U.S. Department of Energy
Office of Health, Safety and Security

Accident Investigation Report

Accident Investigation of the June 1, 2013 Stairway Fall Resulting in a Federal Employee Fatality at DOE Headquarters Germantown, Maryland

August 6, 2013

Disclaimer

This report is an independent product of the Accident Investigation Board appointed by Glenn S. Podonsky, Chief Health, Safety and Security Officer, Office of Health, Safety and Security. The Board was appointed to perform an Accident Investigation and to prepare an investigation report in accordance with Department of Energy Order 225.1B, *Accident Investigations.*

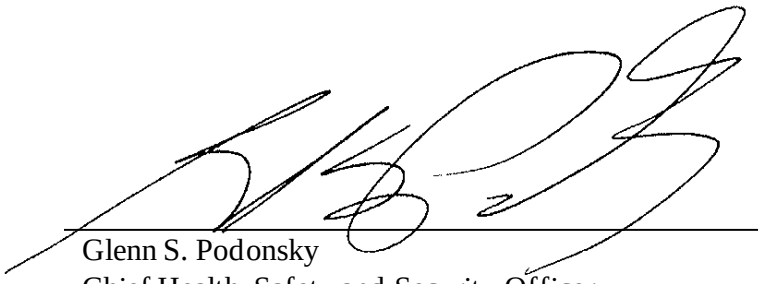
The discussion of the facts as determined by the Board and the views expressed in the report do not assume, and are not intended to establish, the existence of any duty at law on the part of the U.S. Government, its employees or agents, contractors, their employees or agents, or subcontractors at any tier, or any other party.

This report neither determines nor implies liability.

Release Authorization

On June 28, 2013, an Accident Investigation Board was appointed to investigate an accident at the Department of Energy Germantown Headquarters facility, on June 1, 2013 that resulted in a fatality on June 24, 2013. The Board's responsibilities have been completed with respect to this investigation. The analysis and the identification of the contributing causes, the root cause and the Judgments of Need resulting from this investigation were performed in accordance with DOE Order 225.1B, *Accident Investigations*.

The report of the Accident Investigation Board has been accepted and the authorization to release this report for general distribution has been granted.



Glenn S. Podonsky
Chief Health, Safety and Security Officer
Office of Health, Safety and Security

September 5, 2013
Date

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Legend (People)

BLDG ELEC	Building Electrician (Contractor)
BLDG ENG	Building Engineer (Contractor)
CONTR1	Asbestos Abatement (Contractor)
CONTR2	Contractor Electrician (off-duty Emergency Medical Technician)
EC1	Electrical Contractor 1 (Contractor)
FBM	DOE Germantown Federal Building Manager (FMS1 Supervisor)
FMS1	Facility Management Specialist 1
FMS2	Facility Management Specialist 2
FMS3	Facility Management Specialist 3
HVAC Tech	Heating, Ventilation, and Air Conditioning Technician (Contractor)
IH1	DOE Industrial Hygienist 1 (Contractor)
IH2	DOE Industrial Hygienist 2
PF1	Pro Force Security Officer 1 (Contractor)
PF2	Pro Force Security Officer 2 (Contractor)
PF3	Pro Force Security Officer 3 (Contractor)
PF4	Pro Force Security Officer 4 (Contractor)
RN1	Occupational Health Clinic Nurse
RN2	Occupational Health Clinic Nurse
SSGT	Pro Force Shift Sergeant
SSUP	Pro Force Shift Supervisor

Acronyms

CA-1	Federal Notice of Traumatic Injury and Claim for Compensation
CAIRS	Computerized Accident/Incident Reporting System
CAS	Central Alarm Station
CON	Conclusion
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
ECF	Events and Causal Factors
EEOC	Equal Employment Opportunity Commission
EMS	Emergency Medical Service
EMT	Emergency Medical Technician
EST	Eastern Standard Time
FOH	Federal Occupational Health
G	Guide
GP	Guiding Principle
HPI	Human Performance Improvement
HSS	Office of Health, Safety and Security
HVAC	Heating, Ventilation and Air Conditioning
ISM	Integrated Safety Management
JHA	Job Hazard Analysis
JON	Judgment of Need
JSA	Job Safety Analysis
LOTO	Lock Out/Tag Out
MA	DOE Office of Management
MA-1	Office of Management
MA-40	Office of Administration
MA-433	Office of Industrial Hygiene and Safety
MER	Mechanical Equipment Room
TEA	Telework Enhancement Act
O	Order
OHC	Occupational Health Clinic
OEP	Occupant Emergency Plan
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
OWCP	Office of Worker's Compensation Program

Executive Summary

Introduction

On June 1, 2013, a U.S. Department of Energy (DOE) Facility Management Specialist (FMS1) fell from the stairs in a mechanical equipment room during facility modification work in the Main Building of the Headquarters Germantown facility. The FMS1 required hospitalization due to sustained head injuries. The FMS1 later died as a result of his injuries.

This accident meets Accident Investigation Criteria 2.a.1 of DOE Order (O) 225.1B, *Accident Investigations,* Appendix A, (i.e., any injury or chemical or biological exposure that results in, or is likely to result in, the fatality of an employee or member of the public).

Based on the severity of this accident, the Office of Management (MA) began an initial accident investigation on June 3, 2013. After the FMS1 died on June 24, 2013, MA requested assistance from the Office of Health, Safety and Security (HSS). On June 28, 2013, Glenn S. Podonsky, Chief Health, Safety and Security Officer (HS-1), U.S. Department of Energy, formally appointed an Accident Investigation Board (Board) to investigate the accident in accordance with DOE Order 225.1B.

The Board began the investigation on July 2, 2013, completed the investigation on July 26, 2013, and submitted findings to the Chief Health, Safety and Security Officer on August 1, 2013. The Board concluded that this accident was preventable.

Accident Description

On Saturday, June 1, 2013, at approximately 8:27 a.m., a DOE Federal employee, FMS1, suffered a fall from the stairs in Mechanical Equipment Room (MER) 7 of the DOE Germantown Main Building and landed on the concrete floor of the MER. Information from family members provided to DOE staff indicated that FMS1 suffered fractures of the skull, orbital bone, and nose.

Information obtained from initial interviews indicated FMS1 was standing on the landing at the top of the stairs. A Building Electrician (BLDG ELEC), who was in the room at the time of the accident, stated that he heard a noise and found the injured employee face down at the bottom of the steps. DOE Security was called and responded. Montgomery County Emergency Medical Services (EMS) was also called and responded. The individual was transported to a local hospital the day of the accident and was admitted to the intensive care unit. FMS1 was transferred to a local hospice on June 20, 2013, where FMS1 later died on June 24, 2013.

Events Leading up to the Day of the Accident

To understand the management systems weaknesses associated with the Root Cause of this accident, the progression of a 2010 health issue FMS1 suffered, his subsequent return to work, and fitness for duty needs to be discussed.

There were several missed opportunities to have evaluated FMS1's fitness for duty and to have had formal limitation of duty established based on FMS1's disability. A formal documented and appropriate fitness for duty review did not occur.

In May of 2010, FMS1suffered a spinal infarction or stroke in his home, which was non-work related. This stroke left FMS1 paralyzed from the neck down and required several months of recovery and physical rehabilitation to gradually regain mobility.

In October, 2010, FMS1 submitted an email with an attached letter from his doctor requesting an opportunity to return to duty working from home. His request was denied by his supervisor, Federal Building Manager (FBM), due to the requirements of the job that necessitated a physical presence to support facility operations.

On November 16, 2010, FMS1 sent emails to FBM notifying him that he was getting a letter from his doctor recommending his return to full duties. FBM accepted his request.

FMS1 returned to work November 22, 2010, on a limited basis, working partial days; however, no record of a return to work or fitness for duty review was found. The doctor's letter which stated *"…should start back to work part time (about 4 hours per day), and work from home for some portion if possible. He will be the judge of his energy level and stamina, but will likely be able to transition back to full time as he tolerates."* FBM stated this letter was hand delivered to him by FMS1 on November 22, 2010. FMS1 had limited mobility and traveled with a walker or cane.

By January, 2011, utilizing a carpool, FMS1 returned to work full time. By mid-2011, FMS1 regained a State driver's license but continued to use the walker or cane. FMS1 received a handicap parking permit. However, no records could be identified that explain how or when this occurred. The FBM independently verbally instructed the FMS1 to not go on ladders or on the building roof, events that were otherwise normal parts of the duties of FMS1. This limitation of duties was not formally documented.

The Office of Human Capital (HC) was not involved in any return to work or fitness for duty processes or reasonable accommodation process. There is no evidence of any formal documented review for FMS1's return to work, fitness for duty, or reasonable accommodation.

In May 2013, an emergency generator electrical upgrade project began for the Germantown Main Building that would occur over several months, including weekends. During the weeks prior to the accident, FBM discussed roles, requirements, and weekend coverage with his team, including FMS1. FBM required a Federal employee from his staff to provide Governmental oversight of the electrical outage and related scheduled weekend work on the generator expansion project.

Events on the Day of the Accident

On the day of the accident, Saturday, June 1, 2013, FMS1 accepted the assignment to provide oversight of the lockout/tag out (LOTO) and other work related to the electrical expansion in Load Center 4 in MER 6. There was an expectation by FBM that FMS1 was to inspect Load Center 4 inside MER 6, thus requiring FMS1 to use the stairs into MER 6.

Because the LOTO affected multiple systems, FMS1 became concerned that power may be lost to the sump pumps in MER 7, potentially causing a risk of flooding into MER 7. This concern about flooding led to a request by FMS1 for the Building Engineer (BLDG ENG) and BLDG ELEC to accompany him to MER 7.

Information obtained by the Board from interviews indicated FMS1 was standing at the top of the stairs in MER 7 and provided verbal instructions to BLDG ENG and BLDG ELEC to check an indicator panel on the Filtrine system by the stairs and the sump pump on the far side of MER 7. Both BLDG ENG and BLDG ELEC were at floor level facing away from FMS1 at the time of the accident. BLDG ELEC stated that he heard a noise, turned to face the noise, and found FMS1 face down on the floor at the bottom of the steps.

Since there were no eye witnesses of FMS1 falling, and since the accident scene was not preserved, the Board cannot determine exactly what caused FMS1 to fall. The possibilities include:

- FMS1 may simply have fallen due to his physical limitations;
- FMS1 may have caught his foot on the rail post at the top of the stairs because the toeboard was missing, which provides a vertical barrier at the floor level along the exposed opening at the landing;
- FMS1 may have tripped on a torn stair tread cover; or
- FMS1, leading with his cane, may have lost his balance at the bottom step because the rise of the bottom step was 0.75 inches greater than the previous steps, which would have been an unexpected condition.

DOE Security was called and responded. Montgomery County EMS was also called and responded. FMS1 was transported to Suburban Hospital in Bethesda, Maryland, the day of the accident, was admitted to the intensive care unit, and died on June 24, 2013.

Direct, Root, and Contributing Causes

Direct Cause (DC) – the immediate events or conditions that caused the accident.

The Board identified the direct cause of this accident to be that FMS1 fell while descending or transitioning from the stairs to the floor striking his head on the floor of MER 7 resulting in a fatal head injury.

Root Cause (RC) – causal factors that, if corrected, would prevent recurrence of the same or similar accidents.

The Board identified the RC of this accident to be that an effective fitness for duty requirement and process does not exist at DOE Headquarters for Federal employees returning to work from a non-work related injury or illness.

Contributing Causes (CC) – events or conditions that collectively with other causes increased the likelihood or severity of an accident but that individually did not cause the accident.

The Board identified six contributing causes to this accident:

CC1: A reasonable accommodation was not provided such as a medical flexi-place agreement or position description (PD) revision and a review by HC, or Federal Occupational Health (FOH) was not performed. A request to work from home, supported by FMS1's physician's letter dated September 20, 2010, was denied.

CC2: A formal documented and appropriate review of FMS1's fitness for duty did not occur.

CC3: Clear responsibilities and guidance did not exist for conducting oversight of the fitness for duty and return to work processes.

CC4: FMS1 was assigned duties that included entering and transiting stairs in mechanical equipment rooms without a formal review of his physical capabilities.

CC5: Management systems weaknesses existed because oversight of return to work, fitness for duty and Federal Employee Occupation Safety and Health programs had not been conducted.

CC6: The MER 7 stairs were not in compliance with codes and standards, and were not in optimum condition for traversing.

Conclusions and Judgments of Need

Based upon the findings of this accident investigation, the Board concluded that this accident was preventable.

Table ES-1 summarizes the Conclusions (CONs) and Judgments of Need (JONs) determined by the Board. The conclusions are derived from the analytical results performed during this accident investigation for determining what happened and why it happened. Also listed are JONs determined by the Board as managerial controls and safety measures necessary to prevent or minimize the probability or severity of a recurrence of this type of accident.

Table ES-1: Conclusions and Judgments of Need

Conclusion	Judgment of Need
CON 1: The DOE Headquarters (HQ) Pro Force emergency plan, procedures and resources do not address preservation of accident scenes as required by DOE Order (O) 225.1B, *Accident Investigations*.	**JON 1:** The Office of Health, Safety and Security (HSS) needs to assure that procedures are developed and implemented by the Headquarters Pro-Force to preserve accident scenes to support an accident investigation.
CON 2: Regarding Office of Management (MA) response to the accident, there was a delay in the categorization of the accident that would trigger a Federally-led Accident Investigation, which should have occurred after FMS1 had been hospitalized more than five days, pursuant to DOE O 225.1B.	**JON 2:** MA needs to institute procedures to assure initial monitoring of serious injuries requiring hospitalization, to promote prompt DOE O 225.1B categorization, and timely notification and accident investigation to occur in the future.
CON 3: Formal independent oversight review by HSS of the HQ implementation of DOE Order 450.2, *Integrated Safety Management*; 5 U.S.C. 8100, *Federal Workers Compensation Program (OWCP)*; DOE Order 440.1B, *Worker Safety and Health Program for DOE Federal and Contractor Employee*; and DOE O 341.1A, *Federal Employee Health Services*; was not requested by MA, or Office of Human Capital (HC), and therefore not conducted by HSS.	**JON 3:** MA and HC needs to partner with HSS to define and implement a process to review and improve the performance of their employee safety programs. This will allow MA and HC to leverage available HSS subject matter expertise and experience.
CON 4: As a result of a request by FMS1 to perform work from home being denied, FMS1 returned to work and resumed physical activity sooner than was initially recommended by FMS1's physician.	**JON4:** HSS needs to revise DOE Order 440.1B, *Federal Employee Occupational Safety and Health Program*, to include specific requirements for fitness for duty and return to work processes for work related and non-work related injuries/illnesses. **JON5:** HC needs to develop and implement effective and formal fitness for duty and return to work programs for Federal employees' non-work related injuries/illnesses. **JON 6:** HC needs to develop and conduct training for supervisors and employees related to the fitness for duty and return to work processes. **JON 7:** HC needs to ensure employees and supervisors are aware of, and encouraged to utilize, the options associated with the DOE O

Conclusion	Judgment of Need
	314.1, *DOE-FLEX: DOE's Telework Program.*
CON 5: FMS1 was returned to work at the Germantown facility without any formal documented fitness for duty review.	**JON 8:** HC needs to develop and implement effective and formal return to work and fitness for duty programs for Federal employees including work-related and non-work related injuries/illnesses.
CON 6: Oversight by the HC and MA of the return to work and fitness for duty processes was not conducted.	**JON 9:** HC needs to develop appropriate criteria for, and conduct oversight of the program to assure performance with requirements and guidelines for fitness for duty and return to work. **JON 10:** MA needs to develop appropriate criteria for, and conduct oversight of, the program to assure performance with requirements and guidelines for fitness for duty and return to work.
CON 7: Fitness for duty and limitations for duty were not evaluated and accommodations were not reviewed, identified and provided. Beyond the initial injury off-duty, there were additional missed opportunities that should have initiated a formal and appropriate review of FMS1's fitness for duty.	**JON 11:** HC needs to provide reports of first aid from Occupational Health Clinics to the Office of Industrial Hygiene and Safety (MA-433) for tracking and evaluation.
CON 8: All restrictions by FBM to FMS1 were verbal and the Board found that the Access Authorization Memorandum in effect at the time of the accident allowed FMS1 approval to access, potentially alone, hazardous locations including building roofs and mechanical rooms.	**JON 12:** MA needs to strengthen and formalize its process for implementing work restrictions for its employees. Formal work restrictions extend beyond verbal instruction, and could include removal of electronic access for certain areas, documented direction given by the supervisor and acknowledged by the employee, and other suitable form developed by MA.
CON 9: FMS1, a person with limited mobility, was required to negotiate stairs that were not of uniform rise and were damaged.	**JON 13:** MA needs to conduct an extent of condition review to determine if other non-compliant or damaged stairs exist at DOE Headquarters' facilities.

Conclusion	Judgment of Need
CON 10: The overall initial emergency response to the accident was acceptable. However, one issue was noted – the building personnel dialed 911 directly rather than calling the building emergency number 166.	**JON 14:** MA needs to re-visit efforts to publicize the emergency number 166 at DOE Headquarters, increase the visibility of the posting of the number in hazardous areas, such as mechanical rooms, and reduce confusion among employees on the preferred number to call for emergency assistance.

1.0 Introduction

1.1. Background

1.1.1. Department of Energy Germantown Headquarters Facility

The Department of Energy (DOE) Germantown Headquarters facility was dedicated by President Eisenhower in 1957. The 618,852 square foot complex is situated on approximately 98.6 acres in Montgomery County, Maryland. The complex includes office space, an auditorium, a heating and refrigeration plant, a radio building, and equipment sheds and garages. The main office building also includes a cafeteria, various data centers, a warehouse and a computer center.

Figure 1: The DOE Germantown Headquarters Facility

The staircase involved in this accident is located in Mechanical Equipment Room (MER 7) in the G-Wing, ground level of the DOE Germantown Headquarters facility (see Figure 2). The staircase is the single access point to MER 7.

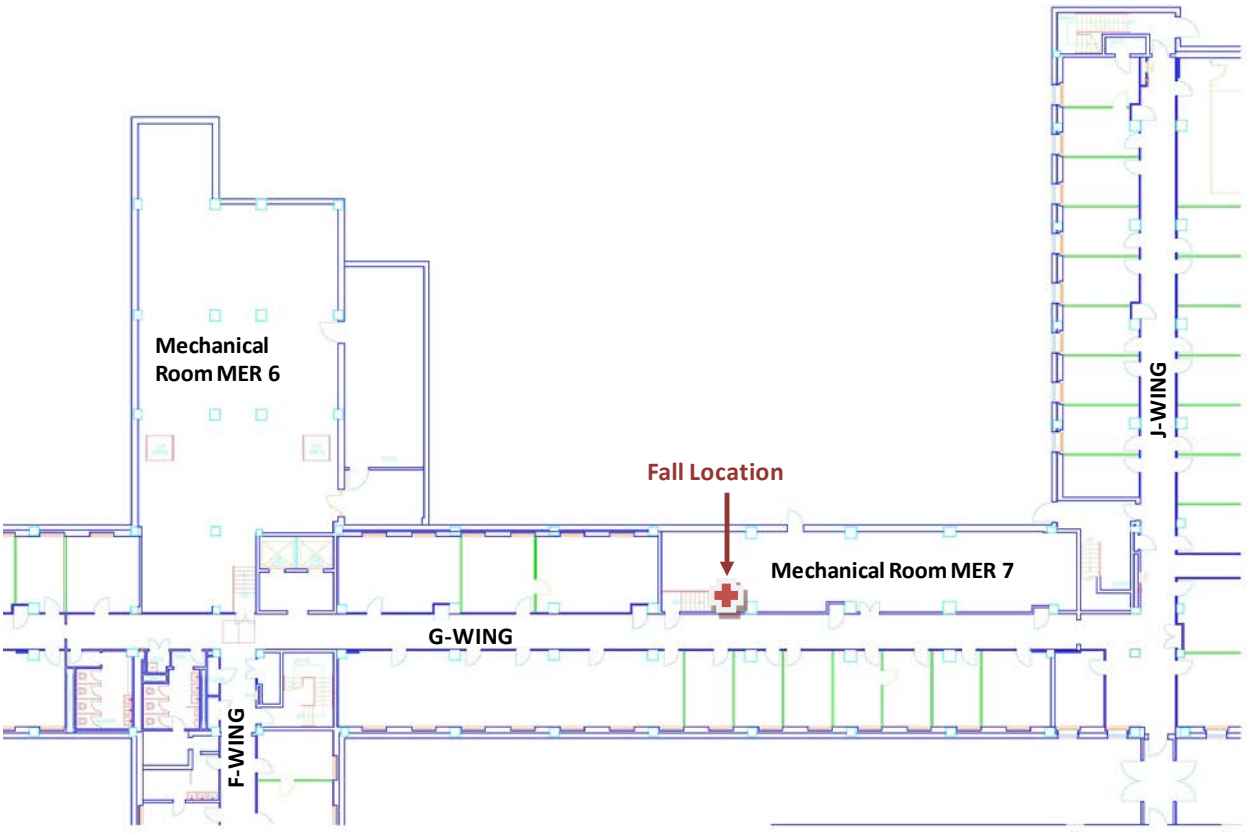


Figure 2: Germantown Building G-Wing Floor Plan

The stairs are poured-in-place concrete. The stairs have six steps, handrails on both sides, and a large landing area; the door opens into the hallway, not into the landing space. The steps in MER 7 are covered with rubber stair treads made by Flexco Floors.

