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POST DISASTER MANAGEMENT FOR INDORE

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Abstract- a post disaster management against the earthquake is done for Indore city the present study attempts to raise awareness and understanding of the hazards (earthquake) for the Indore District. Study focuses on lifeline structures including transportation and emergency services and their coordination and management during earthquake. The study finally gives suggestions so that existing facilities can be improved and finally reduce the impact of earthquake in the city when occurs. Visual inspection forms for existing structure given by different researchers are also suggested to check the stability of existing structures against the earthquake and ultimately improving the strength of weaker structures through retrofitting.

A case study of failure and new construction of Jawahar Marg Bridge is also conducted. It includes the following points- Age of Bridge, Type of Structure, Failure of Bridge, Prefer the routes after the collapse of Bridge, Study of planning and implementation of disaster management after failure of bridge. Using these features the planner and decision-makers can better view and manage the data about the area under study. A suggestion will be given to in proper the common preparedness of Indore city for future.

Keywords: Post disaster, Management, Earthquake, Case Study, Lifeline, Structures, Bridge, Collapse, and Failure.

I. INTRODUCTION

A. Disaster Management

An increase in the frequency of earthquake has been observed in India subcontinent impact earthquakes are observed in past decades. In this entire instance one thing which is common among in all is that there has been a high number of casualties is noticed. These casualties are mainly occurred due to poor quality of building construction and poor planning in all areas. The Past decades, there has been a continuous evolution in the practice of disaster management. The disaster management concept of the 4"R
s is Reduction, Readiness, Response and Recovery (fig1.1). The traditional focus has been on the reduction and readiness phases of the cycle where governments have implemented preparation strategies (e.g. CDEM plans) as well as operational capacities (e.g. Civil Defense) for a more timely and effective response to an impending event. A hazard refers to the possibility of a physical event causing injury or loss of life and the potential for property damage, social and economic disruption.

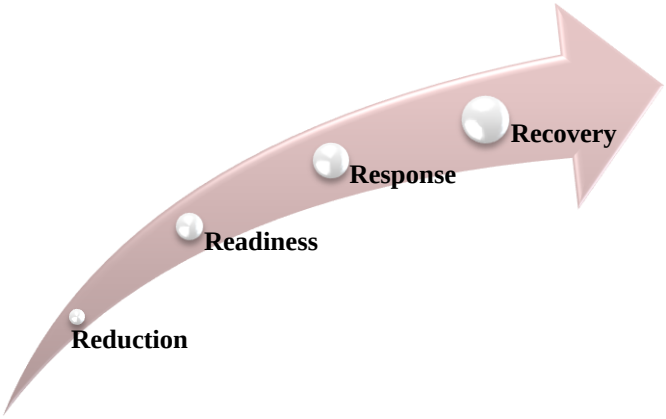

Fig.1 Disaster Management concept of the 4 R"

II. LITERATURE REVIEW

1) Katayama (1994)**:** the beginnings of Lifeline Earthquake Engineering (LEE) are briefly reviewed. The important of damage assessment in LEE is described with respect to the effect of soil, and physical damage network vulnerability analysis.

2) Gupta (2001) had been highlight the lesson learnt from the devastating Gujarat earthquake. The attempted to recovery and reconstruction process should have a strong emphasis on proper understanding and awareness of the risk among different stakeholders, sufficient level of training and confidence building among the professionals.

3) Keith (2008) attempted to raise awareness and understanding of the hazards that threaten the Queenstown Lakes District as well as the importance of lifelines and their management. These include earthquake, mass movements, meteorological hazards and flooding. The potential to cause loss of life or injury and all of them have the potential to cause severe damage to homes, businesses and other infrastructure. Lifelines include electricity, telecommunication, water supply, wastewater removal, transportation and emergency services. Scenarios of each hazard were created based upon current scientific understanding and are used to more clearly these priorities that need to be addressed during the response and recovery phase of a disaster.

4) Srivastava (2016) aimed at analysing the loss that has been caused by a disaster such as an earthquake and highlights the steps that can be taken to save life during and after the disaster.

