INNOVATIVE DESIGN OF TRAIN STATIONS AND PLATFORMS USING

INNOVATIVE COMPOSITE MATERIALS

In the late 1990's Metra initiated a program to repair and upgrade station platforms for the Metra Electric District. The platforms had originally been constructed of either timber or pre-cast concrete planks supported by steel beams. Both systems had deteriorated and created many tripping and safety hazards. In addition, new Federal regulations to accommodate access and safety measures for the physical, visual and hearing impaired required significant improvements to the platforms.

Initial investigation confirmed that the existing pre-cast concrete systems were vulnerable to the extreme Chicago winters and the harsh chemicals used for de-icing. The team invested significant resources in research and development to select and modify platform components both to meet the safety and serviceability requirements and to withstand the de-icing chemicals. The team selected Engineered Plastics Inc.'s Armor Deck Transit Platforms (ADTP), to meet the project requirements.

Description of Structures

The stations and platforms are built in between two active at-grade and elevated railroad tracks. The electric train cars have under-mounted engines and door thresholds at 40 inches above the tracks. Platforms had to meet strict geometrical tolerances to allow for the safe transit of passengers, and all construction was completed during off-peak hours.

The ADTP panels are made of a reinforced polymer composite material formed into a structural shape and incorporating a granite wearing surface with high friction for walking safety. They also include tactile requirements to aid visually-impaired passengers. The platforms themselves are a simple structural system. ADTP panels are supported by two steel beams parallel to the tracks. The beams are then supported by concrete piers spaced 24 feet apart. The platforms are complemented by canopies and other accoutrements.

Description of Tests

Primera worked with Engineered Plastics, Inc. to design and implement a series of tests to justify the use of the Armor Deck system. Strength, serviceability (deflection and vibration) and friction test were done by Wiss, Janney, Elstner Associates, Inc. (WJE). Fire tests were conducted by Underwriters Laboratories, Inc. Finally, a full scale in situ test of one of the completed stations was also completed by WJE. Primera complimented these tests with a series of calculations and finite element analyses.

