



University of Pittsburgh

Cathedral of Learning Exterior Preservation 2007

AUA Case Study 2008



Park Rankin, AUA, AIA
University Architect
Senior Manager of Planning and Design

Cathedral of Learning – History

In 2001, The University undertook the analysis of the Preservation of the Cathedral of Learning

The 42 story historic landmark, in the center of our urban campus, was constructed from 1926 to 1937 and designed by the renown architect Charles Klauder.

The exterior of the Cathedral is clad in Indiana Limestone.

The first 50 years of it's existence was particularly harsh due to Pittsburgh being the center of iron and steel production in the United State.

With the advent of clean air requirements and the reduction in steel production, the Cathedral has started to self clean, but with intricate carvings, spires and details, plus various exposure to wind, the weathering has been inconsistent, and in some areas totally missing.

Cathedral of Learning – History



UNIVERSITY OF PITTSBURGH - CATHEDRAL OF LEARNING
STONE & WEBSTER ENGINEERING CORPORATION
J.O.4567 #295 11-26-30 Bellefield-Fifth Elevation N3484

Cathedral of Learning – History



Substitutions

Cathedral of Learning – History

Aluminum Company of America

2432 OLIVER BUILDING

C. H. WOLFE

Pittsburgh, Pa. June 27th, 1928.

Stone & Webster, Inc.,
P. O. Box J,
Oakland Station,
Pittsburgh, Pa.

Att. Mr. E. M. Post.

Gentlemen:

With reference to your plans and specifications for cast iron window spandrels dated May 7th, 1928, we are submitting herewith prices on cast aluminum window spandrels as shown on the following drawings to be made of #43 alloy. This alloy contains 5% silicon, balance aluminum.

Sheets #933-A - 17 to 20 inclusive
17G top section only
19G " " "
24
25
28
30
31
P-196

We believe that the window spandrels could be furnished in aluminum in either 1/4" or 3/8" thick material and we are attaching hereto our drawing E-997 which shows a typical aluminum spandrel similar to the ones which we would expect to furnish for this job.

Referring to specification 933-A article H, item 1, our price on furnishing, but not erecting, the cast aluminum window spandrels up to and including the fourth floor in 1/4" thick material is \$8,080.10; 3/8" material \$10,370.85. On item 2 our price on



- Furnishing, but not erecting, the cast aluminum window spandrels up to and including the fourth floor in ¼" thick material is \$8,080.10
- Furnishing, but not erecting, the spandrels from the fifth floor to the thirty-sixth floor inclusive in ¼" material is \$35,755.55
- We estimate that there will be approximately 1,760 spandrels required
- Our price for all the spandrels is \$43,835.65
- The Manufactures Transport Company of Cleveland, Ohio could truck these castings to the job for about \$533.00
- Prices are based on a rate of \$.41 per hundreds pounds

Made in America – John Ratzenberger

Cathedral of Learning – History



Getty Grant

Cathedral of Learning – History



PRESERVATION BRIEF: University of Pittsburgh Civic Center Conservation Plan

The Cathedral of Learning

This Gothic-Revival-style structure is a historic landmark, the second-tallest education building in the world. It is the geographic and traditional heart of the campus. The Cathedral contains many architecturally significant interiors including the Commons Room, the Babcock Meeting Room, the Croghan-Schenley Rooms, Braun Room and 26 Nationality Classrooms.



CATHEDRAL OF LEARNING

ARCHITECT:
Charles Zeller Klauder
BUILT:
1928–1937
STYLE:
Gothic-Revival or Neo-Gothic

This Preservation Brief is provided in conjunction with The University of Pittsburgh Civic Center Conservation Plan. The information below presents a summary of conservation challenges and recommendations specific to the Cathedral of Learning. Refer to the Conservation Plan for details on short, middle and long term solutions to maintaining the historic structures that are a part of the Cathedral Complex.

PARAPETS

Bricks and mortar are cracked in hundreds of locations. The initial cracking is often caused by cyclical movements with little accommodation in the original design to allow for this movement. The cracks allow additional moisture to penetrate the walls and further deterioration occurs. Poor detailing of flashing systems and related interior moisture traveling upwards inside the wall systems, along with temporary 10 year solutions, are contributing factors to the demise of parapet walls. In many cases the EPDM is ripping while the flashing detail does not protect the wall from moisture infiltration. The walls need to “breathe” in order to function properly and stand strong for the next 100 years. Properly coordinated, a program of systematically rebuilding all of the parapet/rising walls on the Cathedral will allow several significant maintenance issues to be addressed at once. In addition to replacement of cracked bricks, failed mortar joints, and deteriorated base stones, roof system base and counter flashings can be improved, and displaced limestone copings reset with improved through wall flashing details.

WINDOWS

There are two basic window types in the Cathedral, rolled steel casement windows and pressed metal (steel) double-hung windows.

Casement windows:

The rolled steel frame has a history of dependability, mostly due to their material makeup of early 1900's sheet steel, which had a much higher tensile strength than modern steel and therefore resist penetrating rust that can corrupt a window system. Casement windows were generally found to be in general good condition although there were some isolated problems.

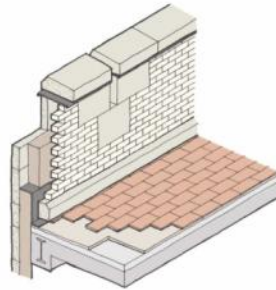
To restore these windows, one must first remove the old paint from the frames and sashes. Then they should be brought into good operable order with working pistons, oiled hinges, working handles and locks and properly aligned frames that fit tightly with the sash. After this is completed then the frames and sashes should be primed and coated with an oil-based paint.

Double-hung windows:

Research indicates that these pressed metal windows may have been one of the earliest installations of this “new technology” of fabrication. These windows are generally in good condition but do require some maintenance. Eventually, these windows will need to be replaced with aluminum, thermally broken windows.



Original design for the construction of the parapet of the Cathedral of Learning, at the 266'-0" high elevation, by Charles Zeller Klauder (c. 1930).



Axonometric Drawing of Original Parapet Condition.



5th floor parapet. Repair condition using EPDM roofing and aluminum flashing (August 2004).



A photo of the south elevation shows the evidence of atmospheric pollution (May 2005).

MASONRY REPAIR

Cracking of individual limestone units was noted in isolated locations. Most often occurring at the parapets, the cracking is typically caused by expansion and contraction unaccounted for in the original design. The parapets, exposed on two sides, are much more susceptible to movement stresses, particularly at the coping runs with battlement type configurations. Several isolated limestone units in the middle of building walls were also cracked. None of the cracks exhibit evidence of metal staining or other indications that the cracking may be related to rusting of fasteners buried in the masonry used for tying the limestone to the structural frame. Stone removal should be considered at several of these isolated locations to try to identify a source for the cracking and verify anchor materials.

