# IS THE NFPA 1710 STANDARD ONE-MINUTE TURNOUT TIME GOAL FOR CAREER FIRE DEPARTMENTS REASONABLE AND ACHIEVABLE?

EXECUTIVE DEVELOPMENT

BY: Jeff Stauber
Green Bay Fire Department
Green Bay, Wisconsin

An applied research project submitted to the National Fire Academy as part of the Executive Fire Officer Program

March 2003

## ABSTRACT

The problem this research project addressed was the Green Bay Fire Department (GBFD) was not meeting the 60-second turnout time segment of the response time goal set forth in the National Fire Protection Association (NFPA) 1710 standard, 2001 edition.

The purpose of this research project was to determine a reasonable and achievable turnout time segment of the fire department response time goal. This research project employed an action method of research to answer the following questions:

1. What standards or regulations exist regarding the fire department response times?
2. What criteria were used to determine the current turnout time segment of response time goals?
3. What factors affect the duration of a turnout time during an emergency response?

The procedures included a literature review that was conducted at the Learning Resource Center (LRC) at the National Emergency Training Center (NETC) and the GBFD library. Personal interviews were conducted with individuals by telephone and in focus group settings. Feedback forms were distributed to Wisconsin fire chiefs and GBFD personnel to identify factors that affect turnout time. Measurements of distance and time were performed at Green Bay fire stations to determine the average time required for personnel to move to the apparatus and dress for the emergency response.

This research project found that prior to the NFPA 1710 standard being issued in 2001 there was not a national consensus standard that addressed turnout time. The definition of turnout time varied widely and agencies were not consistent in measuring

the turnout time benchmark. The turnout time benchmark was based on research completed by the International Association of Fire Chiefs (IAFC) Accreditation Committee. Many factors affect the duration of turnout time, all which can be addressed by an agency determined to decrease the time. A single turnout time goal may not be appropriate for a fire department that responds to multiple types of emergency incidents.

The median time required for GBFD personnel to move to apparatus in the fire station was 19.88 seconds. The median time for personnel to board apparatus and secure for response to an emergency medical service (EMS) call was 15 seconds; and the median time for GBFD personnel to don personal protective equipment and secure for a response to a fire call was 50 seconds.

The recommendations were for the GBFD to: (a) adopt the NFPA 1710 standard data points for turnout time, (b) set turnout time goals of 60 seconds for incidents that do not require turnout gear and 75 seconds for incidents that do require turnout gear, (c) review incident records on a quarterly basis to determine if revisions are necessary.

In addition, it was recommended the GBFD (a) upgrade the records management system to allow logging of the acknowledgment data point, (b) purchase and install a fire station alerting system, (c) install mobile data computers in apparatus, (d) consider personnel location in the design and layout of new and existing fire stations, and (e) collect and analyze data to identify times of peak activity.

Further, it was recommended that the GBFD encourage the Brown County Public Safety Communications Department (BCPSCD) to (a) transmit only essential information during the initial dispatch, (b) implement a dispatch prioritization system, and (c) implement a quality assurance program that involves the GBFD.

Finally, any department interested in decreasing turnout time should study the routine activities of personnel and how those activities affect turnout time.

# TABLE OF CONTENTS

**Tables**



**Figures**

# INTRODUCTION

The problem this research project addresses is that the GBFD does not meet the 60-second turnout time segment of the response time goal set forth in the NFPA 1710 standard (2001). The ability to measure response time, specifically the turnout time segment, was enhanced with the purchase and installation of a new computer-aided dispatch (CAD) system by the BCPSCD in 2002. The dispatch center began using this new system on March 27, 2002. As part of the dispatch center project, a records management system (RMS) was purchased and installed at all seven GBFD fire stations. As the data was collected and analyzed in the new RMS package, it became apparent that the fire department's response to emergencies had not met the turnout time goals as set forth in the standard.

The purpose of this research project is to determine a reasonable and achievable turnout time segment of the fire department response time goal.

This research project employed an action method of research to answer the following questions:

1. What standards or regulations exist regarding the fire department response times?
2. What criteria were used to determine the current turnout time segment of response time goals?
3. What factors affect the duration of a turnout time during an emergency response?

## BACKGROUND AND SIGNIFICANCE

The concept of fire departments being held to professional standards has long been debated in the fire service. Formed in 1996, the Commission on Fire Accreditation International (CFAI) provided a basic methodology that an agency may have used if it chose to evaluate existing emergency response coverage. The system included time parameters and information on collecting data on reliability of response (CFAI, 1997, p. 3-8). However, the process is voluntary and many fire departments have chosen not to participate. With the publication of the NFPA 1710 standard (2001) career fire departments were provided with a consensus standard goal for responding to emergencies. Though not required to meet the goals established in the standard, unless the authority having jurisdiction officially adopts it, a department may be held to the consensus standard in a courtroom setting (Foley and Brodoff, 2002). The NFPA 1710 standard offers an agency the option of determining its own response time goals (IAFC, 2001, p. 12). If an agency chooses to set an equivalent goal, documentation should be provided to the authority having jurisdiction to demonstrate the equivalency (NFPA, 2001).

The GBFD did not have the ability to collect and analyze the elements of response time as defined in the NFPA 1710 (2001) standard prior to installation of a new CAD and RMS system in March 2002. As data was collected and fire department administrators began using the tools in the new RMS package to analyze the response time data, it became apparent that the department was not meeting the goals that were set forth in the NFPA standard.

This Applied Research Project relates to the Service Quality/Marketing Unit as taught in the Executive Development course. The course materials discuss defining "challenging but achievable outcomes against which to measure performance" (Federal Emergency Management Agency [FEMA], 1998, p. 10-19). The project will determine if the GBFD can meet the turnout time goal set forth in the NFPA 1710 Standard. The results are expected to show what factors affect the turnout time segment of the GBFD response to emergencies. The results will determine if a turnout time goal unique to the GBFD should be established and how any deviation from the national standard is justified.

This research project relates to the United States Fire Administration (USFA) operational objectives "reduce the loss of life from fire in the age group 14 years old and below" and "reduce the loss of life from fire in the age group 65 years old and above" (FEMA, 2002, p. II-2). These objectives are met in the research project by providing information on the factors that the fire department can address to determine a reasonable and achievable time goal for the GBFD response to emergencies.

## LITERATURE REVIEW

In the government report *America Burning* the commission charged with the responsibility of identifying the United States fire problem noted:

> For years fire chiefs and local governments have been listening to one outside voice telling them how to improve their fire services. That outside voice has been the score their community receives on the Grading Schedule of the Insurance Service Office (ISO) (formerly of the American Insurance Association). The Grading Schedule was devised as a tool to assist in setting fire insurance rates for

> each community. It was not intended to guide fire department decisions, though circumstances have invited that kind of use (National Commission on Fire Prevention and Control [NCFPC], 1973, p. 18).

Now known as the *Fire Suppression Rating Schedule*, the grading tool uses the location of fire companies and their distance to randomly selected sites as an element of the grading schedule. In the most current edition, no reference is made to the time fire department units are able to respond to the sites selected by the grading team. "The built-upon area of the city should have a first-due engine company within 1½ miles and a ladder-service company within 2½ miles" (ISO, 2001, p. 28).

One of the data elements of the National Fire Incident Reporting System is response time. In the FEMA report *America Burning Revisited*, the need for accurate and uniform data collection was identified, however, no recommendation was made on what that data should be or how the data should be collected. The task force noted that the national fire data system is inadequate. "Data is not collected in a uniform manner, nor is there a national focal point to coordinate and direct its collection" (FEMA, 1990, pp. 93-94).

In discussing issues that planners face when locating fire stations, Barr and Caputo (1997) noted:

> Currently, there are no national standards for either response time or travel time. Essentially each community must decide the appropriate response and travel times for their community. There are a number of factors that may influence the selection of a specific response/travel time. All applicable factors must be

> considered when making a decision on a specific response/travel time for a community (p. 10-251).

The Occupational Health and Safety Administration (OSHA) requires employers to meet with prospective rescue services to evaluate the rescuer's ability to respond in a timely manner, but does not set specific response time goals (Permit-Required Confined Spaces, 1993).

The *Fire and Emergency Self-Assessment Manual* (CFAI, 1997) addresses turnout time in several different areas:

> The location of stations impacts only one segment of the continuum, travel time. Travel time and response time is not the same thing. When we say that a particular station has a four-minute travel time to an address, it doesn't mean that a unit will arrive there in four minutes. Dispatch processing time and turnout time can add another two to three minutes. Consequently, the unit's response time may be seven minutes from the point when the call for assistance was received (p. 3-28).

The CFAI goes on to define turnout time as:

"The time point at which responding units acknowledge receipt of the call from the dispatch center. Total turnout time begins at this point and ends with the beginning of travel time. For staffed stations the benchmark is 60 seconds" (p. 3-39).

Barr and Caputo (2003) identified three NFPA standards that contain time requirements. Of these standards, "only the NFPA 1710 Standard makes reference to turnout time."

Fitch, Keller, Raynor, and Zalar (1993) note that the measurement of response time would seem to be straightforward but in reality this is not the case:

> Many measurements are offered as response times, but fail to designate the standards under with the times were measured. There are three different response times that should be monitored: system response time, service response time, and unit response time.
>
> The system response time is the only time that is truly important to the patient. It represents the interval from when the call for help is answered by dispatch until an appropriately staffed and transport-capable ambulance arrives at the patient's location (p. 207).

Recognizing the importance that local conditions have on a department's ability to respond, Fitch, et al. goes on to state: "the response-time standards for an individual system should be based on its geography, demand levels, and available resources" (p. 209).

Granito and Dionne (1988) recognized that when response time goals are established the delivery of adequate levels of equipment and personnel to the scene are as important as a quick response. Also important is having the correct response to the hazard the department faces on any particular alarm. The authors wrote:

> Community fire protection calls for a variety of goals and objectives (or parameters), including… (The) amount of elapsed time allowed between receipt of an alarm at the dispatch center and the arrival of (a) the initial, or (b) full first alarm assignment at the various zones within the district, or the various high hazard locations, such as schools and hospitals (pp. 101 – 102).

In *NFPA 1710: A Decision Guide* it is recognized that the NFPA 1710 Standard allows a community to develop its own standard for response time to emergencies (IAFC, 2001). The guide goes on to explain that if a community decides to develop an equivalent standard, the fire department must develop the technical documentation and provide it to the authority having jurisdiction or local government and the community then assumes full responsibility of complying with its standard.

Barr and Caputo (2003) offer guidance for departments that choose to develop equivalent standards:

> There are several ways that a community can establish a response/travel time standard. Some of these are (1) the use of historical fire and EMS response data, (2) demand for service, (3) the level of care the community wants to provide, and (4) the level of care the community is able to provide (p. 7-313).
>
> Once the response time standard has been developed, it needs to be broken down into specific time intervals. For most incidents, the dispatch time and turnout time can be established by using historical data (p. 7-315).

