WORKING AT A CONGESTED URBAN SITE

California Pacific Medical Center

By Jay Love, S.E. and Alan Loving

Figure 1. Aerial view of site.

The California Pacific Medical Center is the San Francisco-based affiliate of the Sutter Health System. The November issue of STRUCUTRE magazine included an article on the use of the Integrated Project Delivery (IPD) framework on the project. This month, the topic shifts to the challenges of constructing the project in a congested, urban environment.

Project Site

In seeking a location for a new acute care hospital in San Francisco, Sutter Health/CPMC was fortunate to find in a 'built-out' city, an available full city block (2.5 acres) that also happened to be at the intersection of two major transportation routes: Geary Boulevard and Van Ness Avenue. In doing so, the hospital will be located in an area of the city that will allow it to serve the highest percentage of seniors and children living in San Francisco, as well as provide convenient medical care to the wider Bay Area region.

Geary Boulevard is the major arterial connecting the downtown to the western part of the city. The bus line on Geary Boulevard carries the highest volume of passengers of any line west of the Mississippi River, and serves as a transfer point to major north-south bus lines on Van Ness Avenue that serve both San Francisco and the North Bay counties of Marin and Sonoma. The bus lines on both transportation routes also connect to the Bay Area Rapid Transit System (BART) serving the greater Bay Area. Van Ness Avenue is also State Highway 101, the north-south route connecting points south of San Francisco to the Golden Gate Bridge and also to points north. On the west edge of the site, Franklin Street serves as a one-way arterial route that carries a large volume of local and regional traffic parallel to Van Ness Avenue. The northern edge of the site is bordered by Post Street, a one-way connector to downtown San Francisco (*Figure 1*).

Physically, the site presented a number of challenges to the construction team, from demolition of the hotel and office building that occupied the entire site through construction of the hospital. The site is ringed by major thoroughfares and the neighborhood is fully developed with established uses including churches, residential units, businesses and commercial establishments, leaving no surplus area for the staging of vehicles and materials. As a result, the construction team worked closely with the City and County of San Francisco (City) and state agencies to develop a logistics plan that allowed for the use of adjacent sidewalks, parking and traffic lanes in support of construction related activities. This plan varies depending on the type of work being done, the equipment needed, and the location of the work on the site. It requires permits from the City with fees in excess of $6 million.

Approvals and Permitting

Sutter Health/CPMC spent over eight years seeking approvals from the City for the medical campus. This process included extensive public outreach to neighboring residents, property and business owners, and community organizations to inform them about the project and to get input about how to minimize impacts.

Prior to the commencement of construction work, commitments were made to neighboring property owners that construction activities would not result in excessive noise, vibration, dust or traffic. These commitments were in addition to, and at times more restrictive than, City requirements. For example, City regulations allow construction to occur every day of the week between 7:00 a.m. and 8:00 p.m. Permits may be issued to allow work to occur outside of these hours. CPMC agreed to limit construction work to between 7:00 a.m. and 7:00 p.m. Monday through Friday, and 7:00 a.m. to 5:00 p.m. on Saturday. No work is allowed on Sunday. While this results in a longer construction period, the limitations are important to protecting the quality of life of the project's neighbors.

A community liaison was hired to interface with the community on a regular basis to disseminate information about current and upcoming construction activities. These activities are provided in the form of one week and six week reports. The community is encouraged to contact the liaison, 24 hours a day, should a problem arise.

The project's location in San Francisco means that it is subject to city, state, and federal permitting agencies, including several City and County of San Francisco departments: Public Works, Municipal Transportation Agency (SFMTA), Building Inspection and Planning. The state's Office of Statewide Health Planning and Development (OSHPD) is responsible for the review and approval of the hospital building; the California Department of Transportation (Caltrans) is responsible for issuing permits for construction activity along Van Ness Avenue, which is State Highway 101. Federal Aviation Administration (FAA) permits are required for the height of the hospital building and the two tower cranes that will be used to construct it, as they exceed 200 feet in height. As the project progresses, and the site changes from demolition to excavation to foundations and the erection of steel, the need for access to the site has varied.