The photographs in Figures 3 and 4 were taken two days after the accident by the initial investigator. Figure 3 shows the scene of the accident and the stairs leading into MER 7. Figure 4 shows the side view of the stairs.

Figure 3: Mechanical Equipment Room 7 Entrance Stairs

Figure 4: Mechanical Equipment Room 7 Stair Details

In Figure 5, the inset image was taken by Pro Force (PF) personnel on the day of the accident shortly after the accident occurred. This inset shows the damaged edge of the top step present at the time of the accident. The damage was approximately two inches in length and the photo on

the right in Figure 5, taken two days later by Office of Industrial Hygiene and Safety (MA-433), shows tread damage cut away by PF.

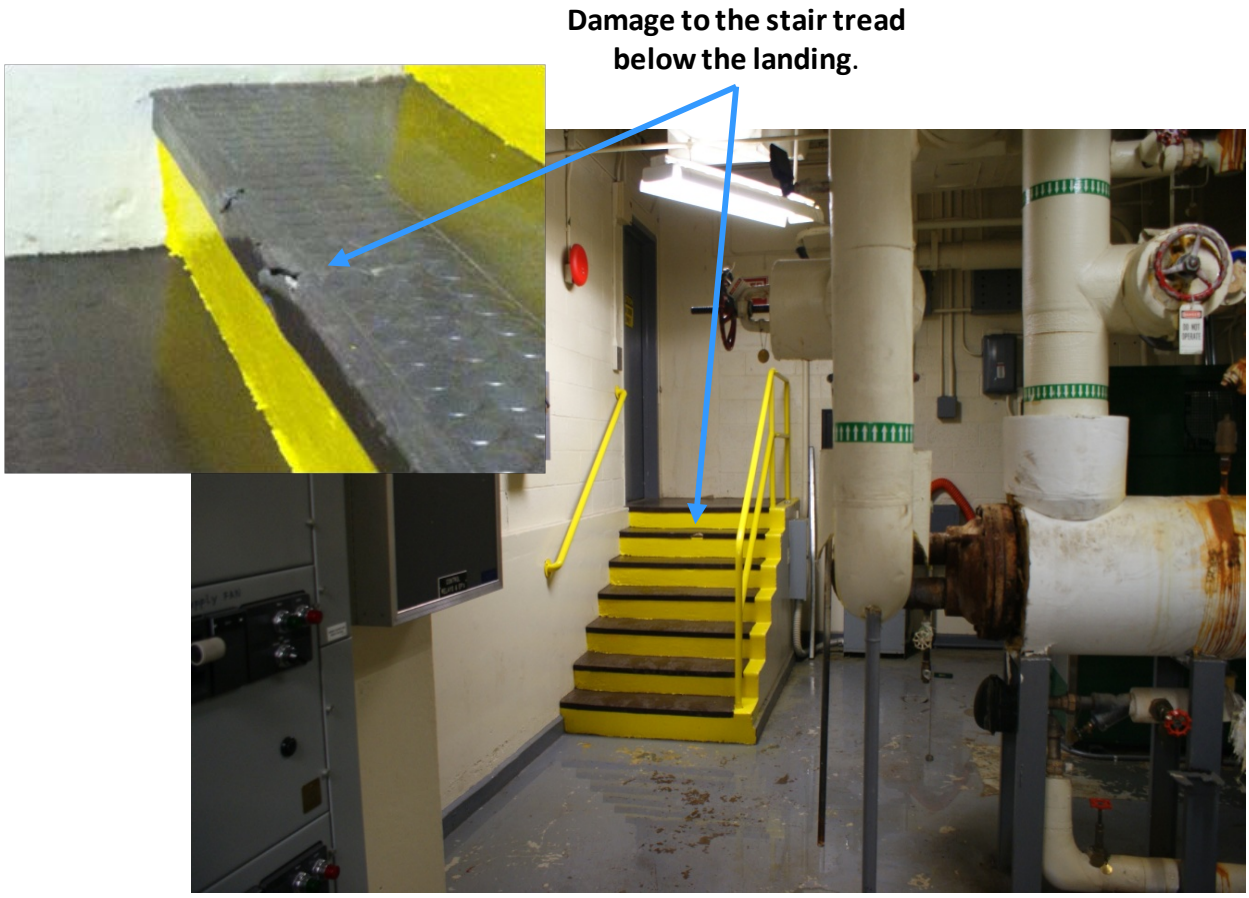


Figure 5: Damaged Edge of the Second Step on Mechanical Equipment Room 7 Stairs

1.1.2. **Office of Management**

The Office of Management (MA) is DOE's central management organization providing leadership in such mission critical areas as project and acquisition management. In addition, MA manages the Department's Headquarters complex and provides administrative support to employees in the Washington, DC area. MA is comprised of the Offices of Administration, Acquisition and Project Management, Executive Secretariat, Information Resources, Scheduling and Advance, and Aviation Management.

The Director of MA oversees an annual budget of approximately $60.4M (FY13, sequestered with reprogramming) and is responsible for management of the Department's multi-billion dollar project portfolio.

On June 27, 2013, the Director of Administration (MA-40) informed DOE management that a Federal Accident Investigation Board (Board) needed to be established to investigate the June 24, 2013 death of the Facility Management Specialist (FMS1), a Federal employee. The accident resulted in FMS1 being hospitalized for more than 20 days before succumbing to his injuries. The Board was formally appointed on June 28, 2013.

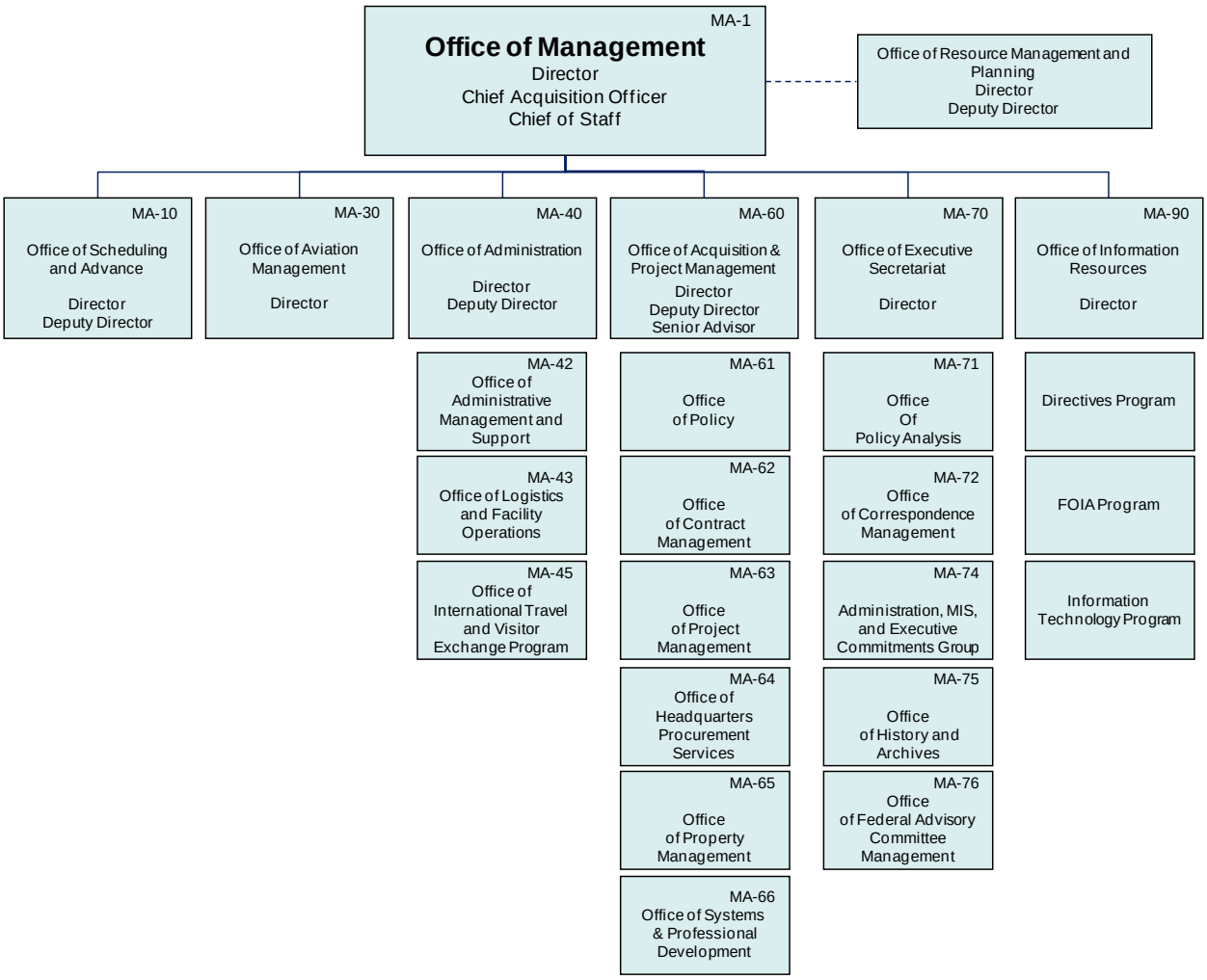


Figure 6: Office of Management Organization

The Office of Administration (MA-40) Organization

The MA-40 is a component of MA-1. The Federal Building Manager (FBM) of the Germantown complex directs facility and maintenance operations in Germantown and reports directly to the Director of Facility Management Operations (MA-431), who is under the Director of the Office of Logistics and Facility Operations (MA-43), who reports to the Director of MA-40. FMS1 was one of five members of the Building Manager's staff (four Federal and one contract employee).

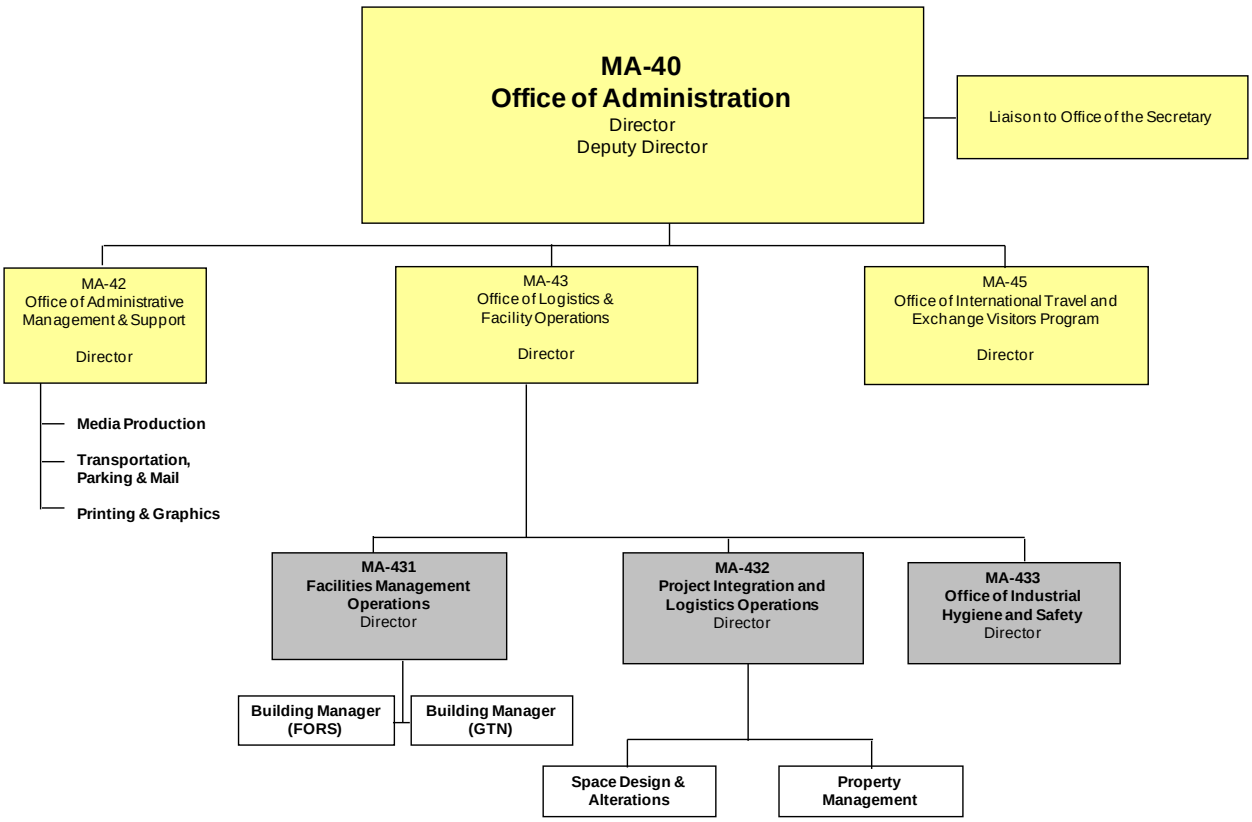


Figure 7: Office of Administration Organization

1.1.3. **Accident Investigation Process**

The Board was formally appointed on June 28, 2013. This report documents the facts of the accident and the analyses and conclusions of that investigation. The Board was on site at Germantown, July 8-26, 2013, collecting evidence and conducting interviews.

The Board conducted its investigation using the following methodology:

- Facts relevant to the accident were gathered through interviews, document, evidence reviews, and examination of physical evidence.
- Event and causal factor charting, along with barrier analysis, change analysis techniques, and error precursor analysis were used to analyze the facts and identify the cause(s) of the accident, and
- Based on the analysis of information gathered, Judgments of Need (JONs) were developed for corrective actions to prevent recurrence.

Figure 8 describes the accident investigation terminology used throughout this report.

Accident Investigation Terminology
A **causal factor** is an event or condition in the accident sequence that contributes to the unwanted result. There are three types of causal factors: direct cause(s), root causes(s), and the contributing causal factors. The **direct cause** of an accident is the immediate event(s) or condition(s) that caused the accident. **Root causes** are the causal factors that, if corrected, would prevent recurrence of the same or similar accidents. Root causes may be derived from or encompass several contributing causes. They are higher-order, fundamental causal factors that address classes of deficiencies, rather than single problems or faults. **Contributing causes** are events or conditions that collectively with other causes increased the likelihood or severity of an accident but that individually did not cause the accident. Contributing causes may be longstanding conditions or a series of prior events that, alone, were not sufficient to cause the accident, but were necessary for it to occur. Contributing causes are the events and conditions that "set the stage" for the event and, if allowed to persist or re-occur, increase the probability of future events or accidents. **Event and causal factors analysis** includes charting, which depicts the logical sequence of events and conditions (causal factors that allowed the accident to occur), and the use of deductive reasoning to determine the events or conditions that contributed to the accident. **Barrier analysis** reviews the hazards, the targets (people or objects) of the hazards, and the controls or barriers that management systems put in place to separate the hazards from the targets. Barriers may be physical or administrative. **Change analysis** is a systematic approach that examines planned or unplanned changes in a system that caused the undesirable results related to the accident. **Error precursor analysis** identifies the specific error precursors that were in existence at the time of or prior to the accident. Error precursors are unfavorable factors or conditions embedded in the job environment that increase the chances of error during the performance of a specific task by a particular individual, or group of individuals. Error precursors create an error-likely situation that typically exists when the demands of the task exceed the capabilities of the individual or when work conditions aggravate the limitations of human nature.

Figure 8: Accident Investigation Terminology

2.0 Facts and Analysis

2.1. Accident Description

On Saturday, June 1, 2013 at approximately 8:27 a.m.[1], a DOE Federal employee, FMS1, suffered a fall from the stairs in MER 7 of the DOE Germantown Main Building and landed on the concrete floor of the MER. Information from family members provided to DOE staff reported that FMS1 suffered fractures of the skull, orbital bone, and nose.

Information obtained from initial interviews indicated FMS1 was last observed standing on the landing at the top of the stairs. A Building Electrician (BLDG ELEC), in the room at the time of the accident, stated that he heard a noise, turned and found the injured employee face down at the bottom of the steps. DOE Security was called and responded. Montgomery County Emergency Medical Services (EMS) was also called and responded. The individual was transported to Suburban Hospital, Bethesda, MD, a level one trauma center, on the day of the accident and was admitted to the intensive care unit. FMS1 was transferred to a local hospice on June 20, 2013, where FMS1 later succumbed to his injuries.

2.2. Chronology of Events

2.2.1. Early Events Leading up to the Day of the Accident

In May 2010, FMS1 suffered a spinal cord injury (a spinal infarction or stroke) as a non-work related accident in his home. This injury left FMS1 paralyzed from the neck down and required several months of recovery and physical rehabilitation to gradually regain mobility.

In October 2010, FMS1 submitted an email with an attached letter from his doctor requesting an opportunity to return to duty working from home. The request was denied by the FBM due to the requirements of the job that necessitated FMS1's physical presence in support of facility operations. FMS1 was instructed by FBM to wait until full recovery and when he had a doctor's letter that would allow a return to full duty at the Germantown facility.

On November 16, 2010, FMS1 sent emails notifying FBM of a pending letter from his doctor recommending return to full duties. FMS1 requested to start work on Monday, November 22, 2010, and would bring the letter with him on that date. FBM accepted his request.

FMS1 returned to work on November 22, 2010, bringing the doctor's letter with him. FMS1 was permitted to work on a limited basis (working as physical therapy sessions and transportations issues allowed). However, no record of a fitness for duty review has been found. The FBM

[1] Note: The timing of the sequence of events on June 1, 2013, is based on an approximate interpolation of electronic door logs and integration of other reported times such as from the Pro Force Incident Report. The Board utilized the times on the electronic door logs and determined that there may have been a difference in time up to five minutes versus times in the incident report.

stated that on the same day he was addressing the sudden loss of another employee from duty due to serious illness that occurred on the day of FMS1's return. FMS1 required the use of a walker on flat surfaces, used a cane when he had occasion to use stairs and had ongoing physical therapy appointments until the time of his death. Following his stroke, FMS1 had turned his driver's license into the State and his spouse or others had to drive him the approximately 30 mile distance from his residence to the Germantown facility. By January, 2011, utilizing a carpool, FMS1 returned to work full time and, by mid-2011, FMS1 recovered mobility sufficiently to regain his State driver's license. FMS1 received a handicap parking permit. However, no records can be identified that explain how or when obtaining the permit occurred.

Using personal judgment, FBM told FMS1 verbally that FMS1 was not allowed to go on ladders or on the building roof, events that were otherwise normal parts of the duties of FMS1. The Office of Human Capital (HC) was not involved in any return to work/fitness for duty process or reasonable accommodation process. There is no evidence of any formal review of FMS1's return to work/fitness for duty or of a reasonable accommodation.

On August 10, 2011, FMS1 slipped and injured his knee while stepping out of a DOE van at the Germantown Headquarters Facility. On September 8, 2011, FMS1 made a visit to the Germantown Occupational Health Clinic (OHC) and initiated a *Federal Notice of Traumatic Injury and Claim for Compensation* (CA-1) application for worker's compensation. The CA-1 was signed by FMS1 on September 8, 2011, and signed by FMS3 on September 16, 2011, as a witness of the accident. The CA-1 was signed by FBM on October 4, 2011. This CA-1 submittal was received by the U.S. Department of Labor (DOL), Office of Workers Compensation Programs (OWCP) on October 11, 2011. On November 28, 2011, the claim for worker's compensation was denied by DOL due to insufficient medical justification (fact of injury not established). This accident was reported to MA-433.

In March 2013, FMS1 tripped over a pallet in a hallway at work while walking with others. FMS1 reported to the OHC for evaluation and first aid treatment of a cut to the hand. Neither FMS1 nor his supervisor initiated an accident and injury report to MA-433. No CA-1 claim for worker's compensation was submitted for this accident.

In April 2013, the old drinking water filtering and cooling system in MER 7 was removed and replaced with a new Filtrine system. During this task, the stair railings were temporarily removed and reinstalled for equipment removal. The installation contractor stated that the stairs were scuffed. In the opinion of the Board, this was the only major work performed in MER 7 for the three to six month period prior to the accident that is likely related to damage noted on the stair treads after the accident on June 1, 2013. The Board found no one noticed and reported the tread damage before the accident.

