

An aerial photograph of a city neighborhood, likely Vancouver, showing a mix of residential buildings, green spaces, and a body of water. The image is used as a background for the title slide.

MULTI-FAMILY APARTMENT CONSTRUCTION AND RELATED CASE STUDY

Vancouver, May, 11, 2018

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OVERVIEW

Discussion of Legal Precedents and Issues
Involved

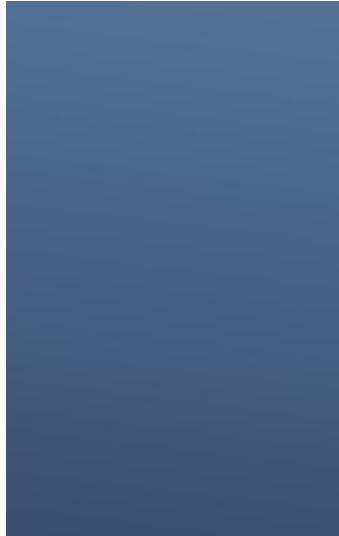
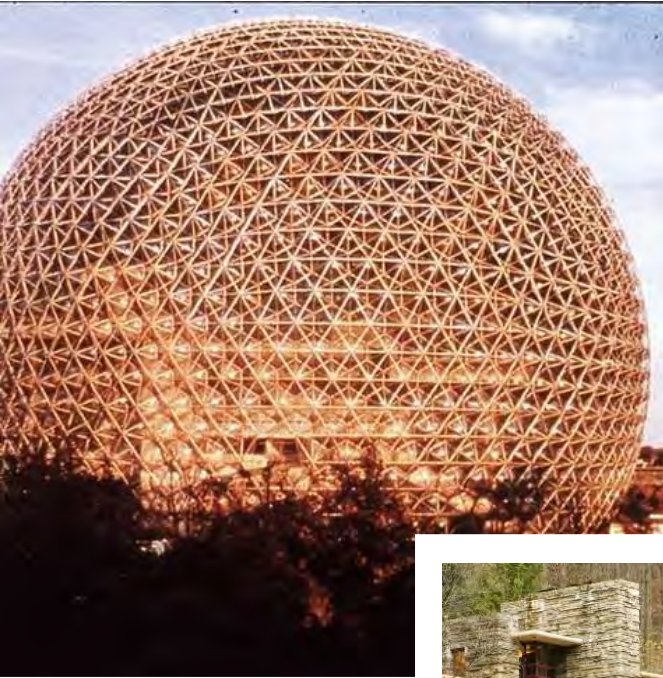
Discussion of Design Documents

Project Design Deficiencies and As-Built
Construction

Investigation and Findings

Concluding Remarks





- ▶ Famous Architects Without an Architecture Degree
 - ▶ Frank Lloyd Wright
 - ▶ Buckminster Fuller

THE PRACTICE OF ARCHITECTURE



LEGAL PRECEDENTS

Florida law states that a licensed architect will supervise the work during construction.

Sampling of deficient construction installations will follow the guidelines set by the state.

Over 1,000 windows – 5 sampled

151 balconies and walkways – All condition assessments performed on every balcony and walkway

