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BAHA
BAY AREA HEADQUARTERS AUTHORITY

Memorandum

Agenda Item 6

TO: Bay Area Headquarters Authority

DATE: June 19, 2013

FR: Executive Director

W. I. 9130

RE: 390 Main Seismic Retrofit Update

The seismic retrofit design for 390 Main Street has been completed in accordance with the requirements of the California Building Code. The design was performed by the structural engineering firm, Holmes Culley, under BAHA's Architecture / Engineering Design contract with Perkins + Will. The criteria for and design of the structural retrofit is described in Attachment A. The building is considered a non-essential services facility, and was designed for the equivalent of a life safety level for the design basis earthquake. The retrofit includes doweling into and thickening with concrete the exterior concrete walls of the structure and foundations below them.

The design has been reviewed and approved as follows:

1. Structural code requirements by BAHA's on-call design firm, URS Corporation.
2. Fire / Life Safety by the State Fire Marshal.
3. Accessibility by the Division of State Architect.

Agenda Item 7 recommends BAHA authorize funding to amend the existing construction contract with McCarthy Building Companies, Inc. to include this work.

Steve Heminger

Attachments
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HolmesCulley

MEMORANDUM

To: Stephen Wolf

Company: Bay Area Headquarters Authority

From: Zander Sivyer & Arne Halterman

Project No: 12123.11 Date: June 2013

Subject: 390 Main, San Francisco – BAHA Building Seismic Design Criteria

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Stephen,

We have completed our seismic retrofit design of 390 Main Street in San Francisco. As you know, this building will house the Bay Area Headquarters Authority (BAHA), as well as other tenants. This memorandum describes the building structure, summarizes the seismic design criteria, describes the seismic retrofit scheme, and qualitatively discusses the expected performance level in a seismic event.

Building Description

390 Main Street is located on the southern half of the city block bounded by Main, Harrison, Beale, and Folsom Streets. The existing building was constructed circa 1940 and is eight stories tall and of concrete construction. The original floor plates are consistent through all floors of the building at approximately 234 feet by 275 feet (64,000 square feet per floor) for a total building area of 518,000 square feet.

The structural system is of cast-in-place concrete. The elevated floors are a two-way spanning slab supported on a grid of columns. The foundations are typically isolated spread footings at the interior of the building and drilled caissons at the northern edge of the building. Based on the geotechnical report provided by Treadwell and Rollo, the site is classified as a Site Class B (i.e., a rock site). Lateral load resistance is provided by concrete walls on the perimeter of the building (in a pier and spandrel configuration).

Seismic Design Criteria

The seismic design criteria used for the seismic retrofit of 390 Main St is as follows:

- California Building Code 2010, at 100% Force level

The seismic retrofit of 390 Main Street was designed to the same level of seismic forces that would be required of a new structure. As a point of comparison, for the seismic retrofit of

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an existing building in San Francisco, the San Francisco Building Code allows seismic design forces to be 75% of those required for new construction.

The 390 Main retrofit was then checked against and deemed to meet or exceed the life safety limit state for a 500-year earthquake and the collapse prevention limit state for a 2500-year earthquake. As a point of comparison, the California Building Code (CBC) would require State-owned buildings with a similar type of building occupancy (Occupancy Category II) to meet or exceed the life safety limit state for a 225-year earthquake and the collapse prevention limit state for a 995-year earthquake.

Seismic Retrofit Description

Numerous alternate schemes were evaluated in the design process. The chosen seismic retrofit scheme augments the existing structure to exceed the performance criteria.

The original and existing lateral force-resisting system is composed of the exterior concrete wall pier and spandrel system at the perimeter of the structure. The new seismic retrofit scheme provides a new structural concrete overlay of the existing system. The new concrete overlay is also located at the perimeter of the structure and is tied to the existing structure with new epoxy dowels at a regular spacing. Where required, new foundations have been included underneath the new perimeter concrete walls.

The new lateral force resisting system works in conjunction with the existing lateral force resisting system. By providing a concrete overlay to the existing structure, the existing lateral load path remains intact. Seismic inertial forces generated at the floor levels travel through the existing floor diaphragms into the new and existing concrete walls at the building perimeter. Once there, the seismic forces are carried into the earth via these walls. By using the existing system where possible, the extent of the strengthening is lessened and the existing seismic system is directly protected by the new.

The lateral system provides a number of benefits over alternative systems. First, this system provides an open floor plate to the building, keeping the interiors open. Alternative schemes compromised the functionality and space planning of the building interior. Second, this scheme is straight-forward in its construction. Through the use of shotcrete, the existing concrete walls serve as the formwork for the new concrete wall overlay.

Expected Seismic Performance Level

The seismic retrofit design for the building structure at 390 Main Street exceeds the seismic design criteria. The retrofitted building is expected to perform very well in the design seismic event, exceeding life safety requirements at the code specified design seismic event. The lateral force resisting system has been designed as a ductile system. Based on the design reinforcing, the reinforced concrete spandrels (i.e., the "beams" as part of the pier

and spandrel system) are expected to be the "weak link" to the structure, acting as a fuse for the entire system. Some non-linear response of these spandrels is expected in a large earthquake and will act to dissipate the energy of the earthquake. In this non-linear response, some cracking of the concrete spandrels is expected as the structure moves with the seismic ground accelerations.

We are pleased to have worked with BAHA leadership team and the Perkins + Will lead design team on the design of the seismic retrofit and renovation of 390 Main Street. We look forward to continuing this working relationship through the completion of construction and occupancy. Please feel free to contact the undersigned with any questions.

HOLMES CULLEY

Zander Sivyer, SE
PRINCIPAL & CEO

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PROJECT MANAGER