International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 03 , March 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

DISASTER MANAGEMENT AND DAMAGE EVALUATION IN STRUCTURAL COLLAPSE

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ABSTRACT

Disaster can be defined as a horrific event which causes the loss, decline, deterioration of production and ability to use an asset to its full economic potential and which often results in the loss of human life. Also it hinder economic growth, cause poverty, waste time, cause diversion of funds, delay development and cause huge financial loss and human suffering and death. Disaster management (or emergency management) is the discipline of dealing with and avoiding both natural and manmade disasters. It involves preparedness, response and recovery in order to lessen the impact of disasters. Emergency management is "the discipline and profession of applying science, technology, planning and management to deal with extreme events that can injure or kill large numbers of people, do extensive damage to property, and disrupt community life.

Study deals with the emergency management in collapse of structure which also can be considered under manmade disaster. Determination of cost of the structural collapse, rather taking the case study of particular project a random project is considered and detail study on the construction of project is analysed. Reverse approach is applied as the cost of construction incurred is approximately loss in collapse of structure .Detailed cost estimate of entire structure is determined to avoid calculation in next project software is developed in visual basic. Software with appropriate input gives the entire cost of the project which itself means loss in its collapse. Measures are suggested in pre as well as post disaster phase to minimize the loss in of wealth as well life. The paper in all gives loss analysis and management in the collapse of structure

Keywords: Disaster; Hazard; Collapse; Rescue; Management

I. INTRODUCTION

Disaster can be defined as a horrific event which causes the loss, decline, deterioration of production and ability to use an asset to its full economic potential and which often results in the loss of human life. Also it hinder economic growth, cause poverty, waste time, cause diversion of funds, delay development and cause huge financial loss and human suffering and death. Disaster management (or emergency management) is the discipline of dealing with and avoiding both natural and manmade disasters. It involves preparedness, response and recovery in order to lessen the impact of disasters. Disaster management does not necessarily avert or eliminate the threats themselves, although the study and prediction of the threats is an important part of the field.

IJARSE
ISSN (O) 2319 - 8354
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Emergency management is "the discipline and profession of applying science, technology, planning and management to deal with extreme events that can injure or kill large numbers of people, do extensive damage to property, and disrupt community life.

In order to avoid, or reduce significant losses, it is essential that emergency managers identify, anticipate and implement processes to respond to critical risks, in order to reduce the probability of their occurrence, or the magnitude and duration of impact. It is essential for them to not only have controls in place to handle the emergency, but they should also have plans to ensure Business Continuity of critical operations post-incident. It is essential for an organization to include procedures for determining whether an emergency situation has occurred and at what point an emergency management plan should be activated. The implementation of an emergency plan involves much more than just its preparation. It must be regularly maintained, in a structured and methodical manner, to ensure it remains up to date and fit for purpose in the event of an emergency. Emergency managers will generally follow a common process to anticipate, assess, prevent, prepare, respond and recover from an incident.

1.1 Disaster Classification

Natural disasters are events arising from natural causes such as volcanic eruptions, cyclones, earthquakes, etc. having little control over it; also often known as "Act of God".

Manmade disasters are non-natural events occurring due to the involvement of human activities. These could be sudden or long term, sudden disasters could be collapse of any building, bridge or structures; while long term are as clearing of jungles, sand mining etcThis report basically deals with the manmade disaster involving the Loss analysis and management of the disaster which could also be referred as emergency management in collapse of structure.

Table 1.1 Structure Collapse in particular year and respective causalities.

Type of Structural Failure	Year	Casualties
Lalita park building, Delhi	15 Nov., 2010	67
Building collapse, Gurgaon, Delhi	17 Feb., 2011	2
Building collapse, Mumbra, Thane	04 April, 2013	74
City light hotel, Secundarabad	June, 2013	13
Building collapse, Vadodara	28 Aug.,2013	7
Civil Engineering Department	27 Sept., 2013	61
Building collapse, Bangalore	26 ov., 2013	4

II. EMERGENCY MANAGEMENT

"Disaster prevention, mitigation and preparedness are better than disaster response in achieving the goals and objectives of disaster reduction. Disaster response alone is not sufficient, as it yields only temporary result at a

very high cost. Prevention contributes to lasting improvement in safety and is essential to integrated disaster management".