Displacement is often related to the cracking and movement of the parapets and walls with the movement resulting in the stones or sections of stone no longer remaining in the same plane as adjacent materials. Bulging of an entire section of brick parapet wall was noted on the west side of the 8th floor roof. This entire parapet should be rebuilt. Other limestone elements of the parapet or traceries have individual stones that have moved. The displacement may also trigger a spalling or cracking of adjacent materials as the movement stresses seek a method of relief.

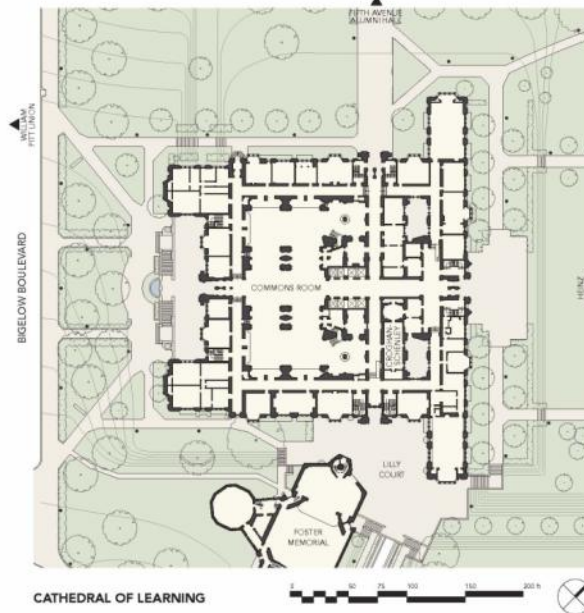
Spalling observed on the Cathedral was limited to small areas of the limestone window elements including mullions, lintels, and tracery elements. Mullions and lintels are typically cracked at locations where edges of the stone can be stressed through building movement or pressures exerted by oxide jacking of fastener and support materials. These cracks are evident at various roof levels where limestone window surrounds can be easily viewed.

MASONRY CLEANING

WHAT IS AN ACCEPTABLE LEVEL OF CLEANING? The solution to this is based upon the concept of removing a significant amount of unnatural soiling, yet understanding the building should not, (and in most instances, will not) be restored to a pristine condition of a new structure. This level of cleaning would be unnatural and it would involve using methods of masonry cleaning that would remove the finish of the limestone. During May 2005, a series of on-site cleaning tests were performed on exterior limestone and cast aluminum spandrel panels of the Cathedral of Learning. Based on preliminary investigation, several techniques were selected that appear to be promising. Testing included micro-abrasive cleaning, water misting and chemical cleaning. These test results helped determine recommendation for cleaning methods and materials that are appropriate for exterior limestone of the Cathedral of Learning.

Getty Grant

Cathedral of Learning – History



For additional information regarding the Cathedral of Learning, refer to "The University of Pittsburgh Civic Center Conservation Plan"

For copies of the report or any further inquiries please contact:
University of Pittsburgh
Facilities Management
3400 Forbes Avenue
Pittsburgh, PA 15213
(412) 624-9500
webmaster@fm.pitt.edu

The University of Pittsburgh gratefully acknowledges the Getty Trust for making this project possible through its Campus Heritage Program.

2005
by Pfaffmann + Associates.

As an additional resource Technical Preservation Services (TPS), Heritage Preservation Services Division, National Park Service prepares standards, guidelines and other educational materials to help the general public understand historic preservation treatments. One of the ways they do this is by publishing easy-to-read preservation briefs on different aspects of preservation. In particular some of the preservation briefs that apply to the Cathedral of Learning are:

- #1) *Assessing Cleaning & Water-Repellent Treatments for Historic Masonry Buildings*
- #2) *Repointing Mortar Joints in Historic Masonry Buildings*
- #3) *Conserving Energy in Historic Buildings*
- #6) *Dangers of Abrasive Cleaning to Historic Buildings*
- #13) *Repair and Thermal Upgrading of Historic Steel Windows*
- #35) *Understanding Old Buildings: The Process of Architectural Investigation*
- #39) *Holding the Line: Controlling Unwanted Moisture in Historic Buildings.*

For copies of these preservation briefs, contact the National Park Service or view and print copies online at <http://www.cr.nps.gov/hps/tps/briefs/presbhom.htm>

