

THE EFFECTIVE USE OF ANIMATED 4D GRAPHICS IN SCHEDULING AND CLAIMS DEFENSE

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As construction projects become more complex, the industry is searching for ways to simply and clearly communicate construction phasing, the schedule and its milestones. As the old adage goes, "A picture is worth a thousand words." PinnacleOne has embraced this concept and has developed in-house capabilities to present issues in a graphic manner ranging from low end 3D animated PowerPoint graphics to high end interactive programs that introduce time as a fourth dimension (4D). The following two project examples illustrate the benefits of 3D and 4D graphics in the applications of scheduling and claims analysis.

The first example is a 3D PowerPoint presentation of a successful constructive acceleration claim defense for a subway station project. The second example is an airport terminal and baggage screening facilities assignment, in which the powerful 4D presentation allowed staff an opportunity to visualize and address some challenges the contractor would face in terms of logistics, timeliness and constructability.

3D Graphics in Claims Defense

A Transportation Authority (Authority) awarded a contract for construction of one of its subway stations at a value of over \$60 million. This 1,600 foot station included a subway platform, crossover and tail track section. After the contractor completed construction, it submitted a multi-million dollar Request for Equitable Adjustment that included damages for various extra work claims and time-related issues. The contractor alleged it was forced to accelerate its operations and modify its intended means, methods and sequence of construction due to authority-caused access delays at the interface point of the adjacent tunneling contract.

PinnacleOne, the authority's claim analyst, negotiated a settlement amount that equated to only 19% of the initial multi-million dollar claim value. PinnacleOne achieved this favorable result by successfully refuting the basis for the claimed constructive acceleration damages with the use of animated 3D PowerPoint graphics. The 3D PowerPoint animation proved to be much more effective in conveying the

results of delay analyses than conventional bar charts and other critical path method (CPM) diagrams. By utilizing its animated 3D graphics format, PinnacleOne demonstrated the constructive acceleration alleged by the Contractor never actually occurred. Moreover, PinnacleOne highlighted fatal inconsistencies between the contractor's baseline schedule, as-built schedule and its narrative and electronic components.

PinnacleOne graphically recreated the contractor's narrative and electronic schedule data, showing an inconsistency within the contractor's own planned schedule and the excavation method used, which they claimed to have been dictated by owner delays, had always been the contractor's plan.

4D Graphics and Scheduling

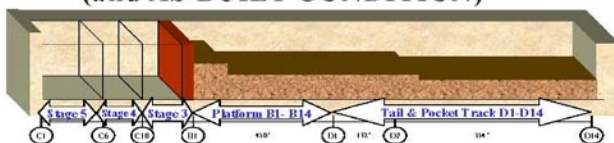
An Airport Authority (Authority) awarded a Construction Management (CM) contract for the \$450 million renovation of its international airport terminal and baggage screening facilities. The CM team included PinnacleOne, which was tasked with performing and overseeing all project control activities, including scheduling, cost engineering, estimating, document control, management of information systems and claims avoidance.

During the design phase, after consulting with all stakeholders of the project, such as the airlines, terminal operations, concessionaires, and US Customs & Immigration, PinnacleOne developed a comprehensive construction phasing plan. The phasing plan allowed for minimal impact to the 33 airlines operating from the terminal and 10 million passengers using the terminal annually. A 1500 activity trade-level master construction schedule was then created that fully complied with the phasing plan. The challenge for the CM team became finding a way to effectively communicate construction phases and their respective schedules to all parties involved. To meet this challenge, PinnacleOne and the CM jointly developed a 4D graphic presentation, using Auto-CAD, Primavera, MS PowerPoint, Adobe Photoshop and Macromedia Flash Player programs.

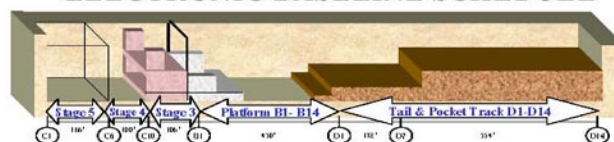
The 4D presentation illustrates a phased sequencing of all architectural/structural and baggage handling system upgrades in the terminal building. During the phasing development the CM identified various constructability and scheduling challenges the contractor will potentially face during construction. Since the bidders will have an opportunity to view this presentation before bidding, they will have the ability to price their bids more intelligently. This exercise is part of the CM's 'claims avoidance' program.

