RAILROAD RISK ASSESSMENT METHODOLOGY

Railroad Risk Assessment - Developing a Methodology

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CERTIFICATION STATEMENT

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

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Abstract

Understanding the vulnerabilities and probabilities associated with railroad activity is critical to planning related emergency response actions. The problem is the Cary Fire Department had not identified the risks associated with railroad emergencies and the probability of those risks within its jurisdiction. The researcher used action research to identify a methodology to assess risk and its probability for railroad emergencies. The research questions include: (a) How do railroad industry related organizations assess hazardous risks and quantify the probabilities for railroad emergencies?, (b) What recognized public safety standards or methods exist for conducting railroad risk assessments?, (c) How do Fire Departments assess hazardous risk for railroad emergencies?, (d) How do Fire Departments quantify risk probability for railroad emergencies?, (e) How do railroad risk assessments from accredited fire departments differ from risk assessments from non-accredited fire agencies? The research included reviewing references that identify hazardous risk assessment methods as well as surveying fire officials to identify any known guidelines that railroad risks and quantify the probability of railroad emergencies. The research included two interviews of railroad officials and a survey of 319 fire officials located throughout the United States. The research results included the discovery of an on-line website that maintains information for all railroad companies regulated by the Federal Railroad Administration. Survey results included information regarding how fire departments conducted risk assessments and how these assessments varied among accredited and non-accredited fire agencies. This applied research project made five recommendations that include: (a) a departmental staff review to develop implementation strategies, (b) a risk assessment template used to collect and assess pertinent information, (c) developing a risk assessment map illustrating the railroad infrastructure, (d) consideration for a full-scale grant opportunity to test local rail-
based hazardous materials response capabilities and (e) direction to improve relations with railroad officials.
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Introduction

Strategic public safety organizations that effectively assess their environments for risks more often than not respond to met those risks with greater success than organization that do not assess their environments. Understanding the risks facing any community helps local emergency planners acquire and deploy the most appropriate resource to mitigate that risk. In the context of public health and safety, risk assessment is the process of quantifying the probability of a harmful effect to people from certain activities (Wikipedia). As a public health and safety provider, successful fire departments employ strategic processes like risk assessment in order to acquire and deploy the most appropriate resources.

As stated in the EAFSOEM student manual, most community responses to perceived risk have been intuitive, not based on analytical assessment (EAFSOEM 4-3). In many ways, this statement is true for the Cary Fire Department which also recognizes the need for improvement with regard to community risk assessment.

The problem is the Cary Fire Department has not identified the risks associated with railroad emergencies and the probability of those risks. If the Cary Fire Department does not understand the risks associated with railroad emergencies it will likely fail to meet resource deployment and emergency operations objectives and thereby unnecessarily place citizens and property at greater risk.

The purpose of this research is to identify a risk assessment methodology for railroad emergencies.

The research questions include (a) How do railroad industry related organizations assess hazardous risks and quantify the probabilities for railroad emergencies?, (b) What recognized
public safety standards or methods exist for conducting railroad risk assessments?, (c) How do Fire Departments assess hazardous risk for railroad emergencies?, (d) How do Fire Departments quantify risk probability for railroad emergencies?, (e) How do railroad risk assessments from accredited fire departments differ from risk assessments from non-accredited fire agencies?

The author will use action research to identify a methodology to assess risk and its probability for RR emergencies. For research question #1, the author will examine RR industry documents and sources to identify any hazardous risk assessment methods. For research question #2, the author will examine public safety standards and other information sources to identify methods for conducting risk assessments. For research questions #3, #4, and #5, the author will examine fire department guidelines or procedures and conduct a survey to identify how fire departments assess risk for RR emergencies and quantify the probability for RR emergencies.

Background and Significance

The Town of Cary is located in the western part of Wake County, NC and extends into a small area of eastern Chatham County which is generally situated in the center of the state. Cary is home to a growing population of 136,000 people located throughout 55.2 square miles. Cary adjoins the City of Raleigh on its eastern border, the City of Durham on its northwestern border and the Towns of Apex and Holly Springs on its southern border. Technology, retail, government and healthcare providers represent the largest industries and employer bases in the Town. The Town maintains an Insurance Services Office public fire classification of three (Town of Cary website).

The fire department employs 209 authorized staff and operates seven fire stations and one fire administration building. Three 24.5 shifts with a total authorized staffing of 193 firefighters
operate seven engine companies, three aerial ladder companies, two truck companies, two light rescue companies and two battalion chiefs. The fire department was accredited by the Commission on Fire Accreditation International in August 1999 and was reaccredited in 2004.

Railroad traffic in the Town of Cary is a frequent activity that often stops traffic in the downtown area all throughout the day. Twelve and eight tenths miles of rail lines cross and bisect the town into northern and southern halves and skirts the southwest border into the Town of Apex. On average, twenty freight and passenger trains travel through Cary on a daily basis.

Every day six Amtrak passenger trains pass through and make stops in Cary. Therefore, any passenger train derailment or collision with another train or large vehicle will place anywhere from 60 to 230 passengers at risk for injury, in need of rehabilitation or short-term sheltering.

Freight train activity in Cary is twice as frequent as passenger train activity and includes large quantities of hazardous materials. Two First Class railroad companies, CSX and Norfolk and Southern (N&S) utilize the 12.2 miles of rail lines cutting through town. In addition two short lines, Nashville County Railroad and Abbeyville Rockfish Rail which are smaller rail road companies, lease railroad segments from CSX and N&S (N.G. High, personal communication June 9, 2009). Although CSX would not cite specific RR workload information such as number of trains, number of cars and specific products carried, informal surveys by the author indicate 15 to 20 freight trains pass through town on any given day. For one train in particular, the author counted fifty-two 30,000 gallon rail cars carrying anhydrous ammonia which is a United Nations/Department of Transportation hazard class 2, nonflammable compressed gas commodity. Anhydrous ammonia is commonly found in compressed gas form while in transit and is a caustic and highly toxic agent especially when inhaled or ingested (NFPA 49-25). CFD
staff regularly identify anhydrous ammonia tank cars as a significant element of the freight trains that pass through town. Anhydrous ammonia is used in agricultural and pharmaceutical processes and these industries serve as large economic bases in central NC as well as provide the foundation for research in adjacent Research Triangle Park and nearby NC State University.

Four Town of Cary facilities lie within 100 feet of the main east-west rail line including Town Hall which houses the Police Department and the 9-1-1 Emergency Communications Center, the Fire Department Administration Building, Fire Station Four, home to the urban search and rescue contingent and the William C. Garmon Public Works and Utilities Operations Center. These facilities are located in such close proximity to the railroad, that a derailment or collision at a crossing involving a hazardous materials vehicle will affect at least one to as many as all four of these facilities. Crossing accidents or derailments in this area would likely result in each of these facilities in situated in hot zones and require isolation and evacuation of occupants. In addition, only two grade separated crossings currently exist within the Town’s jurisdiction. Both crossings are located in extreme east and west corridors of the Town and therefore provide limited help for rerouting public safety traffic even when the train is not involved in some emergency situation.

For a five year period beginning in January 2004 and ending in December 2008, the CFD has responded to one train accident involving a passenger vehicle that crashed into a railroad locomotive (C.J. Oliver, personal communication, September 17, 2009).

In its 2004 Accreditation Report, the peer review team for the Commission on Fire Accreditation International made a strategic recommendation for the CFD to exercise the Town’s emergency operations plan (EOP) through a full scale exercise. CFD has considered a railroad related mass casualty exercise in order to test the EOP. Effectively planning for the exercise or
more importantly the inevitable emergency event requires the CFD to assess the risk and probability of a railroad mass casualty event. At the present, the CFD’s risk assessment document does not include an assessment for railroad vulnerability and probability. In fact, the 2004 Accreditation Report also indicates the Department “should consider a more thorough approach to Risk Assessment.” The CFD recognizes the inadequacies of our current risk assessment practices and the implications of they present for planning a full-scale exercises, much less the implications for developing emergency operations response plans.

Research for developing a risk assessment method for railroad emergencies directly relates to Module Four, Community Risk and Capability Assessment of the EAFSOEM student manual. In addition, this research follows EAFSOEM student activities for conducting a risk assessment using student manual Table 4-2, Hazard Identification, Table 4-3, Vulnerability Assessment and culminating with Table 4-4, Risk Rating. Module Four describes and utilizes a multi-hazard risk assessment process that identifies and rates the community’s vulnerability for specific hazards and rates the relative probability for that hazard. The final risk rating is a product of the vulnerability rating multiplied by the probability rating. Using the EAFSOEM model as a foundation, the research problem examines risk assessment models specifically focused on railroad activity and potential emergencies.

