

**RESIDENTIAL SMOKE ALARM USAGE  
IN  
SINGLE-FAMILY DWELLINGS  
MADISON HEIGHTS, MICHIGAN**

Strategic Analysis of Community  
Risk Reduction

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## ABSTRACT

The city of Madison Heights, Michigan has a local ordinance requiring the use of smoke alarms in single-family dwellings. However, that ordinance has no provision for inspection of the alarms. Therefore, the problem is if compliance with the ordinance cannot be determined by inspection, how can compliance be accurately measured?

The purpose of this applied research project was to assess the current usage level of smoke alarms in single-family residences in Madison Heights and to make recommendations to maintain or increase those levels as needed.

A descriptive research methodology based on a survey sent to single-family residences in Madison Heights was utilized. Answers were sought to the following research questions:

1. What percentage of single-family homes in Madison Heights has at least one smoke alarm and further what percentage of these homes has at least one smoke alarm on every level?
2. What power source(s) is used in these smoke alarms?
3. What percentage of the smoke alarms in place is actually in operating condition and if they are not in an operable state, why not?

For data collection purposes, a seven-question survey was mailed to 300 single-family homes. The goal of the survey was to elicit information on smoke alarm usage, power supply and operability.

Of the 300 surveys mailed, 134 were returned which provided a response rate of 44.66%. This survey revealed that 97.76% of respondents had at least one smoke alarm in their residence and 74.63% had at least one alarm on every level of their home. Battery-powered alarms protected 81.68% of homes and 4.38% of alarms tested in the survey were inoperable.

Recommendations made included supplementing current efforts to encourage smoke alarm usage, expanding the current smoke alarm installation program and requiring inspections for smoke alarm installation when home ownership changes.

**TABLE OF CONTENTS**

**ABSTRACT.....2**

**TABLE OF CONTENTS.....4**

**INTRODUCTION.....5**

**BACKGROUND AND SIGNIFICANCE.....7**

**LITERATURE REVIEW.....9**

**PROCEDURES.....11**

**RESULTS.....14**

**DISCUSSION / IMPLICATIONS.....18**

**RECOMMENDATIONS.....20**

**REFERENCES.....22**

**APPENDIX A (Survey with Cover Letter).....24**

**APPENDIX B (Survey Results by Quadrant).....26**

## INTRODUCTION

Perhaps not since motorized fire apparatus replaced horse-drawn steamers has a single invention had such a profound effect on fire safety as has the residential smoke alarm. Smoke detection technology has been available since the 1960's and is now commonly accepted both at home and in the workplace. Just thirty years ago, only 4% of U.S. homes were protected by smoke alarms. By 1997, that figure had grown to 94% (Ahrens, 2000).

According to the United States Fire Administration (1999, August), the ten-year trend in fire deaths occurring in one- and two-family dwellings from 1987 to 1996 showed a 17.6% decrease, from 3,780 deaths in 1987 to 3,470 deaths in 1996. Ahrens (2000, January) reported that during the same time period, the number of households with smoke alarms increased 13.4%. While the effect of increased smoke alarm usage should not be understated, Goldstein (1999, April) also points out other improvements in fire safety that have had a lifesaving effect such as sprinklers and childproof lighters.

Smoke alarms give occupants an early warning, providing the opportunity to flee a burning structure before a fire prevents escape or smoke overcomes them. Realizing the benefit that smoke alarms provided, actions to require the use of smoke alarms took hold. McLoughlin (1985, pg. 858) states that in 1975, "the BOCA (Building Officials and Code Administrators International) building code was amended to require a smoke detector protecting the bedroom area in each dwelling unit of one-, two-, and multi-family dwellings." McLoughlin goes on to report that by 1977, 18 states had passed some type of statewide smoke detector legislation and that by 1983, 29 states required smoke detectors in all new classes of residential construction. On a local level, it was not until 1989 that the city of Madison Heights adopted a

local ordinance requiring smoke alarms in single or multiple dwelling units.