5) Sharma and Kumar (2018) understand the characteristics of bridge failures under scour conditions and provide useful information for scouring countermeasure. And described the failure causes and suggests engineering lessons to be learned. Engineering is usually about avoiding failures and investigating why failures occur and ways to fix the problem. There is a need to understand the conditions giving rise to past failures and ways to avoid such failures so that loss of life can be minimized. They had a case study over Jahu Bridge (Himachal Pradesh). The major part of the concrete bridge on Seer Khadd and Jabothi khadd had got damaged and washed away due to heavy rain on dated August 11, 2007, & August 12, 2007. Now, a new Bailey bridge was constructed over the site within two years. Again the Bailey bridge over Seer Khadd was collapsed in the morning on 14th August 2014 due to heavy rains.

III. METHODOLOGY

A. ArcGIS

In this work to have a much better understanding of seismic assessment a tool called GIS technology is utilized which has the upper hand while quantizing structural vulnerability, loss estimation etc. The analysis is performed for Indore municipal region**.** GIS tool to present the information in an intuitive way where the decision maker has a bird's eye view and can drill down to the exact details of the Indore area District Profile, Transportation, Hospital, Police, Road Centre Line, Plot Boundary, Building Structure and Earthquake area is showing with the help of Map in GIS software.

*B. C*ase study of jawahar marg bridge

A case study of failure and new construction of Jawahar Marg Bridge is conducted. It includes the following points-

a) Age of Bridge.
b) Type of Structure.
c) Failure of Bridge
d) Prefer the routes after the collapse of Bridge.
e) Study of planning and implementation of disaster management after failure of bridge.

Using these features the planner and decision-makers can better view and manage the data about the area under study. A suggestion will be given to in proper the common preparedness of Indore city for future.

IV. **OBJECTIVE**

- To review the preparedness measures adopted by the local civil bodies (Municipal Corporation) in response to disasters with a specific focus on earthquake in Indore.
- To study the risks posed to lifelines (Transportation Police, Hospital and Ambulance and Emergency Services) for Indore.
- To understand the perception of stakeholders on their understanding and expectations of earthquake preparedness in personal / government buildings (Hospital) and transportation (for Bridge, Railway).
- To develop action plans for different stakeholders (Communities, public departments and other stakeholder groups) for disaster risk education, emergency response and recovery actions.
- Case Study of failure of Jawahar Marg Bridge at Indore

V. **EARTHQUAKE SCENRAIO**

A. Earthquake zone in Indore

Indore district has no earlier history of earthquakes still it comes border of zone 2 and zone 3 as per IS code 1893 (2016) any city comes on the border of to zone should come on the higher zone in their way Indore comes zone 3. The last earthquake recorded in the history was in 1934. Also during 2001 earthquake smaller shocks were felt. and the possibility of an earthquake cannot be ruled out. So, completely ruling out the possibility of a shock would be a mistake Indore has been mostly in zone 3 of the seismic map, and so we can say that there lies quite a risk of an earthquake.

Though people may dismiss that the last earthquake that occurred in Indore was way back in 1934, still as human beings, it is better if we foresee disasters and work towards mitigation. In this regard, the Fire services, Home guard officials and the Municipality officials are quite prepared to meet the needs during any contingency. Adhering to the norms of the building standards is also very important.

B. Earthquake Shakes Indore (4.2)

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4.2 EARTHQUAKE SHAKES INDORE

Sunday, 26 April 2015 | PNS | Indore | in Bhopal

Tremors of earthquake were also experienced in Indore with people in many areas of the city, particularly those living in high-rise apartments, offices experiencing minor jolts.

Apparently in an awe of shock, people rushed out of these buildings and came onto the roads and streets for safety. The intensity of the quake in Indore on the Richter scale has been measured at 4.2.

Like in many parts of the country, earthquake jolts were experienced in Indore at around 11.27 am. Experiencing tremors, people living in high-rise residential and commercial buildings, especially in central and northern parts of the city, rushed out for safety.