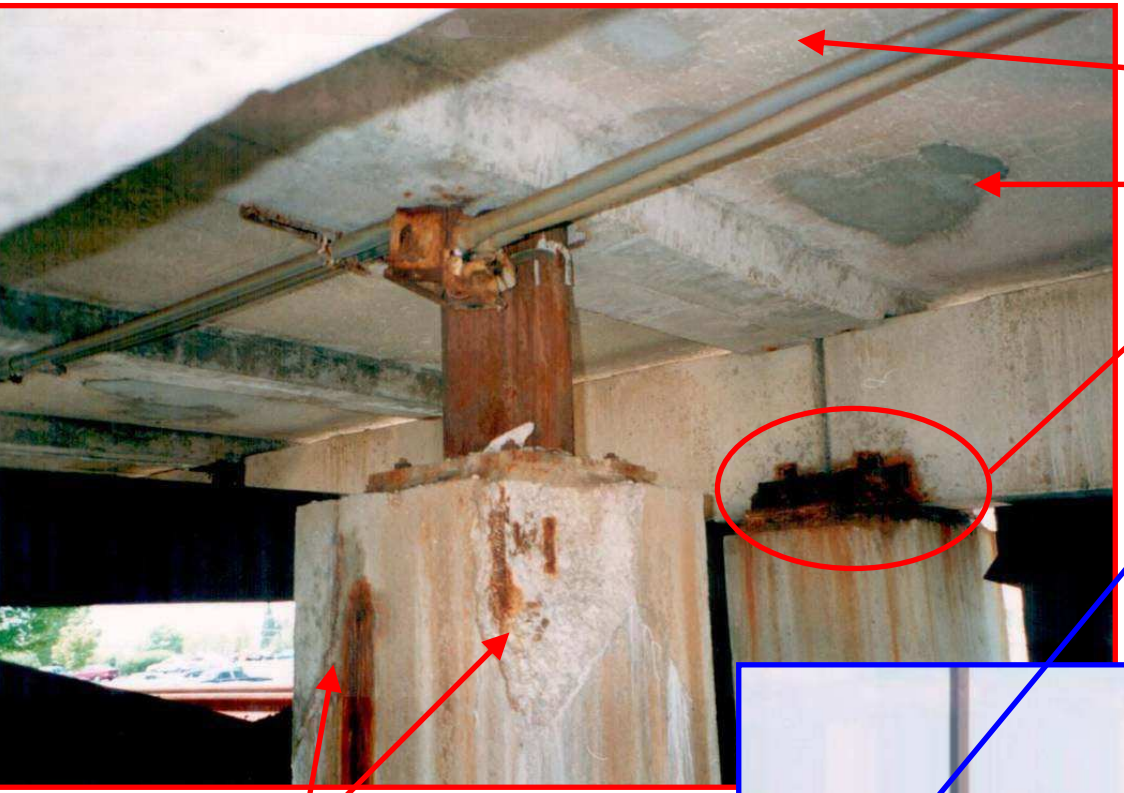
Stations Built to Date

Primera has been the Engineer of Record for 10 stations utilizing this system. Six of the 10 stations have been completed, including four in the City of Chicago. Two more will be built this year and the last two are pending funding. This design has been replicated for two more stations in the City of Chicago by another engineering firm. These projects are the first application of this material for elevated train station platforms in the country.

Advantages of the Armor-Deck Transit Platform System

- Exceeds the Building Code strength and serviceability requirements
- Is resistant to winter weather and de-icing deterioration
- Provides superior slip resistance
- Meets fire requirements for material classification
- Use of light-weight ADTP reduced installation time

Existing Damage to Pre-Cast Concrete Platforms



Imprint of wire mesh reinforcement placed in the slab fresh concrete

Repaired defective concrete surface

Restraints at the support of beams

Deterioration started at the cold joint between slab and rib.

Cold joint between slab and rib.

Spalled concrete at pier from reinforcement corrosion.

Residual disintegration products from the planks: Fine and coarse aggregates and pulverized cement paste

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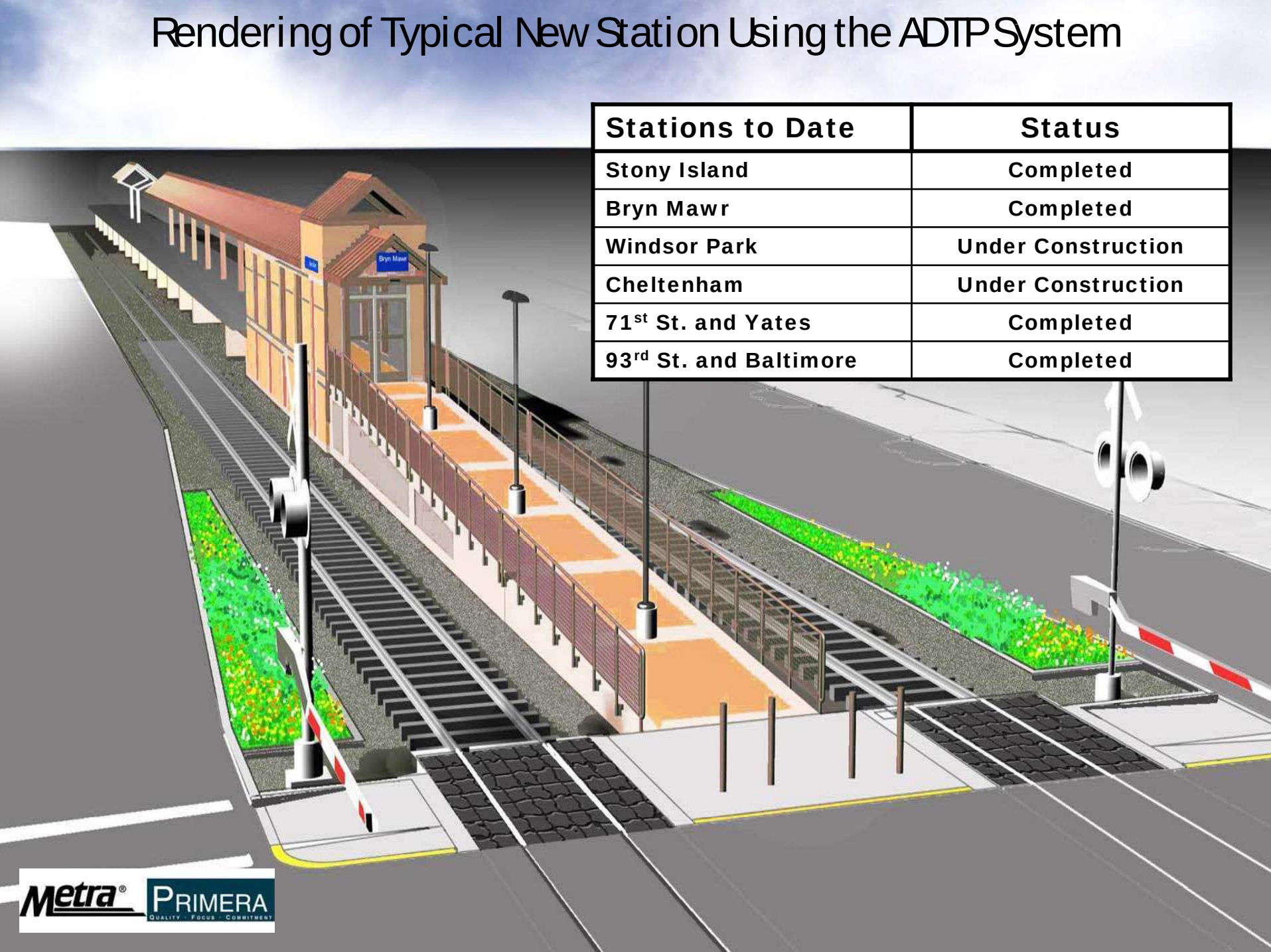
Rendering of Typical New Station Using the ADTP System



