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Risk and Disaster Management in Construction

Question 1.

Considering the Bus Rapid Transit (BRT) Peshawar, what were the risks involved during construction associated with the technical aspects of the project? Support your answer with logical and factual arguments along with references. State how we could counter the risks associated with the technical aspects. Hint: You can take help from book "Risk and Insurance in Construction" by Neal G. Bunni.

Following are the Risks which were associated with Peshawar Bus Rapid Transit (BRT) during construction.

Technical complexity and innovation in design requiring new methods of construction and/or erection:

When traditional materials or methods are used in construction, the familiarity of those involved with the design or the work itself may permit an occasional ambiguity in the drawings or specifications without them being misinterpreted. It may even provide correction of a mistake. However, in a relatively new design, material or construction method, what is needed is precise and thorough communication between the designer, manufacturer or contractor, as the case may be, and others involved in the construction process. The Peshawar BRT project was one of a kind in Peshawar the project team which was involve in the design and construction have no prior experience of such project. Therefore, there were numbers of mistake occurred during design and construction of Peshawar BRT project.

Defective design:

In Peshawar BRT project, the design was defective, and many sections of the project must be dismantled after its construction due to design issues. Some examples of defective design where the construction was dismantled are below:

1. In reach 3, the overhead bridge was dismantled once the engineer find out that the buses will not be able to maneuver due to less width at certain sections of the bridge.
2. Similarly, in reach 3, the width of road constructed for BRT was dismantled due to less width as compared to width of BRT buses.
3. No pedestrian bridges were proposed in the design of BRT project and pedestrians were to take more than 500-meter walk to reach university, schools or offices.

Defective workmanship and material:

The warranty of incorporating or using only good workmanship and material is implied in construction contracts. Despite that warranty, one finds that as long as quality means perpetual care and high cost, this risk of defective workmanship and material will always exist. Even the smallest defect can sometimes cause a disastrous effect, as happened in the case Peshawar BRT project where defective workmanship and material were used.

Extended duration of construction:

It is evident that the longer the period of construction, the greater is the probability of occurrence of the hazards to which a project is exposed. However, in certain circumstances, there are seasonal hazards which occur at specific times of the year and thus require special consideration if the period of construction is to be extended. These hazards include rainfall, temperature changes, flood, storm and wind, traffic etc. During Peshawar BRT construction, at the start of the project, the completion time was announced as six months but later on it was found that the project could not be completed within Six months and several extensions were given to contractor to complete the project. This faulty completion period was severally affected the residences of Peshawar due to continue traffic jam on university road and other area of the project. Similarly, due to extended duration of construction, the business community was severally affected, and their businesses were collapsed.

Some other risks which are involved during construction associated with the Technical aspects of the project are below:

- Defective design, workmanship and quality control
- Mechanical and electrical breakdown
- Inadequate site management
- Defective temporary works and their design
- Collapse of temporary works

How we could counter the risks associated with the technical aspects:

Risks in construction occur as a result of the existence of dormant sets of conditions, which possess the potential for initiating in most cases adverse events (accidents). They are usually in a dormant state but all that is required is an activating agent to trigger the change from a dormant to an active state. To name and identify the hazards and risks in a project is therefore the first step in the process of managing it to success.

Having identified the spectrum of risks in any particular project, it is important to carry out an integral analysis and assessment of the two elements which identify the effect of the risks, i.e. severity and probability of occurrence. As stated earlier, such analysis can be done either through knowledge from previous experience or from calculations using the theories of probability. There are, however, constraints in both of these methods which may render any analysis erroneous.

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Question 2.

You are going to initiate a construction project. During the project, annual probability of occurrence of a hazardous event is (ID/6585200). If the event occurs, then the cost of the loss will be 45,275,000 US$ (consequence). By referring to Table 2.1 & Table 2.2, identify the risk level in the risk matrix shown in Figure 2.1.

The annual probability of occurrence of a hazardous event is ID/6568200 which comes out as 15002/6568200 = 0.002

If the event occurs, the cost of the loss will be 45,275,000

Likelihood Categories for a Risk Matrix

Category	Description	Annual Probability Range
A	Likely	≥0.1 (1 in 10)
B	Unlikely	≥0.01 (1 in 100) but <0.1
C	Very unlikely	≥0.001 (1 in 1,000) but <0.01
D	Doubtful	≥0.0001 (1 in 10,000) but <0.001
E	Highly unlikely	≥0.00001 (1 in 100,000) but <0.0001
F	Extremely unlikely	<0.00001 (1 in 100,000)

As per above table, the annual probability of occurrence of a hazardous event in under “Category C” which is “very unlikely”.

Example Consequence Categories for a Risk Matrix in Monetary Amounts (US$)

Category	Description	Cost (US$)
I	Catastrophic loss	≥10,000,000,000
II	Major loss	≥1,000,000,000 but <10,000,000,000
III	Serious loss	≥100,000,000 but <1,000,000,000
IV	Significant loss	≥10,000,000 but <100,000,000
V	Minor loss	≥1,000,000 but <10,000,000
VI	Insignificant loss	<1,000,000

If the event occurs, the cost of the loss (consequence) will be 45,275,00 which is under “Category IV significant loss”.

By using the above two table, the risk level in the risk matrix table for the subject hazardous event is “LOW”.

Probability category	A	L	M	M	H	H	H
	B	L	L	M	M	H	H
	C	L	L	L	M	M	H
	D	L	L	L	L	M	M
	E	L	L	L	L	L	M
	F	L	L	L	L	L	L
		VI	V	IV	III	II	I
	Consequence category						