

# Call Prioritization Times for Structure Fires in a Fire Priority Dispatch System

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## Keywords

fire dispatch, structure fire, Call Prioritization Time (CPT), emergency dispatch, Fire Priority Dispatch System™ (FPDS®)

## Citation

Dornseif J, Gardett MI, Scott G, Toxopeus C, Grassi R, VanDyke A, Robinson D, Wiggins T, Daubert L, Hutchison M, Crook S, Sipple K, Kalmbach L, Clawson JJ, Olola CH. Call Prioritization Times for structure fires in a Fire Priority Dispatch System. *Annals of Emergency Dispatch & Response*. 2016;4(2):25-30.

## ABSTRACT

**Introduction:** While Structure Fire is not the most common Chief Complaint handled by Emergency Fire Dispatchers (EFDs), the high death toll and other serious consequences that result make structure fires one of the most important types of calls EFDs handle. The time needed to appropriately and effectively prioritize these calls can be evaluated using a time standard called Call Prioritization Time (CPT). In this study, we evaluate CPT for centers using the Fire Priority Dispatch System (FPDS). **Objectives:** The primary objective in this study was to determine CPT for the FPDS Structure Fire Chief Complaint Protocol and its constituent dispatch priority levels.

**Methods:** This retrospective study involved nine emergency communication centers in the USA, accredited by the International Academies of Emergency Dispatch® (IAED™) as Emergency Fire Dispatch Centers of Excellence. The primary endpoints in this study were the percentage of calls prioritized in 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, and 180 seconds, and the median call prioritization time for each priority level.

**Results:** Overall, a structure fire call was prioritized in a median of 49 seconds. Specifically, ECHO priority-level calls had the fastest median CPT (24 seconds). The difference between prioritizing a DELTA (48 seconds) and a CHARLIE (62 seconds) priority-level call was 14 seconds, with three more questions being processed for the CHARLIE level in those 14 seconds. CPT varied significantly by priority level and specific call type.

**Conclusions:** To date, this study represents the most detailed information available about how long it takes to gather the information needed to prioritize a structure fire call at dispatch, after the address and phone number have been verified, so that the correct fire resources can be sent.

## INTRODUCTION

A residential structure fire is reported in the United States every 85 seconds.<sup>1</sup> While Structure Fire is not the most common Chief Complaint handled by Emergency Fire Dispatchers (EFDs),<sup>2</sup> the high death toll and other serious consequences that often result make structure fires one of the most important types of calls EFDs handle. According to the U.S. Fire Administration (USFA) and the National Fire Protection Association (NFPA) report, in 2013, of the 1,240,000 fires in the U.S., over 487,500 were structure fires, which in total resulted in 2,855 civilian deaths, 14,075 civilian injuries, and \$9.5 billion in property damage.<sup>1</sup>

The time it takes to complete the 911 call prioritization process for structure fires is of great interest to the fire service, since it affects the total response time to an incident, given that the response clock is required to start when the 911 phone line is answered by the EFD. Clearly, getting a fire unit or units to the scene of a structure fire as quickly as possible is a necessity. However, without the critical information gathered during the 911 call prioritization process, fire units will not be dispatched in the

correct response configuration or with complete scene information.

