Damage assessment of tunnels during earthquake

Nidhi Gautam[1] , Rishi Bhalavada[2] , Dr. J.K.Sharma [3]

[1]M.Tech. Scholar(C.E.) Rajasthan Technical University Kota, Rajasthan (India)

[2]M.Tech. Scholar (C.E.) Rajasthan Technical University Kota, Rajasthan, (India)

[3]Professor Department of civil Engineering Rajasthan Technical University, kota Rajasthan, (India)

ABSTRACT

The utilization of underground structures, for example, burrow for trams, parkways, material stockpiling, and sewage and water transport is expanding in created countries. Tunnels being underground structures have for some time been accepted to be able to maintain quakes with little harm. This work is depicts the discoveries of a deliberate evaluation of harm in the mountain burrows after the Earthquake. Harm from little to substantial splitting was watched both at the entryway and inside the passage, while areas near the blame totally crumbled A passage going through an uprooted blame zone will endure harm.

Keywords: Earthquake, mountain tunnels, fault damage, seismic, underground structures

I .INTRODUCTION

The basic conduct of mountain burrows amid seismic stacking has been examined by various researchers. Dowding and Rozen (1978) made a database with 71 burrows that endured harm amid a quake. They revealed diverse levels of harm, running from breaking to conclusion, in 42 tunnels.Sharma and Judd (1991) assembled a database with the reaction of 192 passages amid 85 seismic tremors all through the world; 94 of the passages experienced little to substantial harm. Asakura and Sato (1996) gathered an expansive number of case histories of mountain burrows in Japan subjected to seismic tremors; distinctive levels of harm were seen in 124 of the passages; 53 of them endured substantial harm. Wang et al. (2001) gave a deliberate evaluation of the harm saw in mountain burrows due to the Earthquake.earthquake harm in passages to be restricted at segments with two vital qualities: those going through uprooted deficiencies, which were harmed by shear powers that created amid the seismic tremor, and those close surface slants which were harmed inferable from slant disappointments

II. EFFECT OF EARTHQUAKE ON TUNNEL

Impact of tremor waves on an underground structure is identified with three factors in particular (I) source region,(ii) transmitting area and (iii) site district. After tremor event in source area, waves transmit the created vitality to the underground structure. In light of damping impacts in the transmitting region,only part of aggregate vitality will achieve the structure. Separation of the site from the source area and sort of material influence last impact of seismic tremor on the structure. Point by point overviews were then performed for burrows that were altogether harmed, utilizing lining break mapping, photograph recording, and estimating of the significant split attributes The inside of the passage additionally endured huge harm. This was as overwhelming breaking and spalling at the crown and at the sidewall he evaluation of underground structure

IJARSE
ISSN: 2319-8354

seismic reaction comprises of three noteworthy steps:1. Meaning of the seismic powers and improvement of the seismic parameters for analysis.2. ground reaction to shaking, which incorporates ground disappointment and ground deformation.3. Evaluation of structure conduct because of seismic shaking including (a) seismic plan stacking criteria, (b) burrows structure reaction to ground disfigurements.

