all units are available to respond immediately upon dispatch.

TRUCK COMPANY

Existing Conditions

The Sylvania Township Fire Department ladder company is currently unable to provide fire suppression, disaster incident mitigation, and essential emergency medical services on **any roads due to the department not providing dedicated staffing for the truck company**.

"2 IN/2 OUT" OPERATIONS

Existing Conditions

Sylvania Township Fire Department fire suppression companies are currently able to initiate *safe and effective* fire suppression and rescue operations in accordance with the "2 In/2 Out" regulation on **95.5% of all roads within 8 minutes**, assuming all units are staffed and available to respond immediately upon dispatch.

NFPA 1710 INITIAL FULL ALARM

Existing Conditions (15 Personnel On-Scene)

Sylvania Township Fire Department fire suppression and command units are currently able to assemble 15 personnel as part of an "Initial Full Alarm" response, in compliance with NFPA 1710 performance objectives, on **43% of all roads within 8 minutes**, assuming all units are available to respond immediately upon dispatch.

RECOMMENDATIONS

Compliance with NFPA 1710 requires that the department comply with response time performance objectives contained within the standard.¹²⁹ NFPA 1710 states that, "The fire department shall establish the following time objectives...four minutes or less for the arrival of the first arriving engine company at a fire suppression incident and/or 8 minutes or less for the deployment of a full first alarm assignment at a fire suppression incident...The fire department shall establish a performance objective of not less than 90 percent for the achievement of each response time objective."¹³⁰ Furthermore, NFPA 1710 also requires that, "When provided by the fire department, ALS units shall be deployed to provide for the arrival of an ALS company within an 8-minute response time to 90 percent of the incidents to which the department is required and/or expected to respond."¹³¹

Based on these parameters, the department is not in compliance with NFPA 1710 recommendations. It is recommended that additional apparatus and personnel be assigned to the department in an attempt to bring staffing closer to NFPA 1710 recommendations.

¹²⁹ Full compliance with NFPA 1710 also encompasses a number of other aspects related to operations, logistics, and management of the fire department. A checklist is provided in Appendix C.

¹³⁰ NFPA 1710, § 4.1.2.1.1 and 4.1.2.1.2.

¹³¹ NFPA 1710 § 5.3.3.4.3

FINAL SUMMARY

FINAL SUMMARY

The business of providing emergency services has always been labor intensive, and remains so to this day. Although new technology has improved firefighting equipment and protective gear, and has led to advances in modern medicine, it is the fire fighters who still perform the critical tasks necessary to contain and extinguish fires, rescue trapped occupants from a burning structure, and provide emergency medical and rescue services.

It is generally accepted that a municipality has the right to determine the overall level of fire protection it wants. However, regardless of the level of fire protection chosen by the citizens, neither they nor their elected representatives have the right to jeopardize the safety of the employees providing those services. Citizens pay for protection of life and property through their tax dollars, and they assume that their elected and appointed officials will make informed decisions regarding that protection. Too often, however, that decision making process has been based solely on budgetary expedience. Irrespective of the resources provided, citizens continue to believe that fire fighters are prepared to provide an aggressive interior assault on fires, successfully accomplishing victim rescue, fire control, and property conservation. They do not expect fire fighters to take defensive actions- to simply surround a fire and "drown it"- because to do so would be to concede preventable loss of both life and property. When staffing falls below minimum acceptable levels so does service; at this point, the goals and expectations set by the community are essentially abandoned. The staffing and deployment deficiencies that prevail in the Sylvania Township Fire Department are illustrative of this condition.

The ramifications of staffing reductions as they pertain to the loss of life and property within a community are essential when considering modifications to a fire department's deployment configuration. While it is impossible to predict the exact locations of future fire and medical emergencies, **the Sylvania Township Fire Department should examine where emergencies have typically occurred in the past, incorporating CAD data as necessary, and make efforts to ensure that all areas achieve complete compliance with NFPA Standard 1710.** Appendix "B" contains additional deployment scenarios that illustrate projected coverage based upon deployment schemes.

Areas with accelerated development and growth will require additional coverage in the future. Any projected increase in emergency response demands should also be considered before changes are implemented, focusing on associated hazard types and planned response assignments. Any proposed changes in staffing, deployment and station location should be made only after considering the historical location of calls, response times to specific target hazards, compliance with departmental Standard Operating Procedures, existing national standards, including NFPA 1500 and NFPA Standard 1710, and the citizens' expectation of receiving an adequate number of qualified personnel on appropriate apparatus within acceptable time frames.

GIS MAP DETAIL

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APPENDIX



**APPENDIX A:
TIMELINE OF A TYPICAL
EMERGENCY RESPONSE TO AN
INCIDENCE OF CARDIAC ARREST**



**TIMELINE OF A TYPICAL EMERGENCY RESPONSE
TO AN INCIDENT OF SUDDEN CARDIAC ARREST**



ICON	ACTION	NFPA 1710 STANDARD APPLIED	TIMELINE: EMERGENCY RESPONSE SYSTEM	TIMELINE: EFFECTS OF OXYGEN DEPRIVATION ON CARDIAC PATIENT ¹
	Onset of Sudden Cardiac Arrest (SCA).	N/A	N/A	Heart's ability to pump blood compromised as a result of a medical emergency including, but not limited to, respiratory arrest, drowning, traumatic injury, electrocution, irregular heart rhythm, or choking.
	Notification of 9-1-1 system.	N/A	Unknown variable	Contingent upon patient or bystander recognition of event and time to action taken.
	Call processing and dispatch of fire department units to the medical emergency.	NFPA 1710, §6.4.2, states that "All ...operating procedures shall comply with NFPA 1221," which allows no more than one minute for call processing and dispatch.	Time elapsed: One minute	60 seconds: Cardiac irritability if onset of SCA recognized within this timeframe.
	Fire fighters notified of medical emergency, prepare for response and board apparatus.	NFPA 1710, §4.1.2.1.1, states that the fire department shall establish a turnout time of one minute (60 seconds).	Time elapsed: Two minutes $\left\{ \begin{array}{l} 1 \text{ minute "dispatch time"} \\ + \\ 1 \text{ minute "turnout time"} \end{array} \right\}$	Heart's condition continues to worsen if no action taken. If defibrillation is initiated within 1-2 minutes , however, survival rates can be as high as 90 percent.
	Fire fighters respond to emergency scene.	NFPA 1710, §4.1.2.1.1(3) states that a fire department shall establish the response time objective of " Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident."	Time elapsed: Six minutes (approx.) $\left\{ \begin{array}{l} 1 \text{ minute "dispatch time"} \\ + \\ 1 \text{ minute "turnout time"} \\ + \\ 4 \text{ minutes "travel time"} \\ \text{(or less)} \end{array} \right\}$	Research shows that in many cases, full recovery is possible if CPR is initiated within 4 minutes of onset of symptoms, followed by the administration of both basic and advanced life support measures, resulting in the restoration of circulation.

¹ Timeline assumes the emergency medical system is activated at the onset of cardiac arrest.

