

# **Road Over Bridge CUM Road Under Bridge :** **Innovative Solution to Ensure Closure of L-Xings**

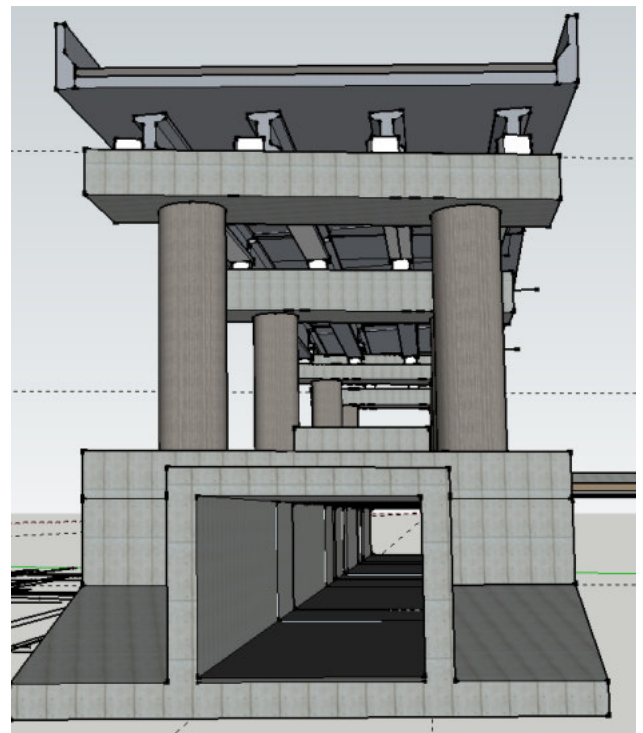
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*Elimination of Level Crossings by construction of grade separators is gaining momentum to reduce casualties and train accidents. At some locations, even after construction of Road over Bridges (RoB), the closure of level crossing is difficult task due to resistance from local people and politicians of the area, even though consent of Local administration is obtained prior to clearance of plans. An innovative design of "RoB-cum-RuB " have been developed, which solves the problem of non-closure of L-Xing even after construction of RoB by providing an Road under Bridge (RuB) within open foundation of RoB. This design reduces requirement of land width due to non-requirement of of footpath and attached staircases and further land width for separate RuB, if compelled by local people before allowing closing of level crossing. The RuB provides easy path to local people to cross Railway land as well as prove economical to the extent of recurring savings of 120 crores per year, if about 200 RoBs are constructed per year using such RuB as integral part of its Open Foundation.*

The design of RoB with open foundation instead of pile foundations have been stressed upon by Railway Board in 2014. Traditionally, open foundations are designed having a connecting beam between columns and both side cantilever slabs to transfer the load on soil through its spread size to the extent of bearing capacity of soil at that depth.

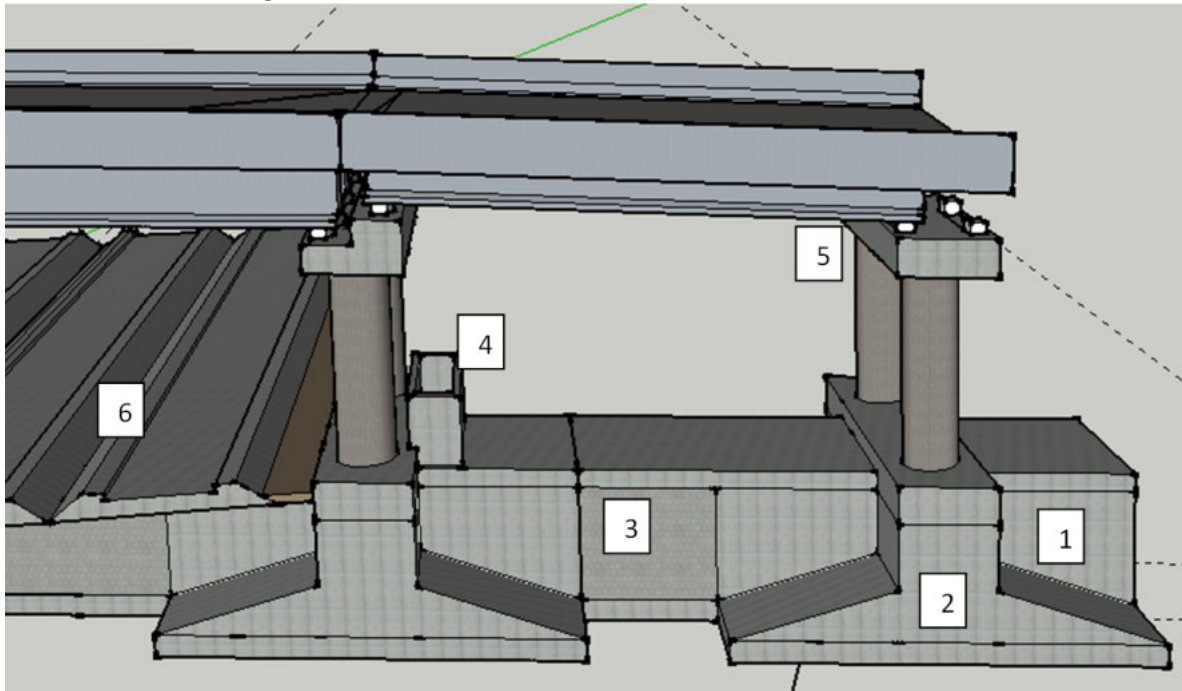
Innovative design with one Road under Bridge (RuB) within open foundation of RoB have been developed and the construction of such bridge is in progress at Sonipat Bypass location by NR Construction. This design allows same area of open foundation, as provided by traditional footing to transfer the load on soil in addition to opening within foundation, which works as RuB to local people/small vehicle to cross the Railway land by using the ramps. Fig-1 shows perspective view of "RoB-cum-RuB".