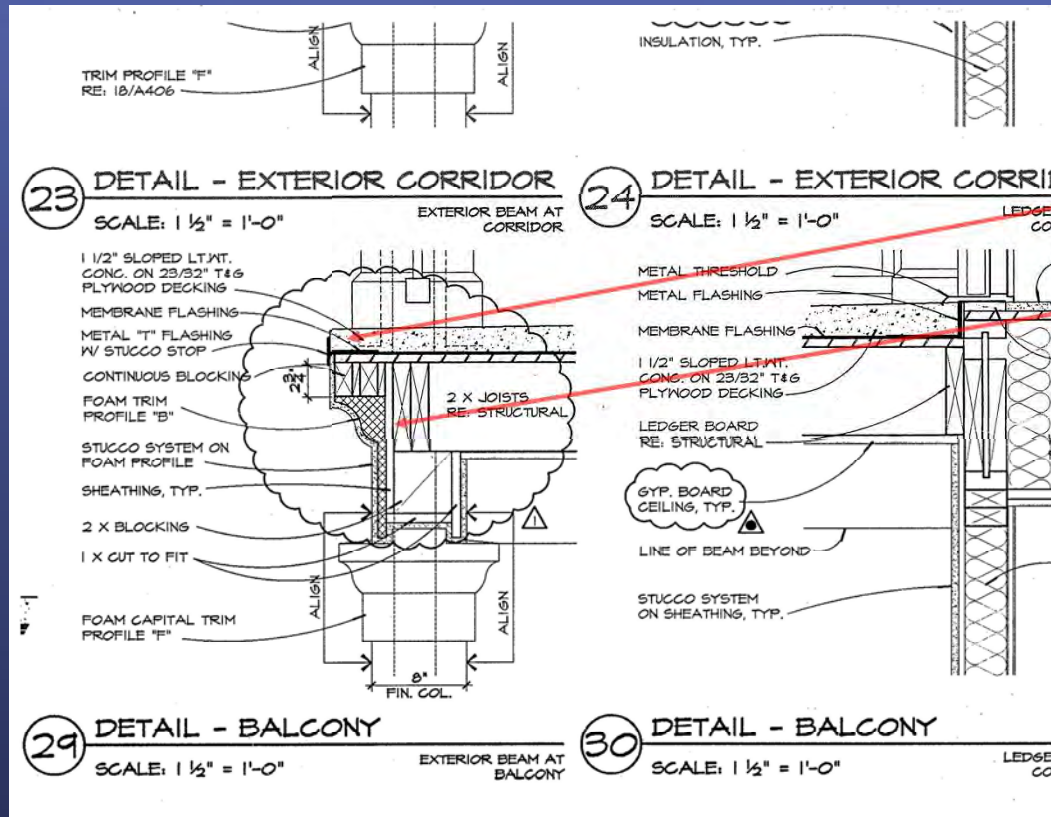
Requests for Information were limited at best – five for the entire project – In the absence of an RFI, the courts have stated that it is assumed that the contractor requires no further information.



DESIGN DOCUMENTS

Drawings and Specifications

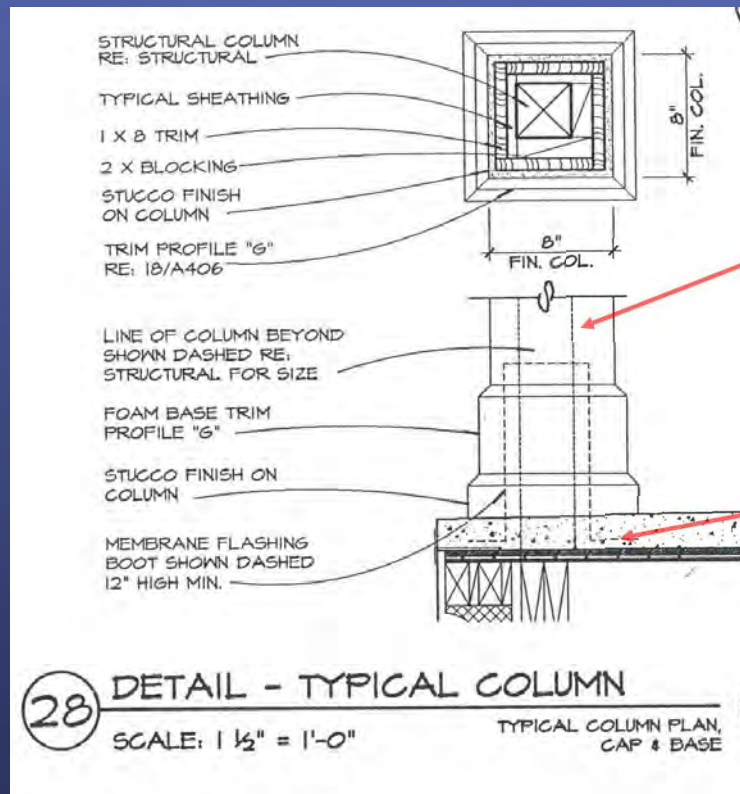
- ▶ The drawings required a single layer of self-adhered waterproofing without a protection course.
- ▶ Details were prepared general in nature without specific details for integration of the materials and systems.
- ▶ Product specifications were abbreviated per the request of the Owner and General Contractor



