# A Structured Approach to Develop an Effective Emergency Preparedness and Disaster Response Plan for Contractors

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## Abstract

**The recent rash of natural disasters has taught many valuable lessons. Unfortunately, the need for preparedness is greater than ever before, given the increasing frequency and worsening intensity of weather-related storms and the escalation of technological threats. Contractors are frequently among the first responders to major disasters and emergencies. No geographic area is immune or protected from the threat of emergencies and disasters; however, prepared contractors can recover from potentially crippling disasters, earn more work as a result of their preparation, and contribute to their communities in times of crisis.**

**Although a good business practice and a requirement under state/ federal occupational safety and health regulations in the United States, in reality, most contractors do not have a well-prepared disaster response plan. Emphasizing the need and benefits of a well written, comprehensive and tested emergency preparedness and disaster response plan, within this research, a structured approach is proposed for preparing an effective emergency preparedness plan. This research has provided a mechanism to evaluate a company's emergency preparedness and create policies to ensure business continuity after a disaster. It is suggested that company factors about business continuity, insurance coverage, IT considerations and communications continuity should be defined and stored because the link between a source and consequence is mainly determined by these factors. Lessons learnt with respect to those rather controllable factors may result in better management of emergency risks in the forthcoming projects. The major benefit of the proposed approach is not the development of a fit-for-all emergency preparedness plan but rather a dynamic, customizable, strengths and weaknesses based emergency preparedness plan.**

**Keywords:** Emergency, Disaster, Vulnerability assessment, Business impact, Preparedness.

## Introduction

The recent rash of natural disasters has taught many valuable lessons. From the U.S. perspective, 2005, for instance, was a year not soon forgotten because of the devastation wreaked by Hurricanes Katrina and Rita. Risk Management and allied professionals have found many valuable lessons in those disasters. Perhaps none is more valuable than the need to have a written, comprehensive, and tested emergency preparedness plan. Although a good business practice and a requirement under state/ federal occupational safety and health regulations in the United States, in reality, most contractors do not have such a plan.

Another valuable, but alarming, lesson is the attitude of invincibility adopted by most people. This lulls people into believing that a disaster will not occur in their geographic area. For example, one may not be immediately affected by the:

- More frequent and intense hurricane cycle in the Atlantic (U.S. News & World Report, 2006).
- Continuing development of coastal properties.
- Shifting population concentrations to areas prone to naturally occurring disasters, such as Florida and northern and southern California (National Ocean Service, 2008).

However, given the expansion of technology in the workplace and the interdependencies of business operations, all regions of the country are vulnerable to business disruption. For example, Hurricane Katrina devastated several oil refineries, reducing domestic oil supplies by about 8% of total U.S. production (Online News Hour, 2005). This reduction helped drive up the price of oil, which drove up the price of oil-based construction materials. Similar global interdependencies have led to the significant material shortages and price escalations.

So, it's clear that many different events can disrupt a contractor's business operations. However, contractors who properly plan and prepare for threats improve the odds for a successful response and recovery.

Emphasizing the need and benefits of a well written, comprehensive and tested emergency preparedness and disaster response plan, this paper provides a structured approach to develop such an effective plan for a contractor, which is also tailored to fit its business operations. The paper provides a mechanism for a contractor to evaluate its company's emergency preparedness and create policies to ensure business continuity after a disaster. Furthermore, based on the premise that for many contractors, the need for emergency response and evacuation at a jobsite is more probable than for a widespread company disaster, the research also provides recommendations for effective project-specific emergency preparedness plans.

## Background and Rationale

### Types of Emergencies & Disasters

Although often used interchangeably, there are technical differences between the terms *emergency* and *disaster* – emergencies are local in nature and response, while disasters have a broader geographic scale and complexity, or require a regional/ federal response. The distinction is most important when state/ federal disaster declarations fund recovery and remediation efforts.

Generally, emergencies and disasters are divided into two categories: naturally-occurring and man-made. Naturally-occurring events usually refer to severe weather. Examples include floods, storms, hurricanes, earthquakes, and landslides. In contrast, man-made events refer to technological failures or malicious incidents. Power outages and computer-related attacks, such as malware, hacking, and viruses are prevalent examples. In addition, contractors are specifically prone to man-made jobsite emergencies, such as material spills, fires, and explosions.

