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An Evaluation of Emergency Response Turnout Times.

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Executive Development

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CERTIFICATION STATEMENT

I herby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

Fire Service organizational effectiveness can be measured by the quality of service delivered to its citizens. One such measurement of performance is emergency response times. Turnout time is one component of overall response time. This research paper investigated why Clackamas Fire was not meeting its established goals.

An evaluative method was used to answer the following questions:

1. What standards include turnout time as a measurement component of total emergency response time?
2. What are the current CCFD#1 emergency response turnout times?
3. What components or tasks contribute to total turnout time?
4. What changes should be made to current practices to reduce turnout time?

A direct correlation between fire station design and emergency response turnout time was anticipated. This was proven incorrect. Proper preparation and employee motivation are key.

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Introduction

Leadership that challenges the status quo requires courage and can put a leader at personal risk. The goals of leadership often extend beyond material gain or personal achievement by making peoples lives better. Leadership provides meaning in life (Heifetz & Linsky, 2002). Fire Service leadership is constantly seeking methods to provide more effective service to our communities.

Efficient and timely responses to emergencies when summoned are a critical aspect of fire service delivery. In conducting research for the Commission on Fire Accreditation International, the (CFAI) Task force spent considerable time looking at response time elements because they believed these elements were the fundamental building blocks to establishing a service level (Coleman, 2001).

Clackamas County Fire District #1 adopted response time and turnout time goals in January 2000. Fire departments have the ability to impact the turnout time segment of the total response time to an emergency. Fire Department personnel should be trained in the importance of a quick response. The reflex time (turnout time) is the only segment of the total response time that is completely under the control of an emergency response organization and its personnel (Dawson, 1999).

The research problem is that Clackamas Fire has established and published emergency response goals which it is currently not achieving. The purpose of this research is to investigate factors impacting Clackamas Fire's response crews not achieving the established goals and the validity of these goals. Research will identify current standards, identify barriers to achieving these standards, and make recommendations to reduce emergency response turnout times within Clackamas Fire.

An evaluative research method will be used to analyze the data involved in the response process, to identify needed areas of improvement within the Clackamas Fire emergency response system.

The following research questions will be answered:

1. What standards include turnout time as a measurement component of total emergency response time?
2. What are the current CCFD#1 emergency response turnout times?
3. What components or tasks contribute to total turnout time?
4. What changes should be made to current practices to reduce turnout time?

Background Significance

Delays in emergency response crews arriving at the scene of emergencies can have real consequences within the community served. The true cost of these delays in terms of property and lives lost can be difficult to accurately measure. Obviously, additional losses in lives and property are connected to longer response times.

Clackamas County Fire District #1 is an accredited agency with the Commission on Fire Accreditation International and was the first fire agency so accredited in the State of Oregon. Clackamas Fire is one of the largest fire protection districts in Oregon proudly serving 179,039 citizens in an area covering 194 square miles. The district's service area includes the cities of Milwaukie, Oregon City, Happy Valley, and Johnson City, and the unincorporated areas of Oak Lodge, Clackamas, Sunnyside, Redland, Carver, Beavercreek, Highland and Clarkes. Clackamas Fire employs 158 full time employees, including one fire chief, one assistant chief, two deputy chiefs, one executive officer, seven battalion chiefs, and 133 sworn personnel. Approximately 50 volunteers

supplement the paid firefighter forces. All career firefighters are, at minimum, certified as emergency medical technicians (EMTs). The district employs 80 certified paramedics and staffs daily with a minimum of one paramedic on each career response unit.

Clackamas Fire operates sixteen community fire stations including Town Center (Station 1), Milwaukie (Station 2), Oak Lodge (Station 3), Lake Road (Station 4), Mt. Scott (Station 5), Happy Valley (Station 6), Clackamas (Station 8), Holcomb (Station 9), Beavercreek (Station 10), Redland (Station 11), Logan (Station 12), Clarkes (Station 13) and Highland (Station 14), Oregon City Downtown (Station 15), Oregon City Hilltop (Station 16), Oregon City South End (Station 17). The district's facilities also include a training center and a logistics supply warehouse. Total career and volunteer work force total over 200 including support personnel. Some specialty services include swift water rescue, confined space rescue, high angle rope rescue, and the self-contained breathing apparatus (SCBA) maintenance program being the most noteworthy.

Clackamas County Fire District #1 is a fire service agency created by a series of mergers with smaller agencies. Approximately eleven fire departments have consolidated into one fire district during the last 30 years to create Clackamas Fire. Some of the larger mergers occurred in 1997 and 1998. These more recent mergers have doubled the total personnel employed by the organization and thus have brought several organizational cultures together. These diverse cultures are the basis for Clackamas Fire's strengths and weaknesses with regard to service delivery.

Clackamas Fire adopted its first formal Strategic Business Plan in March 1999. As part of the 1999-2000 CFAI certification and accreditation process, the fire district was required to develop a Standard of Response document. This document was formally

adopted by the CCFD#1 board of directors in January 2000. The goals were first published and distributed throughout the community in the April 2001 Strategic Business Plan. The Standard of Response document included the fire district's first officially published turnout time response goals. Turnout Times: Provide for a turnout time (the period of time from notification of emergency personnel to the time the emergency vehicle responds) for staffed fire stations of 60 seconds from 7 a.m. to 10 p.m. and 90 seconds from 10 p.m. to 7 a.m. with 90-percent reliability (CCFD#1 2001-2005 Strategic Plan). The source of this 60 second benchmark was the Commission on Fire Accreditation International Fire & Emergency Service Self-Assessment Guidebook.

Attempts to measure unit turnout time in the past had identified a major shortcoming of the data collection system. Dispatch times were recorded by the computer aided dispatch (CAD) system. Unit enroute times were manually typed into the CAD by dispatchers after they acknowledged units responding. During structure fire responses, units would experience lack of radio frequency air time to report their unit responding. This responding time stamping was accomplished again by a manual entry by a dispatcher. Both of these concerns resulted in all data collected to be view as barely better than nothing and not a true reflection of the crew's actual turnout time performance. Because of this skepticism in the validity, the data was rarely distributed or used except in extreme cases.