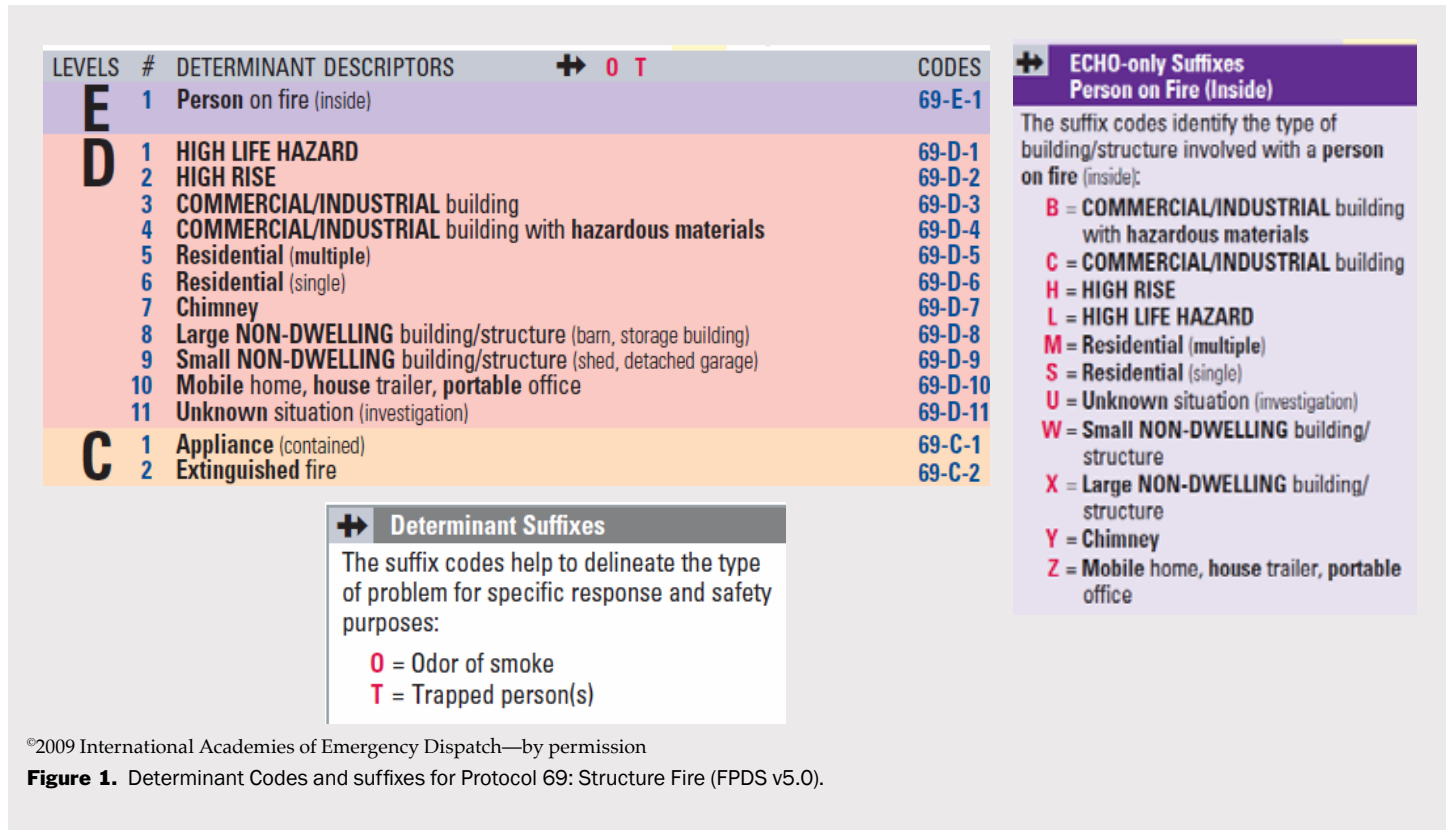
The time needed to appropriately and effectively dispatch these calls can be evaluated using a time standard outlined in previous studies<sup>3,4</sup> called Call Prioritization Time (CPT). This refers to the time period during which the EFD gathers the information needed to correctly dispatch the call. The CPT measurement begins after address and phone number verification and ends when the determinant (dispatch) code has been assigned. CPT is a key subcomponent of the overall call processing time and provides a measure of how long it takes to gather the information that responders need to appropriately respond to the event.