Cathedral of Learning



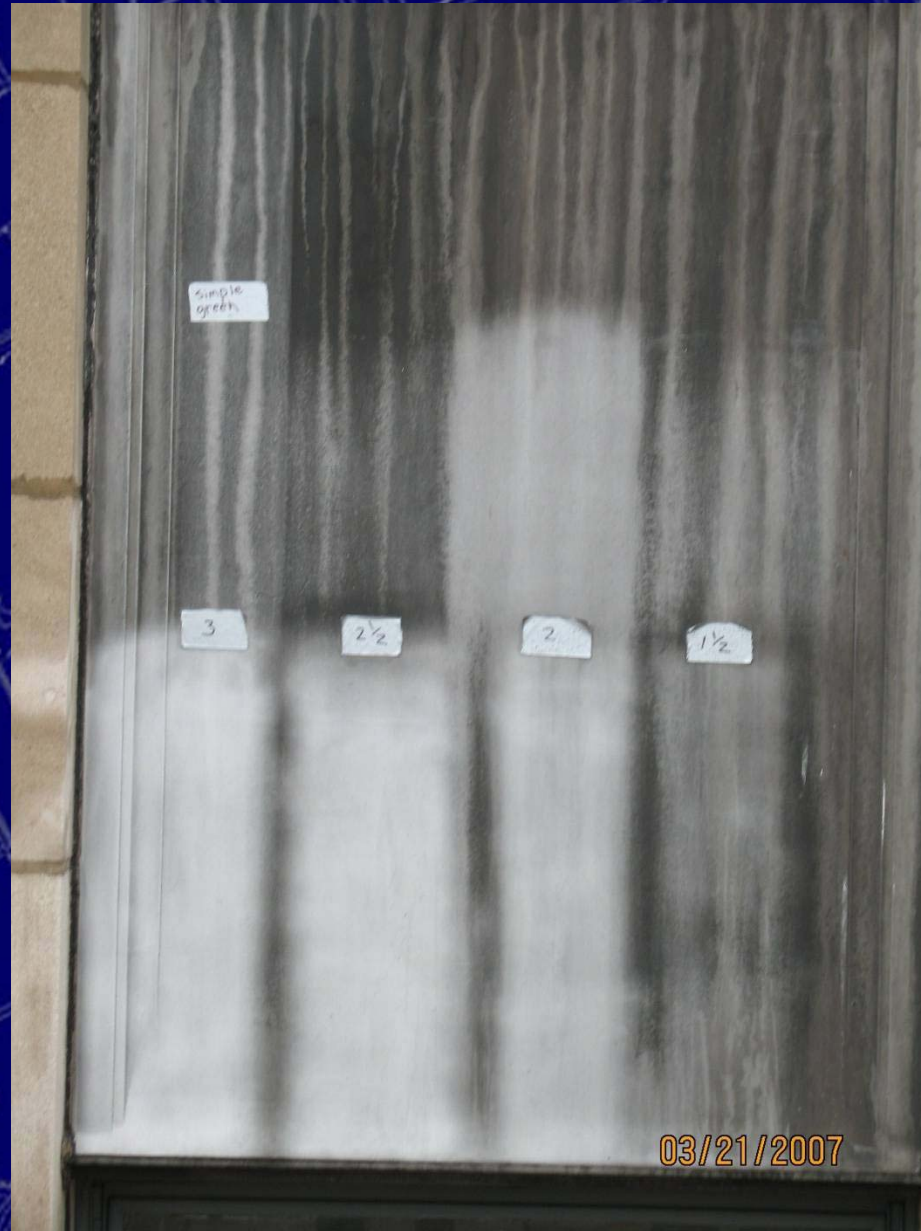
Cathedral of Learning



Cathedral of Learning



Cathedral of Learning



Cathedral of Learning



03/21/2007

Cathedral of Learning



Micro abrasive Cleaning Medium

Cathedral of Learning – History

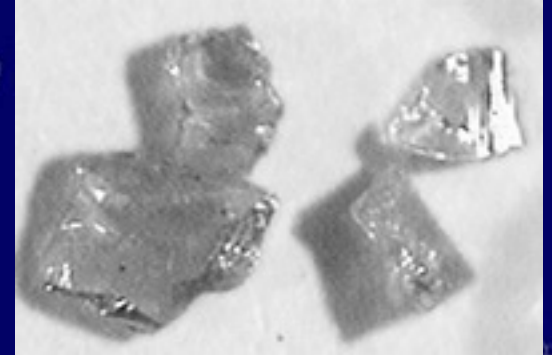
Manufactured from 100% recycled bottle glass.

Use of post-consumer glass directly benefits the environment by reducing landfill waste.

Safe to touch.

Totally organic, totally inert and non-reactive.

Uses a gentle micro abrasive vortex with a high volume of air and low pressure water.



Made in America – John Ratzenberger

Cathedral of Learning – Exterior Cleaning



Cathedral of Learning – Exterior Preservation

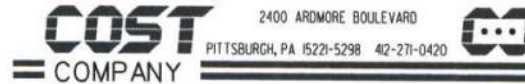
Cost Construction company:

- ❖ The crews and assignments: There was a stocking/set-up crew for material and equipment, a rigging crew, a blasting/cleaning crew, a pointing/caulking crew and a clean-up crew.
- ❖ There were a total of eighteen swing scaffolds and 3 man-lifts at peak performance.
- ❖ There were (5) 185 cfm and (2) 1100 cfm compressors.
- ❖ There were (16) pressure pots at peak performance.
- ❖ There were approx. 20 Stones replaced and approx. 110 pcs patched.
- ❖ There was approx. 200 bags of pointing mortar used.
- ❖ There was 110-120 ton of glass powder dispensed.

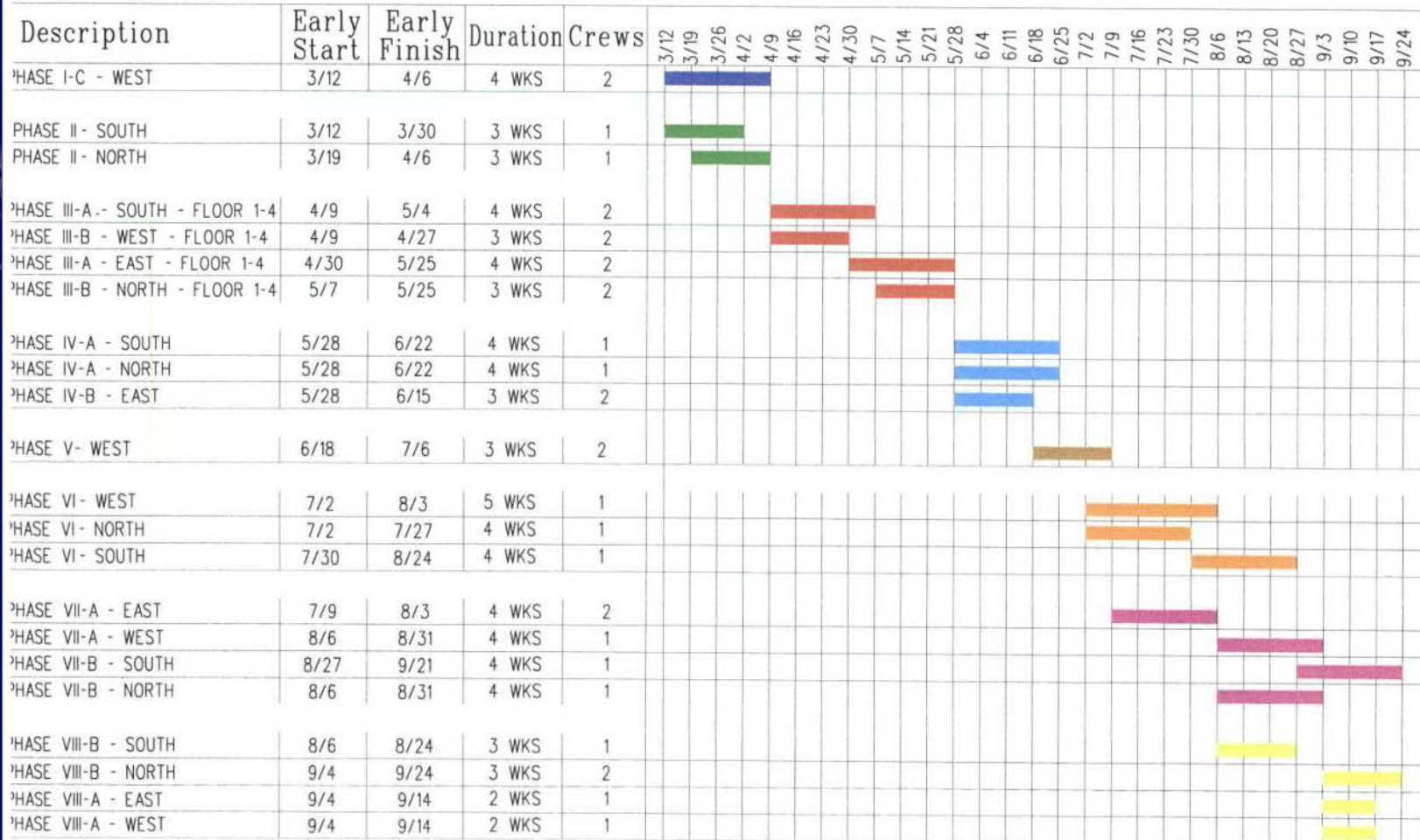
Cathedral of Learning – Exterior Preservation