Compliance with codes and ordinances requiring the installation of smoke alarms in new construction can be monitored through the building inspection process. Compliance in existing structures is far more difficult to assess, especially in single-family dwellings. The Madison Heights Fire Department does not perform inspections of any type in single-family dwellings. A telephone survey of neighboring departments completed on November 9, 2000 revealed that no other departments undertook the inspection of existing single-family dwellings either. The most commonly cited reason for this was concern over liability for unnoticed or unrecognized hazards resulting in fires. Therefore, the problem is if compliance with codes and ordinances cannot be determined through direct inspection and there is no means to assess even voluntary usage absent legislation, how then do we accurately measure smoke alarm usage in single-family dwellings?

The purpose of this applied research project is to assess the current usage level of smoke alarms in single-family residences in the city of Madison Heights, Michigan and to make recommendations to maintain or increase those levels as needed. Using a descriptive research methodology based on a survey sent to 300 single-family residences in the city of Madison Heights, the research questions to be answered are:

1. What percentage of single-family homes in the city of Madison Heights has at least one smoke alarm and further what percentage of these homes has at least one smoke alarm on every level?
2. What power source(s) is used in these smoke alarms?
3. What percentage of the smoke alarms in place is actually in operating condition and if they are not in an operable state, why not?

## **BACKGROUND AND SIGNIFICANCE**

The city of Madison Heights, Michigan is a suburban community of approximately 32,000 residents located two miles north of the city of Detroit. Madison Heights maintains a full-time, paid fire department of 39 sworn members operating out of two fire stations. The department provides fire suppression, advanced life support service with transport and hazardous materials response capabilities to an area of approximately 7.5 square miles.

In addition to the services listed above, residents of the city also enjoy many non-emergency services. The department provides a public fire education program, reaching out to school age children, senior residents and the business community. Many of the department's fire fighters are actively engaged in providing residents with instruction in cardiopulmonary resuscitation and first aid training. Low-income and senior residents are eligible to receive smoke alarms as well as the installation of the devices from the department at no cost. Free blood pressure screenings are offered daily at both fire stations and the Madison Heights Fire Fighters Association provides residents with a no cost "File of Life" program.

According to the Madison Heights Assessing Department, there are 9,587 single-family homes in the city. In addition, 430 single-family mobile home sites exist along with five senior citizen towers comprising 709 units, 2,273 rental apartments and eight condominium complexes with a total of 331 dwelling units. Eleven hotel/motel buildings with a total of 1,053 rooms are also located within the city.

While largely a bedroom community, Madison Heights is also home to 108 office buildings with over 750,000 square feet of space and 23 shopping centers encompassing over 1.3 million square feet of space. An additional 428 commercial buildings are located in Madison Heights as

well as 495 light industrial buildings.

One fire marshal and one fire inspector handle primary fire prevention duties in the city. Retail outlets, places of public assembly, commercial enterprises and industrial sites are inspected on an annual basis. Common areas of apartment complexes are also inspected annually, while individual units are not. Single family homes, mobile homes and condominiums are not subject to inspection by fire prevention personnel. Single family homes utilized as rental properties are, however, subject to inspection by the Building Department as part of the process for securing a landlord license. In other words, this means that fire prevention activities in the home are left up to those who reside within.

In 1989, the city adopted an ordinance (Ordinance #848, Section 12-30, Smoke detectors required) that reads in part, “It shall be the obligation of any owner or operator of a single or multiple dwelling unit to install adequate smoke detectors within said units approved by Underwriters Laboratories and installed in accordance with the requirements of NFPA 74.” The ordinance does not provide for any inspection of single-family dwellings nor any other means of enforcement for these units. In effect, compliance with the ordinance is strictly voluntary. The problem this presents is that there is no accurate measurement available as to the level of compliance with the ordinance. While it might be expedient to assume that in this day and age, every home is adequately protected by smoke alarms, such an assumption could meet with fatal consequences.