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Demolition of the Existing Buildings

Before construction could begin on the hospital, a 10-story, 120-foot tall, 455,000 square foot hotel and an 11-story, 180-foot tall office building had to be demolished. To reduce the impact of noise and dust on neighboring properties during demolition, implosion or the use of a wrecking ball were ruled out. Instead, high reach excavators with jaws and water spray attachments were used to demolish the building in sections from the inside of the site, using the walls along the exterior edges of the project as buffers. This type of operation is referred to as "munching." To prevent debris from falling onto adjacent streets, cranes were used to hang large mesh screens around the exterior of the buildings. All materials were crushed and sorted on site prior to disposal or recycling. In the end, 99.7% of the materials were recycled.

After seven months of demolition work, the site was cleared and excavation work began. This work included archaeological and environmental testing of the soils. See *Figure 2* for the site during the munching operations.

Figure 2. Demolition phase.

Excavation and Shoring

Prior to the start of the shoring, an extensive pre-construction survey of adjacent buildings was undertaken to document interior and exterior structural conditions. These records will serve as source materials should any claims be filed against HerreroBOLDT, the general contractor, for damages caused by construction activities. Vibration and noise monitors were installed at key locations on or in neighboring buildings to provide the contractors with real time alerts of excessive noise or vibrations.

To achieve the three levels of underground parking and foundation system for the hospital, soldier piles and wood lagging shoring was installed during the site excavation to support the soil beneath the streets around the perimeter of the site. The shoring walls were held in place by tiebacks that extended into the roadways, avoiding existing utilities and foundations of neighboring properties. Inclinometers installed in the shoring system ensure that no unusual deformities occur from the pressure of the adjacent streets before the hospital walls could be poured. The concrete foundation consisting of a combination of slab, continuous, and spread footings was placed. The site slopes upward more than 30 feet from east to west. On the west side of the site, the excavation was 65 feet deep. See *Figure 3* for the site during the shoring work.