CATHEDRAL OF LEARNING
UNIVERSITY OF PITTSBURGH

EXTERIOR RESTORATION
PROJECT SCHEDULE



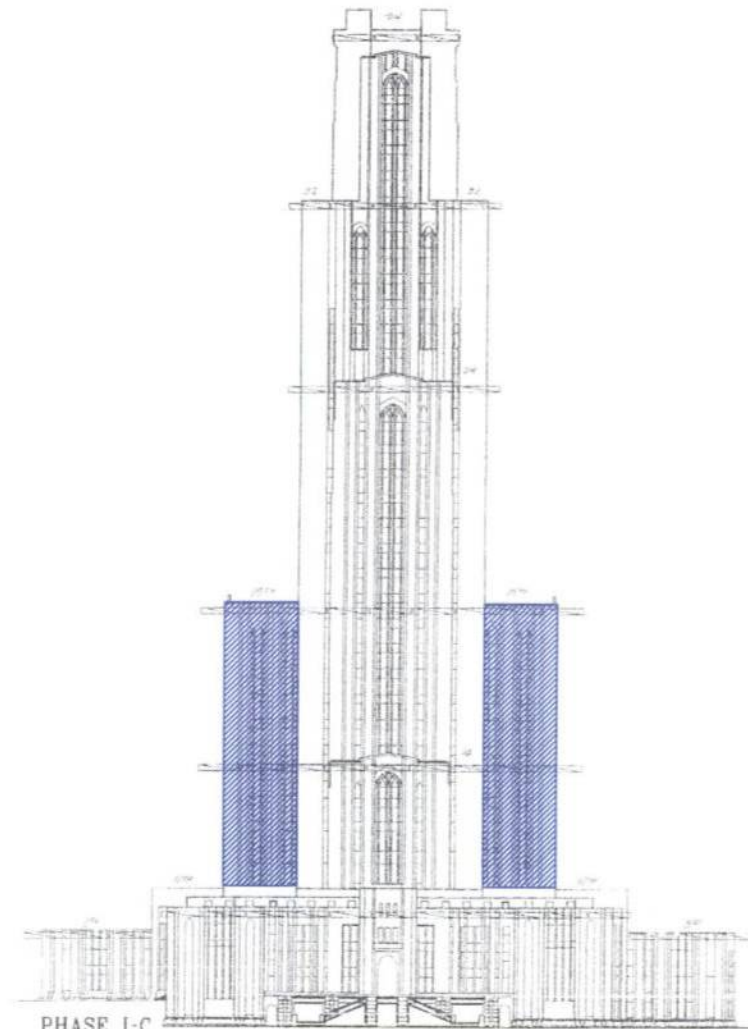
2/20/07



Cathedral of Learning – Exterior Preservation

Phase 1-C

West



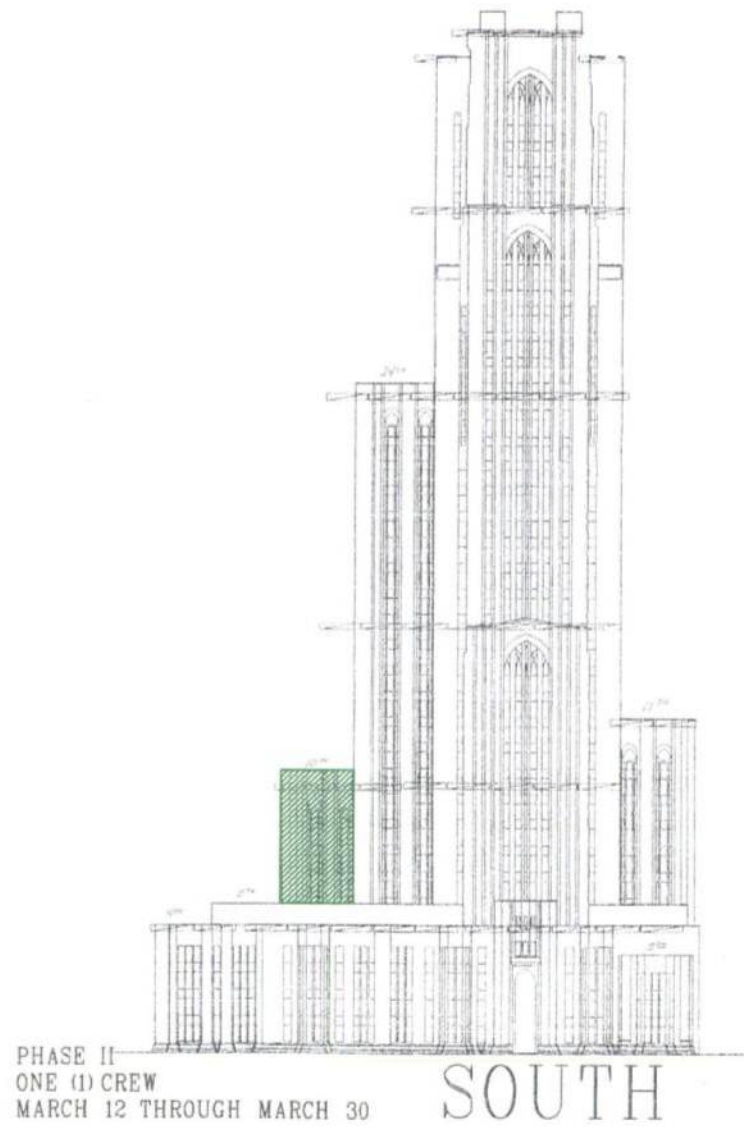
PHASE 1-C
TWO (2) CREWS
MARCH 12 THROUGH APRIL 6

