The Benefits of a Well Maintained Building

"Proactive or Reactive: The Cost of Masonry Maintenance"

Pam Jergenson, CCS, CCCA, BECxP, CxA+BE

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75TH ANNIVERSARY

MNCEG

Minnesota Chief Engineers Guild

1943-2018

Overview

WHY Be Proactive?

Maintenance schedule

- inspection and repairs

Two case studies

- 2006/2007 and 2004

Do the Math

- 3 slides of each case study

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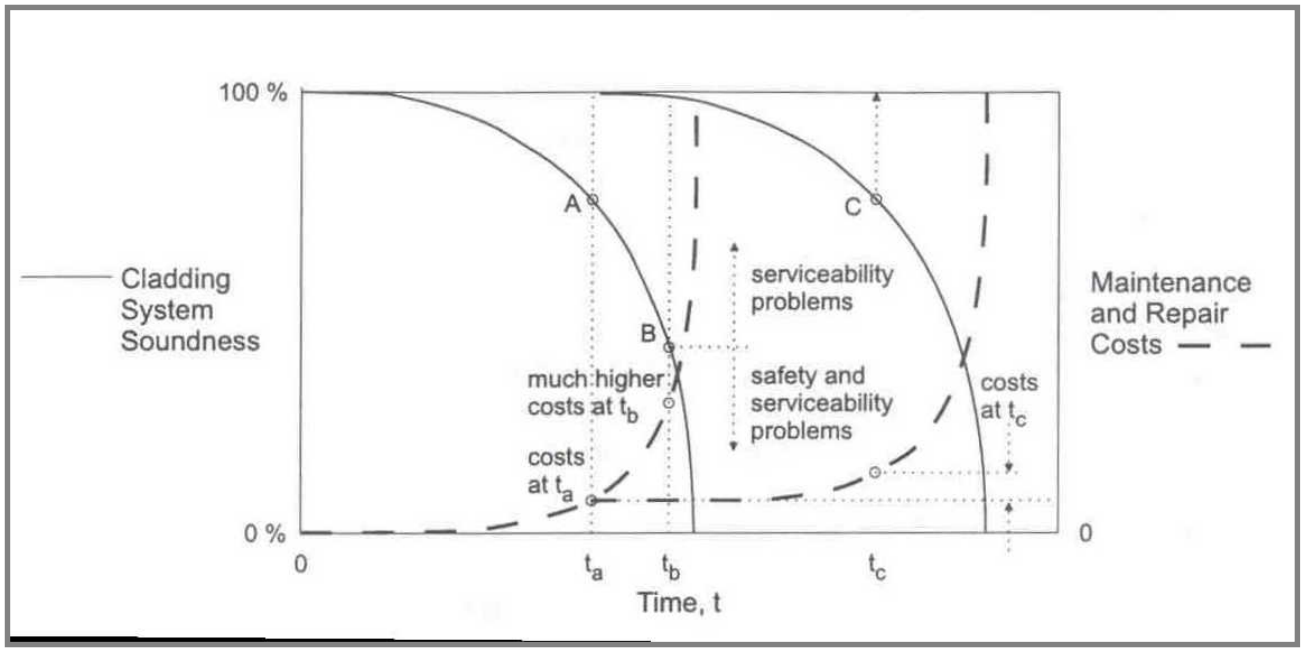
WHY Be Proactive?



From:

Masonry Structures: Behavior and Design

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Contractor's Recommendations