The Strategic Analysis of Community Risk Reduction course offered at the National Fire Academy in Emmitsburg, Maryland as part of the Executive Fire Officer Program provides a risk reduction model utilizing a four-step approach consisting of analysis, planning, intervention



and evaluation. This applied research project will draw from the analysis phase of the model as it seeks to gain insight into the use of smoke alarms in single-family dwellings in the city of Madison Heights, Michigan.

## **LITERATURE REVIEW**

A review of current literature on the broad topic of smoke alarms and smoke detection was undertaken at the Learning Resource Center of the National Emergency Training Center in Emmitsburg, Maryland. This literature review considered current articles in various fire-related publications as well as a number of research projects on the topic completed for the Executive Fire Officer Program. Given the nature of the topic, a number of articles providing a historic perspective were also reviewed.

Smoke detection technology was developed in the 1960's and by 1970, Ahrens (2000) reports that 4% of American homes were protected by this new technology. The next decade brought a rapid expansion in its use. Ahrens reports that by 1980, fully two-thirds (67%) of American homes were equipped with a smoke detection device. As of 1997, Ahrens indicates that 94% of American homes are now protected.

The importance of protection by smoke alarms in the residential setting cannot be understated. According to the Michigan Department of State Police Fire Marshal Division (1999), in the state of Michigan in 1998, residential fires accounted for only 23.6% of all fires that year, yet deaths in residential settings accounted for 76.5% of all fire deaths in 1998. The importance of smoke alarms and early warning becomes even more important when the same Michigan State Police report shows that 55.3% of civilian fire deaths occurred between the hours

of midnight and 4:00 a.m., a time when most people are asleep. Significant among these deaths is that 63.5% of these fatalities were children between the ages of one and nine. On the national level, Brown (1999) cites statistics that indicate 74% of civilian fire deaths occur in residences in spite of the fact that residences are only responsible for 23% of all fires.

Smoke alarms have been and continue to be a major factor in surviving a residential fire. In a report on multiple-fatality fires, the United States Fire Administration (1999, October) states, “a disproportionate number of all fatal fires occurred in homes without working smoke alarms. Nearly 60% of single- and multiple-fatality fires occurred in homes where no smoke alarms were present.” Reporting on the lifesaving effectiveness of home smoke detectors, Ahrens (1998) demonstrated that between 1986 and 1995, the average death rate was 45% lower in homes where a detector was present.

Smoke alarms have clearly demonstrated their lifesaving capabilities. However, the mere presence of a smoke alarm in the home provides no margin of safety if that alarm is not functioning properly. In a British report on domestic smoke alarms Marriott (1995) found that 36 months after installation, 11% of smoke alarms were not working. Of those alarms not working, Marriott reported that 30% had a flat (dead) or missing battery. In a similar report on U.S. smoke detectors, Hall (1989) reported that just over one-fourth of U.S. homes had smoke detectors that did not work. Hall reported that dead or missing batteries or other power source problems were responsible for 61% of the non-working devices.

It is clear that two problems must be addressed, those homes that have no alarm present and those homes with alarms that are not operational. A 1989 report from the National Committee for Injury Prevention and Control contained a recommendation that said, “States and localities

should enact and enforce legislation requiring smoke detectors in all new single-family and multi-family dwellings and should retrofit multifamily dwellings with smoke detectors.” Wolf (1999) reported that while the issue of non-working detectors was important, efforts might be better aimed at getting alarms into homes that have none at all. Finally, Brown (1999) announced a study in which ten states with high residential fire rates will participate. Test communities will be designated and smoke alarms will be distributed as part of the study.

In summary, the literature review confirms the lifesaving technology that smoke detection has evolved into. As many as 94% of U.S. homes are protected by at least one smoke alarm but up to 25% of smoke alarms in homes may not be operational. In addition, while legislation has helped to increase the use of smoke alarms, enforcement and inspection are necessary to ensure compliance with that legislation. Clearly, this literature review demonstrated a need to conduct this project as an assessment of the current level of smoke alarm usage in the city of Madison Heights, MI. It will allow the Madison Heights Fire Department to gain some insight into the community it protects and will help keep the department from relying on faulty assumptions and anecdotal data.