T-bar illustrated "tight" to fascia

Waterproofing layer not illustrated behind fascia

DESIGN DOCUMENTS



No waterproofing layer illustrated at column

Tie-in of waterproofing layer not shown on documents

DESIGN DOCUMENTS

DESIGN DOCUMENTS

- ▶ Design documents were clear – clearly wrong
- ▶ RFI's were not presented to the architect regarding clarification of details.
- ▶ Consultants on the project did not highlight design/as-built deficiencies
- ▶ The result was predictable – the finished facility suffered water intrusion.



► Open column cap at walkway

PROJECT DESIGN DEFICIENCIES AND AS-BUILT CONSTRUCTION



Water flowing off walkway onto
column cap

PROJECT DESIGN
DEFICIENCIES AND AS-
BUILT CONSTRUCTION



► Water infiltrating through the columns

PROJECT DESIGN
DEFICIENCIES AND AS-
BUILT CONSTRUCTION

Lack of integration at base flashing



PROJECT DESIGN DEFICIENCIES AND
AS-BUILT CONSTRUCTION



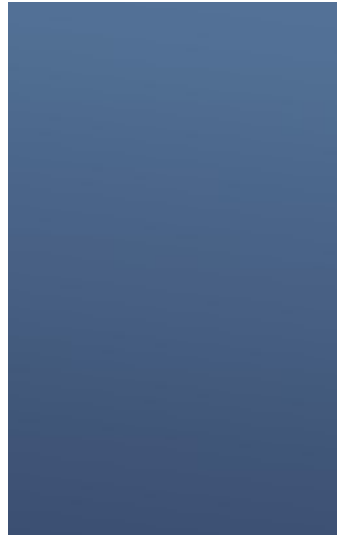
- Water stains (rot) below column

PROJECT DESIGN DEFICIENCIES AND AS-BUILT CONSTRUCTION



- Destructive opening at the column cap in 2005 indicating partial installation of the Tyvek membrane and the paper back lath. Moisture from the top of the column cap drained behind this system

PROJECT DESIGN DEFICIENCIES AND AS-BUILT CONSTRUCTION






- Waterproofing not adhered at critical junctures

PROJECT DESIGN
DEFICIENCIES AND AS-
BUILT CONSTRUCTION



INVESTIGATIONS AND FINDINGS

A rating system was developed to describe the distress at the balconies following the 2005 investigation

-  Red - Severe damage requiring immediate repair and remediation
-  Yellow - Moderate distress and evidence of water infiltration
-  Green - Surface cracking only with little evidence of water infiltration

Unit Number	Unit Type	Photo's	Balcony Condition
1101	A-3c	no observations	patio on grade
1201	A-3d	990 - 993	cracks at column corners, crack at control joint, cracks over one half of the surface
1301	A-3d		cracks at column corners, crack at control joint, cracks over one half of the surface
1401	A-3c	488 - 492	cracks at column corners, crack at control joint, cracks over entire surface
1102	A-3	no observations	patio on grade
1202	A-3	994 - 998	cracks at column corners, crack at control joint, cracks over entire surface
1302	A-3	783 - 785	no distress
1402	A-3	492 - 495	crack at control joint
1103	A-4	no observations	no patio
1203	A-4	no observations	no balcony
1303	A-4	no observations	no balcony
1403	A-4	no observations	no balcony
1104	A-2	no observations	patio on grade
1204	A-2	990 - 1001	no distress
1304	A-2	786 - 788	no distress
1404	A-2	496 - 498	no distress

Balcony ratings

INVESTIGATIONS AND FINDINGS

Results of the rating system after observation of elevated balconies and walkways in 2005.

