

Construction of Grade Separators at TRC, J&K

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Abstract— The Jammu and Kashmir region owing to its geographical and geo-climatic setting is a multi-hazard prone region that has experienced natural disasters like earthquakes, floods, landslides, avalanches, high velocity winds and snow storms. The objective of this study is to restore and improve the connectivity disrupted due to disaster through the reconstruction of damaged roads, and bridges. The infrastructure will be designed to withstand earthquake and flood forces as per the latest official design guidelines. The affected areas will benefit by the restored access to markets thereby increasing the economic growth and timely access to health and education services. Preparation of highway projects involves a chain of activities such as field surveys and investigations, selection of alignment, carrying of various designs, preparation of drawing and estimates to be compatible with technical requirements, consistent with economy, it is essential that every project should be prepared after thorough investigations and collecting all relevant information and evaluating all possible alternative. The extent of high quality of investigation have a strong influence on selection of the most cost effective design, estimation of quantities and execution of job itself. As, such accuracy and completion of surveys deserve very special attention in project preparation. Perform necessary field investigations and tests required for the design of grade separators.

Keywords: SMR, Water Pollution, RWAs, TRC

I. ENVIRONMENTAL CHARACTERISTICS OF JAMMU AND KASHMIR

Jammu & Kashmir is the city center of socio-economic, cultural and political activities of the country. It is mostly located in Himalayan mountains and shares boundaries with Indian states of Himachal Pradesh and Punjab to the south. Jammu & Kashmir The city has become an important center of trade and consists of three regions: Jammu, the Kashmir valley and Ladakh. Srinagar is the summer capital and Jammu is the winter capital. commerce. The climate of Jammu and Kashmir is typically monsoonal, though the region is far west to average 40 to 50mm (1.6 to 2 inches) of rain per month between January and March. The national highways and other major road network carry intracity and intercity traffic traversing to and from the different parts of the country.

A. Geographical Characteristics of Jammu and Kashmir

Jammu and Kashmir is a home to several valleys such as Kashmir valley, Tawi valley, Chenab valley, Poonch valley, Sind valley and Lidder valley. The main Kashmir Valley is 100 km (62 mi) wide and 15,520.3 km² (5,992.4 sq mi) in area. The Himalayas divide the Kashmir valley from Ladakh while the Pir Panjal range, which encloses the valley from the west and the south, separates it from the Great Plains of northern India. Along the northeastern flank of the Valley runs the main range of the Himalayas. This densely settled and beautiful valley has an average height of 1,850 metres (6,070 ft) above sea-level but the surrounding Pir Panjal

range has an average elevation of 5,000 metres (16,000 ft). The Jhelum River is the only major Himalayan river which flows through the Kashmir valley.

Across from the Pir Panjal range, the South Asian monsoon is no longer a factor and most precipitation falls in the spring from southwest cloudbands. Because of its closeness to the Arabian Sea, Srinagar receives as much as 635 millimetres (25 in) of rain from this source, with the wettest months being March to May with around 85 millimetres (3.3 inches) per month.

B. Transport and Traffic Characteristics of Jammu & Kashmir

The study divides the Srinagar city into three broad zones. All the arterials and sub-arterials of road network are considered for the study. Data are collected for household survey, traffic volume count, average traffic speed, free flow speed, roadway geometry, average traffic speed and free flow speed. Srinagar Metropolitan Region (SMR) covers an area of 416.25 km² located at 34°0′-34°20′N latitude and 74°40′-75°05′E longitudes and is 5,200 feet above mean sea level and at present supports a population of 1.7 million. It is the summer capital of Jammu & Kashmir, situated in the extreme North of India. Srinagar is the fastest growing metropolis of Jammu and Kashmir.

Among the major towns of Kashmir, Srinagar city faces immense congestion problem not because river Jhelum passes through the heart of city and as such the river has to be navigated and crossed by the inhabitants and visitors frequently. The city has to be circumnavigated along the famous Dal lake banks by those living on its banks as well as by those intending to visit the Mughal gardens and Hazratbal shrine. Most of the traffic passes through MA road, Residency road (zone1) which is in the heart of the city. Moreover many premium educational institutes and shops befall in the same zone.