In 2002, Clackamas Fire began implementation of a Mobile Data Computer (MDC) system. All front line career staffed units and several reserve apparatus were equipped with a touch screen computer allowing dispatch to communicate alarm information directly to the response units. Prior to this system improvement, crews received alarm

notification via voice pagers and alpha numeric pagers only. One of the justifications for funding this expensive project was to gather accurate data on turnout time for analysis. The MDC provides a large, orange, touch screen button labeled 'RESP'. Turnout time ends when the officer pushes this button in the cab of the unit indicating that the crew acknowledges the alarm and is responding. Turnout time data collected up until July 1, 2002, when MDC were installed in fire apparatus was thought to be unreliable for mentioned reasons. This improvement in technology was thought to allow the fire district now to finally collect and analyze accurate turnout time response data. The district now has the ability to receive data from dispatch including response and turnout times. Unfortunately, the format that the data is received from dispatch requires much manipulation to create a useable report. The details of data reporting, delivered in a useable format has not yet been established.

The ability of fire service leaders to collect and evaluate accurate response time data is a critical component of an effective organization. The majority of budgetary resources within most fire departments are committed to funding a standing-army of suppression personnel whose primary mission is emergency response. Clackamas Fire's response crews seem sensitive to reviewing turnout data with their supervisors. Many continue to question the reliability of the data and are resistant to allow it to be used as a true measurement of performance. The organization culture can be described as; "Trust us, we are moving as fast as we can given the circumstances" or " I know we didn't take that long to get out, the times are inaccurate".

Clackamas Fire's new Chairman of the Board, asked the Fire Chief in July 2003 a question which made the subject of turnout times elevate in importance for the

management team. "Are we meeting our turnout time response goals as established in the Strategic Business Plan?"

Annually Clackamas Fire has assembled a summary of response data for all Fire Management Zones. This data is presented at the annual Standard of Response Workshop. At this workshop, a diverse group discusses the organizational need to adjust staffing and response units based upon an analysis of the data. Available turnout times have been part of this presented data during the last two years. The next Standard of Response Workshop is scheduled for April 2004. It is anticipated that the first accurate analysis of turnout time data will be included in this document. This project will produce the data for this report.

Attempting to reduce emergency response times is related to the United States Fire Administration's 5-year operational objective to reduce the loss of life from fire by 15%. This objective will be reached by reducing by 25% the loss of life of the age group 14 years old and below and also by reducing by 25% the loss of life of the age group 65 years old and above.

The evaluation of the emergency response turnout time's at Clackamas Fire directly corresponds to the National Fire Academy's Executive Fire Officer Program Executive Development class discussions on new leadership's ability to influence a change in organizational culture.

By researching the barriers to effective unit turnout times, recommendations may be developed to improve performance and a greater understanding of the overall response system can be gained. It is hoped that this research will not only prove beneficial for Clackamas Fire but will also provide insight for other agencies pursuing excellence in

performance. I plan to investigate this area of the response system using an evaluative method of research as described in the USFA Executive Development Course Guide. Identifying needed improvements in Clackamas Fire's emergency response system will be the primary focus of this research project.

Literature Review

The Oregon Deployment Process document defines Turnout Time as the interval between activation of station/company alerting devices and the time the responding company notifies dispatch they are responding. During this interval, crews cease other activities, don protective clothing, determine the location of the call, board and start the apparatus. It is expected that the "responding" signal will be given when personnel are aboard the apparatus and the vehicle is beginning to roll towards the emergency (OFCA, 2001).

The Commission on Fire Accreditation International defines Turnout Time as the time point at which responding units acknowledge the call from the dispatch center. Total turnout time begins at this point and ends with the beginning of the units travel time. For staffed fire stations, the benchmark is 60 seconds (CFIA, 1997).

The National Fire Protection Agency (NFPA) defines turnout time in Standard 1710 as the time beginning when units acknowledge notification of the emergency to the time point of the beginning of the response. NFPA continues defining this issue by recommending fire departments deploy resources to provide for the arrival of an engine company within a 4-minute response time with 90 percent reliability (NFPA, 2001).

The Clackamas County Fire District #1 Five Year Strategic Plan 2003-2008 establishes an organizational goal for turnout times. Provide turnout time (the period of

time from notification of emergency personnel to the time the emergency vehicle responds) for staffed stations of 60 seconds from 0700 to 2200 and 90 seconds from 2200 to 0700 with 90-percent reliability (CCFD#1, 2001).

Response times include three variables: Dispatch time, Turnout time, and Travel Time. Dispatch time was found to be the most changeable of the three variables while turnout time was determined to be fairly inflexible. Travel time is primarily dependent upon fire station locations (Hardiman, 1994). This statement of turnout times being fixed or inflexible is in stark contrast to Dawson; the reflex time (turnout time) is the only segment of the total response time that is completely under the control of an emergency response organization and its personnel (Dawson, 1999).

Any fire department interested in decreasing turnout time should study the routine activities of fire department personnel and how these activities affect turnout time. Scheduled company activities such as code enforcement inspections, public education presentations, or target hazard tours will all impact turnout times (Stauber, 2003).

Paid fire departments must base station design assumptions on firefighters and EMT's will be responding from the dayroom, offices, or sleeping quarters to the apparatus. This should dictate the facility layout in terms of accessibility to the apparatus area (FEMA, 1997). An efficient layout of space is the most critical element of a fire station. Time is of the essence in responding to emergencies, and a good layout will minimize response times (Coleman, 2003). Many other sources were located supporting the importance of fire station design and the impact efficient layouts can have on turnout time and total response times (Stauber, 2003; Mesagna & Batoni, 1991; Elliott, 1999).

Fire station design specifications should give primary consideration to firefighter safety: proper walking surfaces and the minimization of stairs and fire poles should be communicated to architects (Granito, 2002).

Turnout times will be longer for fire calls when firefighters are required to don turnouts, and at night when firefighters are responding from sleeping quarters (Pendleton, 1999). Not much information could be found on the turnout step of response times (Pendleton, 1999).