WEST

Cathedral of Learning – Exterior Preservation

Phase 2

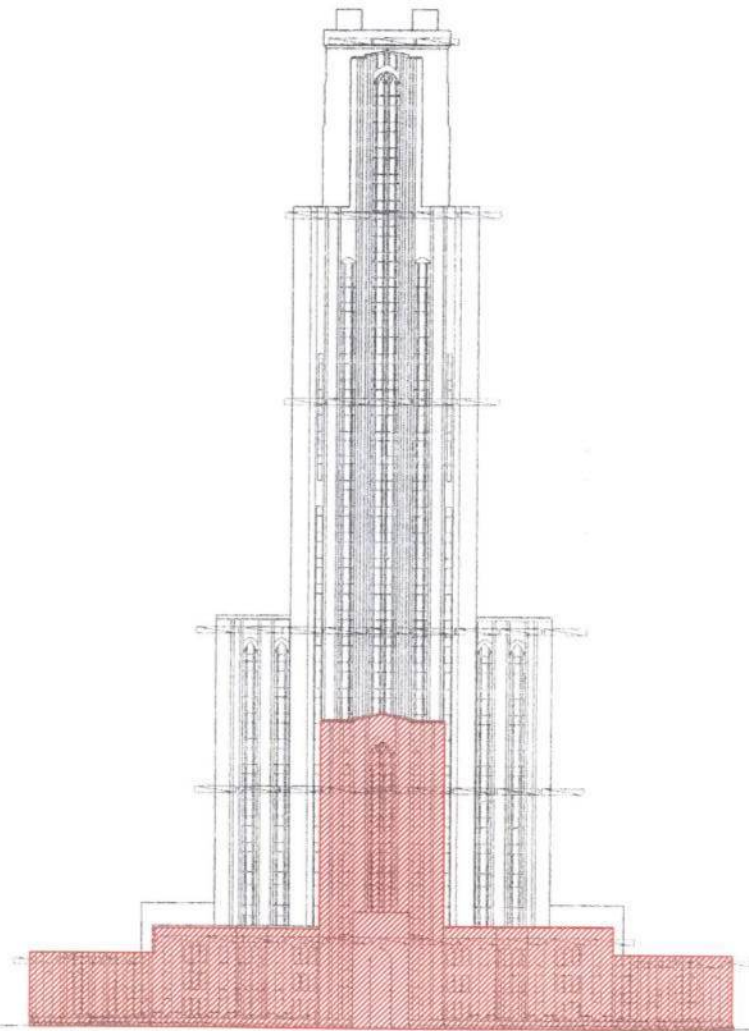
South



Cathedral of Learning – Exterior Preservation

Phase 3-A

East



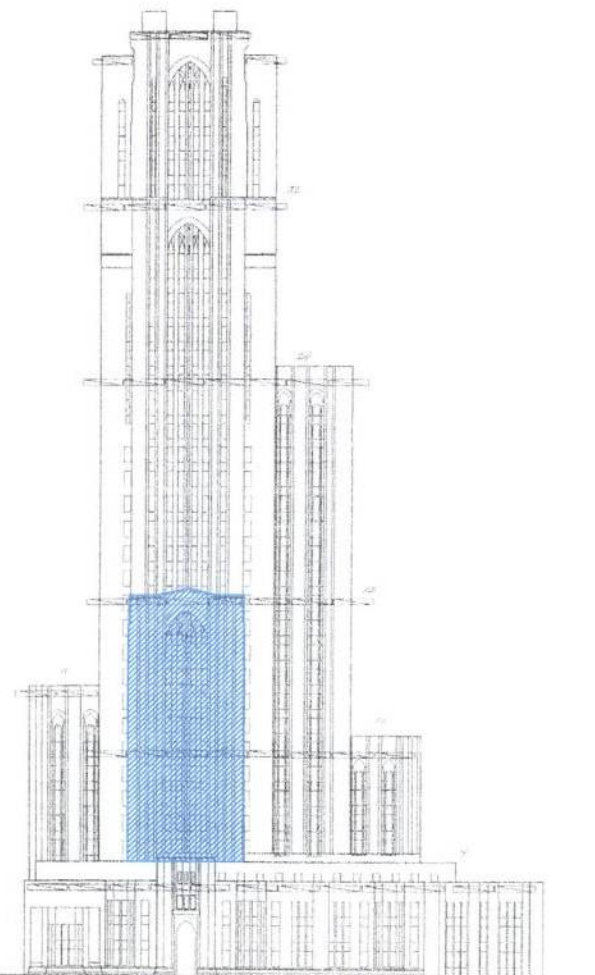
PHASE III-A
TWO (2) CREWS
APRIL 30 THROUGH MAY 25

EAST

Cathedral of Learning – Exterior Preservation

Phase 4-A

North



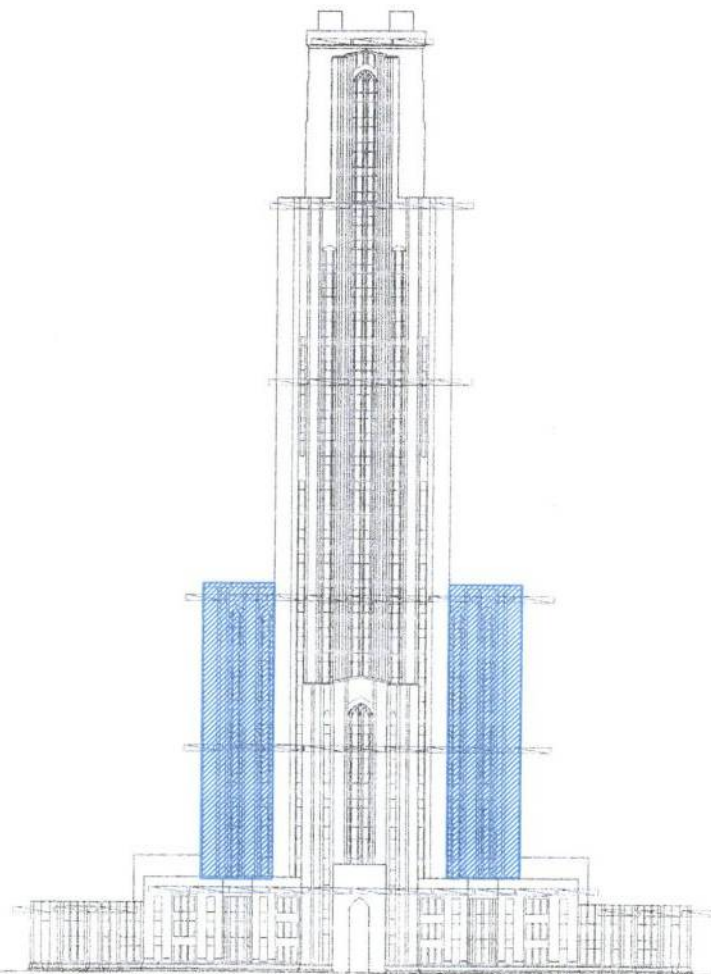
PHASE IV-A
ONE (1) CREW
MAY 28 THROUGH JUNE 22