- ▶ Red balconies – 72 of 142 = 51%
- ▶ Yellow balconies – 46 of 142 = 32%
- ▶ Green balconies – 24 of 142 = 17%

- ▶ Red walkways – 2 of 9 = 23%
- ▶ Yellow walkways – 4 of 9 = 44%
- ▶ Green walkways – 3 of 9 = 33%

INVESTIGATIONS AND FINDINGS



Example of a red balcony

INVESTIGATIONS AND FINDINGS



Example of a yellow balcony

INVESTIGATIONS AND FINDINGS



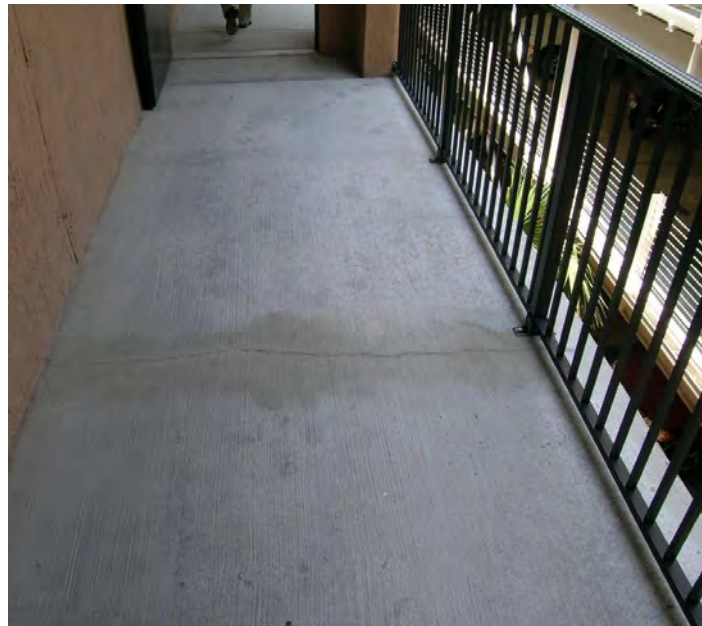
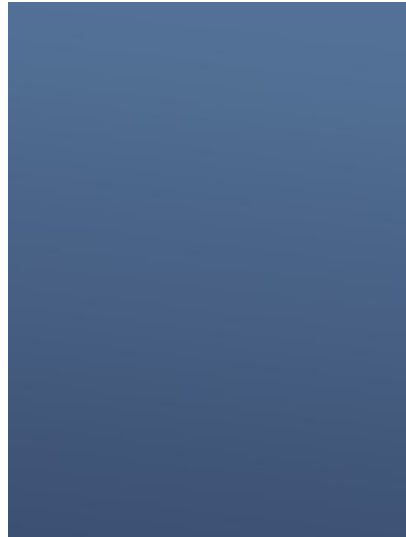
Example of a green balcony

INVESTIGATIONS AND FINDINGS

Example of damage at walkways



INVESTIGATIONS AND FINDINGS



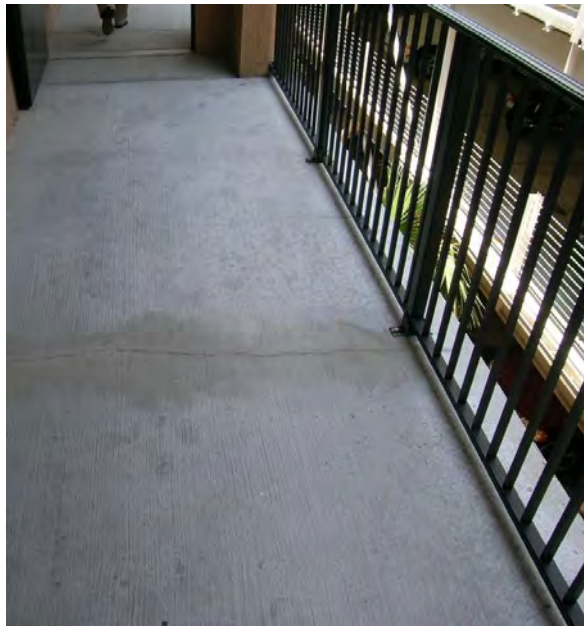
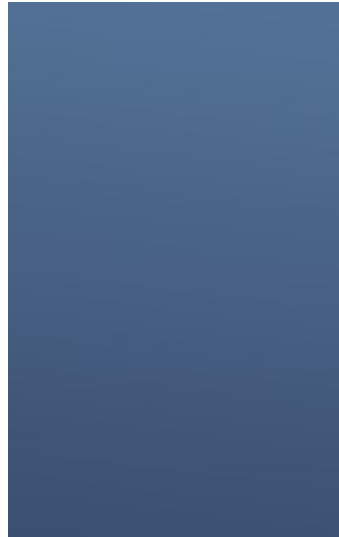
INVESTIGATIONS AND FINDINGS

