THE UNIVERSITY of TENNESSEE

MUNICIPAL TECHNICAL ADVISORY SERVICE

HARRIMAN, TENNESSEE

Comprehensive Fire Management Overview

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Introduction and Scope of Work

Harriman Fire Chief Brad Goss, on behalf of Mayor Chris Mason, requested a comprehensive management overview of the fire department. MTAS conducted this study by review of submitted documentation, field study work involving interviews with Harriman personnel, physical inspection of the fire stations and equipment, and a tour of the service area.

Nothing in this report is a negative reflection of the Harriman Fire Department. The firefighters and staff are dedicated, hardworking, and respond quickly to all emergencies. Descriptors such as aggressive firefighting, professional, dedicated, and caring, came up frequently in the interviews. This report provides an outside perspective of the city's fire services and future needs.

Background

Incorporated as a city in 1891 under a private act of the legislature, Harriman is located primarily in Roane County, with a small portion in Morgan County. Harriman is part of the Knoxville Metropolitan Statistical Area. A city council consisting of a mayor and six councilmembers governs the city. Harriman has a certified population of 6,350 per the 2014 Tennessee Department of Economic and Community Development census. The city covers 12 square miles and could grow to 20 square miles based on the existing urban growth boundary, but that growth will take many years to occur. The community is a mix of residential, retail, commercial, and industrial properties.

In 2014, the fire department responded to 1,348 calls, a rate of 3.69 calls per day (see Appendix A). In 2014, the fire department responded to a total of 75 fires of all types (structure, vehicle, grass, etc.), a rate of 6.25 fires per month. Of those 75 fires, 22 were structure fires, a rate of 1.83 structure fires per month. The 2014 per capita property loss rate from fire is $89.56. The Insurance Services Office (ISO) determined that the basic fire flow for the community is 3,000 gallons-per-minute (gpm), and the community has the three engine companies needed for this basic fire flow.

The Use of the ISO Rating as an Evaluation and Planning Tool

The information on the ISO rating will assist the reader in understanding the complexities of providing modern fire protection. Communities use the ISO rating and the information provided in the Public Protection Classification Summary Report as an indicator of fire department capability, to assist in the prioritization of community needs, and to assist in the decision-making process.

The Insurance Services Office, Inc., also known as ISO, is a for-profit corporation that conducts a comprehensive evaluation of a community's ability to prevent and suppress structure fires. ISO rates a community on a scale of 1 to 10 based upon three major elements: communication (10% of the rating), fire department (50% of the rating), and

water supply (40% of the rating) and awards a Public Protection Classification, more commonly called the ISO rating. An ISO rating of Class 1 is the best (only 0.20% of the fire departments in the county have a Class 1 rating), and an ISO rating of Class 10 is equivalent to not having any fire protection. ISO sells the Public Protection Classification information to insurance companies, and insurance companies use this information as one of the components considered when setting property insurance premiums. Harriman has been rated with a classification of Class 4/4X. Table 1 summarizes the individual scores for Harriman's most recent ISO evaluation, which occurred in 2014.

The Class 4 rating is very good (see Figures 1 and 2), as only 12.75% of all fire departments in Tennessee have a Class 4 ISO rating, and just 72 communities out of 993 communities in Tennessee have a better ISO rating. The Class 4 rating means the city and the fire department have taken steps to provide good fire protection, and because of these efforts, Harriman residents and business owners pay competitive rates for property insurance. The improved classification means an estimated savings of 3% to 5% on residential property insurance premiums. Based on this range, the estimated annual community-wide collective savings on insurance premiums for single and 2-family dwellings resulting from the improved ISO rating is between $22,039.24 (3%) and $36,732.06 (5%). Since ISO will probably not reevaluate Harriman for at least five years, MTAS estimates the collective 5-year estimated savings conservatively at between $110,196.19 (3%) and $183,660.31 (5%) for residential property owners. See Appendix B for more details on the estimated savings. This estimate does not include the savings that commercial and industrial property owners will enjoy as insurance companies rate such properties individually. These property owners will also save money on insurance premiums, which is a consideration when evaluating the total benefit of improved fire protection for the community.

ISO awards ratings on a scale of 0 to 100 points, and the range for a Class 4 rating is a score between 60.00 and 69.99 points. When ISO last evaluated Harriman in October of 2014, Harriman scored 68.45 points. Individually, in October 2014, the communications capabilities received a score equivalent to an ISO rating of Class 3, the fire department a score equivalent to an ISO rating of Class 5, while the water service has a score equivalent to an ISO rating of Class 3. Harriman is 1.55 points shy of a Class 3 rating, so with some effort the city should be able to improve the rating upon the next ISO evaluation, which will result in an estimated 2% to 9% additional savings on property insurance premiums for one and two-family dwellings. Commercial property owners will realize savings too, but it is not possible to estimate a range of savings for commercial property owners as insurers write commercial policies individually.

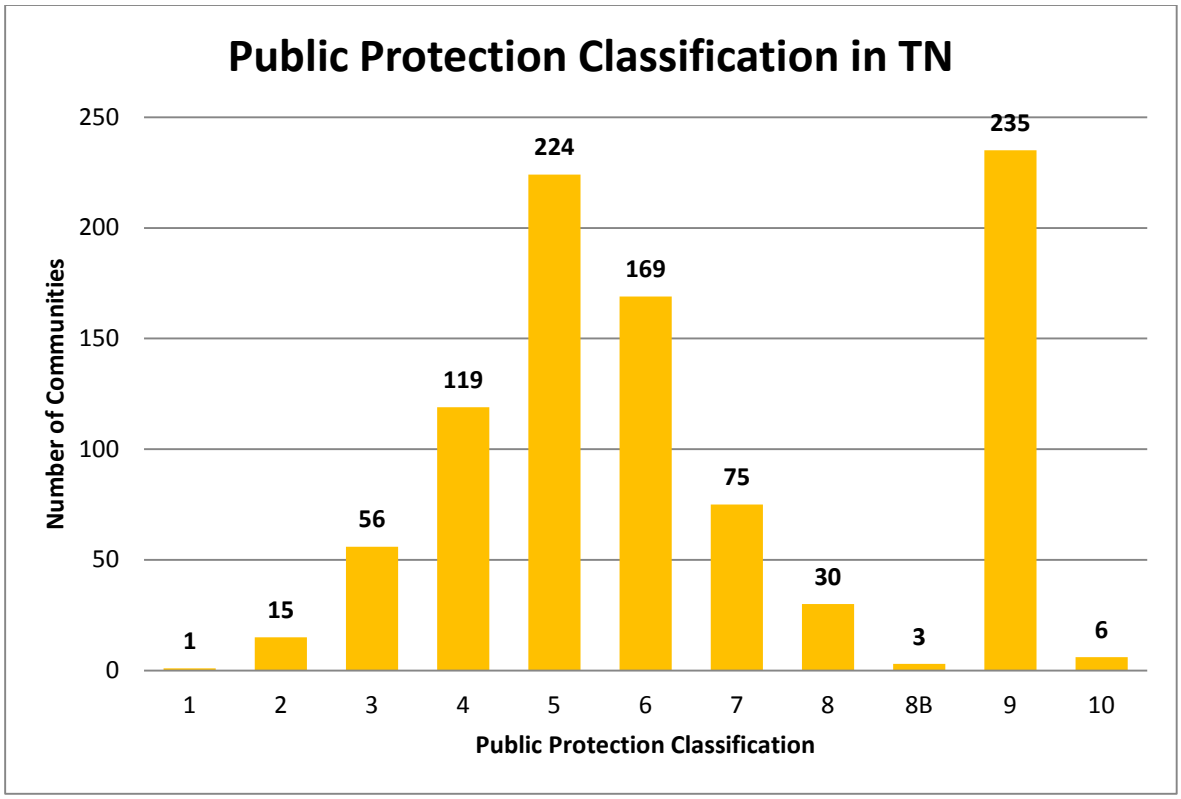


Figure 1 – Public Protection Classification (ISO Rating) in Tennessee

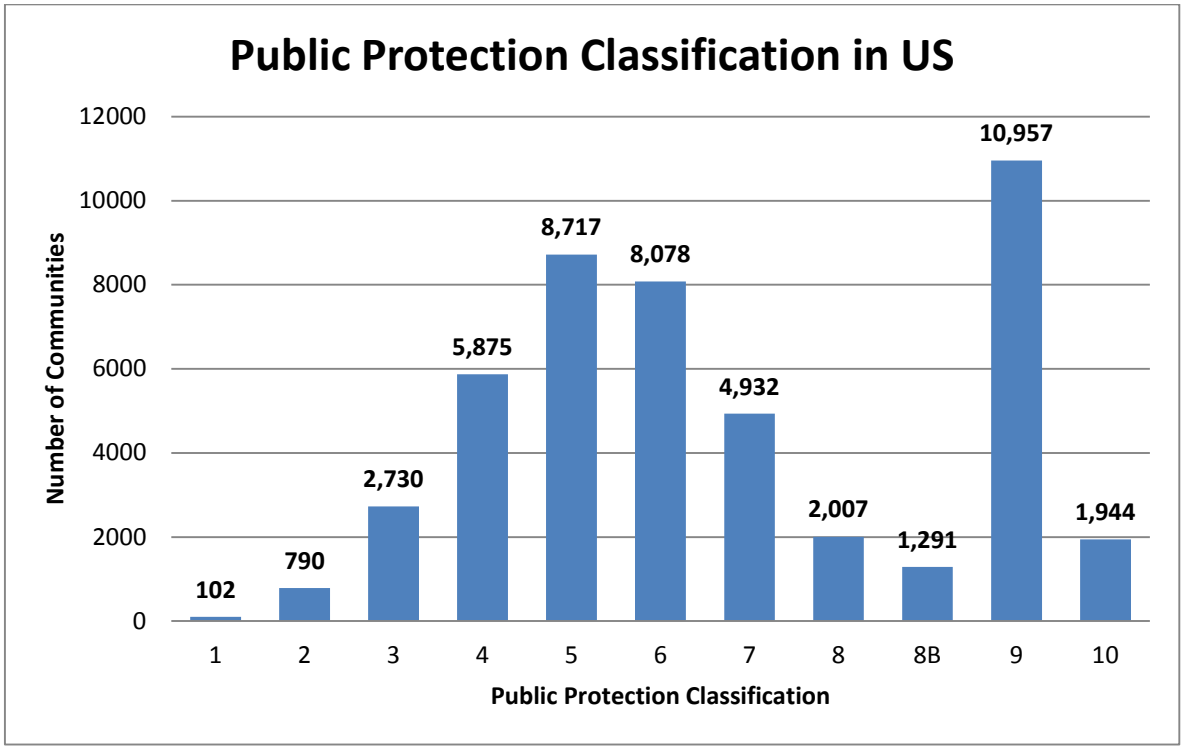


Figure 2 – Public Protection Classification (ISO Rating) in the US

FSRS Section		Credit Earned	Credit Available	Percent Earned
Emergency Communication				
414	Credit for Emergency Reporting	2.55	3.00	85.00%
422	Credit for Telecommunicators	4.00	4.00	100.00%
432	Credit for Dispatch Circuits	0.97	3.00	32.33%
440	**Credit for Receiving and Handling Fire Alarms**	7.52	**10.00**	75.20%
	Relative Classification for Communications	**3**		
Fire Department				
513	Credit for Engine Companies	5.93	6.00	98.83%
523	Credit for Reserve Pumpers	0.49	0.50	98.00%
532	Credit for Pump Capacity	3.00	3.00	100.00%
549	Credit for Ladder Service	1.68	4.00	42.00%
553	Credit for Reserve Ladder and Service Trucks	0.00	0.50	0.00%
561	Credit for Deployment Analysis	6.76	10.00	67.60%
571	Credit for Company Personnel	4.82	15.00	32.13%
580	Credit for Training	5.21	9.00	57.89%
730	Credit for Operational Considerations	2.00	2.00	100.00%
590	**Credit for Fire Department**	29.89	**50.00**	59.78%
	Relative Classification for the Fire Department	**5**		
Water Supply				
616	Credit for Supply System	18.63	30.00	62.10%
621	Credit for Hydrants	2.83	3.00	94.33%
631	Credit for Inspection and Flow Testing	7.00	7.00	100.00%
640	**Credit for Water Supply**	28.46	**40.00**	71.15%
	Relative Classification for Water Supply	**3**		
Divergence		**-2.27**	**–**	
1050	**Community Risk Reduction**	**4.85**	5.50	88.18%
Total Credit Earned		68.45	**105.50**	**64.88%**
	Public Protection Classification	**4**		

Table 1 – Summary of ISO Points Awarded by Element - 2014

Review of Harriman Fire Department ISO Evaluation

On July 1, 2013, a revised version of the ISO Fire Suppression Rating Schedule took effect in Tennessee. The new version places more emphasis on the deployment of resources, which is the number of engine companies and truck companies available and the location of those resources in the service area, than the previous schedule. Given the 1.55-point margin needed for attaining a Class 3 rating, Harriman should consider improvements in the communications, fire department, and water supply capabilities. The cost for improvement may be zero to minimal, but the improvement in service levels will result in a safer community and additional savings in property insurance premiums. This review focuses on the fire department portion of the ISO evaluation. Table 2 summarizes the points available, points earned, and percent of points earned for each sub-section in the fire department section of the grading schedule.

Section	Item	Credit Earned	Credit Available	Percent Earned
513	Engine Companies	5.93	6.00	98.83%
523	Reserve Engine	0.49	0.50	98.00%
532	Pump Capacity	3.00	3.00	100.00%
549	Ladder/Service Co.	1.68	4.00	42.00%
553	Res. Ladder/Service	0.00	0.50	0.00%
561	Deployment Analysis	6.76	10.00	67.60%
571	Personnel	4.82	15.00	32.13%
581	Training	5.21	9.00	57.89%
730	Operational Considerations	2.00	2.00	100.00%
590	Total Fire Department	29.89	**50.00**	59.78%

Table 2 – Summary of ISO Fire Department Points

Section 513 is the credit for engine companies. The basic fire flow for the community is 3,000 gpm, which requires that the fire department have three engine companies in service. The department has three engine companies in service. A response of two engines and a truck company to a low risk fire, such as a single-family residence, is adequate, but commercial and industrial fires require more resources.

Section 523 is the credit for reserve pumpers. The city needs one reserve pumper and it has one reserve pumper. The reserve engine was 98% adequate in terms of the required equipment and hose, and the required annual pump and hose test, and the fire department received the 0.49 out of 0.50 points available.

Section 532 is the credit for pump capacity. Pump capacity is determined by calculating the total pump capacity of all engines and automatic aid engines. Pump capacity

should equal or exceed the basic fire flow for the community, and Harriman has adequate pump capacity to meet the 3,000-gpm basic fire flow.

Section 549 is the credit for ladder service. Harriman needs two ladder companies, or a ladder company and a service company, because the community has a combination of more than five buildings that have a needed fire flow greater than 3,500 gpm or are thirty-two or more feet in height, and the size of the city is too large for a single ladder company. Harriman has one ladder company, Ladder 1. On-duty personnel staff Ladder 1, which responds on all structure fires. Sometimes the fire chief will respond with the ladder truck if he is at the station. For maximum effectiveness in firefighting operations and maximum ISO credit, the truck company should respond on the initial alarm on all structure fires, and have adequate staff to setup and operate the ladder. A service company carries all of the tools and equipment carried on a ladder company, but does not have an aerial ladder. Harriman does not have a service company. For maximum ISO credit, and improved service levels, the city should consider adding a second ladder company or a service company.

Section 553 is the credit for reserve ladder and service companies. The fire department does not have a reserve ladder company and received no credit. The credit for a reserve ladder company is a half-point (0.5), so it may not be cost effective for Harriman to acquire a reserve ladder or service company. Harriman should explore the possibility of sharing a reserve ladder or service company with a neighboring fire department through an interlocal agreement. A shared reserve ladder would provide both ISO credit and a backup ladder truck or service company when needed for continuity of service.