FMS1 performed a quality assurance inspection of the Filtrine system at the end of April, 2013. FMS1 submitted the acceptance inspection report and findings to FBM, which indicated that FMS1 had performed the inspection in MER 7 alone. FBM reminded FMS1 that Federal personnel were not allowed to enter mechanical equipment rooms alone, or without notifying someone of their immediate plans due to safety reasons. FBM had a standing verbal policy that

none of his Federal employees should enter an MER alone. Also, FBM had encouraged FMS1 to include others in inspections to cross train them.

In May 2013, an emergency generator electrical upgrade project began for the Germantown Main Building that would occur over several months including weekends. During the weeks prior to the accident, FBM discussed roles, requirements, and weekend coverage with his team, including FMS1. FBM required a Federal employee from his staff to provide Governmental oversight of the electrical outage and the related scheduled weekend work on the generator expansion project.

FMS1 accepted the assignment to work Saturday, June 1, 2013, to provide oversight of the lockout/tagout (LOTO) and other work related to the electrical expansion in Load Center 4 in MER 6. The outage would disconnect the solar array and the cafeteria motor control center in MER 7, cutting power to the air handling unit and the sump pumps in that room.

There was an expectation by FBM that FMS1 was to inspect Load Center 4 inside MER 6, thus requiring FMS1 to use the stairs into MER 6. FBM's instructions to FMS1 were to verify completion of the LOTO in the morning, perform other desk duties during the day, and verify LOTO removal at the end of the task in the evening. FBM stated after the accident that he did not request FMS1 to enter MER 7 related to the weekend's electrical upgrade work.

On May 30, 2013, FMS1 participated in a task walk down in preparation for the following day's work. FBM excused FMS1 from walking to the exterior solar unit as an unnecessary exertion for FMS1 as FBM and FMS1 had reviewed that area earlier and that power disconnection could be confirmed from the interior of MER 6. MER 7 was not part of this walk down as LOTO activities were not planned for this room. However, FMS2 and Heating Ventilation Air Conditioning Technician (HVAC Tech) entered MER 7 on an unrelated housekeeping inspection that day, and did not notice any safety related damage to the tread.

2.2.2. **Events on the Day of the Accident**

On June 1, 2013, workers for the emergency generator electrical upgrade work started arriving at approximately 6 a.m. Two workers, the BLDG ELEC and Building Engineer (BLDG ENG), associated with the upgrade work also had other duties that day. An asbestos abatement task was also taking place on the first floor of the F-Wing in the building. These workers also observed FMS1 in the building.

FMS1 was observed by two witnesses to be alert and moving about using a walker to navigate the hallways. On the day of the accident, no one noted any degradation in FMS1's speech or mental functions.

At 7:25 a.m., the electronic door log[2] records and testimony indicate that BLDG ELEC entered MER 6 with FMS1as part of the LOTO task. About this time, the door to MER 6 was propped

[2] This report records the electronic door logs time to the minute only. Times from these records do not include seconds and intervals between subsequent events which may be off by up to 117 seconds.

open for the next three hours and, as a result, there are no records of entries and re-entries during that period.

The BLDG ELEC stated that FMS1 used his cane to transverse the stairs in MER 6 more than once. Out of concern for FMS1's mobility/stability on the stairs, the BLDG ELEC asked FMS1 if he needed any assistance at least twice and was rebuffed each time. BLDG ELEC decided not to ask again. BLDG ELEC separated from FMS1, carrying out other tasks.

At 7:48 a.m., the electronic door log records that FMS1 opened the door to MER 7. There were no witnesses that FMS1entered the room at this time. Also, the electronic door logs did not record the duration of door opening or record when personnel exit, therefore providing no indication if FMS1 entered the room or just looked into the room. Because de-energizing the load center in MER 6 resulted in a loss of power to the sump pumps in MER 7, FMS1 became concerned that there may have been a risk of flooding from water from existing equipment installed in MER 7.

The concern about flooding and the subsequent request at 8:20 a.m., from FMS1 for BLDG ENG and BLDG ELEC to meet him at MER 7, suggested to the Board that FMS1 had entered MER 7 at 7:48 a.m. to inspect the situation. This concern for flooding was not raised in work plans or walk downs or with FBM. FBM later stated that sump overflow should not have been a concern, and would have been inconsequential over the short outage period. The Board believes that FMS1's concern about flooding, and desire to supply backup power to the sump pumps, was likely the reason FMS1 entered MER 7 and attempted to descend the stairs at the time of the accident.

At approximately 8:20 a.m., FMS1 returned to MER 6. FMS1 contacted BLDG ELEC, told him there was a task in MER 7 and to bring the BLDG ENG with him. FMS1 requested they meet and the three of them would go to MER 7 to review the power connections on the MER 7 sump pump.

At 8:26 a.m., the electronic door log recorded that the BLDG ENG opened the door to MER 7. FMS1 left his walker in the hallway by the MER 7 door and, after holding the door open for the others to enter first, FMS1 continued into the room with his cane.

The BLDG ENG and BLDG ELEC walked ahead of FMS1 down the stairs into MER 7. The BLDG ENG and BLDG ELEC stated that the floor and stairs were dry, most equipment was off, the room was quiet enough for normal conversation, and the room was well lit by the overhead lights. Neither the BLDG ENG nor BLDG ELEC noted any stair tread damage while descending the stairs.

The BLDG ENG descended the stairs first and proceeded towards the sumps at the far end of MER 7; BLDG ENG briefly observed FMS1 enter the room at the stair landing. The BLDG ENG, with his back to the stairs, heard the conversation and directions exchanged between FMS1 and BLDG ELEC, but did not observe FMS1 descending the stairs.

The BLDG ELEC descended the stairs after the BLDG ENG and, as directed by FMS1, proceeded toward the Filtrine Water Chiller which was located approximately five feet from the base of the stairs. The BLDG ELEC also briefly observed FMS1 entering the room at the stair

landing, but did not observe FMS1 descending the stairs. The BLDG ELEC was talking to FMS1 and received instructions to check the Filtrine power indicator light. The BLDG ELEC had his back to the stairs and was shading his eyes from the glare of room lights to look closely at the Filtrine power indicator light, to determine if it was on or off.

Table 1: Summary Event Chart and Accident Chronology

DATE and Time (hours) (EST)	EVENT
~5/10/2010	FMS1 suffered a non-work related spinal cord injury (stroke).
10/6/2010	FMS1 requested to work from home by email.
10/6/2010	Request to work from home was denied by FBM because duties required FMS1 to be on-site.
11/20/2010	FMS1 emailed to FBM intention to return to work.
11/22/2010	FMS1 returned to work on an abbreviated schedule, using a walker or a cane.
1/2/2011	FMS1 returned to work full time.
Mid 2011	FMS1 regained drivers' license, and received handicap parking permit.
8/10/2011	FMS1 injured knee: slipped getting out of DOE van.
9/7/2011	FMS1 visited DOE Occupational Health Clinic RN1concerning a swollen, painful knee related to van injury.
10/5/2011	FMS1 submitted a CA-1 application.
3/1/2013	FMS1 tripped over a pallet in Germantown Building hallway.
3/1/2013	FMS1 visited DOE Occupational Health Clinic RN2 for injury to hand related to pallet trip.
4/17/2013 to 4/22/2013	Filtrine unit in MER 7 was replaced.
4/29/2013	FMS1 conducted an inspection of MER 7 alone and submitted an inspection report to the FBM.
04/29/2013	FBM verbally reminded FMS1 not to enter MERs alone.
~5/28/2013	FBM assigned FMS1 to provide governmental oversight of generator expansion project scheduled for Saturday June 1, 2013.
5/30/2013	FMS1 participated in task walk down.
5/30/2013	FMS2 and HVAC Tech performed inspection of MER 7.
June 1, 2013 ~ 6:00 a.m.	Workers arrived at Germantown for electrical upgrade project.

DATE and Time (hours) (EST)	EVENT
June 1, 2013 ~ 7:00 a.m.	IH1 spoke to FMS1 in F corridor.
June 1, 2013 7:25 a.m.[3]	BLDG ELEC electronically badged in and opened door to MER 6.
June 1, 2013 7:48 a.m.[3]	FMS1 electronically badged in at the MER 7 door.
June 1, 2013 Between 7:25 a.m. and 8:26 a.m.	FMS1 and BLDG ELEC entered MER 6 at door H-002 and walked with cane down stairs to perform LOTO review multiple times (door propped open, door log disabled).
June 1, 2013 ~8:20 a.m.	FMS1 contacted BLDG ELEC to ask him to locate BLDG ENG and meet at MER 7.
June 1, 2013 ~8:25 a.m.	FMS1 and BLDG ELEC departed MER 6 and walked to MER 7, meeting BLDG ENG on the way.
June 1, 2013 8:26 a.m.	BLDG ENG badge in at door G-044 into MER 7.
June 1, 2013 ~8:26 a.m.	FMS1 held door open with cane, allowing BLDG ENG and BLDG ELEC to enter ahead of him.
June 1, 2013 ~8:26 a.m.	BLDG ENG descended stairs first and proceeded to the sumps at the far end of MER 7.
June 1, 2013 ~8:26 a.m.	BLDG ELEC descended stairs after the BLDG ENG and proceeded towards Filtrine Chiller as directed by FMS1.
June 1, 2013 ~8:27 a.m.	FMS1 fell to floor of the MER 7.
June 1, 2013 ~8:27 a.m.	BLDG ELEC heard a thud sound, turned and saw FMS1 on floor at the base of the stairs.
June 1, 2013 ~8:27 a.m.	BLDG ELEC called FMS1 by name a few times.
June 1, 2013 ~8:27 a.m.	When BLDG ENG heard BLDG ELEC call out for FMS1, turned to see FMS1 on floor and returned to assist.
June 1, 2013 ~8:27 a.m.	BLDG ELEC tried to call 911on his personal cell phone but had no signal.
June 1, 2013 ~8:27 a.m.	BLDG ELEC told BLDG ENG to call 911.

[3] Electronic door times.

DATE and Time (hours) (EST)	EVENT
June 1, 2013 ~8:27 a.m.	BLDG ENG called 911 on his personal cell phone.
June 1, 2013 ~8:28 a.m.	BLDG ELEC ran towards MER 6, met CONTR1 and asked CONTR1 to call 911, but CONTR1 contracted PF1 to make the call.
June 1, 2013 ~8:28 a.m.	PF1 radioed the Central Alarm Station (CAS) to report medical emergency.
June 1, 2013 8:28 a.m.	EC1 and CONTR2 left MER 6, electronically badged in and entered MER 7 to assist.
June 1, 2013 ~8:28 a.m.	CONTR2 rendered first aid.
June 1, 2013 ~8:28 a.m.	CAS dispatched PF2 and PF3 to the scene via radio.
June 1, 2013 8:28 a.m.	PF4 and SSGT, over heard CAS radio message, and responded from warehouse area where security drill was occurring and headed towards MER 7.
June 1, 2013 ~8:28 a.m.	BLDG ELEC left MER 6 and ran toward the loading dock Security Station but met PF4 and SSGT and turned back toward MER 7 with the Officers.
June 1, 2013 ~8:29 a.m.	PF4, SSGT and BLDG ELEC arrived at MER 7, PF4 electronically badged in and SSGT took control of scene. (Door is propped open, door; log disabled).
June 1, 2013 ~8:31 a.m.	FMS1 regained consciousness.
June 1, 2013 ~8:32 a.m.[4]	CAS contacted 911.
June 1, 2013 ~8:33 a.m.	PF3 arrived at scene.
June 1, 2013 ~8:33 a.m.	BLDG ELEC returned to MER 7.
June 1, 2013 ~8:34 a.m.	PF2 arrived at scene with medical supply bag which was used by CONTR2.
June 1, 2013 8:36 a.m.[4]	Ambulance arrived at gate.
June 1, 2013 ~8:40 a.m.	EMS personnel arrived at the scene via the loading dock entrance.

[4] PF Incident report times (CAS clock or watch not synchronized with Door Log clock).

DATE and Time (hours) (EST)	EVENT
June 1, 2013 ~8:40+ a.m.	EMS personnel assessed FMS1 and began medical aid.
June 1, 2013 ~9:00 a.m.	FMS1 was carried out of MER 7 on a backboard and placed on a stretcher in the corridor G, ground level.
June 1, 2013 9:12 a.m.[4]	Montgomery County Ambulance departed for Suburban Hospital, Bethesda, MD.
June 1, 2013 between 9:12 a.m. and 10:03 a.m.	PF2 and SSGT cleaned up the scene.
June 1, 2013 between 9:12 a.m. and 10:03 a.m.	IH1 asked PF personnel if they had noted anything
June 1, 2013 between 9:12 a.m. and 10:03 a.m.	PF3 photographed stair tread after clean-up.
June 1, 2013 between 9:12 a.m. and 10:03 a.m.	PF personnel asked IH1 permission to trim tread tear. Permission is given and tread is trimmed.
June 1, 2013 10:03 a.m.	The Pro Force Facility Commander electronically badged in at MER 7, indicating badge entry had resumed (door closed).
June 1, 2013	Family notified FBM of FMS1's condition.
June 4, 2013	Notification Report was entered into ORPS as a fall.
June 20, 2013	Hospital life support was suspended and FMS1 was transferred to hospice.
June 24, 2013 ~7:30 p.m.	FMS1 succumbed to his injuries.
June 27, 2013	The accident was updated in ORPS as a fatal accident and an accident investigation was requested.
June 28, 2013	Accident Investigation authorized.

2.2.3. **The Accident**

At approximately 8:27 a.m., within a minute or so of BLDG ELEC, BLDG ENG and FMS1 entering MER 7, FMS1 fell, landing face down on the floor at the base of the stairs, striking his head on the concrete floor. Both the BLDG ELEC and BLDG ENG had their backs to the stairs and did not observe the fall. The BLDG ELEC was approximately five feet from the base of the stairs and the BLDG ENG was approximately ten feet away from the base of the stairs at the time of the accident.

Neither the BLDG ELEC nor BLDG ENG heard FMS1 cry out or make any other noise as he fell; the BLDG ELEC stated that he heard a single thud-like impact noise, likely from FMS1 striking the concrete floor, turned to face the noise, and found FMS1 face down on the floor at the bottom of the stairs.

The Board believes the fall was the result of FMS1 descending or transitioning from the stairs to the floor. FMS1 was last observed standing on the landing at the top of the stairs. However, the lack of other falling noises and the extended position of the body with the feet near the stairs and the head away from the stairs strongly suggest that FMS1 was at or near the bottom of the stairs when he fell. It is unclear what caused FMS1 to fall.

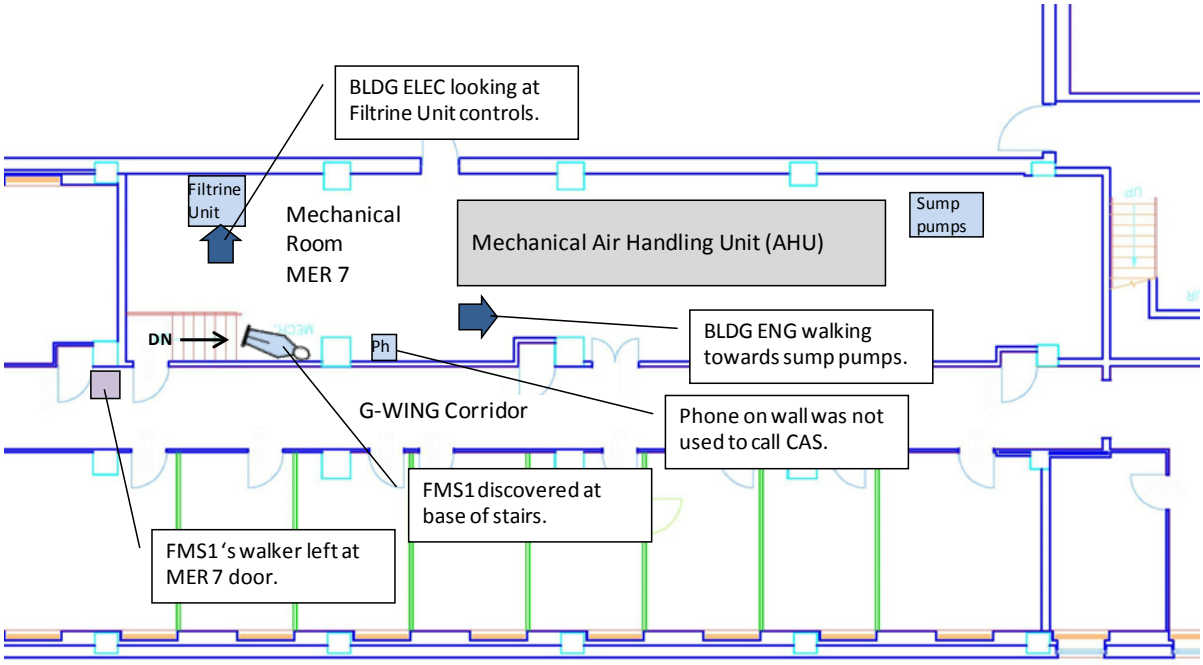


Figure 9: Mechanical Room 7 Floor Plan

2.2.4. **Responding to the Accident**

The BLDG ELEC turned in response to an unusual sound, saw FMS1 face down on the floor, called FMS1 by name and went to FMS1's aid. The BLDG ENG heard the BLDG ELEC call out to FMS1, and came back to the stairs as well. FMS1 was laying face down, legs extended,

his cane and right arm underneath his body, and left arm and hand up to his head. He was unresponsive.

The BLDG ELEC attempted to call 911 from his cell phone but did not have a signal. BLDG ELEC told the BLDG ENG to assist FMS1 and to try calling 911 on BLDG ENG's cell phone. The BLDG ELEC left MER 7 to summon help. Neither the BLDG ENG nor BLDG ELEC realized there was a wall telephone in MER 7, nor did they realize that they should call the DOE Germantown Central Alarm Station (CAS) at phone number 166 instead of dialing directly to Montgomery County emergency services at 911.

The BLDG ELEC ran to MER 6 and asked an Asbestos Abatement Contractor (CONTR1) working near MER 6 to contact help. CONTR1 contacted a Protection Force Officer (PF1) to report the accident. The BLDG ELEC then ran towards the loading dock and the guard station there to report the accident. During this time, the BLDG ENG stayed with FMS1 and called 911 on his personal cellular telephone. Electrical Contractor (EC1) and Contractor Electrician (CONTR2) were working in MER 6, left MER 6 and, at 8:28 a.m., the electronic door log recorded that they entered MER 7 to assist. They found the BLDG ENG talking with the 911 operator as he was kneeling down at FMS1's head. CONTR2, a trained, off-duty Emergency Medical Technician (EMT), proceeded to administer first aid.

CONTR2 observed FMS1 lying face down with his left hand beside his head and his right hand beside his waist. CONTR2 observed FMS1 to be unconscious with a small pool of blood under his head. It was also noted that FMS1's cane was located under his body, in or near his right hand.

PF1 radioed CONTR1's message about a medical emergency to the CAS. The CAS notified security personnel to end an exercise that was in progress due to an actual accident. Officer PF4 and Shift Sergeant (SSGT) left the exercise in the warehouse area and responded to the CAS announcement toward the scene. BLDG ELEC was headed toward the loading dock, met PF4 and SSGT in the hallway and turned back to return to the scene with the officers. At 8:29 a.m., the electronic door log recorded PF4 badged through the door as they entered MER 7 to assist.

SSGT took control of the scene, PF4 cleared the corridor of onlookers, and EC1 propped open the door (stopping door logs for the next 1.5 hours) and moved FMS1's walker out of the corridor into another room. Subsequent accident reports failed to record the initial response or presence of EC1, CONTR2, PF4, or SSGT on the scene.

CAS requested officers PF2 and PF3 to respond to the scene; the Protection Force Incident Report recorded them as the first responders. PF2 and PF3 stated when they arrived on the scene, SSGT was in control of the scene, CONTR2 was administering first aid, and PF2 and PF3 primarily cleared the corridor and assisted in directing the arriving Montgomery County EMS personnel to the scene. PF2 had arrived at the scene with a medical supply bag which was used by CONTR2. At this time, FMS1 was conscious and PF2 observed FMS1 lying face down, head propped up in hands, elbows on the floor.

The CAS contacted 911 at approximately 8:32 a.m. per the PF Incident Report. EMS was already en-route, due to the 911call placed by the BLDG ENG. Facility and PF management

were notified by the CAS. Per the CAS report, the EMS arrived at the gate at 8:36 a.m., and entered the building via the loading dock and was immediately directed to the scene in MER 7. EMS took over first aid from CONTR2 at this time. While retrieving the stretcher, the ambulance was relocated to the J-Wing old library door for quicker access.

