SWRInstitute Trinity Project Awards Program
Project Information: Entry Form II

(For online submission, go to www.swrionline.org)

Project Title: Bellaire Tower - The Jewel of Russian Hill

Location: San Francisco, CA

Entry Classification: (Select One)

☐ Sealant ☐ Waterproofing ☑ Restoration

Project Cost (US $)(Nearest $100k): $5,000,000 Duration (Calendar Days): 990 Days

Start/Completion Date: Start: April 2007 Completion: July 2010

Work Scope (500 words max) (Attach if necessary) :

Please see following document.

Abstract (100 words max) (what makes project worthy):

Unforeseen Conditions:

Problems/Challenges/Solutions:

Safety Considerations (public/property/hours accident free, etc):

Community/Environmental Impact:

Technology/Innovation:

Site Constraints:

Quality Control/Field Testing:

Rigging Approach:

Sustainment:

Bellaire Tower

San Francisco, CA

ABSTRACT:

Bellaire Tower, San Francisco, CA, was built in 1930. The Art Deco building is a high profile, historic building with extensive ornamentation and details. Logistics were unique: interior enclosures were built to protect residents during construction, swing stages were used on the windiest corner in San Francisco. Containment of lead paint during removal process required careful consideration (20 stories high in a densely populated residential area with winds often as high as 90 mph). A very large mock-up was completed 2 years ahead of the project that enabled the Team to better understand the problems and to plan the project.

WORK SCOPE:

The size and complexity of the project required four phases to complete. The Owner wanted to avoid construction activities during the winter holiday and rainy seasons. In general, the following sequence was completed for each elevation:

1. Install scaffolding, swing stages and interior protection
2. Removal and abatement of wall and window coatings
3. Consultant examination for spalls and cracks
4. Concrete demolition and surface preparation
5. Installation of anodes and steel coatings
6. Spall and crack repair
7. Window refurbishment
   a. Grinding of the steel and sash
   b. Removing the glass and existing putty
   c. Install new flashing at the sill
   d. Repaint
   e. Set new glass in a bead of silicone sealant
   f. Install new hinges and handles
8. Perimeter seal of windows
9. Powerwash
10. Consultant inspection and approval of repairs
11. Application of coating

This sequence was completed on a drop by drop basis and planned in order to minimize disruption and avoid comebacks into each of the Owners condominium unit.

The crew size averaged 30 men each day (12 on wall coating and steel window paint removal, 4 refurbishing and replacing windows and 14 on all other concrete repair, sealant and coating application work) for each phase.

3,500 anodes were placed and grouted into cored holes and connected to the steel window flanges. Other anodes were tied directly to the reinforcing steel. In some of the tighter areas a zinc coated sheet was applied to the steel flange. Steel coatings were brushed onto the exposed reinforcing steel and steel window flanges. Window perimeter concrete repair (1,500 LF) was formed on 2 sides and poured into place. Other concrete repairs (2,000 SF) were hand-applied.

Window refurbishment was tedious and labor intensive. All work was done by hand. Work proceeded as originally planned for the south and west walls. Because the fire code restriction did not apply to the north and east elevations, the Team had greater flexibility on how to treat the windows. Windows were either refurbished or replaced depending on cost effectiveness. Approximately 25% of the steel windows were replaced. Additionally, all metal-metal and metal-glass in the aluminum windows received a new wet seal of silicone. In total, 80 steel windows were replaced, another 360 were refurbished; while about 100 aluminum windows received new wet seals throughout and another 100 received a new wet seal around the perimeter.

Ornamental concrete elements were replaced with GFRC. Polyurethane sealants were gunned into the concrete-window joints and other moving cracks (4,500 LF). And lastly, a breathable, waterproof coating (1,200 gallons) was rolled onto the entire exterior wall.

It was over six years from the time the consultant got involved until the last elevation was completed. The Owner, Consultant, Contractor, Contractor's site personnel and Material Supplier worked together as a team. The Board was so please at the conclusion of the project the President was heard to say, 'The building is sound, waterproofed and looking great. The Jewel of Russian Hill is reborn and looking better than ever".

UNFORESEEN CONDITIONS:

The large mock-up and thorough investigation completed before the contract award minimized unforeseen conditions. Less code restraints permitted the project team to replace rather than restore more windows on the north and east elevations. This revised approach saved both time and money.

PROBLEMS / CHALLENGES / SOLUTIONS:

The primary problem was water leakage in and around the windows as well as spalling of the concrete. The building was recoated numerous times resulting in the accumulation of over 90 mils of non-breathable coating(s) over the concrete. The solution was removal and abatement of the coatings (some coatings contained lead), concrete and crack repair and complete window restoration and replacement.

SAFETY CONSIDERATIONS:

No accidents.