Correlation between research of a railroad risk assessment methodology and USFA operational objectives is found in the principal statement that throughout the history of the United States, natural and technological disasters have destroyed lives, devasted property and put large numbers of people at risk as well. Most communities are unaware of the risks they face (EAFSOEM SM-4-3). Research focusing on assessing risk for RR activity is directly related to the United States Fire Adminstration (USFA) operational objective to reduce the loss of life from
fire by 15 percent. Primarily, assessing community risk for RR activity is an indispensable component of emergency program planning and as such, relates directly to the USFA operational objective to develop comprehensive multi-hazard risk reduction plans for 2,500 communities. (USFA Website)

Literature Review

The research conducted to identify how railroad (RR) industry organizations actually assess and quantify probabilities for railroad emergencies produced limited useful results. Many sources cited qualitative or quantitative results that followed both qualitative and quantitative processes and many sources followed common themes to results, but none identified any specific methodology.

CSX Transportation provided two emergency planning and training documents to supplement research sources for this project. The 2004 Community Awareness and Planning Guide and Railroad Safety for Emergency Responders student manual cited similar themes in information emergency responders would need should an accident occur. These common themes included (a) determining the number of railroad tracks within a one’s jurisdiction, (b) determining the rail line grade, whether flat, uphill or downhill, (c) quantifying the daily RR activity within the jurisdiction, (d) knowing local RR officials and emergency points of contact, (e) understanding the history of emergency events, and (f) developing maps that illustrate crossings with and without guard arms and warning devices, railroad bridges and vehicle overpasses as well as identifying railroad milepost markers as recommended in National Transportation Safety Board recommendation R-01-22.

online resource that provides all highway and rail crossing locations, crossing numbers, and railroad milepost numbers. The database also contains accident history and accident prediction data, both of which represent critical information when predicting risk probability.

Lastly, the CSX Planning Guide contained two lists including the top 25 hazardous materials transported by CSX and the top 25 hazardous materials transported in North America which summarily identify hazardous materials with the greatest potential of involvement in a hazardous materials incident resulting from a derailment or crossing collision with another vehicle.

The researcher reviewed Amtrak’s Passenger Train Emergency Response 2008 training manual for information relating to a risk assessment process. With respect to hazard vulnerability, the manual listed each common locomotive type and a range for the maximum amount of diesel fuel each locomotive carries. The manual also noted that some freight locomotives carry as much as 4,000 gallons of diesel fuel.

Other hazard vulnerability information included information on electrical and pneumatic hazards associated with Amtrak trains such as head end power which refers to a 480-volt alternating current power system used on passenger trains to provide electrical power for passenger conveniences, like lighting and cooking. This power system is transferred between cars through what is known as HEP cables for which Amtrak warns emergency responders not to attempt to remove or disconnect (Amtrak 32).

Amtrak’s manual recommends collecting additional information that a hazard vulnerability assessment would typically require. This information includes (a) the number of tracks and track speed for each, (b) a map indicating milepost markers, grade crossing identifiers, and remote areas with limited or no access and tunnels (c) the types, number and frequency of
train operations and corresponding number of passengers for each and (d) the types of locomotives used (Amtrak 15).

A literature search found that the Association of American Railroads (AAR) has no specific risk assessment methodology although the organization has initiated a number of industry initiatives aimed at improving railroad safety for the public. Through AAR and FRA data collection and analysis, the railroad industry has determined the most significant hazards associated with railroad activity and thus provide the basis for fire department risk assessment for hazard vulnerability. These hazards align directly with the information the author received from interviews with CSX and Amtrak representatives. Grade crossing safety, transporting hazardous materials and operator error caused by fatigue represent significant safety challenges for all railroad companies (American Association of Railroads July 2008).

As previously noted, fire departments should know and identify, by the crossing ID number, all highway and railroad crossings within their jurisdictions. The American Association of Railroads reports over 140,000 crossings in the United States, CSX reports over 38,000 crossings in 23 states that constitute its service area and searches on the FRA safety data website indicate 4030 railroad crossings in NC, seven of which exist within the CFD response area. During a five year period from 2005 through 2008, an average of 69 crossing accidents occurred in North Carolina. The most significant crossing accident in Wake County occurred in 2004 when a dump truck drove through downed crossing arms and was struck by an Amtrak passenger train. Four train cars derailed injuring a number of passengers and the driver of the dump truck was killed (FRA). With crossing accidents as one of the leading causes of train crashes and fatalities, departments should know where these crossings exist. In light of these accidents, the railroad companies have undertaken a number of projects designed to improve safety at crossings.
including closing unneeded crossings, installing crossing guards and warning devices and instituting public education marketing campaigns however, crossing accidents will continue to occur (American Association of Railroads 3).

Module Four of the EAFSOEM Manual describes and utilizes a multi-hazard risk assessment process that identifies specific hazards, identifies and rates the community’s vulnerability for that hazard, identifies and rates the probability for that hazard and by virtue of multiplying the vulnerability rating by the probability rating the model produces a final risk rating.

In the Federal Emergency Management Agency’s *Multi-hazard Identification and Risk Assessment Manual*, a risk assessment matrix model for state, local and tribal governments, developed by Arthur D. Little, requires recognition of risks, evaluation of the frequency of those events and potential losses to determine mitigation initiatives from a cost/benefit perspective in order to mitigate human and economic loss caused by disasters (FEMA 1997). A sixteen cell table with rows categorizes the severity of events as minor, serious, extensive and catastrophic and columns categorizing the frequency of events as very low, low, moderate and high follow the general risk assessment concept of identifying hazard vulnerability and indicating the probability of that vulnerability. The model also provides quantitative criteria to define the severity and frequency categories.

A review of National Fire Protection Association (NFPA) codes and standards revealed that while no specific standard for railroad risk assessment or all-hazard risk assessment exists, the concept or principle of risk assessment was referenced throughout a number of standards. In particular, Chapter 12 of NFPA 921, the standard for fire and explosion investigations, recommends a hazard and risk assessment as one of the first tasks when conducting an
investigation. Moreover, while classifying the hazards results in a more systematic hazard identification process, the most important action is to identify the presence of the hazard (NFPA 921-109). NFPA 780, the standard for the installation of lightening protection systems, which contains an annex for lightening protection risk assessment states that lightening risk for a structure is the product of the lightening strike frequency and the consequence of the strike to the structure (NFPA 780-47).

A review of the NFPA Fire Protection Handbook revealed similar discussions of fire or risk assessment methodologies for specialized purposes; however none of these purposes involved railroad activity or an all-hazards purpose. Of particular note is a text sidebar that identifies several risk analysis methods from around the world. CESARE-Risk from Australia, FireCAM from Canada, CRISP from the United Kingdom, single curve methods for probability and severity from Lund University in Sweden as well as a model developed by the Nuclear Regulatory Commission for the fire problems of nuclear power plants illustrate highly specialized fire related risk assessment methodologies based on the risk assessment principle of hazard vulnerability or consequences and its probability (NFPA Fire Protection Guide 3-115).

Two criteria all accredited fire agencies must comply with are risk assessments for the maximum or worst fire risk in their jurisdiction and the maximum or worst non-fire risk in their jurisdiction. As part of the Fire and Emergency Service Self-Assessment Manual, the Commission on Fire Accreditation International (CFAI) provides an example of a risk assessment model that considers the probability of an event occurring and the consequences of that event. The CFAI risk assessment model format these criteria into a four quadrant table based on the combinations of criteria relationships. For example, assessments may follow (a) low probability and low consequence, (b) high probability and low consequence, (c) high
probability and high consequence, or (d) low probability and high consequence. The premise of conducting risk assessments in the accreditation process is the same as described in the EAFSOEM class. Public safety officials should plan for emergencies and deployment of resources based on some quantitative assessment of the jurisdiction, not based on guessing.

As previously reported, the Federal Railroad Administration (FRA) has developed an online user interface that allows anyone with internet access to read a variety of summary reports that include topics such as (a) train accidents by state or railroad company, (b) accident causes, (c) crossing inventory data and (d) crossing accident data. In addition, the website allows users to conduct queried database searches of data and information required by the Code of Federal Regulations and submitted to the FRA by railroad companies. The website URL is http://safetydata.fra.dot.gov/officeofsafety/. The database searches can define criteria and produce summary reports at the state and county levels. This database and search tool provides a tremendous capacity for local emergency planners to identify the most common hazards and the historical frequency for these hazards, which serves as the basis for any risk assessment activity.