Section 561 is the credit for deployment analysis. A community earns points for an adequate amount of fire engines, ladders, and service companies providing coverage to the developed areas of the community. All properties should be within 1½ miles of an engine company and 2½ miles of a ladder or service company. This item also considers the equipment carried on the apparatus, the frequency of pump and hose testing, and pump capacity. ISO awarded 67.6% credit for this item, which is worth 20% of the entire score for the fire department. MTAS does not have access to the actual calculations ISO made, so MTAS will provide general recommendations for improvement, such as ensuring that all engines and ladder/service companies carry all required equipment. The fire department should complete and document all required pump, hose, and ladder tests annually. Before annexing land, or developing vacant land, that is outside of the 1½-mile travel distance for an engine company and the 2½-mile travel distance for a ladder or service company the city should consider the effect such action might have on the current level of fire protection and the ISO rating.

Credit is available in Section 561 for meeting turnout and response time standards based upon the recommendations found in NFPA Standard 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. This is called a standard of cover, and under the standard of cover ISO requires that the first

engine must arrive on the scene within 320 seconds (5.33 minutes) of the fire department's being notified of the alarm, and the rest of the initial alarm assignment must arrive within 560 seconds (9.33 minutes). The credit received for meeting these standards may be higher than the credit based on travel distance. The communication center must have excellent records of fire department turnout time and response time in order for ISO to consider awarding credit based upon the standard of cover.

Section 571 is the credit for company personnel. Firefighting is a labor-intensive job, and having adequate personnel contributes to effective firefighting operations, scene safety, and better outcomes on fire losses. The fire department is a combination fire department, with both on-duty (paid) and on-call personnel. ISO credits on-duty personnel on a 1-for-1 basis. ISO credits on-call personnel on a 3-for-1 basis. Harriman received 32.13% credit for this item. ISO awarded credit for 5 on-duty personnel and 8.12 on-call personnel. On-call personnel riding out at the fire station under a written staffing policy will count the same (1-for-1) as on-duty personnel. Harriman should consider scheduling on-call personnel to ride out as a method to improve on-duty staffing and increase the credit for company personnel.

Recommendation: Schedule on-call personnel to ride out as a method to improve on-duty staffing for responding to incidents and to increase the ISO credit for company personnel.

Section 580 is the credit for training. The department received 57.89% credit (5.21 points out of 9) for this item, which is a good score considering that the fire department does not have a creditable training facility, which represents 35% of the credit available for training.. Table 3 summarizes the breakdown of the training credit. The reader will notice that the credit earned from ISO is different from the credit calculated from the scores provided by ISO. MTAS is not able to explain this discrepancy.

For maximum credit, the department needs a drill tower at least three stories in height and a burn building. Under section 580B, company training, the department should provide sixteen hours of structural fire related training for each firefighter, including all officers, every month. All officers should have at least twelve hours of officer's classes each year and have fire officer certification. For credit under Section 580G, as a best practice the department requires new hires to have Fire Fighter I, Emergency Medical Responder (EMR) certification, and hazmat operations certification before joining the fire department.

The three areas for improvement in the training program are the lack of a training facility of any type (zero credit awarded), lack of training and certification of all fire officers (14.25% credit awarded), and lack of full compliance with the requirements for recruit training (71.6% credit awarded). For the maximum number of ISO points available for recruit training, the fire department should require that new hires already have, or obtain within 12 months of their hire date, Fire Fighter II certification. According to Section 580G, "Firefighters who obtain the Firefighter I and Firefighter II designation (in accordance with the general criteria of NFPA 1001) before employment or within the

first year of employment or tenure meet the intent of Section 580G." The fire department achieved 100% credit for the pre-fire planning program, the new and existing driver training program, and for hazmat training. The department should maintain complete records on all training and pre-fire planning inspections.

Fire Department		Credit Earned	Credit Available	Percent Earned	Points Awarded
581	**Training**				
580A	Facilities and Use	0.00	35.00	0.00%	0.00
580B	Company Training	23.55	25.00	94.20%	2.12
580C	Classes for Officers	1.71	12.00	14.25%	0.15
581D	New Driver and Operator Training	5.00	5.00	100.00%	0.45
580E	Existing Driver & Operator Training	5.00	5.00	100.00%	0.45
580F	Training on Hazardous Materials	1.00	1.00	100.00%	0.09
580G	Recruit Training	3.58	5.00	71.60%	0.32
580H	Pre-Fire Planning Inspections	12.00	12.00	100.00%	1.08
581	**Credit for Training**	51.84	**100.00**	51.84%	4.67

Table 3 – Summary of ISO Training Points

Training of firefighters under realistic conditions is critical for efficient and effective performance of technical firefighting skills on the fire ground and for firefighter safety. For maximum credit, the fire department needs an open area of at least 2 acres in size, a three-story drill tower, and a live fire burn/smoke room. Such a facility is expensive and requires considerable planning and design, but it might be possible for the fire department to construct a drill tower on city owned property at minimal expense. Appendix C includes examples of wooden drill towers. Having a drill tower would allow the fire department to receive partial credit, instead of zero credit, for facilities and use.

Recommendation: Use the ISO Public Protection Classification Summary Report as one of the resources needed to create a strategic plan for providing and improving community fire and emergency services protection. The strategic plan should include the mission, vision, core values, strategic focus areas, strategic goals, and action plans.

Recommendation: Ensure that all fire officers receive 12 hours of officer training annually in accordance with the general criteria of NFPA 1021, *Standard for Fire Officer Professional Qualifications*; NFPA 1521, *Standard for Fire Department Safety Officer*; and/or NFPA 1561, *Standard on Emergency Services Incident Management System*.

Recommendation: Pursue fire officer certification for all officers at a level commensurate with the officer's role and responsibility.

Recommendation: Improve the recruit training program by requiring that all new firefighters have or obtain Fire Fighter I and Fire Fighter II certification in accordance with the general criteria of NFPA 1001, *Standard for Fire Fighter Professional Qualifications* within the first 12 months of employment.

Recommendation: Develop a plan to provide a fire service training facility that meets the general criteria of NFPA 1402, *Guide to Building Fire Service Training Centers*.

Management and Administration

The fire department's organizational structure is typical for a suburban fire department and is functional and efficient (see Appendix D for the organizational chart). The department's mission statement is good. Complementing the mission statement are a comprehensive vision statement and set of values (quality service, responsiveness, integrity, professionalism, commitment, dedication, teamwork, organizational effectiveness, trust, and respect) that provide direction and principles for the fire department to use in developing appropriate goals, objectives, and performance measurements (see Appendix G).

> Mission Statement
>
> It is the mission of Harriman Fire Department to preserve life and property, promote safety and foster economic growth through leadership, management and actions, as well an all risk life safety response provider

Effective management, administration, supervision, communication, and leadership are essential for the fire department to accomplish its mission, achieve its goals, and deliver quality services to its residents. The management team of the fire department includes the fire chief directly supervising the assistant chief and two shift captains.

The fire department uses several types of technology, including records management software (Fire Station Program), and computer aided dispatch (CAD), and manages incident reporting (TFIRS), pre-fire planning and inspections with software.

The department reports to the Tennessee Fire Incident Reporting System (TFIRS) as required by state law under FDID number 73216. Appendix A provides a summary of responses for 2014 by incident type.

The fire department's operating budget for FY14 was $682,523, essentially the same as the FY13 budget of $682,571. Even though the budget amounts are essentially the same, this is actually a decrease for the fire department since the cost of goods and supplies increases from year to year and, according to the Bureau of Labor Statistics, the average inflation rate in United States in 2014 was 1.6 %. The budget tracks expenditures effectively to allow for management of fire department programs.

Leadership of the Fire Department

Interviews with staff and observations of the fire department show a professional, customer service focused working environment. The fire chief has been working steadily to improve the fire department's capabilities and the services provided. The staff and officers have considerable years of experience and are professional. Fire personnel demonstrate an "attitude of service" in their duties. Fire service leaders are "pro-training" as evidenced by the high score on company training. The fire chief desires to increase the level of practical skills training, which will require access to a training facility. The fire department is very active in the community, teaches CPR to the public, and participates in many public events. Several people mentioned the fact that fire personnel show initiative and act and take care of problems as they find them. Fire personnel are very responsive to the needs of fire victims and provide extensive salvage of personal property and recovery assistance.

The fire chief's leadership style is somewhat autocratic. Autocratic leadership has benefits, but there are also disadvantages. For example, when there is a need to set direction and deadlines to get things accomplished or projects completed, an autocratic leader gets things done. In stressful situations, such as fires or other emergencies, an autocratic leadership style allows firefighters and other emergency responders to focus on assigned tasks without the stress of making command or complex decisions.

An autocratic leadership style does have some disadvantages. Employees may see the autocratic leader as being interfering, controlling, and dictatorial, and this can cause discord in the organization. Autocratic leaders who make decisions without consulting the others prevent employees from contributing ideas, which can reduce the number of options available or lead to decisions that may be less effective and/or efficient than other options which could have been considered. Finally, autocratic leaders may micromanage projects, which prevents employee growth and development, and this can lead to poor performance in the organization.

The key to excellent leadership is to use a balance of different leadership styles appropriate to the given situation. For example, there is seldom time to have a group discussion on what course of action to take on an emergency scene: the incident commander makes decisions and employees follow them. Similarly, in situations where the leader has the most knowledge or experience in a given situation, or has access to information that others do not have, the autocratic style may be the best style to use in those instances.

The Harriman Fire Department is a small organization in terms of the number of employees, and it is important that the fire chief provide opportunities for the growth and development of personnel, which includes providing opportunities for input where appropriate. In a fire department, for general operations, fire personnel respond favorably to a more participative management style where subordinates have more input and more decision-making freedom. Because of the small size of the

organization, a more personal approach will provide opportunities for employee development, contribute to succession planning, and get better results.
No single management style is effective in all situations, and on the scene of an emergency, the incident commander should use an autocratic style, but a more personal approach to leadership will produce better results in the fire department. For general operations, management, and leadership, the fire chief should use a participative approach where the chief leads the organization while also listening actively to the input of his personnel when appropriate, making decisions based on the chiefs knowledge, experience, and input from subordinates. A tremendous benefit is that participative leadership contributes to the development of additional leaders who can serve the department in the future. Participative leadership develops the active involvement of other employees, encourages creativity, and uncovers hidden talents and abilities in employees. The chief should monitor employees who have assigned tasks without micromanaging them, which will empower employees to take on more responsibility and develop their knowledge, skills, and abilities.

Recommendation: The fire chief and the command staff should locate and enroll in a formal leadership development program or college level course for a review of management and leadership techniques.

Morale on the fire department is improving. Positive influences on morale include the department's positive outlook, increased training and professionalism in the fire department, a good benefits package, and having good equipment. Items mentioned that have a negative effect on morale include a need increased funding in the fire department's operating budget, the cost of medical insurance premiums, the need for increased staffing to provide a minimum safe response level of firefighters on structure fires, the need to update and replace some equipment and apparatus, the need for a fire training facility, a program for increased training and education on management skills, compensation for additional skills and certifications, and competitive pay with area fire departments.

A fire department should be diverse and reflect the makeup of the community. Presently, the fire department is predominantly male, but the department does have two female reserves and one female explorer. The fire department should actively recruit new personnel that reflect the makeup of the community.

The fire department complies with state laws regarding the fire chief, as the chief has completed the Fire Chief Orientation course and has been appointed an Assistant to the Commissioner of Commerce and Insurance as required by Tennessee Code Annotated (T.C.A.) § 68-102-101.

On all emergency incidents, the fire department uses an incident command system that complies with National Incident Management System (NIMS) requirements. The fire department has a command and accountability board on Engine 1.

Presently, just one firefighter operating inside a structure fire has a portable radio. This is a safety concern, as it is imperative that all firefighters on the fire ground have reliable two-way communication capability. In the event of a mayday situation, such as a firefighter down, trapped, out of air, etc., all firefighters need the ability to both report a mayday and to respond to the request for help. The fire department has enough radios to equip about half of the personnel on the scene of an emergency incident. All firefighters on the scene should have two-way radios. As an excellent safety practice, every firefighter has and uses a personal alert safety system (PASS) device when entering a hazardous atmosphere. The department attempts to comply with the OSHA 1910.134(g)(4) two-in/two-out rule by using rapid intervention teams (RIT) to enhance firefighter safety on the fire ground. The staffing level of 4 to 5 on-duty firefighters is a challenge in attempting to comply with the OSHA regulation.

The fire department has a thermal imaging camera (TIC) on Engines 1 and 4, but not on the ladder truck. One camera is ten years old and the other is fifteen years old.

Recommendation: For firefighter safety, provide every firefighter on the scene of an emergency incident with a two-way portable radio.

Recommendation: The technology associated with thermal imaging cameras has improved significantly in the last 10 years, and the fire department should consider replacing the two existing cameras with newer models and purchasing a camera for Ladder 1.

The department has a blood borne pathogens policy that complies with OSHA 1910.1030. There has been no infectious disease or hazardous chemical exposures involving fire department personnel within the last three years.

The fire department has written job description for every position on the fire department, and the job descriptions are available to fire department personnel.

The fire department conducts a pre-hire evaluation on new fire personnel. The fire department requires annual physical exams and annual agility tests.

The fire department conducts background checks on new firefighters as allowed under T.C.A. § 68-102-308.

The department verifies annually that all personnel that drive city vehicles have a valid driver's license. The city requires immediate drug screening/testing for drivers involved in an accident while operating a city vehicle. There have been no accidents involving fire department vehicles within the last three years.

New firefighters complete the minimum state training requirements outlines in T.C.A. § 4-24-112. This law requires new firefighters to complete a 16-hour class before making their first response, and within thirty-six months to complete a 64-hour basic firefighting course and a 16-hour live firefighting course.

New firefighters are required to achieve Fire Fighter I certification through the Tennessee Commission on Firefighting and Personnel Standards and Education (Commission) within one year of employment. Fifteen full-time personnel and three reserve personnel have achieved Fire Fighter I certification.

The city complies with the requirements of the Fair Labor Standards Act (FLSA). Shift firefighters work a 24-on/48-off schedule with a 28-day overtime calculation cycle.

The fire department does not have a workforce development or succession plan in place.

Recommendation: Use the ISO Public Protection Classification Summary Report, a community risk assessment, nationally accepted guidelines, and other resources to create a strategic plan for the fire department that contains SMART (Specific, Measureable, Accountable, Results-oriented, and Time-bound) objectives and both output and outcome based performance measurements. Publish the strategic plan for all stakeholders.

Recommendation: Perform a job analysis on all positions and then create, review, update, and standardize all current job descriptions accordingly.

Recommendation: Develop a workforce development or succession plan to identify future leaders, and to improve the knowledge, skills, and abilities of employees to help make them better employees.

Communication within the Fire Department and with the City

Communication within the fire department is good, and personnel use the chain of command appropriately.

Fire department staff is responsive when asked to provide information to city hall and others.

The fire department's strategic plan helps communicate the department's vision, mission, goals, and objectives to all members of the fire department and create a unified effort in providing fire and emergency services.

The fire chief holds officers' meetings and meet with the entire fire department quarterly. Budget constraints prevents the chief from holding more frequent staff meetings as he would have to pay personnel to attend. As an alternative, the chief conducts monthly meetings with each shift.

The fire department provides many emergency and essential services and needs a way to measure and communicate the depth and value of those services to all stakeholders. Performance measures report output and outcome results from the work and services provided by the department. Good performance measures allow leaders, managers,

and elected officials to evaluate and compare the department's effort against its goals and objectives and against other departments and industry standards. Performance measures are effective tools to communicate to others on the status of the department.

The fire department provides a monthly activity report to the board that summarizes activities in department events, emergencies, hydrant activities, non-incident activities, and training activities. This output-based report shows the number of activities and associated staff hours. As an all-hazards fire department, there is much more to tell city leaders and the public, and the fire department should develop and report outcome based performance measures as well as output based measures. Examples of outcome based performance measures include the percent of time the first unit arrives on the scene within a given response time standard (i.e. 90% of the time within 6:35), percent of structure fires confined to the area of origin, percent of fire code violations cleared in 90 days, percent of fires where the cause is determined, ratio of fire loss compared to total assessed valuation of all property within the city, annual property value saved as a percentage of market value in the city, and the percentage of pre-fire plans completed/updated annually. Outcome based performance measures show results and may be compared with similar sized fire departments to assess performance. MTAS has a Tennessee Municipal Benchmarking Project that can serve as an example and resource for the development of performance measurements.

