Q#01 Considering the Bus Rapid Transit (BRT) Peshawar, what were the risks involved during construction associated with the technical aspects of the project? State how we could counter the risks associated with the technical aspects.

Bus Rapid Transit (BRT) is an innovative, high quality bus-based mass transit system that is based around the needs of the passenger. It delivers fast, reliable, safe, comfortable and cost effective urban mobility. BRT is often characterized by segregated rights-of-way infrastructure, rapid and frequent bus services and supporting intelligent infracture such as real time passenger information systems and efficient fare collection systems. Stations are purposefully designed, bus fleets are clean and comfortable, service patterns are flexible and tailored to specific markets, and there is excellence in marketing and customer service.

Peshawar BRT is currently under construction by the Peshawar Development Authority (PDA) in Peshawar, Capital of Pakistan's Khyber Pakhtunkhwa Province. Divided into two separate phases, the first phase of the Trans Peshawar BRT system will encompass an east-west corridor to be served by 30 stations with an initial 220 buses.

A multitude of technical errors, faulty design and inept planning has raised its initial projected cost from Rs 41 Billion to Rs 71 Billion mainly for the following technical flaws

(1) the biggest flaw in the BRT project is that the work was initiated soon after the spending billions on the Clean and green Peshawar Project. Therefore, the Peshawar Development Authority (PDA) destroyed initiatives taken under the green and clean project for the construction of BRT corridor

(2) the poor designing and execution is most visible at the entrance of several bus stations - 10, 12, 15 and 20 which is narrower than the buses. For example, the station constructed at Tehkal was razed to the ground because the buses could not pass through it which shows that no proper homwork was done before launching the project

(3) the curves/turns in the elevated corridor are so narrow that the drivers would have to slow buses at these points. As a result extra pillars were added to the structure in the Saddar area to widen the curve.

(4) Due to the frequent changes in shape and design, it is now a routine to watch labourers tearing

apart the constructed structures for reconstruction

(5) A gas pipeline at Aman Chowk was crossing right through the middle of it.

(6) the iron bars used to separate the corridor from road were also stolen, enabling the people to cross bus track on foot. putting it in a high risk to a serious tragedy.

(7) During the construction work, the gas and water pipelines were badly damaged throughout the city due to which people suffered a lot as the government failed to provide any alternative

(8) the corridor construction has generated a serious drainage problem in the city, as the two main arteries - GT Road and University Road - are turned into canals after even light rains the main reason was broken existing drainage lines and not paying attention to new system during and after the construction.

(9) Poor substances, low quality material and defective equipments were used during execution

(10) mismanagment at site work.
the contractor has not submitted any schedule at several location while performing the work which means there was no time line for any task completion

(04)

HOW TO COUNTER THE RISKS ASSOCIATED WITH TECHNICAL ASPECTS OF THE PROJECT:

(1) ⇒ * Extended duration of Construction:

In order to reduce the probability of occurance of the hazards to which a project is exposed, the period of construction should be minimised. If the period of construction is to be extended, special consideration should be required for seasonal hazards i.e rainfall, temperature changes, flood, storm and wind.

(2) ⇒ * Technical complexity and innovation in design requiring new methods of construction and/or erection :→

When traditional materials or method are used in construction, there is hardly no need of worry as the design or the work may be executed smoothly, However, in case of a relatively new design, material or construction method, precise and effective communication is required between the designer, manufacturer or contractor and other stakeholders involved in the construction process to avoid misinterpretation in the drawings or specifications

③ ⇒ * Removal of support:
Supports in construction should be given priority as it plays a very key role to minise risk.
If the supports are removed, it might have very serious consequences even in minor parts of the work.

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

The effect of irrelevant and dangerous substance is enormous and could lead to the failure of the construction if the dangerous substance is involved in the specified material either purposely or unwillingly. It can reduce the required strength of the construction item.

⑤ ⇒ * Construction Defects:

⑥ ⇒ * Defective design, material and workmanship.
Construction defects refer to a deficiency in the construction process be that in design, material or workmanship which leads to a failure in some aspect of the project. Design defects result from a design professional's failure to produce accurate and well organised construction documents

material defects arise due to damaged or inadequate building materials while work manship defects occur when a contractor fails to build a structure or component part in accordance with the construction documents.