II. IMPACT OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

In India, the importance of Environmental Impact Assessment for sustainable development was recognized in the early nineteen eighties. However, it was only by mid-eighties that Environmental Impact Assessment was introduced as a necessary step for the clearance of various developmental activities under the Environmental Protection Act 1986. The construction industry is a major source of pollution, responsible for around 4% of particulate emissions, more water pollution incidents than any other industry, and thousands of noise complaints every year. Although construction activities also pollute the soil, the main areas of concern are air, water, land and noise Pollution.

Construction and operation are the two major activities in which the project interacts physically with the environment and as a result of which the environmental deterioration occur. In assessing the effects of these processes

therefore, all potential impacts of the project should be identified, and attempt to replenish is taken to mitigate the adverse impacts.

Following sections evaluate the impact of the Infrastructure Projects on Air, water and land, three major components of the environment.

A. Air Pollution

Construction activities that contribute to air pollution include land clearing, operation of diesel engines, demolition, burning and toxic materials.

- 1) Earthwork excavation, refilling, handling and transportation of construction materials (like sand and aggregate), and construction of earthen ramps produce large volumes of dust if it is not done properly. This dust can carry for large distances over a long period of time. Construction dust is classified as PM10 - particulate matter less than 10 microns in diameter, invisible to the naked eye. Research has shown that PM10 penetrate deeply into the lungs and cause a wide range of health problems including respiratory illness, asthma, bronchitis and even cancer.
- 2) Another major source of PM10 on construction sites comes from the diesel engine exhausts of vehicles and heavy equipment. This is known as diesel particulate matter (DPM) and consists of sulphate and silicates, all of which readily combine with other toxins in the atmosphere, increasing the health risks of particle inhalation.
- 3) Diesel is also responsible for emissions of carbon monoxide, hydrocarbons, nitrogen oxides and Diesel is also responsible for emissions of carbon monoxide, hydrocarbons, nitrogen oxides and carbon dioxide. Noxious vapors from oils, glues, thinners, paints, treated woods, plastics, cleaners and other hazardous chemicals that are widely.

B. Water Pollution

Nature has bestowed the state with rich fresh water resources especially snow and glaciers. The state is mostly dependent on the water resources which has tremendous effect on statist socio-economic development. The state is potential in its water resources as it is origin of major river systems of Indian sub-continent. Besides the state has 1247 fresh water bodies including internationally famous Dal, Wular, Pangong, Tsomoriri. The state is also rich in ground water potential.

The Rivers and the river ecosystems in J&K are deteriorated, because of sand mining, encroachment and over-exploitation. A revival and remediation programme for the rivers on a river basin basis involving the local self-governments, self-help groups, schools and colleges has to be taken on a high priority. Appropriate acts and laws may also be needed to protect the river systems and maintain its good health.

C. Land Pollution

Construction activities that contribute to land pollution include uprooting of trees, excavation of foundations, land clearing.

- 1) Invariably any construction activity of a grade separator requires uprooting of number of trees thus disturbing the

ecological balance in the project environment. It is observed that for a project comprising of 10000 sqm area, around 200 trees are removed from the construction site.

- 2) The forest are degrading alarmingly and the biodiversity base is shrinking, disrupting the ecology seriously; especially the pristine faunal and floral life. These lead to alarming fall in water availability in the rivers and other wetland systems and, also to landslides and heavy sedimentation of reservoirs.
- 3) During deep excavation for pile foundation, water gets collected in the void, needing disposal. Indiscriminate disposal of this silt – laden water may choke drains, lead to water accumulation etc. Also, existing drains in the ROW gets disturbed.
- 4) Excavation has a potential of causing damage to the existing infrastructure/utilities.

III. IMPACT OF CONSTRUCTION ACTIVITIES ON THE SOCIETY

In Urban Environment, the disturbance caused to the public residing in vicinity is to given due regard and the inconvenience of any kind or sudden disturbance on their life style due to taking up of any project in their vicinity is an area of concern.