In this study, we evaluate CPT for centers using the Fire Priority Dispatch System (FPDS). Using the FPDS, an EFD categorizes each incident by selecting a Chief Complaint Protocol, and after gathering answers to each Key Question, assigns a Determinant Code using a systematic alpha-numeric coding matrix that defines the dispatch priority level and a specific Determinant

Descriptor (Fig. 1). The dispatch priority level defines the relative urgency and type of response needed for a given event: ECHO calls are the highest priority level and receive the most immediate response, followed by the DELTA, CHARLIE, BRAVO, and ALPHA priority levels. The Structure Fire Chief Complaint Protocol utilizes only three of these priority levels (ECHO, DELTA, and CHARLIE) because the FPDS never categorizes a reported structure fire in the lower BRAVO or ALPHA priority levels. The Structure Fire Protocol also provides the option for calltakers to add one of two suffixes: O for *Odor of smoke* or T for *Trapped person(s)*. These are added to the dispatch code when appropriate to provide additional information to responders.

**OBJECTIVES**

The primary objective in this study was to determine the median CPT for the FPDS Structure Fire Chief Complaint Protocol and its constituent dispatch priority levels as a first step toward creating an evidence-based standard for CPT for structure fire calls.



## METHODS

### Design and Setting

This retrospective study involved nine emergency communication centers in the USA, all accredited by the International Academies of Emergency Dispatch (IAED) as Emergency Fire Dispatch Centers of Excellence. The agencies included:

- Guilford Metro 911 Greensboro, NC
- Prince George's County Public Safety Communications, MD
- Mecklenburg E.M.S. Agency (MEDIC), Charlotte, NC
- Harford County Division of Emergency Operations, MD
- Sarasota County Public Safety Communication Center, FL
- Metro/Nashville Emergency Communication Center, TN
- Union County Emergency Communications, NC
- Kent County Department of Public Safety, DE
- Manatee County Emergency Communication Center, FL.<sup>4</sup>

### Study Population

The study sample included all dispatch data collected between 2011 and 2013 at the nine centers, using the FPDS v5.0<sup>5</sup> (running the ProQA<sup>®</sup> Paramount software engine v5.1).<sup>6</sup> Anonymous data for the priority levels, Determinant Descriptors, and CPT for all calls assigned to the Structure Fire Chief Complaint were extracted from the ProQA (software version of FPDS)<sup>5</sup> reporting system.

### Outcome Measures

The primary endpoints in this study were the percentage of calls prioritized in 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, and 180 seconds, and the median CPT for each priority level.

### Data Analysis

STATA software for Windows<sup>®</sup> (STATA Statistical Software: Release 14.1 ©2015, StataCorp, College Station, TX, USA) was used for data analysis. Cases that had a CPT of greater than 600 seconds were excluded from the study sample. These outliers were excluded after discussion with the agencies determined that times longer than 10 minutes resulted from leaving cases open accidentally or from test calls. The percentage of calls prioritized in 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, and 180 seconds for CC Protocol 69 (Structure Fire) overall, and ECHO, DELTA, and CHARLIE priority levels, including their suffixes, were tabulated. 15-second intervals were selected as being the most commonly used by the reporting agencies, and were included up to 180 seconds to ensure that all calls would be captured within the measured times. The median, minimum, and maximum CPT measurements were also calculated.

Agency	N	FPDS Priority Level: n (%)		
		CHARLIE	DELTA	ECHO
Guilford	3,847	307 (8.0)	3,534 (91.9)	6 (0.16)
Harford	1,485	164 (11.0)	1,321 (88.9)	0
Kent	2,014	242 (12.0)	1,768 (87.8)	4 (0.20)
Manatee	1,325	168 (12.7)	1,155 (87.2)	2 (0.15)
Medic	1,092	111 (10.2)	981 (89.8)	0
Nashville	4,108	825 (20.1)	3,280 (79.8)	3 (0.07)
PGC	7,175	478 (6.7)	6,687 (93.2)	10 (0.14)
Sarasota	1,782	166 (9.3)	1,589 (89.2)	27 (1.5)
Union	1,091	107 (9.8)	983 (90.1)	1 (0.09)
Overall	23,919	2,568 (10.7)	21,298 (89.0)	53 (0.22)

FPDS: Fire Priority Dispatch System

**Table 1.** Call volume for each agency sorted by priority level.

## RESULTS

A total of 23,919 cases were included in this study, after excluding 16 cases that had a CPT greater than 10 minutes. The most commonly used dispatch priority level was DELTA (89.0%) in all agencies. Overall, CHARLIE and ECHO priority level codes were used in 10.7% and 0.22% of all the calls, respectively. A similar pattern was observed by agency (Table 1).