It is recognized that the need for commonly accepted definitions and guides for collecting data are lacking in the nation. In their survey of 200 cities, Cady and Lindberg (2001) commented "to properly evaluate or compare response time performance you must measure and compare the same intervals of activity. Also, synchronize all clocks used to measure activities (i.e. call processing, turnout and travel time)." They found considerable variance in when the response time clocks were started and stopped. "These variances are important when conducting quality improvement assessment on system response. A standardized national starting identifier should be established" (Monosky,

2003). It is interesting to discover that 4 percent of the cities surveyed by Monosky reported they started recording response time when the unit reports en route, thereby discounting dispatch and turnout time in the incident response record.

In conducting research for the IAFC Accreditation Committee, Rule (1992) identified the three elements of response time, one of which is turnout time.

> Turnout time is the period of time that it takes for the on-duty emergency system and hazardous material personnel to discontinue the activities that they are engaged in, properly attire themselves, and board the vehicle in readiness for response. Turnout time shall include the elapsed time between being notified that an emergency is in progress and the vehicle actually beginning to respond to the address or location that has been identified (p. 7).

In his definition, Carter (1999) states turnout time "is the speed with which personnel can report for duty. Turnout time depends on the location of the responding personnel at the time of the alarm." According to Barr and Caputo (1997) the definition of turnout time is "the amount of time it takes a crew to: (1) react after receiving dispatch information and (2) prepare to leave the station." The NFPA (2001) defines turnout time as "beginning when units acknowledge notification of the emergency to the beginning point of response time." When the word *acknowledge* was introduced to the definition, the CFAI and the NFPA seemed to have added a new segment to the response time continuum, i.e. the time from which the dispatch message is delivered to the time the responding unit acknowledges the call.

When he compared actual fire department data to the recommended response time goals set forth in the NFPA 1710 standard, Bryson (2002) wrote:

> The rank and file also will be affected by 1710, as we plan to establish programs to monitor and speed up the dispatch process and firefighter turnout time. Most fire departments do not measure turnout time; it will be important to capture this data in the future, whether done by radio, automatic vehicle locators or light beams within stations.

Aware of the impact that fire station design has on a department's ability to respond to emergencies quickly, Mesagna and Baroni (1999) wrote:

> Years of study and experience have made it apparent that a safer and quicker turnout can be made if a fire station is planned properly. The arrangement of traffic flow patterns in a fire station should be as direct as possible. Grouping the fire-fighting personnel in the highest activity areas of the fire station will make them readily available when the alarm comes in.

Cricenti (2003) concurred when he wrote, "because the key time for fire suppression and emergency medical operations is time spent getting the equipment out of the door, the building design should minimize travel time of the personnel to the vehicles."

Page (1988) wrote that the establishment of goals is a dynamic process:

> Factors for evaluation in the fire department's EMS component would include response times for EMS units, relative availability of units to respond to emergencies when needed…. However, for purposes of evaluation these and other factors must be stated in terms of measurable goals and objective from the outset. An end product or result cannot be measured without a starting-point reference. For example, if a fire department's goal is to arrive at the scene of 80 percent of

> all medical emergencies in six minutes or less, that goal should be identified from the outset. Then, if a one-year experience discloses that the six-minute standard was accomplished in only 78 percent of all responses, either the objective or the approach to achieving that objective should be revised (p. 377).

The status of the units that are dispatched is a factor to be considered in determining goals. The workload, consisting of scheduled and non-scheduled activities, affects the ability of fire companies to respond to a call for help. When peak periods of emergency and non-emergency runs can be identified, Fitch et al. (1993) offered that it might be necessary to add additional units so that response times are not affected (p. 215). When statistics show that peak periods of activity exist, response times can be improved if additional units are made available through flexible staffing schedules.

Emergency personnel must be allowed adequate time to ready themselves for the response. Appropriate personal protective equipment (PPE) must be worn while responding to emergencies (GBFD, 2002). Green Bay firefighters that are responding to working fires are required to wear full protective clothing and self-contained breathing apparatus (GBFD, 2001). The Wisconsin Administrative Code requires that "the driver of a fire vehicle may not move the vehicle until every person on the vehicle is seated and secured with a seat belt or safety harness in an approved riding position" (Fire Department Health and Safety Standards, 2001).

The modern fire department responds to many different types of emergencies. It must be recognized that these different types of incidents require varying levels of preparation or types of PPE to be donned prior to leaving the fire station. "It may be appropriate that the response time be the same for all risk categories; but, realistically,

agencies should establish different response times for different types of categories" (CFAI, p. 3-22).

In summary, based on this literature review, national standards for fire department response time did not exist prior to the publishing and adoption of NFPA 1710 standard in 2001. The current 60-second turnout time segment of the NFPA 1710 response time goals was based on research performed by the IAFC Accreditation Committee and results of that research that was published by Rule in 1992. Multiple factors affect the duration of turnout time during an emergency response. These factors include the time frame that is considered in the accepted definition of the turnout time benchmark and by what method it is measured. Fire department facility design, workload, responding unit status, and the type of emergency incident are all factors that must be considered. Local conditions affect turnout time and agencies have the option of establishing a response time unique to their agency. Once community goals are established, incident data should be evaluated on a regular basis to determine if the goals are appropriate and if they should be revised.

## PROCEDURES

This research project employed an action method of research. The initial research for this project began in September 2002 with an electronic search of the online card catalog at the LRC at the NETC in Emmitsburg, Maryland. The terms used in the query were (a) "response time," (b) "NFPA 1710," and (c) "turnout time." The search terms returned 369 records (324 for response time, 45 for NFPA 1710, 0 for turnout time). From these records, approximately 40 of the articles and books were retrieved and reviewed for relevancy.

During the months October 2002 through March 2003, books and manuals available in the GBFD library were reviewed for relevant information. Also, data from the GBFD records management system (RMS) and the 2002 Annual Response Statistics report (GBFD, 2003) was reviewed and analyzed to determine the level of compliance with the NFPA 1710 (2001) standard and whether the project should continue as originally proposed. The fire department RMS program was used to determine response times and periods of peak activity throughout the research project. The procedure by which time data was recorded in the CAD system was observed during visits to the Brown County Dispatch Center.

In the effort to find any laws or regulations concerning fire department response time an electronic search of Wisconsin Statutes and Administrative Codes was performed using the website search engine at www.wisconsin.gov. The search terms were (a) "fire department," (b) "turnout time," and (c) "response time." An electronic search of Occupational Safety and Health Administration (OSHA) rules was performed using the OSHA website (www.osha.gov) search engine. The term "turnout" was used. The electronic copy of the City of Green Bay Municipal Code on the City of Green Bay computer network (intranet) was searched, using the term "fire department" to find all references to fire department duties and obligations.

On several occasions during the first two weeks of January 2003, an electronic search of the Internet was performed using the term "turnout time" at the Google® (www.google.com) and MSN.com (www.msn.com) search engine sites. The purpose of these search procedures was to determine if fire departments have adopted or established turnout time goals and published that information on the Internet.

The procedures above identified several individuals as having significant participation in the adoption of NFPA 1710 Standard in 2001. Correspondence was sent to Ronny J. Coleman and Garry Briese via electronic mail and U.S. Postal Service. The correspondence requested background information on the addition of the turnout time goal to response time during the process of adopting the NFPA 1710 Standard. A personal interview, by telephone, was conducted with R. J. Coleman on January 10, 2003.

On January 10, 2003, a feedback form (Appendix A) was distributed to 66 career fire chiefs in the State of Wisconsin via the Wisconsin Fire Chiefs Education Association E-mail tree. The purpose of the feedback form was to determine the number of departments that had adopted response time goals and what they were. The form also provided feedback on the chiefs' opinions of the factors that affect the turnout time of emergency personnel.

In January 2003, a feedback form (Appendix B) was distributed to employees of the Green Bay Fire Department Suppression Division. The forms were distributed evenly to each of the three shifts. Battalion Chiefs delivered the forms to personnel working their regular shift with instructions to voluntarily complete the form and return it to the office of the fire chief. 150 forms were printed and distributed, 103 responses were received. The purpose of this feedback form was to gain insight into factors that affect turnout time from the viewpoint of the firefighters that are responding to the alarms.

During the week of January 13, 2003, 278 measurements were taken of the distance from the approximate center of each commonly used room or area in the fire station to the officer's door (right, front) of each fire apparatus parked on the apparatus

garage floor. This measurement was repeated at each of the seven Green Bay fire stations. A second series of measurements was performed at each station that used the path beginning at the approximate center of each room to the tear and run printer, then continuing to the officer's door on the fire apparatus. The purpose of these measurements was to determine the distance firefighters have to travel to get to their assigned apparatus after receiving the alarm in the station. To ensure consistency, Green Bay firefighter Brian Turk performed all measurements using a Rolatape® MeasureMaster Model MM-30 distance-measuring wheel. Distances were rounded to the nearest foot, promoting 6-inches or more and dropping 5-inches or less.

An electronic search of the Internet was performed during the week of January 13, 2003 to gather information on the speed at which people travel while walking. The term "brisk walk" was used on the Google® search engine. The purpose of this procedure was to determine the distance a firefighter could cover at the pace of a brisk walk

A series of 46 measurements of the time it takes a firefighter to don required PPE, board the apparatus or vehicle, and become properly seated and secured for the emergency response to a fire alarm was taken during the week of January 13, 2003. This measurement was performed for each position on responding fire apparatus that is staffed when the department is operating at minimum staffing levels. The purpose of this measurement was to determine the time required readying the firefighter for a response to a fire call.

Using the same timing method and equipment, a second series of 46 measurements was taken to measure the time it takes a firefighter, wearing station uniform, to board the apparatus and be seated and secured with a safety belt. The purpose

of this measurement was to simulate the time required to ready the firefighter for a response to an EMS call. During this measurement, depending on their position on the apparatus and the type of apparatus, personnel may have had to take the extra step of stowing PPE in a compartment on the apparatus. To maintain consistency, the same firefighter performed all of the time measurements using a wrist-style stopwatch. Times were rounded to the nearest second, promoting 0.5 seconds or more and dropping 0.4 seconds or less. This data was entered into a Microsoft® Excel (MS Office Suite 1997 version) worksheet. Comparative data analysis was performed using functions of the spreadsheet software.

A focus group session was held on January 21, 2003 with 5 supervisors of the BCPSCD dispatch center. The supervisors, the fire department assistant chief, and the researcher were present. During this session, the matter of accurate recording of the data points for the turnout time benchmark (i.e., call acknowledgment time and en route time) was discussed. Questions posed to the group during this session were: (a) Do the dispatchers log the time that responding units acknowledge the call, and (b) What factors affect the data logging of the en route time?

**Limitations**

Battalion chief command vehicles were not included in the measurements for distance to vehicle and donning protective gear. Command vehicles are staffed with a lone battalion chief; aides or drivers having been eliminated many years prior. Battalion chiefs do not routinely respond to EMS incidents. Although they are included in the GBFD minimum staffing guideline, they do not have the capability of beginning a fire attack when they arrive on a fire scene alone.