Masonry and Roof Maintenance Schedule

STRUCTURAL SYSTEMS	HOW OFTEN INSPECTED	EST TIME OF REPLACEM'T	MAINTENANCE by NEMCO
Exterior Wall Surfaces	Annual	Seldom	• Tuckpointing • Waterproofing
Built-Up Roof Surfaces Single-Ply Roof Surfaces	Spring and Fall	10 - 20 Years	• Inspect • Repair • Replace
Window Caulking	Annual	10 - 15 Years	• Re-caulk
Building and Roof Expansion Joints	Annual	10 - 15 Years	• Re-caulk • Repair • Replace
Protective Flashings	Spring and Fall	10 - 20 Years	• Replace with more durable material
Masonry Mortar Joints and Decorative Trim	Annual	15 - 20 Years	• Cut out and re-point • Install Elastomer coating
Cornice and Balustrade Mortar Joints	Annual	15 - 20 Years	• Cut out and re-point • Re-caulk
Chimneys	Annual	20 - 30 Years	• Replace Cap • Tuck point brick joints
Roof Drains and Gutters	Spring and Fall	5 - 10 Years	• Repair • Replace
Parapet Wall	Spring and Fall	20 - 30 Years	• Repair/Re-point • Replace damaged brick
Slate Roofing	Spring and Fall	25 - 100 Years	• Repair • Replace

New England Masonry & Roofing Company
146 Sheridan Drive
Naugatuck, CT 06770

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NATIONAL CONCRETE MASONRY ASSOCIATION
Sustainable Concrete Products for Structures and Hardscapes

Table 1 – Maintenance Schedule

Building Element	Frequency
Exterior	
Check the overall appearance of the structure for any signs or damage of misfunction to the exterior.	Periodically
Inspect mortar and units. Ensure intimate contact between mortar and units. Check for the presence of cracks, chips and other surface degradation.	Annually
Check plumb and vertical alignment of wall surfaces	Every 2 to 5 years
Check for the pressence of dirt, stains, efflorescence and graffiti and clean as necessary	Annually
Examine flashing and weep holes to ensure proper function. Repair screens as necessary.	Bi-annually
Examine the condition of sealants at the control joints.	Annually
Examine the condition of the caulking materials.	Annually
Check for locations and sources of moisture.	Annually (Spring)
Check for ivy and its effects on the masonry.	Annually (Spring)
Examine the condition of coatings.	Annually
Examine the condition of the parapet cap and copings.	Annually
Examine the condition of the roof membrane.	Annually
Check the condition of the roof drains, gutters, downspouts, and splash blocks. Clean and repair as necessary	Spring and Fall
Check to make sure that the ground slopes away from the building on all sides.	Annually (Spring)
Check the size of trees and shrubs near the building.	Annually
Check for the pressence of insects and vermin. Remove nests and clean weep holes as necessary.	Annually
Verify adequate anchorage and performance of sign, porch lights, etc. attached to the exterior.	Annually
Interior	
Inspect for signs of water leakage and mold growth.	Bi-annually
Check plumb and vertical alignment of wall surfaces.	Every 2 to 5 years
Examine the condition of the sump pump and french drain.	Annually
Windows and Doors	
Examine flashing and repair as necessary.	Bi-annually
Examine caulking or weather stripping and replace as necessary.	Bi-annually
Feel for drafts and look for signs of possible water entering the structure.	Bi-annually
Fireplace	
Examine chimney for loose masonry units or mortar.	Annually
Have chimney flue inspected and cleaned.	As needed

“Maintenance of Concrete Masonry Walls”

NCMA TEK 8-1A, 2004

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THE BRICK INDUSTRY ASSOCIATION
The National Authority on Clay Brick Construction

TABLE 1

Estimated Time to Repair of Materials

Material	Use	Estimated Time to Repair (Years)
Brick	Walls	100+
Sealant	Joints	5-20
Metal	Coping/Flashing	20-75
Metal	Anchors & Ties	15+
Mortar	Walls	25+
Plastic	Flashing	5-25
Finishes		
Paint	Appearance	3-5
Water Repellents	Dampproofing	5-10
Stucco	Appearance	5-10

"Maintenance of Brick Masonry"

