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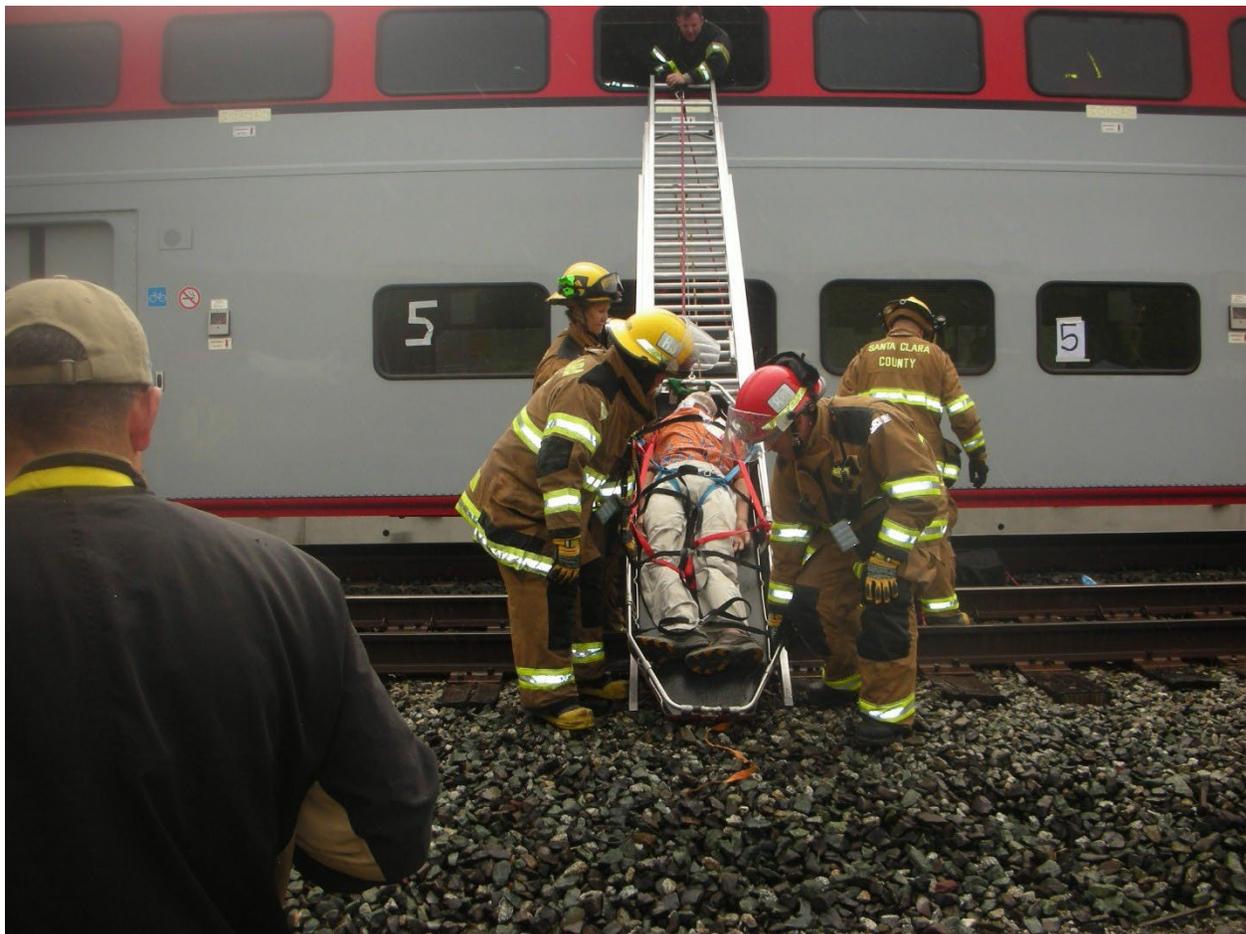Office of Research,
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Washington, DC 20590

Practice Responses to Extreme Events on the Railroad: Exercises of the Plans and Training

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14. ABSTRACT

Emergency management for extreme railroad events is a "seldom-used skill," and responses typically involve many railroad personnel and outside agencies that seldom work together. The emergency management system offers a framework to establish coordination quickly, but it must be practiced through exercises, since (ideally) it will be needed only for a few real incidents. This document serves as a guide to these exercises. The exercises outlined in this document allow the participants to understand the connections and collaboration necessary for successful outcomes, and to see, hear, and do the required activities, which leads to the best information retention by adults. Multiple types of exercises are described in detail to allow emergency management staff to accomplish various levels of familiarization, development, and practice with railroad staff and collaborating agencies. Successful exercises build confidence in railroad staff so that they can work successfully under the high-pressure environment of a real event.

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METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in)	=	2.5 centimeters (cm)
1 foot (ft)	=	30 centimeters (cm)
1 yard (yd)	=	0.9 meter (m)
1 mile (mi)	=	1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2)	=	6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2)	=	0.09 square meter (m^2)
1 square yard (sq yd, yd^2)	=	0.8 square meter (m^2)
1 square mile (sq mi, mi^2)	=	2.6 square kilometers (km^2)
1 acre = 0.4 hectare (he)	=	4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz)	=	28 grams (gm)
1 pound (lb)	=	0.45 kilogram (kg)
1 short ton = 2,000 pounds (lb)	=	0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp)	=	5 milliliters (ml)
1 tablespoon (tbsp)	=	15 milliliters (ml)
1 fluid ounce (fl oz)	=	30 milliliters (ml)
1 cup (c)	=	0.24 liter (l)
1 pint (pt)	=	0.47 liter (l)
1 quart (qt)	=	0.96 liter (l)
1 gallon (gal)	=	3.8 liters (l)
1 cubic foot (cu ft, ft^3)	=	0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3)	=	0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

$[(x-32)(5/9)]$ °F = y °C

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm)	=	0.04 inch (in)
1 centimeter (cm)	=	0.4 inch (in)
1 meter (m)	=	3.3 feet (ft)
1 meter (m)	=	1.1 yards (yd)
1 kilometer (km)	=	0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2)	=	0.16 square inch (sq in, in^2)
1 square meter (m^2)	=	1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2)	=	0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2)	=	1 hectare (ha) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gm)	=	0.036 ounce (oz)
1 kilogram (kg)	=	2.2 pounds (lb)
1 tonne (t)	=	1,000 kilograms (kg)
	=	1.1 short tons

VOLUME (APPROXIMATE)

1 milliliter (ml)	=	0.03 fluid ounce (fl oz)
1 liter (l)	=	2.1 pints (pt)
1 liter (l)	=	1.06 quarts (qt)
1 liter (l)	=	0.26 gallon (gal)
1 cubic meter (m^3)	=	36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3)	=	1.3 cubic yards (cu yd, yd^3)

TEMPERATURE (EXACT)

$[(9/5) y + 32]$ °C = x °F

QUICK INCH - CENTIMETER LENGTH CONVERSION

	0	1	2	3	4	5

Inches

Centimeters

0	1	2	3	4	5	6	7	8	9	10	11	12	13
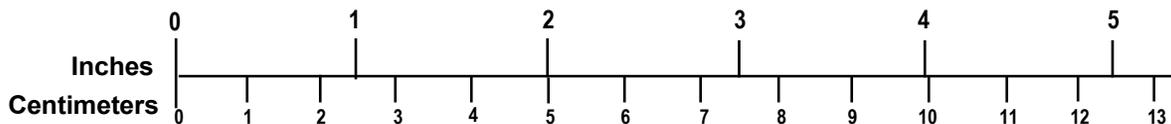
QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSIO

°F	-40°	-22°	-4°	14°	32°	50°	68°	86°	104°	122°	140°	158°	176°	194°	212°
°C	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
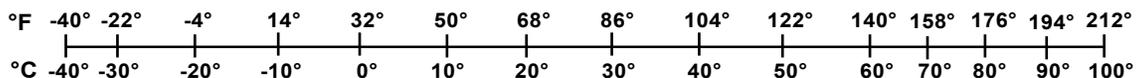
For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50 SD Catalog No. C13 10286

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1. Introduction

Emergency management for climate-driven extreme events on the railroad is a "seldom-used skill." While derailments and grade crossing accidents occur frequently, they generally involve only a few people, and the damage to railroad property is usually repaired without significant impact on overall railroad operations. Internal management systems will usually support the successful outcome of routine emergency events—events that recur without serious long-term consequences—although coordination with first responders may be needed.

Responses to climate-driven extreme events occur less often, and generally involve many railroad personnel, as well as community members, first responders, and other public and private organizations. These entities may have few occasions to work together on the same event that requires cross-discipline and cross-jurisdiction coordination. Climate-driven extreme events may threaten human life, the environment, and railroad property, requiring rapid and accurate response decisions. The emergency management system provides a framework for this kind of seldom used coordination to be established quickly and occur successfully, using the Incident Command System (ICS)[1]. Pre-event training is needed to ensure that personnel are familiar with ICS, the railroad's emergency management system, and the railroad's emergency plan. Exercises are used to ensure that personnel have the knowledge and confidence needed to be successful in the high-stress environment of a real event.

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[1] The Incident Command System is mandated for use by public agencies in multi-jurisdictional and multi-profession emergency events under Homeland Security Presidential Directive 5 (Bush, 2003). While the privately owned railroad enterprises are not required to use this system, railroad personnel should be familiar with the system so that they can effectively collaborate with public first responder agencies that are using ICS during emergencies.

1.1 Emergency Management System
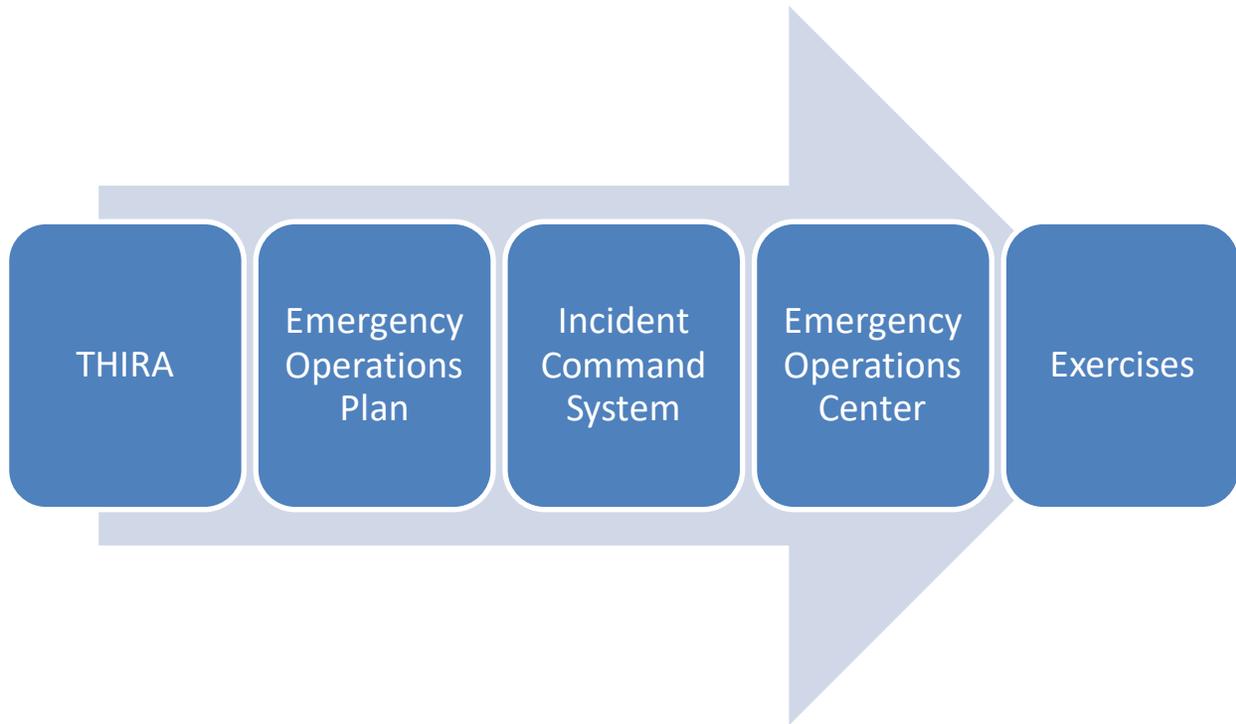
Figure 1. Emergency Management System

The series of steps in the emergency management system, as depicted in Figure 1, begins with an initial evaluation of the hazards to be faced through the threat and hazard inventory and risk assessment (THIRA) process (Task 2 of this project). An emergency operations plan for the railroad's response can then be written based on the known hazards (Task 3 of this project). The Incident Command System (ICS) can be adopted by the organization (Task 4 of this project) to guide the field personnel in executing the plan at the field level during an extreme event in coordination with first responders. Finally, an emergency operations center (EOC) plan (Task 5 of this project) can be created that guides the railroad's management staff in executing the emergency plan at the managerial coordination level, including creating a common operational picture, documenting the event, and ordering and managing resources.