Recommendation: The fire chief should hold staff meetings with the key staff and shift captains to discuss department issues, keep staff informed on city issues as appropriate, gauge department performance against benchmarks, monitor progress on the strategic plan, discuss budget administration, and improve intradepartmental communication. The chief should hold the meetings regularly and schedule them in advance on a weekly, bi-weekly, or monthly basis to meet the needs of the department.

Recommendation: The fire department should develop outcome based performance measurements to track and monitor service levels and should provide regular performance reports to all stakeholders.

Fire Related Ordinances

The fire code is up-to-date in accordance with T.C.A. § 68-120-101(B)(5)(A), but the language of the adopting ordinance needs clarification. The relevant portion of Section 7-201 is quoted below:

> 7-201. Fire code adopted. A certain document, one (1) copy of which is on file in the Office of the Harriman City Clerk, being marked and designated as the NFPA 101 Life Safety Code as published by the National Fire Prevention Association and International Fire Code, 2012 edition including Appendices B, C, D, E, F, G, H, and I as published by the International Code Council, are hereby adopted as the Fire Code of the City of Harriman…

The wording does not make it clear as to which version of the NFPA 101 Life Safety Code Harriman adopted, nor does it address what will happen should a conflict occur between code requirements in the Life Safety Code and the International Fire Code. MTAS recommends rewording the section and provides the following example language for consideration by the city.

> 7-201. Fire code adopted. Pursuant to authority granted by Tennessee Code Annotated, §§ 6-54-501 through 6-54-506, the International Fire Code, 2012 edition, including Appendices B, C, D, E, F, G, H, and I as published by the International Code Council, and the NFPA 101 Life Safety Code, 2012 edition, as published by the National Fire Protection Association, are hereby adopted as the Fire Code of the City of Harriman, in the State of Tennessee for regulating and governing the safeguarding of life and property from fire and explosion hazards arising from the storage, handling and use of hazardous substances, materials and devices, and from conditions hazardous to life or property in the occupancy of buildings and premises as herein provided; providing for the issuance of permits and collection of fees therefore; and each and all of the regulations, provisions, penalties, conditions and collection of fees therefore; and each and all of the regulations, provisions, penalties, conditions and terms of said fire code on file in the Office of the City of Harriman are hereby referred to, adopted, and made a part hereof, as if fully set out in this chapter, with additions, insertions, deletions and changes, if any, prescribed in § 7-204 of this chapter.. Pursuant to the requirement of Tennessee Code Annotated, § 6-54-502, one (1) copy of the international fire code and the Life Safety Code have been filed with the city recorder and are available for public use and inspection. Said International Fire Code and Life Safety Code are adopted and incorporated as fully as if set out at length herein and shall be controlling within the corporate limits. In the event of a conflict between the International Fire Code and the Life Safety Code, the most stringent code requirement shall apply.

Section 7-301 of the Code of Ordinances states:

> 7-301. Creation, composition, compensation, and medical coverage for members, etc. There is hereby created a city fire department to be composed of a chief, a first assistant chief, a second assistant chief, and as many other members or firemen as the city council shall authorize the board of fire department commissioners to appoint.

The current organizational structure (see Appendix D) does not match the structure outlined in Section 7-301 in the code of ordinances. The fire department has but one assistant fire chief, and the board of fire department commissioners no longer exists. Section 7-301 states that the fire chief is appointed by the board of fire commissioners upon authorization by the city council. This is in conflict with the city's charter, which states the city manager appoints department heads.

City Charter, Section 29. The powers and duties of the City Manager are to:

(B) Except as otherwise provided in this charter, appoint, promote, demote, suspend, transfer, remove, and otherwise discipline all department heads and subordinate employees at any time, subject only to any personnel rules and regulations adopted by ordinance or resolution by the commission. Any hearings on, or appeals from, the City Manager's personnel decisions provided for in the personnel rules and regulations shall be exclusively before the City Manager or a hearing officer designated by the City Manager. The City Council retains the right to review and overrule the discipline or firing of Department Heads and Staff.

Section 7-302 requires that the board of fire department commissioners and the assistant fire chiefs "carefully inspect each company of the fire department and shall satisfy itself that each company is in an efficient operating condition" twice a year. Again, this section is out of date.

Recommendation: Revised Section 7-201 of the Code of Ordinances to make it clear which edition of the Life Safety Code is and to address what happens should a code requirement conflict occur between the two codes.

Recommendation: Revised Section 7-301 of the Code of Ordinances to address the current organizational structure, the appointment of the fire chief by the city manager, and the fact that the board of fire department commissioners no longer exists.

Section 1021 of the new ISO Fire Suppression Rating Schedule (FSRS) evaluates the adoption and enforcement of a fire code. Maximum credit is given for adoption of the current edition (which is the 2015 edition of the International codes), and credit is pro-rated for earlier editions. Harriman has adopted the 2012 edition of the International Fire Code (IFC). This code is within five years of the date of the latest ISO evaluation and received 100% credit from ISO.

Section 7-202 establishes enforcement responsibility for the fire code and meets the requirements of Section 1021 of the ISO Fire Suppression Rating Schedule.

The currently adopted edition of the NFPA Life Safety Code is assumed to be the 2012 edition. Neither ISO nor the state address adoption of the Life Safety Code, but MTAS recommends adopting an edition of the Life Safety Code that complements the 2012 edition of the International Fire Code.

Recommendation: Adopt an edition of the NFPA Life Safety Code that complements the 2012 edition of the International Fire Code.

Section 1024F of the ISO rating schedule evaluates fire prevention ordinances and gives credit for ordinances governing fire lanes, fireworks, hazardous materials routes, barbeque grills, and either the wildland-urban interface or weeds and trash. For urban

and suburban communities that abut wildland areas ISO expects to see both addressed by ordinance.

A review of Section 7 of the Code of Ordinances shows that:

- Section 503.3 of the International Fire Code addresses fire lanes adequately.
- Section 7-401 et al. of the code addresses fireworks adequately.
- Section 7-205 addresses gasoline trucks. Section 5005.4.4 of the International Fire Code addresses hazardous materials routes.
- Section 308.1.4 of the International Fire Code addresses the use of barbeque grills on balconies.
- Sections 304.1.2, 307.1.1, and 308.1.4 address the wildland-urban interface risk in Harriman. The city should also enforce an abatement program for weeds and trash.
- Section 307 of the International Fire Code addresses open burning.

Staffing Levels

The city employs 15 full-time personnel, 3 part-time reserves that backfill when short staffed, and 3 volunteer firefighters in the fire department. All staff personnel are trained firefighters and respond to fires and other emergencies as needed. For emergency response, the department operates three rotating shifts. Each shift works 24-hours on duty with 48-hours off-duty. The fire department has a minimum shift staffing requirement of five (5) personnel per shift and a minimum staffing level of two personnel per engine company (Table 4). Staff officers work 40-hour weekday shifts and are subject to call-out at other times.

Even with the use of part-time personnel, the fire department does not have enough personnel to maintain a minimum staffing level of five firefighters on duty 100% of the time. There are no personnel assigned to the ladder truck, and if a structure fire call comes in, a person moves from the engine to the ladder truck to bring it to the scene, or the fire chief may respond with the ladder truck if he is available. This practice may hurt the ISO rating, as ISO does not credit the response of a ladder company unless it responds on the initial alarm on all structure fire responses.

Company	Fire Station	Company Officers	Firefighters	Maximum Staffing	Minimum Staffing
Engine 1	1	1	2	3	3
Engine 2	2	1	1	2	2
Ladder 1	1	0	0	0	0
Totals		**2**	**5**	**5**	**5**

Table 4 – Maximum On-Duty Staff Deployment by Station

On-duty staffing levels are less than the recommend response level for a low risk structure fire. Government, community, and fire service leaders across the country have debated minimum staffing levels for decades. Factors involved in determining adequate staffing levels include but are not limited to community risk, available financial resources, the level of fire service response desired in the community, and the level of safety desired for residents and firefighters. While the decision on staffing levels is a local one, there are guidelines that city, community, and fire service leaders should use to determine the minimum staffing level. Harriman provides five fighters per shift as a maximum and minimum staffing level (31.25% of what is considered adequate for a low risk structure fire) as shown in Table 4.

ISO recognized 5 on-duty personnel and 8.12 on-call personnel responding to structure fires. With the 3:1 ratio for on-call personnel, this response equates to credit 6.7 firefighters, and ISO subtracts one on-duty person for the role of incident commander. Actual on-duty response (5 personnel) is 31.25% of the recommended number of sixteen firefighters for a low-risk structure fire, as shown in Table 5 and Figure 3.

Initial full-alarm structure fire assignment per NFPA 1710, § 5.2.4.2.2		
5.2.4.2.2 Sub-section	Function	Minimum Number
(1)	Incident command	1
(2)	Pump - supply engine and attack engine	2
(3)	Two hand lines with 2 firefighters each	4
(4)	Hand line support, 1 for each hand line	2
(5)	Search and rescue	2
(6)	Ventilation	2
(7)	Aerial device operator	1
(8)	Rapid Intervention Team (RIT)	2
	Total	16
Table 5 – NFPA Recommended Minimum Response for House Fire		

In 1966, NFPA Standard 197, A Training Standard on Initial Fire Attack, stated, "*The desirable number of men normally required to respond with the apparatus to give this level of performance with properly manned hose streams and equipment would be approximately fifteen plus the chief.*" NFPA Standard 1710 replaced NFPA Standard 197 in 1979, but the idea of a minimum of fifteen firefighters plus an incident commander as a valid minimum number of personnel for the initial alarm has withstood the test of time. Various agencies have conducted many studies over the years regarding the number of firefighters needed to extinguish a fire, and there is consensus among NFPA, ISO, and the International City/County Management Association (ICMA) that a low-risk structure fire requires between fourteen to nineteen firefighters for effective operations. A single-family dwelling is an example of a low-risk structure fire. For example, ISO gives full staffing credit for a response of nineteen personnel. NFPA recommends a minimum of sixteen as shown in Table 5 and Figure 3. Though

Harriman has not adopted NFPA 1710, the standard is an industry best practice and is a useful guideline for staffing fire ground operations.

The response level described above is for a residential structure fire of a home of about 2,000 square feet with no basement or exposures. NFPA 1710 Section 5.2.4.2.3 states that higher risk occupancies (schools, hospitals, apartments, commercial properties, etc.) require more resources, which means more apparatus and personnel. Table 6 is from the NFPA Fire Protection Handbook and shows the minimum response recommended for different risk levels.

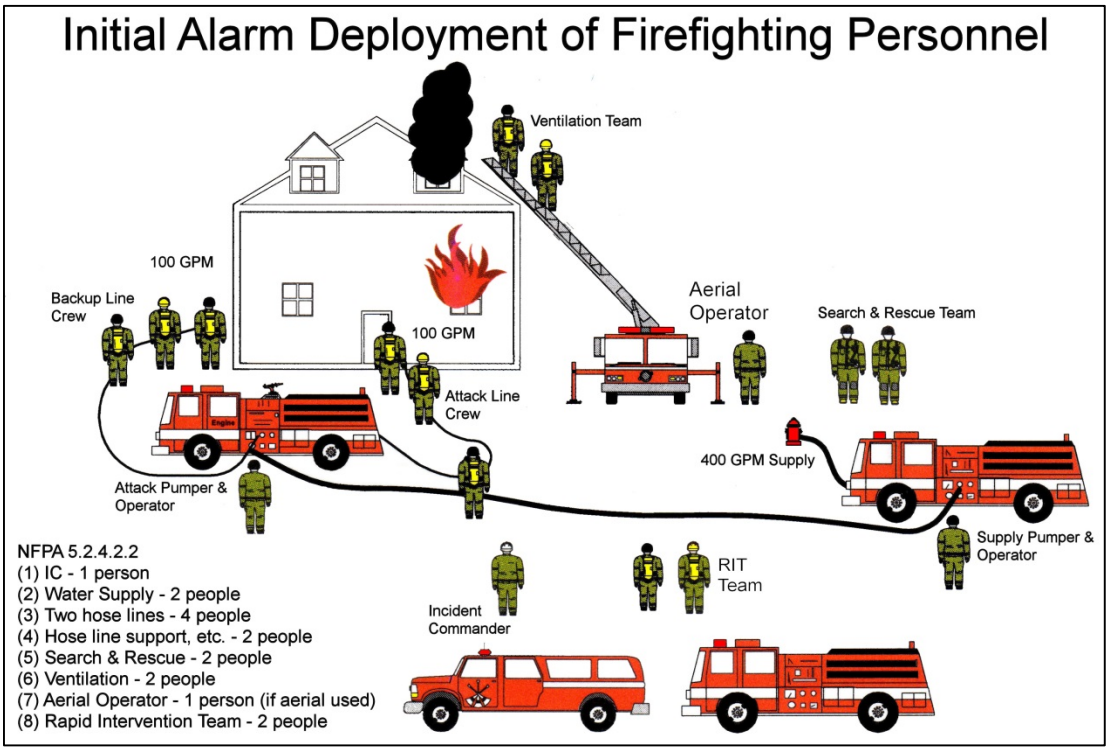


Figure 3 – Initial Alarm Deployment of Firefighting Personnel

Harriman has at least two properties with high needed fire flows that qualify the property as a high-hazard occupancy and therefore require the response of a greater amount of fire resources on the initial alarm. Section 2000 of the ISO FSRS classifies properties with needed fire flows in excess of 3,500 gpm as individual properties. While Harriman has an ISO Public Protection Classification of Class 4, ISO rates the individual properties in Table 7 at a worse PPC classification, which means the cost for property insurance is greater for these properties. According to ISO's FSRS, properties with a needed fire flow of 4,000 and 4,500 gpm should receive an initial alarm response of 4 engines and a ladder company, 5,000 and 5,500 gpm properties should receive an initial alarm response of 5 engines and 2 ladder companies, and 6,000 gpm properties should receive an initial alarm response of 6 engines and 2 ladder companies.

A *standard of cover* is a document that identifies local risks and defines the appropriate response level for the given risk based on the hazard, needed fire flow, life risk, and

other factors. Local leaders must decide on a level of fire protection for their community, balancing the cost of providing the service against the lives and property at risk. To make this decision, it is important for the leaders to understand both the level of risk in the community and the minimum response recommendations for those risks.

Typical Initial Attack Response Capability Assuming Interior Attack and Operation Plus Command Capability		
Risk	**Description**	**Personnel and Apparatus**
High-hazard Occupancy	Schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings, and other high life hazard or large fire potential occupancies	At least 4 pumpers, 2 ladder trucks (or combination apparatus with equivalent capabilities), 2 chief officers, and other specialized apparatus as may be needed to cope with the combustible involved; not fewer than 24 firefighters and 2 chief officers. Extra staffing of units first due to high-hazard occupancies is advised. One or more safety officers and a rapid intervention team(s) are also necessary.
Medium-hazard Occupancy	Apartments, offices, mercantile, and industrial occupancies not normally requiring extensive rescue or firefighting forces	At least 3 pumpers, 1 ladder truck (or combination apparatus with equivalent capabilities), 1 chief officer, and other specialized apparatus as may be needed or available; not fewer than 16 firefighters and 1 chief officer, plus a safety officer and a rapid intervention team.
Low-hazard occupancy	One, two-, or three-family dwellings and scattered small businesses and industrial occupancies	At least 2 pumpers, 1 ladder truck (or combination apparatus with equivalent capabilities), 1 chief officer, and other specialized apparatus as may be needed or available; not fewer than 14 firefighters and 1 chief officer, plus a safety officer and a rapid intervention team.

