

# Study on the Nature and Necessity of Construction Logistics Plan

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**Abstract**— A study has been carried out at Island City Center (ICC) project (an ongoing high rise building project) in Mumbai, India, for duration of seven weeks, under the esteemed guidance of L&T Construction Company's professionals, to understand construction logistics. Significance of construction logistics has been understood by direct observations in the site and interactions with L&T Construction Company's professionals. Many construction companies may not have a well defined construction logistics plan before execution of the project. Over the last decade it has been realized by the Indian construction majors that detailed construction logistics plan is a must for any construction project for timely completion of the project within estimated cost and necessitates contractual bindings as Prelims. This study briefly explains the nature and necessity of construction logistics plan with a practical example.

**Index Terms**— Construction, Logistics, Project Constraints, Resource Mobilization

## 1 INTRODUCTION

All construction projects are unique in terms of their scope, nature, type, constraints and etc. Construction logistics refer to mobilization of resources such as materials, people, and machinery from the point of source to the point of requirement, which plays a significant role to ensure right amount of resources at right place within right time within targeted cost. The construction logistics plan is unique for every for construction project and cannot be replicated due to varied project dynamics. It is crucial to understand the nature and necessity of the construction logistics plan to analyze the practical scenario of onsite and offsite.

## 2. NATURE OF CONSTRUCTION LOGISTICS

Construction Logistics plan is dynamic in nature. It varies from project to project and phase by phase. It varies with respect to time i.e. seasonal variations in logistics plan. It may vary from place to place. Hence construction logistics plan is project specific, client specific, contractor specific, project procurement method specific and varies when there are constraints of time and space. It is often believed that a well experienced professional team can draft an effective and efficient plan in line with project delivery time.

### 2.1 Construction Logistics Plan is Time Dependent

Construction logistics plan varies from time to time at various phases of the project. There can be additional activities or modification or removal of some activities in logistics plan as time progresses. Complexity of the project increases as season changes. Every season has its own impacts on the project. All negative impacts have to be compensated through a sound

heavy rain. Therefore, there should be some extension of logistics i.e. 'Monsoon Recovery Plan' to counteract the negative impacts of monsoon. It is how a logistics plan varies with respect to time. When there is time constraint for a project, logistics has to be planned in such way to meet fast movement of resources and smooth progress over time.

In Island City Centre Project, temporary shelters have been planned for workforce near construction locations which occupied considerable space. Transportation of materials in Mumbai during monsoon becomes extremely difficult as abundant water gets logged on most of the road network. A temporary store has been planned and constructed onsite before starting of monsoon to store more quantity of aggregates which occupied more space and had special attention for unloading and feeding of aggregates. For many hours, work has been paused due to accumulation of water in the site. Monsoon recovery plan has been established to discharge the water from site to ensure safe working environment.

### 2.2 Construction Logistics Plan is Space Dependent

Construction logistics plan is a function of the space available onsite. Construction logistics are different for a project with large vertical and horizontal circulation space when compared with a project of congested space. Because, the movement of resources is more complex in circulation space constraint projects such as building a high rise building in city centre nearby railway station and shopping mall and adjacent to two more high rise buildings alongside the traffic network which are almost extinct in comparison to developed countries.

In ICC project, available space was not enough to provide work-men accommodation onsite. Hence, work-men accommodation has been planned offsite. This needed an attention to choose a location for accommodation which should be near to the site so that workers can come to site on time. There was enough space for main reinforcement yard, main formwork yard, batching plant, and site office hence planned onsite.

### 2.3 Construction Logistics Plan is Location Dependent

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logistics plan. For instance, logistics planned for summer season may not be applicable in monsoon due to issues caused by

Construction logistics plan is a function of location of project. Construction logistics plan for a project located in an urban region is different from same project in a rural region because enough accessibility may not be ensured and lack of resource in local market makes long transportation channel. There can be other factors which may affect logistics plan such as heavy vehicle restriction at peak hours.

The ICC project was located in Mumbai. Mumbai is one of the most congested cities in India. It is really difficult to reach the target point on time through road network due to heavy traffic. During monsoon, transportation is extremely difficult in Mumbai as most of the road network gets water logged. Hence, stock of materials (cement and aggregates) has been ensured onsite for at least three days. The facilities to store the material have been planned accordingly.