Overall, a structure fire call was prioritized in median of 49 seconds (Table 2). Specifically, an ECHO priority-level call had the fastest median CPT (24 seconds). The difference between prioritizing a DELTA (48 seconds) and a CHARLIE (62 seconds) priority-level call was 14 seconds, with three more questions being processed for the CHARLIE level in the 14 seconds.

Approximately 25.0% of ECHO-level calls were prioritized in 15 seconds, and almost 85.0% in 60 seconds (Fig. 2). The numbers were lower for DELTA-level calls: 0.25% were prioritized within 15 seconds, and 70.3% in 60 seconds. For CHARLIE-level calls, 0.23% were assigned a dispatch code in 15 seconds, and almost 50.0% in 60 seconds. At the 90-second mark, 90% of ECHO

FPDS Priority Level	N	Call Prioritization Time (seconds):
		Median (Q1, Q3)*
ECHO	53	24 (16, 49)
DELTA	21,298	48 (37, 65)
CHARLIE	2,568	62 (48, 83)
Overall	23,919	49 (37, 67)

FPDS = Fire Priority Dispatch System.

\*Q1/Q3 = The 25<sup>th</sup>/75<sup>th</sup> percentile for median CPT time.

**Table 2.** Median call prioritization time, categorized by FPDS priority level.

and DELTA calls had been assigned a dispatch code. In 105 seconds, nearly 90.0% of all calls for all three priority levels had been prioritized.

Table 3 shows the median CPT for each Determinant Code, including associated suffixes. Generally, the “T” suffix (*trapped person[s]*) calls tended to have the highest CPT values for each priority level, except for 69-D-7 (*Chimney*) and 69-D-11 (*Unknown situation*), where “T” suffix calls had the shortest CPT values (33 and 50 seconds, respectively).

Among “O” suffix calls and those with no suffix, generally, the 69-C-2 (*Extinguished fire*) and 69-D-4 (*Commercial/Industrial building with hazardous materials*) Determinant Codes had the highest CPT values (62 and 74 seconds, respectively). Conversely, the 69-D-7 (*Chimney*) Determinant Code had the shortest CPT values among the “O” suffix calls and those with no suffix (33 and 42 seconds, respectively).

Otherwise, ignoring calls with very low sample sizes, the 69-D-4 (*Commercial/Industrial building with hazardous materials*) and 69-D-11 (*Unknown situation*) Determinant Codes had the highest CPT values among “T” suffix calls (88 and 84 seconds, respectively). The 69-D-3 (*Commercial/Industrial building*) Determinant Code had the shortest CPT value among the “T” suffix calls (48 seconds).