BIA Technical Note 46, December 2005

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Masonry Repair Detail

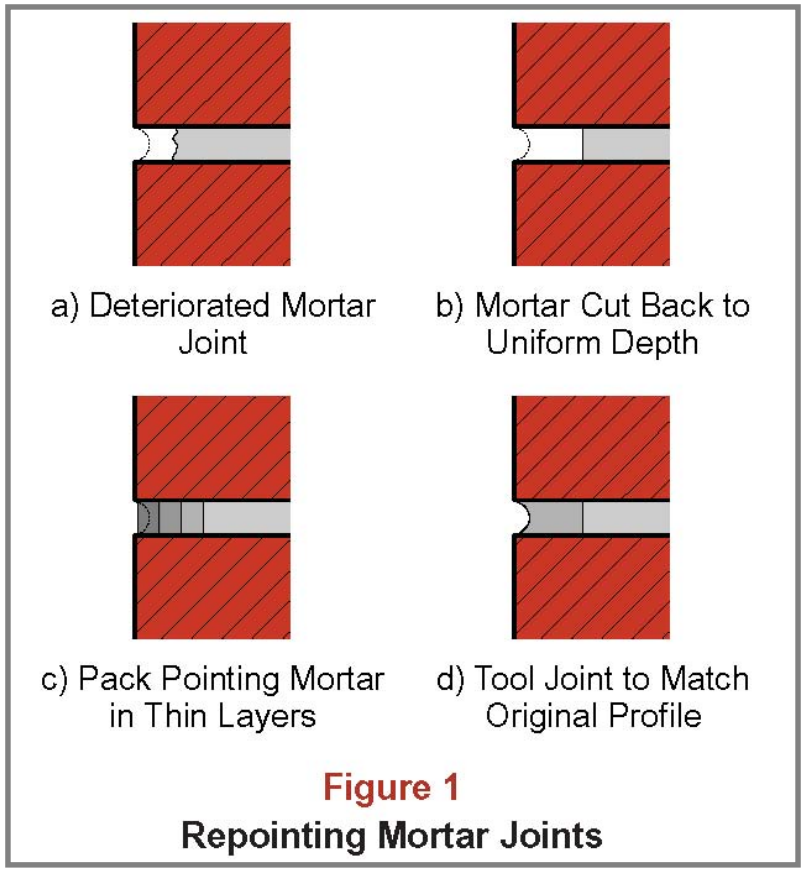

Figure 1
Repointing Mortar Joints

"Maintenance of Brick Masonry"

BIA Technical Note 46, December 2005

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Tuck pointing or Repointing

- Install new mortar in layers
- Compact between layers

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Spot brick replacement

- “Butter” new brick and shove into place
- Point in mortar around new brick

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Two-story brick masonry

- Original construction circa 1937
- No recent masonry maintenance

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Visual observations

- Loose coping tiles, displaced masonry
- Deteriorated mortar on roof side

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Close visual observations

- **Missing mortar**

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Close visual observations

- Cracked mortar
- Lintel exfoliation 3/4” to 7/8”

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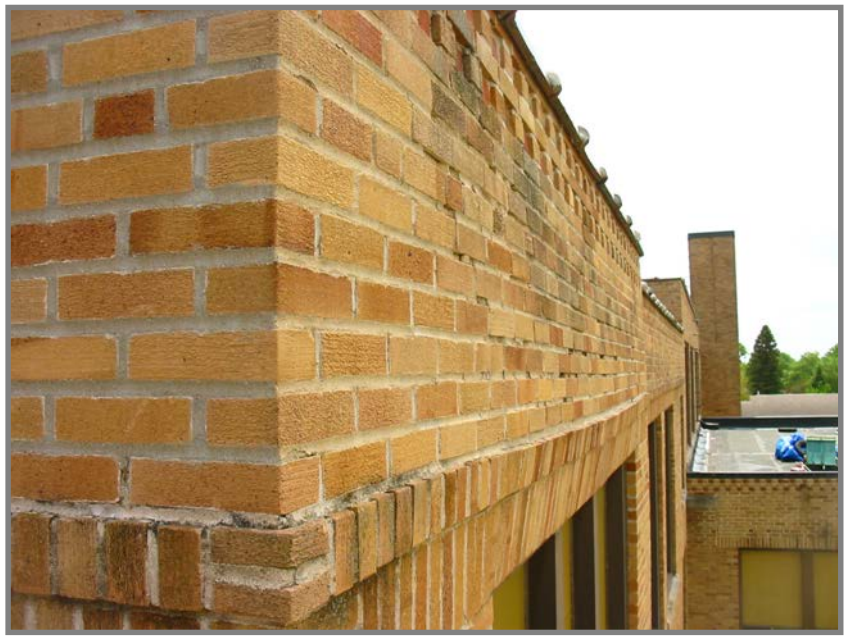
Close visual observations