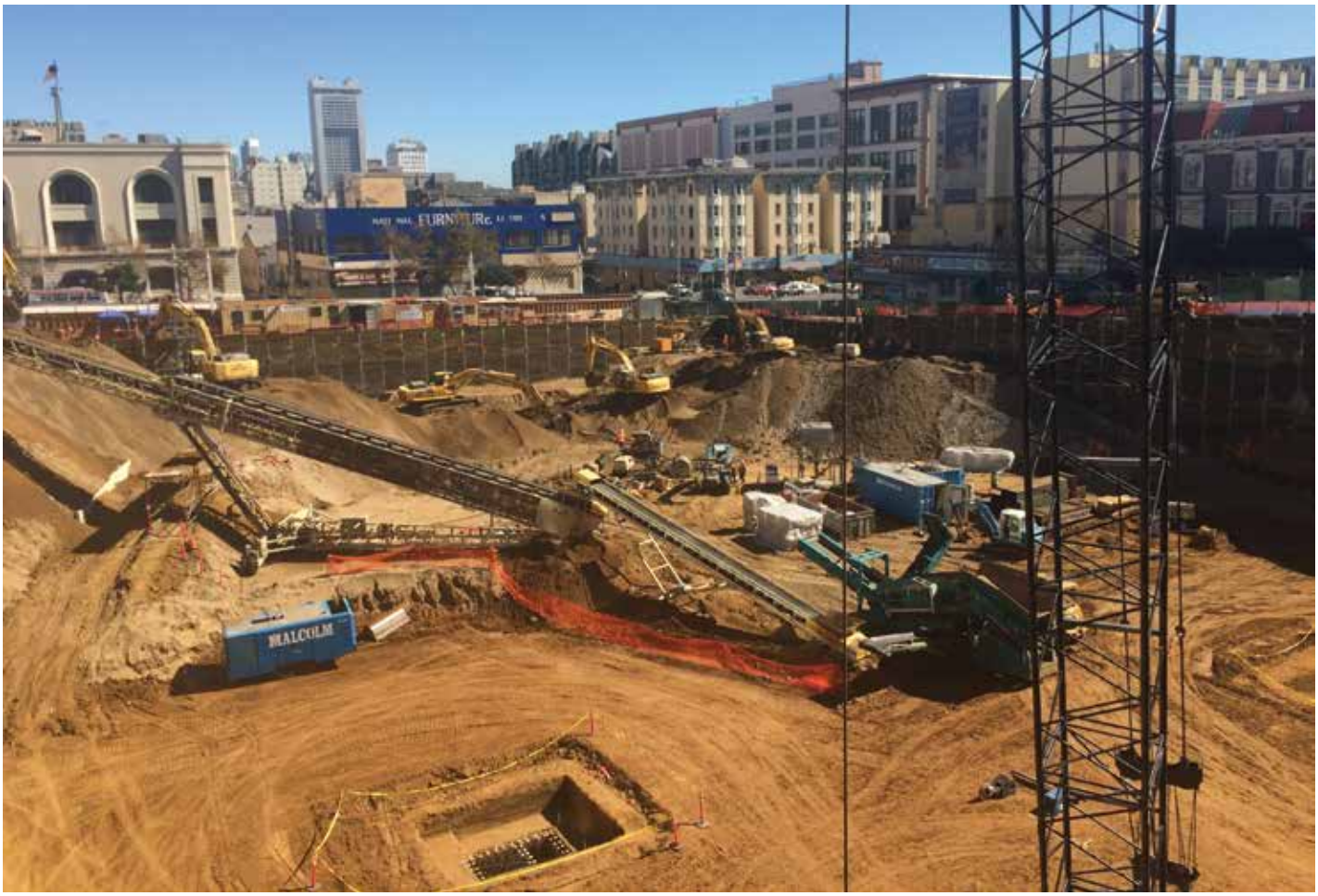

Figure 3. Site during excavation.

The site generated over 100,000 cubic yards of soil, mostly sands. These soils were removed from the site in approximately 10,000 truckloads over a four month period. A logistics plan was created to minimize truck traffic on surrounding streets by directing trucks on-site to be loaded. Throughout the excavation phase, ramps were constructed to provide efficient site ingress and egress for the trucks. During much of the excavation, a large conveyor was used to load the trucks with dirt, reducing the travel area within the site and saving time and effort. Creating a truck route that directed the trucks onto and off the site as soon as possible reduced the impact on city streets and traffic. Truck arrivals were timed to avoid stacking on streets and departures were designed to direct the trucks to outbound city truck routes. Street sweepers were employed by the project to reduce any dirt and dust carried by the trucks onto streets in the area of the project.

To minimize the impact to surrounding streets and traffic from material deliveries, loading and staging areas were created within the expanded construction zone around the site. All deliveries are scheduled in advance and timed to ensure that no trucks wait outside the site. This is achieved by coordinating off-loading with production schedules, tower crane and crew availability. Any unusual deliveries of oversized equipment or items that can't be delivered during normal construction hours are approved by the City in advance with outreach to the neighbors.

Erection of Structural Steel

Once the foundation was completed, erection of structural steel began – which is the current state of the project as this article is written. The project will use more than 12,000 tons of steel in the construction of the 12-story structure. In order to support the large amounts of equipment typical in a hospital, the building has columns that weigh as much as 52,000 pounds. Two tower cranes erected on the site during this phase of work were supplemented by large mobile cranes used to install larger, heavier columns. Once column and beam placement began, walls and decks began to be formed and poured. An aggressive schedule anticipates a 10-month completion period for this phase of work. See *Figure 4 (page 28)* for the site during steel erection.

Impact on Public Transportation and Pedestrian Traffic

Both diesel powered and electric powered buses are used by the San Francisco Municipal Railway (MUNI) in this area of San Francisco. The electric buses connect to an overhead catenary system. Overhead lines run adjacent to the site on two streets; on Post Street to the north and to the east on Van Ness Avenue.

In order to provide greater access to the site and maximize public safety during demolition and the erection of steel, MUNI allowed the project to move the lines on Post Street one lane north. The construction team developed a plan with the City to temporarily de-energize and physically relocate the lines during early morning hours when service on those bus lines was limited. All costs were borne by the project. The move allowed the project to expand its work area by using the adjacent sidewalk and parking lane. Although there are no overhead lines on the remaining three streets adjacent to the site, a similar expansion of the site was permitted by the City and the state to provide critical space to the construction team for staging, delivery of materials, concrete pumping, column placement and other activities.

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Figure 4. Steel erection.

The sidewalks adjacent to the site are closed on three sides in order to provide more space for construction activities and to ensure the protection of pedestrians in the area. Through the use of signage, pedestrians are directed to use the sidewalks on the opposite side of the street. Given the high volume of pedestrian traffic on Van Ness Avenue, a covered pedestrian walkway was constructed in the parking lane.