Penetration of
guardrail fasteners
through concrete
topping

Destructive Building Openings - 2007

- ▶ Additional observations and tests cuts were performed during repair/replacement of exterior cladding two years after the initial investigation.
- ▶ The openings revealed the damage to the facility was progressive.
- ▶ The openings also confirmed initial observations and also confirmed that the rating system was valid

INVESTIGATIONS AND FINDINGS



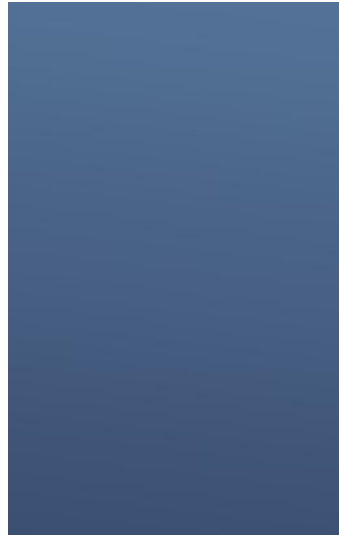
- ▶ Penetration of guardrail fasteners through concrete topping
- ▶ All penetrations indicated consistent leak patterns

INVESTIGATIONS AND FINDINGS



► Before stucco removal

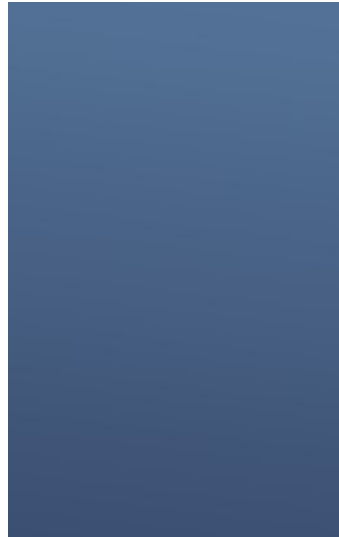
INVESTIGATIONS AND FINDINGS



INVESTIGATIONS AND FINDINGS

After stucco removal

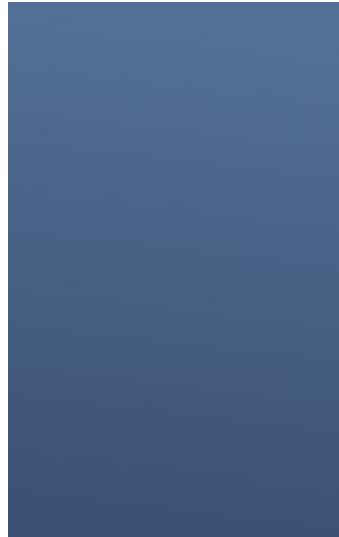




► Stucco removal at windows

INVESTIGATIONS
AND FINDINGS



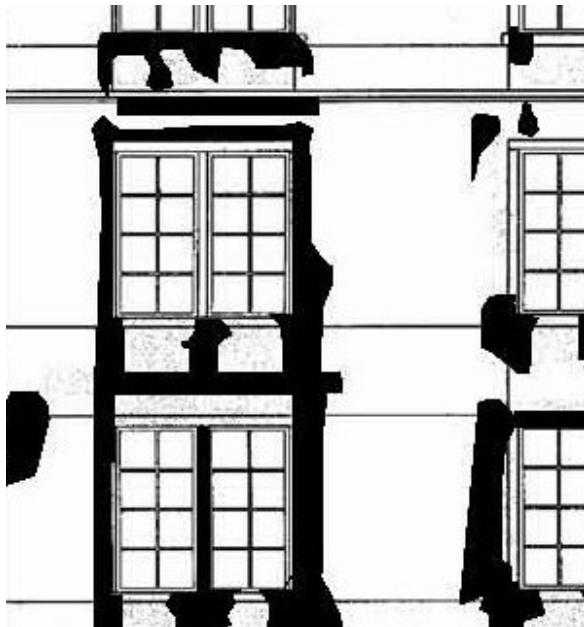
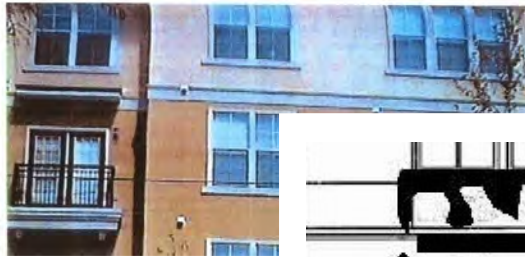


► Stucco removal

INVESTIGATIONS
AND FINDINGS



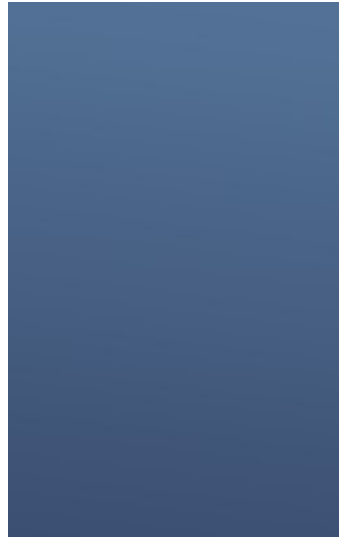
THERMAL VIEW OF SUSPECT AREA - BLDG. 5 - WEST ELEVATION



► Infrared scan

► Elevation with observation findings

INVESTIGATIONS
AND FINDINGS



► Infrared scan after demolition

► Elevation with observation findings

INVESTIGATIONS AND FINDINGS



- Window Specifications

- The Specifications required the windows to be Skotty Series 775 or equal.