From data received from micro seismograph located at Pandhana in Khandwa district, the intensity of this quake has been measured at 4.2. According to seismograph, the first tremor was experienced at 10.42 am with its epicenter being presumed to be 1,890 kms away from Indore.

People living in high-rise buildings on A B Road, Vijay Nagar, Palasia locality, R & T Marg mostly experienced the tremors and its maximum impact was observed at Industry House located on A B Road. Soon after experiencing jolts and tremors, people rushed out of their offices and buildings.

At Industry House, the security in-charge of the building swiftly got the whole building vacated following a warming signal.

A software professional Tanay Shrivastav working in a

Fig. 2: News Paper Cutting I

Industry House located on A B Road. Soon after experiencing jolts and tremors, people rushed out of their offices and buildings.

At Industry House, the security in-charge of the building swiftly got the whole building vacated following a warming signal.

A software professional Tanay Shrivastav working in a software company located on the 7th flood of the Industry House recalling the incident said that at around 12 pm while he was sitting in his office along with his colleagues, felt giddiness and thereafter, felt jerk in his chair. Then one of his colleagues came to him saying that whole building was shaking. In the meantime, safety alarms rang and finally, I came to know that it was an earthquake jolt, Tanay said.

Besides Industry House, tremors were also felt at Corporate Centre Building and Chetak Centre and Jhabua Tower at R & T Marg, Vikram Urbane building Vijay Nagar, Shekhar Planet, Palasia, C 21 Mll, Central Mall and in localities surrounding Regal square, Sapna Sangeeta road, City Centre building on MG Road, Sarafa locality, Dewas Naka, Niranjanpur, in areas surrounding Pardeshipura, Electronics Complex.

At C 21 Mall, people while shopping when experienced tremors. They rushed out of the mall for safety. Tremors were also felt at many schools in the city. No loss of life or property, however, has been reported from any part of the city on account of earthquake.