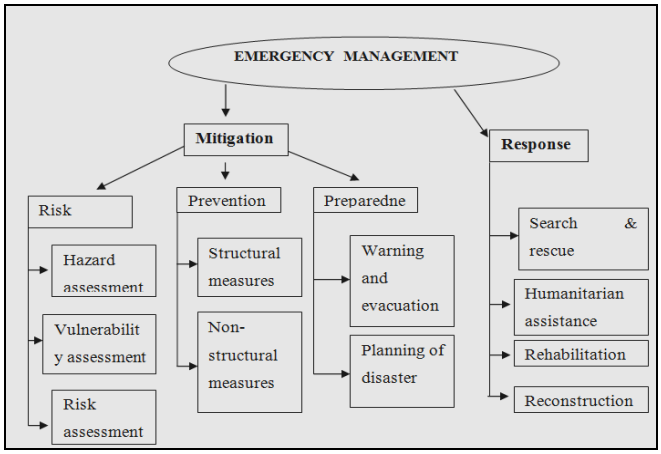

Fig. 2.1 Flowchart for Emergency Management.

2.1 Emergency Preparedness Plans

Every disaster incident has a various phases which may vary according to the type of disaster and incident. The principle of the sequence of action is to alert, rescue and contend disaster. The chart below suggests the preparation of emergency planning.

3.1.1 Elements of Emergency Plans

1) Communication and control system.

2) Assigning key person with specified responsibilities.

3) The work emergency procedures.

4) Liaisons with outside authorities and service in co-operation with outside services.

5) Public relations including media

2.1.2 Objective of Emergency Plan

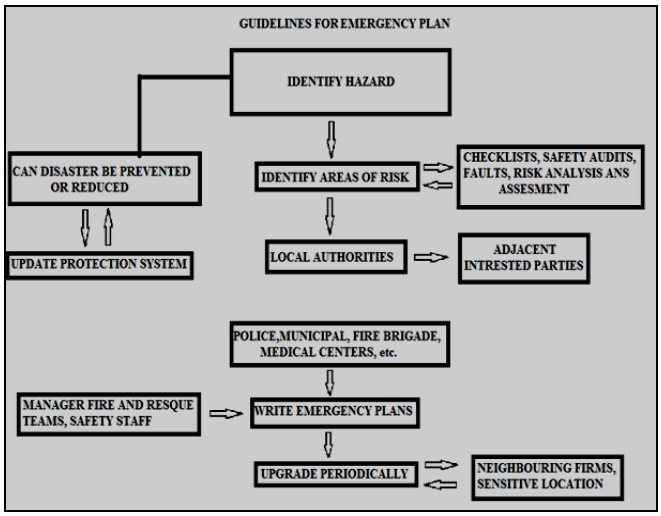

Fig. 2.2 Flowchart for Emergency Plan

1) To minimize the loss of life, injury and environmental change.

2) To hasten the process of controlling and containing the incident.

3) To facilitate co-ordination of external authorities and service.

4) To establish the system for flow of information during the emergency and preservation of relevant data for subsequent investigation

2.2 Disaster Medical Alarm Plan

The medical alarm plan provides speed and efficient medical care for insured people. There need to be trained first aid at the scene of disaster, adequate doctors, first aid men, casualty wards.

The disaster site must have medical service equipped with required ambulance, disasters trailers that can quickly reach the hospital in the surrounding. There should be large rescue section necessary medical aid and prepared dressing material should be available. Proper and speedy internal and external communication is crucial prerequisite to successful hazard prevention.