**TIMELINE OF A TYPICAL EMERGENCY RESPONSE
TO AN INCIDENT OF SUDDEN CARDIAC ARREST**

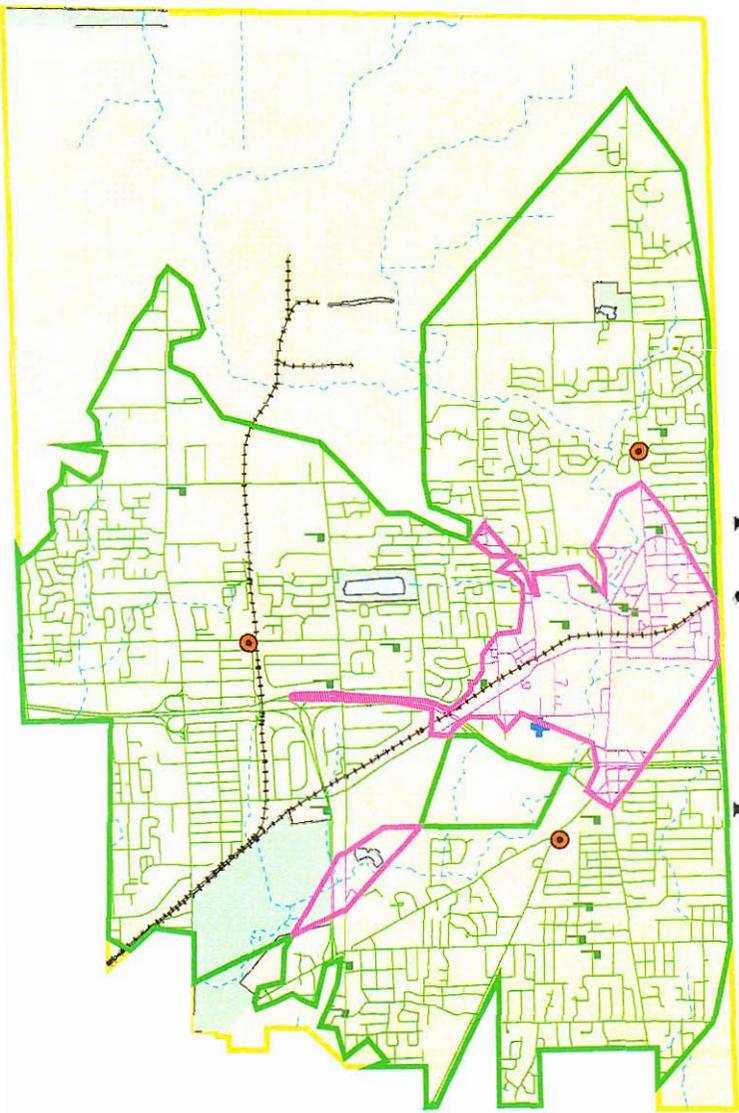


ICON	ACTION	NFPA 1710 STANDARD APPLIED	TIMELINE: EMERGENCY RESPONSE SYSTEM	TIMELINE: EFFECTS OF OXYGEN DEPRIVATION ON CARDIAC PATIENT ¹
	<p>Four fire fighters arrive on the incident scene within 4 minutes: two BLS providers and two ALS providers.</p>	<p>NFPA 1710, §5.3.3.4.4 states that Advanced Life Support (ALS) emergency response deployments "shall include a minimum of two members trained at the emergency medical technician-paramedic (EMT-P) level and two members trained at the emergency medical technician-basic (EMT-B) level arriving on scene within the established response time."</p>	<p>Fire fighters access patient, perform initial assessment, and initiate CPR.</p> <p style="text-align: center;"> } Time can vary due to patient location and accessibility. Time from assessment to initiation of CPR is typically calculated at less than 30 seconds. </p>	<p>4-6 minutes: brain damage likely in the absence of basic and advanced emergency medical intervention.</p>
<p>BLS:</p>	<p>Two BLS providers access and stabilize the patient, initiate CPR, and prepare patient for ALS interventions.</p> <p>One ALS provider prepares the AED and analyzes the results of electrocardiogram (ECG) report.</p>	<p>NFPA Standard 1710 states that "the fire department... shall ensure [that] emergency medical response capability includes personnel, equipment, and resources to deploy at the first responder level with automatic external defibrillator (AED) or higher treatment level."</p>	<p>Time elapsed:</p> <p>Seven minutes (approx.)</p> <p style="text-align: center;"> } 1 minute "dispatch time" + 1 minute "turnout time" + 4 minutes "travel time" (or less) + 1 minute to access patient and initiate CPR </p>	<p>If circulation is not restored, the patient's condition will continue to deteriorate with increased time. According to the Eisenberg study, survival rates decrease by 5.5 percent with every minute that passes without treatment.</p>
<p>ALS:</p>	<p>One ALS provider prepares for and initiates the range of advanced cardiac life support measures, including advanced cardiac monitoring and manual defibrillation, drug therapy, advanced airway management (inclusive of intubation), and the establishment and maintenance of intravenous (I.V.) access.</p>	<p>NFPA Standard 1710 states that a "fire department shall establish the response time objective of 8 minutes or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department."</p>	<p>Time elapsed:</p> <p>Eight minutes (approx.)</p> <p style="text-align: center;"> } 1 minute "dispatch time" + 1 minute "turnout time" + 4 minutes "travel time" (or less) + 1 minute to access patient and initiate CPR + 1 minute to initiate ALS (if not in 1st group, e.g., ALS engine) </p>	<p>6-10 minutes: brain damage very likely in the absence of ALS intervention. Cardiac arrest can be reversed in many victims if it is treated with immediate CPR, and if followed by, an electric shock to the heart within 7 to 10 minutes. Few resuscitation attempts succeed if begun after 10 minutes have elapsed since the cessation of patient's heartbeat and breathing.</p>

**APPENDIX B:
ALTERNATIVE DEPLOYMENT
SCENARIOS**

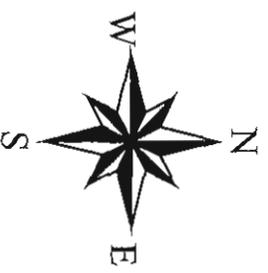


Sylvania Fire Department 4-Minute Engine Company Response Area 3 Station Deployment Option "A"



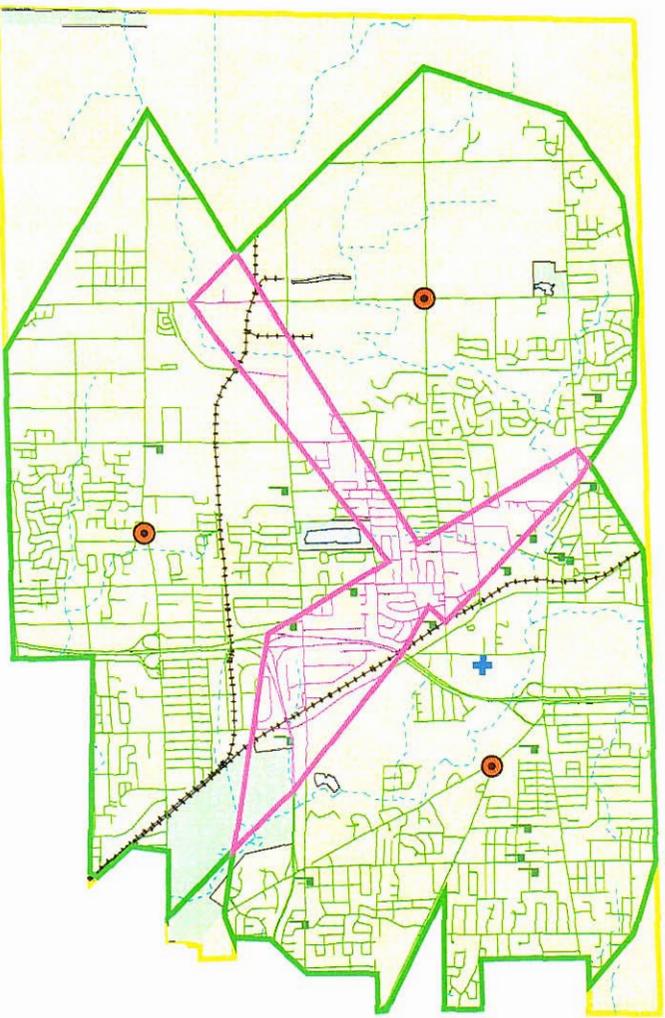
- Optional 3-Station Deployment Locations
- Projected 4-Minute "2-Deep" Response Area*
- 10.7% of All Roads Covered Within 4-Minutes
- Projected 4-Minute Engine Company Response Area*
- 81.8% of All Roads Covered Within 4-Minutes
- Road network
- Rail lines
- Rivers
- + Flower hospital
- Educational institutions
- Parks
- Lakes
- City of Sylvania

* Assumes all assigned units are fully staffed and available to respond immediately upon dispatch.
 "2 Deep" refers to the ability of the fire department to assemble 2-units within the assigned time frame.