Once the emergency management for extreme events process is in place it must be practiced because it is going to be used for few (it is to be hoped) real events. Adults remember best what they see, hear, and do (Zmeyov, 1998). The training provides the introductions to the elements of the emergency management system, during which the railroad personnel see and hear about the system. The exercises allow the participants to both discuss ("see" and "hear") and, in some formats, "do" by moving around the small vehicles or moving through practical learning stations. The exercises may take the shape of an introductory seminar, a workshop, a tabletop, a sand table, or a facilitation. Each has its benefits in developing and refreshing an effective emergency response system for extreme events on the railroad.

2.   Types of Exercises[2]

Emergency management exercises generally fall into two categories: discussion-based and activity-based. One type—the facilitated exercise—is a combination of both types of exercises. Each type of exercise has specific benefits and limitations. Understanding how the various exercises work will help railroad staff select the exercise that best fits their needs at a specific time in the emergency response capability development of the railroad staff.

This guide provides supportive materials for the discussion-based exercises. Activity-based exercises are generally expensive and involve some liability, so it is unlikely that a railroad would want to sponsor such an event, although they might be invited to participate as a Subject Matter Expert (SME) or as an Agency Liaison in a large jurisdiction's exercise.

The facilitated exercise is a combination of discussion-based and activity-based exercises. This guide provides supportive materials for creating this type of exercise, including a checklist and a video of a railroad's facilitated exercise event.

Some of the materials provided in the guide could be used in multiple types of exercises. For example, the ICS Quick Start Cards can be used as guides to the ICS position tasks in any exercise format where the ICS is being used. The two scenarios can be used as the basis for a tabletop exercise or a sand table exercise. A facilitated exercise could be built around some of the skills required to resolve the scenarios.

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[2] The Homeland Security Exercise Evaluation Program (HSEEP) has a comprehensive guide (HSEEP, 2020) that is intended for large government organizations. However, its information can be useful to private sector organizations developing exercises, including for smaller scale events. Edwards and Goodrich (2014) also have an exercise handbook designed specifically for the transportation sector that provides more detailed discussions of the exercise types and their implementation. This can be downloaded for free from the Mineta Transportation Institute's website at https://transweb.sjsu.edu/research/Exercise-Handbook-What-Transportation-Security-and-Emergency-Preparedness-Leaders-Need-Know-Improve-Emergency-Preparedness

2.1 Features of Exercise Types

Different types of exercises are beneficial for different purposes. Table 1 provides a brief

description of each type of exercise and some of the planning determinants: how do the railroad

staff select the appropriate exercise type for their purpose?

Table 1. Exercise Types and Planning Determinants

Type	Definition (based on HSEEP Glossary, 2020)	Overall Cost	Risk to Participants	Overtime	Distance Learning Possible	Internet-Based Possible	Existing EOP and SOPs Required	Training Required Before Participation[1]
Discussion								
Seminar	Orient *participants* to authorities, strategies, plans, policies, procedures, protocols, resources, concepts, and/or ideas.	Low	Low	May be on-duty delivery	Yes	Yes	No[1]	No
Workshop	Increased participant interaction, focus on achieving or building a product (e.g., plans, policies); used to: test new ideas, processes, or procedures; train groups in coordinated activities; and obtain consensus; uses breakout sessions to explore parts of an issue with smaller groups.	Low	Low	May be on-duty delivery	Yes	Yes	No[2]	No
Tabletop	Discussion-based; used to: assess plans, policies, and procedures, or to assess types of systems needed to guide the *prevention* of, *response* to, or *recovery* from a defined incident. Includes senior staff, elected or appointed officials, or other key decision-making personnel; aimed at facilitating understanding of concepts, identifying strengths and shortfalls, and/or achieving a change in plans and policy.	Low	Low	May be on-duty delivery	Yes	No	Yes	Yes

Table 1. Exercise Types and Planning Determinants

Type	Definition (based on HSEEP Glossary, 2020)	Overall Cost	Risk to Participants	Overtime	Distance Learning Possible	Internet-Based Possible	Existing EOP and SOPs Required	Training Required Before Participation[1]
Sand Table	Discussion-based; used to: assess plans, policies, and procedures, or to assess types of systems needed to guide the *prevention* of, *response* to, or *recovery* from a defined incident. Includes senior staff, elected or appointed officials, or other key decision-making personnel; aimed at facilitating understanding of concepts, identifying strengths and shortfalls, and/or achieving a change in plans and policy. Add small vehicles and scene accessories to visualize the scenario and permit participants to move the components around as they describe how the response would be managed.	Low	Low	May be on-duty delivery	No	No	Yes	Yes
Activity								
Drill	*Operations-based* exercise; coordinated, supervised activity usually employed to test a single, specific operation or function in a single agency; used to: provide training on new equipment, develop or test new policies or procedures, or practice and maintain current skills.	Moderate to High	Moderate to High	On-duty or overtime	No	No	No[3]	Yes
Functional	Single- or multi-agency activity designed to evaluate capabilities and multiple functions using a simulated response; typically used to evaluate the management of EOCs, command posts, and headquarters; and assess the adequacy of response plans and resources; includes simulated deployment of resources and personnel, rapid problem solving, and a highly stressful environment.	Moderate	Low	On duty or overtime	Yes	No	Yes	Yes

Table 1. Exercise Types and Planning Determinants

Type	Definition (based on HSEEP Glossary, 2020)	Overall Cost	Risk to Participants	Overtime	Distance Learning Possible	Internet-Based Possible	Existing EOP and SOPs Required	Training Required Before Participation[1]
Full-Scale	Multi-agency, multi-jurisdictional activity involving actual deployment of resources in a realistic coordinated response; tests one or more capabilities within emergency response and recovery; used to assess plans and procedures, and assess coordinated response under crisis conditions. Characteristics include mobilized units, personnel, and equipment; stressful, a realistic environment, and scripted exercise scenarios, but free play by participants; critique only at Hot Wash.	Very High	Very High	Overtime Probable	No	No	Yes	Yes
Discussion & Activity								
Facilitated	Composed of multiple, realistic learning stations that simulate a full-scale response, focused discussion of learning station-specific issues through a facilitator with functional area or subject matter expertise before the practical application is begun, to ensure that all actions are according to the SOPs/EOP. May be multi-agency or multi-jurisdictional.	High	Moderate	Overtime possible	No	No	Yes	Yes

Notes: 1. Specific training for participants is determined by the type of exercise and the scenario selected.

2. May be part of EOP or SOPs development.

3. May be part of training cycle.

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Major determinants for most exercise designers are cost and risk. Organizations generally want to minimize the cost of exercises while achieving maximum knowledge gain for the participants.

2.2 Cost

The first column in Table 1 notes the level of expense required for implementing the exercise. The basic cost for all exercises is personnel time to plan for and participate in the exercise. Office staff may be able to attend exercises on duty time, but field staff may have to attend the exercise on overtime, or have other staff doing their jobs on overtime. Personnel cost budgeting will determine how many hours the exercise can be, and how many people can participate in the exercise.

2.3 Venue

Once personnel cost for participants and exercise planners is calculated, the next budget item is the venue. The seminar and workshop, and most tabletop exercises, can be held in a meeting room of the size required for the intended audience. A seminar will need a podium and PowerPoint capability for the presenter and auditorium-style or classroom-style seating for the participants. A workshop will require the same podium and PowerPoint support, but the seating will be for groups around tables. The number of people per table and the number of tables will be determined by the size of the intended audience and the number of planning or policy elements that will be discussed. Is the discussion on one topic that all will address, or on a variety of topics that will be addressed by different smaller groups? These decisions will determine the size and set up of the venue, and thus the cost.

Figure 2. Tabletop Exercise Set-up

As shown in Figure 2, a tabletop exercise will require a central table large enough for the participants to face each other. A conference room in the railroad administration facility may be large enough. A sand table exercise, as shown in Figure 3, will require a large enough table for the scenario to be depicted in enough detail for the participants to understand the problem. Small vehicles—such as HO-scale trains and layout accessories—should be provided so participants can take items out of service, introduce new vehicles, and clearly observe how these actions affect railroad property. A garage or service facility is a good choice for the sand table set up. A video of a sand table exercise being set up is included in the resources attached to this task.

Another video is a discussion with the designer of the sand table exercise that gives more detailed answers to sand table design and set up questions.

The facilitated exercise requires a venue that depicts the scenario being used. For example, a wildfire on the railroad scenario would require an outdoor location adjacent to railroad tracks and the relevant railroad equipment for managing a wildland fire. Union Pacific and BNSF have fire trains, which could be used in a demonstration, while other agencies collaborate with local fire departments for right-of-way suppression. The scenario drives the decision about the location and the equipment needed.

2.4 Presenters

The next budget item is the presenters. A seminar might be led by an in-house emergency management expert, or a Subject Matter Expert (SME) from your own or another organization might be engaged. A government speaker might be free, while a private sector speaker may require a fee. A workshop should usually be led by the in-house emergency management planners who created the documents under review. They are most able to answer questions about the contents and manage suggested changes or additions to the materials presented. Tabletop exercises and sand table exercises would usually be led by the railroad's emergency management staff, as they have the most thorough knowledge of the organization's emergency plan.

A facilitated exercise would require personnel from within the railroad organization who are recognized by their peers as SMEs, to avoid that person being challenged and undermining the exercise. Outside SMEs may be following different standard operational procedures (SOPs) and policies than those used by the sponsoring organization, causing dissention. SMEs might also be from within local first responder agencies to ensure that their organizations' SOPs are followed.

In-house and local government SMEs would probably participate without a fee, but consultants will charge for their time.

2.5 Supporting Materials

The other major expense is the materials to support the exercise type. While the cost of creating a PowerPoint show for the exercises is usually inexpensive, and might be handled by railroad personnel, someone will need to create the handout materials for the participants and distribute them in advance. Some agencies use digital versions of materials during the seminar and workshop because they will be undergoing revision, but then the venue will have to have adequate outlets for participants to bring tablets or laptop computers.

If field personnel do not routinely use digital media, it might be necessary to provide paper copies. During the tabletop exercise and sand table exercise, the participants will need their position checklists from the ICS card sets or the emergency plan document, probably in hardcopy. Cost includes production and distribution of the materials. All participants in a facilitated exercise will need a method to take notes in the field, either tablets or pen and paper.

2.6 Risk

The issue of risk is what drives the use of discussion-based exercises rather than activities. There is little risk in holding discussion-based exercises indoors. It is unlikely that any physical or psychological harm would come to any participants.

Activities are inherently riskier, as people handle equipment and move around workspaces that may be unfamiliar to them. A simple fire extinguisher drill can lead to inhalation hazards and burns. A full-scale exercise with emergency vehicles driving through the community and groups simulating rescues has the risk of physical injury to all participants and bystanders, and psychological injury to the victim volunteers. While first responders have to practice using their

equipment, other emergency management personnel can gain the needed knowledge from simulated events while avoiding injury.