- The existing windows were Skotty Series 775 windows manufactured by Atrium Aluminum Products and carrying an AAMA certification label indicating that the windows meet the test criteria for H-R30-44x72 and H-R40-48x74. The window submittal indicates that testing was performed with no leakage when tested at water penetration pressure of 6 psf.

WINDOW OBSERVATIONS AND TESTING

► Findings

- Results of the window testing presented in the Window Leakage Testing report dated 4 May 2006 and the Construction Consulting Laboratory, International Test Report dated March 12, 2007.
- All five windows tested leaked at a test pressure below the pressure that was certified in the submittals. Three of the five windows leaked with no pressure applied to the windows.

WINDOW OBSERVATIONS AND TESTING



► Exterior spray rack

WINDOW OBSERVATIONS AND TESTING



- Interior pressure chamber

WINDOW OBSERVATIONS AND TESTING



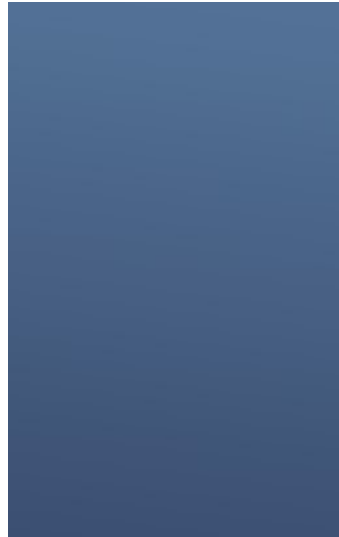
- Leak from alarm sensor

WINDOW ALARM OBSERVATIONS AND TESTING



► Leak at unit alarm wire

WINDOW ALARM OBSERVATIONS AND TESTING



► Extra alarm hole

WINDOW ALARM
OBSERVATIONS
AND TESTING





► Unsealed alarm hole

WINDOW ALARM OBSERVATIONS AND TESTING

Recommendations

After the initial investigation the following recommendations were forwarded to the owner's representative in 21005.

1. Remove and replace all concrete topping and waterproofing membrane.
2. Repair wood framing and sheathing to extent required by damage observed.
3. Install new waterproofing membrane, protection course and drainage mat.
4. Install new concrete topping sloped to drain.