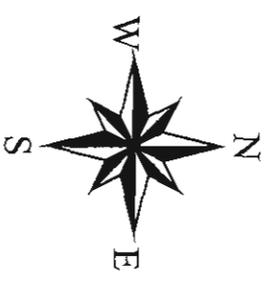


Sylvania Fire Department 4-Minute Engine Company Response Area 3 Station Deployment Option "B"



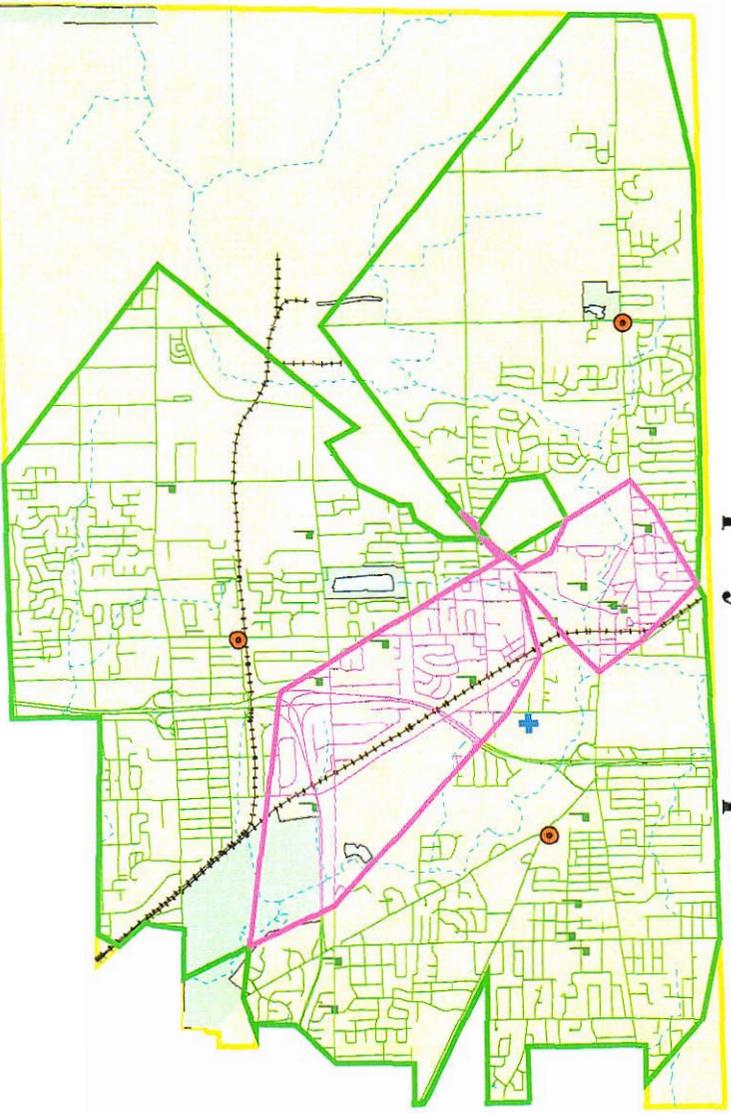
- Optional 3-Station Deployment Locations
- ◻ Projected 4-Minute "2-Deep" Response Area*
- ◻ 10.9% of All Roads Covered Within 8-Minutes
- ◻ Projected 4-Minute Engine Company Response Area*
- ◻ 89% of All Roads Covered Within 4-Minutes
- Road network
- Rail lines
- Rivers
- + Flower hospital
- + Educational institutions
- Parks
- Lakes
- City of Sylvania

* Assumes all assigned units are fully staffed and available to respond immediately upon dispatch. "2 Deep" refers to the ability of the fire department to assemble 2-units within the assigned time frame.





Sylvania Fire Department 4-Minute Engine Company Response Area 3 Station Deployment Option "C"



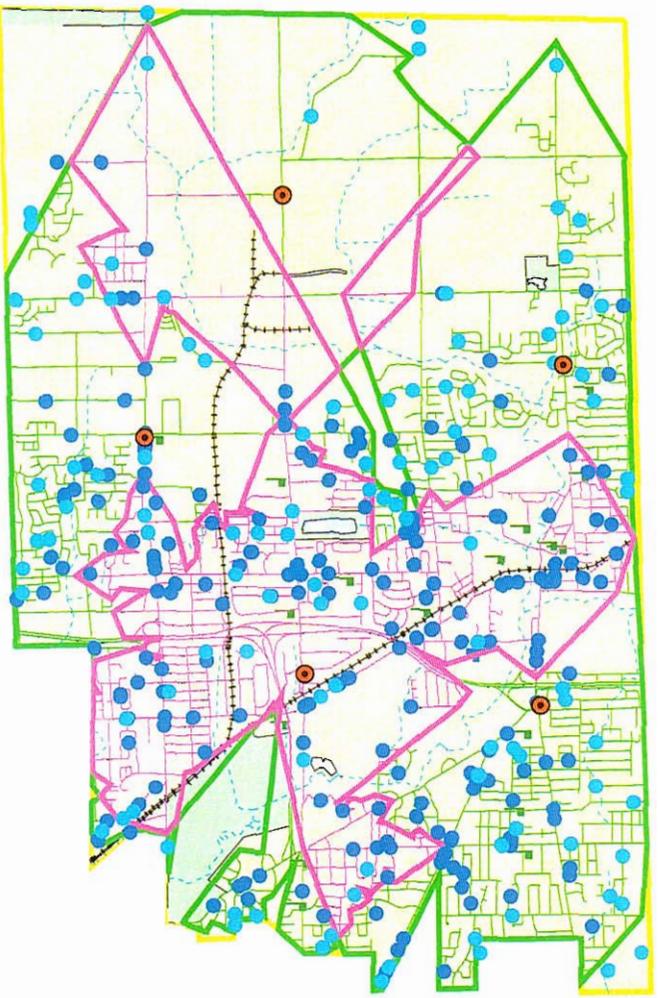
- Optional 3-Station Deployment Locations
- Projected 4-Minute "2-Deep" Response Area*
- 13.5% of All Roads Covered Within 4-Minutes
- Projected 4-Minute Engine Company Response Area*
- 85.8% of All Roads Covered Within 4-Minutes
- Road network
- - - Rail lines
- ~ Rivers
- ⊕ Flower hospital
- ⊕ Educational institutions
- Parks
- Lakes
- City of Sylvania

* Assumes all assigned units are fully staffed and available to respond immediately upon dispatch.
 "2 Deep" refers to the ability of the fire department to assemble 2-units within the assigned time frame.





