Interdependence between Structural Engineering and Construction Management
Edited by Ozevin, D., Ataei, H., Modares, M., Gurgun, A., Yazdani, S., and Singh, A.

ISBN: 978-0-9960437-6-2

TEAMWORK IN SUCCESSFUL CONSTRUCTION MANAGEMENT OF ROAD IMPROVEMENT PROJECTS

SINIT SENIWONGSE

Ardmore Roderick LLC, Chicago, USA

This paper addresses the methodology and the art of construction management of road infrastructure projects from the viewpoint of practicing engineers using teamwork amongst organizations, which include owners, design engineers, consultants, construction managers, contractors, subcontractors, vendors, local residents, publics, and owners of other utilities. The author points out that most construction management text books and research papers have been written by academia without actual construction or management experience, and that successful construction management of infrastructures is not a simple task. To demonstrate this point, the collapse of the roof of the tunnel in the Big Dig project in Massachusetts and the collapse of the pedestrian bridge during installation in Florida in 2017 are mentioned. Both collapses cost the lives of road users and millions of dollars in litigations. The paper gives the factors contributing to successful teamwork as leadership, communication, collaboration, trust, transparency, common goal and mutual benefits. Using these traits, the author describes the construction management using teamwork concept in the successful completion of many road restoration projects in Chicago. It is concluded that the approach can be used equally well in other infrastructure projects of any sizes in USA or any other countries.

Keywords: Collaboration, Communication, Leadership, Role, Transparency, Trust.

1 INTRODUCTION

This paper addresses the concept of teamwork and how to make it work in major infrastructure design and construction from the viewpoint and experience of professional construction management practitioners. There are a countless number of text books and research papers on teamwork in project management, but those are mainly written by academia and research students without real practical experience. Managing inter-organizations that are teamed up to execute construction projects is not a simple task; hence the results are not always successful. Examples of past infrastructure projects of different degrees of success are given to highlight the factors that have impact on the outcome of the project. The factors are listed and briefly described. The author then demonstrates the application of these factors for the successful construction of road restoration and improvement projects in Chicago for the past few years.

2 PREVIOUS PUBLICATIONS ON TEAMWORK

Teamwork and Project Management by Smith (2002) is one of many fundamental classroom text books giving standard information. Fong and Lung (2007) published their research finding on

relationship between trust and human perceptions of inter organizational teamwork and the factors that affect the individual's perception. They collected data via questionnaire surveys from a sample of construction practitioners. They used correlation and multiple regression analyses of the collected data to come up with their hypothesis on teamwork.

3 EFFORTS IN SUCCESSFUL CONSTRUCTION MANAGEMENT

Design and construction of major infrastructure projects are complicated and involve many organizations. Some projects were successfully managed, but many projects had problems. The major parties in construction projects are the Owner, the Design Engineers, the Construction Manager, and the Contractor and subcontractors. Each organization has its own stakeholders, skills and objectives. Each organization works for their self-interest and to maximize their profits. Most major construction projects ended with disputes, claims and litigations that took years to settle after completion of projects.

Successful construction management in this paper refers to the management that results in completion of the construction according to the design and specifications within Contract time and within budgets with good safety record and without post-construction major litigations/claims/disputes. Each participating organization is satisfied with the result and ends the project with good memory and experience. This statement is of course easily said, but difficult to achieve in real life construction. The impact of successes and failures in road construction projects are given below from published references.

3.1 The Cost/Impact of Failure in Construction Projects

Two examples are quoted in this Section from published references to remind the importance of construction management in practice. One example is the Big Dig project in Massachusetts. The Associated Press (2008) published that, "The $14.79 billion Big Dig, which had an initial price tag of $2.6 billion, was plagued by problems and cost overruns throughout the two decades it took to design and build". It reported that the consortium that oversaw the design and construction of the nation's costliest and most complex highway project had to pay nearly $450 million to settle tunnel collapse lawsuit.

Another more recent example was the collapse of the pedestrian bridge at Florida International University (FIU) in March 2018 (ENR 2018). The case is still under investigation, but it highlights the importance of good and effective construction management, which would have prevented the collapse.