Typical Initial Attack Response Capability Assuming Interior Attack and Operation Plus Command Capability		
Risk	**Description**	**Personnel and Apparatus**
Rural Operations	Scattered dwellings, small businesses, and farm buildings	At least 1 pumper with a large water tank (500 gal or more), one mobile water supply apparatus (1,000 gal or larger), and other specialized apparatus as may be needed to perform effective initial firefighting operations; at least 12 firefighters and 1 chief officer, plus a safety officer and a rapid intervention team.
Additional Alarms		At least the equivalent of that required for rural operations for second alarm; equipment as may be needed according to the type of emergency and capabilities of the fire department. This may involve the immediate use of mutual-aid companies until local forces can be supplemented with additional off-duty personnel. In some communities, single units are "special called" when needed, without always resorting to a multiple alarm. Additional units may also be needed to fill empty fire stations.
Source: NFPA Fire Protection Handbook 20th Edition– Table 12.1.1, Page 12-12		

Table 6 – Typical Initial Attack Response Capability

ADDRESS	OCCUPANCY	NEEDED FIRE FLOW	ISO RATING
1225 S. Roane Street	Multi-tenant	**4,500**	**5**
2487 S. Roane Street	Roane Medical Center	**4,500**	**5**

Table 7 – ISO Individually Rated Properties

This report acknowledges Harriman's current limited financial resources to hire enough paid personnel to provide that level of response to a structure fire, but the city is now aware of the need for adequate staffing levels and should consider ways to increase staffing levels. The fire department should prepare a staffing plan that includes estimated costs and options for phasing in paid staffing to achieve a staffing level proportionate with the community's risk. The use of part-time paid firefighters is a viable option for providing additional personnel at a lower cost as part-time personnel would not receive full-time benefits. A sufficient number of part-time firefighters allows flexible

staffing plans to reduce the use of overtime, but the current number of part-time personnel is insufficient to guarantee availability when needed. The use of volunteer firefighters is another option. However, departments with volunteers struggle with volunteer retention and have high turnover rates, meaning the department is constantly training new firefighters. Part-time firefighters have higher retention rates that volunteers and have the advantage of regular training with full-time firefighters while on-duty.

Harriman does not have any automatic aid agreements with neighboring fire departments. Automatic aid is assistance dispatched simultaneously with the primary fire department. Harriman could use automatic aid agreements (ISO recognizes personnel responding on automatic aid, but not mutual aid) to increase the number of trained firefighters on the scene of a structure fire, but this method takes more time to assemble an effective firefighting team of fifteen to sixteen personnel (see Appendix E for estimated response and travel times based on distance). However, neighboring fire departments are reluctant to enter into automatic aid agreements because the call volume in Harriman is higher than the call volume in their city, which means the automatic aid might take the companies out of their city more times than Harriman companies would be responding to their city. This makes automatic aid agreements unattractive for those communities.

Mutual aid is assistance requested after the primary fire department arrives on the scene and discovers that there is a fire. There is a very robust mutual aid response in Roane County, and Harriman uses the model mutual aid agreement found in Tennessee Code Annotated § 58-8-101.

Recommendation: Adopt a plan to provide an effective firefighting response of sixteen personnel to a structure fire within 560 seconds (9.33 minutes) turnout and travel time on 90% of all incidents. Turnout time is the time from when dispatch notifies the fire department of the response until the apparatus leaves the station. Travel time is the time elapsed from when the fire apparatus leaves the fire station until it arrives on the scene of the emergency.

Recommendation: Complete a community risk assessment and establish a standard of cover for each identified risk.

Recommendation: Review current response assignments to ensure that Harriman dispatches a sufficient number of apparatus and personnel to each property at risk based on the standard of cover.

Recommendation: Consider using automatic aid agreements to provide additional firefighters on structure fire responses.

Recommendation: Prepare a staffing plan that includes estimated costs and options, such as part-time firefighters, for phasing in staffing to achieve a minimum staffing level proportionate with the community's risk.

Human Resources

The city has good job descriptions for all positions in the fire department. Job descriptions for all positions are available to all personnel.

The city has a comprehensive Personnel Rules and Regulations manual that covers all city employees. The city's manual includes policies to address typical benefits and requirements for a local government.

The fire department is revising a comprehensive standard operating guideline (SOG) manual. The manual contains standard guidelines for personnel on many subjects and situations. As a best practice, the city manager and city attorney should review the manual. The manual should have a table of contents to assist in locating SOGs quickly. The manual should be available in all fire stations. As a best practice, every member of the fire department should be given, and sign for, a copy of the manual so there is no doubt that fire department members know what is expected of them.

ISO awards credit under the FSRS for established SOGs for fire department general emergency operations in the following areas:

- response of apparatus
- operation of emergency vehicles
- safety at emergency incidents
- communications
- apparatus inspection and maintenance
- fire suppression
- company operations
- automatic-aid/mutual-aid operations
- training
- personnel response

The SOGs MTAS reviewed cover seven of these ten subject areas adequately. The subject areas not addressed are communications, automatic aid/mutual aid operations, and training. The department is developing SOGs for these subject areas.

The fire department responds on mutual aid with other fire departments, and the general orders manual should include a policy on working alongside mutual and automatic aid companies, including but not limited to incident command, common radio frequencies, fire ground safety, and common strategies and tactics.

For maximum credit, ISO requires a policy where the fire department review policies relating to structural firefighting annually.

Recommendation: Complete the review and update of the standard operating guidelines manual to include policies that address adequately to meet local needs in the ten subject areas reviewed by ISO.

Recommendation: Update the general orders manual to include a policy that addresses the annual review and updating, as needed, of structural firefighting related policies.

Recommendation: Appoint a committee of fire department members to review the general orders manual on an annual basis and make recommendations for updates as needed.

Recommendation: Provide training and testing for competency to all fire personnel on the policies found in the general orders manual. Every member should be familiar with its content and copies should be available readily to all fire department personnel. Provide a copy of the SOG manual to all personnel and keep copies in the fire stations and in the human resources office and forward updated policies to fire department personnel and human resources to keep their copies current.

Workforce Development and Succession Planning

The fire department does not have a succession plan or a workforce development plan. Workforce development identifies human resource training needs and provides training and development opportunities for the growth of employees. Succession planning looks to the future, identifies anticipated turnover from retirements, promotions, etc., and anticipates the resulting loss of knowledge, skills, and experience. Succession planning identifies replacement candidates and preserves the organization's knowledge capital through programs that capture the knowledge in standard procedures, written manuals, and mentoring programs. The fire department is a small organization, so the loss of a single member can have a significant effect on operations. The five-year average turnover rate is 12.35%, and the turnover rate for last year was over 35% (Table 8). Unless employees prepare for advancement, the city must go outside the organization for viable candidates. Supervisors must have the opportunity to attend advanced fire service leadership and management classes, such as classes offered at the Tennessee Fire and Codes Enforcement Academy, the National Fire Academy, and on-line through accredited colleges and universities.

Calendar Year	Number of filled full-time positions	Number of full-time firefighter who left during the calendar year	Turnover Rate
2010	19	0	0.00%
2011	16	1	6.25%
2012	16	2	12.50%
2013	16	2	12.50%
2014	14	5	35.71%

Table 8 – Five Year Turnover Rate

Many personnel on the department have certification through the Tennessee Commission on Fire Fighting and Personnel Standards and Education (Commission). There are 22 members on the fire department, and Table 9 breaks down the certification for the entire department and for the paid only and reserve only members. There are seven officers on the fire department, and three of the officers have Fire Officer-I certification and two of those officers have Fire Officer-II certification as well. Certification through the Commission provides documentation of individual knowledge, skills, and abilities referenced to nationally recognized standards. Certification for fire officers at the Fire Instructor and Fire Officer levels is an industry best practice. ISO now awards credit for officer certification under Section 580 of the FSRS. Tennessee state law does not require certification of firefighters or fire officers, so certification is a local policy decision.

Breakdown	Number	FF-I	Percent	FF-II*	Percent
All Members	22	13	59.09%	10	45.45%
Paid only	14	11	78.57%	8	57.14%
Reserve only	8	2	25.00%	2	25.00%
* Firefighter-II certification includes Firefighter I certification					

Table 9 – Breakdown of State Firefighter Certification

The department sends personnel to the state fire academy for officer and specialized training.

The fire department provides occasional training opportunities for supervisors but does not have a formal officer training program. Officer training includes training on knowledge and skills covered in NFPA 1021, *Standard for Fire Officer Professional Qualifications*; NFPA 1521, *Standard for Fire Department Safety Officer*; and NFPA 1561, *Standard on Emergency Services Incident Management System*. Harriman can provide the training in-house, through programs such as MTAS's Municipal Management Academy (MMA) and the Municipal Administration Program (MAP), through classes at the state fire academy, through National Fire Academy classes, and through college courses and degree programs. The state fire academy will deliver training classes locally as long as there are enough students to make the course cost-effective, so Harriman could host officer classes and invite other fire departments to send students.

As of July 1, 2015, the average tenure of the department as a whole is 8.70 years, and the average tenure of all shift personnel is 6.99 years. Table 10 shows the average tenure by position of all shift personnel. This represents a lot of experience at the level of captain and above, but not a lot of experience at the shift level. The department should introduce a workforce development and succession plan now to prepare younger personnel to advance in rank and responsibility as senior personnel retire and to capture organizational knowledge and experience before senior personnel retire.

Recommendation: Establish a workforce development and succession plan for the department. The fire chief should work closely with the training officer and human resources director to develop and offer internal and external training programs to improve the knowledge, skills, and abilities of personnel in all positions, and prepare them for advancement and greater responsibility.
Recommendation: Establish a formal officer development and training program following the NFPA 1021 standard using as many sources for training as possible to provide the most opportunities possible. The program should be required for all officers, and available to firefighters who may aspire to be officers.

Recommendation: Establish as a job requirement that fire officers obtain a level of certification through the Commission matching their position. Company officers should achieve Fire Officer I certification, captains should achieve Fire Officer II or Fire Officer III certification, and chief and staff officers should achieve Fire Officer III or IV certification.

Pay and compensation are important factors to employees, as they are in every organization, and compensation and benefits were mentioned during the interviews. Harriman's salary survey for fire departments showed that the compensation for fire department positions are below the range for the market average and below the median for all positions across the board (Table 10). The fire department has lost personnel to other fire departments because of better pay.

All firefighters are required to know how to drive and operate fire apparatus. While this is a good practice and may be cost effective, it limits the ability of the fire department to offer promotional opportunities and incentives for acquiring new skills. MTAS recommends that the city consider establishing a position of "driver" or "engineer" with the specific responsibility of driving and operating fire apparatus. This does not mean that a regular firefighter cannot or should not learn how to operate fire apparatus, but it establishes a rank structure with a higher pay rate than that of a firefighter and provides promotional opportunities.

The city should develop a compensation strategy to recruit and retain employees aligned with the mission and vision of the organization. Compensation should be aligned with the knowledge, skills, and abilities needed to perform the work required to meet the city's goals and objectives. A career development program, as part of a workforce development program, will quantify the key skills and certifications required for the job and will help justify increases in pay. Incentive pay rewards firefighters who obtain additional training and skills that improves the service the fire department provides.

Use the market to determine pay increases and stay informed of market conditions. For maximum return on the investment of tax dollars, increases above market adjustments should be based on performance, with top performers receiving a higher-than-average increase. Improving an organization's compensation plan is "part of doing business," and the city should plan for and budget for changes in the compensation plan that

support the goals and objectives of the city. Research the market to gather accurate pay and compensation information annually. Having a compensation philosophy in place to support the city's vision and mission contributes to the success of the city. MTAS has human resources consultants who can assist the city in reviewing existing compensation plans and in developing a long-range compensation philosophy.

Position	Lowest Years of Service	Highest Years of Service	Average Years of Service	Harriman Salary Survey Minimum Average	Harriman Salary Survey Maximum Average	Harriman Salary Survey Average Median	Harriman Actual Median
Firefighter	0.67	16.87	4.18	$29,622	$38,374	$33,998	$24,176
Lieutenant	3.54	12.52	7.97	$35,272	$45,874	$40,124	$34,345
Captain	15.21	15.49	15.35	$39,384	$50,248	$44,816	$37,577
Assistant Chief	17.03	17.03	17.03	$42,995	$48,158	$45,780	$41,847
Chief	20.88	20.88	20.88	$56,550	$66,218	$61,384	$47,785

Table 10 – Average Tenure and Annual Salary

Recommendation: Consider establishing a position of "driver" or "engineer" with the specific responsibility of driving and operating fire apparatus.

Recommendation: Review the city's compensation plan annually, and consider a comprehensive career development program to serve as a guide for workforce development and justification for competitive compensation. MTAS can assist the city with this recommendation.

Recommendation: Consider an incentive pay program that recognizes the additional knowledge, skills, and abilities of firefighters who obtain specialized certifications that are beneficial to the department's mission.

Apparatus and Equipment

The fire department has two first out engines and one aerial ladder truck. The ladder truck has a 1,500-gpm pump, which makes it a quint, a vehicle capable of performing as both an engine and an aerial ladder truck. See Appendix H for a complete apparatus and vehicle roster.

Because of the number of square miles in Harriman, the city needs either two ladder companies or one ladder company and one service company. ISO requires a ladder or service company when a community has at least five buildings that are three-stories or more than thirty-two feet in height, or five or more buildings with a needed fire flow greater than 3,500 gpm, or a combination of five buildings meeting these criteria. Harriman has one ladder truck, and for effective operations and full credit under the ISO grading schedule the ladder truck must respond to all structure fires. ISO refers to a "ladder company," meaning the ladder truck plus the personnel to operate the vehicle. Harriman does not have sufficient staffing to operate the ladder truck and to perform essential fire ground operations simultaneously, which limits the effectiveness of fire suppression operations. Placing one firefighter on the ladder truck will get the vehicle to the scene, but without sufficient trained personnel, the truck is not effective and provides a visual false sense of adequate fire protection.

Recommendation: Staff the aerial ladder truck with sufficient personnel to respond the truck on the initial alarm and to operate the truck effectively on all structure fires.

The fire department received 98.83% credit for engine companies, which is an excellent score. For maximum ISO credit and effective suppression operations, apparatus should have the appropriate inventory of tools, hose, equipment, etc. and properly documented annual hose, pump, and ladder tests.

The city has two first out engines, one first out truck company, and two reserve engines as shown in Table 11.

Unit ID	Year	Make	Pump (gpm)	Tank (gallons)	Comments/ Condition	Year Age 15	Year Age 25
E-1	2010	Ferrara	1,500	750	1st out, Station 1, engine/ Good	2025	2035
E-2	1996	Ferrara	1,000	1,000	Reserve, Station 2, engine/ Fair	2011	2021
E-4	1999	Ferrara	1,000	1,250	1st out, Station 2, engine/ Good	2014	2024
L-1	2010	Ferrara	1,500	411	1st out Station 1, quint/ Good	2025	2035

Table 11 – Apparatus Roster

NFPA recommends that, "Because the changes, upgrades, and fine tuning to NFPA 1901, Standard for Automotive Fire Apparatus, have been truly significant, especially in the area of safety, fire departments should seriously consider the value (or risk) to fire

fighters of keeping fire apparatus older than 15 years in first-line service." One (E-4) of the two first-out fire engines is more than 15 years old, and the capital cost to replace that engine is estimated at $550,000 (Table 12).

Unit ID	Type	Year Made	Age	Year should be relegated to reserve service	Year unit should be retired from service	Replacement Cost
E-1	Engine	2010	5	2025	2035	$550,000
E-2	Engine	1996	19	2011	2021	$550,000
E-4	Engine	1999	16	2014	2024	$550,000
L-1	Quint	2010	5	2025	2035	$850,000

Table 12 – Apparatus Replacement Cost

All of the fire apparatus and other vehicles in the table above are in new or like new to operational with minor flaws condition, and the city should develop a plan that aligns with the city's needs and NFPA 1901 recommendations to fund the orderly replacement of fire apparatus.