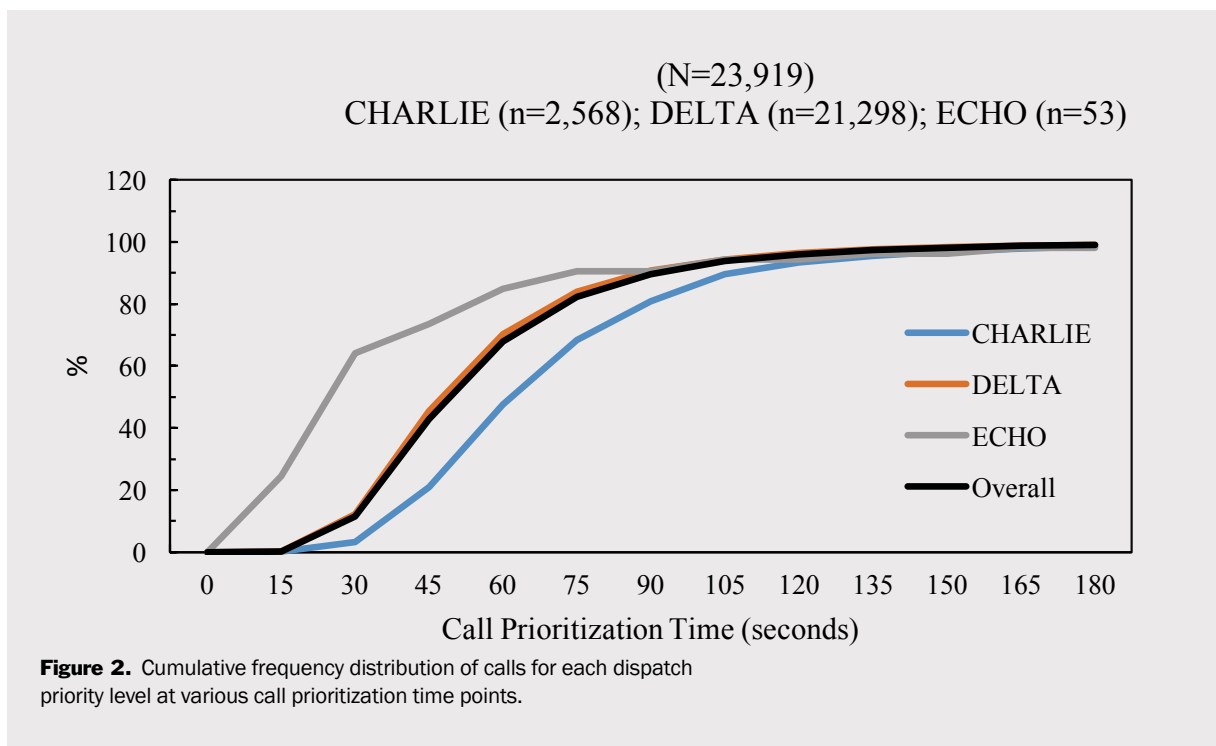
**DISCUSSION**

The results of this study demonstrate that fire dispatch agencies using the FPDS are dispatching structure fire calls quickly and efficiently, with higher-priority calls being dispatched fastest. In particular, the ECHO priority level works as designed, with ECHO calls receiving the fastest

median CPT at 24 seconds. Calls assigned DELTA-level codes were dispatched in a median of 48 seconds, with 90.7% of all DELTA-level codes achieving a CPT of less than 90 seconds. Overall, the higher the acuity of the assigned priority level, the shorter the median CPT. However, ECHO codes were used very seldom, as the Structure Fire ECHO codes refer only to “person on fire – inside” events. These calls most often came from residential events, being coded most often as “Residential (single)” structure types. The single residential event was also the most common call type overall.

Two other suffixes, signifying that the caller reported an odor of smoke (“O” suffix) or a person trapped in the structure (“T” suffix), were also seldom used, and in fact cannot be used with the ECHO priority level. The vast majority (n=19,133) of DELTA- and CHARLIE-level calls received no suffix; the “T” suffix was the most commonly used (n=4,035 cases), while the “O” suffix was rare (n=692 cases).

Many agencies and organizations define call processing time as the overall time it takes to dispatch the call, from the moment it “hits the switch” at the call center to the moment the dispatcher alerts the responders, and use it as a metric in determining the efficiency and effectiveness of emergency dispatch. CPT is a key subcomponent of call processing time because it offers a measure of how long it takes, not simply to send a response to an event, but to gather the information necessary to dispatch the appropriate response. For structure fires, this includes the gathering of scene safety information if applicable, as well as information