The purpose of the measurements taken in the fire station is to determine an average response time. Fire department personnel are involved in various activities throughout the day that may affect their ability to begin moving to the apparatus immediately. These measurements do not take into account the time that may be required for personnel to secure the task they are involved in at receipt of alarm.

**Definition of Terms**

*Tear and run printer*. Each Green Bay fire station is provided with an impact printer that delivers a hard copy of information obtained in the dispatch process. The data is provided by CAD software via the county and city computer networks. This printed sheet has the capability of providing responders with (a) incident number, (b) incident address, (c) cross streets, (d) map page, (e) nature of call, and (f) hazard information specific to the occupancy or address.

## RESULTS

**What standards or regulations exist regarding the fire department response times?**

The ISO Grading Schedule, though it used distance as an element by which response was measured rather than time, had become a standard by which fire department response to emergencies were judged (NCFPC, 1973, p. 18). Equipment and apparatus capabilities are used to judge a fire department's efficiency; the fire department's response time to emergency incidents and its effectiveness once at the scene are not factors considered when a community's fire insurance rating is determined (ISO, 2001).

The federal rules for emergency response to confined space incidents that were published by OSHA did not specify any elements of response time. The rule required that the employer who designated a rescue service evaluate that service's ability to respond in

a timely manner. The response time had to be appropriate to the hazard identified by the employer (Permit-Required Confined Spaces, 1993).

Since a national consensus standard for response and travel times did not exist, communities were responsible for determining their own response time goals (Barr and Caputo, 1997). Communities that chose to set time goals for fire department response were faced with the decision of whether to set a single response time goal or several response time goals based on the level of risk (Barr and Caputo, 2003). Fitch et al. (1993) also remarked that those communities would have to make a second decision of which data points should be recorded in the attempt to determine a meaningful response time. By itself, quick placement of equipment or personnel on scene is not a meaningful measurement of response time. Granito and Dionne (1988) reported that to be meaningful, the time element must be combined with adequate numbers of personnel and proper types of equipment.

The CFAI (1997) provided turnout and response time guidance to fire departments that chose to participate in the accreditation process. The response times were determined by studying fire department historical data. A fire department may choose to determine turnout and response time goals, however they should review performance on a regular basis and be able to justify any deviation from the consensus standard (IAFC, 2001). If the community chooses to adopt goals that vary from the NFPA 1710 standard, they might consider use of historical data, along with the level of care they want or are able to provide to the community (Barr and Caputo, 2003). If a fire department chooses to adopt unique goals, a standard definition of turnout and response

time should be considered in the adoption process along with a nationally accepted start and stop time (Monosky, 2003).

After considerable debate by fire service leaders and organizations, NFPA 1710 (2001) provided career fire departments with a consensus standard for response time. The standard divided response time into three basic elements of dispatch time, turnout time, and travel time. The standard combined the time elements of a response with staffing levels to determine an adequate deployment of emergency resources.

**What criteria were used to determine the current turnout time segment of response time goals?**

Barr and Caputo (1997) and Carter (1999) have similar explanations of response time which can be summarized as the speed by which personnel can report for duty after ending the activity they are involved in.

R. J. Coleman (personnel interview, January 10, 2003) was questioned in regard to his knowledge of how the one-minute turnout time goal, as set forth in NFPA 1710, was determined. During the telephone conversation, he stated the turnout time goals in NFPA 1710 are based on research conducted by Chief Charles Rule and Captain Chris Maxwell for the IAFC Accreditation Committee in the late 1980s. To gather data on response time elements, Rule and Maxwell randomly distributed 200 questionnaires to U.S. and foreign fire departments. Of the 200 questionnaires distributed, 57 fire agencies, staffed and unstaffed, serving a wide range of populations, responded to the survey (Rule, 1992).

Coleman went on to state that a telephone survey was conducted as a follow-up to the research and 60 seconds was determined to be an appropriate benchmark for turnout

time. The time was tested in field trials and found accurate as a mean average for turnout time.

**What factors affect the duration of a turnout time during an emergency response?**

Rule (1992) reported that the activity emergency responders are involved in at the time of the alarm must be considered when measuring turnout time. Responders must also be allowed adequate time to discontinue that activity, move to the apparatus, and don protective clothing that is required prior to boarding the vehicle. The location of personnel at the time of the alarm is another factor that must be considered when determining turnout time (Carter, 1999).

When the clock is started and stopped is a factor in the measurement of turnout time. The NFPA 1710 Standard (2001) defines turnout time as beginning when the responding crew acknowledges the alarm until the time they begin travel to the emergency. The ability of the agency responsible for data collection to accurately record these data points will affect the turnout time reported. How those benchmarks are recorded will also affect turnout time. Newer communication systems have made it possible to transfer responsibility for status changes to the units in the field, eliminating the need for human intervention at the dispatch console (Campbell, 2002). Regardless of how it is done, Bryson (2002) noted that it would be important to capture the data in the future.

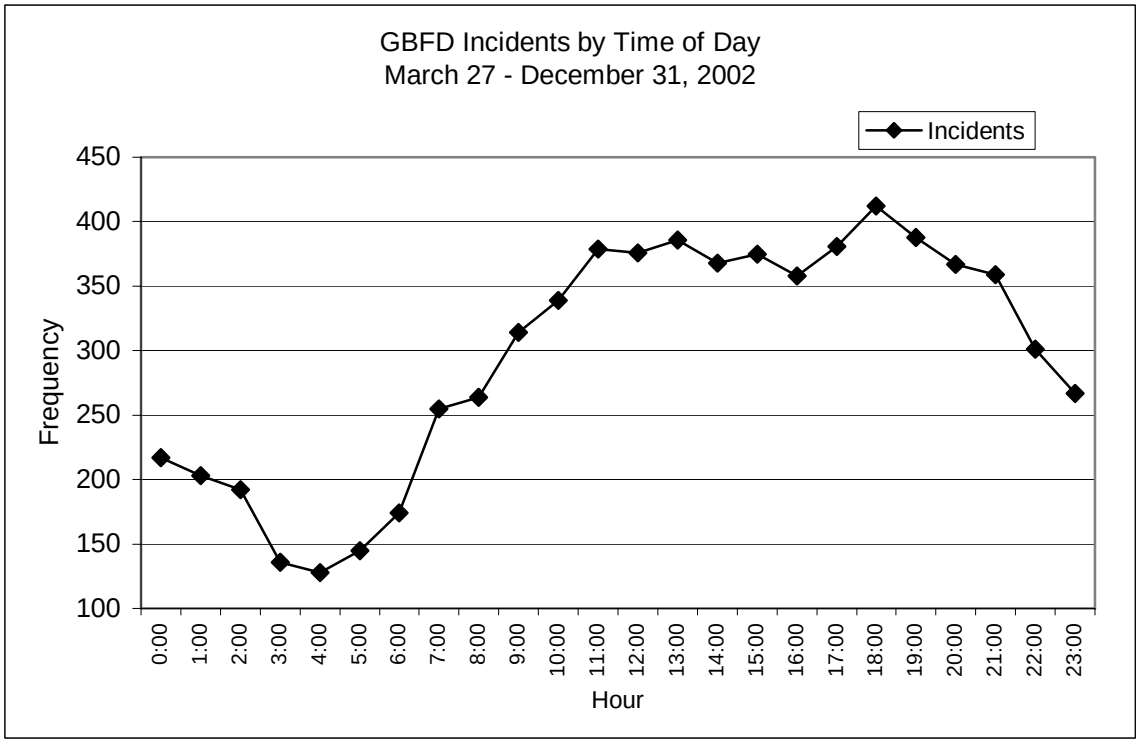
The design and layout of the station is a factor that affects turnout time. The personnel should be grouped in the highest activity areas so they are readily available for response (Mesagna and Baroni, 1999). The fire station architect should consider the traffic flow pattern and attempt to minimize the travel time to the vehicles when

designing the facility (Cricenti, 2003). Large fire stations having multiple companies may have longer response times than smaller stations or those with a single fire company. A fire station on a single level may provide a quicker response by eliminating the delay of moving up or down stairways.

The workload of fire companies must be considered a factor in turnout time. Fitch et al. (1993) identified the situation in which busy EMS units may have an alarm waiting for them prior to clearing from a call to which they are already assigned. The Incidents by Time of Day Chart (Figure 1) shows a peak in call volume activity during the hour of 18:00, while the least number of incidents were recorded during the hour of 02:00 (GBFD Annual Response Statistics, 2003).

Figure 1

*GBFD incidents by time of day, March 27 – December 31, 2002*



Scheduled activities such as code enforcement inspections, public education, or occupancy familiarization tours will affect turnout time. Typically, personnel are away from their assigned apparatus during these events or are involved in an activity that cannot be ended as abruptly as activities in the fire station.

The type and amount of protective clothing and equipment that must be worn is a factor in turnout time. The protective clothing for a fire incident is considerably more than that which is required for an EMS incident (GBFD, 2001). Statutes, ordinances, and safety regulations also affect turnout time. Wisconsin Administrative Code (Fire Department Health and Safety Standards, 2001) requires that all crewmembers must be seated and secured by safety harnesses prior to travel beginning. The process of properly applying the safety restraint varies from lap belt, to combination lap belt/shoulder harness, to self-contained breathing apparatus (SCBA) harness.

Some communities may elect to adopt several response time standards for various levels of risk in the community (Barr and Caputo, 2003). Recognizing at least one of the factors that affect turnout time, the Tempe, Arizona Fire Department has adopted two distinct turnout time standards in their Policies and Procedures (2002). The standard for calls not requiring turnout gear is 40 seconds or less; the standard for calls requiring turnout gear is 60 seconds or less. In that policy, they identify proper preparation and attitudes are the primary elements that affect turnout time. In 2002, the GBFD experienced an 18.6:1 ratio of EMS incidents to fire incidents.

Of the feedback forms (Appendix A) that were distributed to 66 career fire chiefs in Wisconsin via E-mail, 17 (26% response rate) were returned. Question 6 on the form was open-ended; all respondents answered the question. The results of the question

"What do you believe are the factors that affect the turnout time of an emergency response?" are displayed in Table 1.

Table 1

*Factors that Wisconsin fire chiefs Identified as affecting turnout time (n=17)*

| Factor Identified | Number of Chiefs Identifying Factor |
|---|---|
| Activity at time of call | 7 |
| Time of day | 6 |
| Dispatch message | 5 |
| PPE requirements | 3 |

*Note*. The factors (a) type or nature of incident, (b) mechanical condition of apparatus, (c) number of personnel responding, (d) attitude of personnel, and (e) unit status identified by 2 fire chiefs each. The factors (a) facility layout, (b) unit location, (c) station location, (d) accessibility of turnout gear, (e) personnel "hustle", and (f) weather conditions identified by 1 fire chief each.