By the time the EMS arrived, FMS1 was conscious and talking to BLDG ENG and emergency responders. He was initially coherent but slightly confused. One witness recalled that FMS1 stated "I fell." However, as FMS1 was carried from the room on a backboard and placed on the stretcher in the corridor, he appeared conscious but incoherent.

The ambulance left the front gate at 9:12 a.m. FMS1 was transported to Suburban Hospital in Bethesda, MD, a level one trauma center. At the trauma center, FMS1 was determined to have a fractured skull, orbital bone, and nose and was in a coma.

2.2.5. **Events Subsequent to the Day of the Accident**

MA-433 categorized the accident as reportable under the Occurrence Reporting and Processing System (ORPS) on June 3, 2013, and filed the occurrence report on June 4, 2013. It was initially anticipated that FMS1 would recover and the final report would include his statement of what happened.

However, FMS1 remained in a coma until June 20, 2013, when he was removed from hospital life support and transferred to a hospice where he succumbed to the injuries on the evening of June 24, 2013. MA-433 categorized the fatality on June 25, 2013, and finalized the ORPS report on June 27, 2013. MA-1's request to HS-1 to convene an Accident Investigation Board was submitted.

2.3. Management Response, Investigative Readiness and Scene Preservation

Upon departure of the ambulance, the accident scene was promptly cleaned up by PF2 and SSGT. Without complete documentation and evidence collection, MER 7 was returned to normal service at about 10:00 a.m. Photos taken of the accident scene were of the stairs and stair tread tear and were identified by the Officers as a potential tripping hazard that could have caused the accident. PF personnel asked a DOE contractor industrial hygienist (IH1) permission to trim the tread tear and IH1 gave permission to PF personnel and tread was trimmed.

(CON 1) The Board concluded following a review of the DOE Pro Force emergency plan procedures, that procedures and resources did not address preservation documentation of an accident scene as required by DOE O 225.1B, *Accident Investigations*. **(JON 1)**

The accident occurred on June 1, 2013, notification by MA did not occur until after the "fatality" criteria contained in DOE O 225.1B was reached, more than 20 days later.

(CON 2) Regarding the Office of Management Response to the accident, the Board concluded that there was a delay in the categorization of the accident, which would trigger a Federally-led Accident Investigation, which should have occurred after FMS1 had been hospitalized more than five days, pursuant to DOE O 225.1B. **(JON 2)**

2.4. Accident Analysis

2.4.1. Barrier Analysis

After a basic chronology of events was developed, the Board performed a Barrier Analysis of the accident. To start the Barrier Analysis, the Board chose a target (the person or item to be protected) and the hazard (what the person or item is to be protected from). The Board selected FMS1 as the target, and a fall from stairs to the floor as the hazard. There were 11 barrier failures identified and analyzed by the Board:

- HC review of work accommodations for persons with disabilities;
- Return to work[5]/fitness for duty process[6];
- DOE Germantown handicap parking permit process;
- Review FMS1's accidents at work upon returning to work in 2010;
- Submission of CA-1Worker Compensation Case Report Form;
- Work area (MER 7) hazard identification and inspection;
- Formal, written and understood limitations of duty;
- Occupational Safety & Health Administration (OSHA) compliant stairs;
- Oversight of HQ Safety Program DOE O 440.1B, *Federal Employee Occupational Safety and Health Program*; DOE O 341.1A, *Federal Employee Health Services*, and OSHA 29 CFR 1960 by HSS, MA, and HC;
- DOE G 440.1-1B; October 20, 2011; Sec. 8.8.4.3.3.6, *Worker Safety and Health Program for DOE (Including the National Nuclear Security Administration) Federal and Contractor Employees*, which states that the supervisor should notify HC if an employee takes five or more days of sick leave upon returning to work; and
- Assistance while transiting stairs.

The analysis indicated that the barriers played a role in exposing FMS1 to the fall hazard in this accident. The Barrier Analysis worksheet is presented in Appendix B.

[5] Return to work programs are designed to allow employees who have suffered injuries or illnesses to return to work and perform their duties safely and effectively.

[6] Fitness for duty programs ensure that employees are not mentally or physically impaired in a way that can adversely affect their ability to safely and competently perform their duties.

2.4.2. **Change Analysis**

To further support the development of causal factors, the Board performed a Change Analysis of events and conditions associated with the accident. The Board examined the planned and unplanned changes that caused the undesired results or outcomes related to the accident. The changes that related to this accident were:

- FMS1 suffered a prior spinal infarction or stroke that resulted in limited mobility;
- FMS1 requested to work from home, per instruction of his physician;
- FMS1 returned to work without a formal review of fitness for duty;
- Damage to stair tread probably occurred during the replacement of a Filtrine unit in MER 7 prior to the accident but was not identified and repaired; and
- Events relating to the power outage expanded the scope of work from MER 6 into MER 7.

The Change Analysis worksheet is presented in Appendix C.

2.4.3. **Event and Causal Factors Chart**

After performing the barrier and change analyses, the Board assigned results from each analysis to events on the chronology of events. This involved assigning analysis results as conditions that were related to or initiated the events within the chronology.

Assigning these conditions with events resulted in the Events and Causal Factors (ECF) chart in Appendix E. Once conditions were assigned, the Board examined the ECF chart to determine which events were significant (i.e., which events played a role in causing the accident).

The Board then assessed the significant events (and the conditions of each) to determine the causal factors of the accident.

The causal factors that resulted were:

Direct Cause (DC) – the immediate events or conditions that caused the accident.

The Board identified the direct cause of this accident to be that FMS1 fell while descending or transitioning from the stairs to the floor striking his head on the floor of MER 7 resulting in a fatal head injury.

Root Cause (RC) –causal factors that, if corrected, would prevent recurrence of the same or similar accidents.

The Board identified the root cause of this accident to be that an effective fitness for duty requirement and process does not exist at DOE Headquarters for Federal employees returning to work from a non-work related injury or illness.

Contributing Causes (CC) – events or conditions that collectively with other causes increased the likelihood or severity of an accident but that individually did not cause the accident.

The Board identified six contributing causes to this accident:

CC1: A reasonable accommodation was not provided such as a medical flexi-place agreement or PD revision and a review by HC, or FOH was not performed. A request to work from home, supported by FMS1's physician's letter dated September 20, 2010, was denied.

CC2: A formal and appropriate review of FMS1's fitness for duty did not occur.

CC3: Clear responsibilities and guidance did not exist for conducting oversight of the fitness for duty and return to work processes.

CC4: FMS1 was assigned duties that included entering and transiting stairs in mechanical equipment rooms without a formal review of his physical capabilities.

CC5: Management systems weaknesses existed because oversight of return to work, fitness for duty and Federal Employee Occupation Safety and Health programs had not been conducted.

CC6: The MER 7 stairs were not in compliance with codes and standards, and were not in optimum condition for traversing.

2.5. Fitness for Duty and Return to Work

FMS1 had a spinal infarction or stroke in May, 2010. The stroke occurred on the weekend and was not work-related. At that time, FMS1 had suffered paralysis and future work plans were uncertain. On October 6 of that year, FMS1 provided a letter from FMS1's doctor to the FBM through email, dated September 20, 2010, noting that FMS1 was "*feeling well enough to try to work again*."

The note continued by stating:

> *"His transition back to working is likely to be more successful if he is able to work from home initially, and with limited hours." The doctor felt this arrangement would "allow him to take breaks as needed, as he continues to experience fatigue, which is expected with the injuries he sustained."*

This request to work from home was denied by FBM, with the rationale provided that since FMS1 worked in a service organization, he had to be present to do his job. FMS1 was informed by FBM that he needed a doctor's release to return to full duty before he could come back to work.

On November 16, 2011, FMS1 sent an email to FBM noting that his doctor "*stated that she would get the letter out to me*." FMS1 followed up with an email on November 20, 2010, stating that "*I received a letter from (my doctor) to come back to work*," and that he would return to work on Monday at 8:00 am. A copy of a letter dated November 12, 2010, and believed to be the one referenced in the email, had a box checked that stated the patient "*May return to work/school with the following restrictions.*"

The letter goes on to state the restriction that FMS1:

> *"…should start back to work part time (about 4 hours per day), and work from home for some portion if possible. He will be the judge of his energy level and stamina, but will likely be able to transition back to full time as he tolerates."*

FMB stated that this letter was delivered to him by FMS1 on the day FMS1 returned to work. This letter was not documented in the payroll records or FMS1's file; it was produced by the family when requested by the Board.

Payroll records indicate that FMS1 returned to work on Monday, November 22, 2010, and reported sporadically to work until the beginning of January 2011, when FMS1 started to report to duty full time. Upon returning to work, FMS1 used a walker or a cane to traverse the hallways. FMS1 returned to work under his existing PD, which had as physical requirements "*continuous walking, standing, climbing stairs and ladders and light lifting.*"

Individuals who worked with FMS1 reported seeing him navigate stairs two different ways. One way was to step straight down the stairs by holding the hand rail in one hand and walking down holding his cane in the other. FMS1's lead foot would move to the next stair, while his lag foot would come to rest beside the lead foot on the same stair. BLDG ELEC stated that he saw FMS1 walk sideways down the stairs, holding the rail with both hands along with his cane in one hand, and move FMS1's lead foot to the next stair down while FMS1's lag foot came to the next stair to meet it. BLDG ELEC observed FMS1 transcending stairs and estimated that it took FMS1 about 45 seconds to descend the six steps of the MER 6.

The Board is aware of at least two incidents in which FMS1 either fell or slipped on the job after returning to work. Once in August 2011, FMS1 was injured by slipping when stepping out of a DOE van. FMS1 applied for worker's compensation. The CA-1 submitted was denied by DOL due to insufficient medical justification (fact of injury not established). In March 2013, FMS1 tripped over a pallet that was on the third floor of the Germantown facility. His injuries were significant enough that he went to the Occupational Health Clinic for care.

FMS1 returned to work under the PD that had been in place for FMS1 previously. The PD required FMS1 to walk continuously, climb stairs, and traverse ladders. FBM stated to the Board that, FMS1 was verbally instructed not to go up ladders. FBM also stated that he had concerns with FMS1 being on the roof because it was too dangerous for him to be walking on roofs. However, the Board found that FMS1 was on the updated electronic door access lists for both the Mechanical Rooms and the roof in April 2013.

FBM stated that just weeks before the fatal injury, FMS1 had walked into one of the mechanical rooms to do an inspection on his own, and FBM had cautioned FMS1 that he should not be in the mechanical rooms alone in the event there was a problem and no one was around to assist. FBM noted that this was his policy for any Federal employee since the mechanical rooms were high hazard areas in relation to office areas.

Though FMS1 had a physical disability upon his return to work, suffered at least two incidents of falls or slips, and worked in the mechanical rooms where the only means of entry was a staircase, the PD for FMS1 was not formally reviewed or revised upon FMS1's return to work. The

concerns that FMS1 may not be able to do all the physical aspects of his position did not translate into any formal management systems restricting him from accessing areas where he would be most likely to be seriously injured, or have difficulty evacuating in an emergency. There is guidance but no requirement to perform a fitness for duty review. Had there been a requirement and an effective fitness for duty review been performed for FMS1, it may have triggered further appropriate limitations such as not entering high hazard areas such as mechanical rooms, considering the only means of egress into the rooms is a staircase.

The Board reviewed the DOE HC internal guidance document; *Procedures to Facilitate the Provision of Reasonable Accommodations for Individuals with Disabilities.* The guidance notes that employees can ask for accommodations, however, any request that "*lowers standards of performance or production.…will be denied.*" Section III of the guidance also notes that any request for reasonable accommodations must be initiated by an employee or his/her representative to the employee's supervisor. This request may also come from a family member, friend, or health professional. Therefore, it appears from the procedures that any reasonable accommodation request must come from the employee or a representative on the employee's behalf or there is no trigger in the system to formally consider revisions to job tasks.

Other than FMS1's initial request to work from home, the Board found no evidence that FMS1 applied for any reasonable accommodations or that FMS1 was aware that a policy existed. Given the earlier stated difficulty that FMS1 had traversing stairs; a reasonable accommodation could be considered based on his limited mobility.

FMS1's return to work was admirable in the sense that FMS1 had progressed to the point that FMS1 could drive a vehicle and perform most aspects of his position, though he could no longer do all aspects of his job. With FMS1's mobility challenges, FMS1 could not climb ladders and could not easily traverse stairs. While anyone can suffer a fall down stairs, FMS1's physical limitations may have contributed to the probability he could suffer a fall. FMS1 returned from a debilitating illness which left him unable to easily climb stairs or walk long distances. FMS1 fell or slipped on at least two occasions prior to the June 1, 2013 accident. These points were opportunities that were not effectively used to revisit his duties and determine if an accommodation should be made related to his ability to climb stairs and enter the higher hazard areas.

FMS1 had suffered an illness that occurred away from work. The Board contacted Human Capital Benefits and Retirement Team Supervisor, Human Capital Employee Labor Relations Office Director, and Human Capital Headquarters Program Manager in HC to understand how the process at DOE should work when an employee is injured off the job. All contacts in HC indicated to the Board that HC offices would not be involved with injuries and illnesses that occurred "off the job" unless specifically asked for reasonable accommodations. DOE's Office of Learning and Workforce Development confirmed that they do not cover safety topics (including workers compensation issues) in the training provided to supervisors. The Board was provided new training modules from the Office of Learning and Workforce Development. These modules are available to supervisors and demonstrate how to use the new DOL Employee's Compensation Operations and Management Portal system. They do not address any requirements or provide guidance for supervisors attempting to return employees to work who have been away due to a non-work related illness or injury.

Guidance on returning to work from a non-work related injury or illness was unclear and there was no training provided to supervisors on how to address these issues. Multiple supervisors, including FMS1's own supervisor, spoke to the Board and were uncertain about the actions they should take when an employee is returned to duty.

There was a list of Frequently Asked Questions from the Office of Personnel Management from January 1998 that noted an agency can require a medical examination:

> *"…whenever there is a direct question about the employee's ability to meet the physical or medical requirements of a position."*

However, based on previous experience, FBM stated that he was concerned about asking FMS1for anything beyond the doctor's letter to return to work because FBM felt it might be taken as discriminatory. FMS1 was not identified as needing evacuation assistance under the Occupant Emergency Plan (OEP) after he returned to work with a disability. There was no indication FMS1 would have known to notify anyone regarding the OEP, or if FBM knew to inform FMS1 of this notification.

DOE's policies and procedures for returning employees to work after an injury or illness that occurs off the job are inadequate. The procedures were unclear on what role the supervisor had in the process. Supervisors were not made aware of any resources available to them such as; assistance from occupational medicine professionals to conduct independent medical reviews and, supervisor and employee training did not address these issues.

FBM felt legally limited in requiring additional information or medical evaluations when returning an employee to work. An individual's desire to return to work and perform all of their previous duties after an injury or illness that occurs off the job is often laudable. However, DOE has a responsibility to review the tasks that will be conducted and have reasonable policies in place with commensurate training to protect the individual.

Some of the supervisors the Board spoke with were under the impression that they could not ask questions or require a medical examination for someone returning to the job after an injury or illness away from the job. However, the United States Equal Employment Opportunity Commission (EEOC) states that; an employee can be asked questions about their medical condition or be required to take a medical exam "*if the employer needs medical documentation to support an employee's request for an accommodation or if the employer believes that an employee is not able to perform a job successfully or safely because of a medical condition*."[7] All the medical documentation that FMS1 provided upon his return to work was a letter from his doctor that said he "*will likely be able to transition back to full time as he tolerates*." Since FMS1 could not perform all the functions of his PD, a request for an exam to ensure the aspects of his job he could perform would have been consistent with guidance from the EEOC.

One resource that existed but was not utilized in the case of FMS1's return to work was the FOH services. The FOH currently has a contract with the DOE and provides services such as providing a medical advisor to review documentation for employees who have a disability and

[7] http://www.eeoc.gov/laws/types/disability.cfm, accessed 8/1/2013.

conducting fitness for duty examinations. One purpose of such exams is to assist the Department in determining if an employee can perform work in their PD , if alterations are needed in their PD, and which, if any precise restrictions should be put in place either temporary or permanently to ensure that the individual with a disability does not have to perform tasks outside their abilities[8].

The Board reviewed a Fitness for Duty program at one of DOE's facilities, Sandia National Laboratories (SNL). SNL maintains a "*comprehensive Fitness-for-Duty program*" with the goal to, among other things; provide reasonable measures for employees who are not able to perform their jobs due to physical impairment. One of the triggers for a medical evaluation is when specific behaviors are exhibited by an employee that lead a manager to believe there is any impairment. The health services are then responsible to determine temporary or indefinite medical restrictions that should be put in place to allow the employee to work safely. Statistics from past years of the program show that examinations were conducted for employees with various illnesses, such as diabetes and Alzheimer's disease, which occurred off the job[9].

The Board believes that if a comprehensive medical exam had been conducted prior to FMS1's return to full duty, with the specific goal of determining which activities in his PD should be restricted based on his disability, FMS1 would likely have been restricted from entering high hazard areas such as the roof and MERs, and the incident on June 1, 2013, would not have occurred.

2.6. Condition of the Mechanical Equipment Room 7 Stairs

The stairs in MER 7 were examined for potential factors that may have caused or contributed to the accident. As part of this evaluation, the riser of each step of the MER 7 stairs was measured. The damaged tread cover on the top step was replaced subsequent to the accident, so the riser measurement of the top step and the riser measurement to the landing above the top step were adjusted 1/8 inch to reflect the conditions present at the time of the accident. The largest rise was 7.5 inches for the bottom step. The smallest rise was 6.25 inches measured from the tread of the top step to the surface of the landing. The rise of the five intermediate steps measured 6.75 inches. Figure 10 provides a drawing of the stairs in MER 7.

[8] Presentation by Presant and Bingham, *Federal Occupational Health, Disability Prevention and Management Services*

[9] Sandia National Laboratory Fitness for Duty Program, along with accompanying Summary Sheet for Sandia's Fitness for Duty Exams, provided by the DOE Chief Medical Officer, 7/11/2013

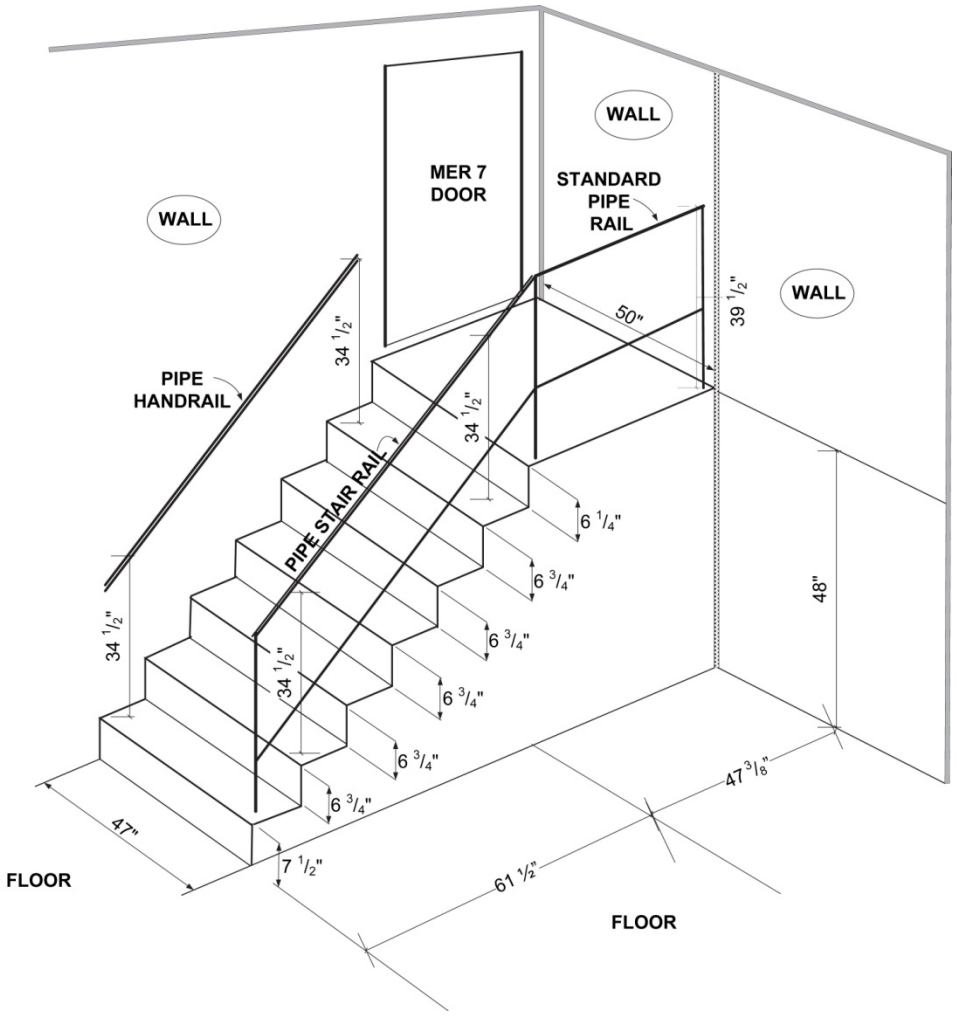


Figure 10: Isometric Drawing of Mechanical Equipment Room 7 Stairs

DOE O 440.1B requires compliance with applicable worker protection requirements including 29 CFR 1910, *Occupational Safety and Health Standards*, and 29 CFR 1926, *Safety and Health Regulations for Construction*.