The problem with using average response times, they don't reveal the shortest or longest response time and clearly 50% of the calls may have taken longer than the average. Statistically, an average is only one measurement of a central tendency (Coleman, 2001).

The speed at which response personnel travel to their vehicles will have an impact on turnout time. Typical walking speed is defined as 1.5 meters per second (4.9212 feet per second) (Wong, 2003). A casual stroll is measured at approximately 3 feet per second as compared to a brisk walk which is measured at approximately 6 feet per second (Cory, Meador, Ross, 2000).

A few seconds don't seem like a long time unless you're holding your breath. We can never make up those missing seconds, so we need to do everything possible to eliminate them from our response system (Coleman, 2003).

An employee's state of readiness can be impacted by their physical well being. Extended periods without sleep, periods of interrupted sleep, and working against the body's sleep/wake cycle can all negatively impact performance (Windmar, 2003). When

personnel are suddenly awakened from a deep sleep, they may experience sleep inertia, a state of confusion, and diminished performance.

Research suggests that emergency response personnel can temporarily overcome fatigue on critical calls, but not as much on routine calls. Regardless of schedule, alertness and performance both suffer when personnel are working during the normal hours the body wants to sleep (Windmar, 2003). Several studies of shift workers have focused on the health consequences of sleep deprivation resulting from working 24-hour shifts (Cody, 2001).

The call type may impact turnout time. When firefighters are sent to non-emergency calls, they probably don't rush to get on the fire apparatus. Factoring these calls into the average response time will have an effect on the average (Coleman, 2001). If employees are dissatisfied with one or more aspects of the work, their ability to respond positively to motivating potential of the job diminishes (Champion, 1993). The Job Characteristics Theory proposes that high employee satisfaction, high performance, and high motivation are present if the employee experiences meaningful work, has responsibility for the outcomes, and gains feedback on results of efforts (Champion, 1993).

Katzenbach discusses several key elements to achieving high levels of employee performance. He believes clear performance standards, an obvious relationship between work and pay, and discipline established within the work force are all vital to success (Katzenbach, 2000).

Procedures

The initial research for this project began while on campus of the National Fire Academy located in Emmitsburg, Maryland during September 2003. An electronic search of Learning Resource Center's (LRC) reference material revealed very few sources under a query limited to "turnout time". Only one EFO Applied Research Project was found which 'turnout time' was included in the title. Fire Chief Jeff Stauber completed the only in-depth study of emergency response turnout times that could be found at the LRC. His ARP was published in March 2003. Several other EFO papers included the term 'turnout time' in the abstract. These papers were investigating response times and only provided a brief discussion on turnout times. The electronic search at the LRC was expanded to include; response time, fire station design, and turnout time. Additional reference sources were identified.

Additional research was conducted on the impact of fire station design on turnout time from October 2003-January 2004. This research included internet searches using the Goggle search engine (www.google.com) and a search of reference books available in the CCFD#1 library.

On November 30th, 2003, 114 surveys were delivered via department mail to the 12 Clackamas Fire career station captains. Each captain was given a description of the request and asked to have the career employees assigned to their station complete the anonymous survey and return it to the author through department mail. 117 career shift employees were present on the payroll at this time. Three employees were assigned as floaters and difficult to account for. It is unknown if these three employees participated in the survey.

The surveys immediately began returning through departmental mail. The results were computed the last week of December as surveys had stopped being returned. A summary of the 52 surveys received was prepared for analysis.

The Oregon Fire Chief's Association (OFCA) *Fire Agencies Member Handbook* was used as a source to identify Oregon fire departments to include in this survey. This directory lists a total of 350 fire agencies in Oregon. The intent was to survey only organizations with one or more career firefighters. Listings identifying themselves as all volunteer agencies were not considered. The Oregon State Fire Fighters Council web site, (osffc.org/memberslocals.htm) was used to identify the 54 Oregon unionized fire departments. Using the author's knowledge of fire organizations within the state of Oregon in conjunction with information provided from both sources mentioned above, 85 Oregon Fire Chiefs were mailed surveys. A self-addressed, stamped return envelop was included with an explanation of the request.

Forty three fire chiefs or their designees returned the completed surveys. Although the intent was to gather information from all Oregon Fire Departments with one or more career firefighters, it is possible that an all volunteer agency was surveyed and that an agency with career firefighters was excluded from an opportunity to participate in this survey.

On December 4, 2003, Marybeth McGee and I meet with Gerry Wiese at C-COM (Clackamas County Communications) to discuss turnout time data. C-COM is the major dispatch center for Clackamas County and dispatches for nine fire agencies and seven police agencies. Gerry Wiese is the communications data system coordinator at C-COM.

Marybeth McGee is currently assigned to the Clackamas Fire Human Resources Division and has the knowledge and skills to manipulate data provided from C-COM. The purpose of this meeting was to confirm the data being analyzed was indeed turnout time as defined by the Oregon Deployment Standard definition.

The following points were defined at this meeting:

1. The beginning of the turnout time interval is initiated by the first alerting tone sent out by the CAD. During a series of tones for a structural response, all unit turnout times begin with the first tone. Gerry estimates this possible time discrepancy as maximum of 8 seconds.
2. The end of the turnout time interval is initiated by the officer pushing the 'RESP' button on the MDC or the dispatcher manually entering the time following radio transmission for any unit without MDC service.
3. The raw data provided from C-COM contains many data points. The data points assumed to represent the turnout time interval were confirmed.
4. We also confirmed the ability of C-COM to deliver monthly reports formatted to our response time and turnout time needs. No turnout time reports had been developed to date for CCFD#1 or any other agency in the county.
5. The C-COM raw data contains alarms with a zero turnout time. These incidents were determined to occur when units arrived on scene without being dispatched or units canceled prior to responding.