NORTH

Cathedral of Learning – Exterior Preservation

Phase 4-B

East



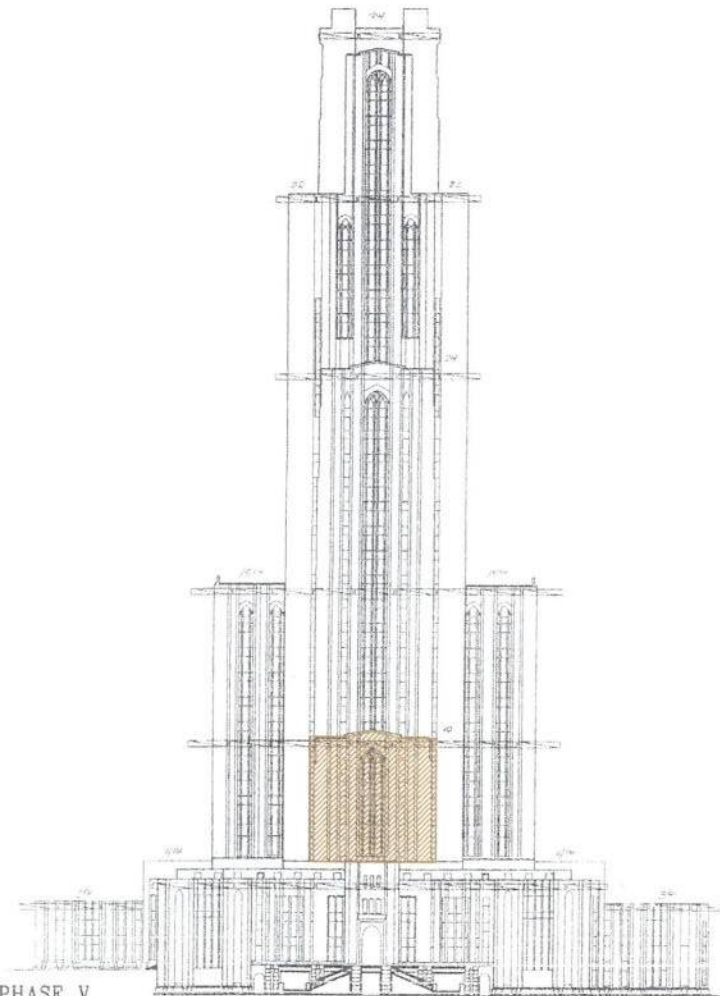
PHASE IV-B
TWO (2) CREW
MAY 28 THROUGH JUNE 15

EAST

Cathedral of Learning – Exterior Preservation

Phase 5

West



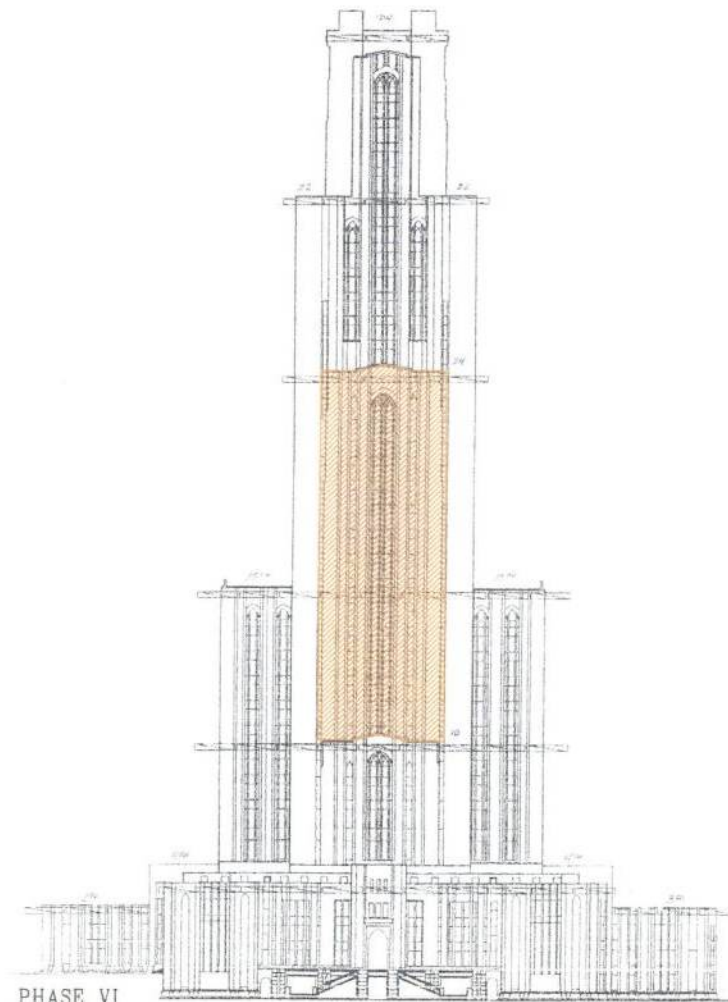
PHASE V
TWO (2) CREWS
JUNE 16 THROUGH JULY 6

WEST

Cathedral of Learning – Exterior Preservation

Phase 6

West



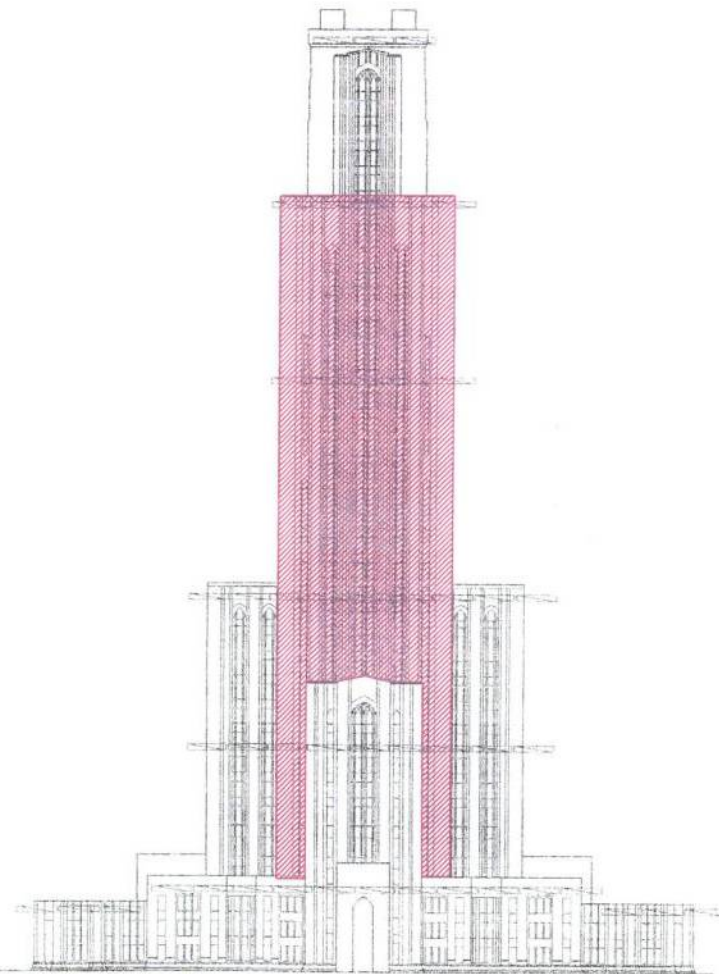
PHASE VI
ONE (1) CREW
JULY 2 THROUGH AUG. 3