- **Displaced masonry**
- **Out-of-plumb 2-3/8” in 12” height**

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Test Openings

- No veneer anchors for 24” above the lintel
- Spalled inner wythe brick and clay tile
- Deteriorated inner wythe mortar

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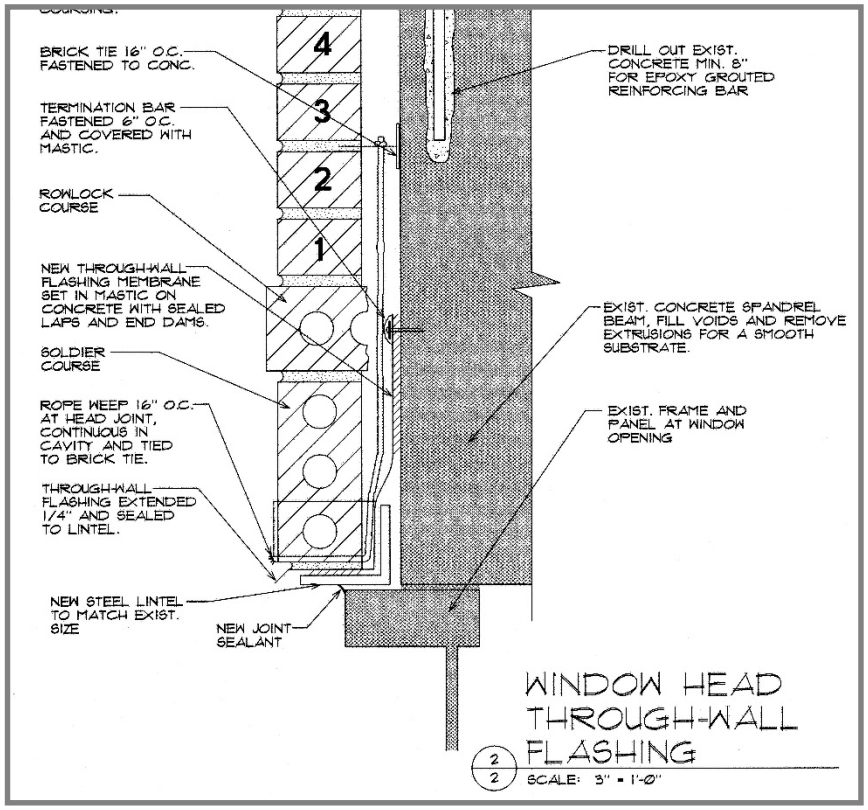
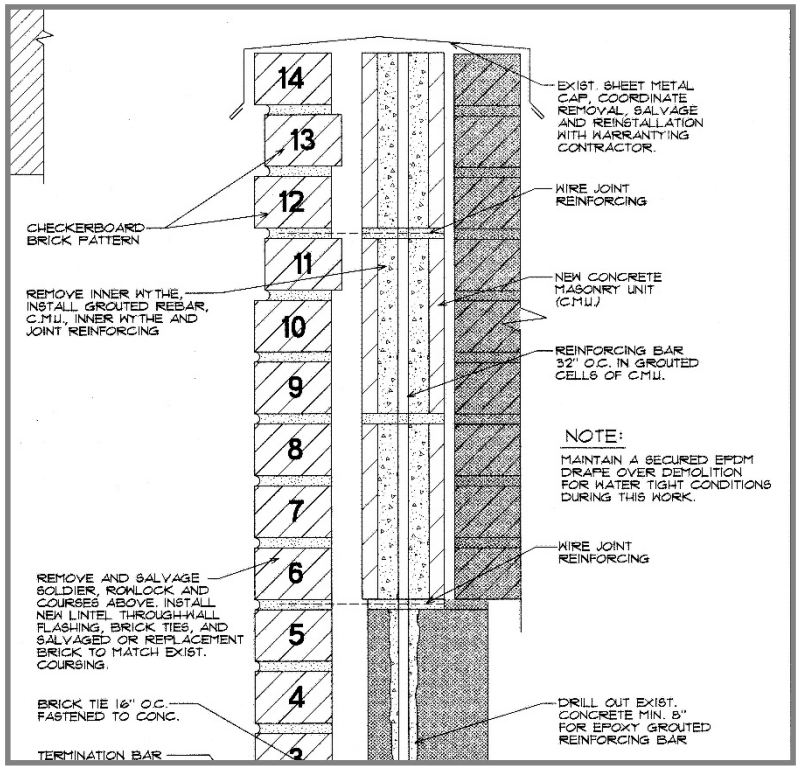
Repair Detail