An additional follow-up phone interview with Gerry Wiese was conducted on January 20, 2004 to confirm the following points:

1. C-Com uses a Tiburon Computer Aided Dispatch (CAD) program which now includes a CAD Activity Report System (CARS). The ability of the CAD to provide users with standard useful reports is relatively new. Gerry has the ability to provide regular monthly data in a user customized format if so needed.
2. Gerry was asked what methods of turnout time reporting may work best. We discussed tracking by officer, tracking by station, tracking by shift and station. Gerry believes he can produce a report identifying turnout time performance sorted by unit and shift. The idea of tracking by officer logged onto the MDC was ruled out because he believes not all employees log onto the MDC each day.

Between December 8th, 2003 and December 17th, 2003 the author collected measurements from each of the 12 career staffed Clackamas fire stations. The measurements identified the travel distances from the approximate center of each normally occupied room in the station, to the officer's door of the primary response apparatus in the apparatus bay. All distances were measured using a Rolatape model 400. All travel distances were rounded to the nearest foot. To account for changes in elevation, the number of stairs treads and the length of fire poles were also measured in the multi-story fire stations. Fire poles were measured from the floor of the lower landing area to floor of the upper landing. These measurements were rounded to the nearest inch.

Turnout travel distances were converted to time measurements for each room at each fire station. These station room travel times were weighted based upon Clackamas Fire survey results establishing number of hours spent in each room of the fire station. The weighted time results were summed and thus creating a systematic approach to rate each

fire station as to its efficiency in design for crew turnout solely for comparison. The fire station rating system separates rooms typically occupied during night time hours (2200-0700) to provide consistency with the CCFD#1 Strategic Plan goals.

On December 18th, 2003, the company officer on duty at Station 3 was asked to assign two employees from his crew to assist with time trails. One Probationary Firefighter, and one Apparatus Operator, the two least senior employees working at this station on this day were assigned to assist. Using a Rolatape model 400, I established the distance between two yellow traffic lines on the apparatus bay floor as 16'. The employees were instructed the purpose of the time trials was to determine the speed an average firefighter travels when moving toward their apparatus, when responding to an emergency. Participants were advised, "Running is not allowed" and the term 'brisk walk' was used to describe the desired pace. Each employee was wearing typical station uniform attire and work boots. They were positioned approximately five feet prior to the first line and instructed to begin walking at their normal response pace. Using a Sportline digital stopwatch, I recorded the travel time beginning when the plane of the first line was broken and ending when the second line was crossed. Each employee completed this task 5 times. The ten collected travel times were averaged and divided by the travel distance to establish a speed of travel per foot of distance.

The same two Station 3 employees were also asked to assist with Personal Protective Equipment (PPE) time trials. Each employee was asked to demonstrate, again at typical response speed, the following PPE and mounting apparatus tasks:

1. EMS call – no coat or traffic vest donned
2. MVA call- Turnouts & safety vest donned

3. Structure fire – Turnouts & SCBA donned
4. Wildland call – Wildland PPE donned

Both employees completed the above tasks five times each. Employees were instructed to complete whatever tasks and don whatever PPE they would normally use for the specified call type. A Sportline digital stop watch was used to collect time data. Time began with the employees standing near the officer's door of Engine 3. Time stopped after the employee was seated and seat belted in either the jump seat or officer's seat wearing the appropriate PPE for the assigned task. It should be noted that significant differences were noted in the tasks completed and PPE donned during these time trials.

On December 18th, 2003, the on-duty employees at Station 1 were asked to assist with time trials involving a fire pole slide. All participants were instructed to slide the pole as though they were responding to a typical incident. Using a Sportline digital stopwatch I timed 5 different employees sliding a fire pole two times each. Each firefighter began by standing on the upper landing. As the employee began to reach for the fire pole the time started. The time was stopped when the employee reached the bottom of the fire pole and their foot made contact with the concrete floor following the first step away from the fire pole. These ten time trials were averaged to determine an average time for the employees involved to complete a fire pole slide. Further, using this established pole speed, a time was calculated for each fire pole in the district using the specific length of each pole.

Also on Dec 18th 2003, the same Station 1 employees were asked to assist with a stair tread time trial. Using a Sportline digital stopwatch, I collected times required to descend 13 stairs. The employees were asked to stand on the top landing of a 13 step

straight stairway. They were instructed to simulate the speed they would normally descend the stairs when responding to an emergency. Each of the five employees descended the stairs twice. The time began when the first employee's foot touched the first stair tread below the landing, and stopped when the employees first foot reached the lower landing. The times collected were averaged to determine the average time required to descend stairs. Further, the average time was divided into 13 to determine the time per stair tread. The employees used in these time trials were all familiar with Station 1 and had prior experience responding to alarms from this facility.

Results

Research Question #1: What standards include turnout time as a measurement component of total emergency response time?

The following documents were identified as impacting the establishment of fire service industry standards and goals for emergency response turnout time in Oregon:

1. Oregon Deployment Standard – OFCA/OFDDA
2. Commission on Fire Accreditation International
3. National Fire Protection Agency – NPFA 1710
4. Department adopted policy

Here is a summary of the information received from the 43 respondents from the Oregon Career Fire Service Survey:

Survey Question: What national or local standards were used to develop established turnout time goals?

- 22 agencies responded they had established turnout time goals?
- 14 of these agencies used past data or local standards to establish their goals.

- 7 agencies did not use an established standard when developing their goals.
- 3 agencies referred to the Oregon Deployment Standard
- 2 agencies refer to the CFAI model
- 2 agencies referred to NFPA 1710, National Fire Protection Agency

Survey Question: What are your established unit turnout time goals?

Established turnout time goals ranged from 45 seconds to 9.5 minutes. All times over 3 minutes were removed from consideration because it was assumed these were from all volunteer agencies or agencies requiring volunteers to respond from their residences prior to emergency response being initiated.

20 responses identified daytime turnout time goals with times ranging from 45 seconds to 120 seconds. The averaged daytime turnout time from respondents was 83.25 seconds.

19 responses identified night time turnout goals with times ranging from 60 seconds to 120 seconds. One respondent simple stated ASAP. The averaged night time turnout time goal from respondents was 95.52 seconds.

Survey Question: Does your department have an accurate method to measure unit turnout times? Explain.