#### **2.4 Construction Logistics Plan is Project Specific**

There are several construction projects. Construction logistics plan is different for different construction projects. Construction logistics plan is different for Building Projects, Railway Projects, Airport Projects, Underground Structures, Surface structures, Elevated Structures and etc. The terrain of the project land plays a vital role while establishing the logistics plan.

As ICC project is high rise building project, vertical mobility of resources is a great challenge because there will be many parallel activities as building rises to sky. It must be ensured that no activity should affect other activities and should not get affected by other activities. Hence, there has been great emphasis on mode and medium of vertical mobility of resources with respect to schedule, bill of quantities and master plan of the project which included location, loading, unloading and climbing mechanism of tower crane; location, capacity and schedule of material cum passenger hoist.

#### **2.5 Construction Logistics Plan is Client Specific**

Client is the one of major stake holder of the project. Future phases opening up acts as major constraints while developing logistics plan. Changes in future plan due to varying investor scenario plays havoc in articulating logistics plan. While in certain projects contractor shares client's logistics plan especially in case of multi contractor project to integrate the overall logistics plan.

In ICC project, client cooperated to locate the batching plant inside the site. Otherwise it has to be planned outside the site which needs enough space, an optimized plan for transportation of concrete from plant to site.

#### **2.6 Construction Logistics Plan is Contractor Specific**

Different contractors have their own approaches to develop a construction logistics plan. It depends on scope of work, contractor financial standing and technical ability, resource requirement plan, organization's norms and other factors. A dedicated organization may have a policy to provide full-fledged living condition to all staff and workforce where in some organizations limited facilities may be provided.

In ICC project, the contractor has no compromise on safety and welfare of staff and workforce and other resources such as concrete, steel and formwork, along with quality of delivering the project. All resources men, material and machinery have been well protected onsite. For instance, an isolated pedestrian path has been planned beside the internal roads to safely allow the traffic inside. Parallel movements of material, machinery and people at the same spot have been limited to avoid accidents.

#### **2.7 Construction Logistics Plan is Project Procurement Method Specific**

Construction logistics plan is specific for each method of project procurement namely Design-bid-build, Design and build (turkey), management contracting and construction management. For instance, logistics plan of Design and build project is different from logistics plan of design-bid-build project as contractor responsibilities are extended in the former case compared to latter case and there is gap of integration between design and construction in the latter case, which has direct effect on logistics plan.

### **3 NECESSITY OF CONSTRUCTION LOGISTICS PLAN**

The following factors have been observed which demand the logistic planning and management

- Complex Nature of the Project
- Scarcity of Resources
- Outsourcing of Available Resources
- Time Constraints
- Cost Constraints
- Space Constraints
- Legal Constraints
- Safety Constraints
- Environmental Constraints

#### **3.1 Complex Nature of the Project**

Every construction project is unique. Every project has its own scope, methodology of design, methodology of construction and finishing. Scope of the project directly affects the logistics plan. For instance, high rise buildings have different plan of logistics as vertical movement resource matters most when compared to construction of long bridge in a water body which needs more horizontal movement of resources and less vertical movement of resources. This factor demands a sound logistics plan.

The ICC project is a high rise building project consists of two buildings each with more than 60 floors, located side by side. Parallel movement of resources to both the buildings has created a complex environment in the site which demanded an elaborated logistics plan. Special attention has been paid to simultaneous movement of tower cranes, feeding points of tower cranes, concrete pump locations, movement of transit mixer and other equipment, temporary formwork and rein-

forcement yards.

### 3.2 Scarcity of Resources

Some of the resources have become scarce. If the resources of right quantity in right time at right place are not ensured, project will get delayed. For instance, river sand is mostly used fine aggregate in the concrete. But, in cities like Mumbai, river sand is extremely scarce. Hence, it is necessary to investigate locally available alternative fine aggregate and plan logistics accordingly. Otherwise, sources of river sand around the Mumbai must be investigated and an effective logistics plan has to be drafted so as to ensure right quantity of river sand in right time at right place. In case of low output during monsoon bulk material staking occupies a major chunk of logistics.