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News from idealmedia.com

Fig. 3: News Paper Cutting II

C. Earthquake Area of Indore (4.2 Intensity)

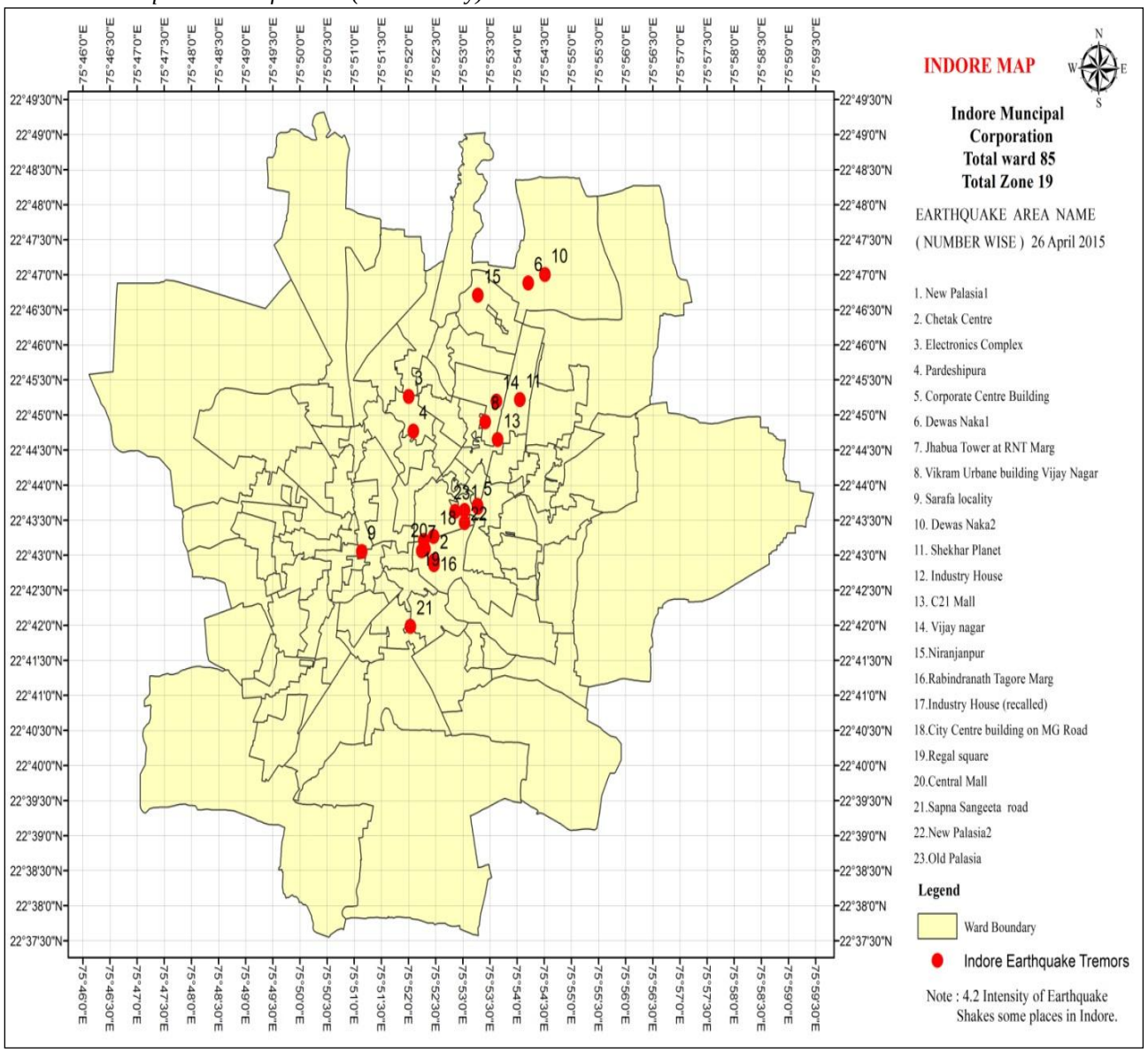

Fig.3 Map showing of Earthquake Area

D. Individual Response

In an earthquake, the general public should follow these guidelines as defined below.

1) Before an Earthquake

- Insurance policies should be check for cover and amount
- Develop a Household Emergency Plan and prepare an Emergency Survival Kit to manage to be for up to two or three weeks.
- Seek qualified advice to make sure houses are secured to its foundations. Also, check that any renovations comply with the IS 1893, IS 4326, IS code 13920 Building Code.
- Heavy items such as furniture should be secured to the floor or wall.
- Share scenarios with others. Talking about surviving and coping an earthquake will help each person to adequately prepare.
- Resource evaluation regarding equipment, transport, hospitals, fire fighting manpower units and so on.
- Draw the hospital contingency plan: surgical units and Mobile field hospitals
- And collect earthquake motion data by suitable instruments.

2) During an Earthquake

- If inside a building, move to a safe place
- If outside, move no more than a few steps, then drop, cover and hold

- If driving, pull over and stop
- If near the beach or shoreline, drop, cover and hold then move to higher ground immediately in case the earthquake.

3) After an Earthquake

- Expect to feel aftershocks.
- If in a damaged building, try to get outside and find a safe, open place.
- Do not go sightseeing to look at the damage the earthquake has caused.
- If there is a gas smell, turn off the gas main outside the building if it is safe to do so.
- If the property is damaged, take notes and photographs for insurance purpose.
- Listen to the radio for information and advice.
- If able to help and it is safe to do so then go to a community sector post to see if you can assist.

VI. LIFELINE

A. Transportation

The transportation system in the Indore District is divided by the mediums in that they use: land transport, water transport and air transport.

1) Land Transport

The road network in the Indore District can be split into three different systems: state highways, local roads and special purpose roads. State highways are generally roads that form part of the integrated national network of roads that are strategic inter-district routes connecting locations of national significance (for example, large population centre, major ports and airports).