Of the 150 feedback forms (Appendix B) that were distributed to Green Bay Fire Department personnel, a total of 104 (69% response rate) were returned. All but 1 respondent offered a reply to Question 1 on the form. The results of the open-ended question "What do you believe are the factors that affect the turnout time of an emergency response?" are displayed in Table 2.

Table 2

*Factors that GBFD personnel identified as affecting turnout time (n=103)*

| Factor Identified | Frequency Identified |
|---|---|
| Time of day | 47 |
| Activity at time of call | 47 |
| Speed of "tear and run" printout | 43 |
| Length of dispatch message | 27 |
| PPE requirements | 23 |
| Slow personnel | 18 |
| Design/layout of station | 16 |
| Personnel location in station | 16 |
| Knowledge of streets/districts | 15 |
| Type or nature of call | 13 |
| Noise, poor dispatch message quality | 11 |
| Personnel attitude | 7 |
| Weather conditions | 6 |
| Accurate logging of time by dispatch | 6 |
| Shift change | 4 |

*Note*. Three fire department personnel each identified the factor (a) location of radio in station, (b) location of PPE on apparatus, and (c) uniform requirements. One person each identified the factor (a) design of apparatus and (b) personnel fatigue.

The four factors identified most frequently by Wisconsin fire chiefs were also identified most frequently by Green Bay fire department personnel, the exception is the

factor “speed of tear and run sheet”, which may be unique to the Green Bay Fire Department.

Two series of distance measurements were made at each of the 7 Green Bay fire stations. The first series of measurements was the shortest path of travel from each room to the officer’s door of each apparatus; the results are displayed in Table 3 (Appendix E). The longest path of travel recorded in this measurement was 278 feet. The longest mean average distance for an apparatus in this measurement was 132.27 feet.

The second series of measurements was the shortest path of travel from each room to the tear and run printer and then on to the officer’s door of each apparatus; the results are displayed in Table 4 (Appendix F). The longest path of travel recorded in this measurement was 278 feet. The longest mean average distance for an apparatus in this measurement was 148.36 feet.

A study by Ainsworth, Haskell, Leon, et al. (as cited in Compliance with physical activity recommendations by walking for exercise – Michigan, 1996 and 1998, [2000]) found that the speed of a brisk walk is ≥ 3.5 miles per hour (mph). At the rate of 3.5 mph, a firefighter will travel 5.13 feet per second. Given this rate of travel, the time (in seconds) for personnel to travel to apparatus using the distances obtained in the research are displayed in Table 5 (Appendix G) and Table 6 (Appendix H). The maximum time for personnel to move to apparatus via the fire station tear and run printer is 54 seconds. The greatest mean average time for personnel to move to an apparatus via the printer is 36 seconds.

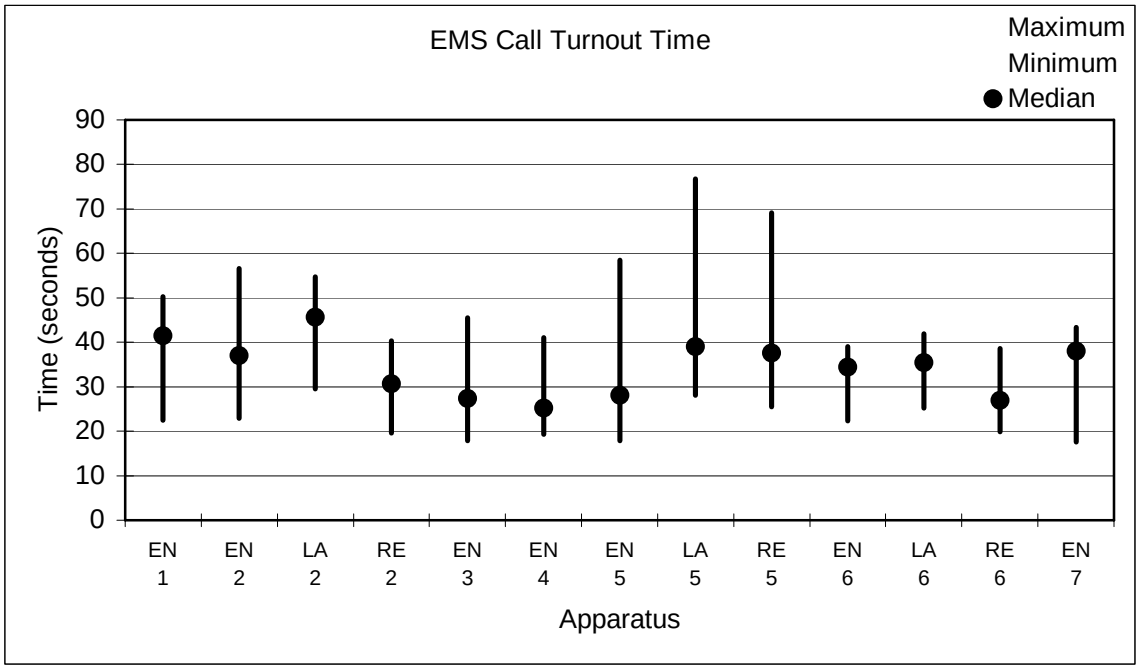
The data contained in Table 5 and Table 6 represents personnel movement to the apparatus only. It does not represent the time required for firefighters to board the

apparatus and prepare for the response. It also does not include time required to start the apparatus and, if necessary, obtain address, directions, or pre-plan information from reference materials in the apparatus.

A series of measurements was taken in which the time required for personnel to board the apparatus and secure themselves with safety belt or a harness was recorded. The results of these measurements is displayed in Table 7 (Appendix I). An additional series of measurements was conducted that calculated the time required for personnel to don PPE appropriate for a response to a building fire, board the apparatus and secure themselves with safety belts or harnesses. The results of these measurements are displayed in Table 8 (Appendix J). Adding the time for the path of travel to the time for the type of PPE required for the incident will result in an average turnout time.

Figure 2

*EMS call turnout time*

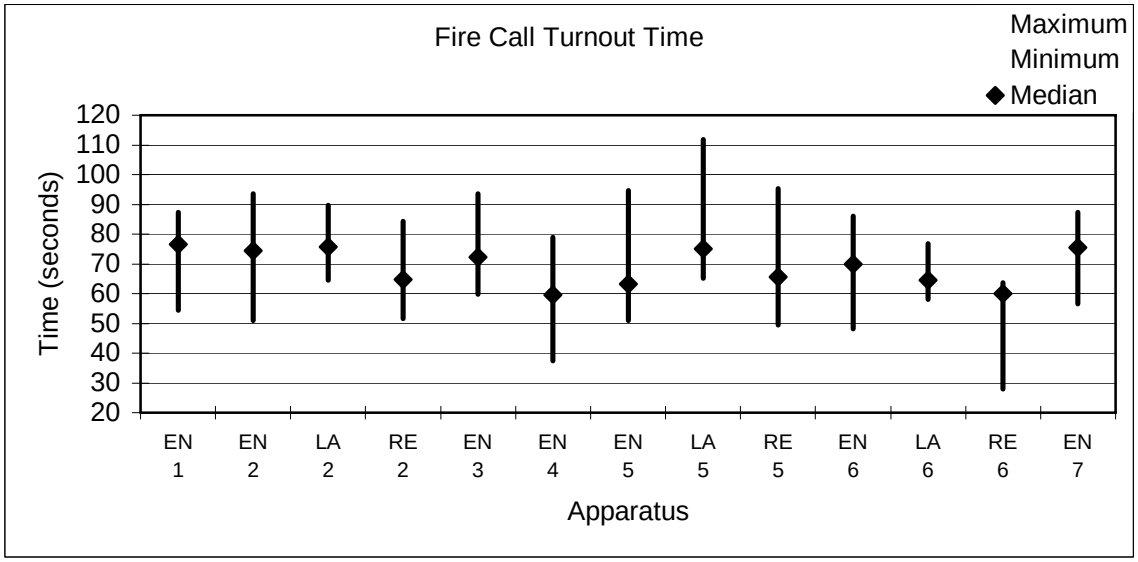


The results of these combined measurements, along with the minimum and maximum times calculated, are displayed in Figure 2. These results are representative of the time required to move to the apparatus and ready the company for a response to an EMS call. As the figure shows, the turnout time measurements vary greatly by the type of apparatus and the fire station at which the apparatus is located. The median turnout time for an EMS call is greater than 20 seconds but less than 50 seconds. The maximum turnout time is 77 seconds.

Figure 3, calculated in a similar manner, displays the results of the time calculations required for firefighters to move to the apparatus and don PPE for a fire call. The chart reveals that the median turnout time for all apparatus is greater than 60 seconds, but less than 80 seconds. The maximum turnout time is 112 seconds.

Figure 3

*Fire call turnout time*




Data analysis was performed using all data collected. The data was sorted by the series of measurement. The results of the data analysis, as a summary of all data

collected, are displayed in Table 9. To compute the average turnout time required for an EMS call, the median time of 19.88 seconds (via printer) was added to the median time of 15 seconds (without PPE). This resulted in an average turnout time of 34.88 seconds. Likewise, to compute the average turnout time for a fire call, the median time of 19.88 seconds (via printer) was added to the median time of 50 seconds (with PPE), This resulted in an average turnout time of 69.88 seconds. The results of this research are comparable to the results of Dawson's (1999) study of the Oregon City Fire Department's response time. In his research, Dawson found the median average reflex time, i.e. turnout time, to be 67 seconds.

Table 9

*Time Required to Move to Apparatus, Don Appropriate PPE and Board Apparatus*

| | Movement to Apparatus | | Board Apparatus | |
|---|---|---|---|---|
| | Direct | via Printer | Without PPE | With PPE |
| Mean | 18.02 | 20.00 | 14.67 | 49.30 |
| Median | 16.76 | 19.88 | 15 | 50 |
| Mode | 18.52 | 19.88 | 15 | 53 |
| Standard Deviation | 8.28 | 8.19 | 4.53 | 9.85 |
| Range | 4.87 to 54.19 | 4.87 to 54.19 | 8 to 28 | 17 to 68 |

*Note*. All times are in seconds. PPE donned prior to boarding apparatus includes boots, hood, turnout pants, and turnout coat.

There are two ways by which unit status can be transmitted to the dispatch center. Manual transmission involves the dispatcher responding to a notification or action initiated by the unit or station and received by radio or telephone. The dispatcher reacts to

this notification by performing a series of manual keystrokes at the dispatch console. The second method, electronic transmission of data, involves the responding personnel touching a button on the radio console or mobile data computer, which sends an electronic message via radio signal to the CAD software (FEMA, 1995). The time is recorded electronically and the human reaction factor at the dispatch console is eliminated from the data collection process. To reduce the margin of error in recording data points, alarm processing time should be electronically determined (Coleman, 2001, April).

