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# Big Projects Big Challenges: Constructing the New Meadowlands Stadium

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## Introduction

In late January, 2007 Skanska USA Building was awarded a contract to Design and Build the New Meadowlands Stadium. When complete, this facility will become the home field for two National Football League (NFL) teams; the New York Giants and the New York Jets. It will be the first facility of its kind built specifically to accommodate two NFL teams. The New Meadowlands Stadium will also be used for concerts and other entertainment and sports activities.

The New Meadowlands Stadium is a technologically advanced open air stadium with seating for 82,500 spectators. There is also 217 Luxury Suite Boxes. The facility was constructed between the existing Giants Stadium and the Meadowlands Race Track located in East Rutherford, NJ. The stadium opened in April 2010.

It probably will not come to a surprise to anyone who has had the experience of working on a large construction project but if you have not there are much more challenges than one would ordinarily encounter when working on one of your typical projects. I like many of my peers had advanced within my safety career having more into management and had taken on more responsibility that goes with those changes. A very sudden surprise was about to happen and it was probably the furthest thing from my mind. In February 2007 I was presented with the opportunity to lead the safety efforts for the construction of the new $1 billion New Meadowlands Stadium. I was excited with anticipation and would have just three short months of planning and preparations until we would break ground and commence with the construction. This paper is a short synopsis of my experiences, challenges and valuable lessons learned from the past three years of while on site during construction of the New Meadowlands Stadium. The unique challenges of this project were quite vast. Some of them were related to the site conditions but many of them were directly attributable to building a “Big Project” like the New Meadowlands Stadium. Below is a summary of the Incident rates from the project which provides you with a snap shot of the success achieved based on this one indicator.

## Safety Results Summary

This was an extremely large scale project, heightened by a 36 month construction schedule to complete the enormous 2.2 million square foot state of the art facility. The size alone posed significant challenges and the magnitude of the man- power that would be needed meet the demands of the schedule would be significant and more than we had ever experienced on any project previously. We stood prepared for the challenges that faced us. From May 2007 through February 2010 there were over 5700 construction tradesmen that cycled through the project orientation. This does not include the repeat tradesman that cycled back through for a second or third stint with other contractors. We reached the peak of construction in the summer of 2009 when we had a maximum of just about 1800 workers on site. Add to those additional personnel from the management team, inspectors and others the number of individuals on site was 2000. During this time we were putting in place over $50 million of work each month during this peak time frame. Below are Tables 1 and 2 of our safety statistics that depict the project's safety statistics and a corresponding graph which shows the injury rates for the project but also compares it to the Bureau of Labor Statistics (BLS) National Average for Non-Residential commercial construction.

| Total Man-hours | Lost Time Cases | Restricted Work Cases | Other Recordables |
|---|---|---|---|
| **4,279,094** | **12** | **5** | **18** |

| Lost Time Incident Rate | Restricted Work Case Rate | Total Recordable Incident Rate |
|---|---|---|
| **0.56** | **0.23** | **1.64** |

