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Memorandum

Date	January 23, 2003	**Job**	SF General Helipad
To	Carlos Villalva	**Job Number**	A00218.00-003
		Subject	Helipad
From	Jay Love		

Report:

Introduction

The purpose of this feasibility study was to determine if there are significant structural requirements that would substantially affect the cost of design and construction of a new helipad on roof of the existing main hospital building at San Francisco General. The proposed project consists of the construction of a

3000 square foot helipad mounted on either the northwest or southwest wing of the main hospital. The pad must be mounted on the roof such that the landing surface is above any vertical obstructions on the possible flight paths. Therefore, the landing surface must be higher than the existing 3'-6" high concrete parapet walls and ventilation penthouses. In order to transport patients on gurneys, a ramp from the landing surface to the existing roof will be required as part of this project. Additionally, an elevator or lift will be required to transport patients on gurneys from the roof to the floors below.

Code Requirements:

The design and construction of a helipad on the roof must conform to the structural regulations of Title 24, Part 2, Division VI-R, of the California Building Code as it pertains to acute care occupancies. If any changes to the live or dead loads of an existing hospital building cause an increase in story seismic shear force of more than 5%, then the building must meet or be retrofitted to meet the Life-safety or Seismic Performance Category 2, of Division VI-R. As part of our SB 1953 evaluation of the existing hospital building, we concluded the building did not meet this level of seismic performance without modification. Any trigger for seismic upgrade of the structural frame would therefore be extensive, as several other aspects of the building's seismic performance would require upgrade, far beyond that necessary to support the vertical loads imposed by a helipad.

Building Description:

The Main Hospital was designed by T. Y. Lin, Kulka Yang and Associates, in 1969, prior to the implementation of the 1973 Hospital Seismic Safety Act. The main building has about 550,000 square feet of area.

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The Main Hospital is a concrete shear wall building consisting of a six-story tower on a two-story base and a single story basement. The floor plan of the tower is H-shaped, and is symmetric. The gravity load-resisting system of the building includes post-tensioned floor slabs, beams, and reinforced concrete framing. The lateral force-resisting system is comprised of concrete walls located around the stair shafts, elevator shafts, and exterior walls.

The columns and walls are supported on spread footings or drilled piers at the foundation level.

Assumptions:

We have evaluated the feasibility of a new helipad of plan dimensions 54 feet by 54 feet on the roof of the northwest and southwest wings. (The building is almost sysmetrical in plan layout at the roof level. Conclusions regarding one wing would be equally applicable to another wing.) To assess the increase in seismic forces that would be associated with this addition, we have assumed the pad to be constructed with a five-inch deep, light weight concrete fill on 3 inch metal deck. The metal deck would be supported by steel beams and girders spanning to steel columns in the middle of the helipad and to the exterior concrete walls on the exterior. The new steel columns would be located directly on top of the existing interior concrete columns. The average weight of this system is 80 psf. The helicopter design load was 18,000 pounds which corresponds to a Bell 412 helicopter take-off load. The helipad would be braced against seismic forces with diagonal steel braces between the landing pad and the existing concrete roof.

Conclusions

Based on the system described above, the additional weight of the helipad does not increase the seismic forces in the top story by more than 5 percent. Therefore, the addition does not cause a regulatory requirement to strengthen the building for seismic forces. The new system itself must be designed for seismic forces in accordance with Section 1632A of CBC 2001 – "Lateral Forces on Elements of Structures, Nonstructural Components and Equipment Supported by Structures."

There is a second option that was not investigated at this time but should be considered if this project moves forward. The second option is to provide prefabricated aluminum framing system with a proprietary helipad surface. The proprietary helipad package includes the framing, non-skid surface, ramps, and lights. The estimated average weight of the proprietary system would be about 30 psf. This system may be easier to install on the roof than the steel framed concrete deck described above. Not only is the proprietary system lighter and therefore, presumably easier to hoist onto the roof, the system would not require placing concrete at the roof level.

Elevator Core:

There are two obvious options for providing elevator access to the roof. The first option is to extend vertically two of the six elevator hoistways, located in the east core, to provide access at the roof level. In order to extend the hoistway, the existing machine slab above the shafts must be removed to allow the cabs to service the roof level. The existing layout of the elevator equipment must also be modified. The feasibility of any new layout must be reviewed by a qualified elevator consultant or vendor. We understand that the new elevator machine room slab would be about 3 to 4 feet higher than the existing location. Access to the new cab at the roof may occur through the existing exterior concrete south wall of the elevator core or through the interior concrete wall. A new slab will need to be designed and constructed to support the relocated elevator equipment.

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A second option is to provide an enclosed, single story lift, located in the existing eighth floor courtyard, to provide access to the roof. This option would require that the patient then be transported to the nearby existing elevators at the eighth floor. To avoid cutting a new opening in the eighth floor post-tensioned slab to create a typical elevator pit, a scissors-lift could be installed above the slab. This would necessitate some ramp or other accommodation to get a gurney from the lift to the courtyard level. This option would not require any modifications to the existing elevators and therefore would be less disruptive during construction.

Construction Issues:

- Connection of the new helipad to the roof will require opening of the existing roofing membrane to install support points. The membrane opening and subsequent repair after installation of the support points should be done as quickly as possible to minimize the risks due to weather.
- The tendons of the existing post-tensioned slab will need to be located prior to anchoring the helipad system to the roof. These tendons may not be cut except under very controlled conditions.
- There are construction issues with lifting the material to the roof. Based on an informal conversation with a General Contractor, a mobile crane can be used to lift materials from the ground to the roof. The parking lot to the south could provide a staging area for the crane. With prefabrication of as much of the platform as can be lifted by a mobile crane, the steel erection should be completed within one week. During this time frame, an area of about 150 feet by 60 feet would be required to assemble the crane, lift the material, and disassemble the crane.
- Access to the roof by construction personnel must be addressed. The most economical approach would be to allow the use of a designated internal elevator within the building. If designated elevator access is not feasible, then an temporary exterior construction lift would be required. For the relatively short duration of construction, this approach may represent a significant premium cost.
- Anchorage of the helipad to the existing roof will cause noise and vibration during construction. The space below the construction may have to be vacated during construction.
- The construction cost of a similar helipad on the 8th floor of a concrete parking structure at a hospital in Southern California was about $400,000. The project did not include any modifications to the existing elevators.

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