Although awareness of the potential for man-made disasters is growing, people tend to overemphasize the frequency of naturally-occurring events. Therefore, it is encouraged to contractors to look beyond the obvious threat of hurricanes in coastal states, earthquakes in California, and tornadoes in the Midwest and Southwest --- and to recognize that, in 2005, there were 248 man-made disasters world-wide compared to 149 naturally occurring disasters (Swiss Re Sigma, 2006).

### The Impact of Emergencies & Disasters

*The Human & Financial Impact:*

A simple working definition of risk management involves the conservation of an organization's human and financial assets. The major adverse consequences from emergencies and disasters involve workers and finances.

On the human side, there is the risk of personal injuries and/or fatalities. There can be short-term workforce absenteeism leading to service disruptions or outright attrition of workers due to fear, poor morale, or lack of confidence in the company's financial stability. On the financial side, the effects include:

- Lost financial data
- Additional expenses due to relocation of operations and replacement of equipment
- Cash flow crisis, or even bankruptcy, due to customer's inability to pay
- Loss of bonding capacity
- Breach of contract, assessed liquidated damages, or default

To help survive a disaster, a contractor's company must develop, implement, test, and periodically update a comprehensive emergency preparedness plan.

*The Solemn Upside:*

While emergencies and disasters can disrupt contractor operations, they can also present opportunities. After all, contractors are frequently among the first responders to major disasters and emergencies.

Emergency remediation and recovery projects are unexpected sources of work with unique risks. Slow reimbursements can lead to a cash flow crisis. Suppliers may not be able to obtain and deliver materials. Project owners may not be able to pay on schedule, and there may be a shortage of subs to perform the work.

The sudden influx of business, and the potential for increased volume and higher paper margins, is attractive – yet, these positives must be offset by the risks of cost escalation and the threat of slow, partial, or disputed reimbursement by government agencies.

### Benefits of Emergency Preparedness Plans

Contractors that develop, implement, test, and periodically update their emergency preparedness plans reap many benefits. Most notably, they protect the lives of employees and the welfare of their families. A comprehensive emergency preparedness plan also:

- reduces business disruptions
- maintains sustainable cash flows
- preserves customer bases
- continues supply of services and products
- maintains confidence of investors or creditors
- mitigates legal liability
- maximizes insurance recovery and reduces the total cost of risk

Business disruption may result from unintended causes; however, business resumption and continuity requires intentional planning and preparedness.

## Research methods

The support data for this research was collected via interviews of general contractors and sub contractors in the state of Florida, working in various sectors of construction works including residential building construction, commercial building construction and non-building construction. The objective of the interviews were to explore the emergency preparedness practices being followed and compile recommendations from the contractors so as to come up with a structured approach toward developing an effective emergency and disaster preparedness plan.

**Research Objectives:**

- To provide a structured approach to develop an effective disaster and emergency preparedness plan for a contractor, which is also tailored to fit its business operations.
- To provide a mechanism for a contractor to evaluate its company's emergency preparedness and create policies to ensure business continuity after a disaster.
- To provide recommendations to contractors for developing effective project-specific emergency preparedness plans.

## Research Results

Based on information gathered via interviews, the following recommendations are made to contractors for developing an effective emergency preparedness plan.

### The Nuts & Bolts of the Plan

Not only does one need an emergency preparedness plan, he or she also needs one tailored to fit his/ her business operations. Testing and periodically updating this plan is also essential to emergency preparedness and business continuity.

The objective is to identify one's company's critical business functions and determine which employees, systems, information, processes, equipment, and materials are critical to restore and resume business operations. One should begin by listing all critical business functions to determine a primary and backup process for restoration in the event of a disruption. Another best practice: Ensure that all mission critical electronic data is automatically backed-up daily at an off-site, secured location.

Also it's important to evaluate one's company's vulnerability to a disruption in supply chain logistics. Asking vendors and suppliers about their emergency preparedness plans, and developing relationships with alternative vendors and suppliers in case your primary ones experience a disruption, would help.