**Table 1. Safety Statistics for Meadowlands Project**

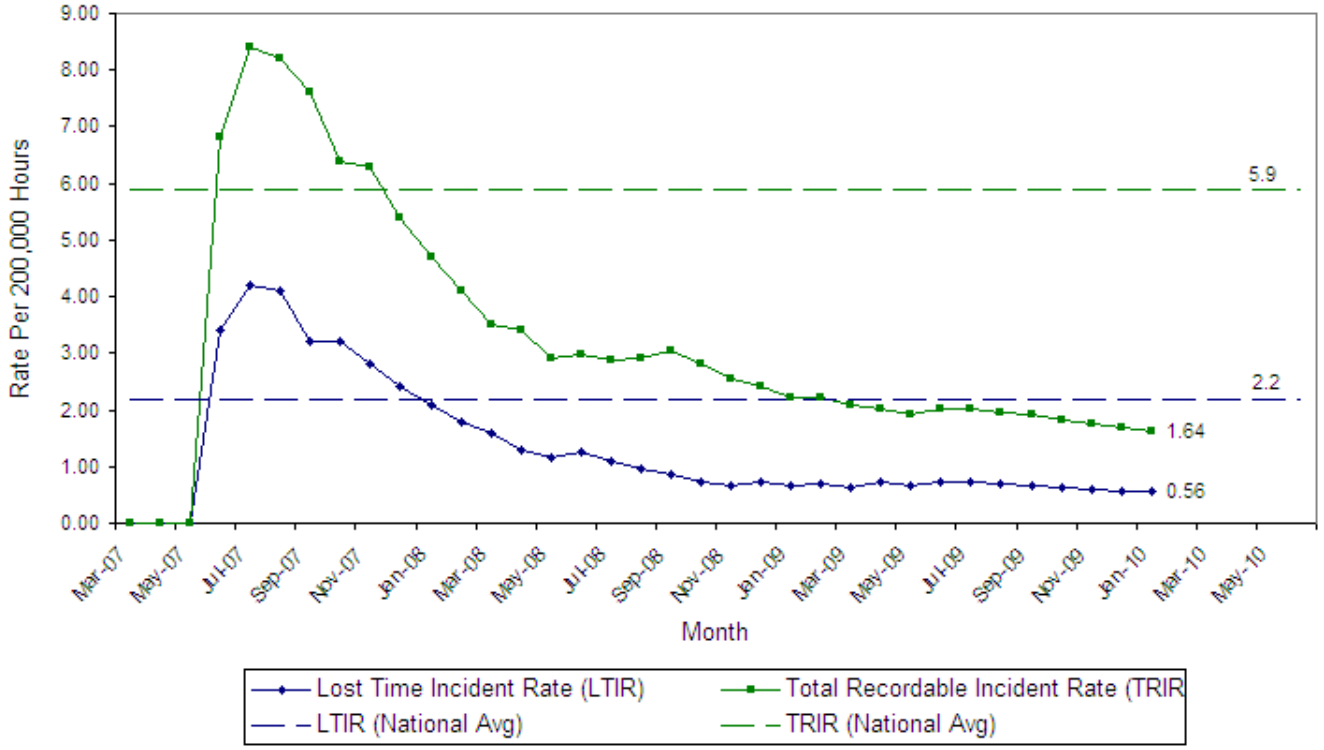


**Figure 1. Injury rates for the Meadowlands project compared (BLS) National Average for Non-Residential commercial construction.**

## Logistics

One of the most important yet often overlooked challenge when constructing the New Meadowlands Stadium project was the site logistics. Keep in mind that the Meadowlands Sports Complex was an active complex with the existing Giants Stadium, Izod Center, and Meadowlands Racetrack which were open for business throughout the construction period. The sports complex was a major venue for world class concerts, NJ State Fair, International Soccer and many other events important events and the construction activities had to be coordinated around such event schedules. To add to the challenge was the fact that during our construction time frame there were three other additional major construction projects that were ongoing the would have an impact on the overall site logistics which included the construction of Xanadau, Giants Practice Facility and New Meadowlands Train Station. Another important issue related to the site logistics was that all work outside the fence line surrounding the new stadium had to be planned and approved by the New Jersey Sports and Exhibition Authority (NJSEA). The NJSEA would require at least 3 day notification for all work that took place in and around the site. In addition a detailed plan would have to be submitted which included a description of the work, the hazards and specific controls that would be implemented to control such hazards. In a lot of ways the NJSEA was a lot like a 3rd owner. Even though we were not under contract to the NJSEA they did dictate what we could do and how do it in particular as itinvolved the site work in and around the sports complex. All of the site utility work was also carefully coordinated with the Sports Authority as they were directly involved and had oversight for all site utilities. This required

again very careful planning as the entire initial phase of the project required us to re-locate all of the site utilities that were in the footpath of the new stadium.