Sylvania Fire Department 4-Minute Engine Company Response Area 5 Station Deployment Option "A"



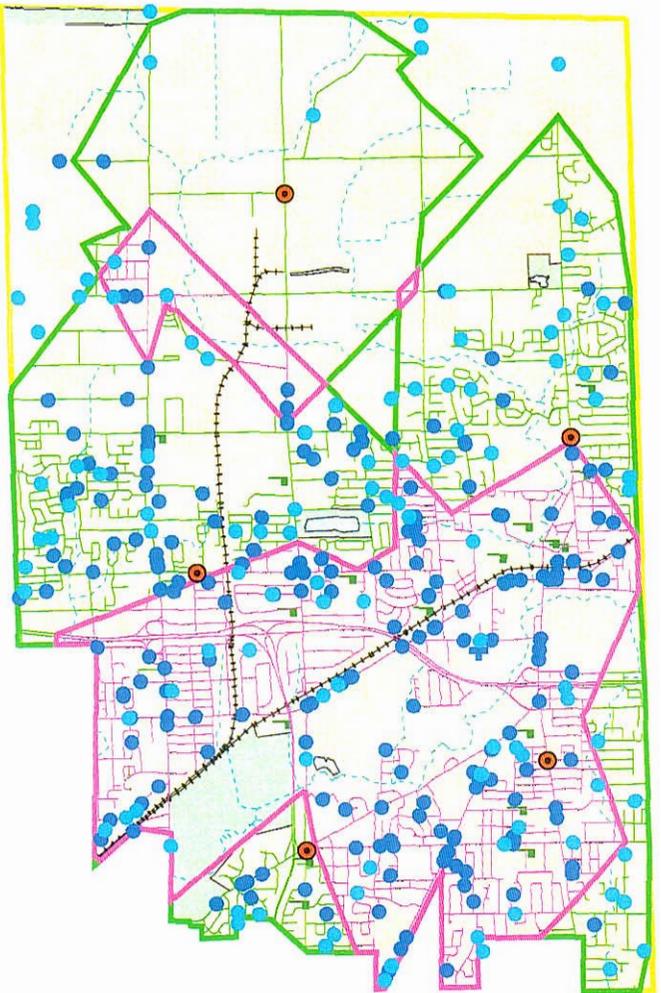
- Optional 5-Station Deployment Locations
- 42% of Incidents First Arriving Engine Exceeds 4-Minutes
- 58% of Incidents First Arriving Engine Within 4-Minutes
- ▭ Projected 4-Minute "2-Deep" Response Area*
- ▭ 43.7% of All Roads Covered Within 4-Minutes
- ▭ Projected 4-Minute Engine Company Response Area*
- ▭ 94.2% of All Roads Covered Within 4-Minutes
- Road network
- Rail lines
- Rivers
- ⊕ Flower hospital
- ⊕ Educational institutions
- ▭ Parks
- ▭ Lakes
- ▭ City of Sylvania

* Assumes all assigned units are fully staffed and available to respond immediately upon dispatch.
 "2 Deep" refers to the ability of the fire department to assemble 2-units within the assigned time frame.



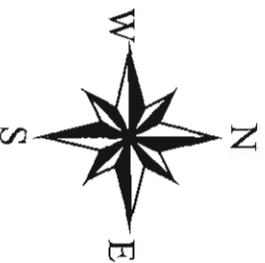


Sylvania Fire Department 4-Minute Engine Company Response Area 5 Station Deployment Option "B"



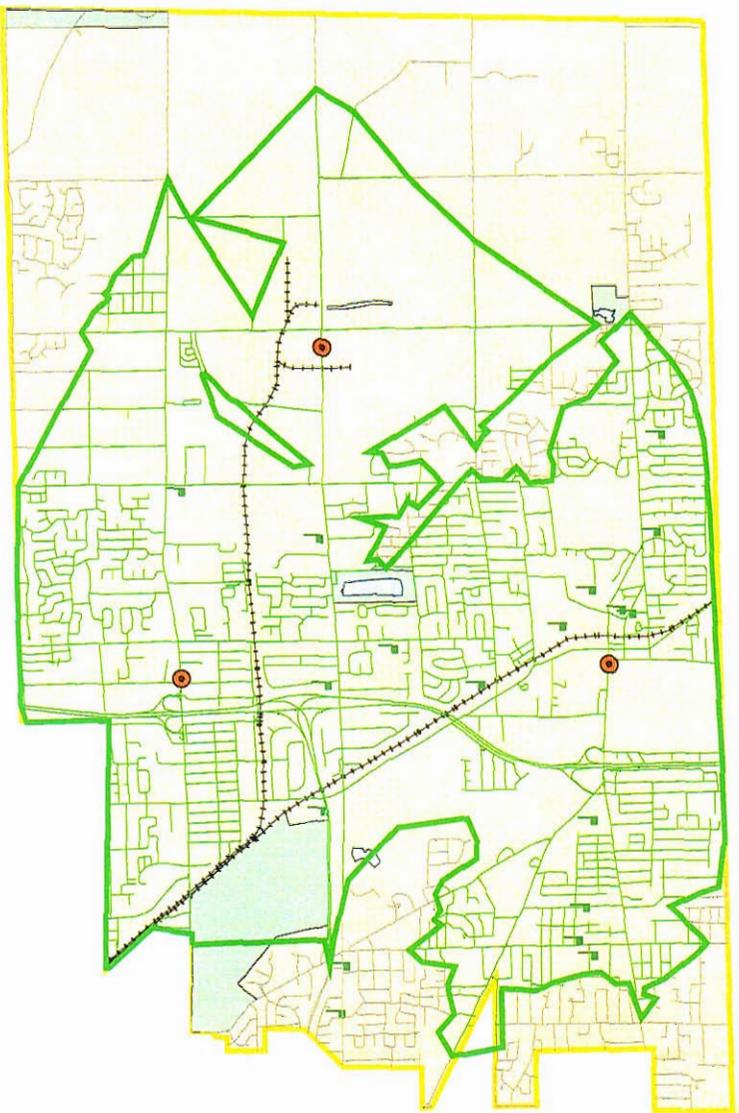
- Optional 5-Station Deployment Locations
- 42% of Incidents First Arriving Engine Exceeds 4-Minutes
- 58% of Incidents First Arriving Engine Within 4-Minutes
- ▭ Projected 4-Minute "2-Deep" Response Area*
- ▭ 52% of All Roads Covered Within 4-Minutes
- ▭ Projected 4-Minute Engine Company Response Area*
- ▭ 92.1% of All Roads Covered Within 4-Minutes
- Road network
- Rail lines
- Rivers
- + Flower hospital
- + Educational institutions
- Parks
- Lakes
- City of Sylvania

*Assumes all assigned units are fully staffed and available to respond immediately upon dispatch.
 "2 Deep" refers to the ability of the fire department to assemble 2-units within the assigned time frame.

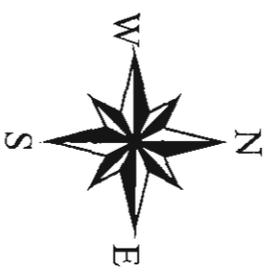




Sylvania Fire Department 4-Minute Engine Company Response Area Current Stations Without Station 3