- 1) The fast growing urbanization impacts the urban landscapes and living environment, making it more and more un-inhabitable, especially when urban waste disposal remains as a daunting job as yet. This is now spreading into rural landscapes as well. Apart from numerous ecological problems, rapid urbanization is also causing loss of sand from rivers and paddy lands. Increasing demand for sand has forced the industry to turn to rock sand destroying the already mauled hills and rocks that are also water sources.
- 2) Workers and public at construction site as well as the public at large passing nearby the construction sites in Urban Environment are always subjected to a risk of accidents or life from accidents on site.
- 3) Construction sites produce a lot of vibration and noise, mainly from vehicles, heavy equipment and machinery, excavation for casting piles, braking up pile heads, road surface but also from people shouting and radios turned up too loud. Excessive noise is not only annoying and distracting, but also lead to sleep disturbance and extreme stress. Even during the operation stage, lot of noise is produced by the fast moving vehicles on flyovers, which is an area of concern in urban environment

IV. SUSTAINABLE SOLUTIONS IN PRACTICE DURING CONSTRUCTION

Good construction site practice can help to control and prevent pollution. The first step is to prepare environmental risk assessments for all construction activities and materials likely to cause pollution. Environment Agency and other government bodies are putting increasing pressure on construction companies to reduce pollution and conform to environmental regulations. In the past the pollution fines have been low and environmental regulations slack, and it could have been perceived as cheaper to pollute than to prevent

pollution. This situation is now changing, and enforcement of environmental regulations is not only very expensive but can be irreversibly damaging to the reputation of a firm. Measures to reduce and control pollution are relatively inexpensive and cost-effective, and the construction industry needs to incorporate these into an environmental management strategy. By employing these practices, the construction industry is well positioned to clean up its act. Measures can then be taken to mitigate these risks.

A. Erosion of Soil and Run-off

The degradation of land, through soil erosion, water logging, pollution, and reduction in organic matter content has several proximate and underlying causes. The proximate causes include loss of forest and tree cover leading to erosion by surface water run-off and winds, unsustainable grazing, excessive use of irrigation (in many cases without proper drainage, leading to leaching of sodium and potassium salts), improper use of agricultural chemicals (leading to accumulation of toxic chemicals in the soil), diversion of animal wastes for domestic fuel (leading to reduction in soil nitrogen and organic matter), and disposal of industrial and domestic wastes on productive land. These proximate causes of land degradation in turn, are driven by implicit and explicit subsidies for water, power, fertilizer and pesticides. Jammu and Kashmir is observed with 35.86% of the total geographical area under desertification/ land degradation for the period of 2011-13. The desertification/ land degradation area in Jammu and Kashmir has increased about 1.94% since 2003-05.

B. Drains Contamination

All drains in the construction site are covered up properly and protected from all possible contamination. Any wastewater generated from site activities like Bentonite from the piling activity are collected in settlement tanks, screened and re-circulated or disposed off according to environmental regulations.

C. Uprooting of Trees

Whenever trees are removed to make the site clear for taking up the construction activities, it is ensured that 10 times the trees removed are planted as compensatory plantation measures according to the A forestation Policy under Forest Conservation Act-1980. While trees are uprooted, best efforts are made to keep the bulb of roots intact and replant the same at other location. It is experienced that 60% of the trees replanted continue to survive.

D. Shifting of Infrastructure/Utilities

Location of underground infrastructure/utilities is done before start of work by physically excavating the earth and by collecting the required information from all the utilities owing departments. Proper planning is done to shift these utilities in safe corridors either through the utilities owners or by construction agency itself. Sometimes shutdown is required in case of essential services like water lines or electric lines. In such a situation, prior public information is provided about the likely disruption of services. It is ensured that alternate arrangements like water tankers are provided during the relocation period.

E. Social Aspects

- 1) Resident Welfare Associations (RWAs), public in general and business establishments in particular are taken into the confidence by consultation with them and informing them of the nature, duration and likely effects of the construction work and the mitigation measures in place
- 2) At the work site, public information/caution boards are provided with information of project name, cost and schedule executing agency and contract details, nature and schedule of work, traffic diversion details, if any, entry restriction information, competent official's name and contact information for public complaints.
- 3) Alternative traffic arrangement/detours are provided so that traffic can be distributed and move on different roads and it is ensured that public is informed about such traffic diversions through media – daily newspapers and local cable television (TV). Service roads and pedestrian walks are maintained in good condition to allow smooth traffic movement. Necessary personnel /Marshalls are provided to guide and control the traffic.

