Smithsonian Institution Building
Earthquake Damage Repairs

Design Development Presentation

May 9, 2012
Agenda

1. Introductions and Project Goals
2. Earthquake Monitoring
3. Mortar Analysis
4. Organization of the Documents
5. Scopes of Work & Bid Organization
6. Review of Individual Repairs
7. Outstanding/Unresolved Items
8. Schedule
9. Questions & Discussion
Earthquake Monitoring

1. An accelerometer provides information on the force experienced by the structure due to a large or close earthquake.
2. Equipment is housed in a metal case, approximately 10 in high, 8 in wide and 15 in long, weighting 15-20 pounds.
3. The Building codes often require 3 accelerographs located in the basement, mid-height and near the top of the structure.
Earthquake Monitoring: First Floor
Earthquake Monitoring: Third Floor
Earthquake Monitoring: Tower Locations
Mortar Analysis

North Tower

1. Bedding mortar deteriorated and loose, high lime content (similar to Type K)
2. Different pointing mortars in each location. Will need to collect fourth sample from Chimney Type 2 when scaffolding is on the roof. (Similar to Type O)
3. Mortar comes out of joints without adhering strongly to the sandstone-. Will ease re-pointing efforts and minimize stone prep for re-use.
4. Will use bedding mortar for reconstructions and pointing mortar unique to each chimney type and era.

Chimney C8

Chimney C9
The Work

1. Scaffolding locations
2. Potential Scaffolding location
3. Cantilevered scaffolding
4. Chimney types:
   Type 1 (Renwick Era):
   C1, C2, C6, C7, C8, C12
   Type 2 (Cluss Era):
   C3, C4, C5, C10, C11
   Type 3: (before 1917) C9
5. FT 1: Flag Tower Sill Repair
6. ST1: South Tower Repair
7. G1: Re-install finial
Organization of the Documents

- **Specifications**
  - SI Small Project Division 1
  - Technical Sections for stone maintenance, liquid applied waterproofing, sheet metal, sealants

- **Drawings**
  - Included in Specification Sections

**Base Bids**
- Re-point, selective re-setting of individual blocks (C1, C4, C8, C9, C10)
- Re-build (C2, C3, C5, C7)
- No work (C6, C11, C12)

**Alternate Bids**
- Re-build in lieu of re-point
- Scaffolding at Flag Tower
- Chimney Type 1: Remove waterproofing and/or ventilators and install new metal flashing
- Chimney Type 2: Install new metal cap.

**Unit Prices**
- Dismantle and reconstruct 1M of brick masonry back-up for Chimney Type 1
- Dismantle and reconstruct 1M of irregular stone masonry back-up for Chimney Type 2
Individual Repairs: Chimney C1
Re-point (Alt: Re-built, New flashing)
Individual Repairs: Chimney C2
Re-build (Alt: Remove waterproofing, New flashing)

Chimney C2 Scope Information
1. Basic Scope: demolition and reconstruction to the condition prior to the chimney.
2. Alarm: Check corresponding to stone and install new metal flashing.

Keynotes
1. Preserve existing metal flashing and each stone course individually above flashing at top cap, in the following order:
   2. Remove condition blocks, examine materials from the top and prepare areas for new installation.
   3. Replace stone and rebuild condition blocks to their original locations with new bonding and pointing mortars per the specifications.
   4. Do not remove stones below this course. Preserve stones below this level.
   5. Remove existing asphalt-coated metal flashing in the area where new metal flashing is being installed.
   6. Patch existing asphalt-coated metal flashing at the same level using similar materials.
   7. Do not remove stones around new flashes.
   8. Existing glass is to remain.
   9. Do not remove bricks in this location.
   10. Repoint all mortar joints in the chimney.
   11. Repoint existing mortar joints in the chimney.
   12. Repoint mortar in lower area of new masonry.
   13. Repoint this stone. Preserve mortar and stonework.
   14. Mortar is filled with a mixture of mortar and pre-mixed mortar for the new masonry.
   15. Repoint all mortar joints in the chimney.
   16. Repoint existing mortar joints in the chimney.
   17. Repoint mortar in lower area of new masonry.
   18. Repoint mortar in lower area of new masonry.
   19. Repoint mortar in lower area of new masonry.
   20. Repoint mortar in lower area of new masonry.
   21. Repoint mortar in lower area of new masonry.
   22. Repoint mortar in lower area of new masonry.
   23. Repoint mortar in lower area of new masonry.