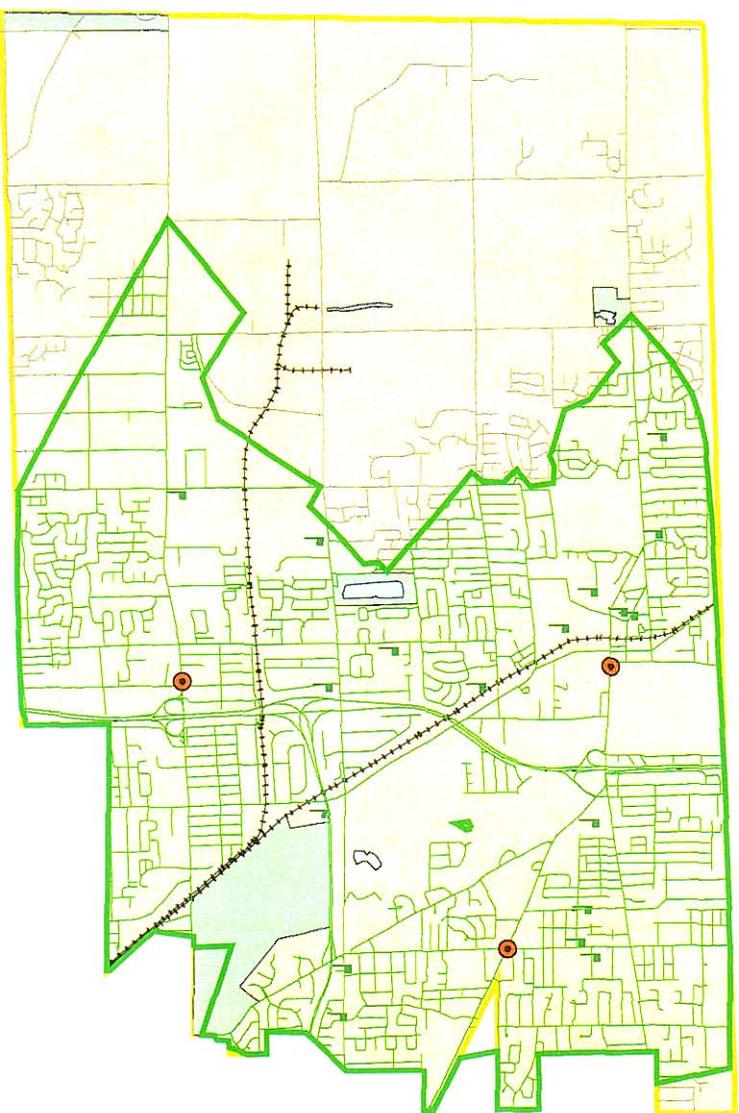


- Current Stations Without Station 3
 - 75.1% of All Roads Covered Within 4-Minutes
 - ▬ Road network
 - ▬ Rail lines
 - ▬ Rivers
 - ▬ Educational institutions
 - ▬ Parks
 - ▬ Lakes
 - ▬ City of Sylvania
- * Assumes all assigned units are fully staffed and available to respond immediately upon dispatch.



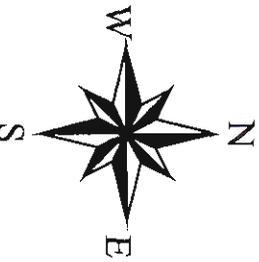


Sylvania Fire Department 4-Minute Engine Company Response Area Current Stations Without Station 4



- Current Stations Within Station 4
- Current Stations Without Station 4
- 77.8% of All Roads Covered Within 4-Minutes
- Road network
- Rail lines
- Rivers
- Educational institutions
- Parks
- Lakes
- City of Sylvania

* Assumes all assigned units are fully staffed and available to respond immediately upon dispatch.





**APPENDIX C:
NFPA 1710 COMPLIANCE
CHECKLIST**



NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
ORGANIZATION					
1	Does the authority having jurisdiction have a written statement that addresses the following?	Existence of the FD?	X		
		Outline of the services the FD provides	X		
		Basic Organizational Structure	X		
		Expected # of FD members	X		
		Functions that FD members are expected to perform	X		
2	Does the organizational statement include service delivery objectives?	Fire Suppression	X		
		EMS	X		
		Special Operations	X		
		Aircraft Rescue Firefighting		X	
		Marine Rescue Firefighting		X	
		Wildland Firefighting		X	
3	Does the FD have objectives for percentage of responses that meet response time objectives?	One minute "turnout time."		X	
		Four minutes or less for the arrival of the first arriving engine company and/or 8 minutes or less for the arrival of a full first alarm assignment at a fire suppression incident.	X		
		Four minutes or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident.	X		
		Eight minutes or less for the arrival of an advanced life support unit at an emergency medical incident (where this service is provided by the fire department).	X		
4	Has the fire department established a performance objective of not less than 90 percent for the achievement of each response time objective specified in Item #3?				X
5	Does the fire department evaluate its level of service and deployment delivery and response time objectives on an annual basis?				X
	<i>Evaluations must be based on data relating to level of service, deployment, and the achievement of each response time objective in each geographic area within the jurisdiction of the fire department.</i>				

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
6	Does the fire department provide to the authority having jurisdiction a written report, quadrennially, defining the geographic areas and/or circumstances in which the requirements of Standard 1710 are not being met?			X	
7	Does the quadrennial report explain the predictable consequences of these deficiencies and address the steps that are necessary to achieve compliance?			X	
8	Does the fire department organizational statement set forth the criteria for the various types of <u>fire suppression incidents</u> to which the fire department is required to respond?		X		
9	Does the fire department organizational statement set forth the criteria for the various types of <u>emergency medical incidents</u> to which the fire department is required and/or expected to respond?		X		
10	Does the fire department organizational statement ensure that the fire department's <u>emergency medical response capability</u> includes personnel, equipment, and resources to deploy at the first responder level with automatic external defibrillator (AED) or higher treatment level?		X		
11	Where <u>emergency medical services</u> beyond the first responder with automatic defibrillator level are provided by another agency or private organization, does the authority having jurisdiction include the minimum staffing, deployment and response criteria in the following:	The fire department organizational statement? Any contract, service agreement, governmental agreement, or memorandum of understanding between the authority having jurisdiction and the other agency or private organization?			X
12	Does the fire department organizational statement set forth the criteria for the various types of <u>special operations response</u> and mitigation activities to which the fire department is required and/or expected to respond?		X		
13	Does the fire department organizational statement ensure that the fire department's <u>hazardous materials response capability</u> includes personnel, equipment, and resources to deploy at the first responder operational level as required by 29 CFR 1910.120?		X		

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
14	Does the fire department organizational statement ensure that the fire department's <u>confined space response capability</u> includes personnel, equipment, and resources to deploy at the confined space operational level as required by 29 CFR 1910.146?	MUTUAL AID FOR CONFINED SPACE WITH TOLEDO FIRE DEPT LOCAL 92.			X
15	Does the fire department organizational statement set forth the criteria for the various types of fire department response during <u>natural disasters or terrorism incidents</u> , weapons of <u>mass destruction incidents</u> , or <u>large scale or mass casualty events</u> ?			X	
16	Does the fire department organizational statement set forth the criteria for the various types of <u>airport rescue and fire-fighting incidents</u> to which the fire department is required and/or expected to respond?	NO AIRPORT IN DISTRICT.		X	
17	Does the fire department organizational statement set forth the criteria for the various types of <u>marine rescue and fire-fighting incidents</u> to which the fire department is required and/or expected to respond?	LIMITED WATER IN DISTRICT, PONDS, STREAMS AND SMALL WAYS MADE LAKE		X	
18	Does the fire department organizational statement set forth the criteria for the various types of <u>wildland fire suppression incidents</u> to which the fire department is required and/or expected to respond?		X		
19	Are <u>mutual aid, automatic aid, and fire protection agreements</u> in writing and address such issues as liability for injuries and deaths, disability retirements, cost of service, authorization to respond, staffing, and equipment, including the resources to be made available and the designation of the incident commander?			X	
20	Are procedures and training of personnel for all fire departments in <u>mutual aid, automatic aid, and fire protection agreement plans</u> comprehensive and produce an effective fire force to ensure uniform operations?			X	