4 TEAMWORK APPROACH IN CONSTRUCTION MANAGEMENT

In an effort to minimize or eliminate confrontation, conflicts, disputes, claims and litigations, a new construction management approach has been adopted for some time, called Teamwork or Partnering approach. Abudayyeh (1994) described the Partnering approach by California Department of Transportation (Caltrans) implemented to reduce or eliminate claims and litigation.

4.1 Defining Teamwork

Teamwork can be defined as "the process of working collaboratively with a group in order to achieve a goal". It is the gathering together a group of individuals or organizations in hopes that their collective talents, skills, and experiences will provide a more efficient and successful outcome. Successful teamwork benefits the group as a whole.

4.2 Teamwork in Engineering Design and Construction Projects

Teamwork in construction projects is more complex than other non-engineering projects. In construction or engineering projects, teamwork is a must within an organization and between organizations for the projects to be successful. This is because there are many organizations, each with different roles and responsibilities from project conception to the end of the project. Each organization by its nature and type of work consists of individuals of different background, skills, qualifications and professional experiences.

4.3 Basic Factors for Successful Team in Construction Management

Seniwongse (1992) described the approach that he used in the successful construction management of international infrastructure projects in the 1990s. It consists of the following considerations:

- **Selection of key personnel:** Selection of the right persons to the key positions within an organization is most important for the success of any organization. Key positions are the leadership roles in each discipline, such as the project manager, lead design engineers, resident engineer etc.
- **Selection of organizations:** Selection of the right organizations for the inter-organizational projects is crucial for the successful result. In construction, there are many organizations involved: Owners, Designers (Engineers/Architects), Construction Managers, Contractors, Subcontractors, and Vendors. For the projects to be successful, all organizations must fulfill their roles of responsibility, and in sequence as required by the project schedule. The selection is by the prequalification process.
- **Financial Remuneration, Contract Sum and Contract Period:** Private organizations cannot survive if the expenses are more than the earnings. The main objective for any organization is still maximizing the profit for Stakeholders. The financial rewards must be reasonable. In fact, it is one of the main motivations. The time (Contract period) for each organization to complete the assigned tasks must be reasonable in order for them to perform quality work.
- **Transparency:** In order for all organizations involved in the project to work cooperatively as a team, they must trust that the others are doing the same for the common goal. Transparency is crucial for developing trust among the inter-organizations.
- **Win-Win Approach:** No organization will be cooperative, if they lose but the others win. The core of the teamwork is for all partners in the team to achieve their intended benefits upon the successful execution of the construction project.
- **Leadership:** For all the above to happen, someone has to take the lead to organize the teamwork. In construction, it is the role of the Construction Managers (CM). The essential attributes of teamwork are communication, commitment, providing support, and sharing ideas and responsibility. For teamwork to be achieved, there has to be great leadership in command. Teamwork cannot work without someone guiding the groups, and ensuring that every group knows their role, and is on the same page. A leader's role is to also coordinate the activity amongst the groups, as well as encourage communication and collaboration.

5 EXAMPLES OF TEAMWORK IN SUCCESSFUL PROJECTS

This section demonstrates the art of construction management to execute and complete road restoration projects in Chicago, using teamwork approach described in Section 4. The methodology can be applied to any other construction projects of any sizes.

5.1 Road Restoration and Improvement in Chicago

The projects are to restore the roads and walkways that are excavated/damaged by the new water and sewer main installation. The projects are under the jurisdiction of the Water Management Department of the City of Chicago. Existing water and sewer mains in Chicago are more than hundred years old. The City has started since 2009 to remove old mains and replaced with new ones with improved alignment and grade design. New catch basins are installed. In the process, the roads and sidewalks are excavated. Once the new pipes are installed and passed the tests, the road restoration phase begins.

Figure 1 shows the typical cross section of the road restoration design of one of the projects. It is noted that many of these projects are taking places simultaneously in all parts of Chicago: north, south, west and east.