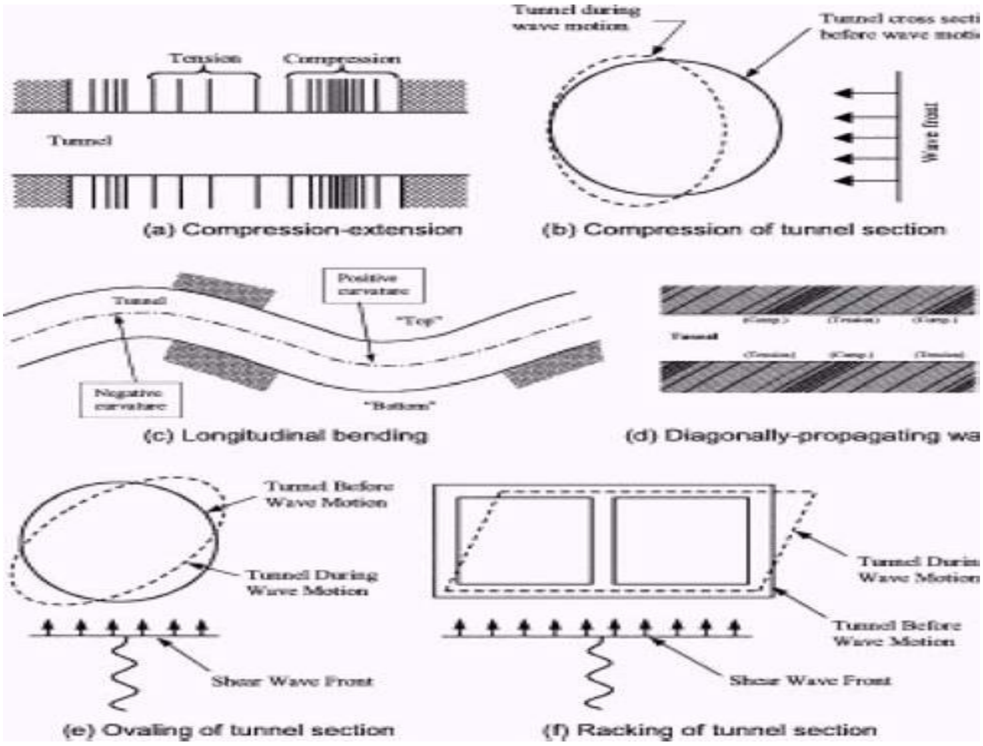


Fig. 1. Deformation modes of tunnels due to seismic waves

III. Types of damage patterns

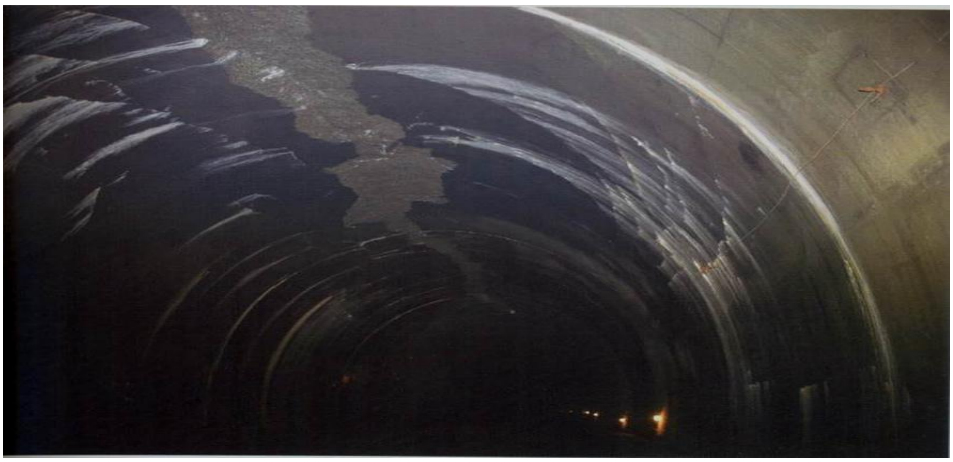


Fig. 2. Spalling cracking of the inside the tunnel.