- **Remove exterior and inner wythes**
- **New lintel, flashing, veneer anchors, inner wythe, and exterior wythe**

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2006 Emergency Repair

Emergency repair for
16 foot window in 2006:

$18,000

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2007 Complete Perimeter

2007 perimeter repairs for 280 feet:
$219,000
2006 emergency repair cost for 280 feet:
$315,000

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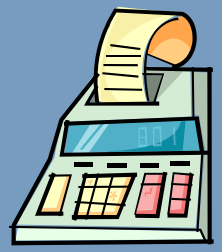

Do the Math

2006 Emergency Repair ($18,000 ÷ 16 ft.)	$1,125.00 per foot of parapet
2007 Complete Perimeter ($219,000 ÷ 280 ft.)	$ 783.00
Tuck pointing ($11/sq. ft. x 4.25 ft.)	$ 46.75
Plus mobilization, etc. ($46.75 x 1.10)	$ 51.43

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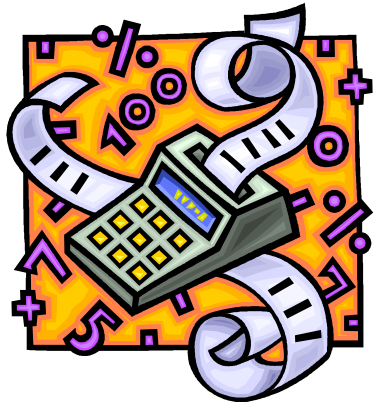
Do More Math

Tuck pointing	$	46.75 per foot
Spot brick replacement ($25/ brick x 2 brick/ft.)	$	50.00
Joint sealant replacement at coping tiles or stones ($7/ft. x 2 ft.)	$	14.00
Plus mobilization, etc. ($110.75 x 1.10)	$	121.85 per foot of parapet



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Do (just a little) More Math

Proactive maintenance for 1937 building parapet restoration in 1957, 1977, and 1997 (3 x $121.85/ft.)	**$ 365.55 per foot of parapet**
2006 Emergency Repair	**$ 1,125.00**
2007 Complete Perimeter	**$ 783.00**

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Three-story brick masonry

- Original construction approx. 1920
- No maintenance records or evidence of previous maintenance

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How It Started

- Tuck pointing project underway
- Stone fell into worker's hands
- Rusted stone anchors, if any present

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Façade Inspection

- 12 drops or vertical passes
- 46 test openings
- Close observations

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Close Observations

- From grade versus close-up

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Inspection Openings

- Damp and deteriorated inner wythe
- No ties in 4 of the 10 parapet openings
- Rusted ties in 5 of the 10 openings

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Inspection Openings

- Rusted ties in 3 of the six stone openings
- Light surface rust on the ties of the remaining openings

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Inspection Openings

- Hard pack rust on east and north elevations
- Deflected lintels at several locations