24 respondents indicated that their agency has an accurate method to capture turnout time data. Many of these respondents did not include an explanation to determine what method they considered accurate. One respondent did include the following explanation: " Yes, CAD time stamps dispatch time when station Z-Tron activation – Electric eye at door of apparatus"

18 respondents indicated that their agency currently has no accurate method to capture turnout time data. Many of these responses included an explanation of dispatchers being required to manually enter time after radio transmissions.

Research Question #2: What are the current CCFD#1 emergency response turnout times?

In July 2003, CCFD#1 crews averaged a 1 minute 7 seconds daytime turnout time. Department wide, we met our established goal of 60 seconds 53.3 percent of the time in July. In August 2003, CCFD#1 crews averaged a 1 minute 3 seconds daytime turnout time. We met our established goal of 60 seconds 57 percent of the time in August.

In July 2003, CCFD#1 crews averaged a 1 minute 39 seconds nighttime turnout time. We met our established goal of 90 seconds 46.6 percent of the time in July. In August 2003, CCFD#1 crews averaged a 1 minute 33 seconds nighttime turnout time. We met our established goal of 90 seconds 51 percent of the time in August. See Tables #1 and #2 for detailed information on turnout time performance by station.

Research Question #3: What components or tasks contribute to total turnout time?

This question can be summarized by breaking down turnout time into the following task components: Crew notification, Mapping, Travel to apparatus, Donning PPE, Mounting apparatus, Transmitting enroute status. The following time distance factors were established by conducting time trials:

Walking speed @ .15 foot traveled per second.
Fire pole slide @ .21 foot traveled per second.
Stair treads @ .25 seconds per tread.

Here is a summary of the information received from the 43 respondents from the Oregon Career Fire Service Survey:

Survey Question: What factors impact a crew's total turnout time during an emergency response?

- 13 respondents listed *Time of Day* (awake vs. asleep)
- 12 respondents listed *donning PPE* (design, location, outside temperature)
- 9 respondents listed *call type* (fire vs. medical) and *crew interpretation* of severity
- 7 respondents listed *fire station design* and/or distance to apparatus
- 6 respondents listed *activity involved in* (shower, training, hose testing, mowing lawn)
- 4 respondents listed *multiple alarms*
- 4 respondents listed *communication notification system design and equipment*
- 3 respondents listed *switching vehicles* due to response type
- 2 respondents listed *mapping* and confirmation of alarm location

The following responses were provided by only one respondent:

- Employee training or education
- Preparation of apparatus for response
- Apparatus bay doors auto open at tap out
- Remote door closers provided in apparatus cabs

Here is a summary of the information received from the 52 respondents from the Clackamas Fire Career Firefighter Survey:

Survey Question: What factors impact a crew's total turnout time during an emergency response?

- 30 respondents indicated being involved in an activity in or out of the station

- 15 respondents indicated being involved in a training activity
- 12 Respondents indicated distance to apparatus (PR event, Inspections, shopping)
- 25 respondents noted being asleep (night time responses)
- 20 respondents noted being caught in the shower
- 19 respondents noted Fire Station design
- 19 respondents indicated FMZ familiarity, the need to look at wall map, mapping
- 14 respondents noted Dispatch error (No voice) or sound quality of dispatch info
- 13 respondents indicated employee attitude or motivation was a key factor
- 13 respondents indicated being caught on the toilet
- 11 respondents indicated donning PPE
- 11 respondents noted call type (structure fire vs. medical call)
- 9 respondents noted prior turnout gear preparation
- 9 respondents indicated MDC not capturing due to reception issues
- 3 respondents indicated fitness workouts
- 3 respondents indicated waiting for a slow apparatus bay door to open
- 3 respondents noted age of employee
- 3 respondents noted other employees donning uniform at night or during PT
- 2 respondents indicated crew not monitoring tap out frequency
- 2 respondents noted donning seatbelts and safety vests
- 1 respondent indicated apparatus malfunctions
- 1 respondent indicated switching apparatus (Swing Company)

Survey Question: Please list the estimated number of hours you spend in each of the listed rooms of an assigned CCFD#1 fire station during a typical 24 hour duty shift.

According to 52 respondents, here is where average CCFD#1 suppression personnel spend their time during a typical shift while in a fire station:

Fire Station Room/Area	Number of hours per shift
Dormitory	7.27 hours
Line Office	3.57 hours
Apparatus room	2.41 hours
Kitchen/Dinning room	2.34 hours
Day room	2.12 hours
Workout room	1.0 hour
Men's locker room	51 minutes
Workshop	34 minutes
Laundry room	20 minutes
Women's locker room	4.3 minutes
Public Meeting room	1.2 minutes

Appendix A compares CCFD#1 fire station design efficiency based upon travel distance/time to primary apparatus and the amount of time crew members spend in each room.

Research Question #4: What changes should be made to current practices to reduce turnout time? Here is a summary of the information received from the 43 respondents from the Oregon Career Fire Service Survey:

Survey Question: What innovations or changes have you made to reduce turnout times in your organization?

- 20 respondents indicated no efforts had been made to improve times.

- 4 organizations indicated *additional personnel* had been hired .
- 4 respondents indicated that *MDC's* had been installed
- 4 respondents listed Using *voice pre-alerts and alpha numeric pagers*
- 3 respondents listed *training*
- 2 respondents mentioned *making employees aware* of turnout times and monthly summary reports delivered to Station Captains
- 2 respondents listed the importance of *turnout gear location*
- 2 respondents mentioned *type of PPE selected by Employer* (Zippered boot vs. laced)
- 2 respondent listed *location of station printers*

  Each subject was listed by only a single respondent:

  - Changing pager activation sequence
  - Reduce number of tones
  - Encourage Employees to hustle – Organizational culture
  - Park apparatus pointed out
  - Standardization of apparatus fleet
  - Improve communications equipment
  - Maps installed on MDC
  - More efficient paths to apparatus

Here is a summary of the information received from the 52 respondents from the Clackamas Fire Career Firefighter Survey:

Survey Question: What changes could Clackamas County Fire District #1 implement to improve turnout time?