After 9/11/01, Transportation Security Administration (TSA) imposed very stringent baggage and passenger screening requirements on all airlines and airports across the country. As a result, the project scope also includes substantial

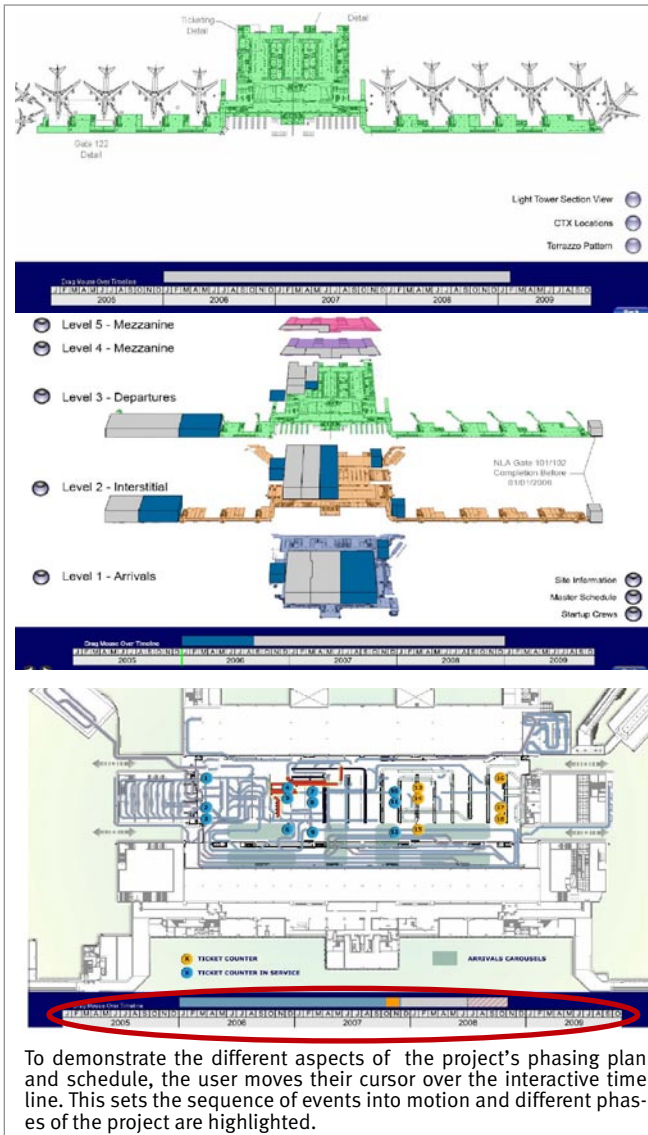
5 Months after the start of Excavation NARRATIVE BASELINE SCHEDULE (and AS-BUILT CONDITION)



ELECTRONIC BASELINE SCHEDULE



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To demonstrate the different aspects of the project's phasing plan and schedule, the user moves their cursor over the interactive time line. This sets the sequence of events into motion and different phases of the project are highlighted.

expansion and improvements to the baggage handling system (BHS). Installation of this system has to be coordinated with the terminal's structural upgrades. To address this the presentation, created by PinnacleOne and the CM, included BHS phasing showing major components being installed over an interactive project time line. Also included in the presentation is a 3D animated sequence that compares the old vs. new BHS, illustrating the system enhancements.

Finally, the 4D model allowed the CM to study alternate phasing scenarios geared towards potential time savings, further minimizing impacts to passenger and baggage flow, and so on. The CM is, therefore, continuing to revise/modify the phasing/scheduling.

The CM presented the phasing plan in a 'Community/Industry Outreach' initiative by the authority that was attended by major contractors interested in bidding on this project. The authority has also used the 4D presentation for obtaining project/funding approvals from its Commissioning Board, as well as the City Council.

The terminal project is an approved 3-year CIP/Non-Master Plan project, and has a 40-month duration.

Technological advancements have touched virtually every industry, and construction is no exception. New developments in presentation and computer-aided-design (CAD) programs coupled with a desire to simplify communication, have led to the concept of 4D modeling in engineering and construction. Although fairly new, 4D modeling has been successfully used on a variety of projects. We are not too far from the time when no one will have to read lengthy reports and charts to understand complex scheduling and claims analyses. Currently, 4D is the most effective way to communicate to an audience that may be unable or unwilling to read technical charts and narratives or does not have enough time to spare.

ABOUT THE AUTHORS-

Sudhir Damle, PE, Vice President - Mr. Damle has over 25 years of experience in construction, project engineering and management, cost and schedule engineering, claims management and resolution. His project experience includes heavy civil construction projects both in the U.S. and overseas. He has extensive experience managing complex jobs on large capital improvement projects, diverse work forces and maintaining excellent owner/client relationships.

Vikram Chopra - Mr. Chopra has over 18 years of international experience in program/project controls involving a variety of general building and heavy/civil projects at managerial and supervisory levels. His expertise includes planning/scheduling, cost engineering, claims avoidance/analysis, and development of high-end graphic/presentation tools. His project work has included buildings, aviation, port facilities, waste-water treatment plants and seismic retrofits.

Craig Halvorson - Mr. Halvorson has over 15 years of professional experience in project management, project controls, project scheduling, master scheduling, claims mitigation and resolution, cost estimating and cost monitoring systems, with six years of experience as a licensed contractor. Mr. Halvorson has performed a variety of construction management services on several large public works programs.