

RESCUE AND EMERGENCY MANAGEMENT OF A MAN MADE DISASTER: LESSON LEARNT FROM CAVED IN TIHRA TUNNEL, HIMACHAL PRADESH

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Abstract

Disaster Management is a strategic planning and procedure that is administered and employed to protect critical infrastructures from severe damages when natural or human made calamities and catastrophic occur. The paper covers the accident in the Tihra tunnel in Kiratpur Ner Chowk, the four lane expressway to pen down the human induced disaster in which a portion of under construction tunnel caved in and it was the first such rescue in which two of the three trapped individuals were evacuated safely after nine days of continuous operation. The paper analyses the strategy followed for the management as well as make suggestions for mitigating such incidents in future.

The present case study is based on the authors' association with civil administration in management of a manmade disaster caused by the caving in of the Tunnel. The paper presents a firsthand description of a disaster and its prompt management to a logical end. The data was collected from the records of the district civil administration. The approach used was both quantitative as well as qualitative. It included data collection from the primary sources of the district collectorate, conversation with the district civil administration and army officials who organized rescue operations, casualty management, and informal discussions with local residents and relatives as well as officers concerned. The reports of various media houses were also taken into consideration while writing this paper.

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Material and Methods

Three core disaster management strategies were adopted to manage the crisis. These included:

- 2.1 Response
- 2.2 Rescue, and relief operations,
- 2.3 Casualty management

2.1 Response

The initial response was carried out immediately by the District Administration. From the initial report on the spot, the district administration was not able to make out the exact number of individuals trapped inside the caved in tunnel. Local people and the company officials feared that the number may be large. After detailed enquiry at the site office and the local people, it came out that there were twelve persons who were going towards 275 meters position for night shift out of which nine individuals ran outwards when the tunnel caved in at 120 meters and unfortunately three persons ran inwards to save their respective lives. The individuals who came out were in trauma and not able to respond. The contact between the innermost site of work and the outer portal through the telephone and the oxygen supply has got disrupted and hence the whereabouts of those feared to be trapped inside was not known and their life was at risk. The District administration reported the accident to the state government on the designated format. The services of the Army, NDRF and experts in Himalayan geology from Jaypee and SJVNL were requisitioned by the district administration led by Deputy Commissioner Manasi Sahay Thakur. They established contacts with experts in the same field from Border Road Organization and its tunnel expert Mr R S Rao, Director(Tunnels), Rohtang Tunnel Project reached the site and the rescue operation was started with his technical assistance from day one. The administration also played a role to persuade the local people, manage law and order at the site and issued directions to the search and rescue team.

2.2 Rescue and relief operations

During the rescue operation, various officers and other dignitaries from the state government not only followed up the operation at personal level but also visited the site. The administration made efforts to apprise all the visiting dignitaries about the progress of the operation. All possible efforts were made by district administration for early rescue of the trapped workers. The efforts include calling up all emergency teams, managing local law and order for smooth functioning rescue teams and company involved and keeping the media updated with all information at par. The administration made arrangements for regular press updates and also boarding, lodging and counselling of the family members of the trapped individuals.

2.4 Causality Management

The District Administration has deployed doctors along with paramedical staff round the clock for causality management. The process was completely video graphed. The news of establishing contact with two individuals spread like wild fire and the family members and all the persons involved in the operation were very happy. This moment also encouraged the administration and without losing any time it directed the company to make alternative road to the top of the tunnel from where drilling can be done to evacuate the individuals. When two of the three workers trapped in the under-construction tunnel, Satish and Mani Ram have responded to remote video calls, the deployed doctors enquired about the health status and other requirements and supplied food, water, medicines etc. to the trapped persons. They have been provided with ORS liquid, water, dry fruits and khichri through a pipe injected vertically. Efforts were on to establish contact with the third worker, Hriday Ram. The families of the trapped individuals were consoled by and then by the administration as well as company officials. An ambulance was deputed at the site so that the trapped individuals can be taken to hospital immediately once they are rescued. A team from the Fire department of Himachal Pradesh has also been called as an alternate..

3. Observations and Results

The results have been designed according to the work done on daily basis and achievements of a particular day.

