

**ANSWER 01: Risks during construction associated with the technical aspects of the project**

Following are the risks involved in the construction associated with the technical aspect in the construction of BRT Peshawar.

**1. Extended duration of construction:**

Work on BRT Peshawar was started in 2017 with completion time of six months but it is ongoing till to date (almost three years) and has no exact completion date on which one can rely.

The construction delay due to many reasons like weather, technical design, traffic etc was as a risk involved in BRT Peshawar but it was not identified in the risk analysis document of the project available on internet however Longer preconstruction time and delayed start of civil works due to (a) the delayed preparation of bidding documents; and (b) the time required for procurement was identified.

This aspect should have been identified, assessed, analyzed and controlled from different prospective for in time completion of project not just due to delay in bidding document or procurement stages.

**2. Technical complexity and innovation in design requiring new methods of Construction and/or erection:**

EPCM consultants have been hired in advance under the PDA and initial surveys for both the design and relocation of utilities have been completed. Traffic management and alternate routes have been identified, and the packaging and phasing of procurement and implementation have been synchronized accordingly. The design was so complex and costly, as it includes the widening of existing road, construction of new lane for buses, and somewhere construction of overhead station, bicycle lines, location of piers in mid road way. The design was rectified several times even the lane width were so short that it was not possible for the buses to pass through. In some places there is no space for the station at all and then it was revised and the station were proposed above. Similarly at Tehkal section the design width of lane when executed were came out to be so narrow that it is impossible to attain 6.5m width and then it was proposed to provide overhead lanes and station and all the work done was dismantled.

The risk has not been identified in the risk analysis project document available. Simple, convenient and light weight sand construct able structure should have been designed to cope with the risk.

**3. Removal of support:**

This technical aspect was observed in BRT construction specifically in the construction of side drains and excavation made for underpasses at different reaches along BRT corridor and the hazard has adverse consequences. In tehkal section, overhead slab formwork support failed and the formwork fall upon a moving car and resulted in car damage and a passenger wounded.

Similarly support of formwork in drains collapsed and the sand filling couldn't supported the nearby passing vehicles and hence result in failure.

In study of BRT project file this kind of risk was not identified. All the formwork supports either in drains, or underpass sides walls support or formwork under the slab of overhead girders should have been identified, assessed, controlled for best interest of public safety,

#### **4. Dangerous substances and items during construction and/or commissioning:**

During the construction of BRT it was observed that no care was taken about the dangerous substances, items, procedures or methods that were used to carry out the construction work. It is a standard practice to perform job safety analysis before execution of a construction activity like concreting, excavation, backfilling etc, once job safety is ensure than the activity can be perform without danger and if case no job safety the activity will be a risk.

If we look at BRT construction that were carried out, no as such safety procedure were adopted in concreting operation, excavation, backfilling activities were performed. Welding used to be carried out above whereas vehicle used to pass under consequently damages were reported.

It is concluded that all the dangerous items, substance, procedure etc must have identified before.

#### **5. Defective design:**

Defective design is a great risk in construction of any project, if a project design comes to be defective at any stage then it is very difficult for construction team to have rectification resulting in time, cost, quality and scope delay.

BRT design has major flaws, an inquiry has been initiated to look into the matter. a 27 page report compiled by provincial inspection team on the order of chief minister KP. Some of points are following:

- a. It mentions that, havoc has been played with the public money through faulty planning and designing, negligence in execution of work, and poor management of the project. The relevant reports of the consultant like feasibility study, drainage report, geotechnical report, highway report, structure report, traffic report, survey and utilities report etc. were found deficient resulting into frequent design changes during execution of work causing delay in timely completion of the work as well as loss to the public exchequer.
- b. The BRT corridor should have been preferably made elevated throughout its length which could have avoided the present traffic jam and also catered by future increase in mixed traffic. Presently the traffic congestion has been found at places where the BRT stations have been constructed at-grid rather than underground. Further, the post-BRT carriageway width for mixed traffic at the locations of BRT bus stations have been reduced by 40 percent on average as compared to pre-BRT conditions. Moreover, the non-maintenance of uniform number of lanes for mixed traffic through BRT route had created funnel like situation/bottleneck at the locations of BRT bus stations which added to the cause of traffic congestion.
- c. Signals have been designed for pedestrian zebra crossings so that passengers could reach the center of the road and move up to the elevated BRT corridor through elevator or escalator. Although such signals will provide easy and safe access to the passengers but will also result into mixed traffic congestion.
- d. The washrooms at the BRT bus stations were being constructed without proper foundation and lintel beams, with poor quality brick work.

- e. Concrete work of the project had been executed in stretched up to 40 meters in length instead of casting them in panels. Therefore the work was not done according to standard engineering practice. Resultantly, cracks were found propagating in the concrete works.
- f. In the present situation neither the width of the carriageway for the mixed traffic can be increased nor can the BRT bus stations be made underground to provide extra and uniform number of lanes for mixed traffic. However, the existing number of lanes/carriageway width for mixed traffic may be temporarily maintained uniformly throughout the BRT corridor – at the stations as well as between stations – to examine the traffic flow and proceed further accordingly.

These issue were raised due to the faulty or defective planning and design. After studying the risk management plan of BRT no as such risk were identified. It is important that risk associated with technical aspect should have been studied in depth before.

#### **6. Defective Workmanship and Material/ Defective design, workmanship and quality control:**

Time limit for BRT was only six month, the contract started the execution and with no sense mobilized the whole crew with no sequence of activities. The work was ongoing like a war. In management when time is short then cost and quality may deviated if not taken care of. So in the situation resulted in poor workmanship, material and quality control. This situation created hazard that had resulted in to risk.

#### **7. Inadequate site management:**

BRT was and in fact is a great challenge. The site has huge traffic passing by. The contractor of BRT was unable to manage the construction site. It resulted into traffic congestion and accidents due improper site management. The formwork, construction material were laying improperly and no care for housekeeping were made.

All these inadequate site management leaded to inconvenience, accidents, traffic congestion etc. BRT project document has not risk as such risk identified.

In short, these risks but not limited to should have been identified before. If it were identified that all the consequences might have not happed and loss would not have been occurred.

**Answer No. 02.**

$$\begin{aligned}\text{Annual Probability of hazard} &= \text{ID}/6585200 \\ &= 15160/6585200 \\ &= 0.00230\end{aligned}$$

From Table 2.1,

0.0023 (1 in 1000) come in category **C Very unlikely**

Now as the Cost of the loss (consequence) has been given = 45, 27,500 Dollars

From Table 2.2,

The value comes in category **IV** i-e significant loss

Now using the values i-e category C and IV, identify the risk level from Risk Matrix which comes out to be **LOW (L)**.

**Hence the risk level is Low in the case.**