F. Safety Measures for Workers and Public

- 1) Standard and safe construction practices are followed. Entire construction area that may come under influence in case of accidents is barricaded properly. This is particularly critical during fixing of pre-cast girders or segments using heavy duty cranes. These activities are generally conducted during lean traffic periods and if required traffic is also stopped. Accidental entry of traffic (pedestrian / vehicular) into site is avoided. Warning boards/ sign boards and post security guards are provided throughout the day and night.
- 2) It is ensured that all workers are provided with and use appropriate Personal Protective Equipment like helmet, hand gloves, boots, masks, safety hoists when working at height or in foul conditions, etc.
- 3) Standard practices of safety checks as prescribed are followed before use of equipment such as cranes, hoists, etc. Environmental, Health and Safety (EHS) Expert is employed at site. Health and Safety Training for all site personnel is provided at site. Any accident that happen at site is reported to the authorities promptly and records maintained.

G. Noise Pollution

Noise pollution is reduced through careful handling of materials, use of modern, quiet power tools, equipment and silent generators. High noise and vibration generating activities like rock blasting are not permitted involved in the project taken up in Urban Environment and manual methods are only deployed, wherever required. Noise generating activities are avoided in the night and work programme is planned properly so that any particularly noisy activities can be scheduled to avoid sensitive times. Modern vehicles and machinery are utilized with the requisite adaptations to limit noise and exhaust emissions and ensuring that these are maintained to manufacturers' specifications at all times.

V. GRADE SEPARATOR TRC, SRINAGAR J&K

A. Location

TRC is located in at the junction of J&K bank crossing along Dalgate – Lal Chowk on MA road Srinagar. It is amongst the most heavily trafficked junctions in the city. Traffic types is a mixed cocktail of Pedestrians, Two wheelers, Three wheelers, Motor cars, Buses (interstate and local), Trucks etc. Traffic Intensity, based on traffic studies in 2000 at this intersection is 3, 30,000 pcu/day, see fig 1.

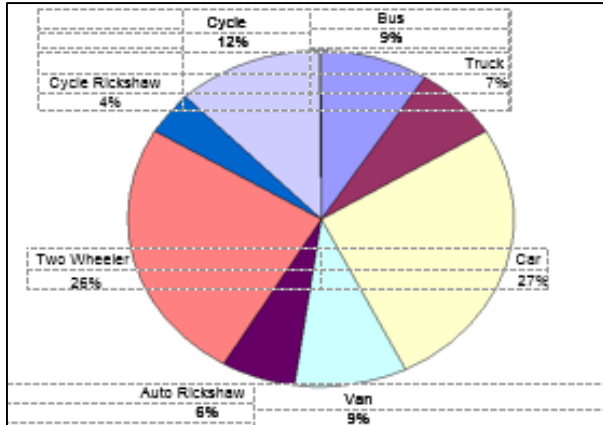


Fig. 1: Composition of Peak Hour Traffic at TRC

Keeping the existing road width and other conditions it is recommended to provide a two lane grade separator. Since, there is a fountain within the TRC circle it is recommended to provide a three spans of viaduct 49m (17+15+17) with central 15m span covering the fountain and 17m span on either sides as obligatory spans for the traffic with two spans of 18m for turning purposes.

VI. CONCLUSIONS

- 1) It is true that civil constructions in urban areas are essential for overall development and benefits of the community, but same is successful only if equal importance is given to the environment and it is given due care for a sustainable development.
- 2) It is essential that every construction activity should be environment friendly as the Environment too has a right to remain protected. Engineering solutions to minimize the Environment impacts and for adopting the mitigation measures are available.
- 3) Many times it happens that planning a Project requires disturbance to heritage structures existing in the vicinity of the scheme. In such a situation, it requires the consultation with heritage experts. Solutions are available under such circumstances, but these may be more challenging for Engineers to plan and construction besides the cost factors. But importance of heritage structures, their restoration is essential and has to be given due importance.
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- 9) Adoption of standard and safe construction practices is very much essential particularly in urban environment. It must be ensured in all times that all workers adopt best safety protections in their own interest. Protection of Health, Safety and Environment should always be kept as the prime goal.
- 10) The right of respectful living of the residents residing around the construction sites should not be jeopardized. This should be given due regarding without compromising on their comforts, safe movements and safe livelihood.

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