29 CFR 1910.24, *Fixed Industrial Stairs*, section (f), states:

> *"Stair treads."…rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs."*

In order to assess the tolerances allowed in stair construction to meet the definition of "uniformity" in the OSHA General Industry standard 29 CFR 1910.24(f), OSHA interpretations were searched. OSHA 29 CFR 1926.1052*Stairways*, section (a) (3) states:

> *"Riser height and tread depth shall be uniform within each flight of stairs, including any foundation structure used as one or more treads of the stairs.*

Variations in riser height or tread depth shall not be over 1/4-inch (0.6 cm) in any stairway system."

OSHA has interpreted the General Industry standard 29 CFR 1910.24(f) to allow the same amount of variation in riser height or tread depth as specified in the construction standard.

The difference between the largest riser which occurs at the bottom step of the MER 7 stairs and the riser of the adjacent step is 0.75 inches. The difference between the riser of the top step and the riser to the landing of the MER 7 stairs is 0.50 inches. The variation in riser heights for both the bottom step and the top riser to the landing exceed the 0.25 inches allowed by the OSHA regulations.

This may be a significant factor for someone with a disability using a cane to descend the stairs. Especially, since the step with the largest rise is the bottom step, where the steps and hand rails end without hand rail extension at floor level, and which FMS1 had to transition to the floor level without a point of support.

The landing rail, stair rail, and hand rail were also checked for compliance with OSHA requirements. The stair rail and hand rail were noted to be 34.5 inches above the stair treads. 29 CFR 1910.23(e) (2) for stair rails and 29 CFR 1910.23(e) (5) (ii) for handrails require the height of the rails to be no more than 34 inches nor less than 30 inches. However, a proposed OSHA Regulation would change the height to no more than 37 inches or not less than 36 inches.

The proposed Rule includes grandfathering provisions which would allow the height to be not more than 42 inches or less than 30 inches. Therefore, the 0.5 inch deviation from 29 CFR 1910.23(e) (2) would be considered de minims non-compliance (or not significant). The top rail on the landing at the top of the stairs in MER 7 was set at 39.5 inches. Although 29 CFR 1910.23(e) (1) required the top of the rail to be 42 inches above the floor of the landing, it was considered a de minims non-compliance by OSHA.

29 CFR 1910.23(c) (1) states,

"Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing (or the equivalent as specified in paragraph (e)(3) of this section) on all open sides except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides, (i) Persons can pass, (ii) There is moving machinery, or (iii) There is equipment with which falling materials could create a hazard."

Since the landing at the top of the stairs in MER 7 was 48 inches above the floor of the room, and above an area where persons can pass, the railing was required to have a toeboard. The railing on the landing at the top of the stairs in MER 7 did not have a toeboard, which is an OSHA non-compliance.

PF2 noticed immediately following the accident, that the rubber tread cover on the first step down from the landing was torn. The Board believes that the tread cover was damaged during the demolition and replacement of the Filtrine Water Chiller in MER 7, between April and May

of 2013. Although there were several walk-through inspections of MER 7 prior to the accident, the torn tread cover wasn't noted until after the accident occurred.

Since there were no eye witnesses of FMS1 falling, and since the accident scene was not preserved, the Board could not determine exactly what caused FMS1 to fall. The possibilities included:

- FMS1 may simply have fallen due to his physical limitations;
- With the toeboard missing, FMS1 may have caught his foot on the rail post on the landing at the top of the stairs;
- FMS1 may have tripped on the torn stair tread cover; or
- FMS1 may have lost his balance at the bottom step, since FMS1 was leading with his cane and the rise of the bottom step is 0.75 inches, a distance greater than the previous steps.

2.7. Integrated Safety Management System Implementation

Integrated Safety Management (ISM) establishes the overall framework and specific guidance for ensuring that the protection of workers, the public, and the environment is fully and effectively incorporated into all work and operational activities.

The guiding principles (GP) are the fundamental policies that guide DOE and contractor actions, from development of safety directives to performance of work. The Board's review of evidence related to this accident identified the following facts related to the guiding principles.

2.7.1. Guiding Principle 1: Line Management Responsibility for Safety
Guiding Principle 2: Clear Roles and Responsibilities

Line management is directly responsible for the protection of the public, workers, and the environment. **(GP1)**

Clear lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the Department and its contractors. **(GP2)**

A common element of these two Guiding Principles is a fully implemented ISM policy by the line organization.

DOE O 450.2, *Integrated Safety Management*, Section 4.Requirements, states:

> *"DOE line management organizations must document their approach for ensuring that both their DOE offices and their contractors establish ISM systems, including the implementing mechanisms, processes, and methods to be used in an ISM System Description Document. The ISM System Description Document must be consistent with the hazards and complexity of the facilities and work performed. Furthermore, this document must clearly describe how ISM Guiding*

Principles and Core Functions (see DOE P[10]) have been applied and how relevant safety goals and objectives are established, documented, and implemented."

Although it was stated that MA had been working to incorporate the ISM principles into their work, MA had not established or implemented a formal ISM program pursuant to DOE O 450.2. In the absence of a formal ISM program, the Board evaluated the ISM Guiding Principles relevant to the accident in this report.

MA did not have a written ISM Description. The Board was told that the principles of ISM had been incorporated into various MA Standard Operating Procedures.

The Board, in an attempt to understand the flow down of ISM to other Headquarters organizations, looked at the HSS interaction with MA safety responsibilities. HSS did develop an ISM Description. However, the document focused on the relationships between HSS and DOE field offices, and did not address the interactions of HSS with MA or HC in Headquarters. Also, the Functions, Responsibilities, and Authorities for HSS, within the ISM Description, have not been maintained and are out of date.

(CON 3) Formal independent oversight review by HSS of the HQ implementation of DOE Order 450.2, *Integrated Safety Management* (ISM); 5 U.S.C. 8100, *Federal Workers Compensation Program (OWCP)*; DOE Order 440.1B, *Worker Safety and Health Program for DOE Federal and Contractor Employees*; and DOE Order 341.1A, *Federal Employee Health Services*; was not requested by the Office of Management, or Office of Human Capital, and therefore not conducted by the Office of Health, Safety and Security. **(JON 3)**

Line management is directly responsible for the protection of workers. On October 6, 2010, FMS1 requested an accommodation to work from home during recovery from a spinal cord injury. The request was supported by a letter from his doctor, which indicated the transition back to working would likely be more successful if FMS1 was allowed to work from home initially. That request was denied by FBM without FMS1's benefit of a subsequent formal and documented review by HC.

Although DOE had been using a form of "flexi-place" since 2000, the Telework Enhancement Act (TEA) of 2010 was not signed into law until December 9, 2010. At the time the request was made by FMS1, formal DOE guidance incorporating TEA guidance for encouraging the use of flexi-place, and the process for requesting and approving/disapproving DOE medical flexi-place, was not in place.

(CON 4) The Board concluded, as a result of a request by FMS1 to perform work from home being denied, FMS1 returned to work and resumed physical activity sooner than was initially recommended by FMS1's physician. **(JON 4, JON 5, JON 6, JON 7)**

[10] DOE P 450.4A, *Integrated Safety Management Policy.*

2.7.2. **Guiding Principle 3: Competence Commensurate with Responsibility**

Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities. **(GP3)**

An element of this GP is for line management to have documented processes for assuring personnel are qualified on job tasks. The GP includes abilities in the list of attributes that are necessary for discharge of responsibilities. Section 2.5 of this report, "Fitness for Duty and Return to Work" contains detailed information regarding the facts and analysis used to support the Conclusions listed in this Section of the report.

The PD for FMS1 listed physical demands as:

> *"The incumbent's work requires preparing progress, inspection and status reports requiring continuous walking, standing, climbing stairs and ladders and light lifting. Noise associated with construction, alterations, and equipment moving, and visual effort in drafting and reading plans, is sustained."*

The PD listed work environment as:

> *"The administrative work is in an office setting. Inspections of office alterations; repair work; and fire and safety conditions are performed inside and outside of buildings as required and in all types of weather."*

FMS1 had limited mobility and stamina as a result of a previous non-work related spinal infarction or stroke. FMS1 was clearly not able to meet the physical requirements associated with continuous walking, standing, climbing stairs, and ladders. However, no formal documented review of FMS1's physical capabilities in relation to his PD was performed.

FMS1 was returned to work at the Germantown Facility with approval of the FBM, but without the benefit of a formal documented fitness for duty process. DOE Guide (G) 440.1-1B, *Worker Safety and Health Program (including National Nuclear Security Administration) Federal and Contractor Employees* noted that the supervisor should notify HC if an employee takes more than five days of sick leave, but that guidance has not been formally implemented.

(CON 5) The Board concluded that FMS1 was returned to work in the Germantown Facility without any formal documented fitness for duty review. **(JON 8)**

(CON 6) The Board concluded that oversight by the Office of Human Capital or Office of Management of the return to work and fitness for duty processes was not conducted. **(JON 9, JON 10)**

Another element of this GP is that there is a mechanism in place to assure that personnel were assigned to specific work activities commensurate with the associated hazards. FMS1 transited flat surfaces with the aid of a walker, and descended and ascended stairs with the aid of handrails and a cane.

Mechanical equipment rooms in the Germantown Facility were considered "higher hazard", in relation to office spaces, and contained high temperature, pressurized, and electrical systems that could require rapid egress during emergency situations. The physical capabilities of FMS1 in relation to the work assigned in higher hazard areas was not formally evaluated, determined and documented.

Following his return to work at the Germantown Building in November 2010, FMS1 was injured in two work related slip, trip, or fall accidents. The first occurred in August 2011, when FMS1 was exiting a vehicle and strained or sprained his knee, and eventually resulted in filing a workers' compensation claim that was denied due to insufficient medical justification. The second occurred in March 2013, when FMS1 tripped over a pallet while performing an inspection and resulted in FMS1 seeking first aid due to cuts on his hands and arms. The cause of these two work related injuries should have been evaluated to determine if FMS1's limited mobility or balance contributed to the falls.

An element of this GP is for line management to establish and implement a process to ensure Environment, Safety and Health training programs effectively measure and improve performance and identify training needs. The Board did not find any facility-specific hazard-related training, or training associated with slips, trips, and falls.

(CON 7) The Board concluded that fitness for duty and limitations for duty were not evaluated and accommodations were not reviewed, identified and provided. Beyond the initial illness off duty, there were additional missed opportunities that would initiate a formal and appropriate review of FMS1's fitness for duty. **(JON 11)**

2.7.3. Guiding Principle 4: Balanced Priorities
Guiding Principle 5: Identification of Safety Standards and Requirements

Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers and the environment shall be a priority whenever activities are planned and performed. **(GP4)**

Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards shall be established that, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences. **(GP5)**

A common element of GP4 and GP5 is for line management to clearly establish that ISM is applied to all types of work and addresses all types of hazards, and apply the appropriate standards. The Board did not identify any documentation that the hazards associated with the roof, mechanical equipment rooms, or other spaces that FMS1 was routinely required to enter, had been evaluated in relation to restrictions or special precautions that may have been appropriate for a person with limited mobility.

(CON 8) The Board concluded that all restrictions by FBM were verbal and found that the Access Authorization Memorandum in effect at the time of the accident allowed FMS1 approval to access, potentially alone, hazardous locations including building roofs and mechanical rooms. **(JON 12)**

The assignment and authorization of FMS1 to enter higher hazard areas including the roof and mechanical equipment rooms in the Germantown Facility that contained high temperature, pressurized, and electrical systems without formally evaluating his ability to quickly egress from those spaces during emergency situations was discussed in GP 3 of this report.

2.7.4. **Guiding Principle 6: Hazard Controls Tailored to the Work Being Performed**

Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards. **(GP 6)**

An element of this GP is that the hazards associated with the work activity are identified, analyzed and categorized so that appropriate administrative and engineering controls can be put in place to prevent or mitigate the hazards.

FMS1 had limited mobility necessitating individualized special accommodations and administrative controls. Upon FMS1's return to work following his spinal stroke, FBM informally restricted FMS1 from climbing ladders or going on roofs. Also, FBM had an informal policy that no Federal employees should enter the MERs alone.

There was no further identification of hazards, or analysis performed, based on the employee's disability, to establish appropriate administrative and engineering controls. A formal analysis and written limitations of duty would have most likely resulted in restricting the employee from entering the MERs and other higher hazard areas of the building.

There were several missed opportunities for an occupational medical evaluation of FMS1's condition. Initially, FBM stated that FMS1 had received a DOE handicap parking permit. FBM managed the organization that issues DOE handicap parking permits at the Germantown facility. However, there was no documentation that FMS1 had applied for the DOE handicap parking permit. Later, in follow up conversations with the Board, FBM also stated that FMS1 must have had a State issued handicap parking permit and not a DOE permit. The application for the DOE handicap parking permit should have triggered a medical review by HC.

As discussed previously, FMS1 had at least two accidents prior to the fatal accident where he had fallen or slipped and was injured on the job. Neither the DOE handicap parking permit process, nor the incidents requiring visits to the DOE OHC triggered an evaluation of the employee's physical condition. As a result, appropriate administrative controls were not clearly identified and established for the employee, allowing FMS1 to enter hazardous parts of the facility.

The stairs in MER 7 were examined for potential hazards that may have caused or contributed to the accident. See Section 2.6 for a discussion of the condition of the MER 7 stairs.

(CON 9) The Board concluded that FMS1, a person with limited mobility, had to negotiate stairs that were not of uniform rise and were damaged. **(JON 13)**

2.7.5. **Guiding Principle 7: Operations Authorization**

The conditions and requirements to be satisfied or operations to be initiated and conducted shall be clearly established and agreed upon. **(GP 7)**

The Board evaluated this guiding principle and found that it did not apply to the causal factors of this accident.

2.8. Emergency Response

Although medical assistance was rendered quickly there was one issue noted during the Board's interviews of the responders. Initially, two calls were made requesting emergency medical services (EMS):

- One call was made directly to 911 by the BLDG ENG who was present at the time of the accident via personal cell phone. Neither the BLDG ELEC nor BLDG ENG called the CAS at 166. A wall phone was available in MER 7 where the accident occurred that could have immediately been available to call the 166 building emergency number.
- The second call was made by a PF Officer responding to the accident, who was contacted by one of the employees present at the time of the accident; the officer then radioed CAS. The CAS contacted Montgomery County EMS.

The response by Montgomery County EMS was timely and appropriate.

CON 10: The Board concluded that overall the initial emergency response to the accident was acceptable. However, one issue was noted – the building personnel dialed 911 directly rather than calling the building emergency number 166. **(JON 14)**

MA needs to re-visit efforts to publicize the emergency number 166 at DOE Headquarters, increase the visibility of the posting of the number in hazardous areas, such as mechanical rooms, and reduce confusion among employees on the preferred number to call for emergency assistance.

2.9. Human Performance Improvement

The Board evaluated Human Performance to determine if it played a part in this accident. The goal of Human Performance Improvement (HPI) is to facilitate the development of a facility structure that recognizes human attributes and develops defenses that proactively manage human error and optimize the performance of individuals, leaders, and the organization.

Human error is not a cause of failure alone, but rather the effect or symptom of deeper trouble in the system. A review of Human Performance is a review of an individual's abilities, tasks, and operating environment to determine if the organization supports them for success.

The significance, or severity, of a particular event lies in the consequences suffered by the physical facility or personnel, not the error that initiated the event. The error precursor that causes a serious accident and the error that is one of hundreds with no consequence can be the same error that has historically been overlooked or uncorrected. In most cases, for a significant event to occur, multiple breakdowns in defenses must first occur.

Whereas human error may trigger an event, it is the number and extent of flawed defenses that dictate the severity of the event. The existence of many flawed defenses is directly attributable to weaknesses in the organization or management control systems. (Figure 11)

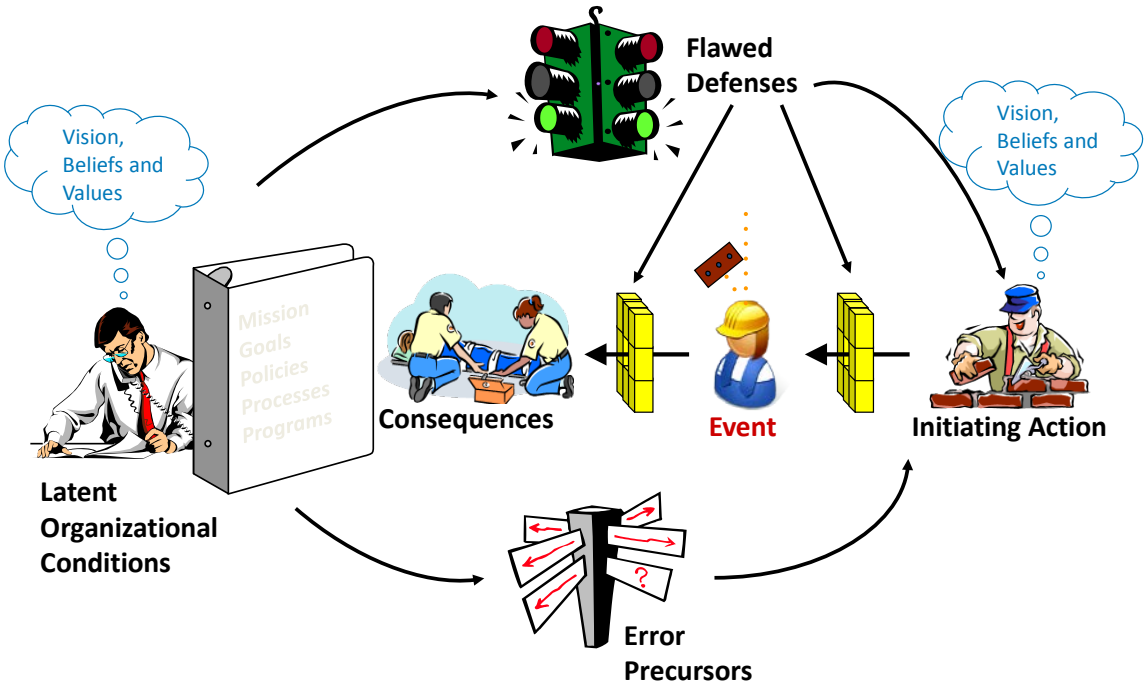


Figure 11: Anatomy of an Event Model

2.9.1. **Error Precursors**

Error precursors are unfavorable conditions that increase the probability for error during a specific action and create what are known as error-likely situations. An error-likely situation typically exists when the demands of the task exceed the capabilities of the individual or when work conditions exceed the limitations of human nature.

Human nature comprises all mental, emotional, social, physical, and biological characteristics that define human tendencies, abilities, and limitations. For instance, humans tend to perform poorly under high stress and undue time pressure. Error-likely situations such as these are also known as error traps. Error precursors exist in the work place before the error occurs, and thus

are manageable. If identified before or during the performance of work, the conditions can be changed or managed to reduce the chance for error(s) leading to an event.

Error precursors (conditions) associated with Human Performance attributes were analyzed by the Board to identify specific conditions that may have provoked error and led to the accident. (Figure 12)

HUMAN PERFORMANCE ATTRIBUTES
Task Demands. Specific mental, physical, and team requirements to perform an activity that may either exceed the capabilities or challenge the limitations of human nature of the individual assigned to the task; for example, excessive workload, hurrying, concurrent actions, unclear roles and responsibilities, or vague standards.
Individual Capabilities. Unique mental, physical, and emotional abilities of a particular person that fail to match the demands of the specific task; for example, unfamiliarity with the task, unsafe attitudes, level of education, lack of knowledge, unpracticed skills, personality, inexperience, health and fitness, poor communication practices, or low self-esteem.
Work Environment. General influences of the workplace, organizational, and cultural conditions that affect individual behavior; for example, distractions, awkward equipment layout, complex tagout procedures, at-risk norms and values, work group attitudes toward various hazards, or work control processes.
Human Nature. Generic traits, dispositions, and limitations of being human that may incline individuals to err under unfavorable conditions; for example, habit, short-term memory, fatigue, stress, complacency, or mental shortcuts.