In the course of this research, the author identified two US Department of Homeland Security (DHS) programs designed to identify local vulnerability to hazard materials and terrorist events and assess local government resource capability to respond to these vulnerabilities. The Community Hazards Emergency Response Capability Assurance Process (CHER-CAP) is a full scale exercise grant opportunity that local governments can request from their respective FEMA Regional Office. CHER-CAP assists communities in developing a greater understanding of community risks as they relate to hazardous materials exposure resulting from railroad activity in the vicinity. In addition, the program identifies opportunities to improve emergency planning, resource development and coordination in order to respond to these risks (FEMA CHER-CAP 1).
Secondly, the DHS Office of Infrastructure Protection (DHS/IP) Regional Resiliency Assessment Program (RRAP) conducts an inter-agency assessment of selected critical infrastructure resources which includes railroad facilities and assess the vulnerability of this infrastructure to terrorist attack (J. Richards personal communication September 15, 2009). This regional assessment is then programmed into a large table-top exercise involving public safety representatives from state and local agencies within the region as well as the National Guard. While vulnerability to terrorist attacks likely rank lower on the frequency scale for most communities, this infrastructure element is a potential terrorist target and the DHS and FRA have focused attention and resources to improve security and emergency response capability for the most vulnerable locations. The RRAP product is a final assessment and report on regional emergency services capability. Unfortunately, the RRAP program scope is a DHS deliverable based on national needs it has defined. Over the last two federal fiscal years, the program has assessed five target regions per year for a total of 10 regional assessments.

A search of the LRC on-line catalog found no specific model for railroad risk assessment. No specific model exists with the N.F.P.A. Codes and Standards. The Federal Railroad Administration, the American Association of Railroads and community emergency planning manuals from CSX Railroad and Amtrak suggest no risk assessment methodology for public safety agencies. In retrospect, two specific public safety risk assessment methodologies, the EAFSOEM model and the CFAI model, emerged as the most widely used risk assessment models. As presented, both models are identified and used as multi-hazard risk assessment tools which one must adapt to specific risk assessment initiatives. Both have significant similarities including identifying hazards or vulnerabilities in the community and secondly developing the probabilities for those hazards to occur. Yet differ in the final risk assessment finding where the
EAFSOEM model produces a final risk rating and the CFAI model characterizes risk based on a risk/probability quadrant location. Given that all of the risk assessment processes discovered rely on the subjective of process of identifying known risks and the relative methods used to determine probability, the research problem is reduced to finding a model that best fits the Cary Fire Department organization.

The literature review discovery that was most surprising and will likely create the greatest impact on railroad risk assessment activity by fire departments was the Federal Railroad Administration’s safety data website. Risk assessments will move from collaborative exercises among public safety stakeholders and local railroad official that require a lot of resources to meet collaborate and produce a final product, to an activity that can produce a detailed risk assessment document in minutes. The collaborative groups will then be able to review and discuss the risk assessment document on-line without the logistical challenges of meeting face-to-face. This website literally redefines railroad risk assessment and emergency planning processes.

Procedures

On Wednesday January 14, 2009, the author conducted a card catalog search at the National Fire Academy’s Learning Resource Center (LRC) in Emmitsburg, MD for publications, journals and applied research papers relating to risk assessment methodologies for railroad hazards. On two subsequent occasions, July 18, 2009 and September 15, 2009, the author conducted LRC online card catalog searches for titles of publications, journals and applied research papers relating to risk assessment methodologies for railroad hazards. These searches used the following individual and combinations of key words including: (a) railroad risk assessments, (b) train risk assessments, (c) risk assessments, (d) risk assessment methodologies, and (e) railroad vulnerability assessments.
On June 9, 2009, at 10:30 a.m. the author interviewed Nelson High, the Liaison for Government Affairs for the CSX Railroad Corporation (CSX). The author selected Mr. High because Mr. High serves as the liaison for Governmental Affairs in North Carolina and South Carolina. As such, responding to governmental requests within this area is one of Mr. High’s primary duties. His email address is nhigh@csx.com and telephone number is (252) 537-2396.

The author conducted a face-to-face interview at the CFD Administration Building and asked the following questions:

1. Who or what CSX office can provide the number of trains and general information regarding hazardous materials cargo for trains that pass through Cary on a daily basis?
2. How are train accidents recorded or measured? For example, does the railroad measure accidents like, X number of accidents per train miles traveled?
3. What government agency regulates railroad activity?
4. Is it possible to receive copies of CSX’s railroad hazardous materials training handouts or curriculum?
5. Are there any federal emergency planning guides for railroad emergencies?
6. What is the primary legislation for railroad safety?
7. What are the primary causes for railroad accidents?
8. What railroad companies use the tracks that pass through Cary?
9. How many miles of railroad bisect Cary?

On June 26, 2009, at 4:15 p.m. the author interviewed Larry Vanover who serves as the regional manager for Amtrak. The author selected Mr. Vanover because Susan Parker, Town of Cary Engineering Department and railroad liaison identified Mr. Vanover as the appropriate representative regarding Amtrak operational issues. As such, responding to requests for
information generated from the Richmond VA to Savannah GA region is one of Mr. Vanover’s primary duties. His email address is vano5754@amtrak.com and telephone number is (919) 602-0358. The author conducted a telephone interview with Mr. Vanover from CFD Administration Building and asked the following questions:

1. How many Amtrak trains pass through Cary each day and how many passengers are typically on those trains?
2. What are the federal regulations that govern passenger train activities?
3. What are the greatest risks associated with rail passenger transportation?
4. What other agencies and contacts would be helpful to understand rail passenger activity and risk in NC?

On September 2, 2009, the author developed an online survey to identify how fire departments assessed hazardous risk for railroad emergencies and how fire departments quantify risk probability for railroad emergencies. In addition, the survey asked respondents if their fire departments were accredited by the Commission on Fire Accreditation International in order to assess how railroad risk assessment methodologies of accredited agencies might differ from non-accredited agencies. Using a multiple choice answer format along with explanation fields, the on-line survey questions followed the specific research questions outlined in the introduction of this paper.

On September 8, 2009, the author distributed the on-line survey, at the URL http://www.surveymonkey.com/s.aspx?sm=N_2bXcIn4WjT_2f_2f4rg_2bNRwuMw_3d_3d, by email to fire chiefs of the 16 largest municipal fire departments in North Carolina. On September 8, 2009, the author distributed the on-line survey by email to 39 EFO classmates from the author’s Executive Development and Leading Community Risk Reduction classes. On
September 12, 2009, the author distributed the on-line survey by email to 14 classmates from the author’s EAFSOEM class. On September 15, the author distributed the on-line survey twice by email; first to 53 EFO students and alumni selected from a random survey distribution list the author had previously received and secondly to 220 EFO students and alumni selected from a random survey distribution list the author had previously received. The author distributed the risk assessment survey 5 times to 342 email recipients. For each electronic distribution, the author edited out all known or recognized repeat email addresses to minimize sending the survey to the same recipient multiple times.

In determining the survey sample size, the Commission on Fire Accreditation International has accredited 135 fire agencies. (R. Black, personal communication September 17, 2009) Research question 5 is designed to compare risk assessment methodologies of accredited fire agencies to methods of non-accredited fire agencies. Given that 135 accredited agencies exist, the survey will target a total population of 270 fire departments. Based on a survey population of 270, figure 5 of the EFOP self-study guide prescribes a needed random sample size of 159 in order to reach a 95% confidence level results for the sample size is representative of the results of the survey population. Assuming an 80% response rate as instructions for table recommends, the random sample size is increased to 190 (159 times 1.20) to insure a 95% confidence level (ARP self-study 38).

The author distributed the survey to 342 EFO participant email addresses. Based on the number of delivery failure notices returned, the author estimates a 6.7% delivery failure rate resulting in 319 successful survey deliveries. By September 19, 2009, the author had received 60 survey responses resulting in an 18.8% return rate. Therefore, the sample size for a 95% confidence level equals 159 times 1 plus 1.00 minus the response rate. Therefore, 159 * 1 +
(1.00 - .188) equals 159 * 1.812 = 288. Given 319 successful email deliveries, the actual survey population sample is greater than the 288 targeted survey sample size. Therefore, the author concludes the survey will provide at least a 95% confidence level that the survey sample results will reflect population responses to the same survey questions.