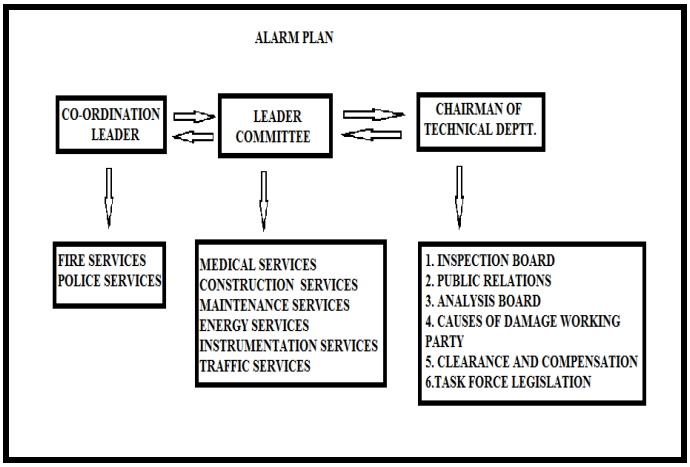

Fig 2.3 Flowchart for Alarming System Plan

2.3 Disaster Actions and Teams

Warning Notification

A warning notification implies that a crisis/ disaster is imminent and advance action may be initiated for minimizing the damage / rescue operations. The warning notification indicating the magnitude of crisis/ disaster should be communicated authorities concerned with the important structures.

Rescue Operation

It will be the responsibility of the emergency management group to identify the essential staff and form a Task force, which reports at defined locations so that they can be readily contacted. It will also holds the responsibility to remove all non-essential staff to assembly points. The rescue team consist responsibilities as mentioned below.

Task Force

Identify source of hazard and try to neutralize / contain it

1) Isolate remaining plant and keep it in safe condition

2) Organize safe shut down of the plant, if necessary

3) Organize all support services like operation of fire water pumps, sprinkler

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Systems,etc.

4) Any other responsibility as decided by Team Leader.

Maintenance Team

1) Attend to all emergency maintenance jobs on priority basis.

2) Take steps to contain or reduce the level of hazard that can create a crisis /disaster.

3) Organize additional facilities as required.

4) Any other responsibility as decided by Team leader, looking into the circumstances at the time of the crisis / disaster.

Security Team

1) Man all the gates

2) Bar entry of unauthorized persons and non-essential staff

3) Permit with minimum delay the entry all of authorized personnel and outside agencies, vehicles, etc. who have to provide assistance

4) Allow ambulances / evacuation vehicles through without normal checks

5) Any other responsibility as decided by Team leader, looking into the circumstances at the time of the crisis / disaster

Safety team

1) Arrange required safety requirement

2) Arrange to measure polluted gas concentration in case of gas leaks at various location.

3) Record location.

4) Collect and preserve evidence in connection with accident, guide authorities on all safety related issues.

5) Any other responsibility as decided by Team Leader, looking into the circumstances at the time related of the disaster.

Medical team

1) Arrange first aid material stretcher and reach accident site quickly

2) Arrange for immediate medical attention

3) Arrange for sending the casualties to various hospitals and nursing homes etc.

4) Ask specific medical assistance from outside including through medical specialists in consultation with the EMM.

5) Any other responsibility as decided by Team Leader looking into the circumstances at the time of the crises / disaster.

Fire Fighting Team

In case fire erupts and emergency is due to fire, the fire Team shall be responsible to:

1) Rush to the fire spot to extinguish the fire.

2) Seek help from external firefighting agencies.

3) Evacuate persons affected due to whatsoever reasons.

4) Any other responsibility as decided by Team leader looking into the circumstances at the time of disaster.

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www.ijarse.com
IJARSE
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III. ESTIMATION OF LOSS AND SOFTWARE DEVELOPMENT

Determination of cost of the structural collapse, rather taking the case study of particular project a random project is considered and detail study on the construction of project is analysed. Reverse approach is applied as the cost construction incurred is the loss in collapse of structure. The details of the structure considered are stated as:

Name of Project: Bliss Central

Owner: Mr. Mahajan S. D.

Location:ShivajiChowkCidco Nasik.

Number of Floor: Ground + Eight.