### The Five Steps to Developing an Effective Emergency Preparedness Plan

There are several starting points to build an effective emergency preparedness plan. Here are five steps to help a contractor evaluate its emergency preparedness and create policies to ensure business continuity after a disaster.

### 1. Conduct a Needs Assessment

If the company does not have a formal written emergency preparedness plan, or if the contractor doesn't know if its company is sufficiently prepared for emergencies, conduct a

needs assessment. A comprehensive needs assessment includes answering these questions:

- Does the company have a formal, written emergency preparedness plan?
- Is this plan up-to-date?
- Has the company thoroughly tested the plan on all levels?
- Does the plan include the following critical elements?

- *Vulnerability Assessment* – Identifies and measures "soft spots" in a company's systems and prioritizes planning action steps.
- *Business Impact Analysis* – Qualifies the effect of a disaster on the company's day-to-day operations.
- *Evacuation Procedures* – Identifies routes to safety, establishes a meeting point for evacuees, and explains how to determine if anyone is missing.
- *Business Continuity Plan* – Details the means to restore critical business operations and resume operations, including data back-up, archiving, and data recovery.
- *Crisis Management Plan* – Outlines how to coordinate communication protocols with the media and other external organizations.

A needs assessment will reveal vulnerabilities and opportunities for improvement. However, before a contractor can create its game plan, it needs to select a team.

## 2. Establish a Planning Team

A multi-disciplinary approach effectively builds an emergency preparedness plan. The composition of this team or task force will vary depending on the size, geographical spread, and nature of operations. However, the core of your planning team should include:

- Chief Executive Officer or Chief Operating Officer
- Chief Financial Officer / Controller
- Construction Operations
- Safety & Health Director
- Risk Manager or General Legal Counsel
- Chief Information Officer / IT Director

Inviting representatives from company's insurance agency/ broker and carrier to participate as *ad hoc* members can provide resources and examples of industry best practices.

Once the core team has met and determined an overall strategy, additional company representatives from HR, Facility Maintenance, Fleet-Equipment / Transportation, and Business Development can provide additional support and resources to more fully develop, implement, test, and update your plan.

### 3. Perform a Vulnerability Assessment

There are four parts in a vulnerability assessment:

1) Identify the top 10 most likely emergencies and disasters facing your company.
2) Assess the probability of each top 10 event. Rate each scenario as a high, medium, or low frequency event.
3) Assess the severity of each top 10 event. Again a high, medium, or low rating scale is simple and useful.
4) Reorder the initial top 10 list by probability and severity.

Once the list is completed, a clear idea can be developed of the biggest dangers to the company's continuity after a disaster. Focus on mitigating the impact of high frequency and high severity events can then be made.

### 4. Analyze the Business Impact of Disruptions

This is an optional step that can have a major impact on organizational decision-making. However, this step is probably necessary for public companies with an outside board of directors or large complex organizations.

The business impact analysis calculates the economic impact of direct and indirect costs from different types and variable durations of unplanned disruptions. This impact is frequently expressed as the *cost-per-down-day*.

### 5. Take Preventive Measures

Contractors who allocate more emergency resources than their competitors will have an edge when disaster strikes. So, it is useful to understand the scope of a disaster and consider how much to invest in preparedness, prevention, and mitigation. Some prevention measures that should be considered include:

- Identify staff capabilities to respond to first aid and medical emergencies or for bilingual translation.
- Cross-train staff in key competencies.
- Maintain contact with employees and essential business partners through an emergency website or toll-free phone number.
- Consider the cost-benefit of satellite phone service in the event that conventional phone and cell service is disrupted.
- Ensure that all critical materials or supplies are not stockpiled in the same area and that major pieces of equipment are garaged in different areas.
- Identify backup suppliers.
- Maintain redundant systems, such as IT data and financial archives.
- Develop lists of key business partners, including company's banker, insurance and surety contacts, vendors, and customers.

An Emergency Preparedness Questionnaire has been developed for contractors to aid them in identifying additional factors that need to be considered. This questionnaire is attached in Appendix A.