Tunnel under Van Ness Avenue

The hospital project includes a 125-foot long pedestrian tunnel beneath Van Ness Avenue, providing a safe connection for medical center patients and staff between the hospital and a medical office building, located on the east side of Van Ness Avenue. The 10-foot by 10-foot tunnel (essentially a box culvert) is approximately 13 feet below the surface of the roadbed and required three separate closures of Van Ness Avenue to complete. Extensive potholing was performed in the road to locate existing utilities beneath Van Ness Avenue prior to the drilling of 37 shoring piles that serve as the structural support of the earth during the tunnel construction (*Figure 5*).

HerreroBOLDT determined that the cut and cover method would be the best way to construct this tunnel. Use of a boring machine was not economically feasible nor physically practical, given the length of the tunnel and the constraints of working directly adjacent to the construction of the hospital.

Excavation of the top 8 feet of the road (+/- 30 feet wide) allowed for the installation of cap beams that support precast concrete panels beneath the temporary roadbed while the tunnel was constructed below. The utilities were supported in place from these panels. The temporary roadbed allowed traffic to resume normal flow on Van Ness Avenue while excavation; formwork and pouring occurred below. The first two road closures were dedicated to installing the soldier piles, removing the road surface and installing the precast panels. The final

closure will see the removal of the temporary roadbed and pre-cast concrete panels, and the placement of the permanent roadbed.

In order to minimize traffic delays on Van Ness Avenue while this surface work was done, the city block in which the tunnel is located was closed and traffic was detoured to parallel north-south arterials. Only city and regional buses were allowed to travel through the work zone during the closures. The work was performed during three 72-hour weekend closures over the course of eight months.

These closures required the close coordination and cooperation of HerreroBOLDT, the City's transportation agency for traffic control and de-energizing of the overhead catenary system within the work area, and the police department for additional traffic control. In addition to approving the detour plan, Caltrans provided regional traffic control assistance through the use of highway message signs that notified motorists of the dates and the status of the closure well in advance of the work. These notifications, combined with a public outreach campaign that included community meetings, mailed notifications, electronic, print and social media significantly reduced the number of motorists travelling in the area during the three designated weekends. This outreach was a key factor in the success of the closures. With fewer vehicles in the area, the construction crews could focus on completing their tasks safely within the 72 hours scheduled. There were no significant traffic delays created by the detours and the work was completed on the first two closures hours earlier than expected.

From a cost standpoint, the tunnel represents a small percentage of the overall budget – $10 million of the $1.1 billion total. The coordination required to successfully construct it in a way that had minimal impact on the construction of the hospital and traffic in the area was, however, quite significant.

Project Labor

Any discussion about the cost to build must include a discussion about labor. As a commitment to the City, Sutter Health/CPMC works with its trade partners and subcontractors to ensure that a minimum of 30% of trade hours (30% of journeyman and apprentice trade hours) are performed by San Francisco residents. In a challenging economic environment that has priced many construction workers out of San Francisco, the project is meeting this goal. In addition, the project continues to work to reach a goal of contracting 14% of the cost of construction, over $140 million, with San Francisco-based businesses.

Employee Transportation and Parking

One of the concerns raised by the community about the project in early discussions was the impact of workers parking in the neighborhood around the job site. HerreroBOLDT assured the community that workers would not be allowed to park on the street. To achieve this, a program was created that encourages workers to carpool, take public transportation, bike or walk to the job site. A limited number of off-site parking spaces are provided for workers in local garages, but incentives like gas cards and gifts are provided to those who carpool. Monthly transit passes are provided to those who use public transportation and gifts are made available for people who walk or bike. To date, over 45% of workers participate in the program.

Figure 5. Tunneling under Van Ness Avenue.

Working With the City and the Community

Constructing a major hospital in the center of San Francisco has presented the contractor and owner with major challenges in the way the project has been approached from demolition through construction. Decisions made about the construction of the project are made to maximize safety and productivity, limit waste, and minimize the impact on the community. Maintaining good relations with the neighborhood and the representatives from the various government agencies that have jurisdiction over the site is very important to the success of the job. The team values their input and their assistance. The project is on schedule to be open for patient care in 2019.▪

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