Figure 12: Human Performance Attributes

2.9.2. Human Error Precursor and Flawed Defenses (Barriers) Analysis

The analysis resulted in the identification of 48 instances of human errors associated with management system barrier weaknesses and changes in conditions involved prior to the accident. Details of the results of the HPI analysis constructed as part of the barrier and change analysis are presented in Appendices B, C and summarized in D.

The Board determined that the human error precursors and flawed defenses associated with this accident related to the decisions and actions taken relating to fitness for duty, return to work, determination of limitations of duty, and reasonable accommodations.

The human error precursors are primarily grouped around: Assumptions; Mindset; Lack of Clear Standards and, Unclear Goals and Responsibilities.

After the initial illness (the spinal stroke FMS1 suffered), both the FBM and FMS1 desired FMS1 to return to full duty as soon as possible. FBM made a decision to return the employee to duty without benefit of appropriate independent review of the employee's medical limitations and scope of duties. This decision made, in absence of clear standards, and clear supervisory

responsibilities regarding return to work and fitness for duty for non-work related illness or injury, may have led to an assumption that FMS1 was fully able to meet the requirements of his PD, without documented accommodations or work restrictions.

3.0 Conclusions and Judgments of Need

Judgments of Need (JONs) are the managerial controls and safety measures determined by the Board to be necessary to prevent or minimize the probability or severity of a recurrence. These JONs are linked directly to the causal factors which are derived from the facts and analysis. They form the basis for corrective action plans which must be developed by line management. The Board's conclusions and JONs are listed below in Table 2.

Table 2: Conclusions and Judgments of Need

Conclusion	Judgment of Need
CON 1: The DOE Headquarters Pro Force emergency plan, procedures and resources do not address preservation of accident scenes as required by DOE Order (O) 225.1B, *Accident Investigations*.	**JON 1:** The Office of Health, Safety and Security (HSS) needs to assure that procedures are developed and implemented by the Headquarters Pro-Force to preserve accident scenes to support an accident investigation.
CON 2: Regarding the Office of Management's (MA) response to the accident, there was a delay in the categorization of the accident, triggering a Federally-led Accident Investigation, which should have occurred after FMS1 had been hospitalized more than five days, pursuant to DOE O 225.1B.	**JON 2:** MA needs to institute procedures to assure initial monitoring of serious injuries requiring hospitalization, to promote prompt DOE O 225.1B categorization, and timely notification and accident investigation to occur in the future.
CON 3: Formal independent oversight review by HSS of the HQ implementation of DOE O 450.2, *Integrated Safety Management*; 5 U.S.C. 8100, *Federal Workers Compensation Program (OWCP)*; DOE Order 440.1B, *Worker Safety and Health Program for DOE Federal and Contractor Employees*; and DOE Order 341.1A, *Federal Employee Health Services*; was not requested by MA and HC, and therefore not conducted by HSS.	**JON 3:** MA and HC needs to partner with HSS to define and implement a process to review and improve the performance of their employee safety programs. This will allow MA and HC to leverage available HSS subject matter expertise and experience.

Conclusion	Judgment of Need
CON 4: As a result of a request by FMS1 to perform work from home being denied, FMS1 returned to work and resumed physical activity sooner than was initially recommended by FMS1's physician.	**JON4:** HSS needs to revise DOE Order 440.1B, *Federal Employee Occupational Safety and Health Program*, to include specific requirements for fitness for duty and return to work processes for work related and non-work related injuries/illnesses. **JON5:** HC needs to develop and implement effective and formal fitness for duty and return to work programs for Federal employees' non-work related injuries/illnesses. **JON 6:** HC needs to develop and conduct training for supervisors and employees related to the fitness for duty and return to work processes. **JON 7:** HC needs to ensure employees and supervisors are aware of, and encouraged to utilize, the options associated with the DOE O 314.1, *DOE-FLEX: DOE's Telework Program.*
CON 5: FMS1 was returned to work at the Germantown facility without any formal documented fitness for duty review.	**JON 8:** HC needs to develop and implement an effective and formal return to work and fitness for duty programs for Federal employees including work-related and non-work related injuries/illnesses.
CON 6: Oversight by the Office of Human Capital or Office of Management of the return to work and fitness for duty processes was not conducted.	**JON 9:** HC needs to develop appropriate criteria for, and conduct oversight of the program to assure performance with requirements and guidelines for fitness for duty and return to work. **JON 10:** MA needs to develop appropriate criteria for, and conduct oversight of, the program to assure performance with requirements and guidelines for fitness for duty and return to work.
CON 7: Fitness for duty and limitations for duty were not evaluated and accommodations were not reviewed, identified and provided. Beyond the initial injury off-duty, there were additional missed opportunities that should have initiated a formal and appropriate review of FMS1's fitness for duty.	**JON 11:** HC needs to provide reports of first aid from Occupational Health Clinics to the MA-433 Office of Industrial Hygiene and Safety for tracking and evaluation.

Conclusion	Judgment of Need
CON 8: All restrictions by FBM to FMS1 were verbal and the Board found that the Access Authorization Memorandum in effect at the time of the accident allowed FMS1 approval to access, potentially alone, hazardous locations including building roofs and mechanical rooms.	**JON 12:** MA needs to strengthen and formalize its process for implementing work restrictions for its employees. Formal work restrictions extend beyond verbal instruction, and could include removal of electronic access for certain areas, documented direction given by the supervisor and acknowledged by the employee, and other suitable form developed by MA.
CON 9: FMS1, a person with limited mobility, was required to negotiate stairs that were not of uniform rise and were damaged.	**JON 13:** MA needs to conduct an extent of condition review to determine if other non-compliant or damaged stairs exist at DOE Headquarters' facilities.
CON 10: The overall initial emergency response to the accident was acceptable. However, one issue was noted – the building personnel dialed 911 directly rather than calling the building emergency number 166.	**JON 14:** MA needs to re-visit efforts to publicize the emergency number 166 at DOE Headquarters, increase the visibility of the posting of the number in hazardous areas, such as mechanical rooms, and reduce confusion among employees on the preferred number to call for emergency assistance.

4.0 Board Signatures

David Pegram
Board Chairperson/Investigator
Office of Health, Safety and Security
Office of Analysis (HS-24)

Joseph Hopkins
Board Member
Office of Health, Safety and Security
Office of Worker Safety and Health Policy (HS-11)

Stephen Wallace
Board Member/Investigator
National Nuclear Security Administration
Office of Associate Administrator for Safety and Health (NA-SH-1)

Doug Parrish
Board Member
Office of Management
Office of Industrial Hygiene and Safety (MA-433)

5.0 Board Members, Advisors and Consultants

Board Members

Chairperson	David Pegram, HS-24
Member	Joseph Hopkins, HS-11
Member	Stephen Wallace, NA-SH-1
Member	Doug Parrish, MA-433

Advisor/Team Coordinator

Accident Analyst/Coordinator/ Consultant Advisor	Robert Seal, MAS
Consultant/Administrative Support	Erick Reynolds, PEC

Administrative Coordinator

Administrative Support	Diane Burnes, PEC
Administrative Coordinator/ Technical Editor	Susan Keffer, PEC

Appendix A: Appointment of an Accident Investigation Board

Department of Energy
Washington, DC 20585

June 28, 2013

MEMORANDUM FOR DAVID PEGRAM
BOARD CHAIRPERSON
OFFICE OF ANALYSIS

FROM: for GLENN S. PODONSKY W. a. Edwards
APPOINTING OFFICIAL
CHIEF HEALTH, SAFETY AND SECURITY OFFICER

SUBJECT: Accident Investigation into the Fall of an Employee at the Department of Energy Germantown Main Building on June 1, 2013, and Subsequent Fatality on June 24, 2013

In coordination with the Office of Management (MA) and in accordance with the requirements of Department of Energy (DOE) Order (O) 225.1B, *Accident Investigations*, I am establishing an Accident Investigation Board (AIB) to investigate the fall of an employee at the DOE Germantown Main Building on June 1, 2013, and subsequent fatality on June 24, 2013. I have determined the event meets the criteria of: "*Any injury or chemical or biological exposure that results in, or is likely to result in, the fatality of an employee or member of the public*" for the conduct of an accident investigation delineated in Appendix A, DOE O 225.1B.

You are appointed as the Board Chairperson. The Board will be composed of the following members:

- Joseph Hopkins, Board Member, Office of Worker Safety and Health (HS-11)
- Stephen Wallace, Board Member, Office of Associate Administrator for Safety (NA-SH-1)
- Doug Parrish, Board Member, Office of Industrial Hygiene and Safety (MA-433)
- Robert Seal, Accident Analyst/Coordinator/Consultant Advisor
- Eric Reynolds, Consultant Advisor/Administrative Support
- Diane Burnes, Administrative Support

All members of the AIB, by this letter, and in accordance of the requirements of DOE O 225.1B, are released from their normal regular duty assignment to serve on the AIB, during the period the AIB is convened.

The scope of the Board's investigation is to include, but not be limited to, identifying all relevant facts, determining direct, contributing, and root causes of the event, developing conclusions, and determining the judgments of need to prevent recurrence. Also, the scope of the investigation is to include DOE's programs and oversight activities.

The Board is expected to provide my office with periodic reports on the status of the investigation. Please submit draft copies of the factual portion of the investigation report to me and MA for factual accuracy review prior to finalization. The final report should be provided to me no later than 30 days of the date of this memorandum. Discussion of the investigation and copies of the draft report will be controlled until I authorize release of the final report.

cc: Ingrid Kolb, MA-1
Paul Bosco, MA-60
Pete O'Konski, MA-40

Appendix B: Barrier Analysis

Barrier analysis is based on the premise that hazards are associated with all tasks. A barrier is any means used to control, prevent, or impede a hazard from reaching a target, thereby reducing the severity of the resultant accident or adverse consequence. A hazard is the potential for an unwanted condition to result in an accident or other adverse consequence. A target is a person or object that a hazard may damage, injure, or fatally harm. Barrier analysis determines how a hazard overcomes the barriers, comes into contact with a target (e.g., from the barriers or controls not being in place, not being used properly, or failing), and leads to an accident or adverse consequence. The results of the barrier analysis are used to support the development of causal factors.

Table B-1: Barrier Analysis

Hazard: Fall from Stairs to the Floor			**Target: Facility Management Specialist 1 (FMS1)**		
Barriers		**How did barrier perform?**	**Why did barrier fail?**	**How did barrier affect accident?**	**Context: ISM / HPI**
B1	Office of Human Capital (HC) review of work accommodations.	Failed: Not used.	No record that FBM submitted a request. FBM would not approve a work at home flexi-place accommodation. FMS1 was not afforded the opportunity to receive a case review.	A review should have considered medical flexi-place (DOE O 314.1) and restricted work duties to non hazardous areas or work activities.	ISM: GP-2, 3 HPI: TD-6,7, 8
B2	Return to work process.	Failed: Nonexistent.	There was no formal process for non-work related illness or injury return to work.	Supervisor made a decision to return the employee to duty without benefit of appropriate review of the employee's medical limitations and scope of duties.	ISM: GP-1, 2, 3, 5 HPI: TD-1, HN-3, 4, 5, 6

Hazard: Fall from Stairs to the Floor			Target: Facility Management Specialist 1 (FMS1)		
Barriers		**How did barrier perform?**	**Why did barrier fail?**	**How did barrier affect accident?**	**Context: ISM / HPI**
B3	DOE Germantown handicap parking permit process.	Failed: Not used.	An evaluation of the employee's limitations was not performed.	Missed opportunity to review of the employee's medical limitations and scope of duties.	ISM: GP-5, 6 HPI: IC-5, HN-6
B4	Review FMS1's previous accidents at work.	Failed: Not used.	Did not identify significant medical conditions and limitations that could have affected the employee's mobility.	Missed opportunity to review of the employee's medical limitations and scope of duties.	ISM: GP-5, 6 HPI: IC-9, HN-3, HN-6
B5	Submission of CA-1Worker Compensation Case Report Form.	Failed: Process not completed.	Not received on time from supervisor. DOL denied the claim due to insufficient evidence.	Missed opportunity to review of the employee's medical limitations and scope of duties.	ISM: GP-5, 6 HPI: IC-9
B6	Work Area (MER 7) hazard identification and inspection.	Failed: Used, but not effective.	Damage to step treads was not identified and repaired prior to the accident.	Unknown: possible tripping hazard.	ISM: GP-1, 2, 3, 5 HPI: HN-2, HN-5, IC-2

Hazard: Fall from Stairs to the Floor			Target: Facility Management Specialist 1 (FMS1)		
Barriers		**How did barrier perform?**	**Why did barrier fail?**	**How did barrier affect accident?**	**Context: ISM / HPI**
B7	Formal, written and understood limitations of duty.	Failed: Not used.	MER 7 was initially not part of the work scope. Work assignments were rotated among Federal employees to maintain QA oversight. As a part of the LOTO, there was an expectation that FMS1 was to inspect MER 6 requiring him to use the stairs.	Work assignment did not restrict entry to hazard area based on employee's disability.	ISM: GP-1, 2, 3, 6 HPI: IC-2, 5, 9 TD-7, 8 HN-3, 6
B8	OSHA compliant stair.	Failed: Noncompliant conditions not identified.	Stairs, hand rails, and toeboards were not uniform and constructed in compliance with OSHA.	Unknown: may have affected employee's ability to maintain stability while descending and transitioning from the stair to the floor.	ISM: GP-1, 6 HPI: WE-6 IC-9 HN-6

Hazard: Fall from Stairs to the Floor			Target: Facility Management Specialist 1 (FMS1)		
Barriers		**How did barrier perform?**	**Why did barrier fail?**	**How did barrier affect accident?**	**Context: ISM / HPI**
B9	Oversight of HQ Safety Program DOE O 440.1B, *Federal Employee Occupational Safety and Health Program*, O 341.1A, *Federal Employee Health Services*, and OSHA 29 CFR 1960 by HSS.	Failed: Not used.	Oversight by the HC or MA of programs was not conducted. Independent oversight by HSS of the HQ implementation of programs was not conducted because it was not requested by MA and HC.	Lack of effective oversight of HQ medical program, and process of return to work, fitness for duty determinations, created a missed opportunity for identification of weakness within the program.	ISM: GP-1, 2, 4 HPI: TD-7, 8 HN-3, 4, 5, 6
B10	DOE G 440.1-1B, Sec. 8.8.4.3.3.6, *Worker Safety and Health Program for DOE (Including the National Nuclear Security Administration) Federal and Contractor Employees* notes that the supervisor should notify Human Capital if an employee takes five or more days of sick leave upon returning to work.	Failed: Not used	Barrier is guidance rather than a requirement, and FBM did not follow the guidance for return to work.	It was a missed opportunity to identify and specify appropriate accommodations for FMS1.	ISM: GP-1, 3, 5, 6 HPI: TD-6, 8 HN-6

Hazard: Fall from Stairs to the Floor			Target: Facility Management Specialist 1 (FMS1)		
Barriers		**How did barrier perform?**	**Why did barrier fail?**	**How did barrier affect accident?**	**Context: ISM / HPI**
B11	Assistance while transiting stairs.	Failed: Not used	On the day of the accident the BLDG ELEC twice offered to assist FMS1 on the stairs in MER 6. Assistance was not offered in MER 7 because assistance had previously been declined twice.	Unknown, but the likelihood of a fall would have been decreased if assistance had been used.	ISM: GP-2 HPI: TD-5,IC-8, 9, HN-6

Appendix C: Change Analysis

Change is anything that disturbs the "balance" of a system from operating as planned. Change is often the source of deviations in system operations. Change can be planned, anticipated, and desired, or it can be unintentional and unwanted. Change analysis examines the planned or unplanned disturbances or deviations that caused the undesired results or outcomes related to the accident. This process analyzes the difference between what is normal (or "ideal") and what actually occurred. The results of the change analysis are used to support the development of causal factors.

Table C-1: Change Analysis

Accident Situation		Prior, Ideal or Accident-Free Situation	Difference	Evaluation of Effect	Context ISM/HPI
C1	FMS1 suffered spinal cord injury (stroke).	No spinal cord injury (stroke).	Reduced FMS1 strength, mobility, balance.	May have resulted in a fall.	ISM: GP-3 HPI: IC-9
C2	FMS1 requested to work from home.	Medical Flexi-place used and evaluated.	FBM stated to FMS1 that a work at home accommodation was not possible because his duty assignment required him to be on-site. There was no evaluation of the medical accommodations needed.	FMS1 may have returned to work sooner than was appropriate.	ISM: GP-2, 3 HPI: TD-7, HN-3

Accident Situation		Prior, Ideal or Accident-Free Situation	Difference	Evaluation of Effect	Context ISM/HPI
C3	FMS1 returned to work without a formal review of fitness for duty.	A formal review of fitness for duty is conducted in all cases including non work related injury or illness.	FBM verbally instructed FMS1 that he was not to use ladders or go on the building roof. Other limitations of duty or accommodations not specified.	Medical evaluation was not preformed which led FMS1 to enter hazardous areas that did not accommodate restricted mobility.	ISM: GP-1, 2, 3, 5 HPI: TD-2, 7, 8 HN-3, 4, 5, 6
C4	Filtrine unit in MER 7 was replaced prior to the accident, damage to stair tread occurred, but was not identified and repaired.	Damage to stair tread would have been reported and repaired.	Stair tread damage constituted a potential tripping hazard.	May have been a possible cause of the fall.	ISM: GP-1, 2, 3, 5 HPI: IC-8 HN-6
C5	Events relating to the power outage expanded the scope of work from MER 6 into MER 7.	Hazards In MER 7 would have been identified prior to entry.	FMS1 would not have entered MER 7.	FMS1 was exposed to potential tripping hazards.	ISM: GP-1, 2,3, 6 HPI: WE-2, 6

Appendix D: Error Precursors

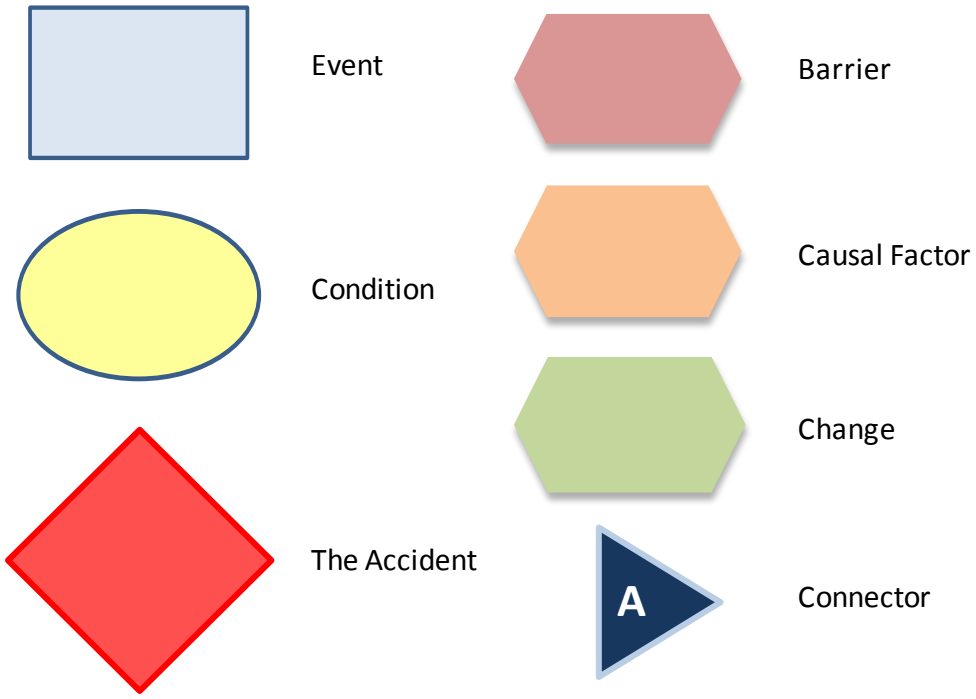
Table D-1: Error Precursors

Task Demands		Individual Capabilities	
1	Time Pressure (in a hurry)		Unfamiliarity with task / First time
1	High workload (large memory)	2	Lack of knowledge (faulty mental model)
	Simultaneous, multiple actions		New techniques not used before
	Repetitive actions / Monotony		Imprecise communication habits
1	Irreversible actions	2	Lack of proficiency / Inexperience
2	Interpretation requirements		Indistinct problem-solving skills
5	Unclear goals, roles, or responsibilities		Unsafe attitudes
5	Lack of or unclear standards	2	Illness or fatigue; general poor health or injury
Work Environment		**Human Nature**	
	Distractions / Interruptions		Stress
1	Changes / Departure from routine	1	Habit patterns
	Confusing displays or controls	6	Assumptions
	Work-arounds	3	Complacency / Overconfidence
	Hidden system / equipment response	4	Mind-set (intentions)
2	Unexpected equipment conditions	10	Inaccurate risk perception
	Lack of alternative indication		Mental shortcuts or biases
	Personality conflict		Limited short-term memory

Total = 48 instances of Error Precursor occurrences in the Barrier and Change analysis.