## **PROCEDURES**

For data collection purposes, a seven-question survey with cover letter and postage-paid return envelope was mailed to 300 randomly selected single-family residential units in the city of Madison Heights, Michigan (Appendix A). The 300 surveys were evenly divided among four quadrants of the city, with 75 surveys being sent to each quadrant.

The survey sought to gain information on the current usage of smoke alarms in single-family residences in the city of Madison Heights. Specific information was sought on the number of

levels of living space in these residences, if the residence had at least one smoke alarm in it, and further if there was at least one smoke alarm on each level. Additional information was sought on the power supply of the smoke alarm(s), if the alarms were in working order and if not, what was the source of the problem. Finally, residents encountering a non-working smoke alarm were asked if the unit had been restored to service.

### **Population**

A total of 300 surveys were mailed on July 17, 2000. Names and addresses for those residents receiving a survey were randomly selected by the Madison Heights City Assessor's office and were identified from city tax records as single-family dwellings. The city was divided into quadrants, east and west along John R Road and north and south along Twelve Mile Road. Seventy-five surveys were then mailed to each of the four quadrants.

### **Instrumentation**

A one-page, seven-question survey along with cover letter and postage-paid return envelope was sent to the selected population. Respondents were informed that their responses would be kept confidential and they were not asked to identify themselves though many chose to do so. The postage-paid envelopes were coded solely for the purpose of determining from which quadrant they were returned. The cover letter informed recipients that the purpose of the survey was to provide information on the use, placement and operation of residential smoke alarms in single-family dwellings in the city of Madison Heights. Recipients were also clearly informed that their responses would be used in an applied research project for the Executive Fire Officer Program at the National Fire Academy in Emmitsburg, Maryland.

### **The Instrument**

Question 1. Question 1 asked how many floors (levels) of living space were in the home including a basement, if applicable.

Questions 2-3. Question 2 asked if there was at least one smoke alarm (detector) in the home. Question 2 was also utilized to inform any resident without a working smoke alarm that the fire department would install one for them free of charge. Question 3 then asked if there was at least one smoke alarm (detector) on every level of the home.

Question 4. Question 4 asked the respondent what power source supplied energy to the alarm(s), battery (DC) or hard-wired (110v AC).

Questions 5-6. Question 5 required the respondent to test the smoke alarm(s) by utilizing the “TEST” button on the unit and recording the number of units working and not working. Question 6 asked the respondent to identify the cause, if possible, for any unit found to be inoperable.

Question 7. Perhaps the most important question, Question 7 asked the respondent if any alarm found to be inoperable had been restored to service, either by repair or replacement.

### **Assumptions and Limitations**

Madison Heights is becoming an increasingly ethnically diverse community. It is assumed that all respondents were able to read and understand the survey. Further, it is assumed that respondents were able to identify and utilize the “Test” button as required in survey question five.

### **Definition of Terms**

Smoke detector- a component of an alarm system used to detect the presence of smoke. This

device does not sound an alarm but transmits a signal to a control unit that in turn sounds an alarm.

Smoke alarm- a unit used to detect the presence of smoke and sound an alarm.

This applied research project attempts to recognize new industry nomenclature for smoke detectors and smoke alarms. Recognition is given here that what is now called a smoke alarm is still commonly referred to as a smoke detector by the general public.

## **RESULTS**

On July 17, 2000, a seven-question survey was mailed to 300 residences in the city of Madison Heights, Michigan. The residences selected to receive a survey were randomly compiled by the City of Madison Heights Assessing Department and were identified from city tax records as being single-family dwellings. Seventy-five residences from each of four quadrants in the city were chosen for a total mailing of 300 surveys. Residents were asked to respond by August 15, 2000. Of the 300 surveys sent, 134 were returned, providing a response rate of 44.66%. However, 169 responses would be necessary to assure a 95% confidence level in the data (National Fire Academy, 1998). The following results were tabulated on the total of 134 responses. Results by quadrant can be found in Appendix B.