WEST

Cathedral of Learning – Exterior Preservation

Phase 7-A

East



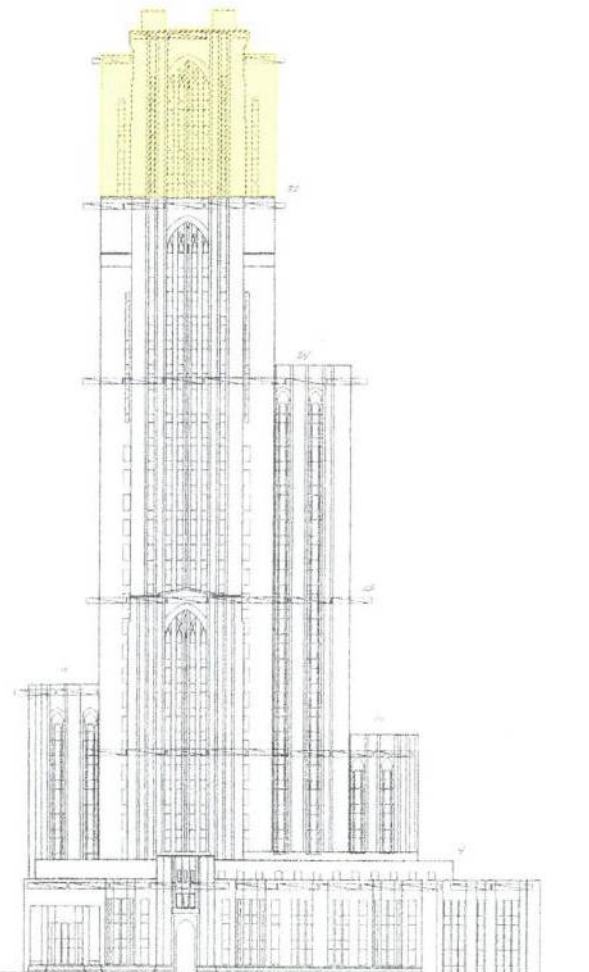
PHASE VII-A
TWO (2) CREWS
JULY 9 THROUGH AUG. 3

EAST

Cathedral of Learning – Exterior Preservation

Phase 8-B

North



PHASE VIII-B
TWO (2) CREWS
SEPT. 4 THROUGH SEPT 24

NORTH

Cathedral of Learning – Exterior Preservation

Cost Construction

Total Construction Value = \$4.8 Million



Cathedral of Learning – Exterior Preservation

Cost Construction



Cathedral of Learning – Exterior Preservation

Cost Construction



Cathedral of Learning – Exterior Preservation

X4224 Support Costs

<u>Contractor</u>	<u>Cost</u>	
•Schindler Elevator	\$14,430	
•Flooring & Roofing	\$11,500	
•Materials & Supplies	\$54,440	
•University Trades	\$231,297	
Carpenters		\$47,860
Electricians		\$37,907
Plumbers		\$9,330
Painters		\$29,900
Temporary Trades		\$106,300
•Miscellaneous Sub-Contractors	\$111,970	
•Total	\$423,637	8.11% Percent Project budget
•Construction Value	\$4,800,000	
•Project Budget	\$5,223,637	

Cathedral of Learning – Exterior Preservation

Multi-Soc 50 Water Protection



Cathedral of Learning – Exterior Preservation

Existing Roof Conditions



Cathedral of Learning – Falcons



Prior to the 1960's, they nested at more than 350 sites east of the Mississippi River, including 44 sites in Pennsylvania.

Populations crashed throughout much of the world by the 1960's, with no successful nestings east of the Mississippi River by 1965.

Peregrines came to the Cathedral of Learning on their own in the mid-1990's but did not nest successfully until 2002

The pair of falcons at the Cathedral wear color coded leg bands identifying them as part of the peregrine recovery program. The 2006 male born on the Rhodes State Office Tower in Columbus, Ohio in 1998 and was named "Erie". The female was born at Fistar Center in Milwaukee, Wisconsin and named Dorothy.