Determinant Code*	N	No Suffix		"O" Suffix		"T" Suffix	
		n	Median CPT (Q1, Q3) <sup>†</sup>	n	Median CPT (Q1, Q3) <sup>†</sup>	n	Median CPT (Q1, Q3) <sup>†</sup>
69-C-1	1,181	1,078	58 (46,75)	98	67.5 (56,94)	3	80 (33,119)
69-C-2	1,387	925	62 (47,83)	458	73.5 (56,97)	4	44.5 (32,116.5)
CHARLIE	2,568	2,003		556		7	
69-D-1	1,187	881	52 (40,71)	248	57 (43,73)	57	58 (40,90)
69-D-2	308	222	44.5 (34,61)	57	49 (41,64)	28	55.5 (41.5,79)
69-D-3	2,522	2,045	46 (36,63)	445	56 (42,73)	32	48 (39.5,62)
69-D-4	100	81	62 (42,84)	11	74 (64,138)	8	88 (74.5,100.5)
69-D-5	5,102	3,974	46 (36,62)	962	55 (42,71)	164	49 (39,71)
69-D-6	10,053	8,116	45 (35,61)	1,586	54 (42,73)	351	49 (36,67)
69-D-7	408	343	42 (34,56)	53	33 (17,47)	12	43.5 (25,150.5)
69-D-8	193	191	58 (44,82)	1	77 (77,77)	1	100 (100,100)
69-D-9	421	412	57.5 (45.5,79.5)	2	96 (95,97)	7	46 (46,85)
69-D-10	691	588	45 (35,59)	89	55 (43,70)	14	68 (42,75)
69-D-11	313	277	56 (38,78)	25	50 (37,81)	11	84 (52,109)
DELTA	21,298	17,130		3,479		685	
Overall	23,866	19,133		4,035		692	

CPT = Call Prioritization Time. \*See Fig. 1 for Determinant Code descriptions. <sup>†</sup>Q1/Q3 = The 25<sup>th</sup>/75<sup>th</sup> percentile for median CPT

**Table 3.** Median call prioritization time for all individual CHARLIE and DELTA Determinant Codes categorized by suffix.

about the type of structure involved, people who may be trapped in the structure, and other critical event details that may affect the type of response or the resources required. Measures such as call processing time and CPT offer important insights into the workings of a protocol-based response system. However, time by itself is not a measure of dispatch success.

That said, a more recent release of the FPDS offers the option for more ECHO-level dispatches for structure fires, meaning that an earlier dispatch point will be available for these calls. Given the results of this study, it is certainly possible that those using the newer FPDS release will experience even faster CPTs for structure fires than are reported here. Future research will compare the new release with this existing data to determine the efficacy of the ECHO-focused Structure Fire Protocol in eliciting faster CPTs.

As of January 2016, the U.S. National Fire Protection Agency (NFPA) promotes a standard call processing time for structure fire incidents that calls for 90% of all structure fire calls to be dispatched within 64 seconds.<sup>7</sup> Many agencies have adopted this standard as their own, requiring call centers in their jurisdictions to conform

to it. However, there is insufficient evidence to support this standard as meaningful. Very little evidence, in fact, exists to determine what an appropriate call processing or CPT standard might be, and the very limited research that has been done suggests that the current standard is not realistic. A study sponsored by the NFPA itself admits that "to a large extent," the stated time standards "are based on qualitative data, experience, and assumptions and do not have a strong body of empirical data to justify them" and that the data suggest that "these times may be unrealistically short" (p. 3) and may actually cause errors.<sup>8</sup> Moreover, while the NFPA standard regulates the total time taken to dispatch a call, it makes no reference to the quality of information gathered—whether amount of information, conformity to objectives, or accuracy. Certainly, some information can be gathered after the units have been dispatched; however, information about the type of structure involved, the number of people potentially trapped inside, the number of floors or stories, and so on, can determine the most appropriate response, and gathering that information after responders have already been sent (or notified) may actually cause delays or incomplete response assignments.

## CONCLUSIONS

The findings in this study demonstrated that of all structure fire calls handled by the agencies studied, 90% were prioritized (with an assigned FPDS code) within 90 seconds. The highest-priority calls were handled more quickly, with a lower median CPT for higher-acuity calls. To date, this represents the most detailed information available about how long it takes to gather the information needed to dispatch the right resources to the scene of a structure fire, after the address and phone number have been verified. Given the prevalence and devastating power of these events, it is critical to conduct further studies to determine not only the time needed to dispatch calls, but the quality and type of information necessary to ensure the safest, most appropriate response. We hope that this study, and future research on this topic, can lead to true evidence-based standards and expectations, not only for CPT, but for the amount and type of information needed to effectively handle structure fire incidents.

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