COMMUNITY / ENVIRONMENTAL IMPACT:

Complexity of addressing the problems with old windows while adhering to strict historic requirements. The Planning department insisted on no changes to the appearance of the building. Restored elaborate ornamental features

TECHNOLOGY / INNOVATION:

Three different forms of anodes were used to protect the steel. Installation of a monitoring system to verify performance of the anodes. Special coring machine allowed for more efficient coring for the anodes. Fabrication of new pilasters in GFRC to replace deteriorated ornamental concrete.

SITE CONSTRAINTS:

Tight city conditions. An uncooperative neighbor required complicated rigging without accessing the neighboring property. Because of the close proximity of the west and south elevations to the neighboring properties, strict fire code regulations would come into effect if the steel windows were replaced.

QUALITY CONTROL / FIELD TESTING:

A full survey of the exterior wall was conducted to document and quantify the amount of spalls and cracks. The thorough documentation allowed for competitive bidding for the entire scope of the project. Five SWRInstitute contractors bid the project. Comprehensive inspections of each stage of work was completed to ensure the highest standards of quality

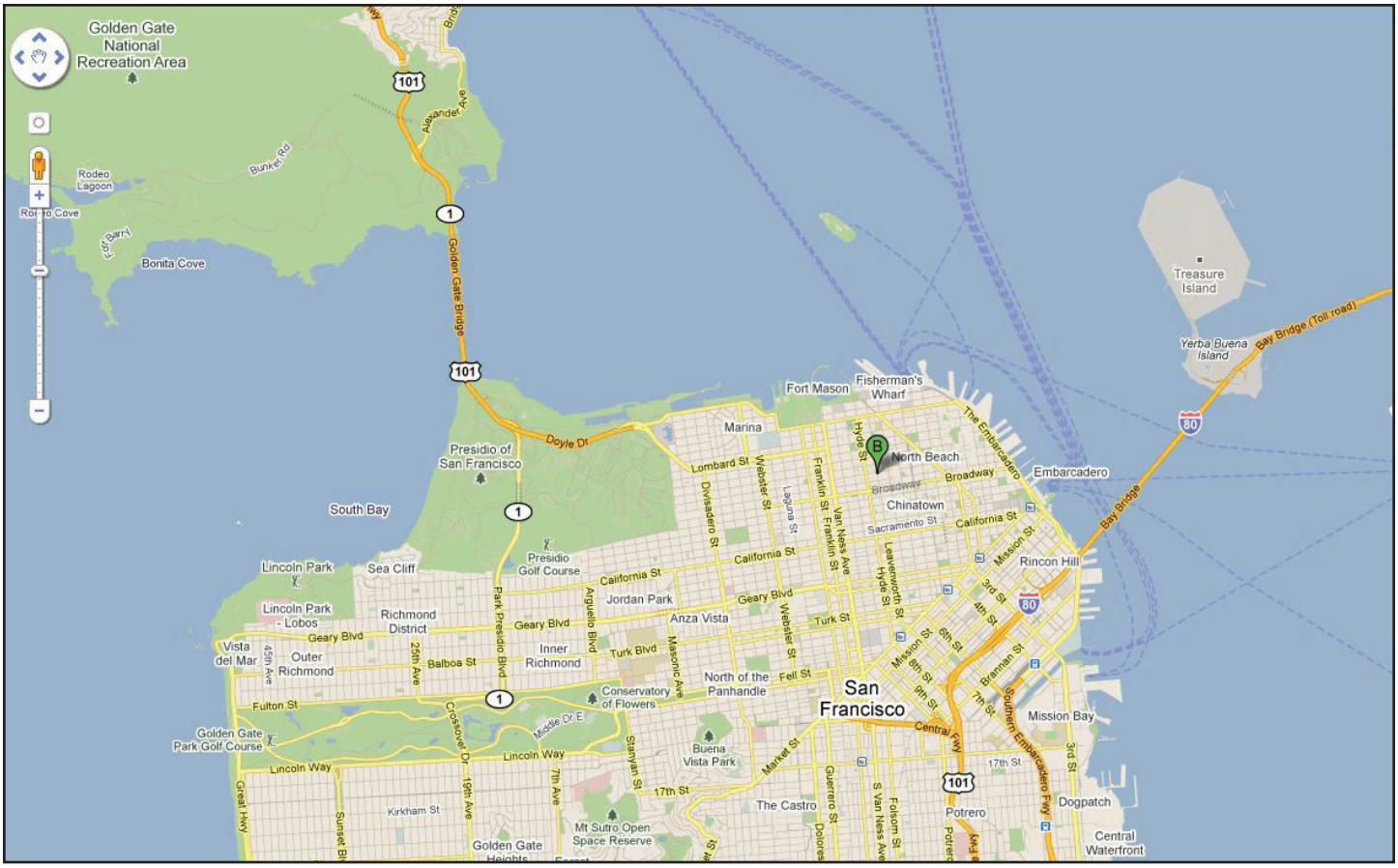
RIGGING APPROACH:

A combination of 20 story frame scaffolding and swing stages were utilized to access the entire exterior wall. The scaffolding and swing stages required suitable enclosures to contain all construction debris, dust and lead-based coating abatement.