## Site Work/ Utility Relocation

One of the most challenging aspects of the project was the site work and utility relocation. The footprint for the New Stadium was located in an existing parking lot which contained underground utilities which serviced the existing stadium as well as the Meadowlands racetrack. These utilities must be relocated in order to install piles for the foundation that would eventually support the structure. The site of the Meadowlands Sports Complex is an old swamp which was also used as an old dump site. The geotechnical conditions were the poorest quality soil I personally had ever encountered on any previous project site. Add to the fact that the soil also contained low level contaminants and an extremely high water table with tidal influences which had to be pumped to a basin and treated prior to discharge to the storm system. This was easily the toughest project to date for conducting the site utility work. Due to time constraints multiple contracts were awarded so that work could commence at different starting points and conclude where the runs would meet somewhere in the middle. Due to poor soil conditions and the deep cuts needed to install the utilities all work required protective systems to be installed which provided safe working conditions for those performing the work. The types of systems used included trench boxes; slide rail shoring, sheet piling, as well as timber shoring were all used to protect employees working in trenches.

## Steel and Structural Pre-Cast Erection

The big challenge with the Structural steel package and precast was to find a contractor the shared our commitment to 100 % Fall Protection. This was an extremely large steel project 24,000 tons and over 3000 pieces of structural precast. The solution was to self perform this work with our sister company Skanska Koch this allowed for the tremendous synergy working together with a company that shared our commitments and company values, now the challenge to get the union Ironworkers to buy into what is we wanted to accomplish. Due to the schedule constraints the erection involved using three large crawler Liebehr cranes. The size of the steel pieces, the distance between floor and decks as well as the large number of welded connections added to the difficulty and the extremely large work force that was required to work at tremendous heights. A system of fall protection was incorporated into each and every phase of the erection sequence and throughout the diligence amongst the project team, Union leadership and key operations personnel enabled this phase of the project to achieve all of its goals. Skanska Koch completed the erection of both the structural steel and precast without a lost time incident while logging a little more the 250,000 man hours.

## Geotechnical Conditions

Due to the poor geotechnical qualities of the soil conditions on site we had no choice but to install an engineered crane road to ensure a safe and level base for the cranes to operate safely during steel and pre-cast erection. At a cost of approximately $1 million an engineered crane road was installed to support the cranes while erecting both the outer and lower bowls of the stadium. In

addition to the cranes for erection of the structure there was an overall concern that required us to ensure that all equipment operating on the soil must be thoroughly planned to ensure the ground bearing pressure would not exceed the soil and in many cases required the use of specific designed cribbing to ensure safe operations. A Professional Engineer (PE) stamped calculations were required for each and every crane pick or aerial lift operation to ensure that the cribbing or that the ground bearing pressure would not exceed the limitations.

## Mobile Elevated Work Platforms (MEWP)

The height of the stadium required that a tremendous amount of work to be conducted while working at heights. Much of this work involved the use of Mobile Elevated Work Platforms (MEWP). Though these work platforms are designed as a great tool to make working at heights safer yet those of us who work around them each and everyday understand that if not properly used serious injuries or even fatal incident may occur. The uses of MEWP were utilized throughout the construction operations by just about each and every trade. The safe operation of these while working posed to be a challenge requiring that each and every worker to be properly trained. The workers were required to pre plan work to ensure that their work operations would not impact the work of other trades who may be in the area or potentially underneath where these operations were conducted. Additional procedures and measures were required to be implemented to ensure safety as was learned through various gained throughout this project. Some of the aerial lifts had limitations due to wind speed that had an impact on their safe operation which required us to pay close attention to constant changing weather and in particular wind gusts which were real common at the project site and to put in place an alarm sequence which would require that these MEWP be shutdown.

## RF Energy

The area surrounding the New Meadowlands Stadium is an area with some of the highest recorded readings of radio frequency (RF) waves in the United States. RF energy can pose significant safety concerns to workers while performing even the most routine construction operations. Prior to the start of the project and even before breaking ground the first thing we did was to retain the services of a RF consultant to take measurements to assess the levels of RF waves in and around the site. From these measurements we could then determine the potential hazards and develop procedures to mitigate the hazards to ensure safe work operations. The interesting thing regarding RF energy is that the radio waves do not pose a health hazard to workers but its how they can impact the work that can cause the hazards. The greatest impact was how the RF energy can affect cranes. Since ca crane in a lot of ways is similar to an antenna cranes would act like antenna therefore if not grounded and bonded then RF energy could travel from the boom down the load line to the load and employees handling any type of metallic load could be shocked from the energy. As part of our site protocol for daily crane inspections it was required to inspect to see that all cranes were properly grounded this usually required some type of cable from the cranes frame being connected to a pipe pile or structural steel column. Additional bonding was also required to keep safe. The bonding was accomplished by installing a Kevlar or nylon sling or a fiberglass non-conductive loop between the block and the hook and this would separate the load line from the load which would make it safe to handle. If the grounding or bonding measures were not implemented it would result in either an electric shock or

