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Quantitative Evaluation of Fire and EMS Mobilization Times

Springer

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Foreword

The ability of emergency response agencies to get personnel and equipment to the scene of an emergency in a timely manner is critical. This involves effective *alarm handling time* and *turnout time*. However, comprehensive data on emergency first responder alarm handling and turnout time is largely absent from the published literature.

Alarm handling time and turnout time are specific measurable segments of the overall *mobilization time* of emergency response units (along with *initiation time* and *travel time*). This study focuses on mobilization times involving alarm handling and turnout, i.e., the measureable time interval from call receipt at a public safety answering point until the first assigned emergency response unit is physically en route to the emergency.

Operational benchmarks for alarm handling and resource turnout would be greatly enhanced with strong empirical validation, and this information is of direct interest to the following four NFPA standards that address certain aspects of this topic: NFPA 450, *Emergency Medical Services and Systems*; NFPA 1221, *Public Fire Service Communications Systems*; NFPA 1710, *Career Fire Department Deployment*; and NFPA 1720, *Volunteer Fire Department Deployment*. It is generally understood that certain factors (e.g., notification methods, facility layout, tasks at time of alarm, etc.) will cause mobilization times to increase or decrease, but the importance and influence of these factors is not well known.

This study provides a quantitative evaluation of fire emergency and EMS mobilization times, and identifies key factors affecting their performance. It provides a statistical analysis of actual fire emergency and EMS alarm handling and turnout times based on data collected across a diverse representative population of North American fire service organizations. The results provide measured data for validation and refinement of requirements provided by nationally recognized standards, and additionally indicates the most significant and variable factors (e.g., difference in daytime and nighttime events).

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The content, opinions, and conclusions contained in this report are solely those of the authors.

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National Fire Protection Association

Preface

Comprehensive data on fire emergency and EMS call processing and turnout time is largely absent from the published literature. Operational benchmarks for *alarm handling time* and *turnout time* specified in the NFPA peer consensus standards 1221 and 1710, respectively, would be greatly enhanced with strong empirical validation. This study presents a clear statistical picture of actual recorded *alarm handling times* and *turnout times* for fire and EMS emergencies across a group of large fire departments. Additionally, the study identifies some significant factors that affect variation in *alarm handling times* and *turnout times* in those departments. These results provide an objective basis for further development of the relevant codes and standards as well as contributing critical information for fire chiefs and other government decision makers tasked with optimum deployment of emergency response facilities (ERFs) and emergency response units (ERUs).

(i) The actual recorded *alarm handling times*, provided to this study from a group of large fire departments, were compiled, statistically analyzed, and compared to the target alarm handling times given in NFPA 1221. Results demonstrated that:

- For both fire and EMS calls, the mean average alarm handling times observed fell well within the current 60 s benchmark.
- For approximately 80 % of the fire and EMS calls, alarm handling was completed in the required 60 s or less.
- Eighty percent of calls processed in 60 s or less fall below the 90 % targeted in the standard.
- The time required for alarm handling of 90 % of the calls was 92 s for fire (slightly over one and one-half times the standard) and 84 s for EMS (slightly less than one and one-half times the standard).
- A second benchmark, which targets 90 s to process 99 % of the calls, is set in the standard. At an elapsed time of 90 s, approximately 90 % of the calls were processed rather than the 99 % required. Given the observed distribution of alarm handling times, where a very long tail is observed, the 99 % criterion

may not be particularly useful for benchmarking. A long tail is observed in the distribution, representing long alarm handling times for a certain fraction of the fire and EMS calls.

(ii) The actual recorded *turnout times*, provided to this study from a group of large fire departments, were compiled, statistically analyzed, and compared to the target alarm handling times given in NFPA 1710.

- For both fire and EMS calls, the mean average turnout times observed fell well within their respective current benchmarks; 80 s for fire and 60 s for EMS.

– For approximately 60 % of the fire calls, turnout was completed in the required 80 s or less.
– For approximately 54 % of the EMS calls, turnout was completed in the required 60 s or less.

- The time actually required and recorded for turnout of 90 % of the calls was 123 s for fire (slightly over one and one-third times the standard) and 109 s for EMS (slightly more than one and two-thirds times the standard).

(iii) The actual recorded *turnout times*, provided to this study from a group of large fire departments, showed a highly significant difference in *turnout times* between daytime and nighttime hours, a factor not currently addressed in NFPA 1710.

- Turnout times were compared between daytime hours (0600–1800), when crews are presumably at their highest readiness; and nighttime hours (0000–0600), when they are presumably at their lowest readiness.
- For both fire and EMS nighttime calls, the mean average turnout times observed fell well above their current NFPA 1710 benchmarks.

– For only approximately 21 % of the nighttime fire calls, turnout was completed in the required 80 s or less.
– For only approximately 12 % of the nighttime EMS calls, turnout was completed in the required 60 s or less.

- The time required for turnout of 90 % of the nighttime calls was 158 s for fire (just under two times the standard) and 144 s for EMS (slightly more than two- and one-third times the standard).

(iv) The simulated *turnout times* recorded in the Baseline Turnout Exercise, reported from a diverse group of fire departments, exceeded the benchmarks set in NFPA 1710.

- For simulated fire EMS calls, the mean average turnout times observed fell well within their respective current benchmarks: 80 s.

– For approximately 80 % of the exercise trials using the "wheels rolling" criterion, turnout was completed in the required 80 s or less.

- For approximately 70 % of the exercise trials using the "crosses sill" criterion, turnout was completed in the required 80 s or less.

- Both percentages of simulated turnouts completed in 80 s or less fall well below the 90 % targeted in the standard.
- The time actually required and recorded for turnout of 90 % of the calls was 86 s for the "wheels rolling" criterion and 96 s for the "crosses sill" criterion.

(v) The Station Layout Data collected indicates that the average station requires as much as twice the travel distance and time to reach the ERU from common station areas as is provided in the Baseline Turnout Exercise.

- Foot travel distance and time to sleeping areas is, on the average, significantly greater than travel distance to any other part of the ERF.
- Foot travel requires 10 s for every 50 feet traveled within the ERF, and stairs more than double that rate.

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Participating Fire Departments

Bainbridge Island Fire Department Bainbridge Island, WA	Lexington Fire Department Lexington, KY
Cary Fire Department Cary, NC	Lincoln Fire and Rescue Lincoln, NE
Chesapeake Fire Department Chesapeake, VA	Orange County Fire and Rescue Orange County, FL
Fairfax County Fire and Rescue Department Fairfax County, VA	Southington Fire Department Southington, CT
Flagstaff Fire Department Flagstaff, AZ	Thornton Fire Department Thornton, CO
Fort Worth Fire Department Fort Worth, TX	Toronto Fire Services Toronto, ON
Green Bay Fire Department Green Bay, WI	Woodland Fire Department Woodland, CA

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