The final risk is poor learning. In an activity-based exercise, participants are assigned to interact with equipment or events, and only at the end of the exercise are they given a critique of their actions and corrected. By then they have done the wrong thing, like entering a dangerous area without breathing protection. When a real event occurs, will the exercise participant remember the right way told to him or her at the critique, or the actual action that he or she took during the activity? Adult learning studies suggest that the participant will remember the action, not the verbal correction. Unless the participant is required to repeat the action properly, which could add hours to the exercise to correct everyone, the learning outcome of the exercise my be muddled or faulty.

2.7 Pre-Event Training

Finally, the need for pre-event training has to be considered. In seminars and workshops the needed information is provided at the start of the exercise. For all of the other exercise types, basic emergency management training, such as ICS, is needed before the exercise scenarios can be addressed. Basic ICS courses are typically several hours long, and can be taken on the computer using the materials from the FEMA Independent Study (IS) resources, available online at https://training.fema.gov/is/ . More detailed emergency operations center section training is usually four hours for each section. IS-2200 Emergency Operations Center is the basic EOC training course that can be taken online, but the EOC section training is in-person class instruction. Before planning an exercise of EOC plans and activities, the training has to be taken by all participants, which is primarily a personnel expense. Railroad personnel may be able to

join local first responders for emergency operations classes, but if they have to hold their own classes, they may have to hire instructors for a fee.

2.7.1   Project Management and Exercises

Project management is "the practice of planning, organizing, and executing the tasks needed to turn a brilliant idea into a tangible product, service, or deliverable" (Project Management Institute, 2025). This approach is used by engineers and planners to move a complex project from concept to completion, so it makes a useful method for developing and implementing emergency management exercises. Since the system is already used in many organizations, it is easily understood by exercise creators and participants. "Key aspects of project management include: defining project scope, identifying deliverables, managing risks, and effective communication across teams" (Project Management Institute, 2025).

This guide recommends the use of project management in developing all types of exercises. One of the attachments to this task is a project management-based checklist set for each type of exercise discussed. Following the Project Management Institute's rubrics, the checklists are organized around key concepts: initiation process, planning process, executing process, controlling process, and closing process. Each step has a comprehensive list of exact steps and actions to be taken to develop the exercise from original concept to completed reports. Video examples of sand table exercises and a facilitated exercise provide additional guidance for exercise designers.

2.7.2   Exercise Types Described

2.8   Seminar

An introductory seminar that lays out the process of emergency management provides an opportunity to introduce the staff to the emergency plan process and documents. It is generally a lecture with a question-and-answer opportunity at the end. The seminar checklist in the attachment gives detailed steps for developing and completing this type.

2.9   Workshop

This may be followed by a workshop where emergency management documents are given to the participants, who are the personnel responsible for the implementation of the plans and policies. These personnel are able to review the drafts, discuss them with colleagues and make suggestions for changes and improvements, based on their practical knowledge of the organization and their roles. The workshop checklist in the attachment gives detailed steps for developing and completing this type.

2.10   Tabletop

Once the emergency plan is completed, an opportunity for discussion of the final product is provided through a tabletop exercise. Railroad staff who would manage an emergency event gather around a conference table with vests or table tents to identify the ICS or emergency management positions. The participants assume their assigned roles and, using a realistic event scenario, talk through what they would each do during such an event. This allows the participants to understand the connections and collaboration necessary for successful outcomes as they hear what actions their colleagues would take, and how these actions would impact their decisions. The tabletop checklist in the attachment gives detailed steps for developing and completing this type.

2.11　Sand Table

Figure 3. Sand Table Exercise

A variation on the tabletop exercise is the sand table exercise, depicted in Figure 3. This method includes setting up the scenario in miniature form on a table, using colored tape and small vehicles to represent the activities and organizations that would be part of a response to an extreme event. Through a sand table exercise, the participants have the benefit of "doing" by moving around the vehicles and resources that would be used in a real response without the risk and expense of a full-scale exercise where real emergency response vehicles are used. A video of two sand table exercises—one using all ICS positions and one focused on a single position—is included in the resources attached to this task.

This exercise was practicing the use of ICS Quick Start cards that provide a checklist for each position. Participants work through the scenario using the cards as a guide to their actions. A set of cards is provided as an attachment in Word format so users can customize the cards to their organization's policies and procedures. Detailed instructions for making the cards can be found in Task 3 of this project. The sand table checklist in the attachment gives detailed steps for developing and completing this type of exercise.

2.12   Facilitated

Figure 4. Learning Station for Hazardous Materials and Explosives at a Facilitated Exercise

Another approach to a discussion-based exercise is the facilitated exercise. A realistic location is selected and learning stations are established, as depicted in Figure 4. At each learning station a SME leads the discussion of the event as it is unfolding, and assists the participants with creating a response to the event as it has unfolded.

Participants arrive in groups of people who work together, doing the same work to resolve the problem. The groups are staggered so that they move through the learning stations in order. The first group starts at Learning Station One and completes it, moving on to Learning Station Two as the next group arrives to start Learning Station One. Spacing is determined by the time needed for activity at the longest station. At the end of the day, the early learning stations close as the last groups move through the stations.

Because adults remember best what they do (Zmeyov, 1998), no actions are permitted at a facilitated exercise until a valid plan for that element of the response has been made by the participants. They then walk through the correct behaviors, whether discovering improvised explosive device models in a rail yard, performing expedient removal of emergency exit windows from a train, or using emergency medical care strategies to care for injured personnel. A video of a facilitated exercise—Iron Horse—created by the City of San Jose first responders and their rail partners from Altamont Corridor Express (ACE), Amtrak, and Caltrain, is also provided in the resources attached to this task. The facilitated exercise checklist in the attachment gives detailed steps for developing and completing this type of exercise.

2.13 Others

Drills, functional exercises, and full-scale exercises are not discussed further in this guide. Those wishing more information can access the HSEEP (2020) guide or the Edwards and Goodrich (2014) handbook.

3. Exercise Components

Each type of exercise requires different components. Table 2 gives an overview of the needs of each type.

Table 2. Exercise Components

Type	Definition (based on HSEEP Glossary, 2020)	Director	Speaker	Evaluator	Controllers	Participation by Other Agencies	Work Product	After Action	Improvement Plan
Discussion									
Seminar	Orient *participants* to authorities, strategies, plans, policies, procedures, protocols, resources, concepts, and/or ideas.	Yes	Yes	No	No	Maybe	No	Yes	No
Workshop	Increased participant interaction, focus on achieving or building a product (e.g., plans, policies); used to: test new ideas, processes, or procedures; train groups in coordinated activities; and obtain consensus; use breakout sessions to explore parts of an issue with smaller groups.	Yes	Yes	No	No	Maybe	New/revised plan, policy, etc.	Yes	No
Tabletop	Discussion-based; used to: assess plans, policies, and procedures, or to assess types of systems needed to guide the *prevention* of, *response* to, or *recovery* from a defined incident. Includes senior staff, elected or appointed officials, or other key decision-making personnel; aimed at facilitating understanding of concepts, identifying strengths and shortfalls, and/or achieving a change in plans and policy.	Yes	No	Yes	No Director fills role	Usually	Maybe a revised plan or SOP	Yes	Yes
Sand Table	Discussion-based; used to: assess plans, policies, and procedures, or to assess types of systems needed to guide the prevention of, response to, or recovery from a defined incident. Includes senior staff, elected or appointed officials, or other key decision-making personnel; aimed at facilitating understanding of concepts, identifying strengths and shortfalls, and/or achieving a change in plans and policy. Add small vehicles and scene accessories to visualize the scenario and permit participants to move the components around as they describe how the response would be managed.	Yes	No	Yes	No	Usually	Maybe a revised plan or SOP	Yes	Yes
Activity									

Table 2. Exercise Components

Type	Definition (based on HSEEP Glossary, 2020)	Director	Speaker	Evaluator	Controllers	Participation by Other Agencies	Work Product	After Action	Improvement Plan
Drill	*Operations-based* exercise, coordinated, supervised activity usually employed to test a single specific operation or function in a single agency; used to provide training on new equipment, develop or test new policies or procedures, or practice and maintain current skills.	Yes	No	Yes	Yes, or Direct or may fill role	Maybe	No	Yes	Maybe
Functional	Single- or multi-agency activity designed to evaluate capabilities and multiple functions using a simulated response; typically used to evaluate the management of EOCs, command posts, and headquarters; and assess the adequacy of response plans and resources; includes simulated deployment of resources and personnel, rapid problem solving, and a highly stressful environment.	Yes	No	Yes	Yes	Maybe	Maybe	Yes	Yes
Full Scale	Multi-agency, multi-jurisdictional activity involving actual deployment of resources in a realistic coordinated response; tests one or more capabilities within emergency response and recovery; used to assess plans and procedures, and assess coordinated response under crisis conditions. Characteristics include mobilized units, personnel, and equipment; stressful, a realistic environment, and scripted exercise scenarios, but free play by participants, critique only at "Hot Wash" (post-exercise review).	Yes	No	Yes	Yes	Yes	Maybe	Yes	Yes
Discussion & Activity									
Facilitated	Composed of multiple, realistic learning stations that simulate a full-scale response, focused discussion of learning station-specific issues through a facilitator with functional area or subject matter expertise before the practical application is begun, to ensure that all actions are according to the SOPs/EOP. May be multi-agency or multi-jurisdictional.	Yes	Yes SME Facilitator at each learning station	Yes	Yes	Yes	Maybe	Yes	Yes

3.1　Director

The exercise director is responsible for the overall conduct of the exercise, from the first organizational meeting to the completion of the improvement matrix. This person must be thoroughly aware of the railroad's emergency management program and policies in order to guide the exercise design to achieve its goals.

3.2　Speakers

Speakers are needed for the seminar. They must be SMEs for the topic being presented. Speakers might come from the railroad, from local first responders or from other levels of government. Speakers might also come from research organizations or universities, but these speakers might charge a fee.

Speakers might also be needed for a workshop if there is a topic that needs explaining or introducing to the workshop participants. In many cases facilitators will be assigned to each table to guide the participants in their review and revision work, and one or some of them might make the opening presentations explaining the purpose of the workshop. The facilitators would generally be from the railroad.

The facilitated exercise requires one or several SMEs as leaders at each learning station. They will speak about the subject of their learning station and then guide the participants in their discussions. These people should generally be from the railroad's management staff, and some first responder organizations might be invited to participate as SMEs.

3.3　Evaluators

Evaluators are needed for the tabletop, sand table, and facilitated exercise. They are SMEs or emergency managers well versed in the railroad's emergency plans and policies. They also have a list of the goals for the exercise and a timeline of anticipated actions during the exercise period.

They are silent observers whose purpose is to find areas for improvement in the way the exercise was conducted, in the way the participants fulfilled their roles, or in the documents that form the basis of the exercise. These could be plans, procedures, or policies, for example. Their reports are given both orally during the after-action briefing and in writing to the exercise director for use in developing the After Action Report and the improvement matrix.

3.4 Controllers

Controllers are needed for the tabletop, sand table, and facilitated exercises. They provide additional information as the exercise unfolds called "injects." The purpose is to allow information to unfold for the participants as it would in a real event. At the start of an emergency only minimal information is known—location, perhaps cause, perhaps people or equipment involved. As the railroad staff members begin to discuss the situation, more information is provided as though first responders were beginning rescues, developing more information about the cause of the event, and getting a better sense of how the event is unfolding. These "injects" provide the type of details that would come from the railroad's agency representative at the Incident Command Post (ICP) or in the emergency operations center (EOC). This information would then inform the railroad's response to the unfolding event.

3.5 Other Agencies

Exercises benefit from including both the primary agency's personnel—in this case the railroad's—and personnel from agencies that would be working with railroad staff to resolve the emergency. These would include local government law enforcement and fire personnel, public works and transportation personnel, and other private sector entities, such as utilities. Bringing outside agencies into the exercise allows them to learn about the railroad's plans and capabilities, and also to inform the exercise participants about their agency's plans and capabilities for

helping to resolve the event. This information can help to refine the railroad's plans and provide a better understanding of what the outside agencies can do as collaborators in a disaster.