The author noted two limitations with the survey methodology including accredited agency response and data analysis challenges for survey questions. As previously noted, the fifth research question was to determine if railroad risk assessment methodologies differed between accredited fire agencies and non-accredited fire agencies. The survey sample was 319 and the target survey sample to reach a 95% confidence level was 288. Of the 60 survey responses, only 7 responses or 11% originated from accredited agencies. While the author was able to make develop some conclusions regarding the risk assessment methods used by these accredited agencies, responses from a larger sample subset would have solidified these conclusions.

In addition to the limited accredited agency responses, survey response data was difficult to analyze because of the survey question format. Instructions for the first question asked respondents to skip subsequent questions if they answered no to question 1. Many respondents did not recognize those instructions or simply failed to follow them as they answered most if not all of the following questions. Instructions for 3 of the 5 questions directed respondents to select all answers from a multiple choice menu that applied to their risk assessment situation. In addition to the multiple choice menu, the survey questions asked respondents to provide brief explanations for most answers. So, the survey used close-ended multiple choice answers with open-ended text boxes for additional information. Given that some respondents skipped entire questions that they were supposed to answer while others answered questions they were not supposed to answer and that respondents could select multiple answers for each question,
aligning explanations with the multiple choice selections proved challenging. While the author acknowledges these shortcomings, the information provided by respondents clearly illustrated various risk assessment practices with some based on conventional principles and others based on professional opinion. Thus, the author believes the conclusions drawn by the survey clearly represent the railroad risk assessment activity employed by fire many fire departments.

Research was limited by the fact the author did not interview or substantially cite Norfolk and Southern (N&S) references. Given that N&S is a major regional First Class railroad company and it uses the same rail lines as CSX, the only tangible difference with N&S compared to CSX is the name of officials and related emergency telephone numbers. N&S is bound by the same rules, infrastructure and cargo types as CSX. The FRA website contains specific data for all railroad carriers and therefore, the author did not attempt to contact N&S officials for an interview.

Results


Interviews

The author’s interview with CSX Railroad official Nelson High, who serves as Liaison with Government Affairs for CSX Railroad, included the following questions and answers:

1. Who or what CSX office can provide the number of trains and general information regarding hazardous materials cargo for trains that pass through Cary on a daily basis?

   Mr. High indicated that CSX could not tell anyone in advance what commodities might be on any train. Building the train for a trip is a constantly moving target. Customers change shipments right up until the train leaves a yard. So consist constantly change too.
2. How are train accidents recorded or measured? For example, does the railroad measure accidents like, X number of accidents per train miles traveled? Mr. High indicated there was no particular way train accidents were measured. CSX tried not to have any accidents. He indicated that railroad companies were required to report any accident that resulted in (a) at least $2,500 in damage, (b) when a railroad employee, while taking medication, is injured on the job, or (c) whenever a hazardous material is released from a railroad container.

3. What government agency regulates railroad activity?

Mr. High indicated the FRA or Federal Railroad Administration regulated railroads.

4. Is it possible to receive copies of CSX’s railroad hazardous materials training handouts or curriculum?

Yes. Mr. High provided four training manuals and a sample shipping paper.

5. Are there any federal emergency planning guides for railroad emergencies? Mr. High indicated he was not aware of any.

6. What is the primary legislation for railroad safety? Mr. High indicated it was a CFR, but did not know the number. He indicated I could get that on the FRA website.

7. What are the primary causes for railroad accidents?

Mr. High reported the most common causes of accidents were (a) vehicles on tracks, (b) trespassers (pedestrians), (c) track maintenance and (d) operator error. He indicated that all CSX trains were equipped with event boxes that capture the last 48 hours worth of information like speed and breaking mechanisms.

8. What railroad companies use the tracks that pass through Cary? Mr. High indicated CSX and Norfolk Southern owned the tracks in Cary. Amtrak leased use of the tracks as well as two short line railroad companies, Nashville County Railroad and Abbeyville Rockfish. Short
lines are smaller railroad companies that lease railroad access from larger First Class companies. The short lines usually fulfilled some smaller transportation need within a smaller geographic area.

9. How many miles of railroad bisect Cary?

Mr. High indicated he did not know.

The author’s interview with Amtrak Regional Manager Larry Vanover included the following questions and answers:

1. How many Amtrak trains pass through Cary each day and how many passengers are typically on those trains?

Mr. Vanover indicated that every day, six Amtrak passenger trains make stops in Cary. Amtrak trains 73 and 74 travel to and from Raleigh, NC to Charlotte, NC with a range of 60 to 120 total passengers. Amtrak trains 79 and 80 travel to and from New York City and Charlotte, NC with a range of 150 to 200 total passengers. Amtrak trains 91 and 92, the Silver Star, travel to and from New York City to Miami, FL carrying an average of 230 total passengers.

2. What are the federal regulations that govern passenger train activities?

Mr. Vanover indicated the Federal Railroad Administration and Code of Federal Regulations 200-399 served as the regulating agency and rules for railroad activity.

3. What are the greatest risks associated with rail passenger transportation?

Mr. Vanover said crossing accidents involving large hazardous materials trucks, derailment, [collisions] with passenger vehicles and lastly trespassing pedestrians illustrated the variety of accidents that Amtrak personnel find.

4. What is the recent history of rail passenger accidents?
Vanover reported that since 1997, there have been two derailments in Wake County. One derailment occurred in Raleigh when a dump truck tried to drive around crossing guards and was struck by an Amtrak locomotive. Two crew members and 10 passengers were injured and the dump truck driver was killed. In another derailment at the “egg plant crossing” a truck carrying pine straw drove through a crossing and was struck by an Amtrak train. Three people in the truck were killed as a result of the collision.

5. What other agencies and contacts would be helpful to understand rail passenger activity and risk in NC? Mr. Vanover indicated Bytrain which is the Rail Division of the NC Department of Transportation.

The interviews and literature review for railroad risk assessment methods indicated that railroad companies inherently conduct risk assessment for railroad emergencies through accident reporting mechanisms required by the Code of Federal Regulations. Each railroad industry source or reference independently conveyed an understanding for the most common accidents and their causes and for the worst accident potential for the railroad. Moreover, the Federal Railroad Administration has developed a powerful on-line database tool designed to answer user designed queries from the FRA’s report database and by virtue of the comprehensive information maintained by this database, railroads, fire departments or individuals can access most if not all of the information needed to complete a railroad risk assessment electronically. With respect to research question 1, while railroad companies perform risk assessment functions, the author found no specific risk assessment methodology used by those companies and therefore no methodology exists that public safety agencies might use as well.
Survey

Question 1 of the risk assessment survey asked recipients “Does your fire department conducted railroad risk assessments?” Sixty recipients responded to the question. Of the sixty respondents, 40 or 66.6% indicated that their department did not conduct railroad risk assessments (RR/RA) and 20 respondents, 33.3% indicated their departments conducted railroad risk assessments. Of the 40 departments that do not conduct railroad risk assessments, 17 or 42.5% indicated their departments did not view RR/RA as a high priority because of low railroad event frequency which creates a reactive attitude for these events. Eleven or 27.5% of the fire departments did not conduct risk assessments because of very short railroad lines, inactive lines or no railroad line existed. Four recipients, 10% of the total that indicated that they did not conduct risk assessments, indicated their departments focused organizational resources on other preplan activities. Three respondents, or 7.5%, indicated their department ha no specific RR/RA, but the jurisdiction’s comprehensive all-hazard plan addresses RR/RA in some less detailed fashion. One recipient, 2.5%, indicated that their risk assessment addressed the limited access to the railroad system in their jurisdiction. Lastly, four survey respondents, or 10%, provided no explanation.

Of the 20 respondents that reported the reason(s) why their department conducted RR/RA, six respondents, 30% of the total respondents that conduct risk assessments, indicated that railroad activity in their jurisdiction presented significant risk in the forms of a large railroad switching yard or lines with a significant amount, up to 140 trains per day, of railroad traffic. Six respondents, 30% of the total that conduct risk assessments, reported that railroad lines divide their jurisdiction and thereby create barriers or impediments for response routes and response travel time. Four respondents, 20%, indicated that local emergency planning
committees, hazardous materials teams or their fire departments proactively planned for emergency incidents. Two respondents, 10%, indicated that local all-hazard plans included railroad risk assessment. Lastly, one respondent reported that his agency conducted RR/RA because of learning about the process while enrolled in the EAFSOEM class, one respondent contracted for the risk assessment and one respondent recognized the potential for large loss of life and property.