Acknowledgment of the call, notification of units going en route and units arriving at the scene are all made by the radio transmission of a verbal message at the GBFD. In the BCPSCD CAD system, the time that the responding company acknowledges the call is logged manually by the dispatcher. However, the fire department RMS program does not include a field for this data point. After discussing dispatch console procedures, BCPSCD supervisors (personal communication, January 10, 2003) agreed that the level of activity at that console affected the time stamp for the en route and on scene data points. When multiple incidents or multiple-alarm incidents are occurring, it may take up to several minutes for the dispatcher to return to the particular incident screen and record those times in the CAD system. The result of this procedure is that, in circumstances during which the dispatcher has multiple incidents occurring at the same time or is involved in a communications-intensive incident, accurate logging of the NFPA-defined benchmark data points might not occur. This corrupted data file will cause the fire department calculations for turnout and response time to be inaccurate.

# DISCUSSION

The ISO upgraded the GBFD from a rating of 3 to a rating of 2 in 1994. Two fire stations have been relocated since that time to provide greater geographical coverage of the built-upon area of the city. The grading schedule does not provide any measure of the department's efficiency or effectiveness, only it's potential ability to supply equipment and deliver water to randomly selected occupancies (ISO, 2001). Although the ISO schedule was designed for insurance rating purposes and not for fire protection planning, it provides one standard by which a city may judge its fire department operations (Hoetmer, 1988, p. 243).

Prior to the OSHA *Permit-Required Confined Space* final rule being published in 1993, the GBFD was marketing itself as a provider of confined space rescue services to community industrial and commercial properties. The vagueness of the rule caused the department to reconsider and, ultimately, withdraw from providing the service on a designated rescuer basis. This decision was made because some hazardous conditions required an "immediate" response time that could not be met without standing by at the scene during the entry.

The need for accurate and uniform data collection in the fire service has been identified (FEMA, 1990). The NFPA 1710 (2001) standard defined benchmarks for each element of response time. While the BCPSCD CAD system has the capability of logging the fire department's acknowledgment of the incident, the acknowledgment data point is not included in the fire department RMS package (personal interview, BCPSCD supervisors, January 10, 2003). Until the RMS software can be modified to include this

data point, the turnout time benchmark set forth by the NFPA 1710 (2001) definition cannot be measured.

The fire chief needs good data to make powerful presentations and managers need accurate data to use resources efficiently (Latin, 2002). Once the defined elements of response time are accepted and adopted by the fire service, the challenge will become attaining the ability to accurately record the data. Dispatch operations may be provided to the fire department by an independent agency. This takes away the direct control of the dispatch segment of response time. It is important that the fire department measures and compares the same intervals of response time as other departments (Cady and Lindberg, 2001).

Local conditions play an important part on a fire department's ability to respond (Fitch, et al., 1993). Only two of the factors listed in the GBFD feedback form (Table 2) are directly beyond the control of the fire department. This includes (a) time of day (identified by 47 respondents), (b) weather conditions (identified by 6 respondents). All other factors identified can be addressed and modified by equipment, procedure, or policy changes. GBFD personnel assigned to fire suppression work on a rotating 24-hour shift schedule. The 24-hour workday can be divided into 3 major areas; (a) required duties and tasks during the daylight hours, (b) optional "free time" during early evening hours, and (c) sleeping hours. Fire personnel responding to the feedback form that identified "time of day" as a factor that affects the duration of turnout time offered further explanation that waking from sleep and dressing as the reason.

Freeman writes that during the 1990's fire departments added significant tasks, both emergency and non-emergency, to the list of services they provide in the community

(2002, p. 128). Throughout the 24-hour workday GBFD personnel are involved in a wide variety of activities, including (a) station and apparatus maintenance, (b) meal preparation, (c) code enforcement inspections, (d) classroom and practical training, (e) public education, and (f) emergency response. All of these activities are a necessary part of the fire department mission, and all have the potential of affecting the turnout time. Eliminating any of the activities may result in better response times but may also result in a less productive workforce.

Firefighters require certain information prior to responding to an emergency. This includes, at a minimum, location and nature of the call (FEMA, 1995). Twenty-seven GBFD personnel (26.2%) responding to the feedback form (Appendix B) identified "length of dispatch message" as a factor (Table 2). If personnel are required to acknowledge calls by base radio prior to moving to the apparatus, wordy dispatch messages create unnecessary delays in the turnout time. Some alert systems use a combination of radio and departmental lines to transmit voice and printed dispatch messages (FEMA, 1995). The time required to receive the printed message may negatively affect turnout time if the message is delayed due to network problems.

The weather conditions are a factor in determining how firefighters dress for the emergency. Pindelski (2003) recommends that firefighters dress in layers of loose-fitting clothing beneath their turnout gear. In addition, two pairs of socks should be worn (p. 21). During periods of cold temperature and increased wind chill factor, GBFD personnel are likely to add another layer of clothing to that which is normally worn in the fire station. These articles of clothing are typically stored at the apparatus and put on prior to donning PPE, thereby increasing turnout time.

When defining turnout time, Carter (1999) recognized that whether career or volunteer, turnout time is influenced by the location of personnel. Sixteen GBFD personnel (15.5%) responding to the feedback form (Appendix B) identified "personnel location in the station" as a factor affecting turnout time (Table 2).

The design of the fire station facility must be considered when adopting turnout time goals. If the location of personnel in relationship to apparatus and traffic flow patterns are not considered, additional time may be needed for personnel to travel to the apparatus after receiving the alarm (Mesagna and Baroni, 1999). The design should minimize the route by which personnel travel to the emergency vehicles (Cricenti, 2003). Sixteen GBFD personnel (15.5%) responding to the GBFD feedback form (Appendix B) identified both "station design" and "personnel location in the station" as factors (Table 2). Data collected in the study shows that the lowest median travel distance was achieved at Station 4, the most recently constructed fire station (Table 4). Conversely, the greatest median travel distance was at Station 2, constructed in 1965.

Once a turnout time and response time goal is established it should be monitored and revised as necessary (Page, 1988). The NFPA 1710 standard (2001) requires both quadrennial and annual reports that identify circumstances in which the standard is not being met. The reports and data analysis tools necessary to analyze response time data by type of response is provided by current GBFD RMS software.

The number of personnel responding from a single location affects the response time and, ultimately, affects the service provided at the emergency scene. A single driver/operator that responded with a single apparatus will have resulted in a quick turnout and response time. However, if an adequate number of personnel did not respond

simultaneously, the service provided at the scene may be inadequate (Granito and Dionne, 1988). The GBFD response to each EMS incident is at the advanced life support (ALS) level. All GBFD engine companies are trained and equipped at the basic life support (BLS) level. Clawson (1989) comments that dispatch priorities must reflect the level of appropriate response. GBFD standard operating guidelines require that a dual-dispatch of ambulance and engine company occur for incidents involving respiratory distress, chest pain, severe trauma, or when the ambulance is responding from outside the fire district. The GBFD minimum staffing levels provide adequate numbers of personnel to begin and sustain operations at a fire scene (GBFD, 2000). At the minimum staffing level, a structure fire would result in a minimum of 15 personnel responding on the first alarm, as compared to the 14 personnel recommended in the NFPA 1710 standard (2001). At the report of a working fire, an additional engine company staffed with 4 personnel would be dispatched to serve as a rapid intervention crew.

Personnel that are slow to respond to the alert message or those that have a poor attitude (Tempe Fire Department…, 2002) are concerns that the fire department administration must be concerned about. In the feedback form (Appendix B) that was distributed to GBFD personnel, 18 respondents (17.4%) identified “slow personnel” as a factor affecting turnout time; 7 respondents (6.8%) identified “attitude” as a factor (Table 2). There is a tendency to become complacent in responding to alarms when all seems well and the time passes without being challenged (Page, 2002). The number of false alarms or a disparate number of true emergencies in relation to the number of emergency dispatches may precipitate the problem of complacency. Peer pressure may be enough stimuli for quicker responses (Fitch, et al., 1993). Aware of achievable turnout time

goals, slow GBFD personnel may speed up their response if compelled to do so by fellow firefighters. Seventeen respondents (16.5%) to the GBFD feedback form (Appendix B) identified “make personnel aware goals” as a step to decrease turnout time (Table 10). Regardless of which average is used to determine turnout time, mean, median, or mode, the fact remains that the unit cannot begin the next phase of the response, i.e. travel time, until the slowest member is on board and secured.

Dispatch prioritization is an essential element in any EMS system for it establishes the appropriate level of care including the urgency and type of response (Clawson, 1989). Thirteen GBFD personnel (12.6%) responding to the feedback form (Appendix B) identified “type or nature of call” as a factor affecting turnout time (Table 2). The BCPSCD currently categorizes all EMS incidents as emergencies and dispatches the calls at the highest priority. The implementation of a medical priority dispatching system would categorize calls at the PSAP into emergency/non-emergency status (Clawson, Martin, Cady & Sinclair, 1999). Conceivably, the number of incidents categorized as emergency responses would be reduced (Page, 2002). The turnout and response time data collected would have greater relevance to the turnout and response time goals adopted or set by the department.

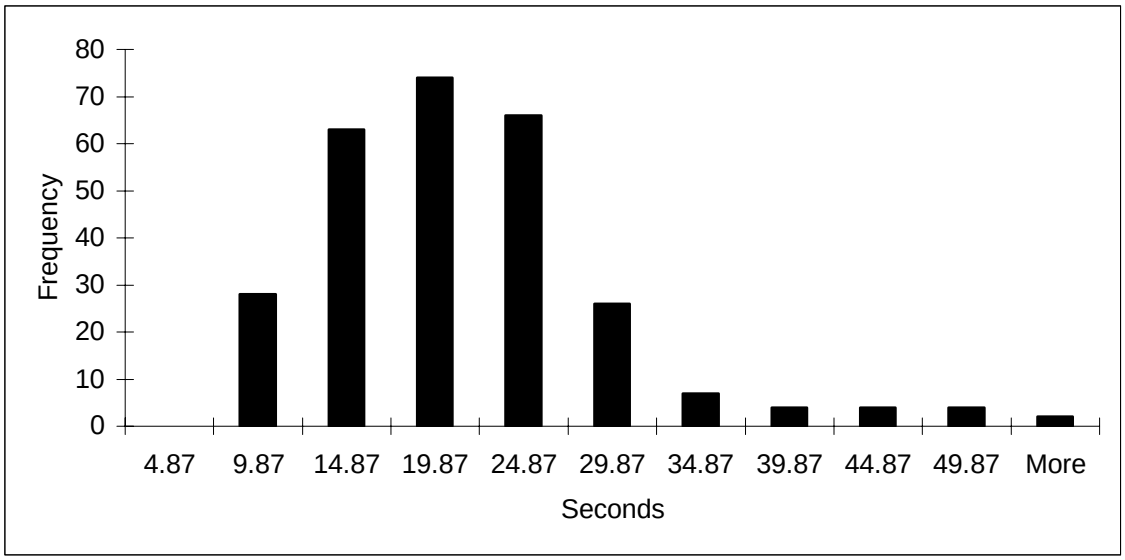
In the IAFC Accreditation Committee Study, Rule (1992) used historical data to determine average turnout times for departments serving various sized populations. It is questionable as to whether using historical data is the proper method of determining a response time goal for fire departments nationwide. This method does not seem to account for the factors that may affect an individual department’s ability to react to an alarm. These include many of the factors identified in the research contained herein. The

age and design of the fire station may play a significant factor in determining the lengths of time personnel need to reach the apparatus. The department's requirements for donning protective gear are a significant factor. The type of incidents the department responds to, how those incidents are classified at the time of dispatch, and the percentage of EMS incidents to fire incidents are all factors which must be considered in determining a department's turnout time goal.