**Elements of Emergency Preparedness Plans**

There is no single acceptable format for an emergency preparedness plan. This is not a one-size-fits-all proposition. The format and length will vary based on areas of vulnerability and the company's size and operations. However, all plans should contain these key elements:

- Purpose and policy statement
- Authority, roles, and responsibilities
- Probable emergencies
- Vulnerability assessment
- Emergency operations center staffing and procedures
- Communications protocols
- Business continuity protocols
- Crisis communication and media relations
- Facility site maps and evacuation procedures
- Internal and external resource lists

**Project-Specific Emergency Preparedness Plans**

The importance of project-specific (jobsite) emergency preparedness plans cannot be overstated. For many contractors, the need for emergency response and evacuation at a jobsite is more probable than for a widespread company disaster.

Pre-planning with local public safety and emergency response agencies can decrease confusion when a jobsite incident occurs. A quick response due to proper pre-planning and preparedness can expedite medical treatment and save lives. Emergency medical professionals call the first 60 minutes after a traumatic injury the "golden hour" and each minute saved through proper pre-planning can influence the survival of a trauma victim.

Because jobsite conditions constantly change, it is vitally important that critical site considerations (like emergency access and staging areas for ambulances) are checked at least daily. Here are some additional considerations for jobsite emergency preparedness plans:

- Train employees in first aid; also, teach them to distinguish when 911 or other emergency services are warranted.
- Establish written procedures for suspending/ securing crane operations, steel and pre-cast erection, and other work in high winds or electrical storms. This should include air horns or other audible signals to notify workers of impending storms.
- Institute proper procedures for utility location and damage prevention for underground and overhead utility construction operations.
- Provide personal flotation devices and water lifesaving equipment for employees working over or near water.

- Pre-plan with emergency agencies for: the response, rescue equipment, and procedures to be used for excavations cave-ins, confined spaces, high voltage contact, and scaffolding or crane boom collapses.
- Develop aerial rescue procedures to retrieve injured or stranded workers from elevated work platforms or from lift equipment. For example, how does your company plan to rescue an employee dangling from a height in his fall protection harness and lanyard?
- Maintain appropriate staging areas for medical transport helicopters responding to a mass-casualty jobsite event.

Also, take special precautions when large concentrations of employees work onsite, especially if there are multiple work crews in different areas of construction work site. Special precautions are even more important if work crews are split between inside and outside operations.

To help improve personnel accountability, require employees to wear badges, and log their assigned working locations. With this information, a supervisor can quickly track employees and determine if someone is missing during an emergency evacuation. In a mass casualty event, this facilitates a more focused rescue effort, and is often required in pharmaceutical, military-industrial, and petrochemical construction operations.

## Conclusions

The recent rash of natural disasters has taught many valuable lessons. Unfortunately, the need for preparedness is greater than ever before, given the increasing frequency and worsening intensity of weather-related storms and the escalation of technological threats.

No geographical area is immune or protected from the threat of emergencies and disasters. But, prepared contractors can recover from potentially crippling disasters, earn more work as a result of their preparation, and contribute to their communities in times of crisis. Hence the need of a well-devised emergency and disaster preparedness plan can not be overemphasized.

Within this research, a structured approach is proposed for preparing a comprehensive and effective emergency and disaster preparedness plan. Learning from organizational behaviors can be facilitated by an emergency preparedness assessment. Based on emergency preparedness information, decision-makers may prepare better plans for emergencies.

This research has provided a mechanism to evaluate a company's emergency preparedness and create policies to ensure business continuity after a disaster. Furthermore, since for many contractors, the need for emergency response and evacuation at a jobsite is more probable than for a widespread company disaster, the research also provides recommendations for effective project-specific emergency preparedness plans.

It is believed that factors about business continuity, insurance coverage, IT considerations and communications continuity should be defined and stored because the link between a source and consequence is mainly determined by these factors. As those factors are basically about company factors, this kind of risk information has the highest potential to affect future decisions. Lessons learnt with respect to those rather controllable factors may result in better management of emergency risks in the forthcoming projects. Moreover, it is clear that the major benefit of the approach is not the development of a fit-for-all emergency preparedness plan but rather a customizable strengths and weaknesses based emergency preparedness plan which is dynamic in nature. Finally, although it is not without flaws and could be improved after testing it on a number of cases, it is believed to be a good attempt to implement an organizational based approach for emergency preparedness.