Question 2 of the survey asked “Who assesses railroad risk for your department?” Twenty eight recipients, 47% of all survey recipients, responded to this question and 32 recipients, 53% of all recipients, skipped this question. Twenty four respondents or 86% of all respondents indicated that fire department staff conducted the RR/RA or fire department staff in conjunction with a larger emergency planning group like a local emergency planning committee, municipal or county staff work group or fire chief’s association conducted the risk assessment. Two respondents, 7% of the respondents, indicated the local emergency management agency conducted the RR/RA. One respondent, or 3.5%, indicated the local fire chief’s association with railroad officials conducted the RR/RA and one respondent, 3.5%, reported that a contractor conducted RR/RA in their jurisdictions.

Question 3 of the survey asked “What methodology your department uses to assess railroad risk?” Twenty seven recipients, 45% of all survey recipients, responded to this question and 33 recipients, 55% of all recipients, skipped this question. Of the twenty seven respondents, 9 or 33% indicated the risk assessment methodology was prescribed by the local emergency management official, hazardous materials team or other ad-hoc planning committee. Eight respondents or 30% of all respondents indicated their risk assessment methodology was based on the EAFSOEM model or a similar vulnerability multiplied by probability methodology. Four
respondents, 15% of all respondents, indicated their risk assessment methodology used actual rail car counts and observed cargo contents. Three respondents, 11% of all respondents, indicated their risk assessment methodology was based on speculative scenarios. Lastly, 3 respondents or 11% of all respondents indicated their risk assessment methodology was a collaborative effort with railroad officials.

Survey question 4 asked “What methodology does your fire department uses to assess risk probability for railroad emergencies?” Twenty three recipients or 38% of all recipients responded to this question and 37 recipients, 62% of all respondents, skipped question 4. Eleven or 48% of the 23 respondents indicated their department used anecdotal evidence to assess the probability for railroad emergencies. Ten respondents or 43% of all respondents indicated their department used historical data to assess risk probability for railroad emergencies. Lastly, 2 departments indicated using an incident commander or operations officer for assessing risk probability for railroad emergencies.

Question 5 asked if the respondent’s “Is your fire department accredited by the Commission on Fire Accreditation International?” Fifty-two recipients, or 87% of all recipients responded to this question and 8 recipients, 13% of all recipients skipped this questions. Of the 52 respondents, 45 or 87% indicated their fire department was not accredited and 7 or 13% indicated their fire department was accredited. The purpose of this question was to cross tabulate responses from the previous survey questions to determine if risk assessment methodologies differed among accredited and non-accredited fire agencies.

Given the aforementioned survey results, 66.6% of all fire departments surveyed do not conduct railroad risk assessments. The remaining 33.3% conduct risk assessments using various methodologies. Eighty-six percent of respondents indicated staff from their departments
conducted railroad risk assessments or participated in joint-agency risk assessment teams with law enforcement, emergency management and railroad officials that conducted railroad risk assessments. Thirty-three percent of the respondents indicated that the risk assessment methodology was prescribed by the emergency management official, hazardous materials team or other ad-hoc planning committee, but respondents did not describe these methodologies. Thirty percent of the survey respondents indicated that their risk assessment methodology followed a vulnerability and probability model similar in concept to the model used in the National Fire Academy Executive Analysis of Fire Service Operations in Emergency Management course. Fifteen percent of the respondents indicated their risk assessments were products of actual railcar counts of trains passing through their jurisdictions. Eleven percent of respondents used speculative emergency scenarios to assess risk and 11% of the respondents reported their methodology was a collaborative effort with railroad officials; however the specific assessment methodology was not reported.

Survey results provided specific answers to the research question, “How does your department assess risk probability for railroad emergencies?” Forty-eight percent of respondents indicated their departments used anecdotal evidence to assess the probability for railroad emergencies. Anecdotal evidence includes (a) subjectively assessing the number of trains and analyzing train commodities based on product labeling, (b) speculating on various emergency scenarios based on local conditions, and (c) using professional judgment based on the individual’s recollection for past events. Forty-three percent of respondents indicated their department used historical data analysis to predict risk probability for railroad emergencies. Historical analysis includes collecting and analyzing incident reports to determine the number of accidents that have occurred and based on that history, predict the probability for future events.
Nine percent or 2 respondents indicated determining probability was a function of incident command or [emergency] operations’ officer.

Survey results provided an interesting perspective to the 5th research question, “How do railroad risk assessments from accredited fire departments differ from risk assessments from non-accredited fire agencies?” Results were determined by cross-tabulating the 7 respondents that answered yes to survey question 5, “Is your fire department accredited by the Commission on Fire Accreditation International?” with answers to survey questions 1, 2, 3 and 4.

Similar to the overall survey results for question 1, 3 of the 7 of accredited departments did not assess railroad risk, mainly because there was no railroad or only a small railroad segment that passed through their jurisdiction. One of the seven respondents indicated his department had not conducted a railroad risk assessment but was starting the process since his return from the NFA EAFSOEM class. The remaining 4 respondents indicated their railroad risk assessments were conducted because of various levels of railroad activity within their jurisdictions.

Four of the 7 respondents indicated that fire department staff, either independently or in conjunction with railroad officials, conducted railroad risk assessments. This response follows the responses for survey question 2 where 86% of respondents indicated fire department staff or committees that include fire department staff conduct the majority of railroad risk assessments.

When asked about the specific risk assessment methodology used by their department, 2 of the 5 respondents indicated risk assessment were conducted in collaboration with railroad officials and one respondent indicated their risk assessment methodology centered on speculating about emergency response scenarios and developing actions based on those scenarios.
When considering risk probability methods as asked in survey question 4, 3 of the 5 respondents from accredited agencies indicated they used historical evidence to develop probability for railroad emergencies and two respondents indicated they used anecdotal evidence to develop probability for railroad emergencies.

In summary, based on the survey data, cross-tabulated answers from respondents representing 7 accredited fire departments did not significantly differ from answers provided by respondents representing 45 non-accredited fire departments.

In the search for answers to survey question 1, “What recognized public safety standards or methods exist for conducting railroad risk assessments?” results indicated limited findings for specific methods, but discovered an underlying theme for conducting risks assessments in general. The two specific methodologies discovered included the EAFSOEM model and the CFAI model. Both models have significant similarities including identifying hazards or vulnerabilities in the community and secondly, developing the probabilities for those hazards to occur.

A search of the LRC on-line catalog found no specific model for railroad risk assessment. No specific risk assessment model exists within the N.F.P.A. Codes and Standards. The Federal Railroad Administration, the American Association of Railroads and community emergency planning manuals from CSX Railroad and Amtrak suggest no specific risk assessment methodology for public safety agencies.

As a final product for this applied research project, a railroad risk assessment template is found in Appendix B.
Discussion

The purpose of this research was to identify or develop a risk assessment methodology for railroad emergencies. The intent was to identify a process Cary Fire Department staff could regularly use in order to effectively plan for emergency incidents. During the course of the literature review, the author discovered two applicable multi-hazard risk assessment models, but no models specifically designed for railroad emergencies. The literature review revealed that most if not all sources referenced herein contained a common theme for risk assessments. This theme included identifying the risks or hazards associated with the activity one is assessing and then determining the probability that these risks might occur. In addition, understanding this common theme brought clarity to the use of various terms. For example, in the context of conducting risk assessments, the terms hazard(s), risks and vulnerabilities are used synonymously. Likewise, frequency and probability of events are synonymous (EAFSOEM and CFAI). Once this conceptual hurdle was understood, research brought a greater appreciation for the relative ease in which the Cary Fire Department can conduct risk assessments for other community hazards as well.