The descriptive statistics analysis of data gathered during the research resulted in three different averages (i.e. mean, median, mode) being reported for each field. No single measurement can tell the whole story. Each has a place and a need (Begnell, 2001). To determine which of the averages should be used in determining a response time goal the researcher reviewed the data in histogram format (McEwen and Miller, 1993, p. 45). A total of 278 distance measurements were made in the 7 GBFD fire stations. The distance measurements were converted to time using the conversion rate of 5.13 feet per second (Compliance… 2000). The range of the data was 49.31. Dividing the range by the recommended 10 intervals, the interval width for the histogram was determined to be 5. The starting point for the intervals is the lowest data point, 4.87 (Endicott, 2002, p. 326). The mode interval on this histogram (Figure 4) is 19.87.

Figure 4

*Time for personnel to move to apparatus after receiving alarm in station*




Ninety-two time measurements were taken of the responder preparing for an emergency response: 46 were taken of the responder preparing for an EMS call and 46 were taken of the responder preparing for a fire call. The EMS response time analysis revealed a range of 20. Dividing the range by 5 data points resulted in an interval of 4. The starting point for the intervals is 8. The mode interval in the histogram (Figure 5) is 16 (Endicott, 2002).

The Fire call analysis revealed a range of 51. Dividing the range by 11 data points resulted in an interval of 5. The starting point for the intervals is 17. The mode interval in the histogram (Figure 6) is 16.

Figure 5

*Time for personnel to board apparatus for EMS response*

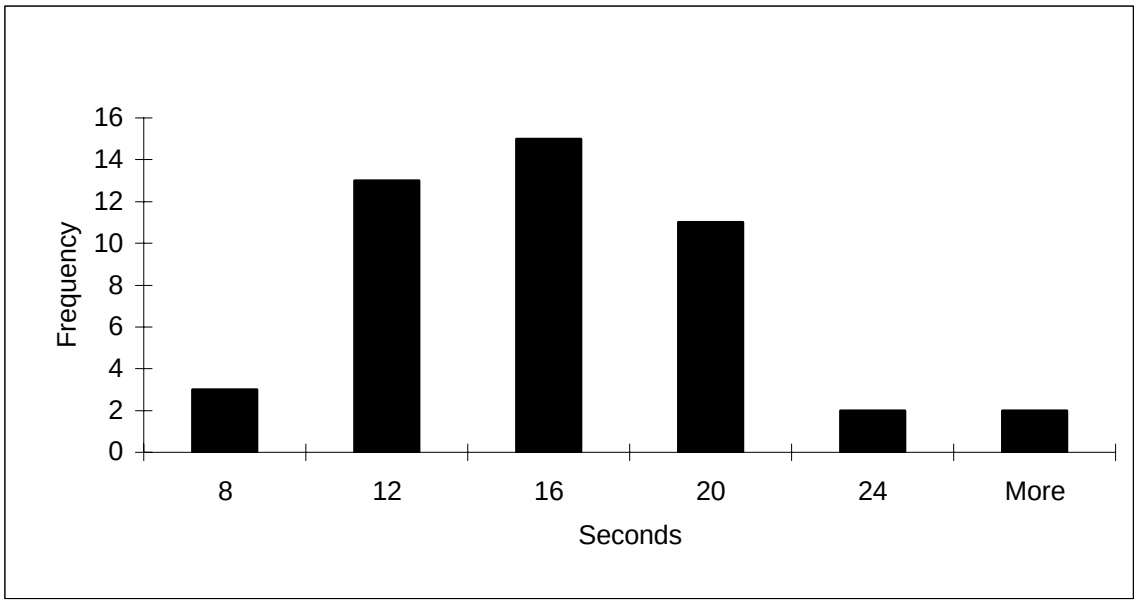
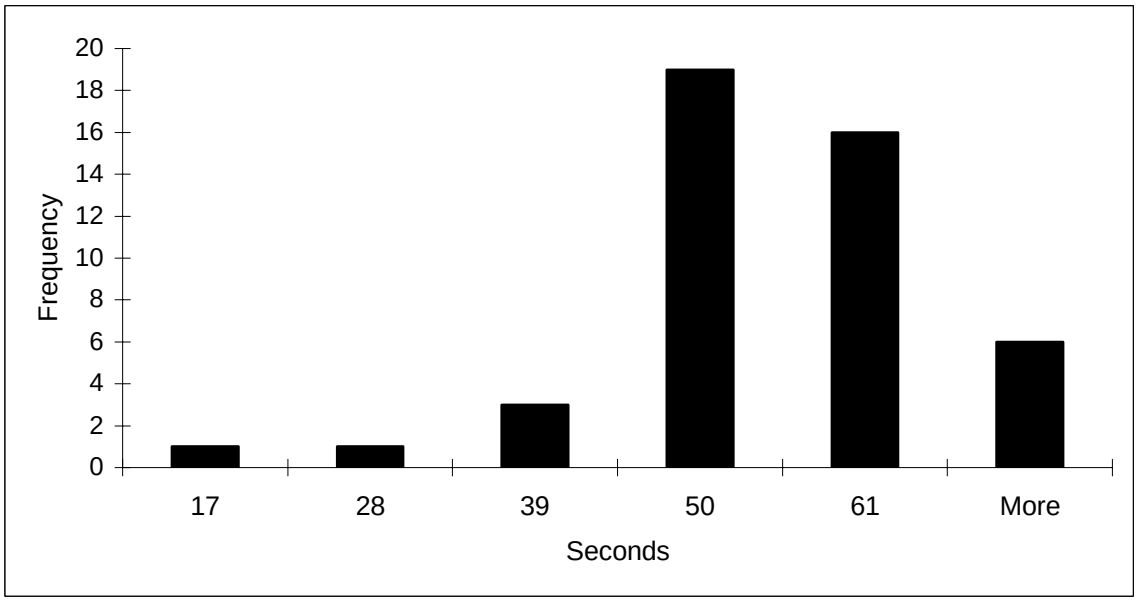



Figure 6

*Time for personnel to don PPE and board apparatus for fire response*



# RECOMMENDATIONS

The recommendations are based on the results of the literature review and data collected as part of this research project. The recommendations are made as a "total package" i.e. all recommendations should be implemented in order for any single recommendation to meet its intended purpose.

**Recommendation 1: Policy**

The GBFD should adopt the turnout time and response time data points as set forth in the NFPA 1710 (2001) standard. By adopting these data points, the GBFD will have the ability to conduct performance benchmarking. Performance benchmarking would allow the GBFD to compare its response performance against fire departments that are of similar size and that deliver similar services nationwide. Facts show that NFPA codes and standards, whether officially adopted or not, are used to judge fire department performance in court proceedings.

The GBFD should adopt a response time of 60 seconds or less for types of emergency incidents that do not require personnel to wear turnout gear and 75 seconds or less for types of emergency incidents that do require personnel to wear turnout gear. Research data shows that these benchmark times are reasonable and achievable if the data points are logged accurately in the CAD and RMS programs. The current ratio of EMS incidents to fire incidents (18.6:1) experienced by the department should result in an overall turnout time performance that meets the NFPA 1710 (2001) standard as it is published.

The department should continue to collect and analyze response data and include the results in quarterly reports. Any areas of deficiency should be addressed by the fire

department administration. The GBFD should continue to collect and analyze data that will identify periods of peak activity. When deemed necessary, the department should add units and personnel during those periods of increased activity to reduce or eliminate delays caused by the increased activity. Data shows that the GBFD experiences increases in incident activity during the period of 8:00 AM to 10:00 PM. In addition, GBFD training and activity records show department personnel are active in training, inspections, and pre-incident planning activity during the period of 8:00 AM to 5:00 PM.

**Recommendation 2: Facilities and Equipment**

The GBFD should pursue an upgrade to its current RMS package that would allow logging of the acknowledgment data point. This modification would allow accurate measurement of the turnout time benchmark as set forth in the NFPA 1710 (2001) standard. The GBFD should pursue the purchase and installation of a fire station alerting system that transmits data by radio. The GBFD should pursue the purchase and installation of mobile data computers in all apparatus. These modifications would allow for immediate notification of an emergency incident that has been created in the CAD system and electronic data stamping of the data points identified in the NFPA 1710 (2001) standard. Research shows that significant delays are occurring in the logging of incident response time data. These upgrades in equipment and software would also move the control of real time data logging to the fire department, eliminating the delays caused by activity level at the dispatch center. The GBFD, when designing new fire stations, should direct the architect to consider the location of personnel in relation to the location of apparatus in the garage area. Every effort should be made to minimize the distance personnel have to travel to the apparatus at the receipt of an alarm regardless of time of

day. The research data shows that the most recently constructed fire station has a shorter travel distance to apparatus as compared to older fire stations.

**Recommendation 3: Interagency Communication and Cooperation**

The GBFD should send official communication to the BCPSCD administrators requesting that the initial dispatch message contain only the essential information that is required to begin an emergency response. Additional dispatch information can be delivered to responders after units are en route. Research data shows that dispatchers are delivering too much information during the initial dispatch, thereby causing delay in firefighter turnout. The GBFD should send official communication to the BCPSCD administrators urging implementation of a dispatch prioritization system. The department should cooperate with the dispatch center to set priorities by type and nature of incident. In addition, the GBFD should participate in a dispatch quality assurance program. The facts show the department is responding to all EMS and fire incidents at the highest priority. Categorizing of incidents at the call taker position will reduce the number of emergency responses, making the response data collected and analyzed relevant to the objective of quick response to emergencies.

**Recommendation 4: Future Readers**

Any interested fire department or emergency agency should go beyond the scope of this research project to determine how the routine activities of personnel, both within and outside of the fire station setting, affect the ability of those personnel to respond quickly to an emergency.

# REFERENCES

Barr, R. C. & Caputo, A. P. (1997). Planning fire station locations. In A. Cote (Ed.), *Fire protection handbook* (18th ed., 1st printing, pp. 10-250 – 10-255). Quincy, MA: National Fire Protection Association.

Barr, R. C. & Caputo, A. P. (2003). Planning fire station locations. In A. Cote (Ed.), *Fire protection handbook* (19th ed., pp. 7-311 – 7-318). Quincy, MA: National Fire Protection Association.

Begnell, G. (2001, February). What performance standards mean. *Fire Chief, 45*, pp. 72 – 78.