### 3.3 Time Constraint

All construction projects have specified duration. Clients focus majorly on timely completion of the project. It is a great challenge to manage the right amount of resource in time at right place. No matter how far is the location of source from the point of consumption, logistics plan must ensure the right amount of resources at point of consumption in time. For instance, a resource of '3x' quantity has to be mobilized from the point of source to the point of consumption within one hour. But actual mobilization process takes place 1.5 hours. 30 minutes of the process must be reduced to reach the hourly requirement of the resource. This needs an efficient logistics plan that may optimize the available routes or medium or mode of transportation, loading and unloading mechanisms etc.

In ICC project, for mobilization resources such as reinforcement and formwork tower cranes have been used instead of manpower even at the ground level construction due to limited time for mobilization. Boom placer has been used to place concrete instead of conventional pipe line system which is cumbersome and consumes more time to handle and movement.

### 3.4 Space Constraints

Space is one of the major factors that governs the logistics plan. Mobilisation of resources in a congested project is extremely difficult. Vertical logistics play a vital role in space constraint projects. For instance, skyscrapers in a water body such as Burj Arab Hotel have confined space for horizontal circulation. This demands an extraordinary logistics plan to mobilize the numerous resources.

In ICC Project, most of the temporary facilities have been planned onsite except work-men accommodation. As discussed earlier, work-men accommodation has been planned offsite. Single lane - two way traffic was managed at some parts of the site due to lack of enough space for internal access.

### 3.5 Legal Constraints

There are many legal issues associated with each construction project. Legal restrictions must not be violated which has severe effect on project. For instance, commercial vehicles are not allowed in particular route and working of plant and machinery is strictly prohibited after 8:00PM. So, logistics have to

be planned to in such way to counteract these issues.

For ICC project, working hours were limited up to 8:00 PM beyond which working operations create disturbance to the neighbouring society. Hence, working of any machinery beyond 8:00PM has not been allowed. Then it was necessary for all facilities to produce enough resources to meet the daily requirement within the maximum working hours of the site. Precisely most activities were planned in daylight. For instance, to meet the daily requirement of concrete in the site, right capacity of batching plant of has been selected which could produce daily requirement within maximum working hours, and got located in right place; number of transit mixers, their parking areas, feeding points; number of aggregate feeding shovels, their circulation area has been planned accordingly; inflow of concrete ingredients has been planned in such way not to cause any congestion inside the site.

### 3.6 Safety Constraints

Safety is the foremost concern in any construction project. For instance, overlapping of movement of plant & machinery, vehicles and workforce has a scope for accidents. A logistics plan must ensure safe movement and storage of all resources at site with a muster roster.

In ICC project, safe pedestrian passages have been planned to avoid accidents. Assembly point and stairs with closed net have been provided in excavation to escape in case of emergency. They have been planned against the direction of danger. Enough safety for storage of materials has been provided to ensure stability of storage such as direction of stacking, height of stacking; location of stacking, loading and unloading direction and etc have clearly been specified.

### 3.7 Environmental Constraints

Weather plays a significant role in governing the logistics plan. Seasonal variations may cause fluctuations in the demand and supply. Logistics must have extension to counteract the demand and supply. Wind, rain, cold climate, and warm climate have direct effect on project activities as well as human productivity. An effective logistics plan must be drafted to overcome the specified issues.

In ICC project, location of temporary external tower cranes was chosen in such way to minimize the effect of wind and rain during monsoon. Vehicles with slurry tyres are not allowed on the roads of city. Vehicle's tyres generally become muddy in the site which must be cleaned before leaving site. A tyre wash area has been planned near the site entrance to clean vehicles' tyres before they exit the site.

## 4 CONCLUSION

Construction logistics plan is unique for every construction project. And it is necessary for any construction project to have a well defined logistics plan sacrosanct with project delivery plan depicted in Master Construction Program before execution. Construction logistics plan must be elaborated for all phases of the project in order to either over-

come or to work around internal and external constraints throughout the project.

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#### **REFERENCES**

- [1]. Island City Center Project, Mumbai, Onsite Observations and Interactions with Technical Staff
- [2]. L&T Construction, Construction Method and Planning Cell, Buildings and Factories IC, Mumbai, Technical guidance