3.6   Master Sequence of Events List (MSEL)

For each discussion exercise type, a master sequence of events list (MSEL) is developed that reflects the steps and timing in a real event of that type. A sun kink might cause an accident that injures the train crew, and that would happen in seconds and require a response in minutes. A wildfire might burn in the wilderness for days before a response is required to protect railroad assets. A storm might pass through an area slowly, with rivers swelling over several days, then when the crest reaches the bank with the railroad route the loss of an embankment, track bed, and bridge might happen in minutes.

The MSEL reflects the goals of the exercise. The scenario unfolds to support these goals. What decisions should the participants make during the discussion? What resources should the participants call for? What plans should they rely on? The evaluators will compare the goals established with the way the exercise unfolds to determine whether the goals have been met.

In each case the discussion-exercise designers need to develop the scenario based on a realistic timeline so that the participants experience the event and response as it might occur in the real world. The operational conditions of the railroad should replicate actual railroad property, equipment, and staffing levels. The information available to the participants should unfold as it might in a real event. Attachment 1 provides an example of a MSEL for the start of an exercise. The length of the MSEL is determined by the complexity of the exercise scenario.

In a facilitated exercise the goal is a combination of training and practice. Participants are introduced to the scenario. Then they travel among the learning stations to learn about equipment and facilities during the SME-led portion. After completing the instruction at each learning

station the participants, guided by the SMEs, discuss a response plan that uses the new knowledge to inform the response. Instead of a MSEL, a learning plan is provided to guide the instructors/SMEs, as shown in Attachment 2. A schedule for each learning station is established to keep the exercise on time, but participants are never allowed to undertake a physical activity until the response has been accepted by the SMEs.

3.7   Work Product

A work product will come from every exercise. All exercises have goals which will include some kind of plan, procedure, or policy that will be the focus. In a seminar the general learning of the audience is the work product, and can be evaluated with a pre- and post-test, showing what the participants knew before the seminar and what they know after the seminar. This allows for improvement of the presentation for future audiences, and for distribution of follow-up material to the attendees that will clarify or enhance the presentation.

The work product is the focus of the workshop. Participants are given a plan, policy, or procedure to evaluate and critique. Working together in small groups that will amend, augment, or delete elements, they will develop a more workable or effective document. The comments from all the groups are evaluated and merged by the exercise director, producing a new version of the focus document that is the workshop's product. It should represent an improvement that can be reviewed and exercised by the railroad's emergency management staff.

3.8   After Action Report

In a tabletop, sand table, or facilitated exercise, the products are the After Action Report and the improvement matrix. The exercise has a set of goals, a master sequence of events list, and a time line that guide the play. At the end of the exercise, the evaluators' responses and the responses of the players at the after action meeting are combined into the After Action Report by the exercise

director. The comments would cover how well the exercise goals were met and how well the documents guiding the play were constructed. The exercise might show that some of the goals have not been attained, or that some of the documents do not provide correct or adequate guidance for emergency management in a real event. Changes to the documents are suggested, and at the next exercise these can be tested.

The after-action meeting is held when the exercise is completed. As many of the participants as possible should be included. In a small group the after-action meeting can be a roundtable discussion. With a large group a different strategy allows for more participation by all the players. Three easels are set up with chart paper, one says "what went well" at the top. One says "what needs to change" at the top. The third says "never again." Each player is then given a set number of Post-it note sheets—usually three or five—and instructed to write one idea on each sheet, and then put the sheet on the appropriate easel. In this way everyone is able to make the same number of comments, so no one dominates and no one is shut out. It also allows for anonymous input. The exercise staff members assisting the exercise director then read the comments and gather them into piles of the same response. Generally, there will be common themes in the participants' answers that can be grouped. Unique comments are left as individual notes.

The exercise director welcomes everyone and has the staff member read the "what went well" comments, overall statement for the common multiple comments, and then reads the individual remarks. The exercise director then invites anyone with a different comment to speak. This allows people who had more than the allowable number of comments to still get their comments acknowledged, as long as they do not duplicate anything already read. The staff then reads the "what needs to change" comments in the same way, and then the exercise director invites

additions from the audience. There may also be some discussion about these, as the need for change will impact the After Action Report and the improvement matrix, so it is important that there be a consensus around these issues. Finally, staff reads the "never again" comments in the same way, and the exercise director invites audience comments. Again, discussion of these issues is important since they will impact the report and the improvement matrix.

When the after-action meeting is completed, the exercise director creates the after-action report for the railroad administration. The After Action Report consists of a description of the exercise type, the exercise goals, and the master sequence of events list. The next section summarizes what went well, what needs to change, and what should never again occur. It documents the successes recognized in the exercise and the changes needed in the future. These changes may require budgetary action to complete, such as assigning projects to staff (staff time) or purchasing new equipment. It ends with a summary of the documents, policies, procedures, or activities that will be impacted by the needed changes. The changes become the heart of the improvement matrix.

3.9   Improvement Matrix

Table 3. Example Improvement Plan Matrix

Task/Station	Recommendation	Action	Responsible Party	Completion Date
Stn 2: Safe operations on the RR	Create rail car familiarization handout	Create handout in conjunction with rail that provides key life safety information on rail cars	San Jose OES	3/31/06
	Create "mechanism of injury" guide for rail accidents	Create "mechanism of injury" guide for rail accident victims	San Jose MMTF	1/16/06
Stn 3: Rail Car Familiarization	Develop SOP for first responder actions when an IED is discovered after they have started patient care	Develop SOP for first responder action when an IED is discovered after they have started patient care	San Jose MMTF	5/31/06
Stn 4: Extraction and Medical Care	Create mechanism of injury guide for rail accidents	Create mechanism of injury guide for rail accident victims	San Jose MMTF	1/16/06

The changes needed as documented in the After Action Report are listed by learning station for the facilitated exercise. For tabletops or sand table exercises, they can be numbered. The example Table 3 is from a facilitated exercise among railroad and first responder personnel that revealed the need for better documentation to support first responder actions on the railroad. In many exercises the need for change is recognized but gets lost in daily work requirements. The improvement matrix lists the needed change and briefly describes it, but then describes exactly what needs to happen, exactly who is responsible to make sure that it happens, and a date by which the change/action/edit should be completed. If more time is needed, the assigned team can consult with the exercise director for a new due date. The improvement matrix allows for accountability among the participating agencies to ensure that the beneficial changes are made before a real event challenges the system in the future.

4. Exercise Purpose and Goals

Once the type of exercise is determined, and the components have been planned for, the specific purpose and goals of the exercise will be documented. Recent natural disaster tragedies like the 2025 Texas floods demonstrate how quickly an emergency can develop, and the various agencies that have to respond to save lives and property. As the environment changes, high heat, flash floods, and stronger hurricanes will impact the United States and the open environment in which the railroads operate. Railroads have plans, policies, and procedures in place that provide guidance for managing various extreme events, but not all have been used in a real situation. Exercises allow railroad personnel to imagine various extreme events that would impact the railroad, and how the company would respond, alone and in concert with others, based on its existing plans, policies, and procedures.

4.1 Who: Railroad Management Staff

An exercise series might be designed for the railroad's internal management staff. Since large disasters are infrequent, management staff may be unfamiliar with the railroad's own emergency response plans. A seminar might be a good familiarization activity when there is new management leadership or when there has been a large-scale disaster that has impacted a railroad in the US or abroad. A seminar describing the event, the actual response, and how the railroad plans to respond to such an event will allow management staff to understand existing plans and ask questions about areas of concern to them. It will allow for risk analysis and an examination of the railroad's fiscal preparedness for disasters. Management staff should also be included in other types of exercises with other elements of the railroad's personnel, especially tabletop exercises that would allow management staff to see how the emergency management activities are carried out, and the role that they would play in a real disaster event.

4.2   Who: Field Operations Staff

An internal exercise series for maintenance of way, signals, and communication staff might start with a seminar for familiarization with existing plans. It is important for field staff to have ICS training so they understand how they will work together with first responders in large-scale events. A discussion-based exercise after that training would allow them to see how their roles complement other aspects of disaster response, including how field activities under ICS collaborate with emergency operations center activities.

4.3   Who: Train Crews

An exercise series for train crews would allow them to understand how the overall railroad organization is responding to disaster events. The train crew of two—engineer and conductor—might be in an isolated area and be working with local first responders to resolve a natural, technological, or human-caused disaster, so they need to understand how they would fit into the ICS structure, and what kind of supporting operations would be conducted at the division or organizational level. The role of the conductor as the railroad's representative in the early stages of an ICS response might be new information to many of them, so basic ICS training is important. After the training they might participate in a discussion exercise with field operations staff.

4.4   Who: Personnel from Other Jurisdictions: Law Enforcement, Fire Rescue, and Others

In large disaster events the railroad staff would be working with other agencies, such as law enforcement, fire and rescue, emergency medical services, and public road departments. The railroad would benefit by sponsoring a discussion-based exercise and inviting these collaborating agencies to discuss the response plans of all entities involved. Railroad staff could learn about the expected operations of the first responders, and the first responders could learn about railroad

plans and resources. The result of such exercises could be the creation of better integrated work plans on each side, and a better understanding of the resources that could be shared. For example, local first responders might not be aware of equipment like fire trains that can help to fight wildland fires. A facilitated exercise for first responders on a rail facility could educate the first responders about how rail equipment operates, and how to operate safely in a rail environment. Issues like how the brakes work and what parts of the cars are electrified would be life safety lessons for first responders.

4.5   What Are You Exercising?

An exercise is focused on evaluating some plan, policy, or procedure to understand how it would support a real event response. It might be the exercise of an existing plan. Following the guidance in the plan, exercise participants can imagine a real extreme event, and determine whether the information in the plan provides adequate information for railroad staff to successfully respond to the disaster. It might be the exercise of procedures like the ICS cards. Exercise participants can follow the steps in the cards and determine whether there are gaps in the guidance, whether the steps are realistic, and whether the railroad staff have had adequate training to follow the steps in the cards.

Plans also contain information about levels of coordination beyond the railroad's immediate response staff. Do the plans correctly identify the likely partner agencies? During an exercise the participants can imagine which outside agencies would be needed to help to resolve the disaster on the railroad. Are there adequate lists of supporting organizations, like first responders, utilities, parts suppliers, service providers, and are there 24-hour contact numbers for each of those organizations? What kind of communication links will be needed? Does the railroad dispatch center have the list of organizations and numbers? Would the railroad emergency

management staff need to call departments within the railroad for services or expedient changes in track management, for example? Do they know how to contact the state warning center for extreme events on the railroad that might spill over into the community?

4.6 Why: Goals

Exercise designers will establish specific goals for the event. In a seminar it might be introducing existing plans to railroad staff. In a workshop it might be the review of new emergency management guidance materials by other railroad staff to get their expertise and information to update or improve the documents, policies, or procedures. Have the emergency management staff envisioned activities by field staff that are not practical, for example?

A tabletop exercise allows all the participants to learn about the full scope of the emergency management system. Each participant plays a specific role that he or she would play in a real event. The exercise director calls on each participant in turn based on the role that each would fill. As the disaster is managed, the individual roles and the coordination of those roles becomes clear. This process allows the participants to see whether there are critical tasks that have not been assigned, whether the wrong section is being tasked with the work, or whether the assigned staff have been adequately trained for their assigned tasks.

The sand table takes the table top one step further and allows the participants to move response equipment and vehicles to see whether the plans are realistic. Under the circumstances of the scenario, would the first responders be able to reach the disaster site? Would railroad equipment be able to reach the disaster site? What personnel and resources would be needed for the response, and do they have a safe route to the disaster site? Using the small models as well as the ICS cards adds a dimension to the understanding of the integrated response from the plan.