Chimney C2 - View Looking North

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Individual Repairs: Chimney C3
Re-build (Alt: New metal cap)

Chimney C3: Overview Looking South

Chimney C3: Detail View Looking South

Chimney C3 Scope Information
1. Basic Scope: demolition and reconstruction of the damaged portions of the chimney
2. Alternate: Install new cap applicable similar to C16.

Keynotes
1. Remove existing metal flashing and such areas beneath chimney. Immerse in a hot solution of 6% sodium hydroxide to remove incrustations. Rinse and dry thoroughly.
2. Remove and replace chimney cap made from stainless steel with one made from stainless steel and prop up for non-damaging.
3. Lift out and replace chimney cap in its original position with new bonding and anchoring system per the specifications.
4. Do not remove stone below this course. Prop up and dry thoroughly.
5. Remove liquid applied elastomeric coating from cap and other flashings. Use a power washer. (ALTERNATE)
6. Finish repair with a new stainless steel flashing per the specifications. (ALTERNATE)
7. Do not remove stone courses above this level.
8. Leaving flux, cap in place.
9. Do not remove metal this location
10. Remove all course prior to chimney.
11. Reinstalling to install new cap and below.
12. Strip excess mortar and jointing compound
13. Reestablish stone courses above.
14. Reinstall stone flash-provided by Owner. Clean and prop up for non-damaging.
15. Install new mortar and 800-grit sand for non-damaging.
16. Install new metal flashing with new stone on top and dry thoroughly. Rinse and dry thoroughly.
17. Protection on existing cap is necessary.
18. Coordinate existing chimney height with owner prior to installation. Can not destructively test for the wall.
19. Install new metal cap. (ALTERNATE)
20. Install new metal flashing after removing all components. Reinstalling to install new cap and below.
21. Provide new end cap or masonry in excess of stone wall.
22. Address all theft pervasive stone missing.
23. Reinstall missing chimney and associated flashing, mortar and bonding. (ALTERNATE)
Individual Repairs: Chimney C4
Re-point (Alt: New metal cap)

Chimney C4 Scope Information
1. Basic Scope: Repair in lieu of movement, Assume removal and resetting of approximately 20ft of defective masonry
2. Alternative Scope: Demolition and reconstruction of chimney beginning one course above the foundation. Provide new metal cap similar to C3.

Keynotes
1. Protect existing metal flashing and each stone course immediately above flashing by applying caulk
2. Remove defective blocks, reinstall course from base and prepare for new intersection
3. Label, protect and reinstall damaged blocks in their original location with new bedding and relevelling mortars per specifications
4. Do not remove course below this course. Protect mortars below this level.
5. Remove/replace asphalt shingles from top course (white over black, use C1 for similar shingles, ALTERNATE)
6. Patch existing asphalt shingles with new spalling or stone cap, remove access covers on flashing, install new C1
7. Do not remove course around the chimney
8. Existing flue, top to return
9. Do not remove blocks in the location
10. Re-point all course joints in chimney
11. No backfilling to return this course and below
12. Repoint mortar below area of recommendation
13. Remove this course. Remove mortar and reveal stone
14. Patch all area as per Mineral’s Cricket Club Code, otherwise as field as required
15. Remove and replace existing flashings, with new sections, each section with new field and 4". Run new drain to non-drained ground
16. Provide new metal cap, ALTERNATE
17. Install new metal flush after removing all debris, backfilling and surrounding mortar
18. Remove/replace existing asphalt shingles, ALTERNATE
19. Remove existing asphalt shingles, ALTERNATE
20. Provide new wood or metal flashing and new wood or metal flashing, ALTERNATE
21. Provide new wood or metal flashing and new wood or metal flashing, ALTERNATE
22. Provide new wood or metal flashing and new wood or metal flashing, ALTERNATE

Chimney C4: Overall View Looking SW
Chimney C4: Overall View Looking East
Chimney C4: Detail Looking East

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Individual Repairs: Chimney C5
Re-build (Alt: New metal cap)

Chimney C5 Scope Information
1. Basic Scope: demolition and reconstruction of condenser portion of chimney.

Keynotes:

- 1. Protect existing masonry from chipping when using brick chisel.
- 2. Remove existing chimney from original location.
- 3. Rebuild chimney to original specifications.
- 4. Do not remove chimney before this course.
- 5. Install new metal cap similar to C10.
- 6. Install new metal cap similar to C10.
- 7. Reinstall chimney to original location.
- 8. Verify chimney height.