Bryson, W. (2002, August). It's time to peer into the 1710 looking glass. *Fire Chief, 46*, pp. 26 – 27.

Cady, G. & Lindberg, D. (2001, August). 200-City Survey. *Journal of Emergency Medical Services, 26*, pp. 24 – 42.

Campbell, T. R. S. (2002). Communication systems and emergency response centers. In D. Compton & J. A. Granito, (Ed.), *Managing Fire and Rescue Services*. (pp. 447 – 483). Washington, DC: International City Management Association.

Carter, H. R., (1999). *Management in the Fire Service* (3rd ed.), Quincy, MA: National Fire Protection Association.

Clawson, J. J. (1989, October – December ). Emergency medical dispatching. *Prehospital and Disaster Medicine*. Retrieved January 19, 2003 from http://www.naemsp.org/Position%Papers/EmerMedDisptch.html

Clawson, J. J., Martin, R. L., Cady, G. A., & Sinclair, R. (1999, June). EMD: Making the most of EMS. *Fire Chief*, *43*, pp. 44 – 52.

Coleman, R. J. (2001, February). Response time? Only your analyst knows for sure. *Fire Chief*, *45*, pp. 34 – 36.

Coleman, R. J. (2001, April). The not-so-funny facts behind alarm processing. *Fire Chief*, *45*, pp. 26 – 27.

Commission on Fire Accreditation International. (1997). Strategic planning, risk assessment, and standards of response coverage. *Fire and emergency service self assessment manual*. Retrieved January 17, 2003 from http://www.iafc.org/downloads/CFAI%2003.pdf

Compliance with physical activity recommendations by walking for exercise – Michigan, 1996 and 1998. (2000). *Morbidity and Mortality Weekly Report. 49*, 560 – 565.

Cricenti, N. J. (2003). Fire department facilities and fire training facilities. In A. Cote (Ed.), *Fire protection handbook* (19th ed., pp. 7-237 – 7-249). Quincy, MA: National Fire Protection Association.

Dawson, K. K. (1999). *Calculating the Oregon City Fire Department's Response Times*. Executive Fire Officer Research Paper. Emmitsburg, MD: National Fire Academy.

Endicott, D. T. (2002). Performance measurement and organizational improvement. In D. Compton & J. A. Granito, (Ed.), *Managing Fire and Rescue Services*. (pp. 292 – 333). Washington, DC: International City Management Association.

Federal Emergency Management Agency. (1990). America Burning Revisited. (USFA Publication No. 1990-724-156/20430). Washington, DC: U.S. Government Printing Office.

Federal Emergency Management Agency. (1995). *Fire Department Communications Manual, A Basic Guide to System Concepts and Equipment*. (USFA Publication No. 1995-624-785/82392). Washington, DC: U.S. Government Printing Office.

Federal Emergency Management Agency. (1998). Executive Development Student Manual. Washington, DC: U.S. Government Printing Office.

Federal Emergency Management Agency. (2002). Executive Fire Officer Program, Operational Policies and Procedures, Applied Research Guidelines. Washington, DC: U.S. Government Printing Office.

Fitch, J. J., Keller, R. A., Raynor, D., & Zalar, C. (1993). *EMS management: Beyond the street* (2nd ed.). Carlsbad, CA: Jems Communications.

Fire Department Safety and Health Standards, WI Administrative Code Comm 30 (2001).

Foley, S. N. & Brodoff, M. (2002). Regulations, standards, and issues of liability. In D. Compton & J. A. Granito, (Ed.), *Managing Fire and Rescue Services*. (pp. 389 – 419). Washington, DC: International City Management Association.

Freeman, P. M. (2002). Organizing and deploying resources. In D. Compton & J. A. Granito, (Ed.), *Managing Fire and Rescue Services*. (pp. 105 – 137). Washington, DC: International City Management Association.

Granito, J. A. & Dionne, J. M. (1988). Evaluating community fire protection. In R. J. Coleman & J. A. Granito, (Ed.), *Managing fire services*. (pp. 100 – 125). Washington, DC: International City Management Association.

Green Bay Fire Department. (2000, October). *Standard Operating Guideline 0601.01 Assignment of Line Personnel*. Green Bay, WI: Author.

Green Bay Fire Department. (2001, July). *Standard Operating Guideline 0203.33 Structure Fires*. Green Bay, WI: Author.

Green Bay Fire Department. (2002, February). *Standard Operating Guideline 0201.01 General Safety*. Green Bay, WI: Author.

Green Bay Fire Department. (2003, January). *2002 Annual Response Statistics*. Green Bay, WI: Author.

Hoetmer, G. J. (1988). Alternative delivery systems. In R. J. Coleman & J. A. Granito, (Ed.), *Managing fire services*. (pp. 418 – 443). Washington, DC: International City Management Association.

Insurance Service Office. (2001). *Fire Suppression Rating Schedule*. Jersey City, NJ: Author.

International Association of Fire Chiefs. (2001). *NFPA 1710: A Decision Guide*. Fairfax, VA: Author.

Latin, O. (2002, December). Data in the driver's seat. *Fire Chief, 46*, pp. 36 – 41.

Law, G. & Ross, P. M. (2000, December). Fire & ice: Warm up to cold-weather firefighting with savvy preplanning. *FireRescue Magazine*, *18*, p. 34.

McEwen, T., & Miller, C. A., (1993). *Fire Data Analysis Handbook*. Washington, DC: U.S. Government Printing Office.

Mesagna, R. A. & Baroni, J., (1999). Fire Station Planning and Design. *A handbook for the planning and design of a fire station*. Retrieved January 13, 2003, from http://firestationarchitect.home.att.net

Monosky, K. A. (2003). 200-City Survey. *Journal of Emergency Medical Services*. *28*. (pp. 36 – 55).

National Commission on Fire Prevention and Control. (1973). *America Burning*. Washington, DC: U.S. Government Printing Office.

National Fire Protection Association. (2001). *Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations for the Public by Career Fire Departments* (NFPA 1710, 2001 Ed.). Quincy, MA: Author.

Page, J. O. (1988). Emergency medical and rescue services. In R. J. Coleman & J. A. Granito, (Ed.), *Managing Fire Services*. (pp. 347 – 378). Washington, DC: International City Management Association.

Page, J. O. (2002). Modern fire protection, emergency medical, and rescue services. In D. Compton & J. A. Granito, (Ed.), *Managing Fire and Rescue Services*. (pp. 3 – 37). Washington, DC: International City Management Association.

Permit-Required Confined Spaces, 29 C.F.R. § 1910.146 (1993).

Pindelski, J. (2003, February). Cold weather ops. *FireRescue Magazine*. *21*. pp. 20 – 21.

Rule, C. H. (1992, September). IAFF Accreditation Committee surveys fire departments, charts response times. *IAFC On Scene. 6*. pp. 7 – 8.

*Tempe Fire Department Policies and Procedures, Turnout Time Standard*. (2002, May 15). Retrieved January 7, 2003, from www.tempe.gov/fire/docs/104.16.htm.

Appendix A

*Wisconsin career fire department feedback form*

**WISCONSIN CAREER FIRE DEPARTMENTS**
TURNOUT TIME FEEDBACK FORM

The NFPA defines "turnout time" as the time beginning when units *acknowledge* notification of the emergency to the beginning point of response time.

1. Has your department or body of government adopted NFPA 1710?

**n17** ☐ Yes **1** ☐ No **13** **No answer** **3**

2. Has your department or body of government adopted other response time goals?

**n17** ☐ Yes **3** ☐ No **11** **No answer** **3**

3. If "Yes" to Question 2, have you adopted a turnout time goal and what is it?

**n3** ☐ Yes **2** ☐ No **0** **No answer** **1**

4. Does your department plan on adopting response time goals in 2003?

**n17** ☐ Yes **3** ☐ No **11** **No answer** **3**

5. Does your department or dispatch authority have the ability to measure turnout time, as defined above, for all emergency responses?

**n17** ☐ Yes **11** ☐ No **3** **No answer** **3**

6. What factors do you believe affect the turnout time of an emergency response?

**Results of Question 6 displayed in Table 1 (n17).**

Thank you for your assistance in this project. If you would like to receive the results of this feedback form, please include your address in the field below.

Forms can be returned to:

jeffst@ci.green-bay.wi.us *or* Jeff Stauber, Fire Chief
Green Bay Fire Dept.
501 S. Washington St.
Green Bay, WI 54301-4218

***Note*. Items in bold indicate data collected.**

Appendix B

*GBFD personnel feedback form*

DATE: January 10, 2003
TO: All Fire Suppression Division Personnel
FROM: Fire Chief Jeff Stauber
SUBJ: Turnout Time

As part of a National Fire Academy research project I am studying our department's response time, specifically the "turnout time" portion of the response time as it relates to goals set forth in National Fire Protection Association (NFPA) standards.

*The NFPA defines "turnout time" as the time beginning when units acknowledge notification of the emergency to the beginning point of response time.*

Keeping the above definition in mind, I am asking you to complete the feedback form below so that the responders' opinions can be reported. Please be honest and objective when answering the questions. Please forward the completed form to my office by January 17, 2003. Thank you for your assistance in this project.

1. What factors affect the duration of the turnout time during an emergency response?

2. What steps or procedures might the Green Bay Fire Department take to improve the turnout time of units responding to emergency calls?

***Note*. Results of Question 1 are displayed in Table 2. Results of Question 2 are displayed in Table 10.**

Appendix C

*Distance to apparatus measurement form.*

**NATIONAL FIRE ACADEMY APPLIED RESEARCH PROJECT**
DISTANCE TO APPARATUS

Apparatus will be parked in their normal position on the apparatus floor. Two measurements will be taken:

- The first measurement will be the path from the approximate center of each area or room listed below to the officer's door on each apparatus.
- The second measurement will be the path from the approximate center of each area or room listed, to the CAD printer, to the officer's door on each apparatus.

Date: _____ Measurement by:_____

Fire Station: _____

Apparatus: _____

| AREA | AREA to APPARATUS | AREA to PRINTER to APPARATUS |
|---|---|---|
| Office | | |
| TV Room | | |
| Dining Room | | |
| Kitchen | | |
| Men's Main Bathroom | | |
| Women's Main Bathroom | | |
| Workshop | | |
| Workout Area | | |
| Dormitory | | |
| Approved Smoking Area | | |
| Other, specify: | | |

***Note*. Results of data collected are displayed in Table 3 and Table 4.**

Appendix D

*Donning protective clothing measurement form.*

**NATIONAL FIRE ACADEMY APPLIED RESEARCH PROJECT**
DONNING PROTECTIVE CLOTHING

Firefighter will begin standing on the floor next to the vehicle. Two measurements will be taken:

- The time it takes a firefighter to don boots, turnout pants, and coat; mount vehicle, and fasten the seat belt or SCBA harness in his/her normal riding position, simulating a fire call.
- The time it takes the firefighter to mount vehicle and fasten the seat belt in his/her normal riding position, simulating an EMS call.