Cathedral of Learning – Falcons



Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation

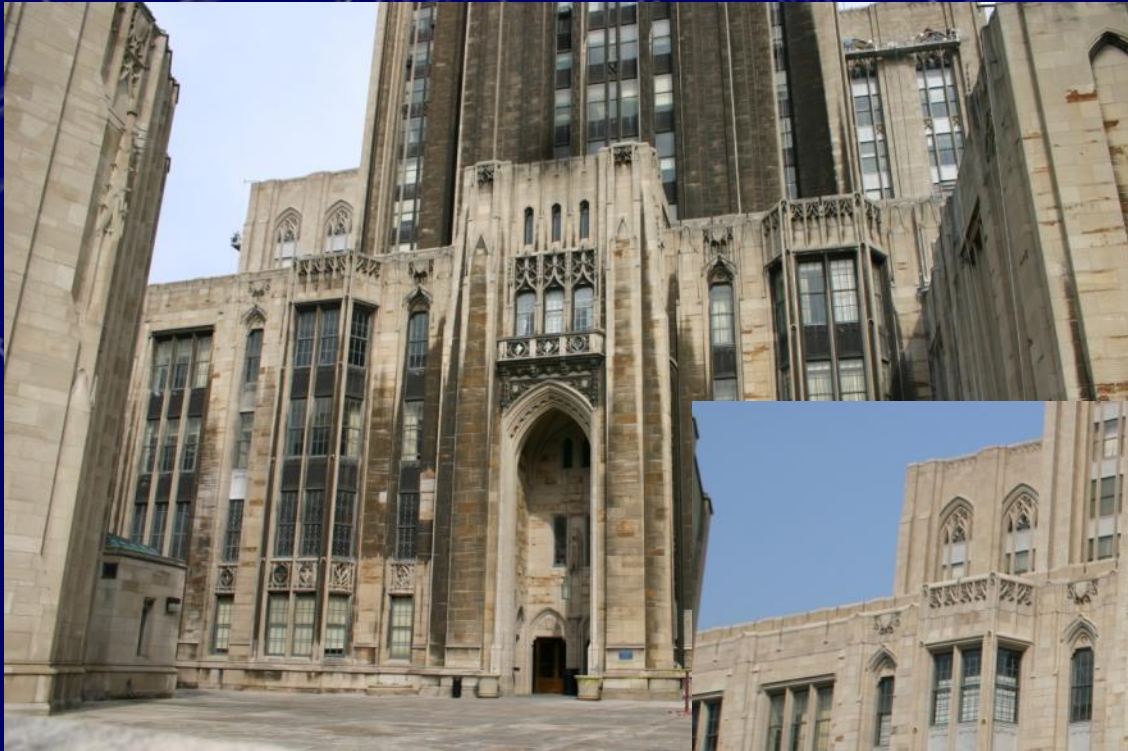


Before



After

Cathedral of Learning – Exterior Preservation

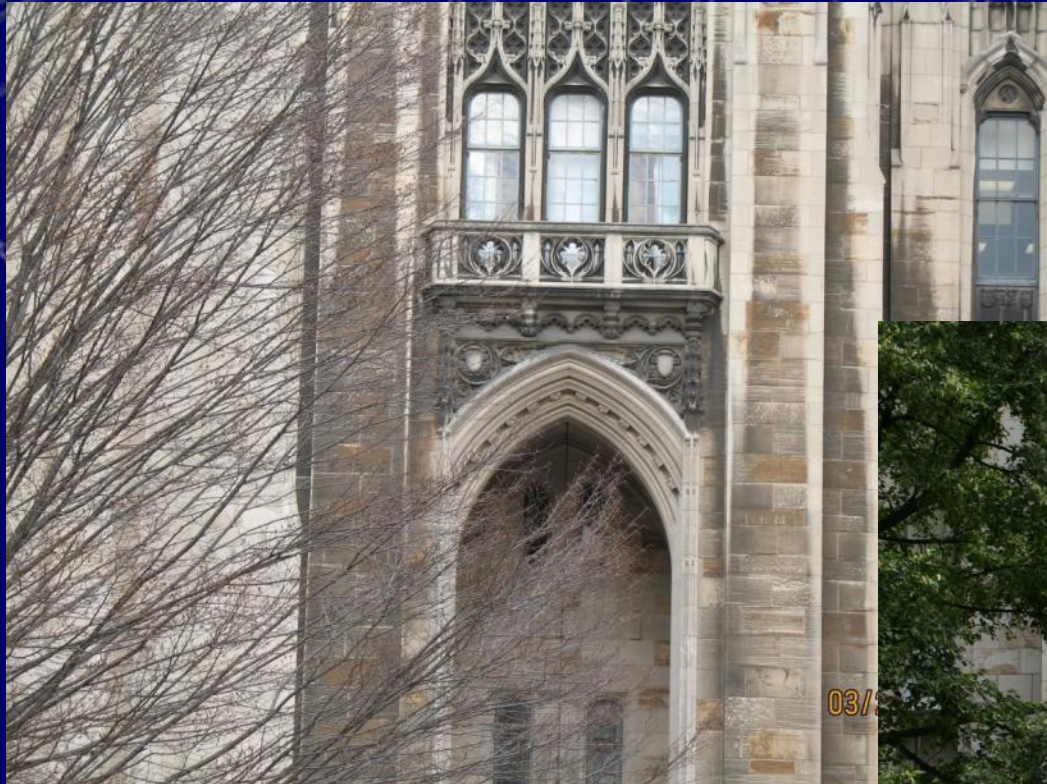


Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before



After

Cathedral of Learning – Exterior Preservation



Before

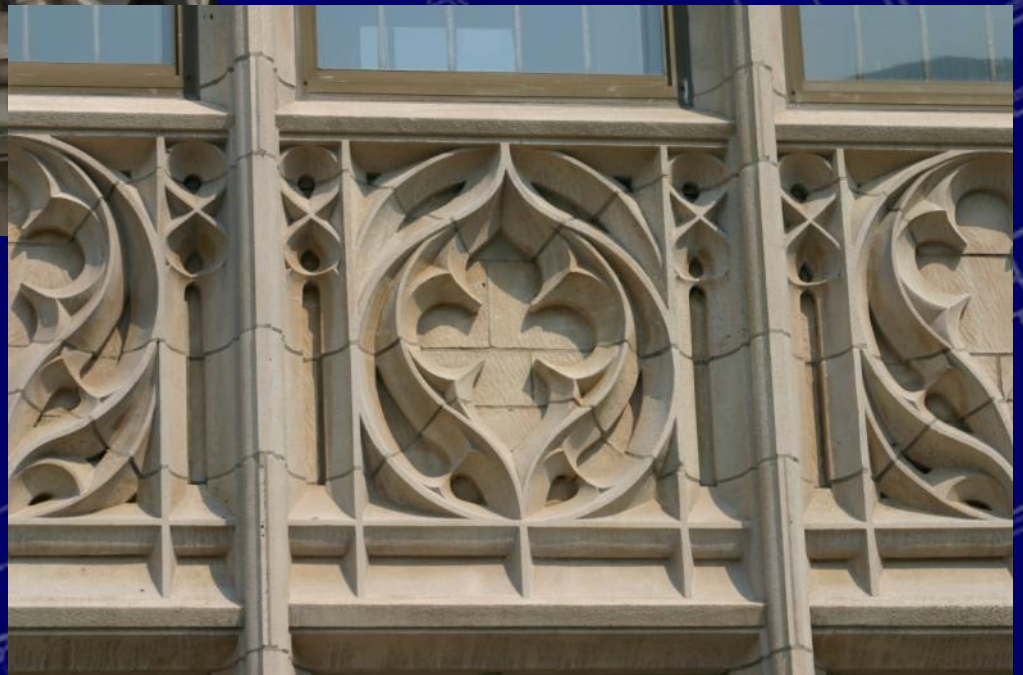


After

Cathedral of Learning – Exterior Preservation

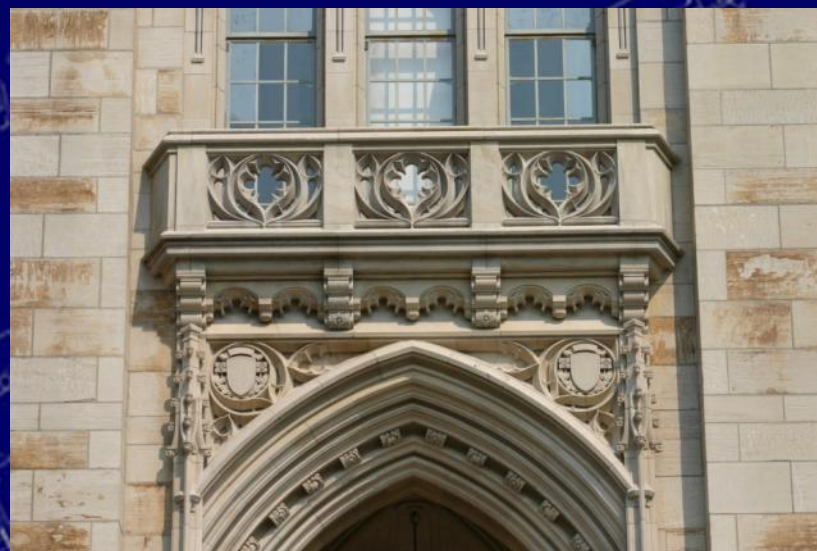


Before



After

Cathedral of Learning – Exterior Preservation



Before

After