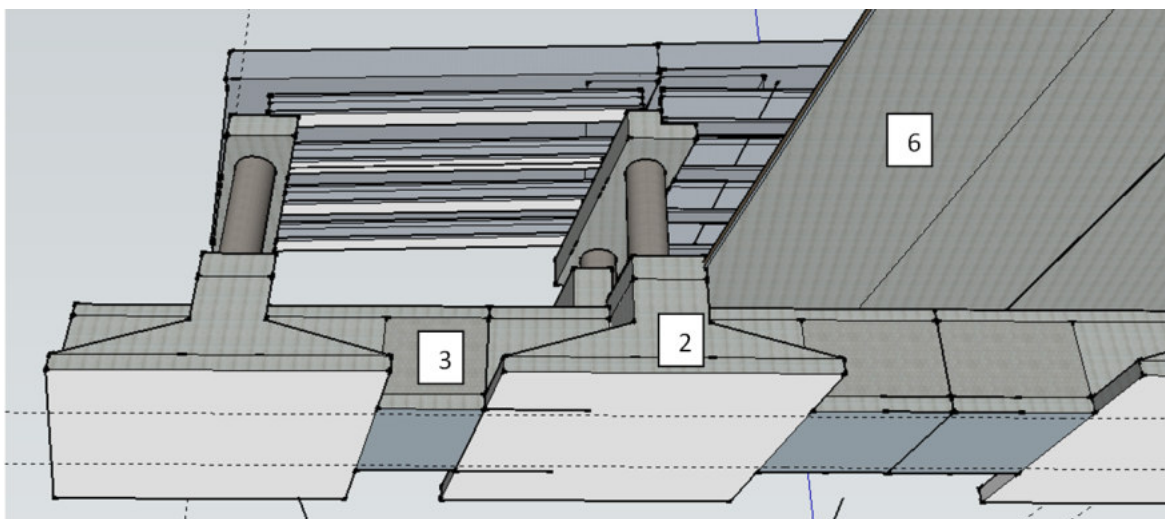
**Fig-1: Typical Perspective View RoB cum RuB**

The details of Open box being proposed as RuB, marked in figures given below, as:

- RuB within open foundation of RoB (1),
- Cantilever foundation beams and pedestals (2),
- Middle RuB box (3),
- Opening to provide light and ventilation (4)
- Slope in superstructure taking advantage of lower depth to reduce approach length(5)
- Track arrangement (6).



**Fig-2: Perspective View RoB cum RuB**



**Fig-3: Perspective View from bottom for RoB cum RuB**

The increase in cost of ROB with LHS as integral part will cost marginally higher when compared with the cost of the ROB alone. However, if the savings taken into account for non-construction of footpath and attached staircases, there will be substantial direct and

indirect economy as detailed in Salient features. This saving will be much more if Railway land is more or wider bridge is required like expressways etc.. It will be further pertinent to mention here that if separate LHS is constructed it will cost in crores depending upon approach length. Indian Railways constructs about 200 RoBs and the savings will be more than 120 Crores every year, based on most conservative estimate. This saving would be further recurring in nature as more and more RoBs are to be constructed every year and proposed innovation is without sacrificing any functional requirement and further provide easy, comfortable and welcome solution to local people to cross Railway land and allows closing of Level crossing without any resistance from local people.

Railway Board has also appreciated this innovation of “RoB-cum-RuB” and advised other Zonal Railways to adopt such arrangement for construction of RoBs alongwith RuB inside of their open foundation.

### **Salient features of RoB cum RuB at Sonipat By Pass (in progress):**

1. Span arrangement: 2 x 15.17m (SK) + 1 x 21.36 (SK).
2. RuB (Subway) is integral part of open foundation of RoB.
3. Two Footpaths and attached staircases removed, which were planned earlier to allow crossing of Railway land by local people by climbing about 9 mtr.
4. Land width have been saved due to non-requirement of (1) Foot paths, (2) Attached Staircases and (3) Separate RuB to avoid local people’s resistance.
5. The RuB under the RoB is further facilitated by roof cover automatically by RoB superstructure, which prevents direct Rain splashes.
6. Openings have been provided in top slab for Air and Light ventilation near pier locations, by keeping clear Schedules of Dimensions for Train movements.
7. Closer of Level crossing is ensured as local people’s requirements are fulfilled by RuB within foundation of RoB.
8. The proposed RuB require much less vertical movement than through stairs along the RoB, which makes it popular among users.

**Conclusion:** The innovative design of “RoB-cum-RuB” has the potential to save in crores of Rupees in addition to facilitate local people to cross Railway land with ease and enhanced safety to train operations through closure of level crossing. The reduced land requirement, reduced length of approaches, improved feasibility of economic open foundation design, possible immunity from bearing capacity variations and enhance aesthetics are advantages which are recurring in nature and makes this design attractive and useful. Railway Board’s appreciation and further advice to other Zones of Indian Railways endorses this innovation as resolute.