Appendix E: Events and Causal Factor Analysis

An events and causal factors analysis was performed in accordance with the DOE Handbook: *DOE-HDBK-1208-2012 Accident Investigation and Prevention.* The events and causal factors analysis requires deductive reasoning to determine those events and/or conditions that contributed to the accident. Causal factors are the events or conditions that produced or contributed to the accident, and they consist of direct, contributing, and root causes. The direct cause is the immediate event(s) or condition(s) that caused the accident. The contributing causes are the events or conditions that, collectively with the other causes, increased the likelihood of the accident, but which did not solely cause the accident. Root causes are the events or conditions that, if corrected, would prevent recurrence of this and similar accidents. The causal factors are identified in Figure E-1: Events and Causal Factors Chart.



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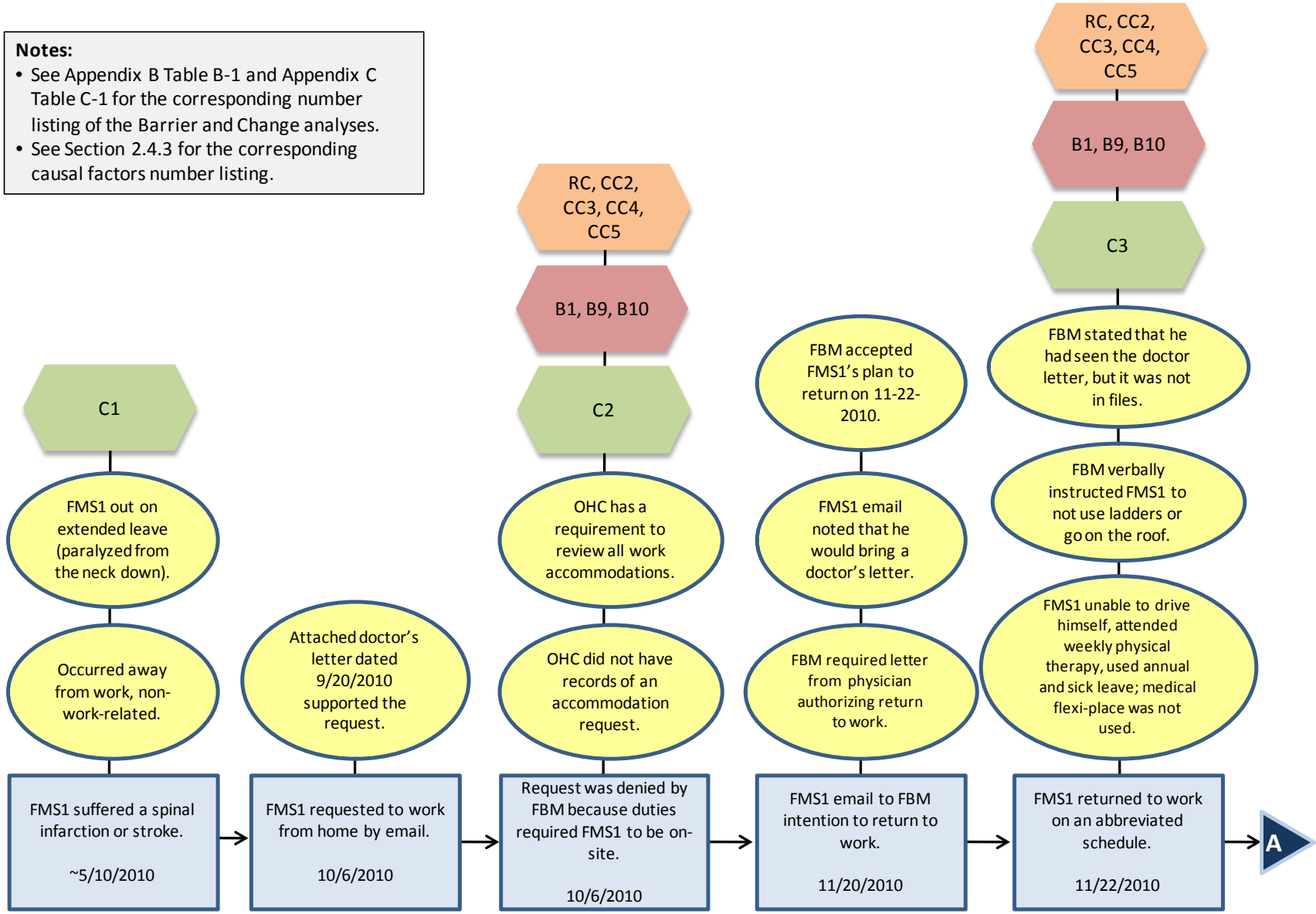
** PF Incident Report time (not synchronized with door log clock).

Figure E-1: Events and Causal Factors Chart



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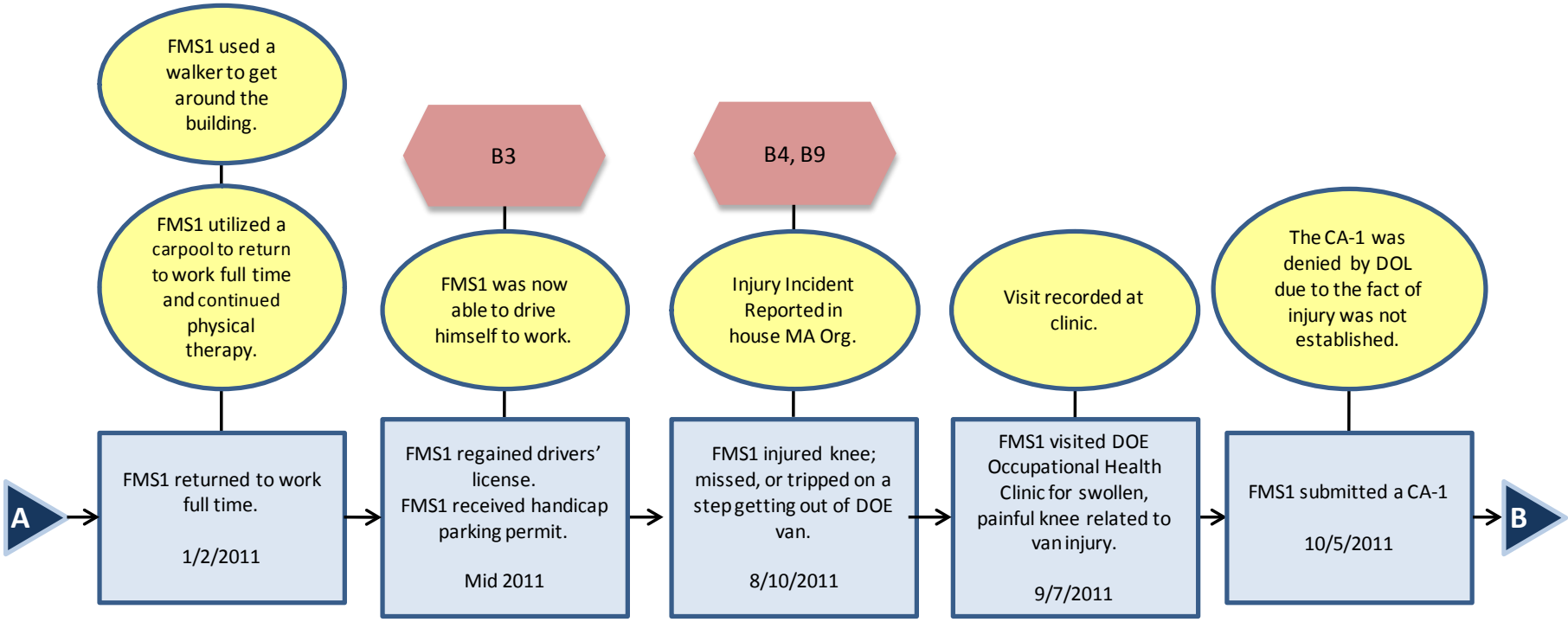

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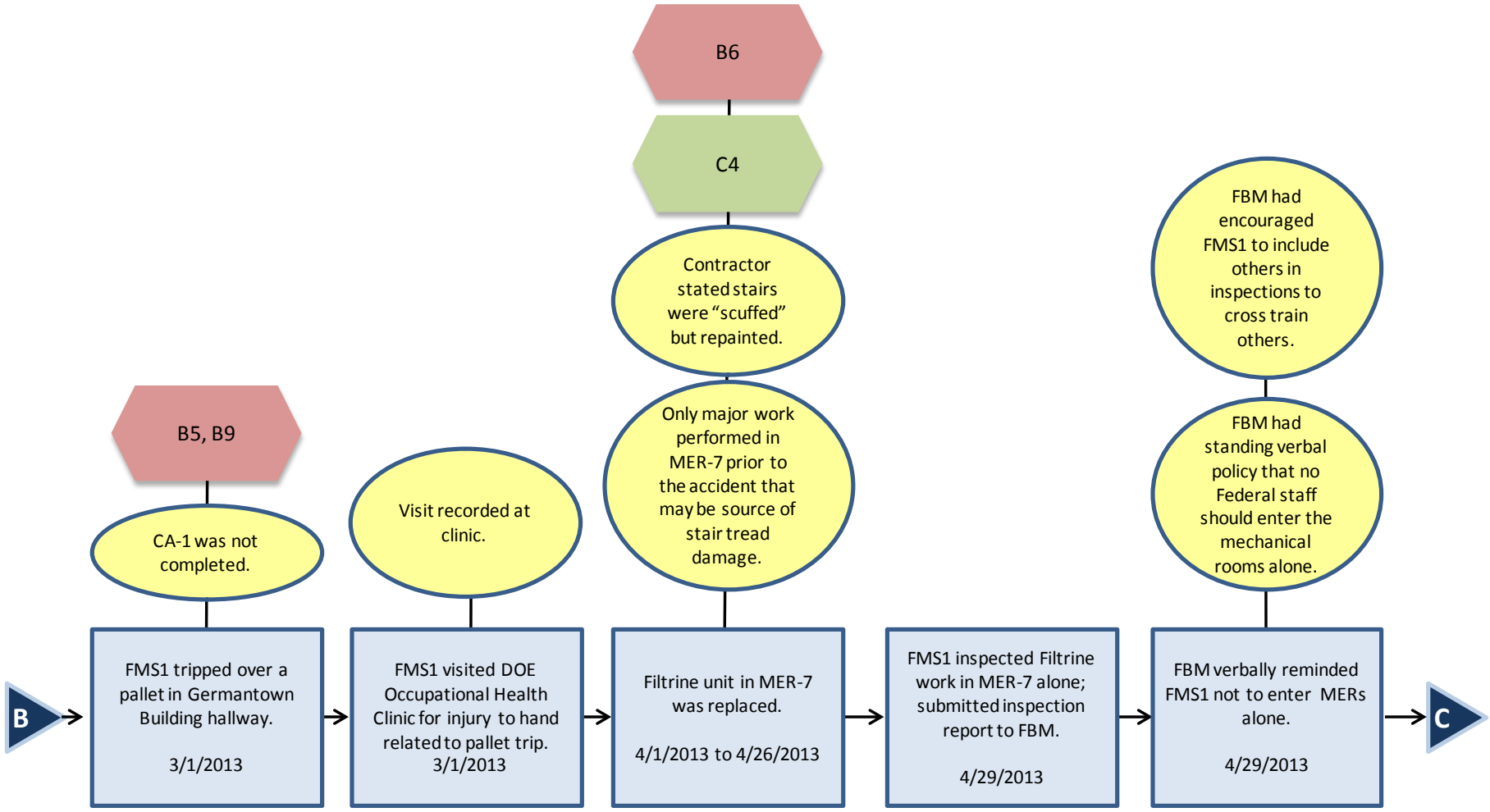

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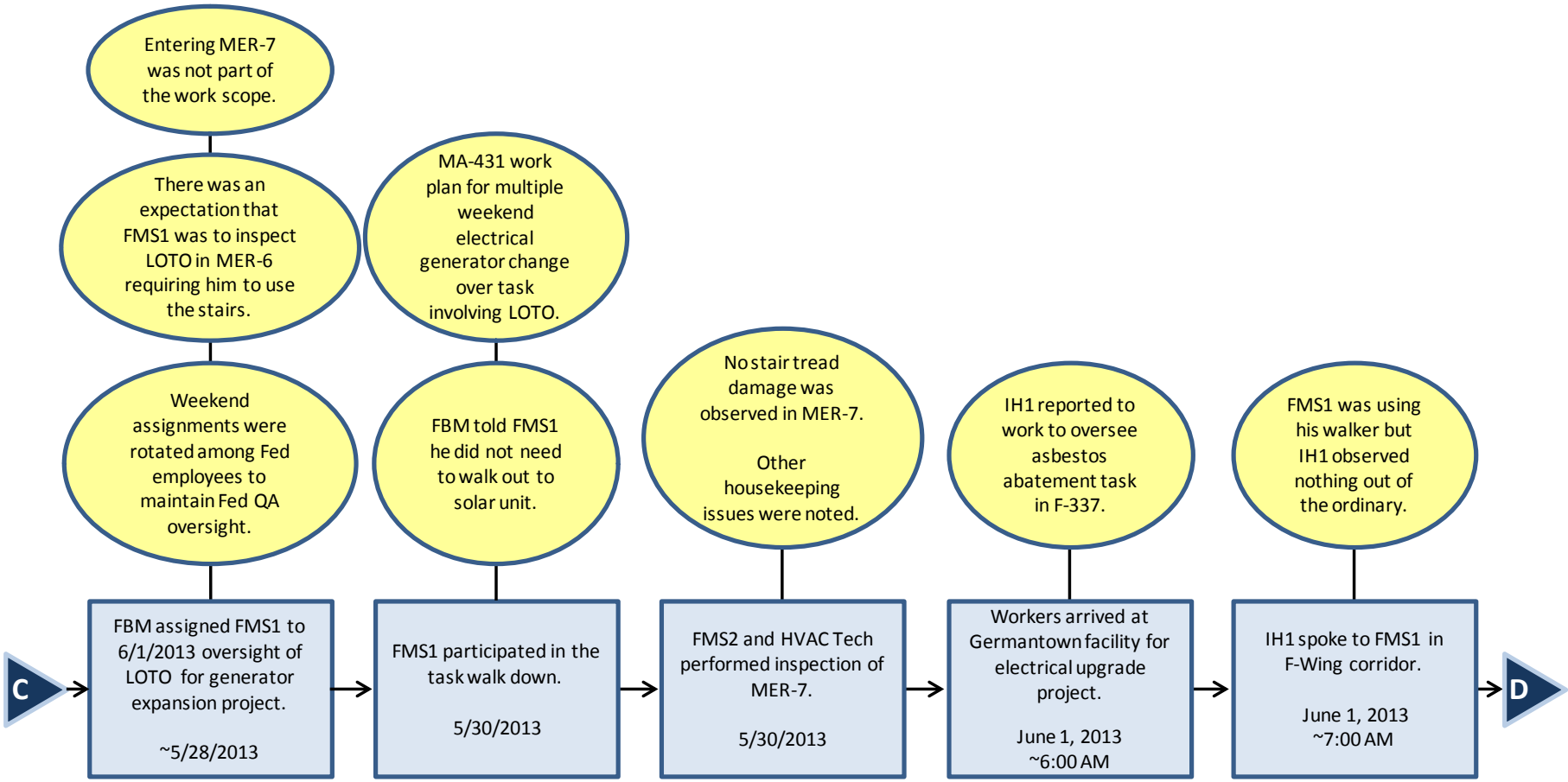

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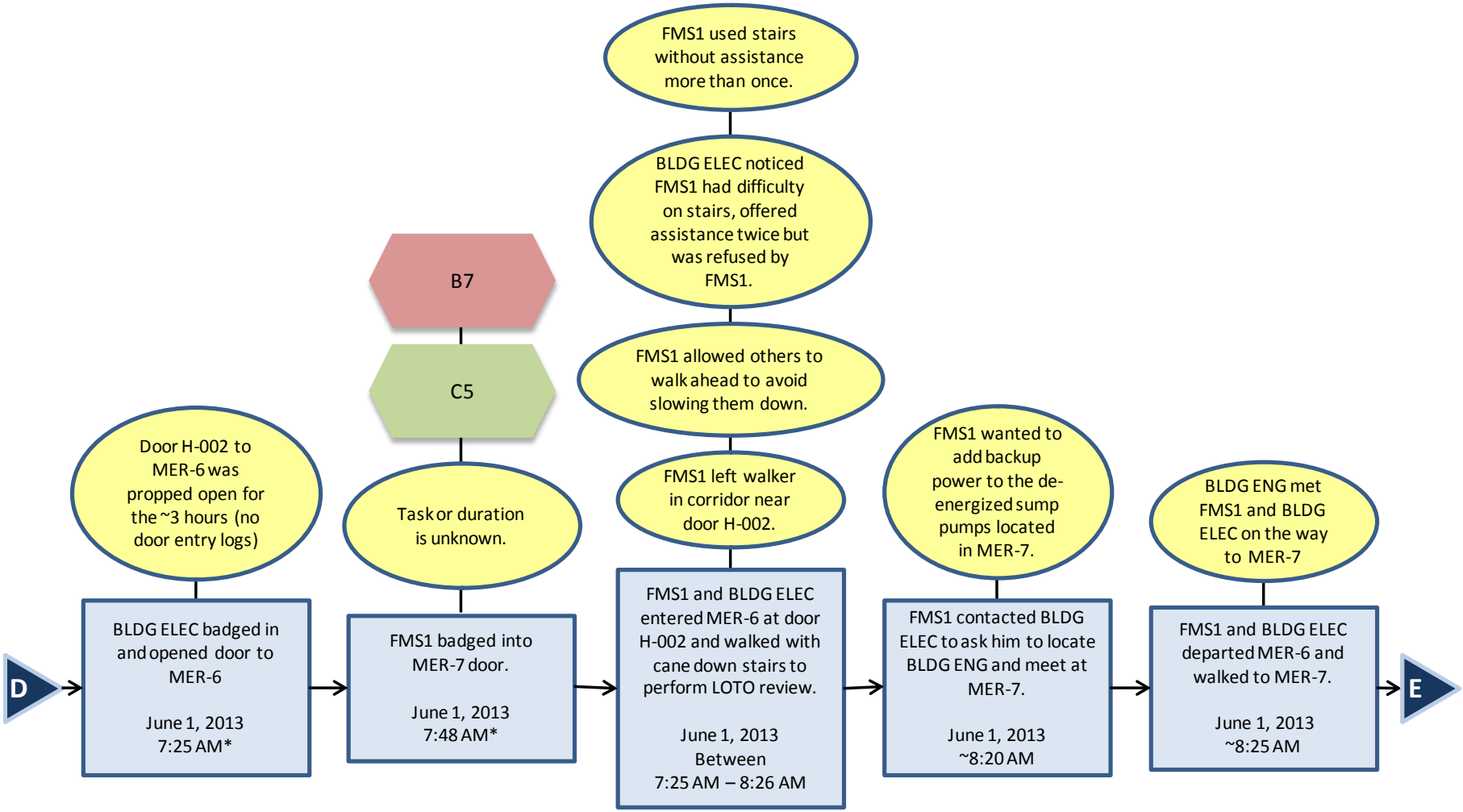