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
21	Are companies responding to <u>mutual aid incidents</u> equipped with communications equipment that allow personnel to communicate with incident commander and division supervisors, group supervisors, or sector officers?	LIMITED	X		
FIRE SUPPRESSION SERVICES					
22	Are fire suppression operations organized to ensure that the fire department's fire suppression capability includes personnel, equipment, and resources to deploy the initial arriving company, the full initial alarm assignment, and additional alarm assignments? <i>(The fire department is permitted to use established automatic mutual aid and mutual aid agreements to comply with these requirements)</i>		X		
23	Are on-duty fire suppression personnel comprised of the numbers necessary for fire-fighting performance relative to the expected fire-fighting conditions, as determined through task analyses that take the following factors into consideration:	Life hazard to the populace protected? Provisions of safe and effective fire-fighting performance conditions for the fire fighters? Potential property loss? Nature, configuration, hazards, and internal protection of the properties involved? Types of fire ground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene?		X X X X X	
24	Are on-duty personnel assigned to fire suppression organized into company units and have appropriate apparatus and equipment assigned to such companies?		X		
25	Has the fire department identified the minimum company staffing levels necessary to meet the deployment criteria required to ensure that a sufficient number of members are assigned, on duty, and available to safely and effectively respond with each company, as required by NFPA 1710, Section 5.2.3?			X	
26	Is each company led by an officer who is considered a part of the company?		X		
27	Are supervisory chief officers dispatched or notified to respond to all full alarm assignments?		X		

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
28	Do supervisory chief officers have staff aides deployed to them for purposes of incident management and accountability at emergency incidents?			X	
29	Are fire company staffing requirements based on minimum levels for emergency operations for safety, effectiveness, and efficiency?			X	
30	Are fire companies whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue (i.e., engine companies) staffed with at least four on-duty personnel?	ONLY ON LIMITED BASIS DEPENDING ON STATION OR MULTIPLE RESPONSE UNITS	X		
31	In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, are engine companies staffed with the required minimum of five or six on-duty members?			X	
32	Are fire companies whose primary functions are to perform the variety of services associated with truck work- such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul, and salvage work (i.e., truck companies)- staffed with at least four on-duty personnel?			X	
33	In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, are truck companies staffed with the required minimum of five or six on-duty members?			X	
34	Are other types of companies equipped with specialized apparatus and equipment provided to assist engine and ladder companies where deemed necessary as part of established practice?		X		

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
35	Are the companies referenced in item 34 staffed with a minimum number of on-duty personnel as required by the tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction?			X	
36	Where applicable, are quint apparatus staffed with four on-duty personnel? <i>NOTE: If the company is expected to perform multiple roles simultaneously, additional staffing, above four on-duty personnel, are required to be provided to ensure that those operations can be performed safely, effectively, and efficiently.</i>	ONLY 1 QUINT - 2 PERSONNEL 1 OFFICER 1 OPERATOR		X	
37	Are the fire department's fire suppression resources deployed to provide for the arrival of an engine company within a 4-minute response time and/or the initial full alarm assignment within an 8-minute response time to 90 percent of the incidents?			X	
38	Do personnel assigned to the initial arriving company have the capability to implement an initial rapid intervention crew (IRIC)?			X	

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
39	Does the fire department have the capability to deploy an initial full alarm assignment within an 8-minute response time to 90 percent of the incidents? Per NFPA 1710, the initial full alarm assignment shall provide for the following:	<p>Establishment of incident command outside of the hazard area for the overall coordination and direction of the initial full alarm assignment. A minimum of one individual shall be dedicated to this task.</p> <p>Establishment of an uninterrupted water supply of a minimum 1480 L/min (400 gpm) for 30 minutes. Supply line(s) shall be maintained by an operator who shall ensure uninterrupted water flow application.</p>		X	
		<p>Establishment of an effective water flow application rate of 1110 L/min (300 gpm) from two handlines, each of which shall have a minimum of 370 L/min (100 gpm). Attack and backup lines shall be operated by a minimum of two personnel each to effectively and safely maintain the line.</p>		X	
		<p>Provision of one support person for each attack and backup line deployed to provide hydrant hookup and to assist in line lays, utility control, and forcible entry.</p>		X	
		<p>A minimum of one victim search and rescue team shall be part of the initial full alarm assignment. Each search and rescue team shall consist of a minimum of two personnel.</p>		X	
		<p>A minimum of one ventilation team shall be part of the initial full alarm assignment. Each ventilation team shall consist of a minimum of two personnel.</p>		X	
		<p>If an aerial device is used in operations, one person shall function as an aerial operator who shall maintain primary control of the aerial device at all times.</p>		X	
		<p>Establishment of an IRIC that shall consist of a minimum of two properly equipped and trained personnel.</p>		X	

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
40	Does the fire department have the capability for additional alarm assignments that can provide for additional personnel and additional services, including: the application of water to the fire; engagement in search and rescue; forcible entry, ventilation, and preservation of property; accountability for personnel; and provision of support activities for those situations that are beyond the capability of the initial full alarm assignment?			X	
41	When an incident escalates beyond an initial full alarm assignment or when significant risk is present to fire fighters due to the magnitude of the incident, is the incident commander able to upgrade the IRIC to a full rapid intervention crew(s) (RIC) that consists of four fully equipped and trained fire fighters?			X	
42	Is an incident safety officer deployed to all incidents that escalate beyond an initial full alarm assignment or when significant risk is present to fire fighters?		X		
EMERGENCY MEDICAL SERVICES (EMS)					
43	Are EMS operations organized to ensure that the fire department's emergency medical capability includes personnel, equipment, and resources to deploy the initial arriving company and additional alarm assignments? <i>(The fire department is permitted to use established automatic mutual aid and mutual aid agreements to comply with these requirements)</i>		X		
44	Does the fire department currently provide standards for the delivery of EMS by the fire department?		X		
45	Does the fire department clearly document its role, responsibilities, functions, and objectives for the delivery of EMS?		X		
46	The basic treatment levels within an EMS system are categorized as first responder, basic life support (BLS), and advanced life support (ALS). Have specific patient treatment capabilities associated with each level been determined by the authority having jurisdiction for the approval and licensing of EMS providers?	First Responder BLS ALS	X	X	

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
47	Have minimal levels of training been established for all personnel that respond to emergency incidents at the first responder/AED level?		X		
48	Does the fire department adhere to the five basic functions within a career fire department EMS system:	Initial response to provide medical treatment at the location of the emergency (first responder with AED capability or higher)	X		
		BLS response	X		
		ALS response	X		
		Patient transport in an ambulance or alternative vehicle designed to provide for uninterrupted patient care at the ALS or BLS level while en route to a medical facility	X		
		Assurance of response and medical care through a quality management program	X		
49	Are on-duty EMS units staffed with the minimum numbers of personnel necessary for emergency medical care relative to the level of EMS provided by the fire department?		X		
50	Are EMS staffing requirements based on the minimum levels needed to provide patient care and member safety?		X		
51	Are all units that provide emergency medical care staffed at a minimum with personnel that are trained to the first responder/AED level?		X		
52	Are units that provide BLS transport staffed and trained at the level prescribed by the state or provincial agency responsible for providing emergency medical services licensing?		X		
53	Are units that provide ALS transport staffed and trained at the level prescribed by the state or provincial agency responsible for providing emergency medical services licensing?		X		
54	Has the fire department adopted service delivery objectives based on time standards for the deployment of each service component for which it is responsible?		X		

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
55	Is the fire department's EMS for providing first responder with AED deployed to provide for the arrival of a <u>first responder</u> with AED company within a 4-minute response time to 90 percent of the incidents?		X		
56	When provided, is the fire department's EMS for providing <u>ALS</u> deployed to provide for the arrival of an ALS company within an 8-minute response time to 90 percent of the incidents?		X		
57	Do the personnel deployed on ALS emergency responses include a minimum of two members trained at the emergency medical technician – paramedic (EMT-P) level and two members trained at the emergency medical technician – basic (EMT-B) level arriving on scene within the established response time of 8 minutes?		X		
58	Has the fire department instituted an EMS quality management program to ensure that the service has appropriate response times as required for all medical responses?		X		
59	Is all first responder and BLS medical care provided by the fire department regularly reviewed by fire department medical personnel?		X		
60	Is the review process referenced in Item 59 documented?		X		
61	If your fire department deploys with ALS services, has it named a medical director charged with the responsibility to oversee and ensure quality medical care in accordance with state or provincial laws or regulations?		X		
62	Is the oversight and review process referenced in Item 61 documented?		X		
63	If your fire department provides ALS services, does it provide a mechanism for immediate communications with EMS supervision and medical oversight?		X		