Everyone on a project is responsible for minimizing construction defects. Proactive measures should be taken to decrease the chance of encountering one.

The contract terms and policy coverage should be reviewed and for all the stakeholders, the contract should clearly assign accountability and confirm that every is responsible for their own work.

Quality Control Programs should be implemented and involve all the project participants early on and form some sort of quality assurance group. Every one should be ultimately responsible for avoiding defects, so this should be a collaborative effort. This group should meet regularly, review plans and make occasional site assessments. Conducting daily inspections of the work and material can help detect issues early on and keeping these well

documented and organized can assist later on when an old project presents a defect claim.
If a defect is discovered, quick action should be taken to determine what the issue is and present it to the owner, contractor or management team as soon as possible.
Having a quality control program provides an opportunity to repair the defective work prior to completion which can reduce monetary damages and prevent future litigation.

(6) ⇒ * Mechanical and electrical breakdown:

Site operations are nowadays more dependent on plant and equipment, the breakdown of which forms a major risk element.

(7) ⇒ * Inadequate site management:

Inadequate site management will eventually lead to going over budget and blowing past the scheduled date for substantial completion. More time and effort should be put into planning out the project by carefully reviewing and fully understanding the plans, specifications, scope of work and client expectations.

other technical aspects such as ground movement, subsidence, explosion and fire, vibration and oscillation and defective temporary works and their design should be taken into consideration as well to minimise risks involved with those aspects as it will adversely affect construction owner, professional team, contractor and other community at large.

Technical aspects such as corrosion, total collapse are the most catastrophic of all hazards as it rarely gives any warning and it therefore carries with it the risk of injury. Collapse of temporary works also plays a key role and it should be considered into account.

Q#02

GIVEN DATA:↓

* Annual probability of occurrance of a hazardous event = 1D / 6585200
* Cost of the loss, Consequence = 45,275,000 $

REQUIRED:↓

* Identification of the risk level in the Risk Matrix.

SOLUTION:↓

Given that the annual probability of occurrance of a hazardous event i.e likelihood = $\frac{1D}{6585200}$

putting 1D = 14817 in above,

likelihood = $\frac{14817}{6585200}$

$= 0.002250045556$

$= 0.002250$

Consequence = 45,275,000 $

Since

Risk = likelihood * Consequence

We need to categorise likelihood and the consequence.

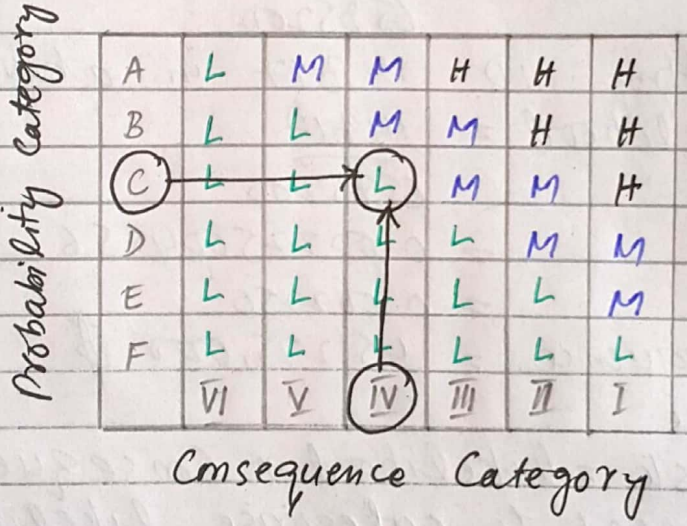
First categorising the likelihood using table 8.1 (given).

Likelihood = 0.002250 which is greater than 0.001 but less than 0.01

Hence likelihood fall in Category C i.e Very Unlikely.

Now categorising the consequence.
Consequence = 45,275,000 $
From table 2.2 it is clear that 45,275,000 is less than 100,000,000 but greater than 10,000,000 which means the consequence is Category IV i.e "Significant loss.

Now to identify risk level using Risk matrix as below



Hence the level of the risk is L (Low).