ISO requires that a community have one reserve fire engine for every eight, or fraction thereof, required engines. The city has one reserve fire engine, as Engine 3, which was 30 years old, in poor condition, and beyond the useful life recommended by NFPA, was sold recently.

Recommendation: Establish an apparatus replacement program to fund and schedule the transition and replacement of fire apparatus on the 15 year/25 year life cycle recommended by NFPA.

Facilities

The map in Figure 4 shows the current city limits and the location of the two Harriman fire stations. The colored circles represent the ISO defined 1½-mile service area for each fire station's engine company. Tables 13 and 14 summarize the age and bay capability of the fire department's facilities, their current condition, the number of square feet, and estimated replacement cost. Modern engines are generally thirty feet or more in length, so bays that are seventy feet in length or longer allow for stacking two engines in one bay. Door heights should be twelve feet or higher.

Station	Address	Year Built	Age	№. Bays	Bay Length	Door Height	Gender Friendly
1	603 Walden Avenue	1953	62	2	60’	11.5’	No
2	400 Carlock	1972	43	3	58’	12’	No

Table 13 – Harriman Fire Stations - Bays

Station	Address	Year Built	Age	Condition	Sq. Feet	Replacement Cost
1	603 Walden Avenue	1953	62	Fair	4,200	$750,000
2	400 Carlock	1972	43	Good	4,000	$500,000

Table 14 – Harriman Fire Stations - Condition

The city has not added any fire stations in the last ten years. Both fire stations have equipment for the removal of carbon monoxide, which is a known health risk to firefighters living and working in the fire station and the public when they visit a fire station.

Facility maintenance is adequate, with fire department personnel being responsible for daily housekeeping and some minor building maintenance issues. However, both fire stations are older and have some issues. Station 1 is 62 years old and has maintenance and space issues inherent with an older building. The station needs a dedicated training room as the department needs a place to hold formal training classes. The station is not gender friendly (see T.C.A. § 4-24-301 and 4-24-302), the bed hall is too small and there is no privacy in the bed hall, the kitchen area is too small, and the station does not have a weight/exercise room. The fire department administration works out of Fire Station 1 at 603 Walden, and more administrative space is needed.

Station 2 is 43 years old, and there are some issues with the foundation. The station is not gender friendly (see T.C.A. § 4-24-301 and 4-24-302), there is no privacy in the bed hall, the kitchen area is too small, and the station does not have a weight/exercise room.

Fire stations are critical infrastructure for a community, which means the stations must be capable of continuous operation during disasters. Harriman uses both fire stations for community meetings and severe weather shelters. The station should have a generator large enough to run the entire building in a power failure. Building codes classify fire stations as storage facilities, but people live in them, which makes them unique structures. In paid and combination department, fire stations are in use 24/7. Fire stations contain the mixed-use functions of storage of motorized apparatus, storage of hazardous chemicals, and use as a business office, contain cooking operations, and overnight accommodations for on-duty crews. Since 2007, the state expects new and existing fire stations to be gender friendly to accommodate men and women working in the same station. Neither fire station has an automatic start generator capable of

supplying electricity to keep the building fully operational during a disaster or extended emergency.

Providing emergency medical services was not something fire departments did when the two existing fire stations were built, so space and facilities for decontamination of soiled/contaminated EMS equipment is not built in to the station. The use of plastics and chemicals in the construction of homes and furnishings was minimal forty years ago. The fires firefighters fight today contaminate their turnouts with soot and chemicals that contain carcinogens. For this reason, fire departments need space for cleaning and decontamination of turnout gear, and neither station has adequate space for this function.

Based on the ISO FSRS, the city needs at least one additional fire station. The exact number and placement of fire stations is outside the scope of this study, but as a rule, a single fire station can cover approximately 4.5 square miles effectively based on the ISO recommended 1½-mile travel distance for an engine company. Using this rule-of-thumb, with Harriman's size of approximately 12 square miles the city needs at least three fire stations. In reality, road networks and geographical features can reduce the size of the covered area, and this is the case in Harriman, as the river and the railroad are obstacles to direct response routes.

There is considerable growth and development in the area where a third fire station is being considered. Because of the size of the area served, the desire to maintain good response times, and growth, MTAS recommends that Harriman proceed to build, staff, equip, and open Station 3 as soon as possible. The proposed location on Pine Ridge Road will fill in a large gap in the coverage in the city.

As a rule-of-thumb, a single ladder truck company can cover approximately 12.3 square miles based on the ISO recommended 2½-mile maximum travel distance. Harriman has one ladder company and no service company and the response territory is shown in Figure 5. For adequate ladder truck coverage, Harriman needs at least one ladder truck company and one service company.

Harriman's borders are asymmetrical, so determining the exact number and location of additional fire stations, ladder companies, and/or service companies will require a fire station location study. The recent changes in annexation law make it unlikely that Harriman will annex any additional land for quite some time. As an alternative to building an additional fire station, Harriman could use an automatic aid agreement to provide service to areas that are further than 1½-miles from a fire station. For any city, the number of, and placement of, fire stations is a local policy decision.

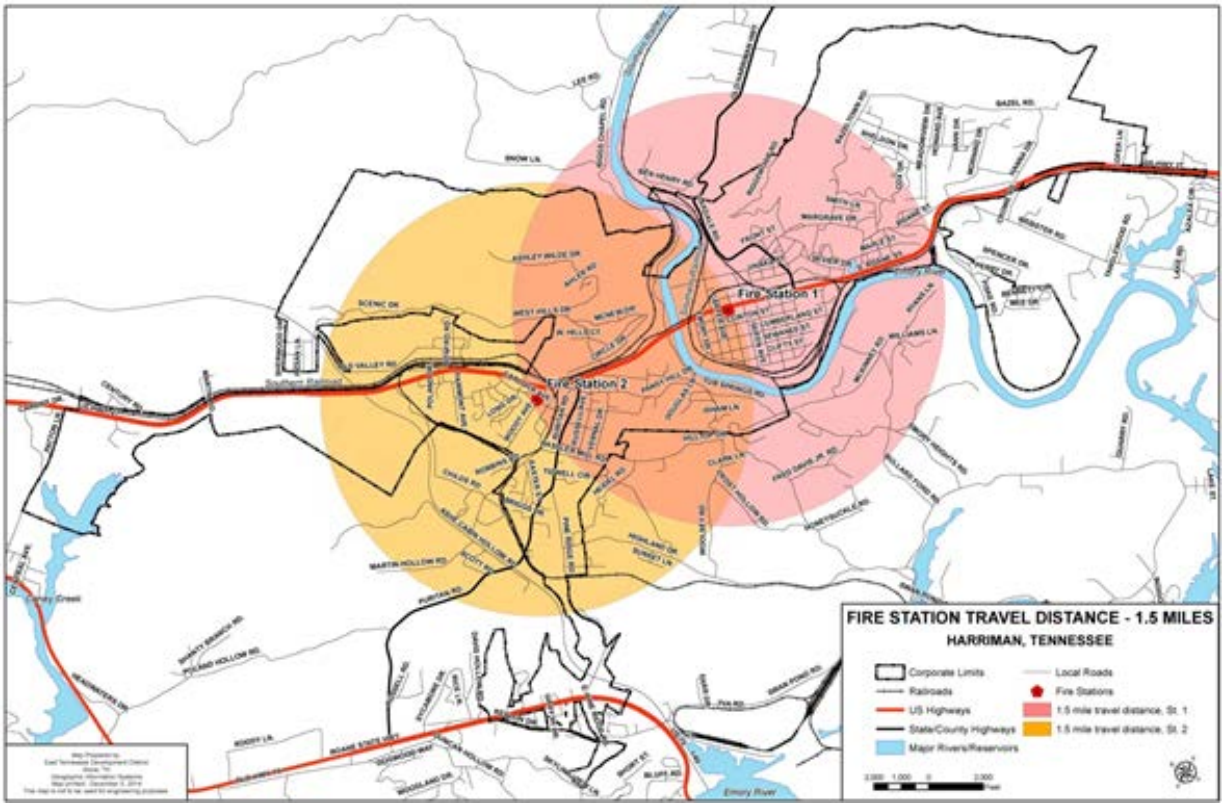


Figure 4 – City Limits and 1½ Mile Response Area for Fire Stations

When planning for adequate fire protection, city leaders must consider the phenomenon known as flashover. As a fire grows in size, it gives off temperatures that heat nearby objects. At some point on the time-temperature curve, all of the objects in the fire room reach their ignition temperature and ignite. The entire room bursts into flames, and the temperature rises to a point where no person can survive, including firefighters: this is flashover. The NFPA Fire Protection Handbook states: "During flashover, however, the temperature rises very sharply to such a level that survival of persons still in the room at that stage becomes unlikely. Thus the time interval between the start of the fire and the occurrence of flashover is a major factor in the time that is available for safe evacuation of the fire area." The development of fire conditions to reach the point of flashover is a function of temperature rise over time. A sufficient number of fire stations strategically located to provide quick response times might reduce the incidence of flashover, thus saving lives and property. As shown in the graph in Figure 6, flashover can occur within 9 to 11 minutes of the start of a fire. Locating fire stations to provide a total response time of six to seven minutes is advantageous, as firefighters need time after arrival to setup, lay fire hose, and gain access to the seat of the fire before they can actually begin to search for trapped occupants or extinguish the fire. Reliance on automatic aid or mutual aid response, with a response time greater than nine minutes, is inadequate except as a second alarm or backup response.

The average response time in Harriman is five minutes, forty-one seconds (5:41). The first unit arrives on the scene within six minutes, thirty-five seconds (6:35) on 85% to 90% of emergency responses.

Recommendation: Proceed to build, staff, equip, and open Station 3 as soon as possible.

Recommendation: Conduct a review and assessment of the physical condition of the existing fire stations that includes the need to update, repair, and/or replace systems and building components. Conduct a needs assessment to determine if the current fire stations contain enough square feet to meet the fire department's space needs. Use this information to develop a short and long-range facilities maintenance and replacement plan.

Recommendation: Conduct a fire station location study to assist Harriman is planning for future fire stations to serve the community.

Recommendation: Adopt a response time standard for the community and use this standard to plan for the placement of future fire stations and service levels. This study recommends a response time standard of 6:35 (six minutes, 35 seconds) for 90% of all responses, which is based upon recommendations found in NFPA Standard 1710, *Standard for the Organization and Deployment of Fire Suppression Operations for Career Fire Departments*. The 6:35 breaks down as follows: ring time – 15 seconds, call processing time – 60 seconds, firefighter turnout time – 80 seconds, travel time – 240 seconds.

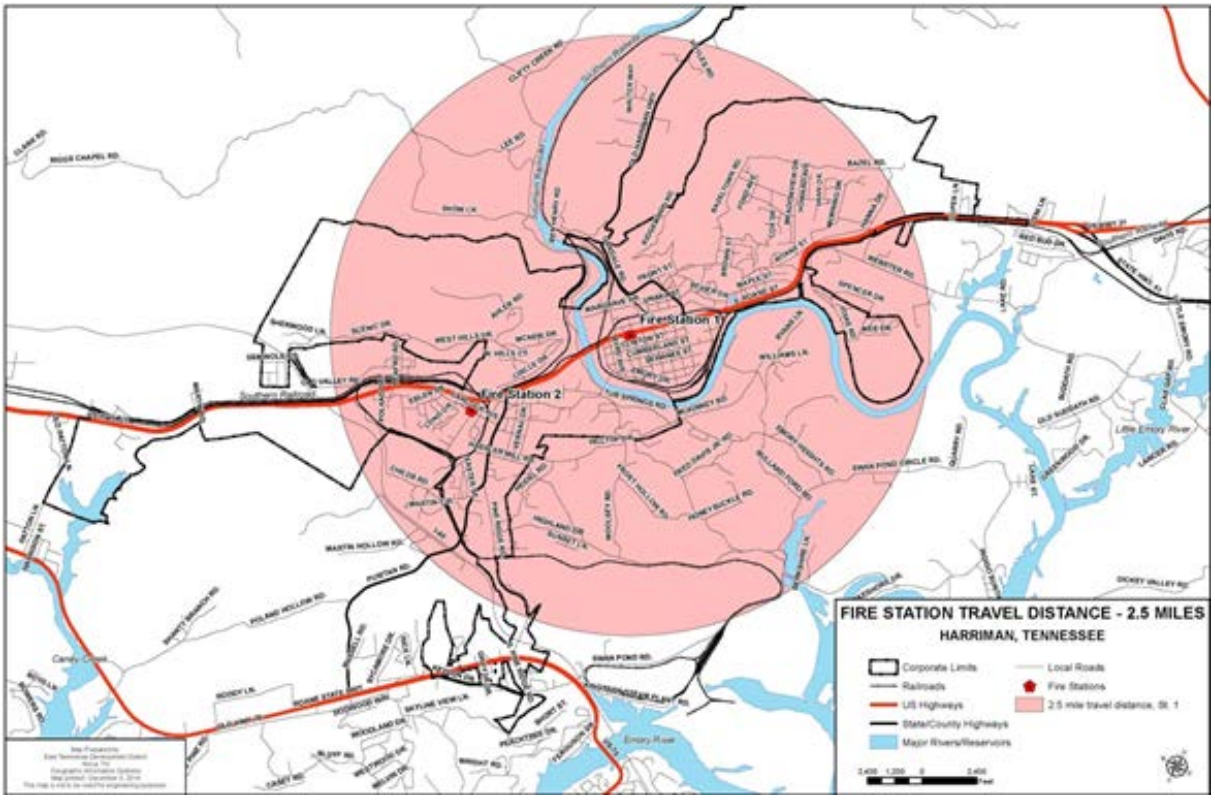


Figure 5 – City Limits and 2½ Mile Response Area for Ladder Truck

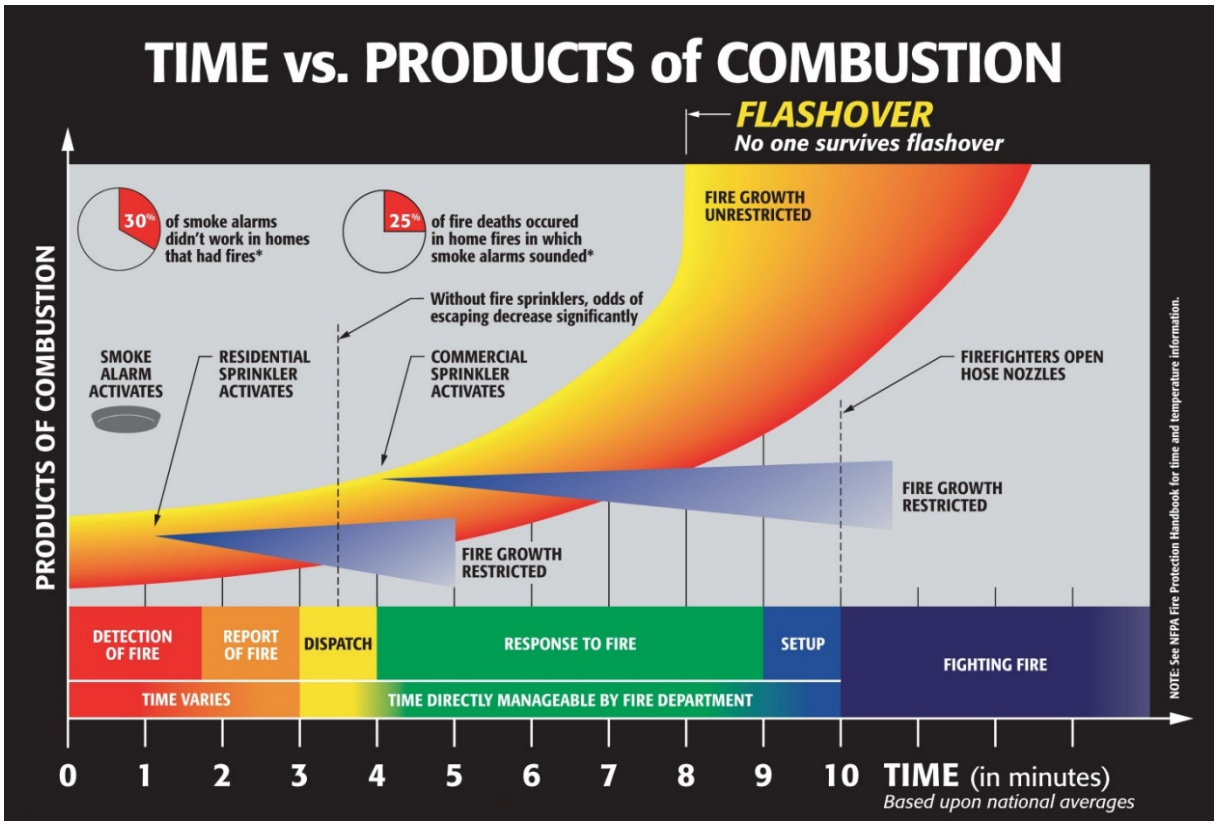


Figure 6 – Time versus Products of Combustion

Training

The department has a dedicated training officer who also works a shift. The position of training officer should be a staff position as the shift schedule limits the ability of the training officer to conduct classes across the department. The position of training officer should have a rank sufficient to reflect the authority and responsibility that comes with the position, which is typically at the level of captain or higher. ISO awarded 57.89% of the training credit available, which is not a low score when one considers that 35% of the credit for training requires a training center and Harriman does not have a training center. When the possible points for the training center are removed from the equation, Harriman received 89.06% of the credit that was available without a training center.