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Other Observations

- Deteriorated joint sealants
- Open roof base flashings
- Both had asbestos

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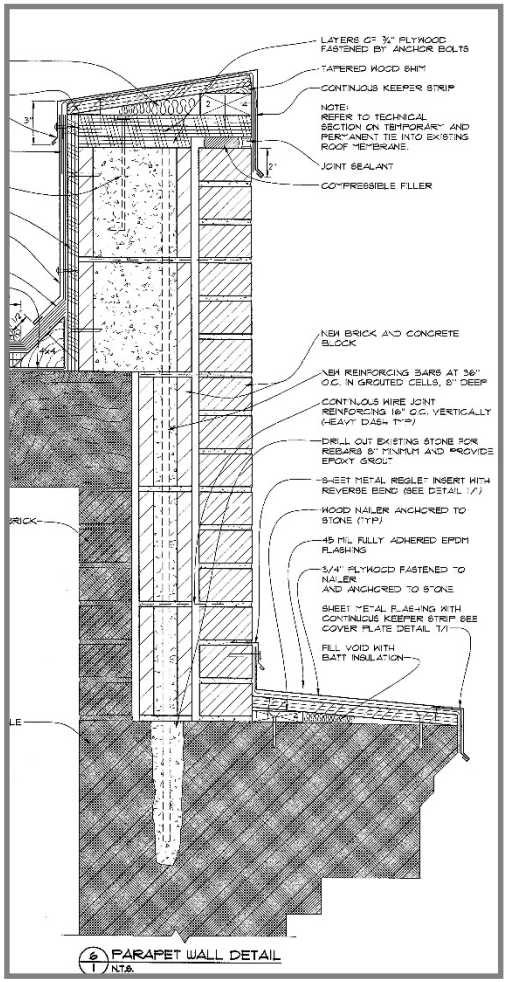
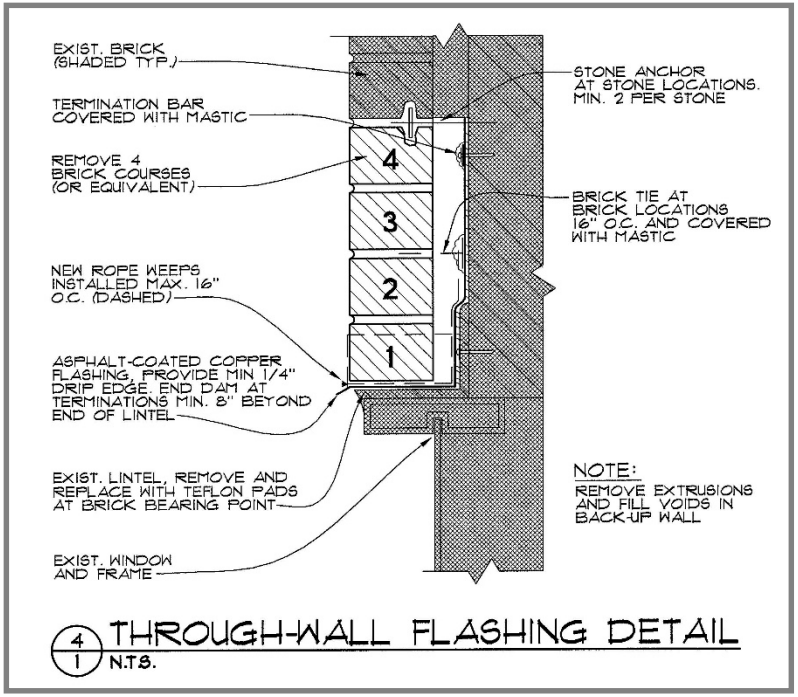
2004 Repair Details