Work Performed

The work performed was a complete removal of all balcony and walkway materials (concrete topping, waterproofing, sheathing and framing) and complete replacement of the entire balcony and walkway.

REPAIR RECOMMENDATIONS BALCONIES AND WALKWAYS

Recommendations

- ▶ Limited removal and replacement of stucco cladding at windows, balconies, and dryer vents to make the repairs to those items and as required due to discovered damage at each location.

Work Performed

- ▶ Remove all stucco and sheathing and install new stucco and sheathing throughout the entire complex.



REPAIR RECOMMENDATIONS STUCCO CLADDING

Recommendations

- ▶ Replacement of limited number of windows after thorough investigation. Repair broken sills per the direction of the window manufacturer. Remove and replace all alarm connections.

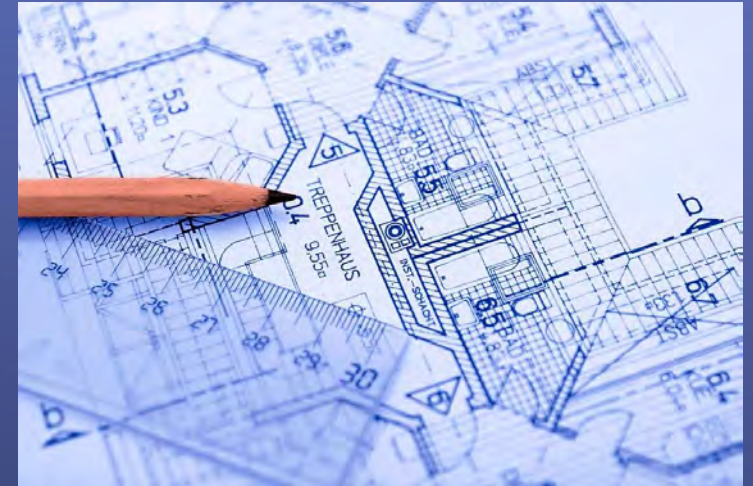
Work Performed

- ▶ Remove all windows and install new upgraded windows throughout the entire complex.



REPAIR RECOMMENDATIONS WINDOWS

- ▶ Architect
- ▶ The Architect was found in violation of codes practices. The plans and specifications were deficient. The Architectural firm was required to pay the full amount of their insurance limits. This project, as well as several others caused the firm to declare reorganizational bankruptcy.



OUTCOMES AND CONCLUDING REMARKS

- ▶ General Contractor
- ▶ Several court precedents had been established which were consistent in many states. "In absence of the issuance of RFI's, it is assumed that the General Contractor and their Subcontractors have sufficient knowledge and direction to complete the work."
- ▶ The General Contractor and Subcontractors constructed the facility in compliance with the plans and specifications which were obviously deficient. In deposition testimony, they had to admit that the details were incorrect and that they should have brought that to the attention to the Architect.



OUTCOMES AND CONCLUDING REMARKS

- ▶ Owner
- ▶ Florida law states that the Owner must notify the General Contractor 90 days prior to commencement of repair. This stipulation of the law was not met.
- ▶ The consultants for the Owner prescribed premium quality windows, enhanced stucco cladding design, and an enhanced waterproofing system for the balconies and walkways. These “betterments” were not allowed by in the settlement of the case.
- ▶ The Owner had a history of “recladding” facilities such as this one several years after build/purchase.



OUTCOMES AND CONCLUDING REMARKS

- ▶ Consultants
- ▶ Florida law requires a minimum number of samples be surveyed or tested during investigations. In several instances, these requirements were not met.
- ▶ The windows were tested to the original specification standards even after exposure to storm events.
- ▶ The consultants for the Owner and the Contractors agreed in principle to a partial repair protocol. The owner rejected that approach emphatically and directed his consultants to prepare a complete recladding design. The consultants complied with this request without proper documentation.



OUTCOMES AND CONCLUDING REMARKS

► Questions

MULTIFAMILY APARTMENT CONSTRUCTION
AND RELATED CASE STUDY

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