The department does not have a training facility and lacks a live fire burn building, smoke room, and drill tower. A training facility allows firefighters to learn and improve on the knowledge, skills, and abilities developed through hands-on practical training. For maximum ISO credit on drills, all personnel (including all officers) should receive 18 hours of structural firefighting related drill training annually at a training facility.

For maximum ISO credit on company training, all personnel (including all officers) should receive 16 hours of structural firefighting related training each month. Fire personnel need to train in other skills as well, such as EMS and extrication, so the amount of training hours needed to cover all subjects and skills is considerable.

For recruit training, the department requires that all new paid personnel have Fire Fighter I certification from the Tennessee Commission on Fire Fighting. For maximum credit, the fire department needs to have all new firefighters achieve Fire Fighter II certification from the Tennessee Commission within their first 12 months of employment.

The department conducts officer training classes and sends officers to the fire academy, but the department lacks a formal fire officer training plan or program. It is a common misconception that many years of service and good skill as a firefighter makes a person a good fire officer. This is not always the case, as good firefighting ability is not the same as good management and leadership ability. The department needs a workforce development plan to provide good firefighters the opportunity to acquire the knowledge, skills, and abilities needed to be good fire officers. For maximum ISO credit, the department needs to establish a formal officer training program and require all officers to complete at least twelve hours of classes each year that cover qualifications and skills found in NFPA 1021, *Standard for Fire Officer Professional Qualifications*. Officers should achieve state certification as fire officers (Fire Officer I through Fire Officer IV) at a level that is appropriate to their position.

The department has a formal training program for new driver/engineers meeting the requirements of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*. New driver/engineers complete a minimum of 80 hours of formal

classroom and practical training. Current driver/engineers complete a minimum of 12 hours of training that meets the requirements of NFPA 1002 annually.

The fire department has a good training library and training props, and the fire department's budget should include adequate funds to keep the library current, maintain the training props, and send personnel to outside training classes and college level courses related to fire administration and fire operations.

The department has a pre-fire planning inspection program, conducts pre-fire planning inspections semi-annually, and maintains complete records on all training and pre-fire planning inspections for maximum credit under the ISO grading schedule.

Recommendation: Provide 18 hours of structural firefighting drill training per firefighter and fire officer per year. The training must occur at a training facility.

Recommendation: Continue to provide at least 16 hours of company training in structure fire related subjects per month (192 hours per year) for each firefighter and officer.

Recommendation: Continue to provide at least 240 hours of recruit firefighter training for each new recruit, either in-house or through an outside agency such as the Tennessee Fire and Codes Academy.

Recommendation: Provide 12 hours of leadership, management, supervisory, or incident management training per officer annually that complies with NFPA 1021, *Standard for Fire Officer Professional Qualifications*.

Recommendation: All current and new officers should achieve state certification from the state firefighting commission as fire officers (Fire Officer I through Fire Officer IV) at a level that is appropriate to their position.

Recommendation: Continue to provide a formal training program for new driver/engineers and existing driver/engineers meeting the requirements of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*.

Recommendation: As part of the strategic planning process, evaluate the cost and benefits of establishing a training facility with a training tower, burn building, and drill field.

Recommendation: Provide college-level supervisory and management training for the fire chief and command staff officers. Encourage and support command staff officers to apply for and take National Fire Academy courses.

Technical Services and Safety

The fire department has a lot of specialized equipment, such as self-contained breathing apparatus (SCBA), rescue equipment, thermal imaging cameras, radios, and an air compressor and cascade systems. Fire engines and ladder trucks are complex and require technical expertise to maintain and repair. The fire department does some of this work in-house (i.e. oil changes at the city shop) and uses vendors for technical work on SCBA and major repairs to apparatus. The department also does some of the station maintenance. The fire chief is a certified safety officer through the Tennessee Commission on Fire Fighting, however, when the chief serves as the incident commander on an emergency scene he cannot serve as the safety officer.

The department has a breathing air compressor, used to fill the SCBA cylinders used by the firefighters when fighting a fire, which meets current National Fire Protection Standards for breathing air compressors.

The fire department provides vehicle extrication services, and the department has two sets of extrication equipment. The oldest set is ten years old and this set does not have some of the tool attachments needed to make the tool functional in all rescue situations. The newest tool is five years old and needs repair work to make the tool functional. However, the manufacturer of this tool is out of business, and the fire department cannot find a company to repair and recertify the tool. Newer cars use hardened metals and special alloys to provide high strength for passenger safety at less weight. This new vehicle technology requires vehicle extrication tools with higher cutting and spreading pressures in order to move, and remove, car parts to reach trapped occupants. The fire department should research and purchase a set of vehicle extrication equipment that is capable of cutting the high strength materials found in newer vehicles.

The department should explore the option of creating a staff position that would be responsible for the majority of the maintenance and repair of the department's technical equipment and radios, and would provide technical expertise to the shop personnel for the maintenance of fire apparatus. The position could also serve as the department's safety officer. The safety officer position would be responsible for TOSHA compliance, would teach specialized safety classes, and the person would respond to fires to assist the incident commander with fire ground safety and accountability.

Recommendation: Research and purchase a set of vehicle extrication equipment that is capable of cutting the high strength materials found in newer vehicles.

Recommendation: Explore the need for a technical services and safety officer to address the department's needs in maintaining specialized fire equipment and in complying with TOSHA and other safety regulations.

Fire Prevention

The easiest fire to fight is the one that never happens. ISO lists pre-fire planning credit under training, but it is really fire prevention through code enforcement, the elimination of fire hazards, and the maintenance of fire protection features. The department completes annual pre-fire planning inspections on all commercial, industrial, and institutional properties, and every property has a pre-fire plan. ISO awarded the fire department 100% credit for pre-fire planning inspections.

The fire department enforces the fire code in Harriman and conducts fire code enforcement inspections on existing buildings. The number of individual occupancies is increasing, and there are an estimated 275 in Harriman now. The fire department completed pre-fire planning inspections on 100% of these occupancies in 2014.
The fire department provides public fire education programs, and the department is at many events, especially events for children. The department received 91.25% credit from ISO for its public safety education efforts, which is an excellent score.

The department investigates all fires to determine cause and conducts arson investigations. The fire department is able to determine the cause of the fire on 75% of all fires, and ISO awarded 100% credit for the department's fire investigation program.

The department should continue to conduct building familiarization and pre-incident planning tours of all commercial, industrial, institutional, and other similar building at least annually. Planning tours and pre-plans should meet the general criteria of NFPA 1620, *Standard for Pre-Incident Planning*. The department should continue to keep accurate records of the inspections (paper or electronic formats are acceptable) that include through notes, floor plans, and other pertinent information. All pre-plans must be available to the responding incident commander.

The fire department should be involved in all future community planning efforts relative to future annexation plans, expansion of existing buildings, and the review of development plans for new commercial and industrial construction.

Recommendation: Continue annual inspections of all commercial, industrial, and institutional occupancies in the city, create/update the pre-fire plan, and have current pre-plans available to the incident commander on the scene.

Recommendation: Conduct annual fire code compliance inspections on all commercial occupancies.

EMS First Responder Program

The fire department values its role as the initial provider of emergency medical care (EMS) for life threatening illnesses and injuries. The fire department does not respond on every EMS call, which helps reduce annual call volume and keeps emergency resources available for true emergencies. The fire department typically arrives at least

three minutes before the ambulance and carries automatic external defibrillators (AED) and other equipment to initiate lifesaving care. The prompt provision of such care contributes to a positive outcome for the patient. Harriman provides care at the Emergency Medical Responder (EMR) level, which is basic life support. Fire department personnel work under the protocols of the Roane County EMS service.

Personnel must be trained and certified or licensed by the state to provide emergency care. Personnel must complete a minimum number of continuing education training hours every two years to maintain their certification or license, and the number of hours required increases with the skill level and capability of the certification or license. The fire department must have a quality assurance (Q/A) program in place to monitor the care provided and provide remedial training when needed. The fire chief handles the Q /A duties, and the other duties associated with the EMS program, such as required paperwork and maintaining supplies.

EMS is a significant value-added emergency service the fire service provides to the community and accounts for a large portion of the effort expended to serve the residents and visitors to the community. Statewide in Tennessee in 2014, for example, fire departments reported that EMS responses accounted for 60.19% of all responses made that year. The percentage of EMS calls the fire department responds to in Harriman is higher, as the department's EMS calls represented 71.25% of the call volume for 2014. For the first six months of 2015, EMS calls represent 76.24% of the department's call volume, and the number of EMS calls is likely to increase.

The fire department should consider expanding the level of emergency medical care it provides from emergency medical responder, which is very basic care, to advanced, which would result in an increased level of service to the community and an improvement in morbidity and mortality rates for life threatening illnesses and traumatic injuries.

The fire department should explore different delivery methods, such as using a dedicated EMS response vehicle to respond to medical calls. The department must be mindful in considering alternate delivery methods while not reducing the ability to respond to fires and other alarms.

Recommendation: Continue to provide first responder service on prioritized emergency medical calls.

Recommendation: Expand the first responder program to provide both basic and advanced life support services.

Recommendation: Explore options for EMS service delivery methods.

All Hazards Response Capability

The fire department provides other emergency and essential services for the community. These emergency response services include vehicle extrication and hazardous materials incident response. These technical rescue services add value to the fire department's mission and contribute to a safer community. The fire department should have and maintain the proper tools and equipment for the particular response discipline and have the ability to train locally and/or off-site as needed to maintain the knowledge, skills, and abilities required for successful technical rescue operations.

Recommendation: Continue to provide technical rescues services based on the risks found in the community and maintain the training and equipment necessary to provide these services.

Dispatch and Radio Communications

Roane County Central Dispatch provides dispatch and communication services. The comments on dispatching and communications were positive, but it was noted that the dispatch office is very busy. The department does not have information on call processing times in the 911 center.

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2013 edition, section 7.4 sets performance marks for dispatching. The phone must be answered within 15 seconds (that is less than 3 rings) 95% of the time and, with the exception of certain types of calls defined in section 7.4.2.2 that require gathering additional information, the call must be processed (this includes all conversation with the caller, all fact/information gathering, and determining what resources need to be sent) within 60 seconds 80% of the time, and within 106 seconds 95% of the time (see Appendix F). This is a tight performance standard and cannot be met without sufficient resources (personnel, technology, training, etc.) and awareness in the 911 center of this performance standard. All of the expensive fire equipment and well-trained and equipped firefighters are worthless unless they are dispatched promptly.

The dispatch office has a minimum of two dispatchers on duty, and sometimes has three on duty. The dispatchers have completed fire dispatch training. It would be beneficial to include practical training for the dispatchers, where the dispatcher spends a minimum of four hours, and preferably an eight-hour shift, riding out at a fire station to observe firsthand what it is like for the firefighters to receive an alarm, respond to the call in a fire engine with the siren and engine noise, and function on the scene of the emergency. The fire chief should maintain an excellent working partnership with the 911 director to help the city benefit from quick total response times from the point the person in need of help calls 911 until the fire truck arrives on the scene.

For consistency, all dispatches should be from a common script, where the information is transmitted in the same order on every call. This makes it easier for fire personnel to

receive and understand the dispatch information. For example, “Engines 1 and 2, 123 Main Street, smoke in the building, the cross street is Elm, caller states everyone is out of the building.” In this example, the units that will respond are given first, followed by the address, the nature of the call, the cross street, and any other relevant information. The department should tailor the exact order of the information to meet local needs. Consistent use of a dispatch script will reduce errors and improve turnout times.

The department has interoperability capability with area fire departments to facilitate an effective emergency response in a disaster or large-scale emergency.

The fire department has a standard operating policy for communications that the Roane County Central Dispatch uses for fire dispatch. The fire department should review the policies at least annually and update the policies as required.

To insure consistent quality of dispatch and to monitor performance and compliance with national standards, Harriman needs a quality assurance (Q/A) program for dispatch. Under a Q/A program, the Q/A officer selects a number of random calls and reviews them for compliance with dispatch protocols and call processing times. The Q/A officer reviews the results with dispatchers on a regular basis to improve the quality of the service.

Recommendation: The fire chief should maintain an excellent working partnership with the 911 director to help the city benefit from quick total response times from the point the person in need of help calls 911 until the fire truck arrives on the scene.

Recommendation: Provide dispatchers with formal fire department indoctrination and familiarization of fire department operations that includes allowing dispatchers to ride-out and observe fire department operations for at least four hours every quarter.

Recommendation: Establish a quality assurance review procedure to review random dispatches for ways to improve dispatch services, and monitor compliance with the response time standard.

Recommendation: Use a dispatch script tailored to local needs on every dispatch event.

Water Supply and Fire Hydrants

The Harriman Utility Board provides water for Harriman, and the fire department has a good working relationship with the utility. The assistant fire chief serves as the department’s water supply officer.

The water supply is adequate, with very few hydrants flowing less than 500 gpm, but there are deficient fire flows. During the recent ISO evaluation, 14 of the 15 flow tests

were deficient (see Appendix I). It is not possible to tell from the information ISO provided whether the fire flows were deficient because of the supply works, main size and capacity, or a need for additional fire hydrants. Harriman should contact ISO and request details on the limiting factors for the deficient flow tests. Once the cause of the deficiencies is identified, Harriman can consider the cost-benefit of addressing the deficient fire flows.

Fire hydrant maintenance is good, and the color-coding of fire hydrants for flow rates has improved. The fire department checks the 249 fire hydrants annually and each check includes a static pressure test and flushing the fire hydrant. Fire hydrants are well located and adequate in number for the given occupancy at risk. However, 55 of the fire hydrants do not meet the ISO standard for a full-credit fire hydrant. For full credit, ISO requires that a fire hydrant meet American Water Works Association (AWWA) Standard C503. Standard C503 hydrants have a 6-inch or larger branch connection and a 4-inch or larger pumper connection.

Harriman inspects and flow tests the entire water system at least once every five years.

Recommendation: Contact ISO and request the limiting factors details for the deficient flow tests.

Recommendation: Establish that the water department will purchase and install hydrants that meet the AWWA C503 standard.

Summary

The purpose of this comprehensive management review is to provide a summary report of key issues affecting the provision of fire services in Harriman. Nothing in this report is a negative reflection of the Harriman Fire Department. The firefighters and staff are dedicated and provide good service to the community. The report is an outside view of the department at a single point in time and includes recommendations for improvement.

The recent achievement of an ISO Public Protection Classification of Class 4 is very good and speaks to the work the city and fire department have done so far. Additional effort is required to improve the Class 4 rating, and immediate major needs include an additional fire station, additional personnel, and a training center. Other needs include the development of a strategic plan, development of an apparatus replacement program, and an evaluation of compensation and benefits.