Initially for the determination of the loss detailed estimate is formed of the labour and material requirement of the entire structure. Plan of the entire structure is determined by in the excel sheet which need to be formulated each time for new project. It becomes tedious and laborious to calculate hence software was developed in visual basic which makes very convenient to calculate and determine the loss incurred in collapse of structure. Software with executable format need not to install and directly worked as a compatible file.

Advantages of Software:

1) It is useful to find out the approximate cost of the collapsed structure.

2) The .exe file enables to work and utilize without any installation.

3) Approximate approach avoids the data of the collapsed structure.

4) The loss in disaster can be found out quickly.

5) Easy and user friendly avoiding tedious calculations.

6) Generalized approach makes its use countable in any circumstantial collapse of structure.

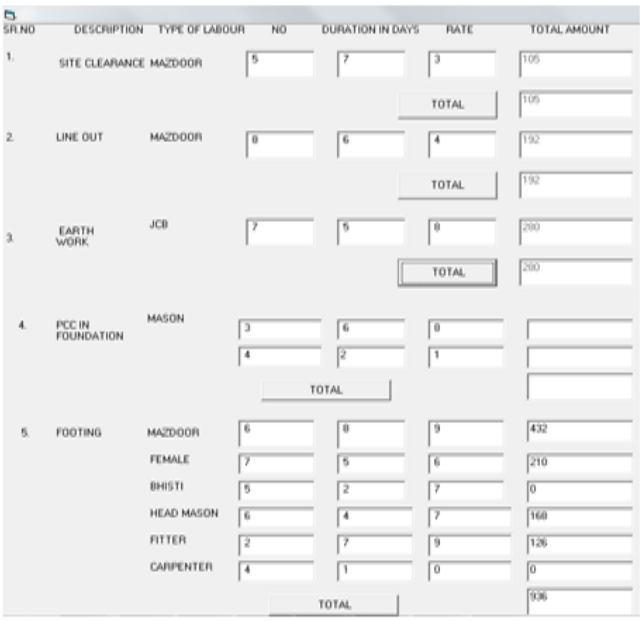

Fig -1: Snap Shot of Software

IV. RESULTS

Loss due to the collapse of structure in Mumbra Building (collapsed on 4th April 2013), collapse is determined by our generalized approach as:

Detailed cost analysis of Bliss Cental Project:

Total Labour cost Rs. 3146400

Total Material cost Rs. 20195231

Total Cost is found to be Rs 23341631.

Loss in ithe project: Assuming reducing factor by 20% as the probable loss in the project so,

Loss found to be: Rs 18673304.8

Total Casualities are 67 and Rs 500000 to each announced as compensation which becomes: Rs 52173304.8.

Table 4.1: Snapshots for Detailed Estimation

LABOUR REQUIRMENT FOR CONSTRUCTION OF G+8 STRUCTURE						
SR.NO.	DESCRIPTION	TYPE OF LABOUR	NO.	Duration in Days	RATE	TOATAL AMOUNT
1	Site Clearance	Mazdoor	15	1	300	4500
	Total					4500
2	Line Out	Mazdoor	6	1	600	3600
	Total					3600
3	Earth Work	JCB	8	15	650	78000
	Total					78000
4	PCC In Foundation	Mason	1	1	450	450
			10	1	300	3000
	Total					3450
5	Footing	Mazdoor	10	6	300	18000
		Female	4	6	225	5400
		Bhisti	2	6	250	3000
		Head Mason	1	6	700	4200
		Fitter	8	6	400	19200
		Carpenter	8	6	400	19200
	Total					69000
6	Column& Ground Beam	Mazdoor	8	30	300	72000
		Female	4	30	225	27000
		Bhisti	2	30	250	15000
		Head Mason	1	30	450	13500
		Fitter	6	30	400	72000
		Carpenter	6	30	400	72000
	Total					271500
7	Plinth Filling (Solling + Muram)	Mazdoor	15	20	300	90000
		Bhisti	2	20	250	10000
		Female Mazdoor	4	20	300	24000
	Total					124000