The first research question in this project dealt with the percentage of homes with at least one smoke alarm in the residence and further the percentage of homes with at least one alarm on every level of the residence. Question one of the survey first sought to determine the number of floors (levels) of living space in each respondent home. Of those responding to question one of the survey, 22.39% (30 of 134) reported a single level of living space while 58.12% (78 of 134) reported two levels of living space. While no one reported four levels of living space, 19.40%

reported three levels. Question two of the survey then asked if there was at least one smoke alarm (detector) in the home. Respondents provided an affirmative response in 97.76% (131 of 134) of the cases while 2.24% (3 of 134) reported having no smoke alarm (detector) in the home. It is important to note here that those respondents who said they did not have a smoke alarm in their home were advised on the survey form that they could contact the Madison Heights Fire Department to make arrangements to have a smoke alarm installed at no charge. Question three expanded upon the previous question as those surveyed were asked if there was at least one smoke alarm on every level of the home. Approximately three-fourths, 74.63% (100 of 134) of the respondents said there was a smoke alarm on every level of their home while one-fourth, 25.37% (34 of 134) were not protected in this fashion.

The second research question sought to determine the power source for the smoke alarms used by Madison Heights residents. Question four of the survey asked residents if their smoke alarms were battery-powered (DC), hard-wired (110v AC) or if they utilized a combination of both types. No distinction was drawn between standard nine-volt batteries and long-life lithium batteries. Results to question four were based on 131 responses due to the three respondents in question two who did not have a smoke alarm in their home. Battery-powered smoke alarms were the choice in 81.68% of the residences (107 of 131). Hard-wired smoke alarms were found in 8.40% (11 of 131) of the residences while 9.92% (13 of 131) were protected by both types.

The third research question dealt with the operation of the smoke alarms in place. Survey question five asked residents to test their alarms, utilizing the “Test” button on the device. The survey resulted in a total of 297 smoke alarms being tested with 95.62% (284 of 297) working and 4.38% (13 of 297) not working. As a follow-up to question five, question six then asked

respondents to determine, if possible, the reason their non-working smoke alarms were inoperable. The overwhelming majority, 76.92% (10 of 13) had a worn-out battery. Missing batteries were found to be the cause in 15.39% (2 of 13) of the cases while one cause (7.69%) was undetermined. Finally, survey question seven asked if those who found a non-working alarm repaired or replaced it. According to the respondents, 100% (13 of 13) of non-working smoke alarms were returned to service.



## SURVEY RESULTS

### All Quadrants

Surveys sent – 300

Surveys undeliverable – 7

Surveys returned – 134

1. Including the basement, if applicable, how many floors (levels) of living space are there in your home?

1 – 30                      2 – 78                      3 – 26                      4 – 0

2. Is there at least one smoke alarm (detector) in your home?

Yes – 131                      No – 3                      Don't Know – 0

3. Is there at least one smoke alarm (detector) on every level of your home?

Yes – 100                      No – 34                      Don't Know – 0

4. Are the smoke alarms (detectors) in your home powered by

Battery (DC) – 107      Hard-Wired (110v AC) – 11      Both – 13      Don't Know – 0

5. Utilizing the “TEST” button on the smoke alarm(s), please test your alarm(s) to see if it works and report your findings below.

Number Working – 284                      Number Not Working – 13

6. If a smoke alarm(s) was not working, please indicate the reason below.

Number with Battery Missing – 2                      Battery Worn Out – 10

Cord/Wiring Problem – 0                      Other/Undetermined – 1

7. If an alarm was found to be not working, did you repair/replace it?

Yes – 13                      No – 0

## DISCUSSION/IMPLICATIONS

This applied research project represented the first attempt in the city of Madison Heights to gather data on the topic of smoke alarm usage in single-family residences. While the survey utilized reached only 1.4% (134 of 9,587) of the single-family homes in the city, it is important to review the data, especially when compared to national statistics.