It is our sincere hope that the city and fire department leaders will use the report as a guide for improving the delivery of fire-related emergency services in the community. There is no doubt that the members of the fire department have the capability to fix any problems noted and implement most of the recommendations made within existing budgetary restrictions. Major issues should be addressed through short and long range planning, and issues requiring significant expenditures should include a proposed

budget that identifies funding sources. The city and fire department leadership should determine a reasonable time line and plan for prioritizing and adopting the recommendations proposed. MTAS would like to thank the City of Harriman, its city leaders and staff, and the members of the Harriman Fire Department for their professionalism, cooperation, and assistance in this study.

The summary of recommendations is a table listing each recommendation found in this report. There is a column for Harriman to identify the key person responsible for overseeing the activities required to implement the recommendation, and a column to record the date the recommendation is implemented or completed. MTAS recommends that Harriman officials in all departments involved in implementing specific recommendations work together to identify key personnel needed and to develop a timeline for implementation.

Table of Recommendations

Recommendation	Responsibility	Completed
1. Recommendation: Schedule on-call personnel to ride out as a method to improve on-duty staffing for responding to incidents and to increase the ISO credit for company personnel.		
2. Recommendation: Use the ISO Public Protection Classification Summary Report as one of the resources needed to create a strategic plan for providing and improving community fire and emergency services protection. The strategic plan should include the mission, vision, core values, strategic focus areas, strategic goals, and action plans.		
3. Recommendation: Ensure that all fire officers receive 12 hours of officer training annually in accordance with the general criteria of NFPA 1021, *Standard for Fire Officer Professional Qualifications*; NFPA 1521, *Standard for Fire Department Safety Officer*; and/or NFPA 1561, *Standard on Emergency Services Incident Management System*.		
4. Recommendation: Pursue fire officer certification for all officers at a level commensurate with the officer's role and responsibility.		
5. Recommendation: Improve the recruit training program by requiring that all new firefighters have or obtain Fire Fighter I and Fire Fighter II certification in accordance with the general criteria of NFPA 1001, *Standard for Fire Fighter Professional Qualifications* within the first 12 months of employment.		
6. Recommendation: Develop a plan to provide a fire service training facility that meets the general criteria of NFPA 1402, *Guide to Building Fire Service Training Centers*.		

Recommendation	Responsibility	Completed
7. Recommendation: The fire chief and the command staff should locate and enroll in a formal leadership development program or college level course for a review of management and leadership techniques.		
8. Recommendation: For firefighter safety, provide every firefighter on the scene of an emergency incident with a two-way portable radio.		
9. Recommendation: The technology associated with thermal imaging cameras has improved significantly in the last 10 years, and the fire department should consider replacing the two existing cameras with newer models and purchasing a camera for Ladder 1.		
10. Recommendation: Use the ISO Public Protection Classification Summary Report, a community risk assessment, nationally accepted guidelines, and other resources to create a strategic plan for the fire department that contains SMART (Specific, Measureable, Accountable, Results-oriented, and Time-bound) objectives and both output and outcome based performance measurements. Publish the strategic plan for all stakeholders.		
11. Recommendation: Perform a job analysis on all positions and then create, review, update, and standardize all current job descriptions accordingly.		
12. Recommendation: Develop a workforce development or succession plan to identify future leaders, and to improve the knowledge, skills, and abilities of employees to help make them better employees.		

Recommendation	Responsibility	Completed
13. Recommendation: The fire chief should hold staff meetings with the key staff and shift captains to discuss department issues, keep staff informed on city issues as appropriate, gauge department performance against benchmarks, monitor progress on the strategic plan, discuss budget administration, and improve intradepartmental communication. The chief should hold the meetings regularly and schedule them in advance on a weekly, bi-weekly, or monthly basis to meet the needs of the department.		
14. Recommendation: The fire department should develop outcome based performance measurements to track and monitor service levels and should provide regular performance reports to all stakeholders.		
15. Recommendation: Revised Section 7-201 of the Code of Ordinances to make it clear which edition of the Life Safety Code is and to address what happens should a code requirement conflict occur between the two codes.		
16. Recommendation: Revised Section 7-301 of the Code of Ordinances to address the current organizational structure, the appointment of the fire chief by the city manager, and the fact that the board of fire department commissioners no longer exists.		
17. Recommendation: Adopt an edition of the NFPA Life Safety Code that complements the 2012 edition of the International Fire Code.		

Recommendation	Responsibility	Completed
18. **Recommendation: Adopt a plan to provide an effective firefighting response of sixteen personnel to a structure fire within 560 seconds (9.33 minutes) turnout and travel time on 90% of all incidents. Turnout time is the time from when dispatch notifies the fire department of the response until the apparatus leaves the station. Travel time is the time elapsed from when the fire apparatus leaves the fire station until it arrives on the scene of the emergency.**		
19. **Recommendation: Complete a community risk assessment and establish a standard of cover for each identified risk.**		
20. **Recommendation: Review current response assignments to ensure that Harriman dispatches a sufficient number of apparatus and personnel to each property at risk based on the standard of cover.**		
21. **Recommendation: Consider using automatic aid agreements to provide additional firefighters on structure fire responses.**		
22. **Recommendation: Prepare a staffing plan that includes estimated costs and options, such as part-time firefighters, for phasing in staffing to achieve a minimum staffing level proportionate with the community's risk.**		
23. **Recommendation: Complete the review and update of the standard operating guidelines manual to include policies that address adequately to meet local needs in the ten subject areas reviewed by ISO.**		
24. **Recommendation: Update the general orders manual to include a policy that addresses the annual review and updating, as needed, of structural firefighting related policies.**		

Recommendation	Responsibility	Completed
25. Recommendation: Appoint a committee of fire department members to review the general orders manual on an annual basis and make recommendations for updates as needed.		
26. Recommendation: Provide training and testing for competency to all fire personnel on the policies found in the general orders manual. Every member should be familiar with its content and copies should be available readily to all fire department personnel. Provide a copy of the SOG manual to all personnel and keep copies in the fire stations and in the human resources office and forward updated policies to fire department personnel and human resources to keep their copies current.		
27. Recommendation: Establish a workforce development and succession plan for the department. The fire chief should work closely with the training officer and human resources director to develop and offer internal and external training programs to improve the knowledge, skills, and abilities of personnel in all positions, and prepare them for advancement and greater responsibility.		
28. Recommendation: Establish a formal officer development and training program following the NFPA 1021 standard using as many sources for training as possible to provide the most opportunities possible. The program should be required for all officers, and available to firefighters who may aspire to be officers.		

Recommendation	Responsibility	Completed
29. **Recommendation: Establish as a job requirement that fire officers obtain a level of certification through the Commission matching their position. Company officers should achieve Fire Officer I certification, captains should achieve Fire Officer II or Fire Officer III certification, and chief and staff officers should achieve Fire Officer III or IV certification.**		
30. **Recommendation: Consider establishing a position of "driver" or "engineer" with the specific responsibility of driving and operating fire apparatus.**		
31. **Recommendation: Review the city's compensation plan annually, and consider a comprehensive career development program to serve as a guide for workforce development and justification for competitive compensation. MTAS can assist the city with this recommendation.**		
32. **Recommendation: Consider an incentive pay program that recognizes the additional knowledge, skills, and abilities of firefighters who obtain specialized certifications that are beneficial to the department's mission.**		
33. **Recommendation: Staff the aerial ladder truck with sufficient personnel to respond the truck on the initial alarm and to operate the truck effectively on all structure fires.**		
34. **Recommendation: Establish an apparatus replacement program to fund and schedule the transition and replacement of fire apparatus on the 15 year/25 year life cycle recommended by NFPA.**		
35. **Recommendation: Proceed to build, staff, equip, and open Station 3 as soon as possible.**		

Recommendation	Responsibility	Completed
36. Recommendation: Conduct a review and assessment of the physical condition of the existing fire stations that includes the need to update, repair, and/or replace systems and building components. Conduct a needs assessment to determine if the current fire stations contain enough square feet to meet the fire department's space needs. Use this information to develop a short and long-range facilities maintenance and replacement plan.		
37. Recommendation: Conduct a fire station location study to assist Harriman is planning for future fire stations to serve the community.		
38. Recommendation: Adopt a response time standard for the community and use this standard to plan for the placement of future fire stations and service levels. This study recommends a response time standard of 6:35 (six minutes, 35 seconds) for 90% of all responses, which is based upon recommendations found in NFPA Standard 1710, *Standard for the Organization and Deployment of Fire Suppression Operations for Career Fire Departments*. The 6:35 breaks down as follows: ring time – 15 seconds, call processing time – 60 seconds, firefighter turnout time – 80 seconds, travel time – 240 seconds.		
39. Recommendation: Provide 18 hours of structural firefighting drill training per firefighter and fire officer per year. The training must occur at a training facility.		
40. Recommendation: Continue to provide at least 16 hours of company training in structure fire related subjects per month (192 hours per year) for each firefighter and officer.		

Recommendation	Responsibility	Completed
41. Recommendation: Continue to provide at least 240 hours of recruit firefighter training for each new recruit, either in-house or through an outside agency such as the Tennessee Fire and Codes Academy.		
42. Recommendation: Provide 12 hours of leadership, management, supervisory, or incident management training per officer annually that complies with NFPA 1021, *Standard for Fire Officer Professional Qualifications*.		
43. Recommendation: All current and new officers should achieve state certification from the state firefighting commission as fire officers (Fire Officer I through Fire Officer IV) at a level that is appropriate to their position.		
44. Recommendation: Continue to provide a formal training program for new driver/engineers and existing driver/engineers meeting the requirements of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*.		
45. Recommendation: As part of the strategic planning process, evaluate the cost and benefits of establishing a training facility with a training tower, burn building, and drill field.		
46. Recommendation: Provide college-level supervisory and management training for the fire chief and command staff officers. Encourage and support command staff officers to apply for and take National Fire Academy courses.		
47. Recommendation: Research and purchase a set of vehicle extrication equipment that is capable of cutting the high strength materials found in newer vehicles.		

Recommendation	Responsibility	Completed
48. Recommendation: Explore the need for a technical services and safety officer to address the department's needs in maintaining specialized fire equipment and in complying with TOSHA and other safety regulations.		
49. Recommendation: Continue annual inspections of all commercial, industrial, and institutional occupancies in the city, create/update the pre-fire plan, and have current pre-plans available to the incident commander on the scene.		
50. Recommendation: Conduct annual fire code compliance inspections on all commercial occupancies.		
51. Recommendation: Continue to provide first responder service on prioritized emergency medical calls.		
52. Recommendation: Expand the first responder program to provide both basic and advanced life support services.		
53. Recommendation: Explore options for EMS service delivery methods.		
54. Recommendation: Continue to provide technical rescues services based on the risks found in the community and maintain the training and equipment necessary to provide these services.		
55. Recommendation: The fire chief should maintain an excellent working partnership with the 911 director to help the city benefit from quick total response times from the point the person in need of help calls 911 until the fire truck arrives on the scene.		
56. Recommendation: Provide dispatchers with formal fire department indoctrination and familiarization of fire department operations that includes allowing dispatchers to ride-out and observe fire department operations for at least four hours every quarter.		

Recommendation	Responsibility	Completed
57. Recommendation: Establish a quality assurance review procedure to review random dispatches for ways to improve dispatch services, and monitor compliance with the response time standard.		
58. Recommendation: Use a dispatch script tailored to local needs on every dispatch event.		
59. Recommendation: Contact ISO and request the limiting factors details for the deficient flow tests.		
60. Recommendation: Establish that the water department will purchase and install hydrants that meet the AWWA C503 standard.		

Harriman Fire Department Summary By Incident Type from TFIRS Records
Report Period: From 01/01/2014 through 12/31/2014

Calls By Incident Type		Frequency	Percent Of Total Calls	Mutual Aid None	Mutual Aid Given	Mutual Aid Received	Exposures	Total Incidents
FIRES								
	Structure Fires (110-118, 120-123)	17	1.27 %	12	5	5	0	22
	Vehicle Fires (130-138)	11	0.82 %	11	0	0	0	11
	Other Fires (100, 140-173)	42	3.14 %	42	0	0	0	42
	Total Fires	70	5.23 %	65	5	5	0	75
Pressure Ruptures, Explosion, Overheat (200-251)		0	0.00 %	0	0	0	0	0
RESCUE CALLS								
	Emergency Medical Treatment (300-323)	954	71.25 %	954	0	0	0	954
	All Others (331-381)	11	0.82 %	11	0	0	0	11
	Total Rescue Calls	965	72.07 %	965	0	0	0	965
Hazardous Condition Calls (400-482)		41	3.06 %	40	0	1	0	41
Service Calls (500-571)		134	10.01 %	133	1	1	0	135
Good Intent Calls (600-671)		56	4.18 %	56	2	0	0	58
Severe Weather or Natural Disaster Calls (800-815)		2	0.15 %	2	0	0	0	2
Special Incident Calls (900-911)		3	0.22 %	3	1	0	0	4
Unknown Incident Type (UUU)		0	0.00 %	0	0	0	0	0
FALSE CALLS								
	Malicious Calls (710-715, 751)	2	0.15 %	2	0	0	0	2
	Other False Calls (700, 721-746)	66	4.93 %	66	0	0	0	66
	Total False Calls	68	5.08 %	68	0	0	0	68
TOTAL CALLS		**1,339**	**100.00 %**	**1,332**	**9**	**7**	**0**	**1,348**
	Total Incidents With Exposure Fires		0		**Total Fire Dollar Loss**			$ 568,714.00
	Total Exposure Fires		0		**Total Dollar Loss**			$ 568,714.00

Appendix B – Estimated Residential Community-Wide Insurance Premium Savings

Number of housing units: **2,404**

Value Range of Housing	Distribution	Number of Units 37748	Total Units	Middle Price	Est. Value
Less than $20,000	6.24%	150	150	$20,000	$3,000,000
$20,000-$39,999	14.10%	339	339	$30,000	$10,170,000
$40,000-$59,999	15.22%	366	366	$50,000	$18,300,000
$60,000-$79,999	15.22%	366	366	$70,000	$25,620,000
$80,000-$99,999	18.22%	438	438	$90,000	$39,420,000
$100,000-$124,999	12.69%	305	305	$112,500	$34,312,500
$125,000-$149,999	3.08%	74	74	$137,500	$10,175,000
$150,000-$174,999	8.36%	201	201	$162,500	$32,662,500
$175,000-$199,999	3.45%	83	83	$187,500	$15,562,500
$200,000-$249,999	2.66%	64	64	$225,000	$14,400,000
$250,000-$299,999	0.29%	7	7	$275,000	$1,925,000
$300,000-$399,999	0.37%	9	9	$325,000	$2,925,000
$400,000-$499,999	0.04%	1	1	$425,000	$425,000
$500,000-$749,999	0.00%	0	0	$625,000	$0
$750,000-$999,999	0.00%	0	0	$875,000	$0
$1,000,000+	0.04%	1	1	$1,000,000	$1,000,000
TOTAL	100.00%	2,404	2,404		$209,897,500

Housing data source:

http://www.clrsearch.com/Harriman-Demographics/TN/37748/Home-Values-and-Rental-Rates