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8	PCC in Bed	Mazdoor	6	1	300	1800
		Female	4	1	225	900
		Head Mason	1	1	450	450
		Bhisti	2	1	250	500
		Total				3650
9	Brick Work	Head Mason	2	160	450	144000
	Including Window	Mazdoor	8	160	300	384000
	& Door Fframe	Bhisti	2	160	250	80000
		Total				608000
10	Plastering	Head Mason	2	200	700	280000
	External + Internal	Mazdoor	8	200	300	480000
		Bhisti	4	200	250	200000
		Total				960000
11	Lintel (W+D)	Mason	1	12	450	5400
		Mazdoor	4	12	300	14400
		Female	2	12	225	5400
		Bhisti	4	12	250	12000
		Total				37200
12	Slab	Mazdoor	30	30	300	270000
		Bhisti	4	30	250	30000
		Head Mason	2	30	700	42000
		Carpenter	4	30	400	48000
		Fitter	2	30	400	24000
		Total				414000
13	Flooring + Skirting	Mazdoor	6	20	300	36000
		Bhisti	4	20	250	20000
		Head Mason	2	20	700	28000
		Total				84000
14	Plumbig&	Plumber	8	30	450	108000
	Electrification	Helper	2	30	325	19500
		Electrician	6	30	400	72000
		Helper	4	30	325	39000
		Total				238500
15	Painting	Painter	7	30	550	115500
16	Brick Bat	Head Mason	2	8	700	11200
		Mazdoor	12	8	300	28800
	Slab Brick Bat	Head Mason	4	15	700	42000
		Mazdoor	8	15	300	36000
		Female	4	15	225	13500
		Total				131500
		TOTAL LABOUR COST				**3146400**

MATERIAL REQUIRMENT FOR CONSTRUCTION OF G+8 STRUCTURE					
SR.NO.	DESCRIPTION	QUANTITY	UNIT	RATE	TOATAL
1	**CONCRETE**				
	PCC In Footing	23.14	m^3	4500	104130
	Footing	80.94	m^3	4500	364230
	Column Below GL	13.85	m^3	4500	62325
	Ground Beam	14.76	m^3	4500	66420
	Column	228.54	m^3	4500	1028430
	PCC	33.76	m^3	4500	151920
	Lintel	35	m^3	4500	157500
	Slab				
	2BHK	139.86	m^3	4500	629370
	3BHK	196.77	m^3	4500	885465
2	Murum	100	m^3	650	65000
3	BBM				
	3BHK	1045.94	m^3	2000	2091880
	2BHK	745.91	m^3	2000	1491820
4	Plastering Internal				
	2BHK	2449.58	m^2	120	293949.6
	3BHK	3434.88	m^2	120	412185.6
5	Ceiling Plaster				
	2BHK	932.4	m^2	120	111888
	3BHK	1311.84	m^2	120	157420.8
6	External Plastering	3000	m^2	165	495000
7	Tiles				0
	2BHK	10032.47	ft^2	45	451461.2
	3BHK	14120.65	ft^2	45	635429.3

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

V. CONCLUSIONS

1. Responsibilities of the different group of people involved in the rescue operations. This resulted in lack of coordination of work among different organizations.
2. Lack of rescue equipment and trained personnel was evident in the events that involved collapse of such kind.
3. Equipment had to be obtained from different government and private organization the government has taken steps to procure some equipment, but that is still very inadequate for such a situation.
4. The Armed Forces lacked relevant training and equipment but was, nevertheless, the only institution in the country with the capacity to respond to managing such collapse event. The civilian authorities lack the capability to take control of disaster management in such a situation. The involvement of the civilian authorities needs to be improved.
5. The Armed Forces have developed a plan for post-disaster management but whether these proposed operational centers are safe need to be assessed first.
6. The collapse events have shown that there was lack of clarity in distribution of work.
7. Government has to take quick and precise steps in the law binding process for the justification of the incident occurred
8. Roles and duties to each person and organization should be predefined and necessary training to tackle such incidents.
9. Many models have been made, but most of them are based on empirical models and are therefore very tedious.
10. Need of software for easy evaluation of loss avoiding repeated process.

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