Stations to Date	Status
Stony Island	Completed
Bryn Mawr	Completed
Windsor Park	Under Construction
Cheltenham	Under Construction
71st St. and Yates	Completed
93rd St. and Baltimore	Completed

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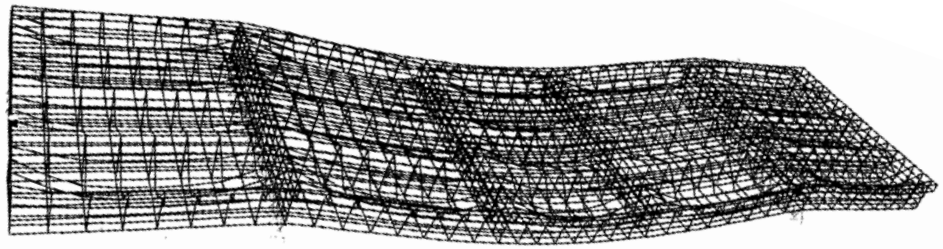
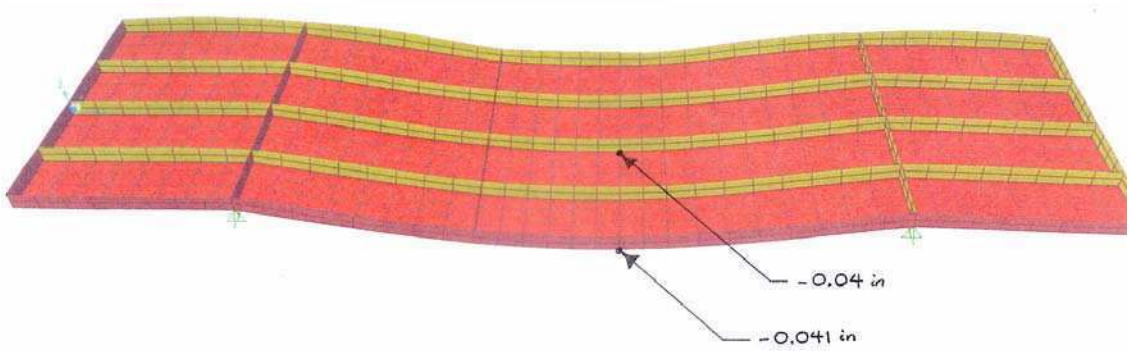
New Platform Showing ADTP System

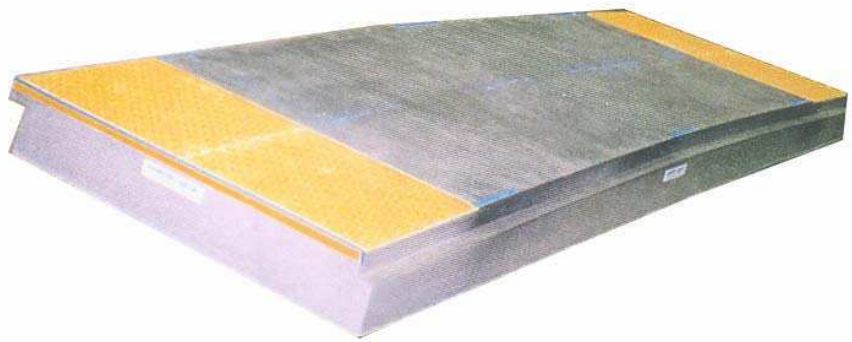
ADTP Panel and Analytical Calculations



Finite Element Analysis of ADTP



Typical ADTP Panel



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Tests Performed by WJE and UL