- 18 respondents noted improved fire station design

- 11 respondents indicated monitor tap out and/or working frequencies
- 7 respondents noted distributing turnout times by station and shift
- 7 respondents noted area familiarity/map familiarity
- 7 respondents indicated limiting station personnel rotations
- 5 respondents noted increased dispatch efficiency
- 5 respondents noted a need for employee motivation
- 4 respondents indicated an employee incentive program
- 4 respondents indicated allowing employees to run to the apparatus
- 4 respondents noted improved PA systems in the fire stations
- 4 respondents indicated a need for improved reception for MDCs
- 3 respondents indicated a quicker night time uniform (Coveralls or bunker pants near bed)
- 2 respondents indicated reducing inspection activities
- 2 respondents noted better design of PPE
- 2 respondents noted restricting EE during shift change calls unless gear is ready

Each subject was listed by only a single respondent:

- Apparatus placement in bay
- Bay door open at tone out
- Remove pre-alert
- Require zipper boots or slip on boots
- Install slides rather than fire poles
- Brush swing companies not take turnouts to brush fires

Discussion

One critical component of response time is turnout time (Jones, 2003). Dawson 1999, elaborates that turnout time is the only segment of the total response time completely under a fire department's control. Hardiman 1994, describes turnout times as "fairly inflexible". Dawson's comments more closely represent my understanding of the turnout time interval. Many organizational or individual decisions have negative impact on turnout times each day. Not properly preparing your PPE at the beginning of shift, not being in uniform at 0730, not requesting a move-up company or reserve vehicle before removing all the hose for hose testing, all have impact on turnout times. Company officers must daily anticipate the delays in response for each activity and seek methods to limit or mitigate these reductions in service levels. It also must be acknowledged that some scheduled crew activities may result in slight response delays. These activities pay dividends in other arenas such as the value of target hazard walk through with respect to firefighter safety. This risk vs. benefit awareness is a vital part of a company officer's responsibility.

The fire service is constantly adapting to external pressures. Many factors have impacted fire station design in the past few decades. The America's with Disabilities Act of 1990, recognized hazards associated with diesel exhaust, local zoning and land use changes, more community involvement in facility planning, the concept of shared facilities, including law enforcement offices and public meeting rooms, and the issue of security or potential terrorism have all had an impact on fire station design. The "superstation" concept, where a single building houses more than a fire station is a trend which is expanding (Elliot, 1999).

In general, fire stations being built today may be stereo typed as occupying more square footage than those built many years ago. This trend may equate to longer travel distances to apparatus thus longer turnout times.

I expected to establish a relationship between fire station design and turnout time performance within Clackamas Fire. Reviewing the data, I documented just the opposite in the July 2003 data review. Our Beavercreek Fire Station was built in 2002. This facility has absolutely the shortest night time travel distance to the apparatus as compared to any other facility. Beavercreek's time/distance/weighted score was half that of the next closest station's score for night time responses. Yet, Beavercreek's average night time turnout time is the longest in the fire district and ranked 12 of 12. In addition, the Holcomb Fire Station was rated as the overall most efficiently designed fire station but it ranked 12 of 12 with regard to daytime turnout times.

Chief Jeff Stauber's research into the components of turnout time was the only in-depth study of this subject I could locate. The age and design of fire stations may play a significant role in determining the length of time personnel need to reach the apparatus. (Stauber, 2003) Fire station design may have an impact on turnout time. This research has shown that it does represent the direct relationship which may be anticipated. Chief Stauber also identifies proper preparation and attitudes are the primary elements that affect turnout times (Stauber, 2003). This research may more closely support this assumption. There are many components that impact turnout times. Many such issues were collected during the Oregon Fire Chief survey and the Clackamas Fire survey. Each represents a potential for delays and many are difficult to collect accurate data due to inconsistencies. Clackamas Fire PPE and vehicle mounting were an example of this

difficulty. Not all apparatus in the fire district is standardized. Not all PPE is standardized. Not all employees approach “appropriate PPE” in the same manner. Chief Stauber, established PPE donning times for Green Bay Fire. Too many variables were identified with observations of the first two employees to establish any such usable data at Clackamas Fire.

Several major flaws continue to be present in the Clackamas Fire data collection methods. The turnout time interval as currently measured is the period of time actually measured. The time begins at the first station tone being transmitted from the CAD. Up to an 8 second delay can be recorded during a long string of tones used for a commercial structure fire response. This inaccuracy can be downplayed because structure fire responses represent a small portion of the total number of responses any unit responds to in a given month.

A second issue of concern is the lack of consistency when the company officer pushes the ‘RESP’ button. Since the end of the turnout time interval is determined when this task is complete, it becomes critical to the accuracy of the data. One officer may push the button and then don his turnouts before entering the apparatus cab, while another officer waits until the vehicle has begins to roll out the door. These discrepancies in the ending point of this interval seem to represent a major flaw.

The third issue concerning the reliability of the data is the ability of the CAD to receive the MDC ‘RESP’ transmission on the first attempt. Nine of fifty two CCFD#1 company officers (17 %) surveyed, reported MDC not capturing due to reception issues as a cause for delays. This again can have a significant impact on the turnout time interval.

Recommendations

1. Clackamas Fire should clearly define the expectations for all personnel with regard to turnout time. Response personnel shall immediately discontinue current activities and briskly walk to apparatus. Clear direction identifying when the RESP button is to be pushed is also needed. I recommend using the Oregon Deployment Standard language with regard to the definition of turnout time.
2. Include crew turnout time as a comment area on all annual company officer performance appraisals. This will cause battalion chiefs to review this information annually with their subordinates.
3. Crew notification is an important component of turnout time. Providing a voice pager and requiring each shift employee to wear it will help in this area. Providing a VHF/800 MHz scanner for each station dayroom will also reduce turnout time.
4. Mapping can have significant impact on turnout time if crews are not familiar with the address they are dispatched to. Regular map drills and driving tours of the response area will decrease the mapping component. An automated mapping program integrated into the MDC will also reduce the required mapping time.
5. Travel distances to apparatus should be considered daily. Parking the primary apparatus in the closest bay to the living quarters should be required, unless safety considerations prevent it. When conducting target hazard tours, inspections, PR events, and daily grocery shopping officers, should consider the distance crews will be from their apparatus and minimize this whenever possible.

