The EDiS Intern Experience: Top Down Construction

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As an **architectural engineering** student at the **Pennsylvania State University**, I have been exposed to a plethora of **construction methods**. One of the most unique of these methods is known as top down **construction**. This method was first introduced to me by one of my instructors – John Bechtel, the Assistant Director of **Design & Construction** for the Pennsylvania State University's Office of Physical Plant – during the Fall 2011 semester in my **Building Construction Engineering** I class. The topic was introduced as a way for large skyscrapers in urban areas to be built faster. In general, since tiebacks cannot be utilized due to immediately adjacent foundations, perimeter retention/foundations walls are constructed with concrete slurry walls. Concrete caissons are then installed for the building's **foundation structural support**.

Now, the **engineering** marvel begins. The superstructure **construction** both above and below grade can proceed simultaneously now. As the first slab-on-grade is poured (with access holes left to allow further excavation below) the steel structure erection can commence (since its support is already in place). After the first slab cures, excavation below this slab can begin for the lower basement levels (perhaps for an underground parking garage). Temporary shoring is placed under each slab for support, as excavation continues through the temporary access holes for each successive level. Moreover, the concrete slabs act as lateral bracing for the previously poured perimeter foundation walls. Now, it is understood how projects can save time by **building** down and up, at the same time.

When I began my internship this summer, I did not anticipate applying lessons from this method to one of the projects I was working on. The projects were an addition to an **elementary school, production plant construction**, and **office renovation work**. However, at the production plant, a new **steel structure** needed to be erected inside an enclosed area. This previously constructed building had a large high-bay style space. The owner desired to add multiple floor levels – an equipment platform, a main level for production, and a penthouse level for mechanical equipment. Three new floor levels of steel needed to be erected in one month. One hundred pieces of steel normally would only take a week to erect in an open field, but in this enclosed space we allotted 4 weeks (that is an average of only five pieces per day).

In order to start the process, the iron workers took field measurements, prepared the existing steel for bolting and welding of new members, and brought in a truck crane through a temporary overhead door. In general, erection proceeded from the penthouse level down (after erecting the equipment platform steel which was located in an area to the right of the main atrium space). Each piece of steel required careful attention as one of the main walls was covered with a temporary plastic partition. This temporary partition protected a critical clean room production area. It was imperative that the erectors not puncture this barrier. To accomplish this, most pieces of steel were raised on guide lines so the crew could carefully control its path through the air, slowly move it into place, bolt the member, and finally weld the member into place. While welding, welding blankets were used to prevent the temporary partition from catching fire.

Lastly, after the month of erection concluded, the ironworkers continued work with decking installation and miscellaneous steel installation.

In conclusion, I learned three important lessons from this **top-down process**. First, preconstruction and pre-installation planning and coordination with the owner, construction manager, and subcontractor can help solve unforeseen issues before they even arise. We went through several iterations of the erection sequence with the subcontractor before finalizing a plan that was eventually diagrammed on our jobsite office wall. Second, constant communication between the ironworker's foreman and EDiS' field manager assisted in maintaining schedule and resolving minor issues as they arose. This occurred several times when a member was to be erected in a tight space such as a perimeter corner, a floor opening frame-out, or near critical pipes and conduit which could not be relocated. And third, yet most importantly, providing, maintaining, and enforcing a **safe working environment** as a **construction manager** was paramount to this top-down erection process. EDiS' project team members continually helped the iron workers work safely on a daily basis, with a safety video orientation, tool box talks, and daily field reports.