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## Appendix A: An Emergency Preparedness Questionnaire for Contractors

The destruction of the World Trade Centre in 2001 changed many things, including the perspective on disaster planning. Much of what we take for granted (such as phone service, Internet connections, and a place to live and work) could disappear quite suddenly. And, everyone is vulnerable. How well your company is prepared with a written emergency preparedness plan could determine whether your company survives at all. Below are the questions every contractor should answer in order to develop a tailor-made emergency and disaster preparedness plan.

### Business Continuity

1. What type of external/internal vulnerabilities could impact your company? For example, is your home office and jobsite security adequate to prevent vandalism and theft?
2. Does your company have a written plan stored offsite to protect or evacuate employees, irreplaceable equipment, and such vital records and documents as insurance policies, deeds, vehicle titles, and financial information?
3. How long would it take to replace your company's furnishings and equipment?

4. How would your company function if 20, 30, 50, or 100 employees were absent?
5. How would your company survive if it couldn't operate for a significant period of time?
6. How long could your company function without access to its home office? If uninhabitable, could your company maintain its workforce in an alternative location and still access crucial files?

**Insurance Coverage**

1. How much insurance does your company need? What can your company cover and how much will your insurance pickup in the event of a loss?
2. Does your insurance policy pay for temporary repairs or temporary workspace?
3. Does your insurance policy cover each item's replacement value?
4. Will the insurance policy pay for an upgrade in order to get equipment promptly?
5. Does your insurance policy reimburse relocation costs?

**IT Considerations:**

1. Are there fire sprinklers located in your computer room? If so, could they malfunction and destroy your network?
2. Has an expert determined how difficult (or easy) it would be for an outsider to break into your IT system electronically? What about an employee bent on destruction?
3. Is your company protected if a disaster destroyed your entire data centre?
4. Does your IT staff regularly test the integrity of backup tapes? Are tapes safely stored away from your computers?
5. Can your backup tapes restore the data onto a new server equipped with a newer operating system?
6. Is business critical software safely stored? Are the license numbers kept offsite?
7. Can your IT vendors help get the data centre back online? Or, are they apt to suffer as much from a regional disaster as your company?
8. Is there a plan to get new computers and backup equipment if the region's infrastructure is destroyed?
9. Is computer/network documentation available offsite? Is it detailed enough that a reasonably competent person could follow the directions and get the system up and running?
10. A company with fairly new equipment, current versions of most software, and offsite backups may be able to resume operations in an alternate location within two to three days. Is that acceptable?

**Communications Continuity:**

1. Is critical contact information stored offsite?
2. If your company loses its computers and phone systems, is there a plan for emergency communication with employees, vendors, and project owners?
3. If your home office must relocate, how long would it take to get phone service at the alternate location?

## Author's Biography

The lead author, Mr. Rizwan U. Farooqui, is an Assistant Professor in the Department of Civil Engineering at the NED University of Engineering and Technology in Karachi, Pakistan. He is currently pursuing his Ph.D. degree in Construction Engineering and Management from Florida International University in Miami, Florida, USA. He has an MS degree in Structural and Construction Engineering from National University of Singapore and a B.Eng. degree in Civil Engineering from NED University. Mr. Farooqui has over eight years of research, teaching and construction industry experience by working in USA, Pakistan, Singapore and Ethiopia. Few of his major accomplishments include: development of the M.Eng. Program in Engineering Management (with specializations in construction management and industrial engineering management) for NED University; development and implementation of a construction process re-engineering model for construction industry in Ethiopia, procurement of a Pak-US collaborative research grant for *Development of a strategic model for improvement of construction project management education, research and practice in Pakistan* (grant amount: $403,000 jointly funded by USAID, USA and MoST, Pakistan; Time Period: January 1, 2006– December 31, 2008). Mr. Farooqui has ten publications in refereed international conferences, while another nine have been accepted for publication. He is a member of the American Society of Civil Engineers (ASCE), Project Management Institute (PMI), Sigma-Lambda-Chi Construction Management honour society, Chi-Epsilon Civil Engineering Honour Society, Tau Beta Pi Engineering Honour Society and Phi Khappa Pi Honour Society.