3.1 Day 1: The search and rescue operation continued uninterrupted from day one under technical assistance of Director Rohtang tunnel project. The work of removing debris and muck was continuous; however the muck and water kept pouring from top and virtually the heap of mud remained the same even after 24 hours. The situation was worrisome and other workable options were being explored. By the evening the process of removal of debris was stopped and a Boomer (a horizontal boring machine) was placed inside the tunnel and activities were started to get through the debris by inserting penstocks of 120 mm diameter with the help of Boomer from the left side of the tunnel. It was thought that this would enable the rescuers to establish contact and also supply water, food, light, oxygen and essential items to the trapped individuals till the time they are not rescued physically. However, contact with the three trapped labourer namely Satish Tomar from Sirmaur, Mani Ram and Hriday Ram both from Mandi could not be established till now. Along with the horizontal insertion of GI pipes with the help of Boomer, another boring of one meter diameter by hydraulic pressure was started from the right side corner of the collapsed tunnel for evacuation of the trapped victims. The process was cumbersome and after many initial hiccups the process was started. The process of inserting G I pipes by using boomers was started on three sites and continued till late hours of next day. It was reported that G I pipes were getting broken after insertion of 4-5 GI pipes (each 3 meters). It was observed by the experts that the process of passing GI through the muck is going to take a lot of time and it will be difficult to establish contact with the victims early. After detailed discussion, it was decided to work vertically also by digging bore from the top of the hill. The hill over the tunnel was to be pierced horizontally so as to create connectivity with the individuals trapped inside the caved in tunnel. However, easier said than done, the hill top was covered with thick vegetation and moreover there was no access to the top of the hill. It was not clear as to what can be the most appropriate place for piercing the hill. The experts sat and under all pressure to establish contact with the trapped individuals at the earliest, decided to locate the vertical boring machine about 60 meters away from the place where the tunnel caved in.

There were many doubts in going for vertical boring but still the administration went with the decision and the company started to take the machinery to the point. The same is reported by Amar Ujala and other media houses.

3.2 Day 2: The teams of NDRF and Army reached the site and they undertook detailed survey of the site. For technical expertise, a team of BRO experts were also called but the expert from Rohtang Tunnel Project was providing his guidance from the beginning. When the machinery on the top of tunnel started operating, the administration started thinking about a mechanism which can enable them to establish audio visual connection within the caved in portion of the tunnel. Such connectivity can provide insight of the situation inside the tunnel and the search and rescue operation can be progressed accordingly. The drilling almost went smoothly except at about 35 meters depth when it encountered obstacle and the speed of drilling got dropped to few inches per hour. At the same time, the drilling from inside the tunnel was also going on. The supervision of the work was ensured in shifts and officers from district headquarters were deployed for the same. The High court of Himachal Pradesh took cognizance of the news printed and sought reply from district administration in this matter.

3.3 Day 3: A meeting with the representative of NDRF, Army; experts from BRO, SJVNL, Jaypee and the administration was convened and the representatives from NDRF and Army intimated that they can't help in the present situation due to technical nature of the rescue operation. However, they assured that they will provide all assistance when any evacuation process is to be carried out at a later stage. Hence, the NDRF and Army teams were relieved from the site. The process of vertical drilling was going on uninterrupted and at the same time the horizontal drilling with boomers and penstocks of 1.2 meter diameter was also carried out.

3.4 Day 4: A little success was achieved as the process of drilling vertically crossed the rock and it reached the empty space of the tunnel. This was followed by insertion of complete GI casing until the end of the tunnel and immediately the technical team started to work for inserting small night

vision camera along with microphone. Later that evening, almost 96 hours after the accident when the team from the top of the tunnel called the name of trapped person Satish tomar and a soothing voice came from the inner side the tunnel and the persons trapped inside responded after some time upon locating the place of camera. The two way communication was established and the details of persons present inside the caved in tunnel was received. The two trapped persons namely Satish Tomar and Mani Ram were viewed on camera after 96 hours of the incidence. The Deputy Commissioner talked to both the trapped persons and assured them that she will not leave any stone unturned to bring them safe. The doctors enquired about their health status. The process was completely video graphed. This moment also encouraged the administration and without losing any time it directed the company to make alternative road to the top of the tunnel from where drilling can be done to evacuate the individuals.

3.5 Day 5: As Satish and Mani Ram have responded to remote video calls and have been provided with ORS liquid, water, dry fruits and khichri through a pipe injected vertically. The process for construction of road to the top of the tunnel was in progress and the company has called latest machine for making 1.3 meter diameter vertical bore from Jaipur.

3.6 Day 6: The work on approach road to the top of the tunnel was going on uninterruptedly and the machinery for drilling 1.3 meter bore has been got placed on the spot and the process to drill was started. In the meanwhile the check-up of the trapped persons by the doctors and supplying essential items to them was continuous. The NDRF team has been called again and they reported at the site for the process of evacuation.

3.7 Day 7: The work on the drilling was disrupted after the machinery developed some fault as the spare parts as well as mechanic are not available locally and the same has been called from Delhi.

3.8 Day 8: Almost the last 3-5 meters was now remaining for boring. The rain also played spoilsport and the rescue operation was stopped due to heavy rains. The team of NDRF has brought its equipments to the site.

