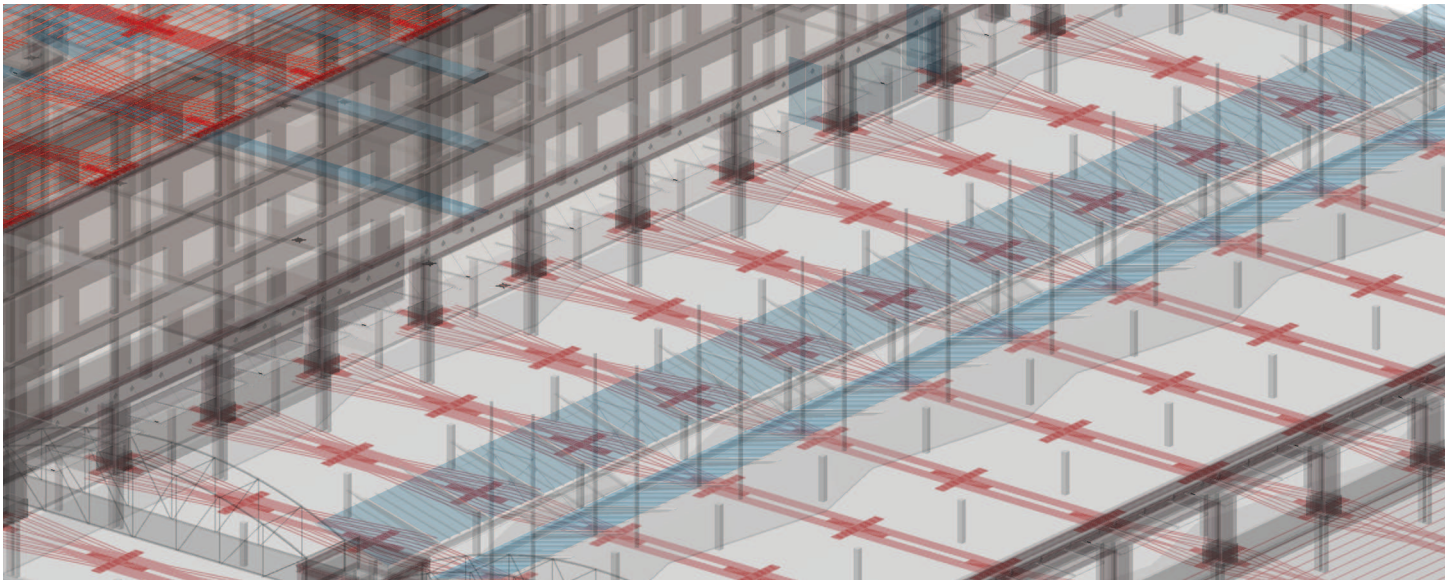

Marion County Courthouse Square
555 Court Street NE, Salem Oregon
Remediation Study Final Report
February 07, 2011

Volume Three of Six

VOLUME III

I. MILLER CONSULTING ENGINEERS: Structural Photographic Documentation

II. RDH BUILDING SCIENCES: Exploratory Openings

III. SERA ARCHITECTS: Observation Detail

Miller Consulting Engineers, Inc.
Structural Photographic Documentation

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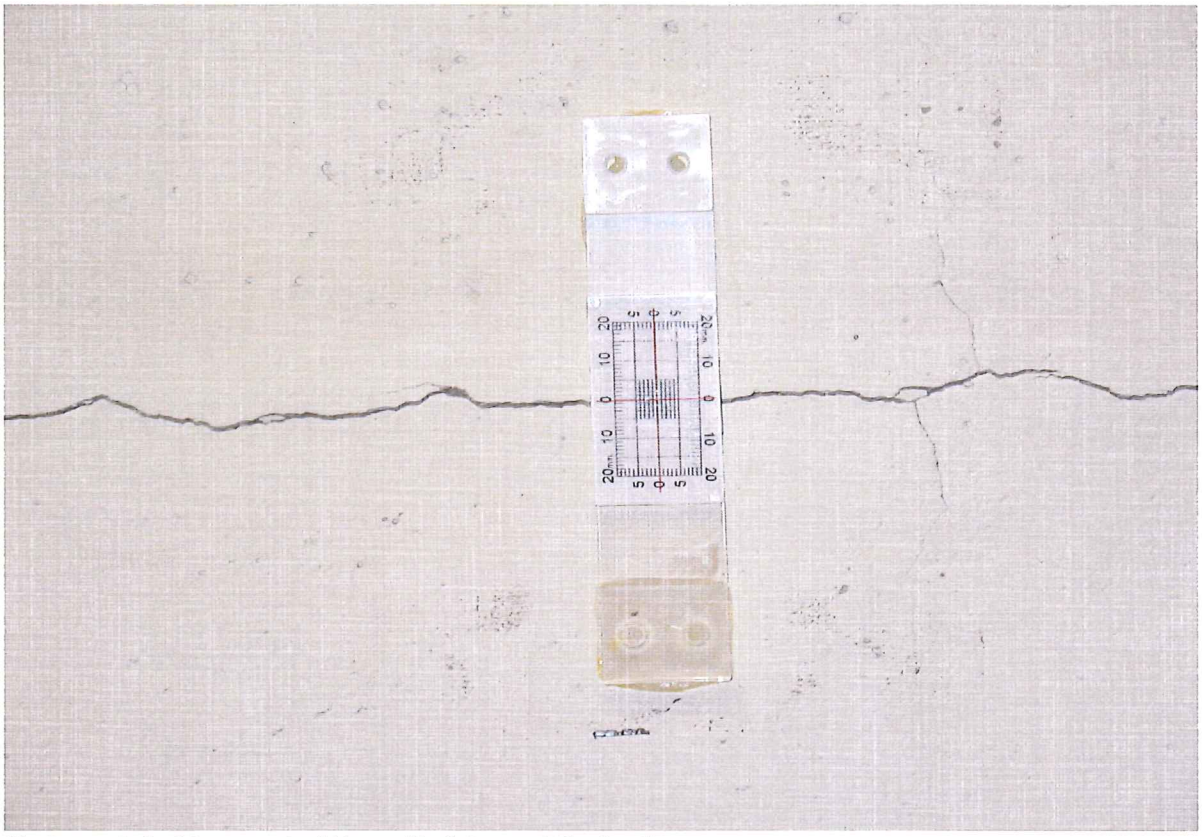
Miller Consulting Engineers, Inc.
Structural Photographic Documentation