Similar conclusions surfaced from the review of NFPA 780 and 921. First, regardless of the specific activity for which an agency is assessing risk, the process of identifying the hazards for that activity and determining the probability that those hazards might occur serves as the foundation for any risk assessment. Secondly, while this concept is broad and subjective in nature, most risk assessment reports employ very specific data gathering processes and relate to very specific activities (NFPA Fire Protection Guide 3-115). As a result, conducting risk assessments requires an understanding for this concept and then developing or utilizing an expertise to assess the factors relating to the specialized activity or environment in question.
One of the most significant benefits of the literature review included information regarding the FRA online safety data website which was presented in CSX’s *Community Awareness and Planning Guide*. In addition, the FRA website and its advantages for gathering data were discussed by Nelson High, CSX Government Liaison, during his interview. The database also contains accident history and most importantly an accident prediction report function. Given the basic risk assessment formula of hazard vulnerability multiplied by its probability as described in the EAFSOEM student manual, the FRA safety data website provides much of the unknown vulnerability information and probability data required to adequately start any local railroad risk assessment. It’s important to note that one can access this railroad information without having to request the information from the railroad company.

One can reasonably assume that AAR safety initiatives related to crossing safety improvements, improving transportation of hazardous materials and regulating activities related to railroad employee fatigue resulted in reducing hazard vulnerability and probability. As such, fire departments should develop a process for the ongoing assessment and review of these initiatives and corresponding activity measures and not rely on a one-time assessment as the basis for long-term fire department operations. Just as crossing collision accidents decrease, one would expect a corresponding adjustment to emergency services resource needs. For the Cary Fire Department to effectively identify needs and deploy resources and in order to maintain accredited agency status, developing an on-going risk assessment should follow the *Fire and Emergency Services Self-Assessment Manual* core criteria to conduct risk assessments for non-fire hazards found in the community. Railroad risk assessment for the Cary Fire Department should include an annual review of data from specific queries of the FRA on-line safety database and revise its risk assessment portfolio accordingly.
Although the process to complete risk assessments as conveyed in the EAFSOEM student manual as well as what was conducted during classroom activities resulted in students gathering subjective information and making slightly educated guesses about vulnerability and severity ratings for a fictional city. The intent of the practical exercise is to cause students to develop an understanding for these processes and to gather more objective and valid information in their respective jurisdictions. Conducting risk assessments for various vulnerabilities even when the process or local information may appear incomplete, results in better and more informed emergency response decision-making by public safety officials and therefore translates into a safer community. As more staff from the Cary Fire Department attend the EAFSOEM class, instilling the EAFSOEM process into Cary Fire Department practices should become easier over time.

Based on the railroad risk assessment survey, the greatest limiting factor of the EAFSOEM risk assessment model with respect to its breadth of use within the fire service is its focus as an all hazards assessment tool which conveys the message that the process is all things to all risks. While its practical applicability is evident, each community hazard-type presents unique challenges and instilling a better understanding for how the EAFSOEM model might apply to these various hazards would greatly increase its use and user confidence in the field.

Understanding the implications of instructional time, National Fire Academy curriculum development and instructional staff should consider additional examples and general instruction to assist the user in adapting the risk assessment model to particular hazards. Nonetheless, the EAFSOEM model establishes a useful foundation on which users can build community risk assessment portfolios. Given its simple format, non proprietary status and its exposure to fire and emergency management services in particular, the EAFSOEM risk assessment model should
serve as a sound beginning for railroad risk assessment activities. Given the author’s newfound understanding for the conceptual process of risk assessments and how the EAFSOEM model adaptability is particularly useful, the Cary Fire Department will use the EAFSOEM model as the basis for all risk assessment activity.

The Federal Railroad Administration (FA) is the government agency charged with policing railroad activity and the Code of Federal Regulations (CFR) 200-399 prescribe all regulations. Within the applicable CFR regulations, there is no requirement nor does a methodology exist for railroad companies to conduct risk assessments. However, railroad companies must report all accidents to the FRA and as a result, railroad companies analyze these reports and use the information gleaned as the foundation for understanding current risks associated with railroad activity.

As one might expect, railroad officials represent the most expert sources of information regarding railroad accidents. As such, fire departments can enhance their knowledge and understanding for railroad emergencies by cultivating relationships with local railroad officials. During the interview with Mr. High, the author recognized a number of communication barriers that inhibited a frank interview. Specific interview questions relating to the numbers of trains passing through Town as well as questions regarding the types and amounts of commodities transported on those trains received ambiguous answers. The author perceived that those interview questions might be perceived as intruding into protected or proprietary railroad information and Mr. High sought to downplay CSX’s ability to provide specific answers to those questions.

This interview in particular reinforced a long-held public safety principle to develop relationships with local industrial counterparts before an accident occurs in order to effectively
manage them after they occur. Given the Cary community is exposed to three railroad companies and numerous other industrial facilities, the Cary Fire Department must establish effective relationships with not only local railroad officials for these three companies, but with officials in other industrial sectors as well.

Regarding the Department of Homeland Security’s Regional Resiliency Assessment Program (RRAP), its scope of assessment is predicated on national needs which it has already defined. Over the last 2 federal fiscal years, the program has assessed 5 target regions per year for a total of 10 regional assessments. Given the broad impact of railroad activity across the U.S. and the RRAP’s limited scope of work, its risk assessment methodology is not considered a realistic model for widespread public safety use.

Recommendations

The author recommends the following actions based on the literature review and results and of this applied research project:

1. Within two weeks, present this applied research project to the Cary Fire Department’s General Staff which includes the Deputy Fire Chief for Operations and the Assistant Fire Chief for Budget and Planning for their review. The findings and subsequent recommendations to incorporate the railroad risk assessment template and map will impact emergency operations and the Fire Department’s emergency planning process, in particular developing the Department’s risk assessment for non-fire risks. Conducting risk assessments for non-fire risks also positively impacts compliance with core criteria for fire department accreditation. Given these implications, the responsible general staff members should fully understand the scope of impact and provide input for the best method to implement the risk assessment processes.
2. Within thirty days, develop a risk assessment template to record pertinent railroad information and data on which to determine vulnerabilities and probabilities for railroad emergencies. Examples of information to collect for each railroad company in the assessment includes but is not limited to the following: (a) milepost markers, (b) the number of tracks and their uphill or downhill grades, (c) bridge and overpass identification numbers, (d) train speed, (e) emergency telephone numbers as well as contact information for area managers and dispatch offices, (f) accident history, (g) cargo types including relative quantities of hazardous materials shipped and the number of passengers on Amtrak trains and (h) the total probability rating as calculated by FRA Safety Data website accident prediction module. Moreover, the Cary Fire Department can utilize the FRA Safety Data website to collect most of this specific information without a significant commitment to survey the railroad network or request the information from local railroad staff. Collecting and assessing this information will assist in rating the community’s vulnerabilities for railroad emergencies as (a) low, (b) medium or (c) high. In addition, the accident prediction model will assist in rating the probability of a railroad accident as (a) unlikely, (b) possible, or (c) likely.

3. Within thirty days, request the Town of Cary Geographic Information Services (GIS) group develop a permanent GIS map layer identifying railroad lines that extend through the Fire Department’s jurisdiction. This map will include all at-grade road crossings as well as bridges, overpasses and tunnels. In addition, information such as milepost markers, bridge identification, accident history, critical or key facilities like Town Hall, the Fire Department Administration building, the Garmon Operations Center and Fire Station 4, and any significant economic center that may be evacuated shall be identified by a unique map icon.
In addition, the map shall identify a 500 feet shadow area extending away from the railroad lines in both directions. This shadow area will delineate an initial evacuation area for small leaks of hazardous materials and will identify housing, other commercial properties and any special-risk facilities one might consider when evacuating.

4. One long-term recommendation is to consider a request to conduct a CHER-CAP exercise in order to assess the Town of Cary’s capability to respond to a railroad emergency involving a hazardous material leak or fire. If the Town pursues this request, it must petition the Wake County Local Emergency Planning Committee to make the exercise request to the regional FEMA office.

5. Lastly, the Cary Fire Department shall identify and implement the best strategies to improve its professional relationship with local railroad officials. We would use this opportunity learn more about the Town’s vulnerabilities from railroad emergencies and to validate the railroad risk assessment portfolio. Within the next 90 days, the CFD will initiate contact to schedule an informal introduction meeting with the area managers of CSX, Norfolk and Southern and Amtrak railroad companies.
Reference List


Amtrak. (June, 2008). *Passenger Train Emergency Response Training* Wilmington, DE: Perry, John A.


Appendix A

Railroad Risk Assessment Survey Results

Survey Question 1, does your Department assess risk for railroad hazard? Briefly explain why you assess or do not assess railroad risk.