Before drawing a comparison with national statistics, however, a look at what the project survey accomplished is worthwhile. Surveys were mailed to 300 single-family residences. While seven were returned as undeliverable, this still meant that 293 homes were apprised of the fact that the Fire Department was concerned with their well being. Those that saw fit to take the time to complete the survey also took the time to check the operation of 297 smoke alarms. More importantly, the survey led to the discovery of 13 non-working alarms, all of which were repaired or replaced. Finally, three homes without a single smoke alarm were advised that a smoke alarm along with installation of the device was available to them at no cost from the Madison Heights Fire Department.

Results of the survey conducted for this project showed that 97.76% of the respondents reported having at least one smoke alarm in their Madison Heights home. This compares favorably with 1997 national statistics that show 94% of U.S. homes protected by at least one alarm (Ahrens, 2000). Conversely, Madison Heights statistics showed 2.24% of homes unprotected while the national figure in the Ahrens study was 6%.

On the subject of power supply for smoke alarms, the survey results showed 81.68% of residences utilized batteries, 8.4% employed hard-wired alarms and 9.92% used a combination of the two. Nationally, these figures are 72%, 26% and 2%, respectively (Smith, 1997).

According to the National Fire Safety Council (1999), surveys showed that 20% of home smoke alarms are not operational. This compares to the Madison Heights survey that showed only 4.38% of alarms to be in a non-working condition. In the Madison Heights survey, over 92% of non-working alarms experienced some power supply problem, specifically either a worn-out or missing battery. A 1992 survey conducted by the U.S. Consumer Products Safety Commission (Smith, 1993) revealed that 80% of non-working alarms in that survey had missing or dead batteries.

The implications for the Madison Heights Fire Department are clear. The project survey showed 2.24% of single-family homes without smoke alarm protection while the national figure for homes is around 6%. Extending these figures out over the 9,587 single-family homes in Madison Heights would mean that between 215 and 575 homes are not protected by a single smoke alarm.

The survey revealed that there was an average of 2.27 smoke alarms per home (297 alarms in 131 homes) in homes equipped with the devices. This would extrapolate out to 21,762 alarms in the 9,587 homes previously cited. Figures collected on the operability of smoke alarms showed between 4.38% (Madison Heights) and 20% (nationally) to be in a non-functioning condition. This would mean that between 953 and 4,352 smoke alarms in Madison Heights were in a non-working state, providing residents with a false sense of security.

These figures clearly indicate two things. First, the city of Madison Heights is a well-protected community in terms of smoke alarm usage. The percentage of homes protected exceeds national figures while the number of non-working alarms is well below national numbers. Second and more importantly, the job in Madison Heights specifically and the nation as a whole

is not complete. Until such time as residential sprinkler systems become the norm rather than the exception, working smoke alarms remain the best protection against fire in the home. No person should lay their head to rest unprotected by a smoke alarm!

### **RECOMMENDATIONS**

The recommendations that follow are based upon the body of research compiled for this project and are made in response to the research questions established for it. They take into account the wealth of published material available on the subject that was reviewed for this work as well as data that was collected from the locality. It is imperative that the Madison Heights Fire Department act in a responsible manner as it seeks to protect the lives of the citizens it serves.

1. It is recommended that the Madison Heights Fire Department continue its efforts to publicize and encourage the use of smoke alarms. Currently, this is accomplished through public education efforts in the elementary schools, open house activities, and participation in the national “Change your clock, change your battery” campaign. These efforts should be further supplemented by cable television public service announcements on local public and governmental access channels. Encouraging the use of smoke alarms should also become an integral part of all fire station tours. Any opportunity not taken to advance this cause is an opportunity lost to save a life.