Figure 5. Union Pacific Supervisor Explains the Electrical System of a Train to First Responders at a Facilitated Exercise

The facilitated exercise moves elements of the disaster into full scale, as shown in Figure 5. Participants visit learning stations that focus on one aspect of the disaster, allowing participants to learn more about that aspect, to discuss options with the SMEs who are leading that learning station, and then to collaborate with each other to develop a response plan that would be safe and effective. The SMEs guide the participants to find a safe and workable solution, and then the participants are allowed to act out that skill. For example, in one facilitated exercise, the railroad staff taught the first responders how to identify electrical hazards in the railroad equipment, and how to operate safely in that environment during a rescue of railroad personnel. Once the firefighters developed a safe plan, they rescued a mannequin from the engine under the

supervision of the SMEs, acquiring both the skills and the knowledge to conduct a future rescue

on the railroad.

5. Conclusion

Emergency management for extreme events on the railroad is a seldom-used skill. Responses to extreme events occur infrequently, and generally involve many railroad personnel, as well as outside agencies who may have few occasions to work together. The emergency management system provides a framework for coordination to be established quickly and occur successfully. Once the emergency management for extreme events process is in place, it must be practiced through exercises, because it is going to be used for few (it is to be hoped) real events. Exercises allow the participants to understand the connections and collaboration necessary for successful outcomes, and to see, hear, and do the required activities, which leads to the best information retention by adults.

Multiple types of exercises are available to allow emergency management staff to accomplish various levels of familiarization, development, and practice with railroad staff and collaborating agencies. Successful exercises build confidence in railroad staff so that they can work successfully under the high-pressure environment of a real event.

6. Scenarios and Case Studies

6.1 Exercise Scenario: Wildfire in the Mountains

Note: This scenario is used in the example tabletop exercise, and has also been recorded separately as a video that could be used as the scenario of a climate evolution sand table exercise.

It is a warm day in early summer. There is a slight breeze blowing from the northwest. It is after the afternoon break. Crews are working on brush clearance in advance of wildfire season. The work site is in a relatively flat area just before the incline to a tall mountain. A river runs alongside the train tracks for several miles. The river flows north with white water rapids and trout fishing areas that draw many sport enthusiasts. The railroad and outdoor sports tourism are the area's only economic engines.

Two crews are clearing brush along the railroad right-of-way 1 mile north of the main regional train yard and administrative center. One is a maintenance-of-way crew from the railroad. The other is a tree trimming contractor working for the electric utility company. They are working collaboratively to create a large fire break by clearing their adjacent land at the same time. The crews are using power tools to cut off tree limbs and cut down saplings. The train right-of-way continues for hundreds of miles, but the utility company's land abuts a state park just before the land begins to rise into the mountains about 2 miles to the south.

There is no road in or out from the isolated wilderness area. The utility crew has special overland trucks that traveled along the railroad right-of-way and the train crew used their Hi-Rail trucks.

Suddenly one of the utility contractors strikes a spike that has been hammered into the tree to deter logging and creates sparks. The sparks fly on the breeze into a pile of cleared dry brush material and ignite a fire. By the time the crew gets the fire extinguishers from their trucks the

fire has spread through the duff on the forest flood and into the high branches through flying embers from the debris pile.

Downwind of the work area is the railroad's regional yard. There is a headquarters building with about 25 employees working there today. Another maintenance crew is working on the track in the yard replacing the combustible ties with concrete ties that are more resilient to wildfires.

The yard includes a 40' x 25' tool shed and a 25' x 25' hazardous materials storage shed, with adjacent diesel fuel dispensing facility. The tool shed has a cedar shake roof and siding. The hazardous materials storage shed is all metal, roof and walls. The administration building has been retrofitted to be fire resistant, with a tile roof, enclosed eaves, and stucco walls.

The yard space includes a siding with a helper engine used to help large freight consists to climb the nearby mountain and help manage the descent into the next valley. There are also two damaged empty tank cars awaiting new trucks and a caboose awaiting new wheel bearings.

The area adjacent to the work area and train tracks is dense evergreen forest into the highest mountain elevations. The developing fire is moving south on the wind, traveling uphill and toward the yard.

6.2 Scenario: Storm and Landslide on the Railroad

ABC Shortline Railroad has a main line that runs east to west from Rural Center to Junction City, used by its trains carrying various agricultural products to the city's market and processing centers. The train consist includes ten cars of bulk fertilizer, a cattle car with 24 dairy cows, 10 cars of miscellaneous canned tomato products, 5 hopper cars of stone fruits—peaches, pears, and plums—and a refrigerator car of packaged butter.

The track is owned by a Class 1 railroad and used by it for long haul freight, and by the local commuter train service from various suburbs along the western track into Junction City. A portion of the route between Rural Center and Junction City runs through an isolated canyon where the Blue River runs close to the base of the hillside with the track lying between them. Due to the curve in the track, the speed limit is 35 miles per hour.

It is mid-summer. The summer has been very rainy, with showers and thunderstorms every week. The warming atmosphere has caused the clouds to hold more moisture, and thus drop larger amounts of rain in each storm. It is currently 10 am and 85 F degrees, with a high of 95F projected for the day. There is a strong wind blowing from the northwest that is carrying black clouds. Blue River, which runs along the Shortline Railroad route, has been nearing capacity for the last week. The hillside above the tracks is saturated. It is covered with apple trees that are full of fruit not yet ready to pick.

Another cloud burst storm begins just as the Shortline agricultural products train, which had been traveling west to Junction City with a full load for two hours, arrived at the area where the track runs between the base of the hill and the river. The track has a curve as it goes around the base of the hill, and the train has slowed to 35 mph.

As the engine reaches the closest point to the river in the downpour, a large gust of wind blows down the hill, uprooting two large apple trees heavy with fruit. These two trees crash into a large oak tree that in turn is uprooted, and all three tumble down the hill toward the train. Mud from the holes left by the trees in the hillside flows after the trees onto the track. The trees crash into the eighth manure car and it derails into the river, pulling cars 9 and 10 (manure cars) with it, and they land partly on the bank and partly in the river. The cattle car has tipped and partially derailed but remains attached to the manure car on one end and the tomato car on the other.

There is no direct roadway route into the isolated canyon area where the train has partially derailed. South across the river and about a mile inland is a two-lane county road, CR-1, that connects to a state route, SR100, three miles away to the east. Between Blue River and CR-1 is a field of corn that is almost ready to pick.

Another county road, CR 2, is five miles down CR-1 to the west. The closest town to the landslide accident is fifteen miles south on CR-2 and ten miles southwest on SR 110 that connects to CR-2. This town has a volunteer fire department with no specialized equipment, and most members work in Junction City, which is another 35 miles to the west on SR110. Other towns are east of Rural Center or in the outskirts of Junction City.

The accident has occurred in Cornstalk County, which has a sheriff's department for highway patrol and public safety services. There is one sheriff's patrol car within a 30-minute drive of the accident scene on CR-2. The farmer who owns the apple orchard lives on the north side of the hill and would have to travel from his home to SR 100 then to CR-1 to reach the accident scene.

There are rail yards in Rural Center to the east and Junction City to the west. There are two reserve engines in Junction City.

7. Case Studies

7.1   Texas Floods, 2025: Impact on Railroads

The July 4, 2025 heavy rain caused flood damage across Texas Hill Country communities as the Guadalupe River rose to its second highest level in history. The river rose 26 feet within 45 minutes (Emanuel, 2025). The National Weather Service (NWS) had been issuing flood watches for several days, and late on Thursday, July 3, it issued a flash flood warning for the area. At 4 am on July 4, they issued a flash flood emergency, but observers in Kerrville, one of the hardest hit areas, said there was no rain locally at that time. Between 4 am and 6 am the river rose as much as 30 feet, leaving its banks and swamping everything (Emanuel, 2025).

At 5:16 am the Kerrville Police Department issued an evacuation order for people along the river to get to high ground. The Texas Department of Emergency Management had pre-positioned water rescue resources that were deployed about 7:30 am. The Texas emergency management director said that resources included "14 helicopters, 12 drones, nine rescue teams" and rescue swimmers in the water. Over 1,000 people were in the flood zone helping with rescue (Emanuel, 2025, n.p.). Local people on horseback patrolled the riverbanks, using ropes to pull people out of the water, trees, and riverbanks (CBS, 2025).

Judge Robert Kelly, the highest elected official in Kerr County, said that the area along the river near Kerrville had no flood warning system. One was considered but people balked at the cost. Although the National Weather Service issued watches and warnings for three days before the flood, there was no specific local notification to evacuate (Beavers, 2025). "AccuWeather's preliminary estimate of $18 billion to $22 billion in economic loss for the Texas floods" (Jordan, 2025) shows the need for a warming system for people and businesses.

The Texas *Tribune* asserted that "climate change helped fuel heavy rains" that led to the rapid rise of the Guadalupe River, and the deaths of more than 100 people (Martin, 2025, n.p.). Climate experts have noted that a warmer atmosphere can hold more water vapor, meaning that rain storms drop more water in a shorter time (Martin, 2025). The holiday weekend saw many tourists in the area who had no idea how to flee to safety (Beavers, 2025).

Infrastructure was also damaged by the flash flooding. "This event serves as a crucial case study for nations globally, highlighting the urgent need for enhanced resilience in rail networks in the face of a rapidly changing climate" (Jordan, 2025).

Freight rail operations in the area are operated by BNSF and Union Pacific Railroads. Their service faces "severe disruptions due to washed-out tracks or submerged rail yards" (MitKat, 2025, n.p.). "Major freight rail operators like BNSF and Union Pacific, along with regional lines, were forced to halt or significantly delay operations across affected zones. Intermodal facilities, crucial hubs for transferring cargo between rail and truck, were closed due to flooding and power outages. Even after the immediate floodwaters receded, the assessment and repair of damaged tracks and signaling systems proved to be a time-consuming and labor-intensive process, leading to prolonged closures and bottlenecks" (Jordan, 2025, n.p.).

Texas "relies heavily on its freight rail network to transport everything from crude oil and refined petroleum products to agricultural goods, chemicals, and manufactured products. The sheer volume and speed of the recent flash floods, particularly in the low-lying and riverine areas, overwhelmed existing drainage systems and infrastructure. Rail lines were submerged, track beds eroded, and in some instances, bridges were compromised or outright washed away" (Jordan, 2025, n.p.).

Railroads had planned for storm-related service disruptions, undertaking emergency stockpiling. "The pre-positioning of equipment and supplies, such as fuel cells and ballast, by rail companies, while a proactive measure, could only mitigate, not prevent, the widespread disruption" (Jordan, 2025, n.p.).

Impacted economic segments included shippers of raw materials and completed goods. Rerouting around the floods and shifts to more expensive trucking led to increased costs for shippers (Jordan, 2025). Some of these costs might be avoided in the future if "Cross-Sector Collaboration and Planning" occurred in advance of disaster events. "Effective disaster response and long-term resilience require seamless coordination between rail operators, government agencies (local, state, and federal), emergency services, and other critical infrastructure providers. Integrated planning that considers the interdependencies of different sectors is crucial" (Jordan, 2025, n.p.).

7.2 Texas Storms 2024: Railroad Resilience

On July 4, 2025, a fatal flash flood impacted Kerrville, Texas, and other Hill Country towns, causing the loss of more than 100 lives (Martin, 2025). Such storms are not unknown in Texas, where a May 2024 storm series hit the Gulf region from Houston to New Orleans with "high winds, baseball-size hail and torrential rainfall. Due to the weather systems, the Gulf Coast area also experienced flash floods, downed trees and power lines that affected rail service" (TRA Newswire, 2024, n.p.).

"Rivers reached levels we haven't seen since Hurricane Harvey in 2017," said Eric Gehringer, Union Pacific Executive Vice President-Operations. "Team members from all areas of our operation stepped up to the plate, continuing to move freight along critical routes and ensuring equipment was at the ready" (TRA NewsWire, 2024, n.p.).