equipment damage or even worst could lead to other significant hazards. This was even a greater significance due to the large volume of work conducted in MEWP which were also affected by RF energy and the entire workforce from ironworkers handling and steel to the carpenters working on the exterior framing all of whom could have conducted the electrical energy if safe work practices were not followed.

## Fall Prevention and Protection

A major emphasis for all trades was fall prevention and protection. We knew that the nature of the project would require so much of the work to take place while working at heights. Our aim from the earliest phase of the project was to change the culture and to empower the work force to recognize the hazards associated with working at heights and that they could make a difference to the overall safety of the project. A total emphasis was placed on fall awareness which at the very onset made a difference because the reality was that very few members of the work force had ever had any formal training in fall protection. The program was rolled out and was incorporated into the orientation program for all trades and every worker who would work on the project that way it could have its greatest impact for everyone involved. The program was entitled “Choose to Save A Life.” The focus was on the hierarch of controls so that all workers would have an understanding of engineering controls that could be used, the administrative controls and lastly the use of a personal fall arrest system (PFAS). We did focus mostly on the understanding the use of a PFAS as that is what the individual employee is most engaged with and that it would have its greatest impact on them as they performed work on this project site. By introducing to each and every employee this program it made them more familiar with what to expect and to recognize that there are alternatives to use in order to keep them safe.

## Electrical Distribution

Once the structure was in place our emphasis with regard to worker safety shifted gears to focus on electrical distribution and equipment start-up. This by itself on any project is always a challenging phase of the project and a major concern for the safety and health of those workers who would be directly involved with the process. This project took on additional challenges due to the massive distribution system and that also included over 2000 pieces of equipment requiring start up and eight different electrical subcontractors involved in the various aspects of the electrical systems. Emphasis was placed on establishing stringent controls from the initial energizing of each substation and continued through until each and every bus riser, panels, subpanels and equipment was energized. The process through many believed to be time consuming and overkill to many it was the only way in which we could control the process and ensure the safety of all workers who could be potentially exposed to energized circuits throughout the project site. A great deal of emphasis was placed on the proper procedures for lock out/ tag out with a standardized process used by all qualified electricians on the site. Additional controls were established through the use of permits in order to access any of the electrical rooms as well as energized work permit whenever work had to be performed on “live” circuits.

## Fire Prevention and Protection

Fire Prevention and Protection were essential from very beginning of the project until final completion. As is the case in any construction project there needed to be planned into every phase of the project the ability to promptly and effectively respond to any fire event. The key to our successes in this area was developing a proactive dialogue with the Meadowlands Fire Department that included monthly fire safety tours. The most important aspect of any fire safety program was keeping the project site clean. Ensuring that all combustibles were promptly removed from the site and were not allowed accumulating which creates an unsafe condition. This would only be exasperated due to the extreme large amount of welding and other “Hot Work” that was required to take place throughout this project and did not let up at any point throughout the project. Temporary stand pipes were constructed and maintained throughout the construction operations

## Conclusion

This was an extremely challenging project that was able to be completed ahead of schedule, under budget and safely. No matter how difficult it appeared to be we were able to persevere due to the great teamwork and the strong leadership. With top management’s support to do anything that we felt we needed to do to achieve success we were off and running. There were many great systems implemented along with the numerous “Best Practices” help contribute to achieving a great safety culture on the project. The one thing that was key for us to overcome the numerous challenges was the strong leadership for safety by many and a group of the finest safety professionals ever assembled together on one team.