2. It is recommended that the Madison Heights Fire Department officially expand its smoke alarm installation program to include any person seeking a device. The program currently targets low-income and senior residents. With costs for smoke alarms as low as they now are, no person seeking an alarm should have to be turned away by the department. A recent (November 4, 2000)

visit to the Home Depot store in Madison Heights found smoke alarms priced as low as \$4.90 (9-volt battery included). By partnering with local businesses, the Madison Heights Fire Department should be able to provide alarms and/or batteries to all residents who seek them.

3. It is recommended that the Madison Heights Fire Department seek to ensure compliance with local codes and ordinances requiring smoke alarm usage by requiring inspections when a change of home ownership occurs. This would be a logical first step to implement toward increasing compliance with existing legislation.

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**APPENDIX A**  
**Survey with Cover Letter**

**(Letterhead)**

July 10, 2000

Dear Resident:

As Chief of the Madison Heights Fire Department, the protection of you and your loved ones from the ravages of fire is my paramount concern. To this end, I am asking for your help by completing the enclosed survey.

This survey is designed to provide information on the use, placement and operation of residential smoke alarms (detectors) in single family dwellings in the City of Madison Heights. Your answers will be kept **confidential**. I will use your responses as part of an applied research project that will be submitted to the National Fire Academy in Emmitsburg, Maryland. I am completing this project as part of the Executive Fire Officer Program, in which I am currently enrolled.

Your responses to this survey will not only provide data for use in the applied research project, but will supply key information necessary to the Fire Department in fulfilling its obligation to you.

Please take the time to fill out the survey and return it to me in the enclosed postage-paid envelope by August 15, 2000. Your participation is vitally important to the success of this undertaking. Thank you.

Protectively yours,

James E. Martin  
Fire Chief

enclosure



### SMOKE ALARM SURVEY

Please answer the following questions to the best of your ability, based upon the use, placement and operation of smoke alarms (detectors) in your home. Place an "X" in the appropriate box. Thank you.

1. **Including the basement, if applicable, how many floors (levels) of living space are there in your home?**

1       2       3       4

2. **Is there at least one smoke alarm (detector) in your home? \*\***

YES       NO       DON'T KNOW

3. **Is there at least one smoke alarm (detector) on every level of your home?**

YES       NO       DON'T KNOW

4. **Are the smoke alarms (detectors) in your home powered by**

BATTERY(DC)     HARD-WIRED(110vAC)     BOTH     DON'T KNOW

5. **Utilizing the "TEST" button on the smoke alarm(s), please test your alarm(s) to see if it works and report your findings below.**

NUMBER WORKING \_\_\_\_\_      NUMBER NOT WORKING \_\_\_\_\_

6. **If a smoke alarm(s) was not working, please indicate the reason below.**

NUMBER WITH BATTERY MISSING \_\_\_\_\_      BATTERY WORN OUT \_\_\_\_\_

CORD/WIRING PROBLEM \_\_\_\_\_      OTHER/UNDETERMINED \_\_\_\_\_

7. **If an alarm was found to be not working, did you repair/replace it?**

YES       NO

Your time and effort in completing this survey are sincerely appreciated. Please place your completed survey in the enclosed postage-paid envelope and return it by August 15, 2000. Thank you.

**\*\* IF YOU DO NOT HAVE A SMOKE ALARM IN YOUR HOME, PLEASE CONTACT THE MADISON HEIGHTS FIRE DEPARTMENT AT 588-3665 TO MAKE ARRANGEMENTS TO HAVE ONE INSTALLED FREE OF CHARGE.**

**APPENDIX B**  
**SURVEY RESULTS BY QUADRANT**

**Quadrant 1 (Northwest)**

Surveys sent – 75

Surveys undeliverable - 2

Surveys returned – 43

8. Including the basement, if applicable, how many floors (levels) of living space are there in your home?

1 – 5                      2 - 34                      3 – 4                      4 - 0

9. Is there at least one smoke alarm (detector) in your home?

Yes - 42                      No - 1                      Don't Know – 0

10. Is there at least one smoke alarm (detector) on every level of your home?

Yes - 30                      No - 13                      Don't Know – 0

11. Are the smoke alarms (detectors) in your home powered by

Battery (DC) - 37      Hard-Wired (110v AC) – 2      Both - 3      Don't Know – 0

12. Utilizing the “TEST” button on the smoke alarm(s), please test your alarm(s) to see if it works and report your findings below.