SUSTAINMENT:

Comprehensive repair and protection approach to ensure long lasting durable performance. The entire exterior wall was repaired, waterproofed, sealed and coated. Every window was either replaced or restored.

PHOTOS:

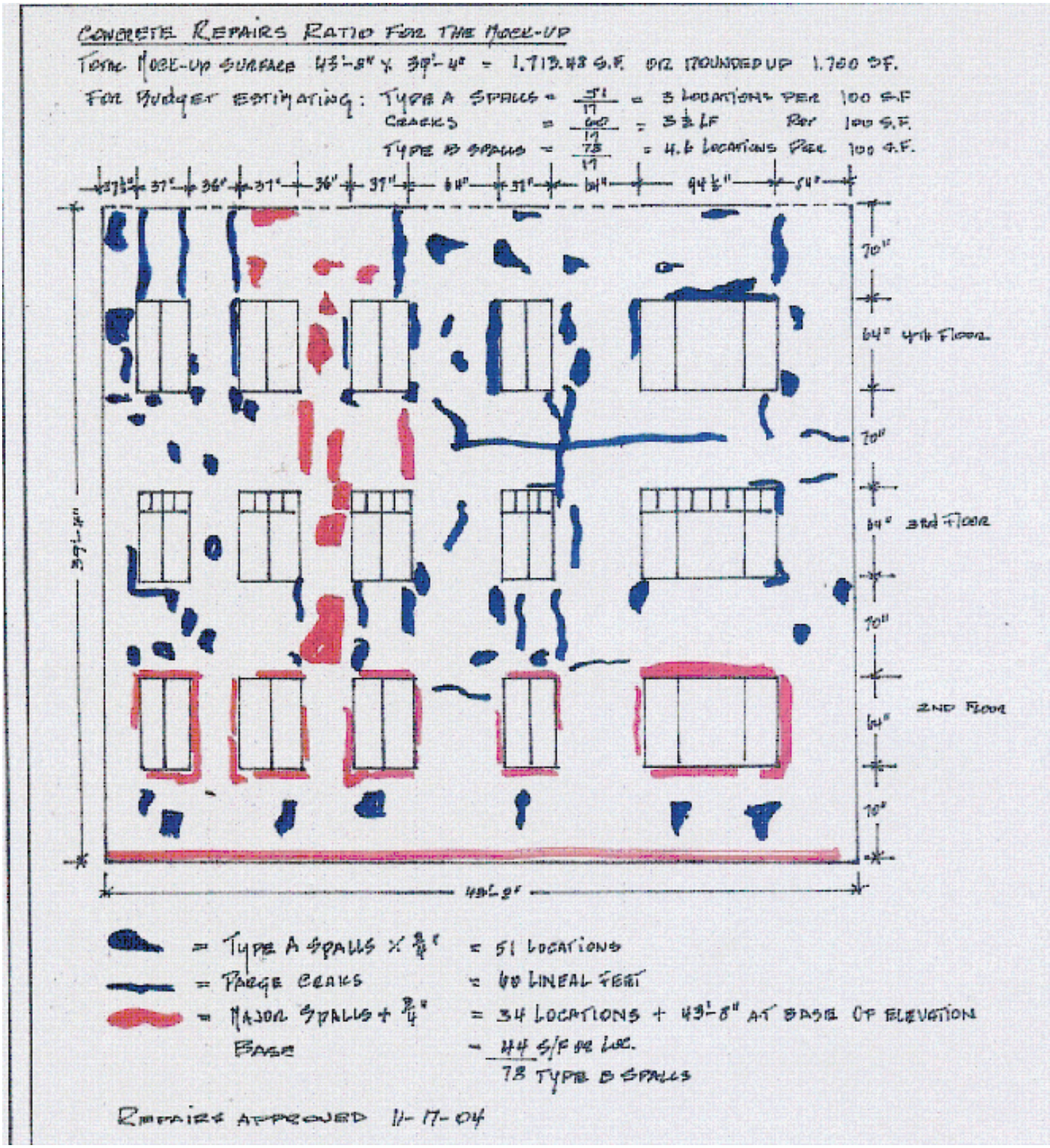


Google Maps View

South elevation, looking North.

An old window showing signs of its age.

Mock-up phase, coating removed and delamination and cracks identified.