Table 1: National and State highway

1. National Highway 52 to NH3 (Agra Bombay Road)	• Start - Sangrur, Punjab • Runs through- Jaipur, Rajasthan, Indore ,Dhule • End- Ankola in Karnataka.
2. National Highway 47	• Starts- Gujarat Bamanbore • Reach- Ahmedabad to Indore • End- Betul at Nagpur

Table 2: Highway goes from Indore

1. National Highway 3	• Connect-Agra to Mumbai and Indore & Dhule
2. National Highway 59	• Start- Ahmedabad • Passed - Godhra, Indore, Raipur, Odhisha ,Brahmapur • End - Gopalpur
3. National Highway 59A	• Indore and Betul

Table 3: State Highway passing through Indore

1. State Highway 27	• Runs from - Jhalawar in Rajasthan • Through- Ujjain, Indore, Burhanpur • End - Malkapur, Buldhana in Maharashtra.
2. State Highway 31	• Neemuch , Ratlam , Dhar

2) Air Transport

Aero planes and helicopters are abundant and widespread in the district due to the high levels of tourism in the region. Currently, Devi Ahilya Bai Holkar Airport is8 km away from the Indore city; The fastest way into and out of the Indore District is by air. airport is essentially the main airport as most commercial flights land. It is the biggest airport in the states of Madhya Pradesh (M.P.) and Chhattisgarh (C.G.) form April 2017- March 2018. Indore has been award as the best airport under 2 million annual passengers. Devi Ahilya Bai Holkar Airport has become an Airport by hosting flights to Sharjah, United Arab Emirates (UAE) from 31st March 2019. During a major disaster such as earthquake, air transportation will become a critical link in the provision of supplies and the transport of people.

3) Railway Transport

The Indore Junction is an A-1 grade railway transport with a revenue of Rs. 50 crore (500 million).The Indore Junction comes under Ratlam Division of the Western Railways. And Ratlam-Indore broad gauge conversion was completed in September 2014. Indore-Mhow section upgraded to broad gauge in 2016 and electrified in 2017. .A new line from Indore to Dahod junction is also work in progress. It would be completed in the year 2022 & 2023. In Indore come six railway stations.

Table 4: Name of Railway Station under Indore

Station name	Station code	Railway zone	No. of Platforms	Kilometer
Rajendra Nagar	RJNR	Western	2	6
Lokmanya Nagar	LMNR	Western	1	3
Indore Junction	INDB	Western	4	0
Saify Nagar	SFNR	Western	1	2
Indore platforms 5	–	Western	0	800m
Lakshmibai Nagar	LMNR	Western	3	4

4) Transportation Management

The transportation system in the Indore District is owned and maintained by several organizations. Trans power is ultimately responsible for the state highways in the area; Nagar Nigam is maintaining all area. The local road network is owned by the Indore District Council and is maintained by Nagar Nigam. The Indore District council also owns airports.

Table 6: Restoration Activity

RESTORATION ACTIVITY	TIME TAKEN
Potholes	1 day to 1 week
Crack Sealing	1 day to 1 month
Temporary bridge replacement	1 week to 1 month
Bridge repairs	1 day to 3 months
Jetty repairs	1 day to 3 months
Runway repairs	3 days to 4 months
Surface deformations	1 day to 1 month
Bridge construction	18 months to 2 years

B. Indore Police

Police organization has to see as a major player in disaster management and Police in the Indore District have a responsibility to serve the community by reducing the incidence and effects or crime, detecting, maintaining law and order and enhancing public safety. There are many police stations in the district. Together they provide services throughout the district 24 hours a day, 365 days a year. The types of services they provide range from 100 emergency services to fire alarms safety and licensing to road policing and theft

1)Functions of Police

- Local Police arrive first.
- Maintain Law and Order.
- Take all measures within their power and authority to facilitate the movement of rescue, medical, fire.
- Assist in the registration of evacuees and the location of missing persons.
- Control access into and out of a disaster area to assist in the efficient response of emergency services.
- Help distribute Civil Defense warning messages.
- Ensuring the security of the Civil Defense emergency operation centers, all hospitals or emergency medical.

2) Police Response Priorities

We need to be addressed during disastrous situations and the agencies responsible for the management, and Police manage lots of tasks describe below.