6. Future fire station design should give consideration to turnout time efficiency based upon where personnel spend their time in the building.
7. Personal protective equipment design can have a significant impact on turnout time. (zippered boots vs. laced boots) Speed of donning should be a consideration in the R & D process when selecting uniform and PPE items in the future.
8. Additional research is needed into the issue of inadequate MDC capture caused by poor reception. Additional equipment may be needed to correct this problem.
9. All of the above recommendations can be described as solutions to a technical problem. The impact of attitude and motivation can not be over emphasized in turnout time performance. Employee motivation may be considered an adaptive challenge. A standardized turnout time report should be produced and distributed quarterly, to confirm the importance of this segment of response time. The report should be separated by station, shift, and day time/night time. This sharing of information alone may create some competition amongst crews and stations, which should be healthy and productive. Some method of recognizing top performers could be developed to further emphasizing the importance. Motivated employees will develop methods to reduce turnout times not anticipated.
10. Future researchers may want to investigate the percentage of employee usage of stairs, fire poles, or slides during emergency responses.
11. Minimal information is available on the turnout time interval for emergency response crews. Additional research in this area will increase the professionalism of our field and help future leaders to better understand this component of the response system.

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Table 1

CLACKAMAS FIRE TURNOUT DATA JULY 2003

Rank	Station #	0700-2200 average turnout time	Median	Daytime Goal reliability
1	8 – Clack	55 sec	52 sec	64%
2	11 – Red	57 sec	62 sec	45%
3	16–Hilltop	58 sec	51 sec	65%
4	1 – T C	58 sec	56 sec	59%
5	5 –Mt S	58 sec	56 sec	60%
6	4 –Lake	1 min 1 sec	57 sec	56%
7	6 – HV	1 min 8 sec	69 sec	38%
8	3 – OL	1 min 9 sec	58 sec	51%
9	2 – Milw	1 min 10 sec	57 sec	56%
10	15 – OC	1 min 16 sec	78 sec	35%
11	10 – BC	1 min 22 sec	77 sec	24%
12	9-Hol	1 min 28 sec	88 sec	8%
		0700-2200 average turnout time		
	District Averages	**1 min 7 sec**	**58 sec**	**53.3%**

CLACKAMAS FIRE TURNOUT DATA JULY 2003

Rank	Station #	2200-0700 average turnout time	Median	Nighttime Goal reliability
1	11 – Red	1 min 25 sec	84 sec	64%
2	16–Hilltop	1 min 25 sec	93 sec	45%
3	1 – T C	1 min 27 sec	87 sec	57%
4	4 –Lake	1 min 27 sec	85 sec	55%
5	5 –Mt S	1 min 28 sec	81 sec	63%
6	3 – OL	1 min 32 sec	92 sec	48%
7	8 – Clack	1 min 38 sec	101 sec	32%
8	2 – Milw	1 min 40 sec	90 sec	51%
9	9 – Hol	1 min 40 sec	113 sec	25%
10	15 – OC	1 min 44 sec	99 sec	39%
11	6 – HV	2 min 10 sec	116 sec	27%
12	10 – BC	2 min 13 sec	120 sec	14%
		2200-0700 average turnout time		
	District Averages	**1 min 39 sec**	**93 sec**	**46.6%**

Table 2

CLACKAMAS FIRE TURNOUT DATA AUGUST 2003

Rank	Station #	0700-2200 average turnout time	Median	Daytime Goal reliability
1	16–Hilltop	53 sec	45 sec	66%
2	1 – T C	54 sec	51 sec	68%
3	4 –Lake	56 sec	56 sec	59%
4	3 – OL	57 sec	51 sec	66%
5	5 –Mt S	59 sec	63 sec	49%
6	8 – Clack	1 min 4 sec	56 sec	61%
7	10 – BC	1 min 5 sec	64 sec	43%
8	2 – Milw	1 min 8 sec	59 sec	51%
9	6 – HV	1 min 9 sec	63 sec	44%
10	11 – Red	1 min 10 sec	67 sec	72%
11	9 - Hol	1 min 11sec	71 sec	47%
12	15 – OC	1 min 13 sec	69 sec	40%
		0700-2200 average turnout time		
	District Averages	**1 min 3 sec**	**56 sec**	**57%**

CLACKAMAS FIRE TURNOUT DATA AUGUST 2003

Rank	Station #	2200-0700 average turnout time	Median	Nighttime Goal reliability
1	5 –Mt S	1 min 16 sec	67 sec	56%
2	4 –Lake	1 min 18 sec	81 sec	63%
3	16–Hilltop	1 min 20 sec	78 sec	64%
4	8 – Clack	1 min 29 sec	90 sec	52%
5	3 – OL	1 min 30 sec	85 sec	56%
6	9 – Hol	1 min 30 sec	72 sec	33%
7	1 – T C	1 min 30 sec	92 sec	48%
8	11 – Red	1 min 34 sec	67 sec	72%
9	2 – Milw	1 min 34 sec	85 sec	55%
10	10 – BC	1 min 49 sec	1O2 sec	25%
11	15 – OC	1 min 53 sec	115 sec	28%
12	6 – HV	1 min 53 sec	115 sec	18%
		2200-0700 average turnout time		
	District Averages	**1 min 33 sec**	**89 sec**	**51%**

Table 3

Fractile Distribution Report
Turnout times July 2003 (0700-2200 hrs)

Turnout time	Number	Percent	Cumulative Percent
<= 0m59s	481	52.11 %	52.11 %
<= 1m59s	406	43.98 %	96.09 %
<= 2m59s	25	2.70 %	98.79 %
<= 3m59s	5	.54 %	99.33 %
<= 4m59s	3	.32 %	99.65 %
<= 5m59s	2	.21 %	99.86 %
<= 6m59s	1	.10 %	100 %
Total	923	100 %	

Turnout times July 2003 (2200- 0700 hrs)