Visualizing the delay and the report of the trapped persons that the water inside the tunnel is increasing at a fast pace, I & PH department was asked to bring machinery on the spot to suck out water from the tunnel. It was reported by the company officials that the boring machine is not able to go through the last about one to two meters which may be due to the girdle ribs at the inner top of the tunnel. In such a situation, local driller was called and asked to get through the hurdle by using small hole boring machine. The hope was already in fractions as it was considered tough to overcome a problem which a heavier machine could not get. He succeeded in getting through the hurdle through 4 inch diameter boring. This was followed by multiple bores at the site so that the heavier machine can get the 1.3 meter bore complete.

3.9 Day 9: The final boring was completed by the heavy machine and it was planned to go inside the bore. Sub inspector Naresh Pal of NDRF was the first rescuer to go down the 1.3 meter wide and 40 meters deep hole at 9.21 am, and stayed for 45 minutes inside the bore where he hit a 2-ft concrete block that could not be removed even with a gas cutter. He informed that if manual cutting had been done, it will take one or two days more. On Pal's advice, the heavy driller was pressed back into action to clear the cement and steal. After making the hole complete, the another NDRF rescuer, Ashok Kumar Samotia, dropped down using ropes around 3.15 pm. Within minutes, in an operation monitored on camera, Samotia reached Mani Ram. "The tunnel was filled with waist-deep water and both the workers were standing at one corner of the tunnel as reported by the rescuer. Within no time both Mani Ram and Tomar came out of the tunnel and both were rushed to a hospital and the NDRF team searched inside the tunnel to trace Hirdey but without any success.

3.10 Day 10: The work which was continued till now of horizontal boring was stopped as the instruments showed that the seismic activity in the tunnel increased and can lead to more devastation. Therefore, the administration was monitoring the progress of grouting of the hill and waiting for the technical report of the stability so that rescue operation can be progressed further. The passing of each day was very difficult for the family of the untraced Hriday Ram, as no one was able to give the details of his whereabouts. The rescue operation continued for next ten months.

The information of founding body parts of Hriday ram was given by the company to the administration and the family members. The body of Hriday Ram (52), couldn't however, be taken out immediately, as the construction company has to first strengthen the portion of the tunnel and thereafter move slowly to retrieve the remains so that the body is not damaged and in the presence of family members, the body of Hriday Ram was brought out from the tunnel.

Discussion

The concerted efforts of the district administration along with the experts of Himalayan geology and the executing company resulted in achieving a difficult task. The lack of scientific advancement and any laid down standard operating procedure was the major bottlenecks in safe rescue of two trapped individuals and displayed a sense of responsibility in excavating the remains of third individual only after assuring the safety of future operation. The operation also established the administrative capabilities of the system to take immediate steps for any unforeseen situation.

All said and done, although only technical persons can point out the exact reasons of the mishap, the major deficiencies noted from the data sources during the operation are as follows:-

1. The DDMP has not visualized any probability of such incident despite the fact that the planning of the project was envisaged in the year 2012. The concerned department has not included any specific protocol of mock exercise for such disaster.
2. The district administration was not aware of the working schedule and standards of the company and hence only reaction to the present disaster was made. The administration has even not asked the company to provide details of their preventive steps in such underground works.
3. The use of latest technology like whatsapp group for sharing all necessary updates within the officers and the media was appreciated by the media, as it enabled free access to authentic information.

4. The enquiry report has mentioned that the inspections of the NHAI were not as per schedule due to which there was no proper check on the company.
5. The company had not followed the security instructions as per laid down instructions due to which there was no telephone connectivity, no supply of oxygen and no escape tunnel.
6. The rescuer agency like NDRF was also hesitant in taking up the work immediately. The head of the organization informed that it is first rescue operation of this kind for the NDRF as well. It was also observed that the NDRF showed initial inability citing their departmental procedures due to which the district administration requisitioned state Civil defense personnel as part of contingency plan of evacuation through 1.3 meter vertical bore.
7. As per previous practice the rescue operation was only the task of Deputy Commissioner and the Superintendent of Police. The contribution of other departments was minimal.

Recommendations

On the basis of the present study of a new type of disaster, the following are the recommendations to be considered by appropriate authority:

1. Invariably the opinion and advice of the experts of the concerned field is useful and it should be sought at the earliest.
2. The separation of duties and responsibilities in such situation resulted in better management of rescue operation, making arrangements of necessary logistics, attending VVIP's and also replying the CWPIL during the operation.
3. The standard operating procedures for all possible disasters in view of the developmental projects should be framed and circulated.
4. The mock drills of the SOP's should be frequent so that every stake holder is aware and responsive at the time of need.
5. The monitoring agencies should be held responsible in case of such lapse.

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