- Impact Assessment and Reconnaissance
- Emergency Operations (Pre-declaration)
- Warnings & Public Information
- Evacuations
- Care of Deceased
- Perimeter Control
- Transport
- Emergency Shelter

C. Hospitals

Health facilities, hospitals are among the facilities that can suffer severe damage in the time of natural disasters especially earthquakes. The purpose of hospitals and health services is to provide the most effective treatment for injured and distressed people during an emergency through the integration of all medical resources in the community.

The responsibilities of health providers are not changed due to a state of emergency. Wherever possible, the normal system for the movement of Casualties and their documentation and treatment will be used and health professional will continue to work using standard procedures and in familiar surroundings to the greatest extent possible.

Table 7: Emergency Number

CHILD HELPLINE	1098
We Care for You (Indore)	0731-2522111
Ambulance	102
Emergency Response Services 24/7	108
Fire services	101

1) Health Services

- Their services in emergency and after the disaster: Search, rescue, relief and recovery
- The people in these centres: Including medical teams, such as doctors and nurses, a technical team such as professional staff and support and others such as patients, elderly, children and visitors.,
- The important and costly medical equipment: MRI, Heart Scan and other equipment.

2) Health management

Part of the health management activities is during the disaster which is as follows:

- Awareness of the existing conditions.
- Guiding patients and other hospital personnel.
- Controlling the information and notifying to the search, relief, and support teams.
- Public awareness through mass media.
- Conducting a list of the emergency numbers of patient's relatives.

VII. CASE STUDY JAWAHAR MARG BRIDGE

Jawahar Marg Bridge is located at Siyaganj in Indore Madhya Pradesh, it is at an elevation of 552 meters above sea level, in Indore and having a life of 65 years and constructed of stone masonry in 1951 on Saraswati River to connect the various areas of Indore and reduces the traffic problems in Indore.

Fig. 4 Jawahar Marg Bridge

A. 65year old Bridge had collapsed after the rains (October 1, 2018, 8:06 am)

The 65-year-old bridge damaged and dilapidated Jawahar Marg Bridge began early on Sunday morning. The Indore Municipal Corporation(IMC) commissioner Ashish Singh reached the spot the dismantling drive began.Half side of the bridge was dismantled after which the other half fell off marking the weak bridge's condition. IMC used four poclain machines to dismantle the bridge. Some residents had also gathered at the spot. IMC officials said the debris of dismantled bridge would be removed using dumpers within 8 to 10 days. The debris will be dumped in earmarked landfill areas across the city.

Fig. 5 Bridge damaged due to heavy rain.

Fig.6 the 65-yr-old bridge had collapsed after the rains

B. Bridge weakens brick by brick

The bridge is weakening brick by brick. On Friday evening, the plaster of a pillar had started peeling off. Many bricks had also fallen off making the bridge rickety and weak. A portion of the huge pillar had fallen apart. Fearing that it could collapse, the IMC had barricaded the bridge and stopped vehicular movement on it. In the morning, more bricks fell off from the pillar weakening it further.

Fig.6 Bridge weakens brick by brick

D. Jawahar Marg bridge 'bandh' for 6 months (24 September 2018 10:16 am)

Friday was officially sealed for six months on Sunday; traffic police faced a hard time in managing traffic on this busy road which connects the eastern part of the Indore city to the western regions. The vehicular movement generally remains very less on Sundays but jams still took place on roads which connected Jawahar Marg as a bridge on it was closed. Police teams which were deployed on connecting roads to divert traffic had a tough time. They diverted all the traffic moving towards the bridge to MG Road or Pandrinath/ collectorate road which led to increasing in pressure on the roads. Jam like situation took place on both MG and Pandrinath Road too.

E. Police manning bridge give up

Seven policemen were deployed at the bridge to ensure that nobody crosses the barricades put on both sides of it. Till 2 pm, they turned every person reaching there but then they gave up. They told their senior officials that it would be impossible to stop people from entering the barricaded area all day. They feared that people coming to Rajwada to see tableaux procession in the evening would enter the restricted area, and the bridge could collapse. Indore Municipal Corporation sent tin sheds to seal the bridge.