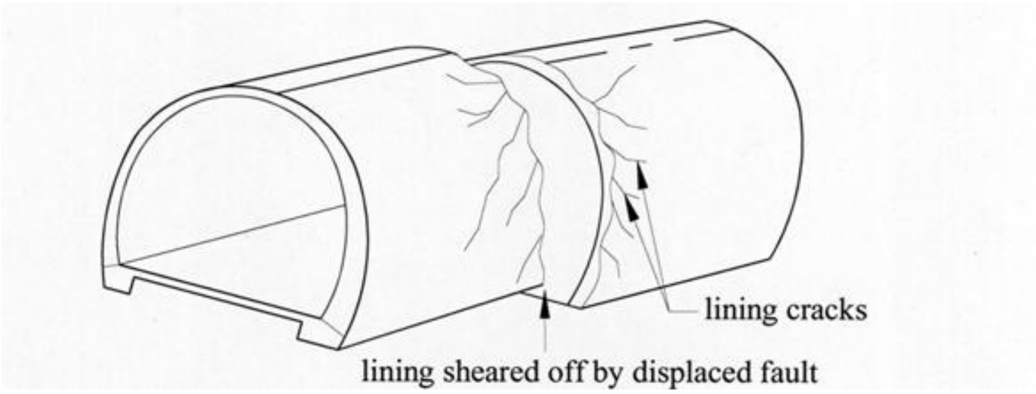


Fig. 3 sketch of sheared off lining damage.

Fig. 4 Inclined cracking at the sidewall with water leakage and spalling.