Turnout time	Number	Percent	Cumulative Percent
<= 0m59s	65	20.18 %	20.18 %
<= 1m59s	188	58.38 %	78.56 %
<= 2m59s	59	18.32 %	96.88 %
<= 3m59s	6	1.86 %	98.74 %
<= 4m59s	2	.62 %	99.36 %
<= 5m59s	1	.31 %	99.67 %
<= 6m59s	1	.31 %	100 %
Total	322	100 %	

Turnout times August (0700-2200 hrs)

Turnout time	Number	Percent	Cumulative Percent
<= 0m59s	441	56.03 %	56.03 %
<= 1m59s	313	39.77 %	95.80 %
<= 2m59s	27	3.43 %	99.23 %
<= 3m59s	4	.51 %	99.74 %
<= 4m59s	1	.13 %	99.87 %
<= 9m59s	1	.13 %	100 %
Total	787	100 %	

Turnout times August 2003 (2200- 0700 hrs)

Turnout time	Number	Percent	Cumulative Percent
<= 0m59s	41	16.08 %	16.08 %
<= 1m59s	157	61.57 %	77.65 %
<= 2m59s	55	21.57 %	99.22 %
<= 3m59s	2	.78 %	100.00 %
Total	255	100.00 %	

Appendix A CLACKAMAS COUNTY FIRE DISTRICT #1

OVERALL STATION DESIGN FOR TURNOUT TIME RATING

Rank	Station #	Station	Day time	Night time	Overall score
1	9	Holcomb	71.86	78.52	150.38
2	16	Hilltop OC	99.15	79.61	178.76
3	8	Clackamas	100.59	82.88	183.47
4	10	Beavercreek	165.34	45.80	211.14
5	11	Redland	137.80	109.05	246.85
6	17	South End	168.28	87.24	255.52
7	5	Mt Scott	148.30	110.72	259.02
8	4	Lake Road	160.44	100.91	261.35
9	6	Happy Valley	167.91	104.69	272.60
10	1	Town Center	204.79	105.92	310.71
11	3	Oak Lodge	196.37	138.49	334.86
12	15	Oregon City	209.80	141.55	351.35
13	2	Milwaukie	199.20	156.07	355.27

DAY TIME STATION TURNOUT TIME DESIGN RATING

Rank	Station #	Station	Day time	Night time	Overall score
1	9	Holcomb	71.86	78.52	150.38
2	16	Hilltop OC	99.15	79.61	178.76
3	8	Clackamas	100.59	82.88	183.47
4	11	Redland	137.80	109.05	246.85
5	5	Mt Scott	148.30	110.72	259.02
6	4	Lake Road	160.44	100.91	261.35
7	10	Beavercreek	165.34	45.80	211.14
8	6	Happy Valley	167.91	104.69	272.60
9	17	South End	168.28	87.24	255.52
10	3	Oak Lodge	196.37	138.49	334.86
11	2	Milwaukie	199.20	156.07	355.27
12	1	Town Center	204.79	105.92	310.71
13	15	Oregon City	209.80	141.55	351.35

NIGHT TIME STATION TURNOUT TIME DESIGN RATING

Rank	Station #	Station	Day time	Night time	Overall score
1	10	Beavercreek	165.34	45.80	211.14
2	9	Holcomb	71.86	78.52	150.38
3	16	Hilltop OC	99.15	79.61	246.85
4	8	Clackamas	100.59	82.88	183.47
5	17	South End	168.28	87.24	255.52
6	4	Lake Road	160.44	100.91	261.35
7	6	Happy Valley	167.91	104.69	272.60
8	1	Town Center	204.79	105.92	310.71
9	11	Redland	137.80	109.05	178.76
10	5	Mt Scott	148.30	110.72	259.02
11	3	Oak Lodge	196.37	138.49	334.86
12	15	Oregon City	209.80	141.55	351.35
13	2	Milwaukie	199.20	156.07	355.27

- Station rating scores are based upon travel distance/time to primary apparatus officer's door and then weighted by average time spent in each room of the fire station.

Appendix B

SAMPLE EFFICIENCY RATING FORM
CLACKAMAS COUNTY FIRE DISTRICT #1
CAREER FIRE STATION DESIGN TURNOUT TIME DATA FORM

FIRE STATION **Town Center Station #1** **DATE** **12-10-03**

DATA COLLECTOR **S. Weninger**

FIRE STATION ROOM	DISTANCE TO APPARATUS	FIRE POLE Ft	STAIRS # treads	TOTAL Time to arrive at apparatus	Hours spent in room	Room efficiency rating
Dayroom	111' x .15	12.0 x .21	0 x.25	19.07 sec	2.12	40.43
Kitchen/ Dinning room	153' x .15	12.0 x .21	0 x.25	25.52	2.34	59.72
Men's Locker Room	81' x .15	12.0 x .21	0 x.25	14.72	.085	12.51
Women's Locker Room	90' x .15	12.0 x .21	0 x.25	16.07	0.073	1.17
Line Office	97' x .15	12.0 x .21	0 x.25	17.12	3.57	61.12
Workshop	50' x .15	0	0 x.25	7.5	0.57	4.27
Laundry room	125' x .15	12.0 x .21	0 x.25	21.32	0.34	7.25
Workout room	105' x .15	12.0 x .21	0 x.25	18.32	1.0	18.32
Total daytime efficiency rating						**204.79**
Dormitory	80' x .15	12.0 x .21	0 x.25	14.57	7.27	105.92
Total nighttime efficiency rating						**105.92**

- **All measurements will begin at the approximate middle of each room listed and end at the driver's officer's door of the primary response apparatus.**
- **All measurements will be based in feet rounded to the nearest foot. (less than 6" dropped, more than 6" rounded up)**
- **If a fire pole is present, the fire pole route will be used for measurement as the primary route. Fire poles will be measured from upper floor to lower floor.**
- **Stair treads will be counted, stair landings will be measured as feet traveled.**
- **Distance/time factors used:**
    - **Walking speed calculated @ .15 foot traveled per second.**
    - **Fire pole slide calculated @ .21 foot traveled per second.**
    - **Stair treads calculated @ .25 seconds per tread.**