Emergency planning by the railroad included the creation of an emergency response "command center" and training of railroad employees to respond quickly to storm demands. "Members of the Union Pacific 24/7 command center coordinated preparations, analyzed train counts and determined detour routes to minimize service impacts. In all, Team UP unloaded 18,000 tons of ballast, raised 3.5 miles of track, installed 200 rail ties, tamped nearly 16,000 feet of rail, installed more than 75 generators and cleared more than 150 trees. UP maintains a Flood Planning and Recovery page for more information regarding the railroad's severe weather protocols" (TRA NewsWire, 2024, n.p.).

"UP was not the only Class 1 railroad affected by severe weather. Earlier this year [May, 2024] BNSF Railway reported similar issues. A track washout occurred near Navasota, Texas which affected the main track. Navasota, Texas is approximately 24 miles Southeast of College Station, Texas. BNSF personnel responded and the main track reopened on Saturday, May, 11" (TRA

NewsWire, 2024, n.p.). Such rapid response is the result of an emphasis on resilience, that includes emergency planning and personnel training.

Previous experience with major hurricanes has encouraged disaster preparedness among the area's Class 1 railroads. "In 2017 Hurricane Harvy [August 25] and Hurricane Irma [September 10] caused severe flooding in the Texas and Florida regions. BNSF Railway Co., Union Pacific Railroad and Kansas City Southern had major emergency response efforts in Texas during Harvey, and CSX and Norfolk Southern Railway in Florida during Irma." In preparing for the storm, "CSX teams evacuated more than 1,500 rail cars from Florida and held about 200 trains and thousands of cars to avoid damage" (Sneider, 2017, n.p.). Being able to store cars outside of the storm area was critical to railroad business activities. "Houston-based Commtrex Inc. — an open electronic exchange that connects shippers with rail assets, storage, service providers and data — offered free listings during and immediately after Harvey to help shippers with routing, storage and asset availability and repair. Within a week, the exchange experienced a 400 percent increase in storage requests in southern and central Texas" (Sneider, 2017, n.p.). This kind of collaboration across business lines is critical to rail resilience.

Rain storms and hurricanes are not the only natural hazards that impact railroads in Texas. In April of 2024 "extreme straight-line winds were said to be responsible for some 24 rail cars derailing at Trent in West Texas. Union Pacific Senior Communications Manager Mike Jaixen told FOX Weather that no injuries were reported. The National Weather Service office in San Angelo, Texas said that based on Doppler radar data, they believe that straight-line winds caused the derailment. A local storm report issued by the office said an 80-mph wind gust was estimated at the time of the incident" (TRA NewsWire, 2024, n.p.).

8. Exercise Checklists

8.1 Seminar Exercise Checklist

Initiation Process
- ☐ Identify exercise director
- ☐ Identify driver(s)
    - ☐ Contract
        - Specific wording concerning exercise?
    - ☐ Regulatory requirement
        - Are there regulatory requirements for exercises?
    - ☐ Internal
        - What is motivating this change/update to be tested?
- ☐ Identify stakeholders
    - ☐ Establish stakeholder's list
        - Name
        - Department/Organization
        - Contact Information
        - Position
        - Key
- ☐ Identify funding streams
    - ☐ Discretionary
    - ☐ General fund- budgeted for exercise
- ☐ Identify scope of exercise
    - ☐ Who will be the lead agency?
    - ☐ Who are the participants?
        - Railroads
        - First responders: police, fire, EMS
        - Road transportation
        - Mass transit
        - Public Works
        - Utilities
        - Emergency management
        - Nearby businesses
    - ☐ Jurisdictions involved
        - Special district
        - Local: city, county
        - Regional, Metropolitan Planning Organization
        - State
        - Federal
- ☐ Scenario restrictions
- ☐ Establish charter
    - ☐ Identify Exercise Director
    - ☐ Internal and external restrictions
    - ☐ Identify Goal and Objective(s) of exercise

Planning Process

- Establish design team
  - ☐ Technical (field)
  - ☐ Procedural (management)
  - ☐ Legal
  - ☐ Speaker
- Site selection
  - ☐ Bathroom facilities
  - ☐ Seating
  - ☐ Audio/Visual
  - ☐ Safety plan
  - ☐ Medical/fire
- Resources list and their sources
  - ☐ Handouts
    - Background
    - Location description/map
    - Existing plans
    - Scenario
- Scenario development
  - ☐ Realistic/Believability by participants
- Location set-up and tear-down plan (who brings what and sets it up/takes it down)
  - ☐ Check-in/out
  - ☐ Audio/Visual
  - ☐ Directions (Email, mail, handouts)
- Exercise documentation
- Print

Suggested meeting agenda topics

Meeting 1

Goal & Objectives – Develop

Location – Identify options

Scenario – Discuss

Identify logistical/support issues specific to this exercise

Meeting 2

Location – Report on the options then select best option

Scenario – Develop

Evaluators and controllers – Discuss evaluation tools for goal and objectives

Identify logistical/support resources

Meeting 3

Location – Confirm date, time, and point of contact

Scenario – Complete and finalize

Evaluators and Controllers – Ensure evaluation tools are synchronized to scenario and identify assignments

Confirm logistical/support entities commitment

Executing Process

- Issue exercise documentation, as required
- ☐ Check In
- ☐ Begin presentation
  - ☐ Document time
- ☐ Terminate presentation
  - ☐ Document time

Controlling Process

- ☐ Presenters
  - ☐ Provide presentation of situation and relevant plans and procedures
  - ☐ Keep any discussion focused on exercise goal
  - ☐ Interact with participants to address additional information requests
- ☐ Exercise Director
  - ☐ Issue Participant Feedback Form
  - ☐ Document discussion
  - ☐ Thank funding source, location owner, exercise design team, presenters
  - ☐ Thank participants for attendance
  - ☐ Collect Participant Feedback Form
- ☐ Debrief
  - ☐ Discuss course of exercise events with all exercise staff.
  - ☐ Document conversation

Closing Process

- ☐ Exercise Director reviews documentation
  - ☐ Participant feedback forms
  - ☐ Notes from debrief
- Consolidate notes and other lessons learned from exercise into exercise turn- over jacket

8.2   Workshop Exercise Checklist

Initiation Process
- ☐ Identify exercise director
- ☐ Identify driver(s)
    - ☐   Contract
        - Specific wording concerning exercise?
    - ☐   Regulatory requirement
        - Are there regulatory requirements for exercises?
    - ☐   Internal
        - What is motivating this change/update to be tested?
- ☐ Identify stakeholders
    - ☐ Establish stakeholder's list
        - Name
        - Department/Organization
        - Contact Information
        - Position
        - Key outcome desired from exercise
- ☐ Identify funding streams
    - ☐ Discretionary
    - ☐ General fund- budgeted for exercise
- ☐ Identify scope of exercise
    - ☐ Who will be the lead agency?
    - ☐ Who are the participants?
        - Railroads
        - First responders: police, fire, EMS
        - Road transportation
        - Mass transit
        - Public Works
        - Utilities
        - Emergency management
        - Nearby businesses
    - ☐ Jurisdictions involved
        - Special district
        - Local: city, county
        - Regional, Metropolitan Planning Organization
        - State
        - Federal
- ☐ Scenario restrictions
- ☐ Establish charter
    - ☐ Identify Exercise Director
    - ☐ Internal and external restrictions
    - ☐ Identify Goal and Objective(s) of exercise

Planning Process
- Establish design team
  - ☐ Technical (field)
  - ☐ Procedural (management)
  - ☐ Legal
- Site selection
  - ☐ Bathroom facilities
  - ☐ Seating
  - ☐ Audio/Visual
  - ☐ Safety plan
  - ☐ Medical/fire
- Resources list and their sources
  - ☐ Handouts
    - Background
    - Location description/map
    - Existing plans
    - Focus document being reviewed, revised, evaluated
- Document development
  - ☐ Goal/objective(s) addressed
  - ☐ Product to be created from the workshop
- Location set-up and tear-down plan (who brings what and sets it up/takes it down)
  - ☐ Check-in/out
  - ☐ Audio/Visual
  - ☐ Directions (Email, mail, handouts)
- Exercise documentation
- Print

Suggested meeting agenda topics

Meeting 1

Goal & Objectives – Develop

Location – Identify options

Document to be the focus of the workshop – Discuss

Identify logistical/support issues specific to this exercise

Meeting 2

Location – report on the options then select best option

Document to be the focus of the workshop - select

Evaluators and controllers – Discuss evaluation tools for goal and objectives

Identify logistical/support resources

Meeting 3

Location – confirm date, time and point of contact

Document to be the focus of the workshop – finalize and arrange distribution

Evaluators and controllers – Ensure evaluation tools are synchronized to document and identify
assignments

Confirm logistical/support entities commitment

Executing Process
- Issue workshop documentation, as required
- Controller briefing (immediately prior to exercise)
- ☐ Check In
- ☐ Begin exercise
  - ☐ Document time
- ☐ Terminate exercise
  - ☐ Document time

Controlling Process
- ☐ Controllers
  - ☐ Monitor and adjust workshop segments
  - ☐ Interact with participants to address additional information requests
- ☐ Exercise hot wash
  - ☐ Conducted by Exercise Director
  - ☐ Include all participants, exercise staff, controllers, exercise planners, and observers
  - ☐ Issue Participant Feedback Form
  - ☐ Thank location owner, exercise design team, controllers, evaluators, and volunteers; funding source if applicable
  - ☐ Discuss exercise Goal(s), objectives, document being discussed, actions taken, what went right/wrong, and areas for improvement
  - ☐ Document discussion
  - ☐ Thank participants for attendance
  - ☐ Collect Participant Feedback Form
- ☐ Controller debrief
  - ☐ Conduct by the Controller immediately following the hot wash
  - ☐ Ensure all controllers are included
  - ☐ Discuss course of exercise events and outcomes
  - ☐ Document conversation
  - ☐ Submit findings to Exercise Director

Closing Process

- ☐ Exercise Director reviews documentation
  - ☐ Participant Feedback Forms
  - ☐ Evaluator Observation Forms
  - ☐ Notes from Controller Debrief
  - ☐ Notes from hot wash
- ☐ Prepare draft of After Action Report
  - ☐ Incorporate comments related to goal and objectives
  - ☐ Draft of document resulting from the workshop
- ☐ Convene After Action Conference
  - ☐ Invite controllers
  - ☐ Review draft of After Action Report and document that was reviewed
  - ☐ Create Final After Action Report with document draft attached

- ☐ Establish list of action items for inclusion in the Improvement Plan
- Exercise Director creates Improvement Plan
  - ☐ Each improvement element is tied to one of the workshop goals
  - ☐ Each improvement action is assigned to a specific individual with start/ending dates
- After Action Report/Improvement Plan submitted to Management
- Retain Improvement Plan for inclusion in future budget planning
- Consolidate other lessons learned from exercise into exercise turn-over jacket

8.3 Tabletop Exercise Checklist

Initiation Process
- ☐ Identify driver(s)
    - ☐ Contract
        - Specific wording concerning exercise
    - ☐ Regulatory requirement
        - Are there regulatory requirements for exercises
    - ☐ Internal
        - What is motivating this exercise?
- ☐ Identify stakeholders
    - ☐ Establish stakeholders' list
        - Name
        - Department/Organization
        - Contact Information
        - Position
        - Key outcome desired from exercise

- ☐ Identify funding streams
    - ☐ Discretionary
    - ☐ General fund- budgeted for exercise
- ☐ Identify scope of exercise
    - ☐ Who will be the lead agency?
    - ☐ Who are the participants?
        - Railroads
        - First responders: police, fire, EMS
        - Road transportation
        - Mass transit
        - Public Works
        - Utilities
        - Emergency management
        - Nearby businesses
    - ☐ Jurisdictions involved
        - Special district
        - Local: city, county
        - Regional, Metropolitan Planning Organization
        - State
        - Federal
    - ☐ Scenario restrictions
    - ☐ Establish charter
        - ☐ Identify Exercise Director
        - ☐ Internal and external restrictions
        - ☐ Identify Goal and Objective(s) of exercise, documents, procedures, plans being exercised