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
SPECIAL OPERATIONS RESPONSE					
64	<p>Are special operations organized to ensure that the fire department's special operations capability includes personnel, equipment, and resources to deploy the initial arriving company and additional alarm assignments providing such services?</p> <p><i>(The fire department is permitted to use established automatic mutual aid and mutual aid agreements to comply with these requirements)</i></p>				X
65	<p>Has the fire department adopted a special operations response plan and standard operating procedures that specify the role and responsibilities of the fire department and the authorized functions of members responding to hazardous materials emergency incidents?</p>		X		
66	<p>Have all fire department members who are expected to respond to emergency incidents beyond the first responder operations level for hazardous materials response been trained to the applicable requirements of NFPA 472, <i>Standard for Professional Competence of Responders to Hazardous Materials Incidents</i>?</p>			X	
67	<p>Have all fire department members who are expected to respond to emergency incidents beyond the confined space operations level for confined space operations been trained to the applicable requirements of NFPA 1670, <i>Standard on Operations and Training for Technical Rescue Incidents</i>?</p>				X
68	<p>Does the fire department have the capacity to implement a RIC during all special operations incidents that would subject fire fighters to immediate danger of injury, or in the event of equipment failure or other sudden events, as required by NFPA 1500, <i>Standard on Fire Department Occupational Safety and Health Program</i>?</p>			X	

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
69	<p>If a higher level of emergency response is needed beyond the capability of the fire department for special operations, has the fire department determined the availability of outside resources that deploy these capabilities and the procedures for initiating their response?</p> <p><i>The fire department shall be limited to performing only those specific special operations functions for which its personnel have been trained and are properly equipped.</i></p>		X		

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
70	<p>Has the airport fire department adopted an operations response plan and SOPs that specify the roles and responsibilities for non-aircraft incidents that address the following (<i>reference Item 39</i>):</p> <p style="text-align: center;">AIRPORT RESCUE and FIRE-FIGHTING (ARFF) SERVICES</p>	<p>Establishment of incident command outside of the hazard area for the overall coordination and direction of the initial full alarm assignment. A minimum of one individual shall be dedicated to this task.</p> <p>Establishment of an uninterrupted water supply of a minimum 1480 L/min (400 gpm) for 30 minutes. Supply line(s) shall be maintained by an operator who shall ensure uninterrupted water flow application.</p> <p>Establishment of an effective water flow application rate of 1110 L/min (300 gpm) from two handlines, each of which shall have a minimum of 370 L/min (100 gpm). Attack and backup lines shall be operated by a minimum of two personnel each to effectively and safely maintain the line.</p> <p>Provision of one support person for each attack and backup line deployed to provide hydrant hookup and to assist in line lays, utility control, and forcible entry.</p> <p>A minimum of one victim search and rescue team shall be part of the initial full alarm assignment. Each search and rescue team shall consist of a minimum of two personnel.</p> <p>A minimum of one ventilation team shall be part of the initial full alarm assignment. Each ventilation team shall consist of a minimum of two personnel.</p> <p>If an aerial device is used in operations, one person shall function as an aerial operator who shall maintain primary control of the aerial device at all times.</p> <p>Establishment of an IRIC that shall consist of a minimum of two properly equipped and trained personnel.</p>			X

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
71	<p>Are airport rescue and fire-fighting (ARFF) operations organized to ensure that the fire department's capability includes personnel, equipment, and resources to deploy the initial arriving company, the full initial alarm assignment, and additional alarm assignments?</p> <p><i>NOTE: The procedures involved in these services, including operations and deployment, should be established through written administrative regulations, standard operations procedures, and departmental orders.</i></p>				X
72	<p>Does the airport fire department have access to special tools, equipment, supplies, personal protective equipment (PPE), and other airport resources that are required to perform operations safely and effectively in their assigned roles and responsibilities at an incident involving aircraft fire fighting and rescue operations?</p>				X
73	<p>Do the airport fire department's ARFF resources deploy the required number of vehicles as required for the airport assigned category as established by NFPA 403, <i>Standard for Aircraft Rescue and Fire-Fighting Services at Airports</i>?</p>				X
74	<p>Are airport fire department companies equipped with specialized apparatus and equipment to assist ARFF companies where deemed necessary (<i>reference Item 70</i>)?</p>				X

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
75	Do airport fire department companies that deploy to structural incidents on airport property meet the following response time requirements:	<p>One minute (60 seconds) for turnout time</p> <p>Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and/or 8 minutes (480 seconds) or less for the deployment of a full first alarm assignment at a fire suppression incident</p> <p>Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident</p> <p>Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department</p>			X
76	Do airport fire department companies that deploy to emergency medical incidents on airport property meet the response following response time requirements:	<p>The fire department's EMS for providing first responder with AED shall be deployed to provide for the arrival of a first responder with AED company within a 4-minute response time to 90 percent of the incidents.</p> <p>When provided, the fire department's EMS for providing ALS shall be deployed to provide for the arrival of an ALS company within an 8-minute response time to 90 percent of the incidents.</p> <p>Personnel deployed to ALS emergency responses shall include a minimum of two members trained at the emergency medical technician - paramedic (EMT-P) level and two members trained at the emergency medical technician - basic (EMT-B) level arriving on scene within the established response time.</p>			
77	Does the airport fire department use established automatic mutual aid or mutual aid agreements?				
78	Are airport fire department ARFF companies staffed as required by NFPA 403, <i>Standard for Aircraft Rescue and Fire-Fighting Services at Airports</i> ?				

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
79	Do airport fire department companies that deploy to structural incidents on airport property meet the staffing requirements relative to:	<p>Life hazard to the populace protected</p> <p>Provisions of safe and effective fire-fighting performance conditions for the fire fighters</p> <p>Potential property loss</p> <p>Nature, configuration, hazards, and internal protection of the properties involved</p> <p>Types of fire ground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene</p>			X
80	Are airport fire department companies that deploy to emergency medical incidents on airport property staffed and trained at the level prescribed by the state or provincial agency responsible for providing emergency medical services licensing?				
81	At all aircraft emergency scene operations, is an Incident Management System provided in accordance with NFPA 1561, <i>Standard on Emergency Services Incident Management System</i> ?				
82	At all aircraft emergency scene operations, is incident command typically established outside of the hazard area for the overall coordination and direction of the initial full alarm assignment?				
83	At all aircraft emergency scene operations, is an individual regularly dedicated to the task of "Incident Commander?"				
84	At all aircraft emergency scene operations, is an incident safety officer deployed to all incidents that escalate beyond a full alarm assignment or when there is a significant risk to fire fighters?				

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
85	Does the incident safety officer ensure that the safety and health system is established in accordance with NFPA 1500, <i>Standard on Fire Department Occupational Safety and Health Program</i> ?				X
MARINE RESCUE and FIRE-FIGHTING (MRFF) SERVICES					
86	Are Marine Rescue and Fire Fighting operations organized to ensure that the fire department's marine capability includes personnel, equipment, and resources to deploy to the alarm assignments associated with a marine emergency incident?				
87	Has the fire department adopted a marine operations response plan and SOPs that specify the roles and responsibilities of the fire department and the authorized functions of members responding to marine emergencies?				
88	Are fire department MRFF SOPs coordinated with the applicable agencies, such as the port or harbor authority and supporting agencies?				
89	Does the fire department's marine services division have access to special tools, equipment, supplies, PPE, and other marine resources that are required to perform operations safely and effectively in their assigned roles and responsibilities?				
90	Are on-duty marine personnel comprised of the numbers necessary for safe and effective fire-fighting performance relative to the expected MRFF conditions?				