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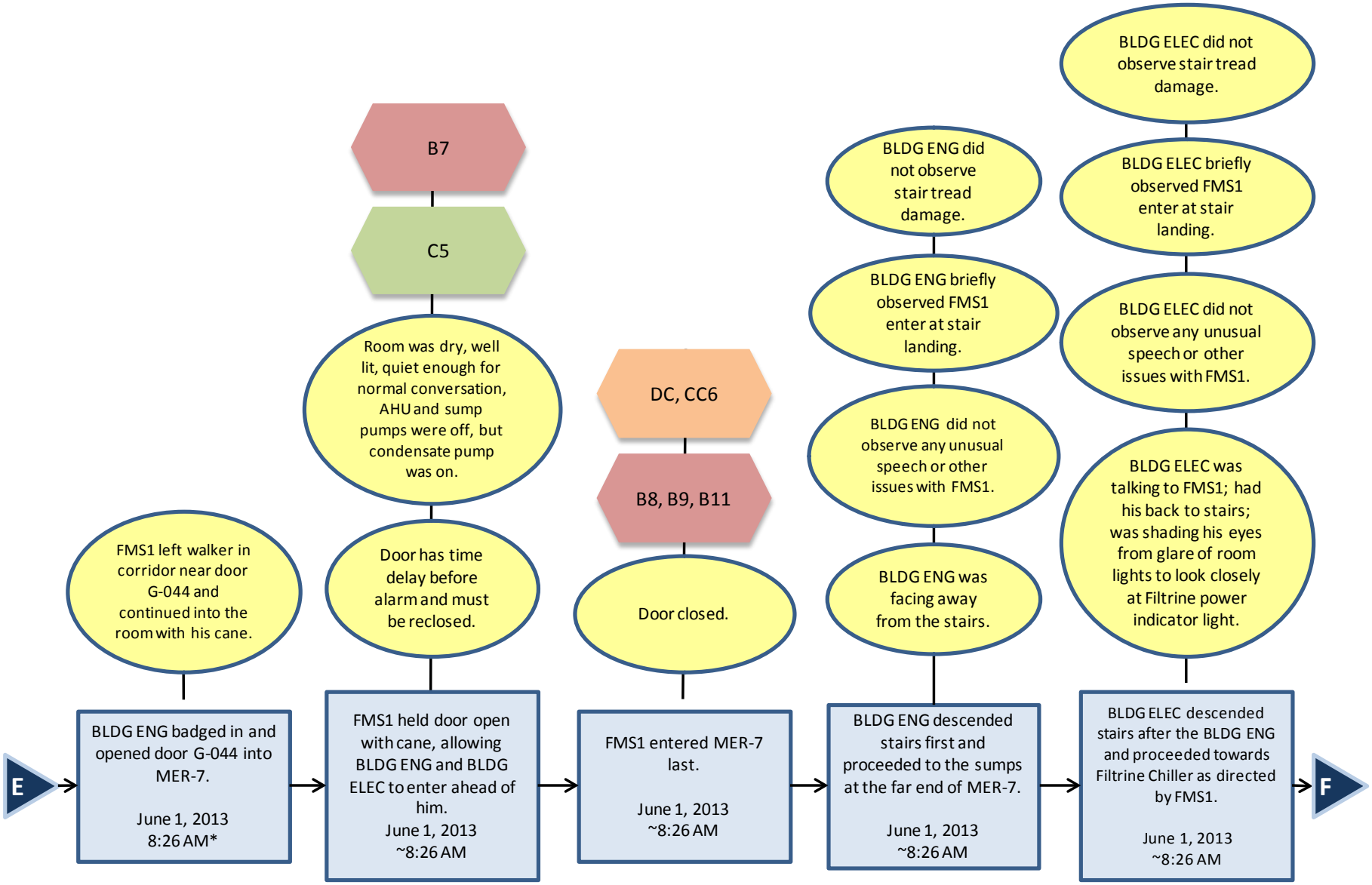

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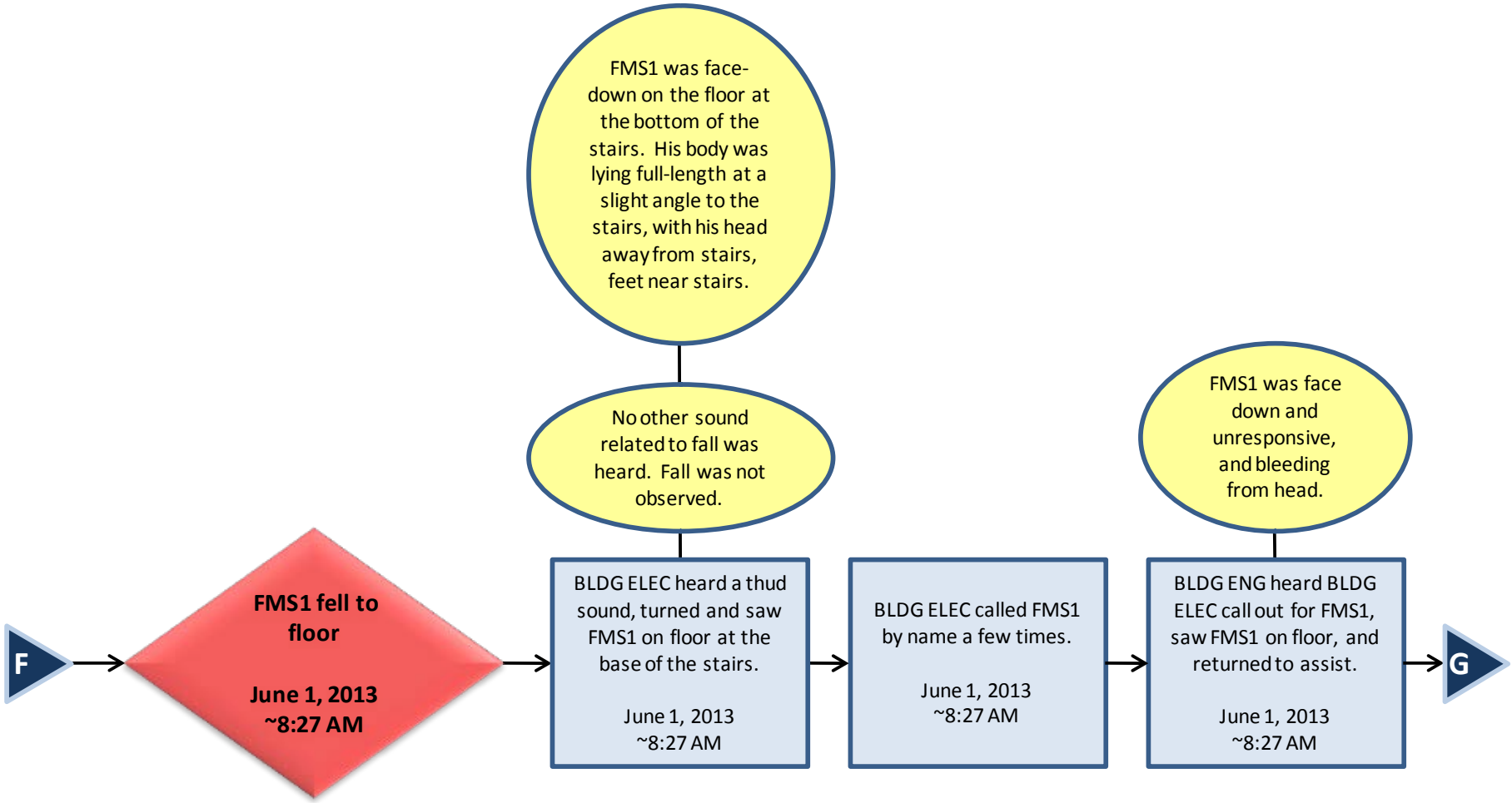

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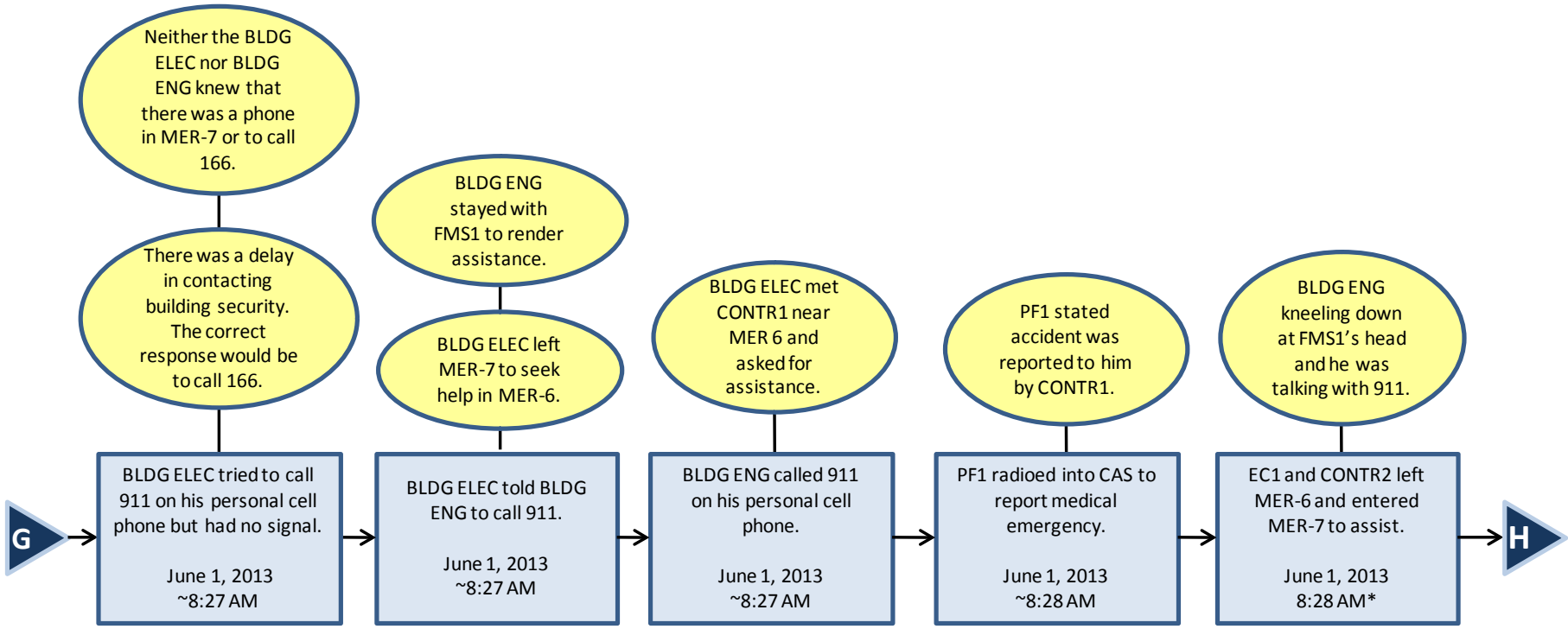

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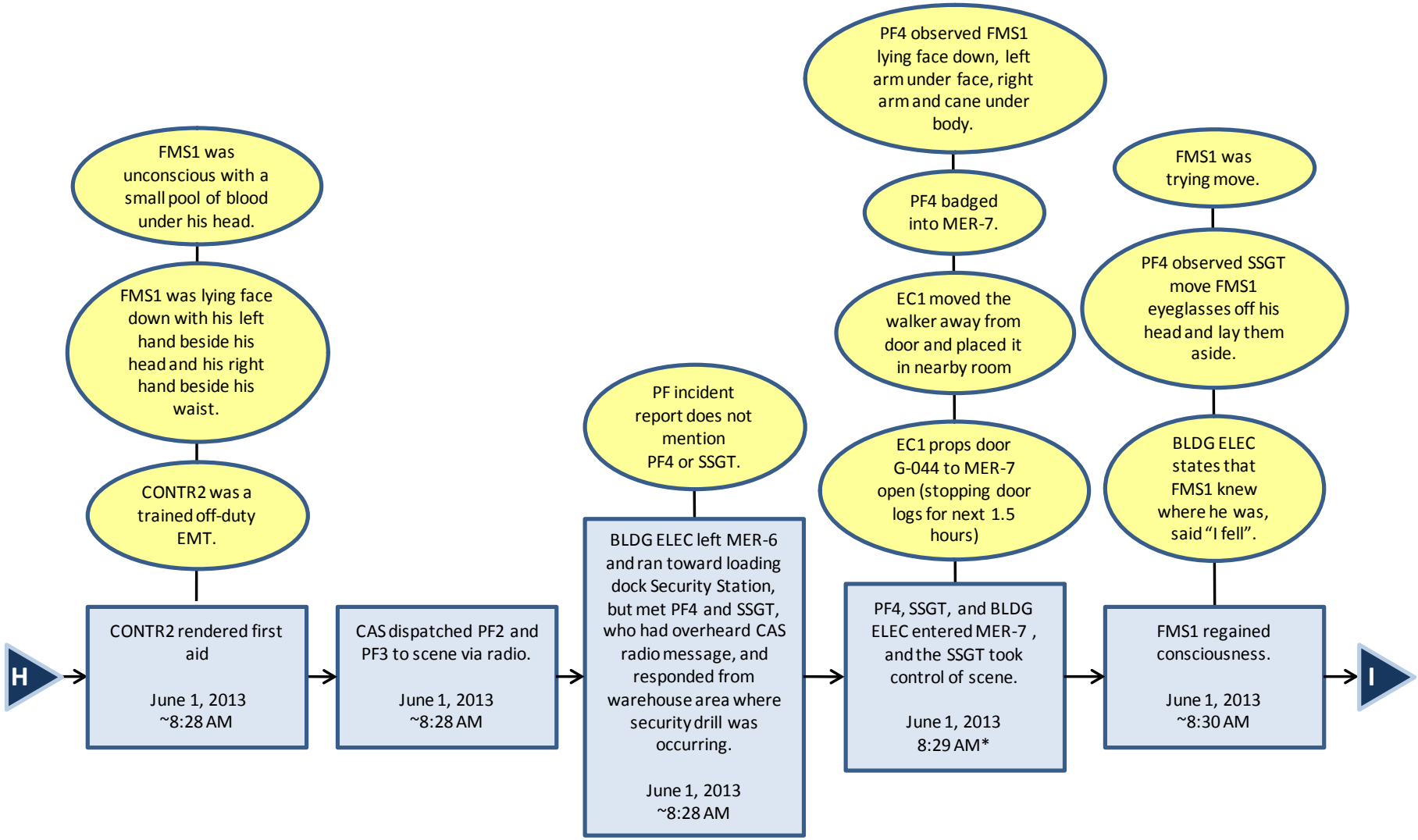

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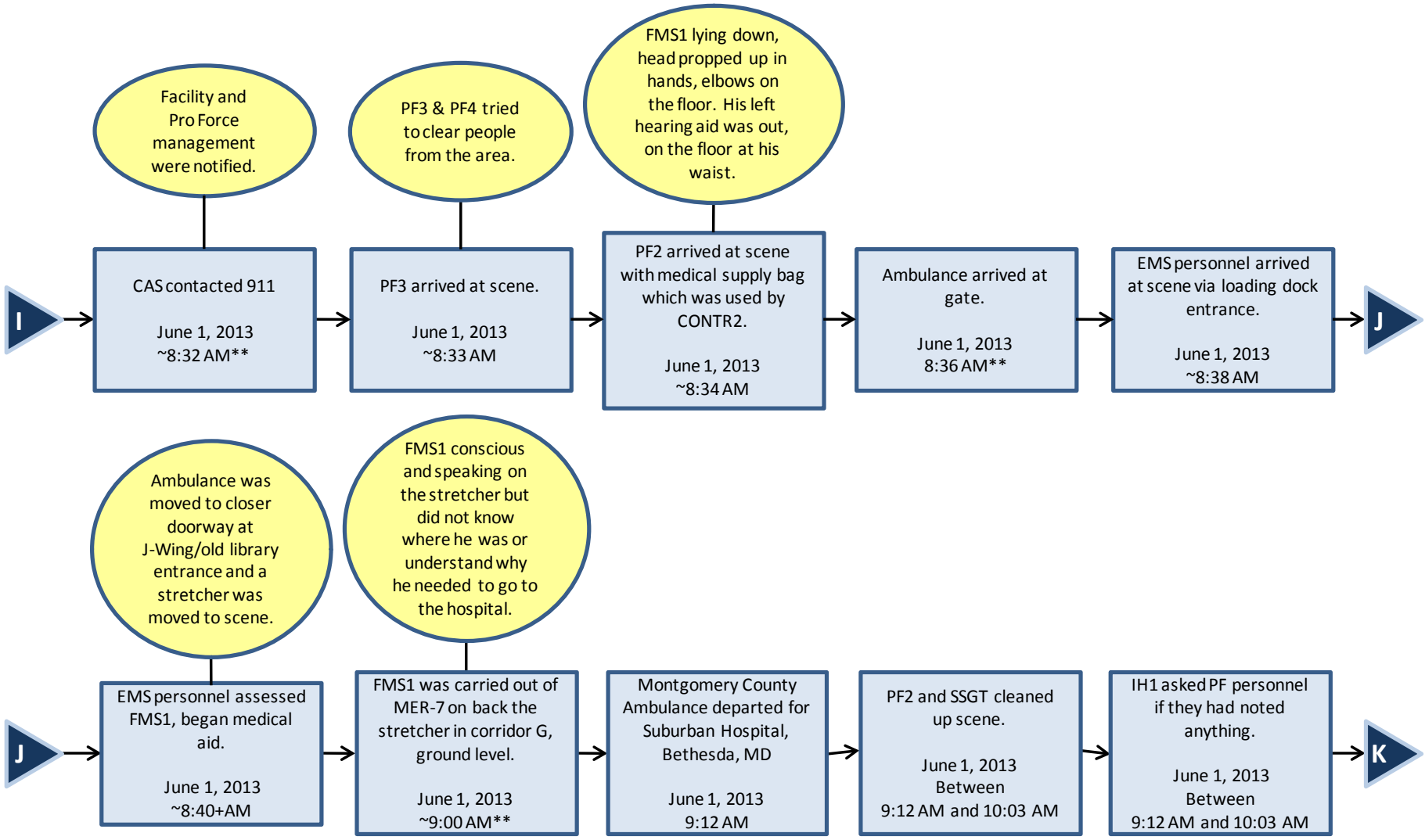

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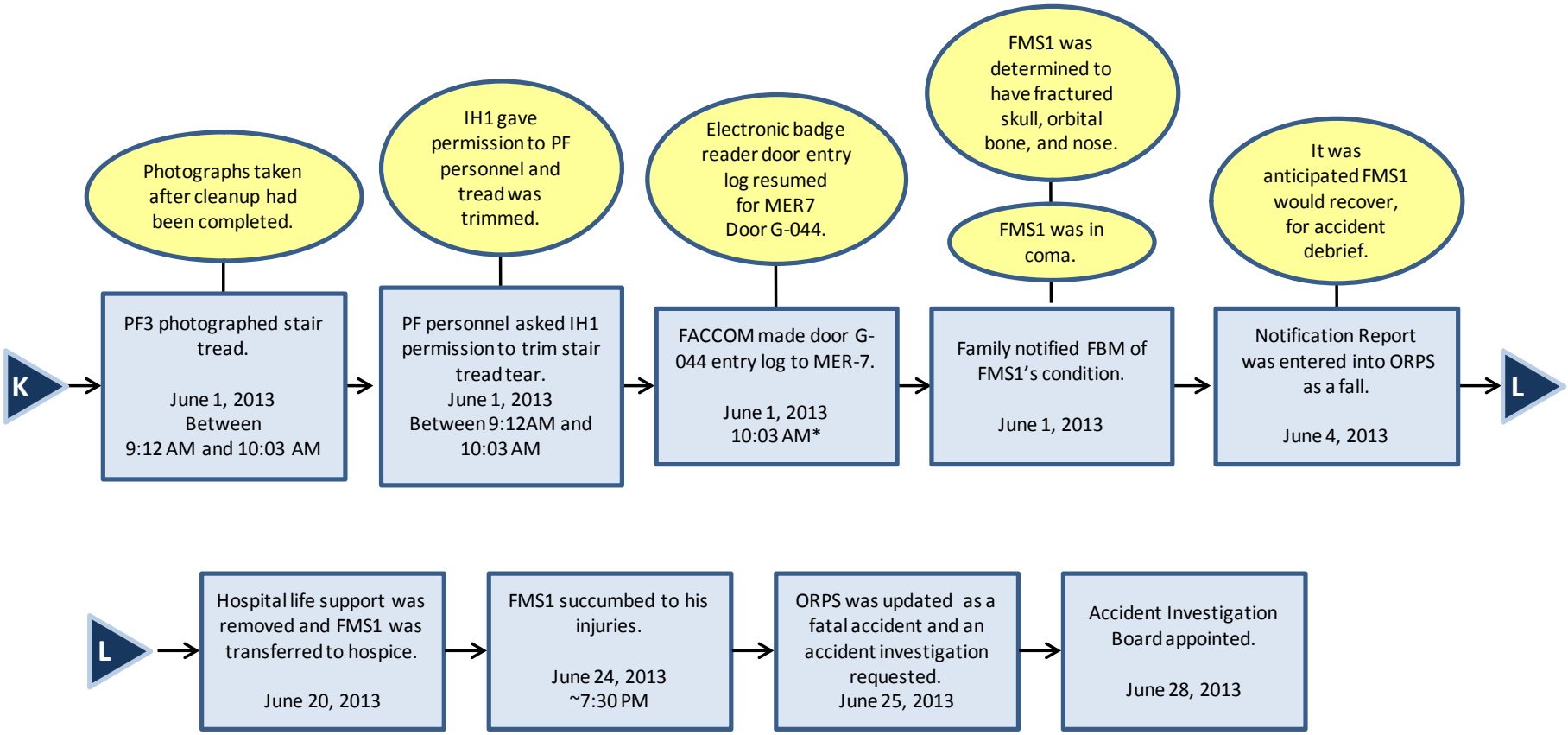

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