Planning Process
- Establish design team
  - ☐ Technical (field)
  - ☐ Procedural (management)
  - ☐ Legal
- Evaluation team
  - ☐ Identify leader
- Site selection
  - ☐ Bathroom facilities
  - ☐ Seating
  - ☐ Audio/Visual
  - ☐ Safety plan
  - ☐ Medical/fire
- Resources list and their sources
  - ☐ Handouts
    - Background
    - Location description/map
    - Existing plans
    - Scenario
- Scenario development
  - ☐ Goal/objective(s) addressed
  - ☐ Realistic/believability by participants
  - ☐ Create Master Sequence of Events List (MSEL) to guide discussion question creation
- Location set-up and tear down plan (who brings what and sets it up/takes it down)
  - ☐ Check-in/out
  - ☐ Audio/Visual
  - ☐ Directions (Email, mail, handouts)
- Create Situation Manual (SitMan)
  - ☐ Include step-by-step discussion questions
- Exercise documentation
- Print

Suggested meeting agenda topics

Initial Planning Meeting

Goal & Objectives – Develop

Location – Identify options

Scenario – Discuss

Identify logistical/support issues specific to this exercise

Identify participants and ensure that they have the appropriate training (e.g., ICS)

Midterm Planning Meeting

Location – report on the options then select best option

Scenario – develop

Evaluators and controllers – Discuss evaluation tools for goal and objectives

Identify logistical/support resources

Master Sequence of Events List

Use Goals & Objectives to identify critical tasks/conditions/standards

Establish timeline with appropriate triggering events to activate critical tasks/conditions/standards

Create outline for packets to be distributed to the participants: maps, plans, checklists

Prepare contingency injects to be used if participants fail to engage appropriately

Address artificialities the exercise venue may create

Final Planning Meeting

Location – confirm date, time and point of contact

Scenario – Complete and finalize

Confirm creation of exercise participant packets

Evaluators and controllers – Ensure evaluation tools are synchronized to scenario and identify assignments

Confirm logistical/support entities commitment

Executing Process

- Issue exercise documentation to participants
  - Ensure that every participant has a specific role assigned
- Evaluator briefing (immediately prior to exercise)
- ☐ Check In
- ☐ Begin exercise play
  - ☐ Document time exercise begins
- ☐ Terminate exercise play
  - ☐ Document time exercise ends

Controlling Process

- ☐ Exercise Director
  - ☐ Monitor and adjust exercise play
  - ☐ Provide injects to participants as required by MSEL
  - ☐ Interact with participants to address additional information requests
- ☐ Evaluators
  - ☐ Monitor and document activities/actions of participants
  - ☐ Discussion with Controllers on objectives missed
- ☐ Exercise hot wash
  - ☐ Conducted by Exercise Director
  - ☐ Include all participants, exercise staff, evaluators, exercise planners, and observers
  - ☐ Issue Participant Feedback Form
  - ☐ Thank location owner, exercise design team, controllers, evaluators, and volunteers; funding source if appropriate
  - ☐ Discuss exercise goal, objectives, scenario, actions taken, what went right/wrong, and areas for improvement.
    - With a large group, set up easels marked "What Went Well", "What Needs to Change" and "Never Again". Give each participant 4 sheets of Post-It notes to identify the 4 major issues they identified during the exercise. Have exercise staff group similar comments, then report these items to the whole group. Then begin an open opportunity to add to the existing list of comments in each category.
    - Note specific changes needed in the document, process, plan being exercised
  - ☐ Document discussion
  - ☐ Thank participants for attendance
  - ☐ Collect Participant Feedback Form
- ☐ Controller/Evaluator Debrief
  - ☐ Conduct by the lead evaluator immediately following the hot wash
  - ☐ Ensure all evaluators are included
  - ☐ Discuss course of exercise events.
  - ☐ Document conversation
  - ☐ Submit findings to Exercise Director

Closing Process

- ☐ Exercise Director reviews documentation
    - ☐ Participant Feedback Forms
    - ☐ Evaluator Observation Forms
    - ☐ Notes from Evaluator Debrief
    - ☐ Notes from hot wash
- ☐ Prepare draft of After Action Report
    - ☐ Incorporate comments related to goal and objectives
    - ☐ Draft of any documents, procedures, plans resulting from the exercise
- ☐ Convene After Action Conference
    - ☐ Invite controllers and evaluators
    - ☐ Review draft of After Action Report and any documents, procedures, plans amended as a result of the exercise
    - ☐ Create Final After Action Report with amended items attached
    - ☐ Establish list of action items for inclusion in the Improvement Plan
- • Exercise Director creates Improvement Plan
    - ☐ Each improvement element is tied to one of the workshop goals
    - ☐ Each improvement action is assigned to a specific individual with start/ending dates
- • After Action Report/Improvement Plan submitted to Management
- • Retain Improvement Plan for inclusion in future budget planning
- • Consolidate other lessons learned from exercise into exercise turn-over jacket

8.4 Sand Table Exercise Checklist

Initiation Process
- ☐ Identify Exercise Director
- ☐ Identify driver(s)
    - ☐ Contract
        - Specific wording concerning exercise
    - ☐ Regulatory requirement
        - Are there regulatory requirements for exercises?
    - ☐ Internal
        - What is motivating this exercise?
- ☐ Identify stakeholders
    - ☐ Establish stakeholder's list
        - Name
        - Department/Organization
        - Contact Information
        - Position
        - Key outcome desired from exercise

- ☐ Identify funding streams
    - ☐ Discretionary
    - ☐ General fund- budgeted for exercise
- ☐ Identify scope of exercise
    - ☐ Who will be the lead agency?
    - ☐ Who are the participants?
        - Railroads
        - First responders: police, fire, EMS
        - Road transportation
        - Mass transit
        - Public Works
        - Utilities
        - Emergency management
        - Nearby businesses
    - ☐ Jurisdictions involved
        - Special district
        - Local: city, county
        - Regional, Metropolitan Planning Organization
        - State
        - Federal
- ☐ Scenario restrictions
- ☐ Establish Charter
    - ☐ Identify Exercise Director
    - ☐ Internal and external restrictions
    - ☐ Identify Goal and Objective(s) of exercise, documents, procedures, plans being exercised

Planning Process

- Establish Design Team
  - ☐ Technical (field)
  - ☐ Procedural (management)
  - ☐ Legal
- Evaluation Team
  - ☐ Identify leader
- Site Selection
  - ☐ Bathroom facilities
  - ☐ Seating
  - ☐ Audio/Visual
  - ☐ Safety plan
  - ☐ Medical/fire
- Resources list and their sources
  - ☐ Sand table elements
    - Table large enough for all participants to gather and see the small replicas, small enough for people to reach replicas to move them as the scenario unfolds.
    - Committee responsible to gather the small replicas needed to display the scenario: e.g., HO trains and track, small buildings, small cars and trucks; colored tape to create topography/ natural features (e.g., electrical tape for roads, green tape for open space, forests; brown tape for dirt roads and paths)
  - ☐ Handouts
    - Background
    - Location description/map
    - Existing plans with checklists and/or ICS cards
    - Scenario
- Scenario development
  - ☐ Goal/objective(s) addressed
  - ☐ Realistic/believability by participants
    - Try to select an actual event that participants would recognize, either local or national event
  - ☐ Create Master Sequence of Events List (MSEL) to guide discussion question creation
    - Be realistic in timing, especially the arrival of off-site resources
- Location set-up and tear-down plan (who brings what and sets it up/takes it down)
  - ☐ Check-in/out
  - ☐ Audio/Visual
  - ☐ Directions (Email, mail, handouts)
- Create Situation Manual (SitMan)
  - ☐ Include step-by-step discussion questions
- Exercise documentation
- Print

Suggested meeting agenda topics

Initial Planning Meeting

Goal & Objectives – Develop

Location – Identify options

Scenario – Discuss

Identify logistical/support issues specific to this exercise

Identify participants and ensure that they have the appropriate training (e.g., ICS); set up a training before the exercise if needed by participants

Midterm Planning Meeting

Location – report on the options then select best option

Scenario – develop

Evaluators and controllers – Discuss evaluation tools for goal and objectives

Identify logistical/support resources

Master Sequence of Events List

Use Goals & Objectives to identify critical tasks/conditions/standards

Establish timeline with appropriate triggering events to activate critical tasks/conditions/standards

Create outline for packets to be distributed to the participants: maps, plans, checklists

Prepare contingency injects to be used if participants fail to engage appropriately

Address artificialities the exercise sand table representation may create, e.g., wind direction, time of day, topography

Final Planning Meeting

Location – confirm date, time and point of contact

Scenario – complete and finalize

Sand table set up – confirm and finalize

Confirm creation of exercise participant packets

Evaluators and controllers – ensure evaluation tools are synchronized to scenario and identify assignments

Confirm logistical/support entities commitment

Executing Process
- Issue exercise documentation to participants
  - Ensure that every participant has a specific role assigned
- Evaluator briefing (immediately prior to exercise)
- ☐ Check In
- ☐ Begin exercise play
  - ☐ Document time exercise begins
- ☐ Terminate exercise play
  - ☐ Document time exercise ends

Controlling Process
- ☐ Exercise Director
  - ☐ Monitor and adjust exercise play
  - ☐ Provide injects to participants as required by MSEL
  - ☐ Interact with participants to address additional information requests
- ☐ Evaluators
  - ☐ Monitor and document activities/actions of participants
  - ☐ Discussion with Controllers on objectives missed
- ☐ Exercise hot wash
  - ☐ Conducted by Exercise Director
  - ☐ Include all participants, exercise staff, evaluators, exercise planners, and observers
  - ☐ Issue Participant Feedback Form
  - ☐ Thank location owner, exercise design team, controllers, evaluators, and volunteers; funding source if appropriate
  - ☐ Discuss exercise goal, objectives, scenario, actions taken, what went right/wrong, and areas for improvement.
    - With a large group, set up easels marked "What Went Well", "What Needs to Change" and "Never Again". Give each participant 4 sheets of Post-It notes to identify the 4 major issues they identified during the exercise. Have exercise staff group similar comments, then report these items to the whole group. Then begin an open opportunity to add to the existing list of comments in each category.
    - Note specific changes needed in the document, process, plan being exercised
  - ☐ Document discussion
  - ☐ Thank participants for attendance
  - ☐ Collect Participant Feedback Form
- ☐ Controller/Evaluator Debrief
  - ☐ Conduct by the lead evaluator immediately following the hot wash
  - ☐ Ensure all evaluators are included
  - ☐ Discuss course of exercise events.
  - ☐ Document conversation
  - ☐ Submit findings to Exercise Director

Closing Process

- ☐ Exercise Director reviews documentation
  - ☐ Participant Feedback Forms
  - ☐ Evaluator Observation Forms
  - ☐ Notes from Evaluator Debrief
  - ☐ Notes from hot wash
- ☐ Prepare draft of After Action Report
  - ☐ Incorporate comments related to goal and objectives
  - ☐ Draft of any documents, procedures, plans resulting from the exercise
- ☐ Convene After Action Conference
  - ☐ Invite controllers and evaluators
  - ☐ Review draft of After Action Report and any documents, procedures, plans amended as a result of the exercise
  - ☐ Create Final After Action Report with amended items attached
  - ☐ Establish list of action items for inclusion in the Improvement Plan
- Exercise Director creates Improvement Plan
  - ☐ Each improvement element is tied to one of the workshop goals
  - ☐ Each improvement action is assigned to a specific individual with start/ending dates
- After Action Report/Improvement Plan submitted to Management
- Retain Improvement Plan for inclusion in future budget planning
  - ☐ Consolidate other lessons learned from exercise into exercise turn-over jacket

8.5   Facilitated Exercise Checklist

Initiation Process
- ☐ Identify Exercise Director
- ☐ Identify Driver(s)
    - ☐ Contract
        - Specific wording concerning exercise
    - ☐ Regulatory requirement
        - Are there regulatory requirements for exercises?
    - ☐ Internal
        - What is motivating this change/update to be created?
- ☐ Identify stakeholders
    - ☐ Establish stakeholders' list
        - Name
        - Organization
        - Contact Information
        - Position
        - Key outcome desired from exercise