Chimney C5 View Looking North

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Individual Repairs: Chimney C7
Re-build (Alt: Remove ventilator, New metal flashing)

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Individual Repairs: Chimney C8

Re-point (Alt: Re-build, New metal cap)
Individual Repairs: Chimney C9

Re-point (Alt: Re-build, Remove ventilator, New metal cap)

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Individual Repairs: Chimney C10
Re-point (Alt: New metal cap)

Chimney C10 Scope Information
1. Basic Scope: Re-point existing chimney. Existing mortar is dry.
2. Alternative Scope: Dismantle and reconstruct the chimney beginning one course above the flashing.

Keynotes
- Protect existing metal flashing and existing stone courses immediately above flashing until a new cap is installed.
- Remove condition blocks, reposition mortar below block and prop stone for re-installation.
- Label removed and reinstalled condition blocks in their original location with new building and pointing mortar per the specifications.
- Do not remove stone below this course. Protect stone below this level.
- Remove top applied elastomeric coating from top stones (alternate). See C1 for another option. (ALTERNATE)
- Protect remaining Chimney top applied waterproofer at chimney cap from rain. Use C1.
- Do not remove stone courses around this chimney.
- Existing flashings to remain.
- Do not remove bricks this location.
- Regular mortar joints this chimney.
- No gapkeeping to occur this course and below.
- Regular mortar below area of focus.
- Remove this stone. Remove mortar and stone.
- Remove all rain drain provided by Owner. Clean and re-lap butte and bottom courses of brick for new mortar setting.
- Remove and install existing mortar and associated flashing. Rebuild, and complete.
- Remove and replace existing stones with new stones and beads of same dimension and length. See new blocks in new shadow gap.
- Do not point joints along line. Infiltration.
- Cut old dished mortar joints prior to installation. Cut and fill with new mortar.
- Seal new metal cap. (ALTERNATE)
- Install new metal flashing. Cut and fill with new mortar. (ALTERNATE)
- Provide new outlet or rework to existing outlet if horizontal and vertical outlet.
- Install all new metal flashing. (ALTERNATE)
- Reassemble existing chimney and associated flashing. Return to original condition. (ALTERNATE)
Individual Repairs: Reinstall Finial G1

Gable Repair Scope Information
1. Basic Scope: Reinstalled finial.

Keynotes:
1. Protect existing metal flashing and existing stone masonry immediately above the flashing area.
2. Remove existing stone masonry from edge of roof. Keep the masonry intact. Reinstall masonry in original location with new bedding and pointing mortar per the specification.
3. Remove existing stone masonry from above the finial. Reinstall masonry in original location with new bedding and pointing mortar per the specification.
4. Do not remove stone below the course. Preserve stone below this level.
5. Remove existing stone masonry from above the finial. Reinstall masonry in original location with new bedding and pointing mortar per the specification.
6. Do not remove stone below this level.
7. Do not remove stone below this level.
8. Existing stone, if present, is to be retained.
9. Do not remove stone below this level.
10. Re-install all note points on the chimney.
11. Re-install all note points on the finial.
12. Re-install all note points on the finial.
13. Re-install all note points on the finial.
14. Re-install all note points on the finial.
15. Re-install all note points on the finial.
16. Re-install all note points on the finial.
17. Re-install all note points on the finial.
18. Re-install all note points on the finial.
19. Re-install all note points on the finial.
20. Re-install all note points on the finial.
21. Re-install all note points on the finial.

MAINTENANCE OF STONE MASONRY

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Individual Repairs: South Tower
Limited Re-pointing
Individual Repairs: Flag Tower
Sealant at Concrete Window Sill

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Flag Tower — North Elevation
MAINTENANCE OF STONE FINISHES

Keynotes
1. Prevent existing metal flashing and other metal pieces from coming into contact with new concrete.
2. Remove condensation blockage from concrete.
3. Label pieces and reinstall condensation blockage in their original locations or install new blocking and gasketing as per the specifications.

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Individual Repairs: Alternate Metal Caps/Flashing
Outstanding/Unresolved Items

1. Confirm status of chimneys and ventilators – used or not used.
2. Determine final scope/alternates for tops of chimney Type 1
   1. Patch waterproofing after re-pointing/reconstruction complete
   2. Cover waterproofing with new metal flashing
   3. Remove waterproofing, new metal flashing
   4. New liquid or membrane waterproofing (over existing if possible)
3. New metal caps on chimney Type 2
4. Final details/specs for tops of chimneys
5. SI make window in flag tower operable
Schedule

May 9, 35% presentation, 1-2 PM
May 23, 35% review meeting, 1-2 PM
June 6, 95% presentation, 1-2 PM
June 20, 95% review meeting, 1-2 PM
Discussion