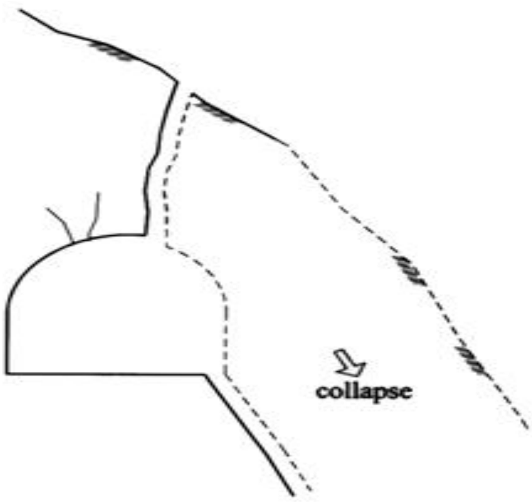


Fig. 5 sketch of damage pattern

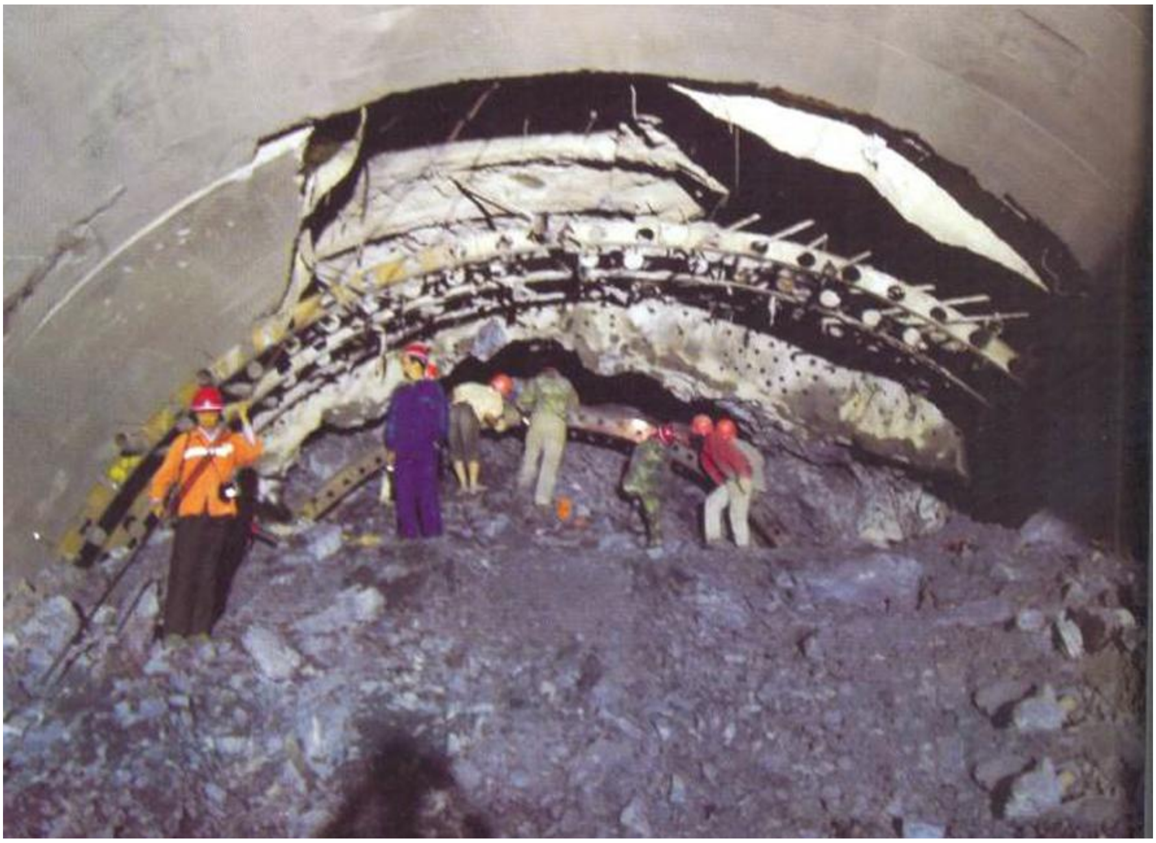


Fig. 6 Collapse of the tunnel at the crossing of the fault.

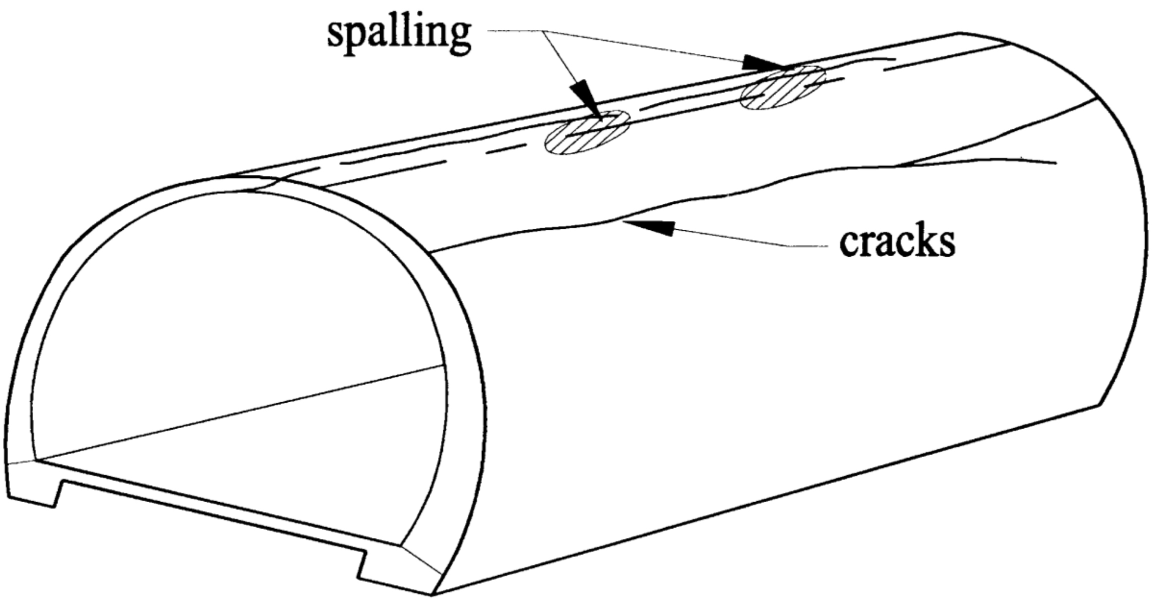
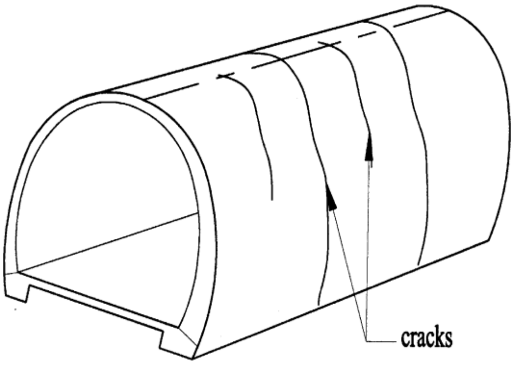
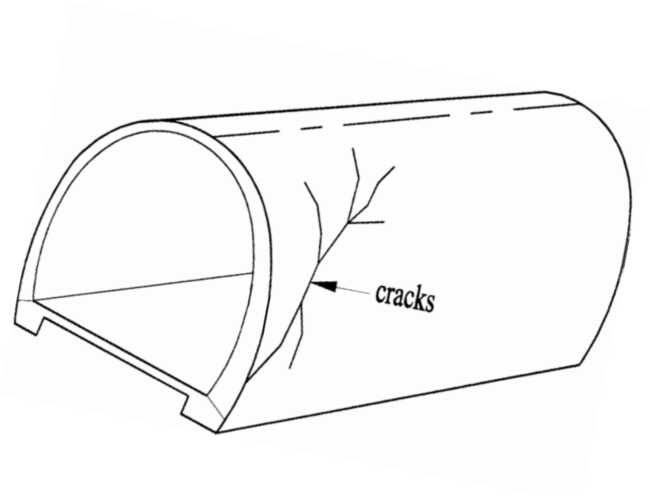