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
91	Have the required number of on-duty personnel been determined through task analyses, as required for types of marine vessels, and through additional task analyses that take the following factors into consideration:	Life hazard to the populace protected Provisions of safe and effective fire-fighting performance conditions for the fire fighters Potential property loss Nature, configuration, hazards, and internal protection of the properties involved Types of tactics and evolutions employed as standard procedure, type of marine vessel used, and results expected to be obtained at the fire scene Requirements of the regulatory authorities having jurisdiction over navigable waters, ports, and harbors			✓
92	Are on-duty personnel assigned to marine fire fighting organized into company units and have appropriate vessels and equipment assigned to such companies?				
93	Is each marine company led by an officer considered a part of the company?				
94	Are companies whose primary function is to deliver and pump water and extinguishing agents at the scene of a marine incident (marine companies) staffed with a minimum number of on-duty personnel as required by the tactical and occupancy hazards to which the marine vessel responds and by the regulatory authorities having jurisdiction over navigable waters, ports, and harbors?				
WILDLAND FIRE SUPPRESSION SERVICES					
95	Are wildland fire suppression operations organized to ensure that the fire department's wildland fire suppression capability includes personnel, equipment, and resources to deploy wildland direct operations that can address marginal situations before they get out of control and wildland indirect fire-fighting operations that can be assembled and placed into operation against major wildland fires?				

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
96	Has the fire department adopted a wildland fire-fighting operations response plan and SOPs that specify the roles and responsibilities of the fire department and the authorized functions of members responding to wildland fire emergencies?			X	
97	Are all wildland fire suppression operations organized to ensure compliance with NFPA 295, <i>Standard for Wildfire Control</i> ?				
98	Does the fire department have access to special tools, equipment, supplies, PPE, and other wildland resources that are required to perform operations safely and effectively in their assigned roles and responsibilities?				
99	Are on-duty wildland fire-fighting personnel comprised of the numbers necessary for safe and effective firefighting performance relative to the expected wildland firefighting conditions?				
100	Are the numbers referenced in Item 99 determined through task analyses that take the following factors into consideration:	<p>Life hazard to the populace protected</p> <p>Provisions of safe and effective fire-fighting performance conditions for the fire fighters</p> <p>The number of trained response personnel available to the department including mutual aid resources</p> <p>Potential property loss</p> <p>Nature, configuration, hazards, and internal protection of the properties involved</p> <p>Types of wildland tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene</p> <p>Topography, vegetation, and terrain in the response area(s)</p>			
101	Are the on-duty personnel assigned to wildland operations organized into company units and have appropriate apparatus and equipment assigned to such companies?				

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
102	Has the fire department identified the minimum company staffing levels necessary to meet the deployment criteria to ensure that a sufficient number of members are assigned, on duty, and available to safely and effectively respond with each company?				X
103	Is each company led by an officer who is considered a part of the company?				
104	Are supervisory chief officers dispatched or notified to respond to all full alarm assignments involving wildland fire control operations?				
105	Is an incident management system provided in accordance with NFPA 1561, <i>Standard on Emergency Services Incident Management System</i> , to form the basic structure of all wildland emergency operations?				
106	Are fire companies whose primary function is to deliver and pump water and extinguishing agents at the scene of a wildland fire (wildland companies) staffed with a minimum of four on-duty personnel?				
107	Are engine and ladder (truck) companies that respond to wildland fire-fighting and/or urban interface wildland fire-fighting incidents shall be staffed with a minimum of four personnel?				
108	Are other types of companies equipped with specialized apparatus and equipment for wildland fire fighting-including aircraft, heavy equipment, mini pumpers, and fast attack vehicles- provided to assist wildland engine and ladder companies where deemed necessary as part of established practice?				
109	Are the companies referenced in Item 108 staffed with a minimum number of on-duty personnel as required by the tactical, topographical, environmental, fuel (vegetation), and occupancy hazards?				
110	Do the fire department's wildland resources deploy the required number of vehicles as required for a direct and/or an indirect attack?				X

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
111	Does the fire department, prior to the initiation of any wildland fire attack, establish a lookout(s), communications with all crew members, escape route(s), and safety zone(s) for vehicles and personnel?				X
112	Does the fire department have the capability to safely initiate a direct wildland attack within 10 minutes after arrival of the initial company or crew at the fire scene?				
113	Is one individual in the first arriving company or crew assigned as the incident commander for the overall coordination and direction of the direct attack activities?				
114	Does a direct wildland attack include the following:	Establishment of an effective water flow application rate of 111 L/min (30 gpm) from at least two 150 m (500 ft) 1.2 in. diameter attack handlines from two engines. Each attack handline shall be operated by a minimum of two personnel to effectively and safely deploy and maintain the line.			
		Provision of one operator who shall remain with each fire apparatus supplying water flow to ensure uninterrupted water flow application.			
		Provision of a wildland crew leader or company officer with each crew who shall be responsible for overall supervision of each of the crew and for maintaining personnel accountability and crew safety.			
115	Does the fire department have the capability to deploy an indirect attack, including application of water to the fire, engagement in search and rescue and preservation of property, accountability for personnel, and provision of support activities for those situations that are beyond the capability of the direct attack?				
116	Is an incident safety officer deployed to all incidents that escalate beyond a direct attack alarm assignment or when there is a significant risk to fire fighters?				S

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
117	Do wildland companies that deploy to structural incidents meet the following response time requirements:	<p>One minute (60 seconds) for turnout time</p> <p>Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and/or 8 minutes (480 seconds) or less for the deployment of a full first alarm assignment at a fire suppression incident</p> <p>Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident</p> <p>Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department</p>			X
118	Do wildland companies that deploy to emergency medical incidents meet the following response time requirements:	<p>One minute (60 seconds) for turnout time</p> <p>Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and/or 8 minutes (480 seconds) or less for the deployment of a full first alarm assignment at a fire suppression incident</p> <p>Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident</p> <p>Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department</p>			X

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
SAFETY & HEALTH SYSTEM					
119	Are fire-fighter occupational safety and health programs provided in accordance with NFPA 1500, <i>Standard on Fire Department Occupational Safety and Health Program</i> ?			X	
INCIDENT MANAGEMENT SYSTEM					
120	Is an incident management system provided in accordance with NFPA 1561, <i>Standard on Emergency Services Incident Management System</i> , to form the basic structure of all emergency operations of the fire department, regardless of the scale of the department or the emergency?		X		
121	Has an effective incident management system been designed and implemented to manage incidents of different types, including structure fires, wildland fires, hazardous materials incidents, emergency medical operations, and other types of emergencies that could be handled by the department?		X		
TRAINING SYSTEM					
122	Does the fire department have a training program and policy that ensures that personnel are trained and competency is maintained to execute all responsibilities consistent with the department's organization and deployment?	POORLY MANAGED	X		
COMMUNICATIONS SYSTEMS					
123	Does the fire department have a reliable communications system to facilitate prompt delivery of public fire suppression, emergency medical services, and special operations?		X		
124	Do all communications facilities, equipment, staffing, and operating procedures comply with NFPA 1221, <i>Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems</i> ?			X	

NFPA 1710 COMPLIANCE CHECKLIST

ITEM	QUESTION	SUB-CATEGORY/COMMENTARY	YES	NO	N/A
125	Do operating procedures for radio communications provide for the use of standard protocols and terminology at all types of incidents?		X		
126	Has standard terminology, in compliance with NFPA 1561. <i>Standard on Emergency Services Incident Management System</i> , been established to transmit information, including strategic modes of operation, situation reports, and emergency notifications of imminent hazards?		X		
PRE-INCIDENT PLANNING					
127	Has the fire department set forth operational requirements to conduct pre-incident planning, with particular attention provided to all target hazards?		X		