<table>
<thead>
<tr>
<th>Answer choices</th>
<th>Number of responses</th>
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<tr>
<td>Yes</td>
<td>20</td>
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<tr>
<td>No</td>
<td>40</td>
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Explanations

1. September 8, 2009 9:19 p.m. We just started this process after I took the EAFSOEM Course.
2. September 8, 2009 9:22 p.m. The only railroad we have is a short spur for the purpose of delivering coal to the UNC power plant. No through rail lines are in the jurisdiction.
3. September 8, 2009 9:51 p.m. Our Department is generally reactive to such incidents. Unless anything happens with a high frequency, our department doesn't utilize any research based models to plan accordingly. Even the stuff we do frequently, planning is one of our many weaknesses.
4. September 8, 2009 9:59 p.m. Commuter trains only. We have only worked on access. No preplanning in place.
5. September 9, 2009 12:12 a.m. There are no railroads that run through Scottsdale, AZ
6. September 9, 2009 2:30 a.m. We do not have active rail service in our community or region.
7. September 9, 2009 3:14 a.m. We have a HIGH amount of RR traffic through our district. What I mean by assessment is that we know that hazardous materials (a lot of them) travel through our district. One of the major lines runs through our downtown area where population density is high.
8. September 9, 2009 10:50 a.m. Railroad runs through middle of city. Many of the trains are a mile long or better. This affects our response times. We installed cameras at major intersections to allow different response routes to be chosen.

9. September 9, 2009 11:44 a.m. It just has not been done with the department, but was touched by an overall hazard mitigation plan.

10. September 9, 2009 12:04 p.m. They turned the train tracks into a yuppie bike trail and in the process put a half-dozen companies out of business or forced them to move.

11. September 9, 2009 12:13 p.m. RR risk is assessed in order to be prepared for an incident and have a basic understanding of what measures may be anticipated.

12. September 9, 2009 12:58 p.m. We only have one railroad under pass and the train can separate our first and second due from the largest industrial area we have. That is one concern the other we look at what and how the transportation of hazardous cargo is being conducted. We have a set of tracks that are out along the Mississippi River and that is where most of our incidents occur. the tracks do pass very close to several of our subdivisions and that is also a concern. in the last five years we have had one incident involving the railroad and that was an engine fire.

13. September 9, 2009 2:30 p.m. We conducted a risk assessment of our north-south line and our western line about 8 years ago. Used a private company to conduct and report. To evaluate preparedness of our local hazmat resources.

14. September 9, 2009 3:21 p.m. to be quite honest, the topic has not come up before. We can respond to and mitigate a variety of railroad emergencies, but no assessment has been completed.

15. September 9, 2009 4:46 p.m. The Department Haz-Mat Unit trains for an all risk response.
The Department has a SOP for assessing all responses to a railroad. On any given day, we can not determine which hazardous material is being shipped through the city and therefore risk assessment to any one product would be futile.

16. September 9, 2009 8:04 p.m. Yes, primarily do to cutting off portions of the city, delaying emergency response.

17. September 9, 2009 9:00 p.m. We treat the hazard as any other transportation hazard.
   However, as the population density increases, then this is something that needs to be implemented. Please email results to Ken.chadwick@gwinnettcounty.com

18. September 10, 2009 1:27 p.m. The CSX rail system bisects the downtown area with two sets of rails. Also, there is a main switch yard that has just been annexed.

19. September 10, 2009 9:15 p.m. No railways in our jurisdiction.

20. September 11, 2009 9:36 p.m. Readiness and preparation, have available tools and equipment for an event.

21. September 13, 2009 3:03 p.m. We have no formalized railroad risk assessment plan.

22. September 14, 2009 12:22 p.m. We are spending the bulk of our pre-incident planning on empty buildings and what is in them along with our regular pre-incident planning of all businesses in the city. We are planning to work on accreditation this year which will contain research and risk assessment on all types of incidents.

23. September 14, 2009 1:27 p.m. No railroad tracks run through our jurisdiction.

24. September 14, 2009 4:57 p.m. We have one railroad track through our fire district that is only used about twice a month. It hauls materials to a federal installation.

25. Sep 14, 2009 6:31 p.m. Railroad emergencies are part of the City’s all hazard planning
process. Concord is divided north to south by Norfolk Southern Railway and also has Amtrak service through the area. The number of direct rail crossings has been reduced to two which has reduced the risk. Commodity flow studies provided information regarding the risk of impact from hazardous material rail transportation. Based on the proximity of rail service to local critical facilities, (hospital, schools, day care, public safety facilities, governmental center, etc…), limited access, and potential impact including loss life, hazard vulnerability assessment was conducted. We found the probability of an accident to be low, but the impact potential to be high.

26. September 15, 2009 2:13 a.m. We don't pre-plan for it, probably because we have many other things on the table. I have been operations at several fires where railroad tracks were a factor and we dealt with it during the incident. (ie. supply lines stretched across). Wisconsin Emergency Management (WEM) and our Haz Mat Team might do some risk assessment, but I have never.

27. September 15, 2009 1:01 p.m. We are spending the bulk of our pre-incident planning on empty buildings and what is in them along with our regular pre-incident planning of all businesses in the city. We are planning to work on pre-incident planning relating to accreditation this year. This will take us into all aspects of risk assessment.

28. September 15, 2009 4:06 p.m. Rail accidents have not occurred frequently enough to warrant special planning. We did have a tanker derailment and fire approximately 20 years ago but nothing of any significance since that time. We do have a city and county hazardous materials response team that trains for various hazmat situations including railroad accidents.

29. September 15, 2009 4:18 p.m. Has not been an issue yet, city is not going to spend $ on something that hasn't happened. That is the way of city government. Not right but the way.
30. September 15, 2009 4:49 p.m. We have a major rail line running through the middle of our city plus we have several spurs to major chemical companies with in our response area.

31. September 15, 2009 4:51 p.m. Tracks run through town and there is a large switching yard south of town in our district.

32. Sep 15, 2009 5:57 p.m. Large potential for loss of life or damage to property.

33. September 15, 2009 6:15 p.m. Nothing currently being done with risk assessment of the railroads through our District. I am doing my second year ARP of the EFO on a topic of railroad starts that will be relevant for us in risk assessment of fires from the railroads.

34. September 15, 2009 8:40 p.m. Major N/S West Coast line from Seattle to LA with 140+ trains/day.

35. September 15, 2009 10:54 p.m. The railroad line traversing the City of Thornton is not an active line.

36. September 16, 2009 3:28 a.m. I recently submitted an ARP dealing with this issue

37. September 16, 2009 4:20 a.m. We have no rail in our city.

38. September 16, 2009 11:26 a.m. It has not been an issue raised by our department, and with a lack of support staff it is not a priority.


40. September 16, 2009 12:04 p.m. Haven't put that much consideration into rail incidents. We should and we will. Thanks for nudging us!

41. September 16, 2009 1:06 p.m. No explanation other than it just hasn't been done. We do have a Hazmat Team that has responded to several different types of incidents with the railroad. Not much other planning has been done.

42. Sep 16, 2009 1:35 p.m. We only have about 200 yards of railroad line within our city.
43. Sep 16, 2009 1:37 p.m. This has not been a practice of our organization.

44. September 16, 2009 2:05 p.m. Two railroad lines, 50 trains per day, including commuter rail.

45. September 16, 2009 2:15 p.m. Not identified as a priority for us.

46. September 16, 2009 2:33 p.m. Major rail lines, junction, yards and port with numerous hazardous materials.

47. September 16, 2009 2:34 p.m. We haven't and I don't have a good answer as to why. I guess we haven't asked the question, why not?

48. September 16, 2009 2:54 p.m. We have no railroad in our vicinity.

49. September 16, 2009 3:55 p.m. Though we have a railroad line through our city we have not focused on a risk assessment. We have tried to work with the railroad on other projects and met resistance to share information.

50. September 16, 2009 4:30 p.m. We have a major freight rail line (Union Pacific) that bisects our city and has the potential to cause response issues as we only have one station on the west side of the tracks. Trains are allowed to go through at 65 mph which obviously poses a derailment risk. The track is also shared by Burlington Northern Sante Fe when theirs is down for repair.

51. September 16, 2009 5:36 p.m. I would say no to this question. If it was a maybe it would be pretty weak. The only formal planning was when our LEPC got a grant to study the most frequent products that come through our community.

52. September 16, 2009 6:44 p.m. While we have a railroad storage area within city limits staging rr cars full of lots of scary chemicals for the paper mill outside of the city limits- we do not know at any given time what might be out there, or the quantities.
53. September 16, 2009 9:15 p.m. We are not familiar with the process nor have someone that we can assign to this process.