- ☐ Identify funding streams
    - ☐ Discretionary
    - ☐ General fund- budgeted for exercise
- ☐ Identify scope of exercise
    - ☐ Who will be the lead agency?
    - ☐ Who are the participants?
        - Railroads
        - First responders: police, fire, EMS
        - Road transportation
        - Mass transit
        - Public Works
        - Utilities
        - Emergency management
        - Nearby businesses
    - ☐ Jurisdictions involved
        - Special district
        - Local: city, county
        - Regional, Metropolitan Planning Organization
        - State
        - Federal
- ☐ Scenario restrictions
- ☐ Labor/Union restrictions
    - ☐ Number of hours between breaks
    - ☐ Number of hours between meals
    - ☐ Number of hours before overtime
    - ☐ Scope of work
- ☐ Establish charter

- ☐ Identify Exercise Director
- ☐ Internal and external restrictions
- ☐ Identify Objective (s) of exercise

Planning Process
- Establish design team
    - ☐ Technical (field)
    - ☐ Procedural (management)
    - ☐ Legal
- Establish facilitator team
    - ☐ Identify Leader
    - ☐ Identification of SMEs from within sponsoring/participating organizations

- Site selection
    - ☐ Site owner/controlled contact info
    - ☐ Traffic route
    - ☐ Ingress
    - ☐ Egress
    - ☐ Staging
    - ☐ Check-in point
    - ☐ Rehab (Red Cross, Fire Associates, Caterer)
    - ☐ Bathroom facilities
    - ☐ Water
    - ☐ Facilitation stations – locations and props
- Safety plan
    - ☐ Heat/cold
    - ☐ Medical/fire
    - ☐ Security/trespassing
    - ☐ Traffic
- Communications plan
    - ☐ Between controllers
    - ☐ Between facilitators and controllers
- Resources (list and their sources)
    - ☐ Signs, cones, parking
    - ☐ Mannequins
    - ☐ Actors
    - ☐ Water bottles
    - ☐ Portable toilets/handwashing stations
    - ☐ Trash cans
- Scenario Development
    - ☐ Goals/objective addressed
    - ☐ Realistic/believability by participants
    - ☐ Create player direction cards
    - ☐ Create actor/victim symptom cards
    - ☐ Create Master Sequence of Events List (MSEL)
- ☐ Divide goals/objectives between facilitation stations based on MSEL

- □ Identify goal/objective with facilitator(s) and station
  - o ALTERNATIVELY embed facilitator with participants and rotate through all stations
- □ Schedule groups to permit transition periods and overlap time
- □ Ensure facilitators review the participants' proposed verbal plan before allowing execution
- Location/site plan layout
  - □ Ingress/egress
  - □ Cones/signs/parking
  - □ Staging
  - □ Rehabilitation station – hydration, snack, post-event review of psychological impacts
- Location set-up and tear-down plan (who brings what and sets it up/takes it down)
  - □ Site staging
  - □ Check-in/out
  - □ Cones
  - □ Signs
  - □ Directions
  - □ Event construction
  - □ Vehicle layout
  - □ Dummy positioning
  - □ Rehab station chairs/ tent, if needed
  - □ Trash cans
  - □ Portable toilets, hand washing stations
- Create Exercise Plan (ExPlan) Recommend use of Template
- Exercise documentation
- Print handouts for participants
- Develop digital version for facilitators

Suggested meeting agenda topics

Initial Planning Meeting

Goal & Objectives – develop

Location – identify options, contact venue to confirm potential dates and times

Scenario – discuss

Identify logistical/support issues specific to this exercise

Midterm Planning Meeting

Location – report on the options then select best option, date, times

Scenario – develop

Create facilitated stations – select topics and SME facilitators

Evaluators and controllers – discuss evaluation tools for goal and objectives

Identify logistical/support resources

Master Sequence of Events List Meeting

Use Goals & Objectives to identify critical tasks/conditions/standards

Establish timeline with appropriate triggering events to activate critical tasks/conditions/standards

Prepare contingency injects to be used if participants fail to engage appropriately

Address artificialities the exercise venue may create

Facilitator Meeting

Review scenario and how each facilitated station advances the action

Review station assignments and group times

Review actors, props, equipment needed

Identify potential gaps in policies/procedures from participant perspective and address

Final Planning Meeting

Location – confirm date, time and point of contact

Scenario – complete and finalize

Confirm logistical/support entities' commitment

Evaluators and controllers – ensure evaluation tools are synchronized to scenario and identify assignments

Executing Process
- Issue exercise documentation, as required
- ☐ Check In (for support staff, Facilitators)
    - ☐ Safety brief
    - ☐ Actor/victim briefing
    - ☐ Actor/victims with symptom cards
- ☐ Check in for participants
    - ☐ Reinforce safety message
    - ☐ Reinforce the safety word that halts the exercise
- ☐ Initiate exercise play
    - ☐ Document time exercise begins
    - ☐ Notify all involved parties of exercise commencement
- ☐ Terminate exercise play
    - ☐ Document time exercise ends
    - ☐ Notify all involved parties of termination

Controlling Process
- ☐ Controllers
    - ☐ Monitor and adjust exercise play
    - ☐ Provide injects to participants as required by MSEL if needed
    - ☐ Interact with participants to address resource requests
- ☐ Evaluators
    - ☐ Monitor and document activities/actions of participants
    - ☐ Discussion with controllers on objectives missed
- ☐ Controller/evaluator Debrief**
    - ☐ Conduct by the lead evaluator immediately following exercise termination
    - ☐ Ensure all evaluators, controllers are included
    - ☐ When possible, include exercise design team and Exercise Director
    - ☐ Discuss course of exercise events. Were Goal and objectives met?
    - ☐ Document conversation
    - ☐ Submit findings to Exercise Director

This time is used by participants and other exercise staff to pack up and standby for the Hot Wash
- ☐ Exercise Hot Wash
    - ☐ Conducted by Exercise Director
    - ☐ Include all participants, exercise staff, rehab staff, actor/victims, evaluators, controllers, exercise planners, and observers
    - ☐ Issue Participant Feedback Form and pens
    - ☐ Thank funding source, location owner, exercise design team, controllers, evaluators, and volunteers
    - ☐ Discuss exercise Goal, objectives, scenario, actions taken, what went right/wrong, and areas for improvement.
    - ☐ Document discussion
    - ☐ Thank participants for attendance
    - ☐ Collect Participant Feedback Form

Closing Process

- ☐ Exercise Director reviews documentation
  - ☐ Participant Feedback Forms
  - ☐ Evaluator Observation Forms
  - ☐ Notes from Controller/Evaluator Debrief
  - ☐ Notes from Hot Wash
- ☐ Prepare draft of After Action Report
  - ☐ Incorporate comments related to goal and objectives
- ☐ Convene After Action Conference
  - ☐ Invite controllers and evaluators
  - ☐ Review draft of After Action Report
  - ☐ Create Final After Action Report
  - ☐ Establish list of action items for inclusion in the Improvement Plan
- Exercise Director creates Improvement Plan
  - ☐ Each improvement element is tied to one of the goals and objectives
  - ☐ Each improvement action is assigned to a specific organization, a contact person and their contact information, and given start/ending dates
- After Action Report/Improvement Plan submitted to railroad management and each participating organization named in the plan
- Exercise Director will track the Improvement Plan progress to the end date of the assignments, and create an outcomes-based improvement plan after the last completion date
- Retain Improvement Plan and outcomes for inclusion in future exercise planning and department budgeting
- Consolidate other lessons learned from the exercise into exercise turn over jacket
  - o Include practical and logistics exercise improvements as well as policy and management improvement steps

Attachment 1

Example Master Sequence of Events List

8:30 am	At 8:30 am a light blue service van enters the rail administration building parking lot. The driver parks in the public spaces adjacent to the office. The driver, wearing brown clothing, unloads a preloaded dolly from the back of the van with several large copy paper boxes and several plotter toner boxes, then proceeds to the entrance.
8:35 am	The driver has to cross the lobby entrance to reach the office corridor and elevator.
8:40 am	He takes one of the public elevators to the third floor where the executive offices are.
8:45 am	The driver places 2 small boxes on the ground in the center of the elevator lobby. They are connected by a wire. The driver then pulls a large gun from the boxes.
8:47 am	The driver approaches the receptionist at the entrance to the executive suite. He shows the M4 and orders the receptionist to open the locked door to the executive suite. The receptionist steps on the panic button while opening the door as commanded.
8:48 am	The panic button alerts the railroad security staff in the rail yard that an emergency exists in the building. The security staff has access to a board that shows where the alarm originated, the 3rd floor.
8:49 am	The driver enters the 3rd floor workspace and yells for attention, then fires two rounds across the work space from his M4. He demands that all the employees go to the northeast corner, to the area near the director's office.
8:50 am	The security staff calls the reception area phone where the alert occurred and gets no answer.
8:52 am	The sergeant of the security staff phones the local law enforcement agency, using coded language. This sets in motion the Incident Command System, with the sergeant as Incident Commander until law enforcement arrives.
8:52 am	The driver keeps the M4 pointed at the center of the crowd, then sweeps the edges and urges those on the edges inward, until all 20 employees at work that day are herded into the corner of the 3rd floor closest to the fire stairs. He tells them that he has enough fire power to kill them all, and that if his demands are not met, he will blow up the whole building. He demands to see the director. One of the women says that the director is in New York at a conference. With that the driver fires two rounds into the fire escape door with the FN FAL (second weapon), creating two holes in the reinforced metal door.
8:58 am	Hearing the gunshots, the sergeant calls 9-1-1 to request two patrol cars (two officers) to be dispatched to his office. He also asks for 2 ambulances to be staged on the rail yard behind the repair garage, and for a fire battalion chief to be requested to go to the office so they can form unified command.
9:00 am	The driver tells everyone in the corner of the 3rd floor to sit down on the floor. He says he has been ruined by the railroad in the last flood, and someone is going to pay.

Attachment 2

Learning Station 2: Rail Operations

Instructors/SMEs: Rail Police and Rail Operations; Fire Battalion Chief

Topics

1. Safety first
2. Rail line construction
   a. Terminology
3. Emergency procedures
   a. Grounding the rail
   b. Setup of flares
      i. Stopping distance of train
   c. Notification
      i. Information needed by rail dispatch
         1. Milemarker
4. Statistics
   a. Peak periods of use
   b. Economic impact of natural disaster event.
5. Physical layout of a rail yard
6. Previous high traffic events/traffic control
7. Personnel resources
8. Emergency response effort
   a. ICS structure
   b. EOC location
9. Recommendations for IC, triage, staging
10. Previous natural disasters that damaged rail equipment – flood, wildfire, high heat, other
    a. Region
    b. State
    c. Country
    d. N. America
    e. World

Acronyms and Glossary

AAR	Association of American Railroads
Amtrak	The American heavy rail passenger service railroad
BNSF	Burlington Northern Santa Fe Railroad, a class 1 railroad
CCEETR	Climate Change and Extreme Events Training and Research
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FRA	Federal Railroad Administration
HO scale trains	Model trains built at 1:87 scale compared to real trains. HO means "half of" the larger O gauge model trains. HO is the most common scale used by model train hobbyists.
Hot wash	An informal discussion of the exercise held among participating staff immediately after the exercise event. It may be conducted the same as an after action meeting.
HSEEP	Homeland Security Exercise and Evaluation Program
HSPD-5	Homeland Security Presidential Directive-5
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
IS	FEMA Independent Study courses, available on-line
MSEL	Master Sequence of Events List
n.d.	No date
n.p.	No page, typically found in quotations from internet sources
SME	Subject matter expert
SOP	Standard Operating Procedure
THIRA	Threat and Hazard Inventory and Risk Assessment
Turn-over jacket	A folder of information on the exercise and its conclusion that is passed to the next exercise director to help in the creation of future exercises.
UP	Union Pacific, a class 1 railroad
US	United States of America

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