E. Less Traffic on Jawahar Marg

Being a Sunday, there was less traffic on Jawahar Marg, which generally sees around 2 lakh vehicles every day. As it's a local holiday on Monday, the situation would be somewhat the same as it was on Sunday. But on Tuesday, there may be chaos when two lakh vehicles would take diverted routes. Handling the situation on that day will not be easy for traffic police. In the traffic department, 90 per cent of officers are new to the city. So they are finding its detailed plan for diversion.

F. Why Jawahar Marg Bridge Collapse

There are many reasons for the Collapse of Jawahar Marg Bridge

- The bridge life is 65 years, and due to heavy rain, the pier collapse and the bridge collapsed.
- One of the reasons for the bridge collapse is traffic load, as when it is designed the traffic load is not assumed as the today traffic; therefore, the bridge collapse.
- Foul gases badly affect the structure, the nature of gases is acidic, and it continuously deteriorates the structure.
- Sewage water touch from the structure and above the water level of the structure is affected by the fusion gases.
- Joint water leakage is also one of the reasons for bridge damage.
- From the general investigation, it is found that some stone part is removed slowly and damaged and Nagar Nigam do jacket of one pillar also but some other pillar collapse, and due to pillar collapse the bridge is collapsed.

G. Take these routes After the Collapse of Bridge

- People who want to go Rajwada or surrounding markets by Jawahar Marg should now take Nandalalpura route

or Prince Yashwant Road near Rajwada.

- Commuters using Jawahar Marg to reach collectorate and Mhow Naka should take Rambagh route. They should go to Bada Gapanti from Rambagh Square and from there Mhow Naka and collectorate.
- Those who want to go to Harshiddhi or Pandrinath should take the turn from Safi Hotel and reach the destination by passing through Juni Indore and Raoji Bazaar police station.
- Those who want to come to the centre of the Indore city from the collectorate side should take the Tower Square route. People who want to reach Sarvate bus stand should use Juni Indore and Murai Mohalla routes.

H. Bridge closed till the new one is constructed

City Engineer Mr. Arun Goyal said that the 65-year-old bridge had been closed till a new one is constructed at the place. He said that it might take around six months for the new bridge to be constructed. He signalled at starting construction of a new bridge within a fortnight. "Whatever official formalities need to be done will be done at the earliest and the construction on the bridge would be started. Jawahar Marg Bridge is also part of the Smart city project.

Fig.7 Construction running at the day

Fig. 8 Construction running at the night

I. ***Bridge completed duration***

(Work started on 1 October. And completed at 25 January)
Jawahar Marg Bridge, Built by the City Improvement Trust in the city between 1951, broken on September 22. And Danik Bhaskar explained the problems of the public to the responsibilities of the corporation. Monitor every day, and Countdown.

The effect was that the government system also worked on a project related to the public in mission mode. And now result, the bridge was ready in 115 days. On Saturday 12.30 pm, the bridge will be inaugurated by Cabinet Minister Jitu Patwari, Mayor Malini Gaur, MLA and Leader of the Opposition.

Fig 9: Bridge work completed

J. Jawahar Marg Bridge new construction

Tender detail for Jawahar Marg Bridge new construction process.
DA Tenders from Madhya Pradesh Tender Notice - 17684622

Table 8: Tender Detail

TDR No	17684622
Tender No	MPISCDL/TENDER NO -221
Tendering Authority	Development Authority
Tender Brief	Construction of Jawahar Marg Bridge On River Sarasvati, Near Sanjay Setu
Competition Type	Indian
State	Madhya Pradesh
Publish Date	01/10/2018
Due Date	08/10/2018
Tender Opening Date	08/10/2018
Key Value	Document Fees
Refer document	EMD

The tender for new construction of Jawahar Marg Bridge is given to Parth Contractors, and Nagar Nigam give completion time of 5 months for the project, and if the project does not complete on time, the Nigam will charge one lakh rupees fine for one day from company.