54. September 17, 2009 12:30 a.m. This risk has not been given very little attention in my community.

55. September 17, 2009 7:56 p.m. Our department assesses railroad risk because of the proximity of the railroad to our town and the known chemicals and large quantities that are transported daily.

56. September 18, 2009 11:00 p.m. Risks are assessed for our community's comprehensive risk management plan. Risks include life safety at crossings, hazmat, and high value property loss and risk potential with rail passenger transportation.

Survey Question 2, who assesses railroad risk for your department? Check all that apply.

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Explanations

1. September 9, 2009 3:14 a.m. By FD staff in conjunction with city and county staff when preparing the COOP.


3. September 9, 2009 12:58 p.m. The Burlington Northern works with the fire chiefs association

4. September 15, 2009 4:51 p.m. Umatilla County Emergency Management

5. September 15, 2009 5:57 p.m. FD Training officer
6. September 15, 2009 8:40 p.m. Emergency Management

7. September 17, 2009 7:56 p.m. The assessment was incorporated into an all hazards assessment that was contracted out to consultant firm. The fire department is responsible for reviewing/revising the document on a biannual basis.

8. September 18, 2009 11:00 p.m. Emergency Management Coordinator is staffed within the FD.

   Survey Question 3, what methodology does your department use to assess railroad risk? Check all that apply.

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Explanations

1. September 8, 2009 9:19 p.m. EAFSOEM Risk and Vulnerability Matrices

2. September 9, 2009 3:14 a.m. I believe the vulnerability items were similar to what we used in class (EFO 3). I'm sure it was a FEMA document or template. All of this planning is done using FEMA forms and equations.

3. September 9, 2009 10:50 a.m. We worked with the railroad to develop a risk plan

4. September 9, 2009 12:13 p.m. Basic description of products carried, quantities, frequency and potential exposure issues based upon designated areas throughout the county. For example, heavily populated areas vs lightly populated. Frequency of events and event types based upon Hx data. Such as MVA involving RR crossing vs loading or unloading product at a fixed site.

5. September 9, 2009 12:58 p.m. We basically look at what type of incidents there are and how the response to them is arranged. We also keep track of the type of cargo when possible.
6. September 9, 2009 2:30 p.m. Actual train car count and contents

7. September 9, 2009 8:04 p.m. Informal approach. Basically, evaluating the commodities flowing on the railway and "what ifing". What types of hazards would be present and how would we manage derailment situation?

8. September 10, 2009 1:27 p.m. Internally done through a process of collaboration with RR officials.

10. September 11, 2009 9:36 p.m. Speak with railroad personnel as well as randomly visualize what is coming through town.

10. September 14, 2009 4:57 p.m. This is completed by the county DEM

11. September 14, 2009 6:31 p.m. A hazard analysis based similar to that developed by Kaiser Permanente was developed which takes into account the probability or likelihood that an incident will occur, the severity based on human impact (possibility of death or injury), Property Impact (Physical losses and damages), Business Impact ( Interruption of essential community services), Preparedness (Preplanning), Internal response (time, effectiveness and internal resources), and External response (Mutual aid) to determine the community risk.

   This can be defined by the formula, Risk = Probability x Severity.

12. September 15, 2009 2:13 a.m. WEM probably assists us in this area, but if they do it is with our Haz Mat Team.

13. September 15, 2009 4:49 p.m. The emergency management coordinator assesses risk

14. September 15, 2009 5:57 p.m. Locally assessed risk but using a national and local training delivery system to assess and train on railroad issues.

15. September 15, 2009 8:40 p.m. Work with HM teams and projected area of impact with cascading events.

17. September 16, 2009 4:30 p.m. Department members were formed into a committee to create the EOP, and the risk assessment was done by them.


Survey Question 4, how does your department assess risk probability for railroad emergencies?

Answer choices

<table>
<thead>
<tr>
<th>Answer choices</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use historical data and analysis on incident frequency to indicate probability</td>
<td>10</td>
</tr>
<tr>
<td>Use anecdotal evidence on incident frequency to indicate probability</td>
<td>11</td>
</tr>
<tr>
<td>Other (Briefly explain)</td>
<td>2</td>
</tr>
</tbody>
</table>

Explanations

1. September 9, 2009 2:30 p.m. counted all placarded cars, listed specific materials, evaluated PPE and tools available.

2. September 10, 2009 1:27 p.m. Also utilize volume and types of hazardous materials that pass through downtown rails. Currently, about 26,000 cars per year with EHS, primarily sulfur products.

3. September 14, 2009 6:31 p.m. This information is based on historical data of railroad accidents, severity, and frequency and weighed against the impact should an incident occur.

4. September 15, 2009 2:13 a.m. Command and / or operations assesses the likelihood or
probability of railroad tracks creating additional problems. If you are looking at pre-planning or assessing then WEM probably handles that.

5. September 15, 2009 8:40 p.m. Risk benefit related to cargo.

Survey Question 5, is your fire department accredited by the Commission on Fire Accreditation International?

<table>
<thead>
<tr>
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<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>No</td>
<td>45</td>
</tr>
</tbody>
</table>
Appendix B

Cary Fire Department Railroad Risk Assessment Template

General Instructions

1. The Cary Fire Department shall conduct an annual railroad risk assessment for each first class railroad company using railroad lines passing through the Town’s jurisdiction shall.

2. Use on railroad risk assessment template for each railroad.

3. Follow specific instructions to complete each template field.

4. Submit the complete risk assessment to the Assistant Fire Chief for Budget and Planning.

5. The Assistant Fire Chief for Budget and Planning shall forward the complete railroad risk assessment portfolio to the Deputy Fire Chief for Operations.

6. The Assistant Fire Chief for Budget and Planning shall incorporate the complete railroad risk assessment portfolio as an appendix to the Fire Department’s risk assessment document for non-fire hazards. The risk assessment for non-fire hazards shall serve as an exhibit to the planning category of the CFAI Self-Assessment Manual.

Cary Fire and Rescue Department Railroad Risk Assessment Template and Map

<table>
<thead>
<tr>
<th>1. Railroad Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Non-emergency telephone number</td>
</tr>
<tr>
<td>3. Rail line name</td>
</tr>
<tr>
<td>4. Number of tracks</td>
</tr>
<tr>
<td>5. Number of miles of tracks in</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
</tbody>
</table>
| 6. | Emergency shutdown number  
(Verify calling non-emergency number) |
| 7. | Dispatch telephone number  
(Verify by calling non-emergency number) |
| 8. | General location of milepost numbers, all at-grade road crossings, overpasses and tunnels. (Verify by FRA website) |
| 9. | Types of trains (Freight and or passenger) |
| 10. | Average train frequency per day |
| 11. | Call non-emergency number) |
| 12. | Types of locomotives |
| 13. | Freight cargo (Ascertain by requesting copies of shipping papers for five random days each year from area) |
14. Amtrak passenger numbers
   (Ascertain by requesting from area manager)

15. Accident history and prediction
   (Verify by FRA website for 5.02 Accident prediction – WBAPS report)

16. Special notes and other instructions

Federal Railroad Administration Safety Data website
http://safetydata.fra.dot.gov

Railroad vulnerability equals the consideration for items 4, 5, 8, 9, 10, 12, 13, 14 and any notes for 16 that relate to hazard or risk associated with railroad activity not assessed in the aforementioned fields. Attach a brief summary for these items and rate railroad vulnerability as (a) low, (b) moderate or (c) high.

Probability for railroad vulnerability equals the consideration for item 15 and any notes for 16 that relates to the likelihood that a railroad accident will occur but is not addressed in item 15. Rate the probability of occurrence as (a) unlikely, (b) possible or (c) likely based on the total predicted collision probability indicated in the WBAPS report.
Develop a map that illustrates items 4, 5, 8, and 15. In addition, based on the most dangerous hazardous materials cargo, shade the railroad corridor with the evacuation distance for a small product release as prescribed in the Department of Transportation Emergency Response Guidebook. For example, if anhydrous ammonia is the most dangerous hazardous material transported through the jurisdiction and 500 feet is the evacuation distance for a small leak, then shade the map along the railroad corridor 500 feet on each side of the tracks. This shaded area identifies all potential small leak evacuation considerations for the worst case hazardous materials scenario in the jurisdiction. Larger maps could include a shaded area for large leaks and fires for the same hazardous material. See attached map.