Mock-up phase, defects transferred to a drawing for record keeping.
Note approval of repairs.

Good example of spalling caused by the window steel flange corrosion.

Completed mock-up.

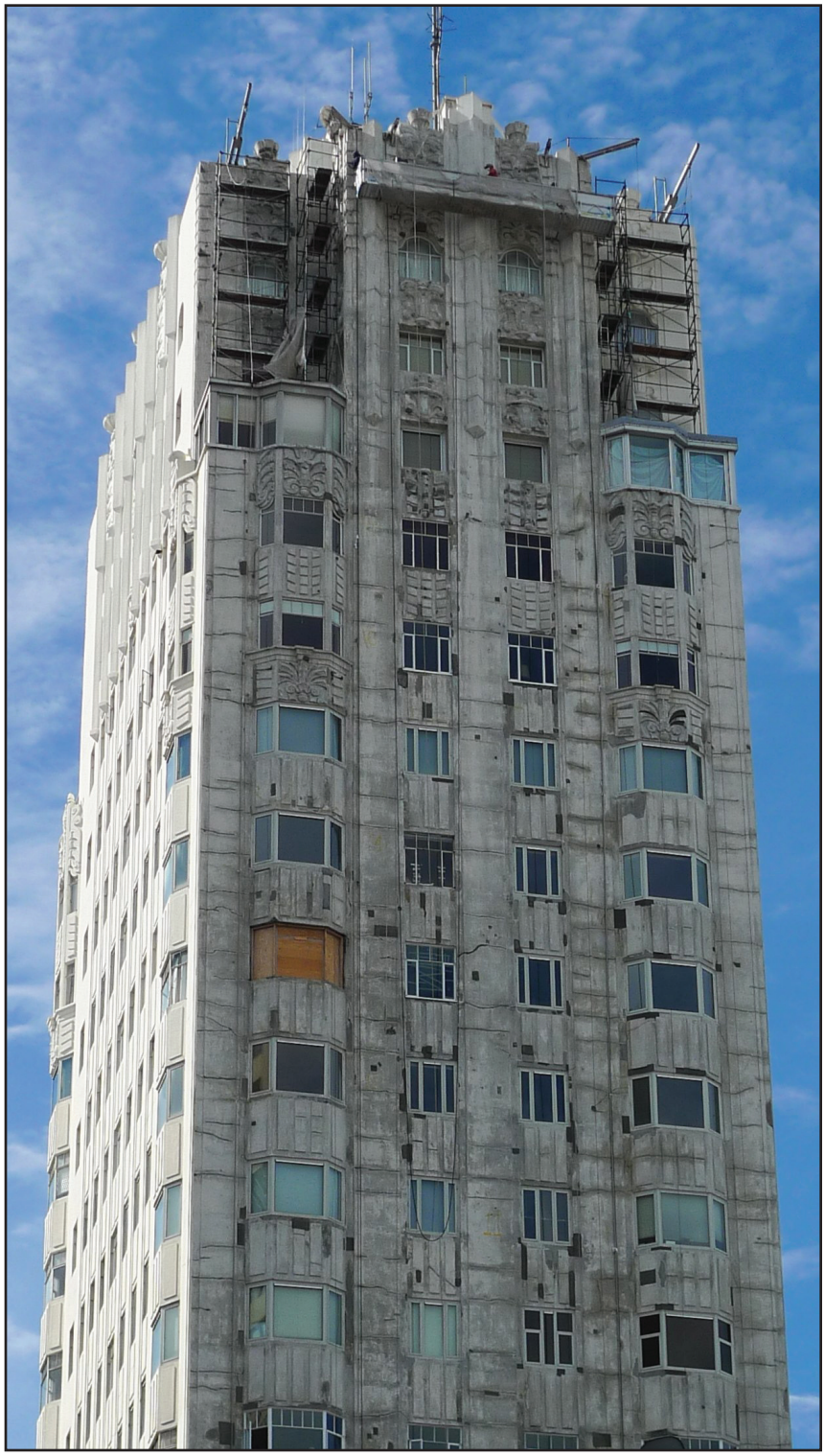
20 story scaffolding erected on the west wall, fully enclosed.

Coating removal required several passes using different methods to complete.

Areas to be repaired were cleaned and rinsed. Joints were wiped clean for the new sealant. Ahead of applying the coating, the exterior wall was powerwashed.

Workers rebuilding a window sill.
Note the workers are standing inside a condominium unit with protection in the background.

Window refurbishment was tedious and labor intensive.
Example of the work required to restore the windows.



North facade: 1. coating removed, 2. Crack and concrete repair in progress

Completed area. Note the intricate detailing and ornamentation.
The four vertical elements of the window are made of GFRC.

Bellaire Tower - San Francisco, CA