Also: re-anchor stone, rebuild inner wythe, and replace wood joist ends

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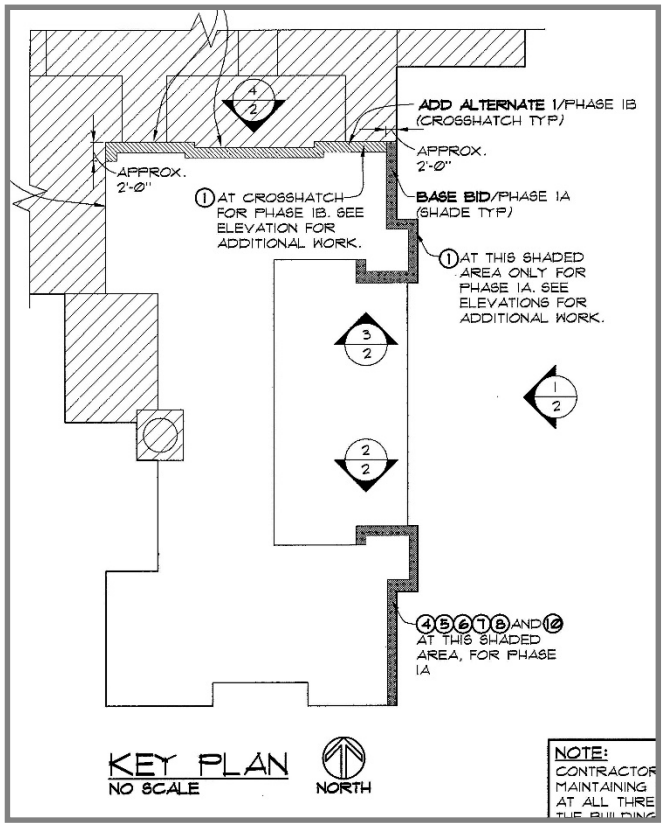
2004 Key Plan



- **Extent of work divided into 1A and 1B**
- **Included re-anchoring stone, tuck pointing, spot brick replacement, joint sealant replacement, temporary and final roof tie-in, and limited asbestos abatement**

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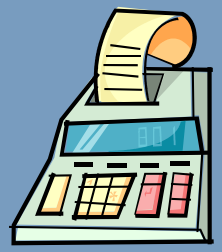

Do the Math

2004 Phase 1A	$	2,179.00 per foot
($329,000 ÷ 151 ft.)		
2004 Phase 1B	$	1,989.00
($175,000 ÷ 88 ft.)		
Tuck pointing	$	93.50
($11/sq. ft. x 8.5 ft.)		
Plus mobilization, etc.	$	102.85
($93.50 x 1.10)		

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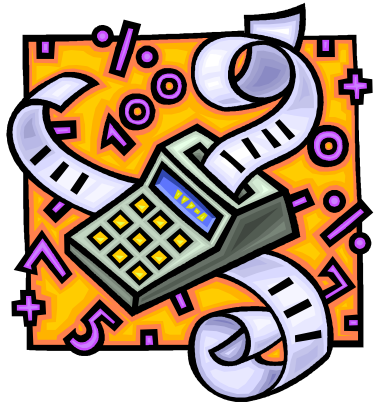
Do More Math

Tuck pointing	$	93.50 per foot
Spot brick replacement ($25/ brick x 2 brick/ft.)	$	50.00
Joint sealant replacement at coping tiles or stones ($7/ft. x 2 ft.)	$	14.00
Plus mobilization, etc. ($157.50 x 1.10)	$	173.25 per foot of parapet



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Do (just a little) More Math

Proactive maintenance for 1920 building parapet restoration in 1940, 1960, 1980, and 2000 (4 x $173.25/ft.) **$ 693.00 per foot of parapet**

2004 Phase 1A **$ 2,179.00**

2004 Phase 1B **$ 1,989.00**

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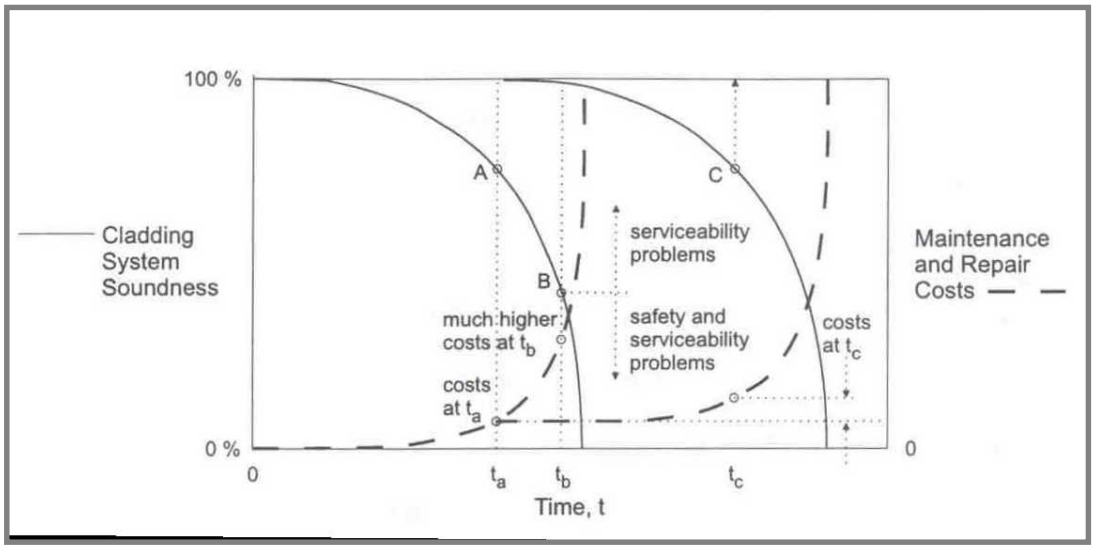
Conclusions