Measurement will begin at the word "GO" and end when the firefighter is secured into the riding position.

Date: _____

Measurement by: _____

Fire Station: _____

Apparatus: _____

Location of protective clothing prior to time measurement beginning:

☐ Compartment
☐ Hanging or resting on apparatus
☐ In vehicle cab or rear seating area
☐ Other, please specify: _____

Time to complete task with turnout gear, in seconds: _____

Time to complete task without turnout gear, in seconds: _____

***Note*. Results of data collected are displayed in Table 7 and Table 8.**

Appendix E

Table 3

*Measurement results, averages, room/area to apparatus*

| Apparatus | Minimum | Maximum | Mean | Median | Mode |
|---|---|---|---|---|---|
| Engine 1 | 37 | 176 | 111.80 | 125.50 | 125 |
| Engine 2 | 66 | 157 | 103.18 | 105.00 | |
| Ladder 2 | 95 | 183 | 132.27 | 130.00 | 109 |
| Rescue 2 | 49 | 140 | 87.18 | 90.00 | |
| Engine 3 | 40 | 121 | 73.30 | 68.50 | |
| Engine 4 | 38 | 113 | 69.91 | 65.00 | |
| Engine 5 | 25 | 213 | 83.00 | 70.00 | |
| Ladder 5 | 47 | 250 | 103.73 | 83.00 | |
| Rescue 5 | 33 | 278 | 119.55 | 99.00 | |
| Engine 6 | 41 | 102 | 82.55 | 89.00 | 94 |
| Ladder 6 | 40 | 89 | 70.00 | 74.00 | 52 |
| Rescue 6 | 52 | 106 | 84.09 | 88.00 | 78 |
| Engine 7 | 45 | 105 | 78.78 | 85.00 | |

*Note*. All measurements in feet.

Appendix F

Table 4

*Measurement results, averages, room/area to apparatus via printer*

| Apparatus | Minimum | Maximum | Mean | Median | Mode |
|---|---|---|---|---|---|
| Engine 1 | 74 | 176 | 132.60 | 133.5 | |
| Engine 2 | 66 | 157 | 110.00 | 118.00 | 119 |
| Ladder 2 | 95 | 183 | 135.45 | 142.00 | 109 |
| Rescue 2 | 49 | 140 | 93.00 | 101.00 | 102 |
| Engine 3 | 40 | 131 | 75.00 | 68.50 | 61 |
| Engine 4 | 48 | 123 | 75.36 | 65.00 | |
| Engine 5 | 25 | 213 | 83.00 | 70.00 | |
| Ladder 5 | 62 | 250 | 121.27 | 103.00 | |
| Rescue 5 | 90 | 278 | 148.36 | 131.00 | |
| Engine 6 | 68 | 123 | 97.82 | 102.00 | 123 |
| Ladder 6 | 52 | 107 | 78.55 | 74.00 | 107 |
| Rescue 6 | 56 | 111 | 86.18 | 92.00 | 78 |
| Engine 7 | 49 | 125 | 96.56 | 105.00 | |

*Note*. All measurements in feet.

Appendix G

Table 5

*Calculation results, averages, room to apparatus*

| Apparatus | Minimum | Maximum | Mean | Median | Mode |
|---|---|---|---|---|---|
| Engine 1 | 7 | 34 | 21 | 24 | 24 |
| Engine 2 | 13 | 31 | 22 | 20 | |
| Ladder 2 | 19 | 36 | 27 | 25 | 21 |
| Rescue 2 | 10 | 27 | 18 | 18 | |
| Engine 3 | 8 | 24 | 16 | 13 | |
| Engine 4 | 7 | 22 | 15 | 13 | |
| Engine 5 | 5 | 42 | 23 | 14 | |
| Ladder 5 | 9 | 49 | 29 | 16 | |
| Rescue 5 | 6 | 54 | 30 | 19 | |
| Engine 6 | 8 | 20 | 14 | 17 | 18 |
| Ladder 6 | 8 | 17 | 13 | 14 | 10 |
| Rescue 6 | 10 | 21 | 15 | 17 | 15 |
| Engine 7 | 9 | 20 | 15 | 17 | |

*Note*. All results in seconds.

Appendix H

Table 6

*Calculation results, averages, room to apparatus via printer*

| Apparatus | Minimum | Maximum | Mean | Median | Mode |
|---|---|---|---|---|---|
| Engine 1 | 14 | 34 | 24 | 26 | |
| Engine 2 | 13 | 31 | 22 | 23 | 23 |
| Ladder 2 | 19 | 36 | 27 | 28 | 21 |
| Rescue 2 | 10 | 27 | 18 | 20 | 20 |
| Engine 3 | 8 | 26 | 17 | 13 | 12 |
| Engine 4 | 9 | 24 | 17 | 13 | |
| Engine 5 | 5 | 42 | 23 | 14 | |
| Ladder 5 | 12 | 49 | 30 | 20 | |
| Rescue 5 | 18 | 54 | 36 | 26 | |
| Engine 6 | 13 | 24 | 19 | 20 | 24 |
| Ladder 6 | 10 | 21 | 15 | 14 | 21 |
| Rescue 6 | 11 | 22 | 16 | 18 | 15 |
| Engine 7 | 10 | 24 | 17 | 20 | |

*Note*. All results in seconds.

Appendix I

Table 7

*Calculation results, board apparatus and secure with safety harness*

| Apparatus | Minimum | Maximum | Mean | Median | Mode |
|---|---|---|---|---|---|
| Engine 1 | 8 | 16 | 12 | 15.5 | 16 |
| Engine 2 | 10 | 26 | 18 | 14 | |
| Ladder 2 | 11 | 19 | 15 | 18 | |
| Rescue 2 | 10 | 13 | 11.5 | 11 | |
| Engine 3 | 10 | 20 | 15 | 14 | |
| Engine 4 | 10 | 17 | 13.5 | 12.5 | |
| Engine 5 | 13 | 17 | 15 | 14.5 | |
| Ladder 5 | 16 | 28 | 22 | 19 | 13 |
| Rescue 5 | 8 | 15 | 11.5 | 12 | |
| Engine 6 | 9 | 15 | 12 | 14.5 | 15 |
| Ladder 6 | 15 | 21 | 18 | 21 | 21 |
| Rescue 6 | 9 | 17 | 13 | 9 | 9 |
| Engine 7 | 8 | 19 | 13.5 | 17.5 | |

*Note*. All results in seconds.

Appendix J

Table 8

*Calculation results, board apparatus, don PPE, and secure w/safety harness.*

| Apparatus | Minimum | Maximum | Mean | Median | Mode |
|---|---|---|---|---|---|
| Engine 1 | 40 | 53 | 47 | 50.5 | |
| Engine 2 | 38 | 63 | 51 | 51.5 | |
| Ladder 2 | 46 | 54 | 50 | 48 | |
| Rescue 2 | 42 | 57 | 50 | 45 | |
| Engine 3 | 52 | 68 | 60 | 59 | |
| Engine 4 | 28 | 55 | 42 | 47 | 47 |
| Engine 5 | 46 | 53 | 50 | 49.5 | |
| Ladder 5 | 53 | 63 | 58 | 55 | |
| Rescue 5 | 32 | 41 | 37 | 40 | |
| Engine 6 | 35 | 62 | 49 | 50 | |
| Ladder 6 | 48 | 56 | 52 | 50 | |
| Rescue 6 | 17 | 42 | 30 | 42 | |
| Engine 7 | 47 | 63 | 55 | 55 | |

*Note*. All results in seconds.

Appendix K

Table 10

*Steps or procedures GBFD might undertake to improve turnout time (n=103)*

| Improvement Suggested | Frequency |
|---|---|
| Shorten dispatch message | 32 |
| Install mobile data computers | 21 |
| Increase printout speed | 19 |
| Modify station design | 18 |
| Make personnel aware of goals | 17 |
| Modify information on printout | 8 |
| Modify uniform, PPE requirements | 6 |
| Modify location of turnout gear | 3 |
| Modify acknowledgment policy | 3 |
| Accurate data logging | 2 |
| Relocate radio, printer | 2 |
| Increase knowledge of districts | 1 |

*Note*. This table contains the results of Question 2 on the GBFD personnel feedback form (Appendix B).

Appendix L

*GBFD standard operating guideline implementing recommended turnout time goal*

Chapter: 7 Reports and Communications

Subject: 01 Dispatch and Response to Alarms

Topic: 07 Emergency Response Time Goals

**A. PURPOSE**

To provide a response time goal for the emergency incidents to which Green Bay Fire Department companies are dispatched.

**B. SCOPE**

This guideline shall apply to all emergency incidents to which the Green Bay Fire Department is dispatched.

**C. TERMS AND DEFINITIONS**

1) Dispatch time: The time beginning when the Brown County Public Safety Communications Center receives the alarm to the time when fire department companies acknowledge receipt of the alarm.

2) Fire department response time: The time beginning when companies acknowledge notification of the emergency to the time when companies arrive at the scene (turnout time + travel time = fire department response time).

3) Incident response time: The time beginning when the alarm is received at the dispatch center to the time when the fire department companies arrive at the scene (dispatch time + turnout time + travel time = incident response time).

3) Travel time: The time beginning when the companies are en route to the emergency incident and ending when companies arrive at the scene.

4) Turnout time: The time beginning when companies acknowledge notification of the emergency to the beginning point of travel time.

Appendix L, continued

**D. GUIDELINE**

1) The response time to an emergency incident is a fundamental component by which the success of the service we provide is measured.

   a) The turnout time goal for emergency incidents that do not require turnout gear is 60 seconds.

   b) The turnout time goal for emergency incidents that require turnout gear is 75 seconds.

   c) The travel time goal is 4 minutes (240 seconds) or less for the first-arriving company and/or 8 minutes (480 seconds) for all companies dispatched on the first alarm to a fire suppression incident.

   d) The travel time goal is 4 minutes (240 seconds) or less for the first-arriving company at emergency medical incident and 8 minutes (480 seconds) or less for the arrival of an advanced life support company at an emergency medical incident.

2) It shall be a fire department objective to achieve the response time goals set forth in this guideline for not less than 90% of all incidents.

3) Multiple factors affect each element of the incident response time. Fire department members can decrease response time by preparing for emergency incidents.

   a) Members shall place all protective gear and clothing on apparatus when arriving for their assignment.

   b) Keep protective gear stowed in a location that does not delay response. Turnout pants and boots may be kept at bedside during evening hours to decrease turnout time.

   c) Do not continue to talk while units are being dispatched. Listen carefully to the dispatch instructions.

   d) Begin moving to the apparatus upon receipt of alarm, walking in a brisk but safe manner.

   e) Do not delay response waiting for dispatch printouts. Information can be communicated by radio while en route to the incident.

Appendix L, continued

4) The fire chief shall evaluate performance in relation to response time objectives on a quarterly basis and make adjustments where necessary.

**-END-**