WJE Wiss, Janney, Elstner Associates, Inc.
Engineers, Architects, Material Scientists

STRUCTURAL AND MATERIAL TESTS
OF
ARMOR-DECK© TRANSIT PLATFORM PANELS
FOR
ENGINEERED PLASTICS, INC.
WJE No. 980557
July 1, 1999

Collapse of platform under 500lbs load at approximately 25 minutes of testing

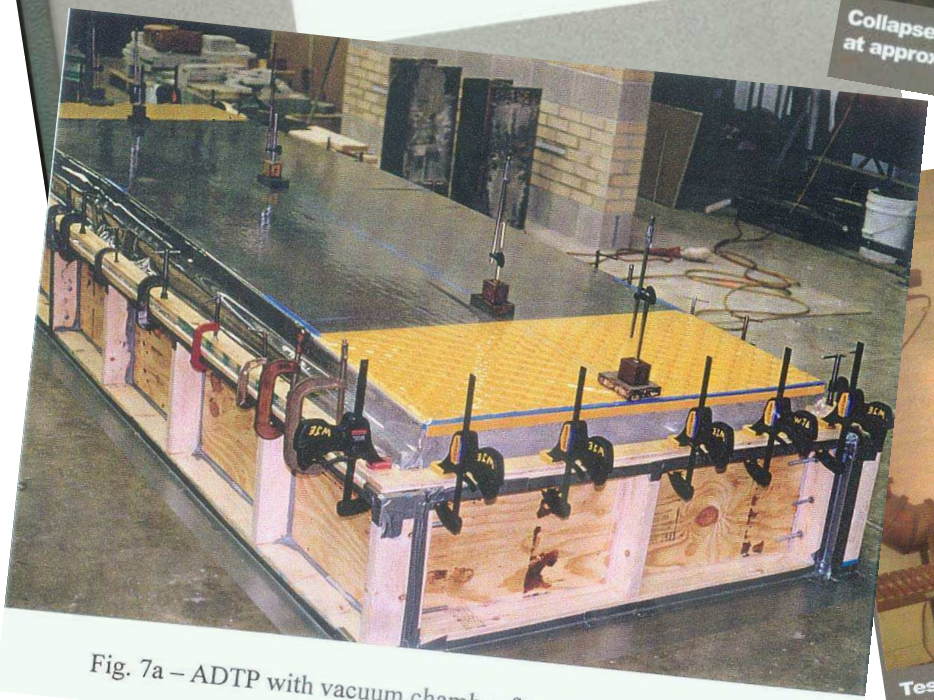

Fig. 7a – ADTP with vacuum chamber for ultimate load test

Test underway with smoke and flames penetrating wooden panel

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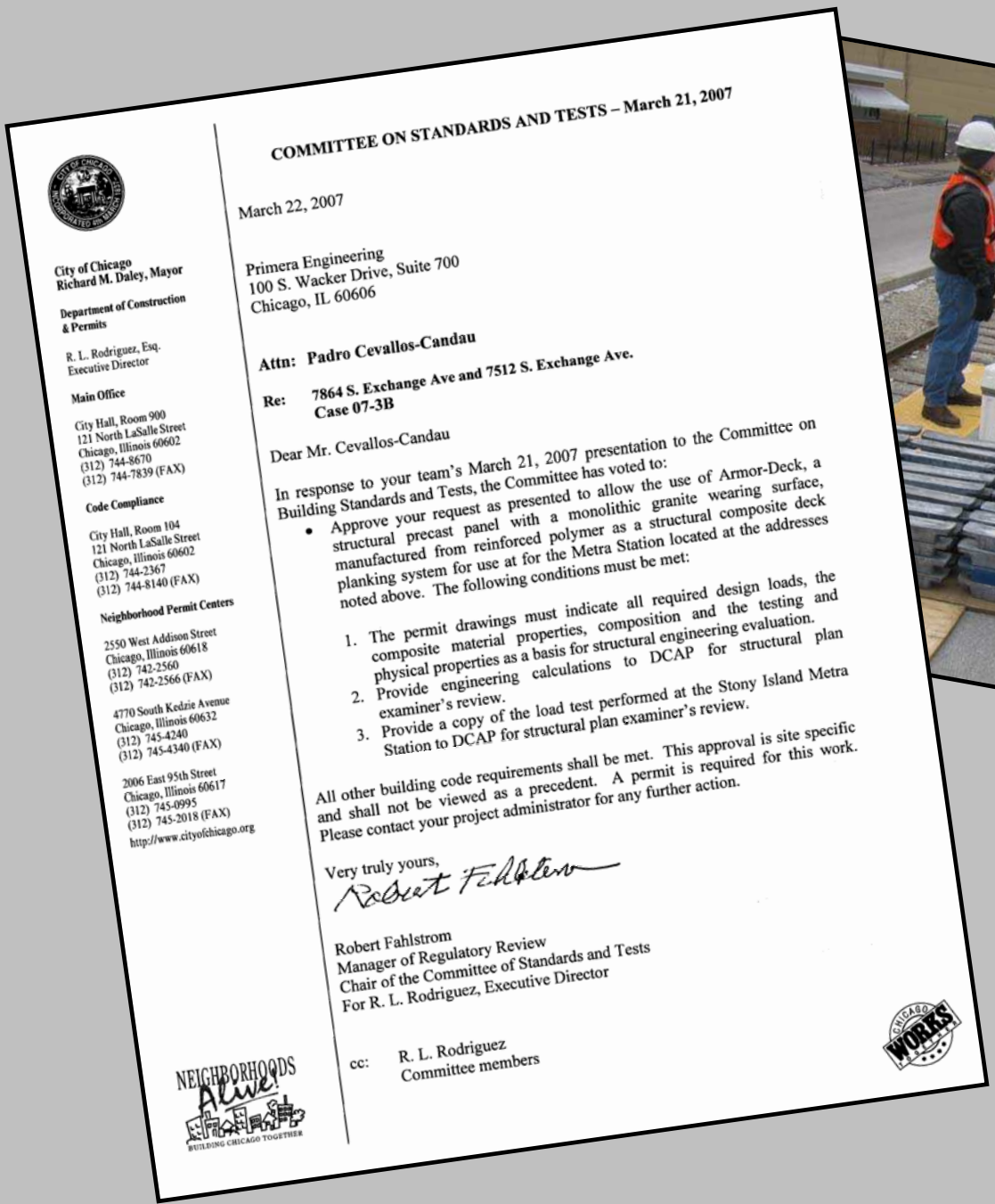
In Situ Test (250 PSF) and Approval from the City of Chicago



COMMITTEE ON STANDARDS AND TESTS – March 21, 2007

City of Chicago
Richard M. Daley, Mayor

Department of Construction & Permits

R. L. Rodriguez, Esq.
Executive Director

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4770 South Kedzie Avenue
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(312) 745-4340 (FAX)

2006 East 95th Street
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(312) 745-0995
(312) 745-2018 (FAX)
http://www.cityofchicago.org

March 22, 2007

Primera Engineering
100 S. Wacker Drive, Suite 700
Chicago, IL 60606

Attn: Padro Cevallos-Candau

Re: 7864 S. Exchange Ave and 7512 S. Exchange Ave.
Case 07-3B

Dear Mr. Cevallos-Candau

In response to your team's March 21, 2007 presentation to the Committee on Building Standards and Tests, the Committee has voted to:

- Approve your request as presented to allow the use of Armor-Deck, a structural precast panel with a monolithic granite wearing surface, manufactured from reinforced polymer as a structural composite deck planking system for use at for the Metra Station located at the addresses noted above. The following conditions must be met:

1. The permit drawings must indicate all required design loads, the composite material properties, composition and the testing and physical properties as a basis for structural engineering evaluation.
2. Provide engineering calculations to DCAP for structural plan examiner's review.
3. Provide a copy of the load test performed at the Stony Island Metra Station to DCAP for structural plan examiner's review.

All other building code requirements shall be met. This approval is site specific and shall not be viewed as a precedent. A permit is required for this work. Please contact your project administrator for any further action.

Very truly yours,
Robert Fahlstrom

Robert Fahlstrom
Manager of Regulatory Review
Chair of the Committee of Standards and Tests
For R. L. Rodriguez, Executive Director

cc: R. L. Rodriguez
Committee members

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CHICAGO WORKS TOGETHER

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