Number Working - 72                      Number Not Working – 5

13. If a smoke alarm(s) was not working, please indicate the reason below.

Number with Battery Missing - 1                      Battery Worn Out – 4

Cord/Wiring Problem - 0                      Other/Undetermined – 0

14. If an alarm was found to be not working, did you repair/replace it?

Yes – 5                      No – 0

### Quadrant 2 (Northeast)

Surveys sent – 75

Surveys undeliverable – 0

Surveys returned – 27

1. Including the basement, if applicable, how many floors (levels) of living space are there in your home?

1 - 2

2 - 14

3 - 11

4 - 0

2. Is there at least one smoke alarm (detector) in your home?

Yes - 27

No - 0

Don't Know - 0

3. Is there at least one smoke alarm (detector) on every level of your home?

Yes - 22

No - 5

Don't Know - 0

4. Are the smoke alarms (detectors) in your home powered by

Battery (DC) - 18

Hard-Wired (110v AC) - 5

Both - 4

Don't Know - 0

5. Utilizing the "TEST" button on the smoke alarm(s), please test your alarm(s) to see if it works and report your findings below.

Number Working - 75

Number Not Working - 2

6. If a smoke alarm(s) was not working, please indicate the reason below.

Number with Battery Missing - 0

Battery Worn Out - 2

Cord/Wiring Problem - 0

Other/Undetermined - 0

7. If an alarm was found to be not working, did you repair/replace it?

Yes - 2

No - 0

### Quadrant 3 (Southwest)

Surveys sent – 75

Surveys undeliverable – 5

Surveys returned – 34

1. Including the basement, if applicable, how many floors (levels) of living space are there in your home?

1 - 13                      2 - 14                      3 - 7                      4 - 0

2. Is there at least one smoke alarm (detector) in your home?

Yes - 33                      No - 1                      Don't Know – 0

3. Is there at least one smoke alarm (detector) on every level of your home?

Yes - 21                      No - 13                      Don't Know – 0

4. Are the smoke alarms (detectors) in your home powered by

Battery (DC) - 29      Hard-Wired (110v AC) - 2      Both - 2      Don't Know – 0

5. Utilizing the “TEST” button on the smoke alarm(s), please test your alarm(s) to see if it works and report your findings below.

Number Working - 71                      Number Not Working – 4

6. If a smoke alarm(s) was not working, please indicate the reason below.

Number with Battery Missing - 1                      Battery Worn Out – 2

Cord/Wiring Problem - 0                      Other/Undetermined – 1

7. If an alarm was found to be not working, did you repair/replace it?

Yes - 4                      No - 0

### Quadrant 4 (Southeast)

Surveys sent – 75

Surveys undeliverable – 0

Surveys returned – 30

1. Including the basement, if applicable, how many floors (levels) of living space are there in your home?

1 - 10

2 - 16

3 - 4

4 – 0

2. Is there at least one smoke alarm (detector) in your home?

Yes - 29

No - 1

Don't Know – 0

3. Is there at least one smoke alarm (detector) on every level of your home?

Yes - 27

No - 3

Don't Know – 0

4. Are the smoke alarms (detectors) in your home powered by

Battery (DC) - 23

Hard-Wired (110v AC) - 2

Both - 4

Don't Know – 0

5. Utilizing the “TEST” button on the smoke alarm(s), please test your alarm(s) to see if it works and report your findings below.

Number Working - 66

Number Not Working - 2

6. If a smoke alarm(s) was not working, please indicate the reason below.

Number with Battery Missing - 0

Battery Worn Out – 2

Cord/Wiring Problem - 0

Other/Undetermined – 0

7. If an alarm was found to be not working, did you repair/replace it?

Yes - 2

No - 0