- **Conduct periodic inspections of exterior walls (and other building envelope systems)**
- **Plan for and budget maintenance of exterior walls**

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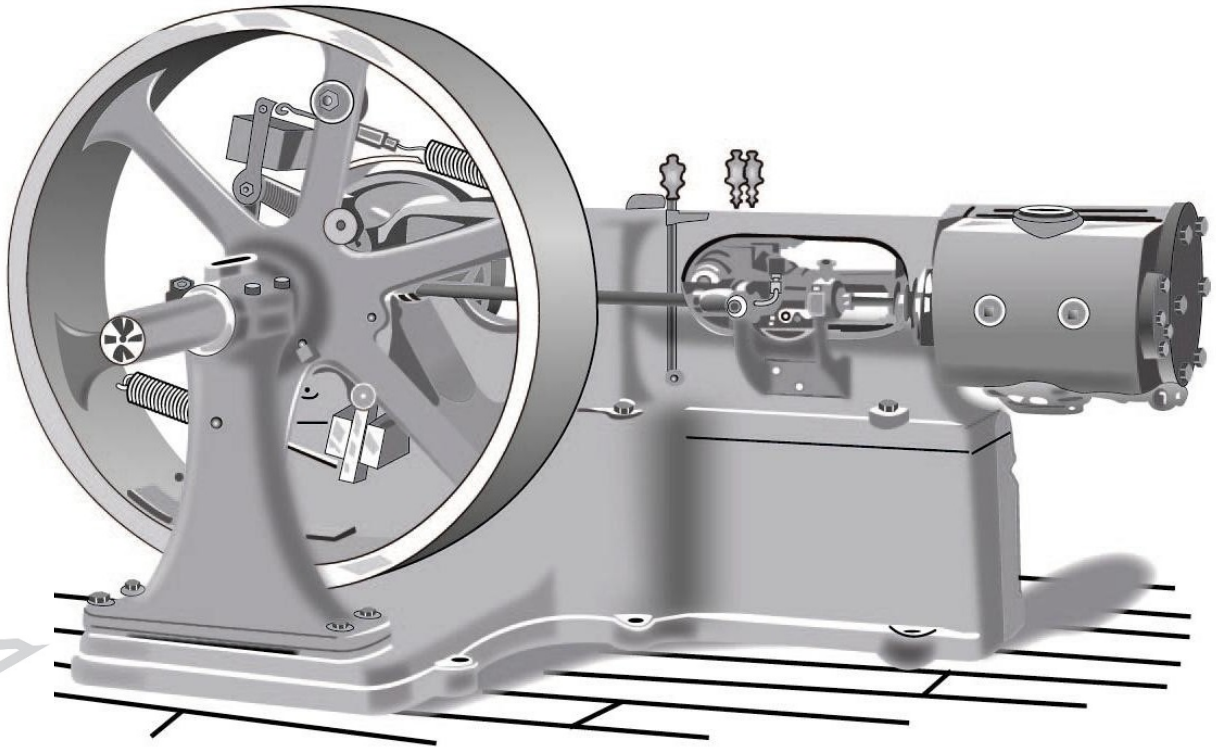
QUESTIONS?



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