K. Early Bridge construction completed as a Record for Indore City

Jawahar Marg Bridge completed early at the time. And Bridge construction as a record for Indore. This Bridge completed in 115 days. And the total cost of construction is 7 crore. And the bridge was collapsed at 22 September 2018 at night.
In tender, the completion time was fixed for bridge construction is 5 month. And the condition was that if the construction of the bridge was not completed at the time, then Nagar Nigam will be charged 1 lakh rupees for one day. And if construction will complete ago 5 months, then 1 lakh rupees will have to give to Nagar Nigam in the form of prize every day.

Awareness of Nagar Nigam and hard work paid by company employees day and night will have given very well, and the result has completed work at 25 January 2019 in 115 days and 26 January traffic was allowed for public.
And the dimension of new bridge 60 feet width and 150 feet long. Bridge railing is designed the same as the railing of Dubai bridge.

VIII. CONCLUSIONS

In Indore, there are very efficient public sector organizations and media (FM staions) such as the transport department (which can work along with Police department) e.g. AICTSL, medical facilities such as Bombay hospital, Medanta

hospital, CHL, Apollo, Choithram etc., fire fighting department etc. which can work as a team during the earthquake. Many committees should have members, e.g. Panchayat, Social welfare, District Manager, NABARD, District Women & Child Development Officer, Lead Bank Officer the Public Works Department, business organization represent and other interested persons in the Indore of disaster management. The following points should be considered for the Indore city for Earthquake Preparedness.

A. Preparedness

- District-based Disaster management planning (Risk reduction, Preparedness, Response, Recovery)
- Review and upgrade DM plans.(National crisis management committee, Crisis management group, District planning Committee, District emergency control room)
- Review policy of disaster management.

1. Hazard and Vulnerabilities monitoring & analysis,
2. Regional Early Warning monitoring & analysis,
3. Emergency Disaster Reporting & Communication to the Public,
4. Principles & Responsibilities for effective early warning.

- Assist and participate in the preparation of DM plans at district, IMC, and gram panchayat level.
- Support in preparing hazard strategy and plans for structural and non-structural.
- Training of common peoples for preparation during and after earthquakes.

B. Preparedness before emergency response

- Maintenance of Law and Order.
- Care of the sick and injured.
- Preservation of life and safety.
- Animal care.
- Missing person search.
- Protection of property.
- Inspection of damage.
- Disposal of dead bodies.
- Identification of sources for supply of drink water.
- Coordination of volunteers.

C. Disaster recovery

- Minimizing the escalation of the disaster.
- Restore infrastructure and lifelines.
- Create and maintain the disaster recovery plan.
- Co-ordinate inspections of structures (schools, hotel etc.) for repairs/replacement of damaged buildings.
- Manage emergency group activities.
- Formulate recovery policy and strategies.
- Create a time frame for recovery actions.
- Monitoring recovery activities.

D. Earthquake shakes in Indore

Data received from micro seismograph located at Pandhana in Khandwa district. The earthquake in Indore has been measured intensity 4.2 on the Richter scale at 4.2 during 26 April 2015 of Indore. According to a seismograph, the first tremor was experienced at 10.42 am with its epicentre being presumed to be 1,890 km away from Indore. And came shakes another area of Indore, that show with the help of a map with latitude and longitude.

E. ***Lifeline***

If transportation system damage in future due to the earthquake so in this situation, volunteers cannot help for supply food, water, and any other neediness thing as per requirement. And in that case, tourism want to go outside form the city so Land way, Railway and Airway system it is necessary required.

F. ***Emergency Services***

- Hospital: Hospital where the doctor looks the entire population of the district, so this service is very important role play for injured person form the disaster.
- Police: The local emergency will be ordered to give police the power to control the affected area from an earthquake. e.g. Jawahar Marg Bridge, This required for completely blocking traffic. And managing of incoming persons to near district routes.

G. Case study

This case study investigated the failure of the Jawahar Marg Bridge. And the bridge collapse due to heavy rain on 22 September 2018 and the new bridge was constructed over the site within 4 month. The bridge tested by 250 Ton load of stone Track by Nagar Nigam. And traffic started on 1 February 2019.Construction of Jawahar Marg Bridge completed early at the time. New bridge construction as a record for Indore.

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