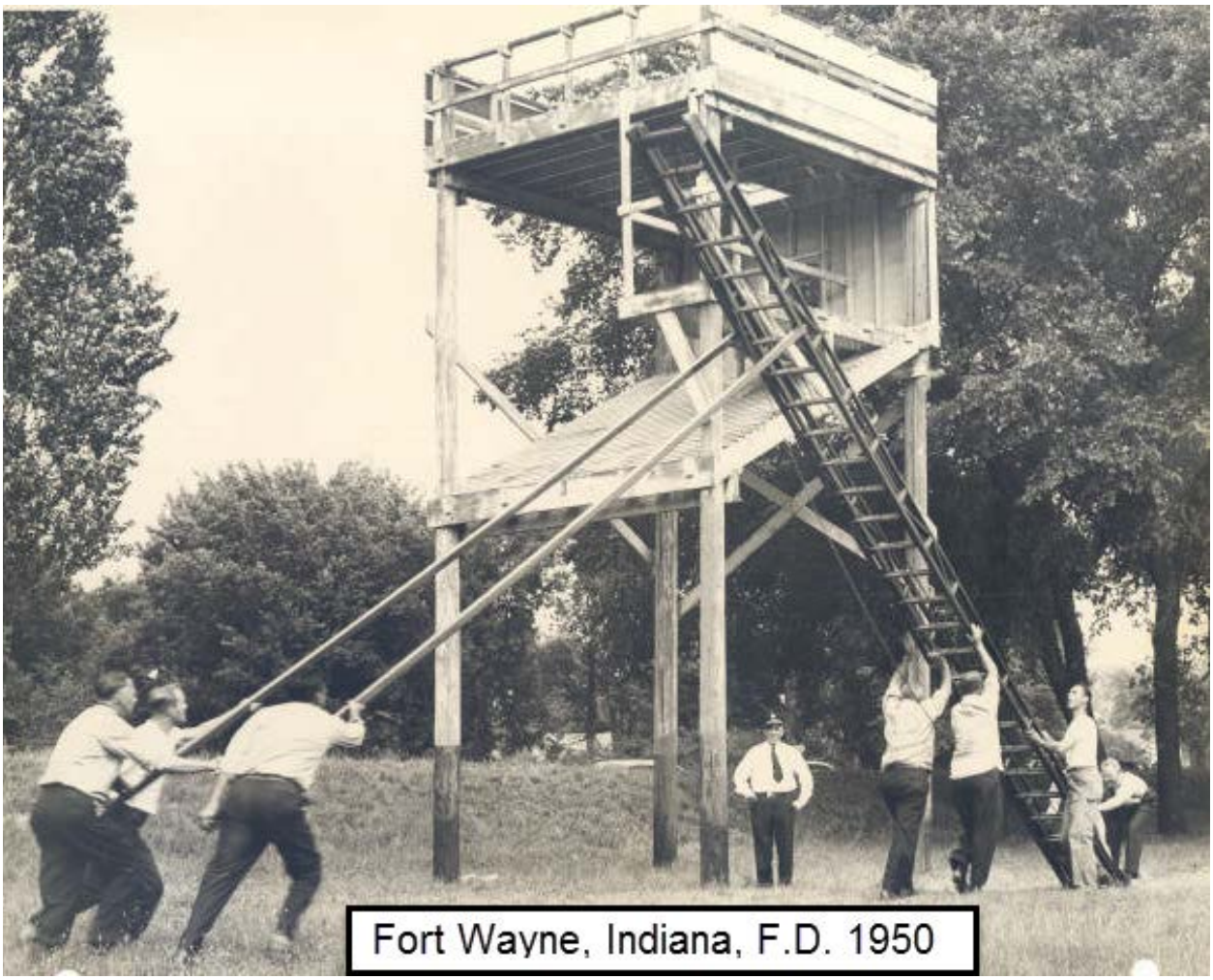
NOTE: This covers 1 & 2-family residential only. Commercial and industrial property owners will also enjoy reduced insurance premiums.

Aggregate premiums	$734,641.25
Enter % savings	3.00%
Est annual savings	**$22,039.24**
Est 5 year savings	$110,196.19
Enter % savings	5.00%
Est annual savings	**$36,732.06**
Est 5 year savings	$183,660.31

Appendix C – Examples of Wooden Drill Towers

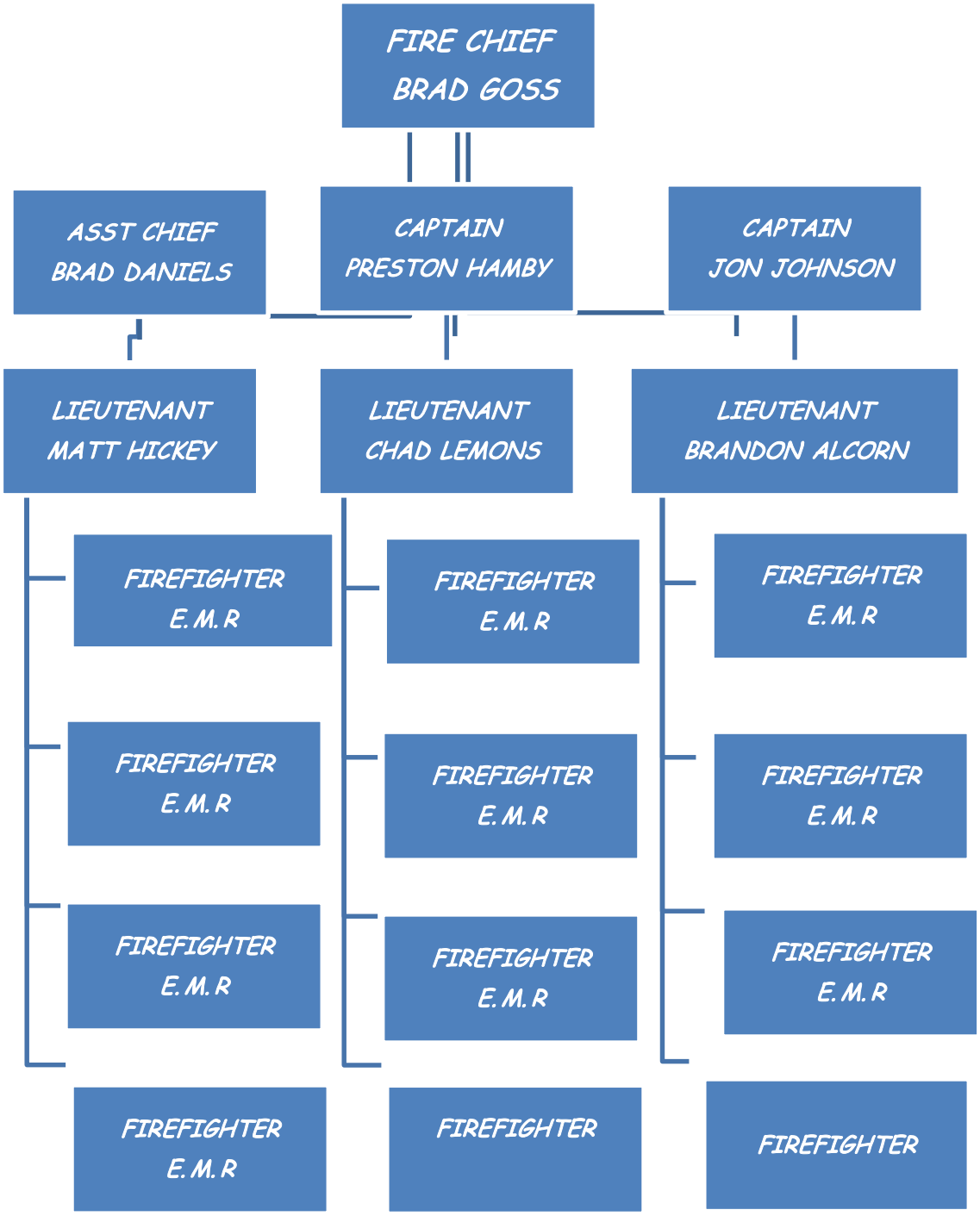
Three story drill tower under construction. Built-in stairs allow hose advancement drills and easy access to the upper floors.

The second floor of wooden drill tower showing the window opening for ladder placement evolutions and the floored work area of adequate size for firefighters to stand and work.



Example of a 3-story wooden drill tower in use. Notice window opening on the rear of the second floor and incorporation of pitched roof simulator.

Appendix D – Harriman Fire Department Organizational Chart



Appendix E – Estimated Travel Times and Total Response Time in Minutes

Distance To Travel in Miles	Estimated Travel Time	Ring Time	Call Processing Time	Fire Dept. Turnout Time	Total Response Time
0.25	1.08	0.25	1.00	1.33	3.66
0.38	1.30	0.25	1.00	1.33	3.88
0.50	1.50	0.25	1.00	1.33	4.08
0.75	1.93	0.25	1.00	1.33	4.51
1.00	2.35	0.25	1.00	1.33	4.93
1.25	2.78	0.25	1.00	1.33	5.36
1.50	3.20	0.25	1.00	1.33	5.78
1.75	3.63	0.25	1.00	1.33	6.21
2.00	4.05	0.25	1.00	1.33	6.63
2.25	4.48	0.25	1.00	1.33	7.06
2.50	4.90	0.25	1.00	1.33	7.48
2.75	5.33	0.25	1.00	1.33	7.91
3.00	5.75	0.25	1.00	1.33	8.33
3.25	6.18	0.25	1.00	1.33	8.76
3.50	6.60	0.25	1.00	1.33	9.18
3.75	7.03	0.25	1.00	1.33	9.61
4.00	7.45	0.25	1.00	1.33	10.03
4.25	7.88	0.25	1.00	1.33	10.46
4.50	8.30	0.25	1.00	1.33	10.88
4.75	8.73	0.25	1.00	1.33	11.31
5.00	9.15	0.25	1.00	1.33	11.73

Notes:

- Travel time was calculated using the Rand formula of T = 1.7(D) to estimate travel time, where T is time and D is the distance to be covered expressed in miles.
- The 15-second ring time, 60-second call processing time, and 80-second turnout time are based on recommendations found in NFPA Standard 1710.
- Minutes expressed as decimal minutes: to compute seconds, multiply the decimal number by 60. For example, 3.66 decimal minutes equals 3:40 (three minutes, forty seconds).

Appendix F – NFPA Dispatch Performance Standards

The following information is quoted from NFPA 1221 *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2013 Edition.

7.4 Operating Procedures.

7.4.1* Ninety-five percent of alarms received on emergency lines shall be answered within 15 seconds, and 99 percent of alarms shall be answered within 40 seconds. *(For documentation requirements, see 12.5.2.)*

7.4.1.1 Compliance with 7.4.1 shall be evaluated monthly using data from the previous month.

7.4.2* With the exception of the call types identified in 7.4.2.2, 80 percent of emergency alarm processing shall be completed within 60 seconds, and 95 percent of alarm processing shall be completed within 106 seconds. *(For documentation requirements, see 12.5.2.)*

7.4.2.1 Compliance with 7.4.2 shall be evaluated monthly using data from the previous month.

7.4.2.2 Emergency alarm processing for the following call types shall be completed within 90 seconds 90 percent of the time and within 120 seconds 99 percent of the time:

(1) Calls requiring emergency medical dispatch questioning and pre-arrival medical instructions
(2) Calls requiring language translation
(3) Calls requiring the use of a TTY/TDD device or audio/video relay services
(4) Calls of criminal activity that require information vital to emergency responder safety prior to dispatching units
(5) Hazardous material incidents
(6) Technical rescue

7.4.3* For law enforcement purposes, the AHJ shall determine time frames allowed for completion of dispatch.

7.4.4* Where alarms are transferred from the primary public safety answering point (PSAP) to a secondary answering point, the transfer procedure shall not exceed 30 seconds for 95 percent of all alarms processed. *(For documentation requirements, see 12.5.2.)*

Note: NFPA offers free read-only access to their codes at: http://www.nfpa.org/codes-and-standards/free-access.

Appendix G – Harriman Fire Department Mission Statement, Values, and Goals

HARRIMAN CITY FIRE DEPARTMENT
MISSION STATEMENT
*FOCUS *VALUES *GOALS

"FIREFIGHTER SAFETY # 1 PRIORITY"
EVERYONE GOES HOME

OUR MISSION
It is the mission of HARRIMAN FIRE DEPARTMENT to preserve life and property, promote safety and foster economic growth through leadership, management and actions, as well an all risk life safety response provider.

OUR FOCUS
The Department will focus its effort on responding rapidly to emergencies, providing appropriate intervention and community education.

OUR VALUES
We owe the residents the highest quality of service possible through responsiveness, integrity & professionalism.
We owe the Fire Department our full commitment & dedication. We should always promote teamwork and organizational effectiveness.
We owe to each other a working environment characterized by trust and respect for the individual and open communication to each one.
We owe to ourselves personal & professional growth and always striving to give 110% every day.

OUR GOALS
#1 Develop an organization to effectively administer & manage the resources of the Department

#2 Develop a system for minimizing the impact of disaster and other emergencies on life & property

#3 Provide an effective FIRE & EMERGENCY SERVICE SYSTEM

#4 Provide an effective Fire Prevention & Public Safety System

Appendix H – Apparatus and Vehicle Roster

Equipment Type and Description	Year	Make	Model	Condition	Station/ Unit	Replacement Cost
Pumper 750 g tank/1,500 gpm	2010	Ferrara	Intruder	Great	Sta. 1/Eng 1	$550,000
Pumper 1,000 g tank/1,000 gpm	1999	Ferrara	Intruder	Very Good	Sta. 2/Eng 4	$550,000
77' quint/aerial 300 g tank/1,500 gpm	2005	Ferrara	Intruder 2	Very Good	Sta. 1/Lad 1	$850,000
Pumper 1,000 g tank/1,000 gpm	1996	Ferrara	Intruder	Fair	Sta. 2/Eng	$550,000
4x4 Pick-up	2006	Ford	F150	Fair-Good	Sta. 1/R 7	$26,000
Fire Chief/Command vehicle	2000	Dodge	Durango	Fair	Sta. 1/101	$8,500
Asst. Chief's vehicle	1998	Ford	CV	OK	Sta. 1/102	$5,500
4x4 Pick-up	1996	Ford	F150	Very poor	Sta. 1/U 6	$26,000
Special Ops / Rehab (old EMS unit)	2002	Chev	3500	Good	Sta. 2	$75,000
Sportsman 500 ATV	2012	Polaris	Ranger	Great	Sta. 1	$9,500

The total replacement cost for all apparatus and vehicles on this roster is $2,650,500.

Appendix I – Hydrant Flow Data Summary

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Harriman, TN

County Tennessee (Roane), State: TENNESSEE Witnessed by: Harriman Fire Department Date: Mar 18, 2014

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM Q=(29.83(C(d2)p^0.5)) INDIVIDUAL HYDRANTS		TOTAL	PRESSURE PSI STATIC	PRESSURE PSI RESID.	FLOW - AT 20 PSI NEEDED **	FLOW - AT 20 PSI AVAIL.
1.0		North Roane @ Morgan	Harriman Utility Board, Main	1,550	0	1,550	110	55	4,500	2,000
10.0		North Roane @ Cresent St	Harriman Utility Board, Main	1,300	0	1,300	120	60	1,750	1,700
11.0		Childs Rd @ South Roane St	Harriman Utility Board, Main	990	0	990	80	35	1,250	1,200
12		Kroger @ Front of Store	Roane Central Utility District, RCUD Main Zone	1,300	0	1,300	110	60	2,000	1,800
1A		North Roane @ Morgan	Harriman Utility Board, Main	1,550	0	1,550	110	55	3,500	2,000
2.0		1212 South Roane St	Harriman Utility Board, Main	1,240	0	1,240	90	55	4,500	1,800
2A		1212 South Roane St	Harriman Utility Board, Main	1,240	0	1,240	90	55	1,500	1,800
3.0		Roane Med Center @ 27 South	Harriman Utility Board, Main	650	0	650	80	15	4,500	600
3A		Roane Med Center @ 27 South	Harriman Utility Board, Main	650	0	650	80	15	2,500	600
4.0		Ruritan @ Hassler Mill	Harriman Utility Board, Main	1,060	0	1,060	80	40	3,000	1,300
5.0		Old Roane @ Margrave	Harriman Utility Board, Main	1,260	0	1,260	120	45	2,250	1,500
6.0		Trenton @ Crescent	Harriman Utility Board, Main	650	0	650	90	35	2,250	750
7.0		Cliffy @ Cresent	Harriman Utility Board, Main	1,010	0	1,010	120	25	2,000	1,000
8.0		Cumberland @ Walden	Harriman Utility Board, Main	1,300	0	1,300	100	50	2,000	1,700
9.0		1845 South Roane St	Harriman Utility Board, Main	1,010	0	1,010	120	35	2,000	1,100

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city using the FSRS

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.