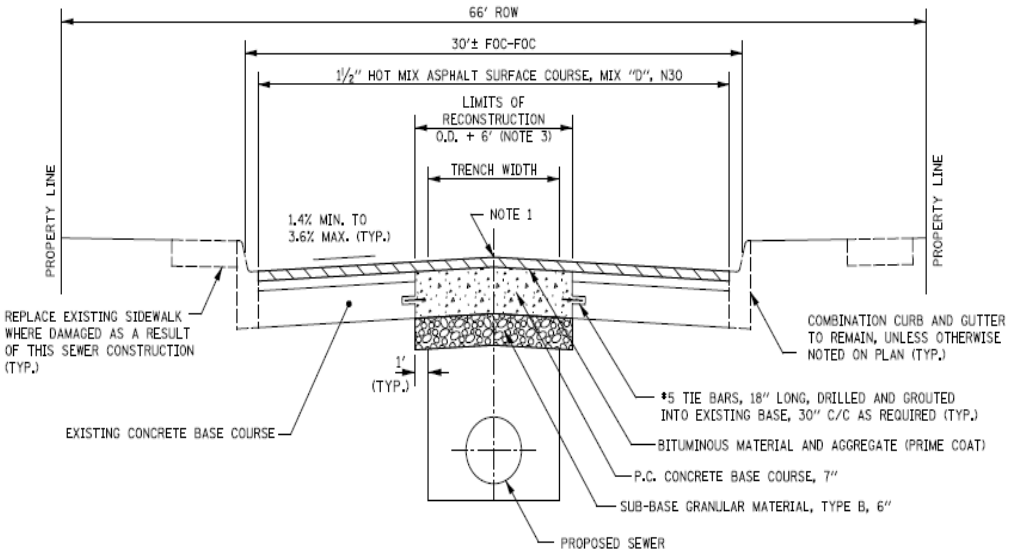

Figure 1. Example of partial pavement restoration cross section (City of Chicago 2014).

5.2 The Team

Many organizations take part in the project. The Project Owner in this case is the City of Chicago Department of Water Management. It acts on behalf of the city for the public. The Engineers are the designers for the Water and Sewer (W/S) Project, and for the Road Restoration (RR) Project. The Consultant is the construction management team (CM). In this case, the author represents the CM for the RR Project. The CM is the center of all operation of the RR Project.

One other group in this Team of RR project that cannot be overlooked is the local residents. In the big city like Chicago, the neighborhood is diversified from north to south, east to west. The importance of achieving cooperation from local residents cannot be overemphasized.

5.3 The Methodology of RR Construction Management

The CM (Consultant) has to coordinate with all parties. The process begins once the city notifies the consultant that the installation of water main is near completion, usually around 2 weeks prior. The project manager (CM) then reaches out to the city engineers to get an update of when the crews and equipment will be demobilized from the site.

Just prior to the demobilization, it is the responsibility of the restoration project manager and consultants to schedule a walkthrough with the city engineer to see what has been done and what remains to be done by the RR Contract. After the completion of the walkthrough, the restoration project manager is responsible to notify the contractor of when work can begin. It is vital that this information is communicated to the contractor in a timely manner. The contractor and the city do not communicate with one another. The contractor has 30 days after the city demobilizes from site to complete restoration. Beyond the 30 days, liquidated damages will be assessed.

During restoration, it is the project manager responsibility to communicate with the General Contractor and utilities companies/ departments to resolve any conflicting site conditions/utilities. This has to be done effectively for the construction to be on schedule. Meetings on construction progress/issues are held every two weeks. All projects have been completed with good success.

6 CONCLUSIONS

This paper has demonstrated the art of construction management and the power of teamwork to bring about the successful road restoration and improvement projects in the City of Chicago. For citywide infrastructure projects of this size, there are many organizations, many steps, and millions of dollars involved. The paper shows how to manage inter-organizations as one team to achieve a common goal to complete the assigned construction project per specifications within schedule and within budgets. The successful management of road restoration projects in Chicago confirms essential attributes of teamwork are leadership, communication, commitment, providing support, and sharing ideas and responsibility. The approach can be adopted for construction management of worldwide projects of any sizes.

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