Fig. 7 sketch of longitudinal cracks damage





Damage pattern - transverse cracks.   Damage pattern - inclined cracks.

Fig. 8 Show Types of Cracks

IV .CONCLUSION

The most severely damaged tunnel sections in the hanging wall are those close to surface slopes or portal openings, while sections with a thick overburden generally suffered less. Nevertheless, however badly the tunnels were damaged, they remained relatively unscathed when compared to surface structures. The extent of damage to tunnel linings was influenced by the position of the tunnels in relation to fault zones, ground conditions, and closeness to the epicentre and surface slopes. Additionally, the presence and type of lining and lining reinforcement, and any unusual condition in the linings are also important influence factors.

V.ACKNOWLEDGEMENTS

This is to recognize our obligation to under direction of resources of University College of Engineering (RTU) Kota, Rajasthan for their direction and recommendation for setting up this article. Theirs transcending nearness introduced in us the cutting to work harder and finish this overwhelming ta autonomous investigation. We are profoundly appreciative for his enlightening direction and support demonstrated to us all through the finish of this report.

REFERENCES

[1.] Haitao Yu a, Juntao Chen b, Antonio Bobet c, Yong Yuan d,⇑ Damage observation and assessment of the Longxi tunnel during the Wenchuan earthquake

[2.] W.L. Wanga, T.T. Wangb,_, J.J. Sua, C.H. Lina, C.R. Senga, T.H. Huangb Assessment of damage in mountain tunnels due to the Taiwan Chi-Chi Earthquake

[3.] Asakura, T., Sato, Y., 1996. Damage to mountain tunnels in hazard area. Soils Foundations, Special Issue, 301–310

IJARSE
ISSN: 2319-8354

[4.] Bernaud, D., Maghous, S., Buhan, P.D., et al., 2009. A numerical approach for design of bolt-supported tunnels regarded as homogenized structures. Tunnel. Underground Space Technol. 24, 533–546.

[5.] Asakura, T., Sato, Y., 1996. Damage to maintain tunnels in hazard area. Soils Foundations, Special Issue, 301_310.

[6.] Asakura, T., Sato, Y., 1998. Mountain tunnels damage in the 1995 HYOGOKEN-NANBU Earthquake. Q. Rep. RTRI 39 (1)., 9-16.

[7.] Dowding, C.H., Rozen, A., 1978. Damage to rock tunnel from earthquake shaking. J. Geotech. Eng. Div. ASCE 104 ŽGT2.,

[8.] 175_191

[9.] Sharma, S., Judd, W.R., 1991. Underground opening damage from earthquakes. Eng. Geol. 30, 263_276.