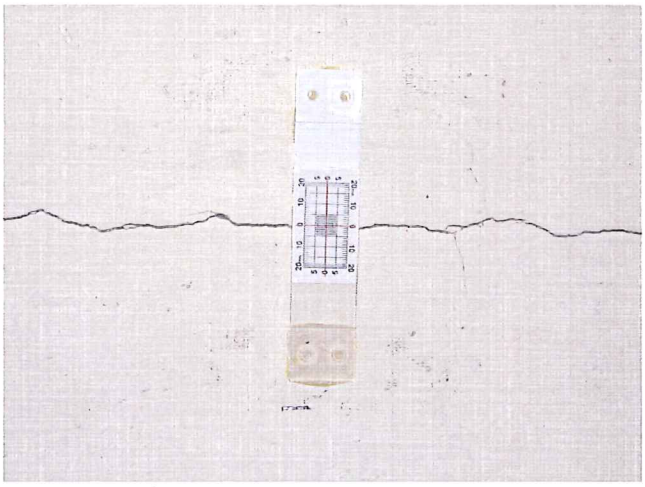
WST 1st Floor (on north wall)	No Movement	No Movement	No Movement	No Movement	Not Observed	Not Observed	No Movement
EST 5th Floor (on south wall)	No Movement	No Movement	No Movement	No Movement	Not Observed	Not Observed	No Movement
EST 3rd Floor (on south wall)	Movement of bottom hash toward the west	Movement of bottom hash toward the west	Movement of bottom hash toward the west	Movement of bottom hash toward the west	Not Observed	Not Observed	Movement of bottom hash toward the west
EST Basement (on north wall)	No Movement	No Movement	No Movement	No Movement	Not Observed	Not Observed	No Movement
Room P298 South Wall at Grid M-3	Movement of bottom hash toward the west	Not Observed	Not Observed	0.75mm movement toward west 0.60mm vertical movement	0.75mm movement toward west 0.75mm vertical movement	Not Observed	1mm movement toward west 1mm vertical movement
EAST Basement (Grid O-10)	N/A	Installed 6-3-10	Movement of top hash toward the north	Movement of top hash toward the north	1mm movement toward the north	Not Observed	1.5mm movement toward the north
WEST Basement (Grid A-10)	N/A	Installed 6-3-10	No Movement	No Movement	No Movement	Not Observed	No Movement
Column at Grid N-10 (North Face)	N/A	N/A	N/A	N/A	Installed 12-01-10	Movement: top hash .01mm to the east	Movement: top hash .01mm to the east
Column at Grid N-10 (West Face)	N/A	N/A	N/A	N/A	Installed 12-01-10	Movement: North hash .01mm down; bottom hash .01mm east	Movement: North hash .01mm down; bottom hash .01mm east

1. Crack Gauge Monitoring

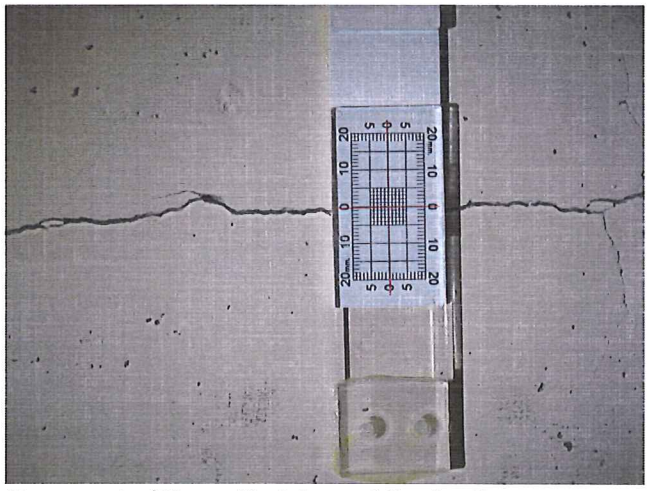
1.1 Building West Stair Tower, Fifth Floor on West Wall



Photograph 1: Movement of Upper Hash toward the South
Date: April 14, 2010

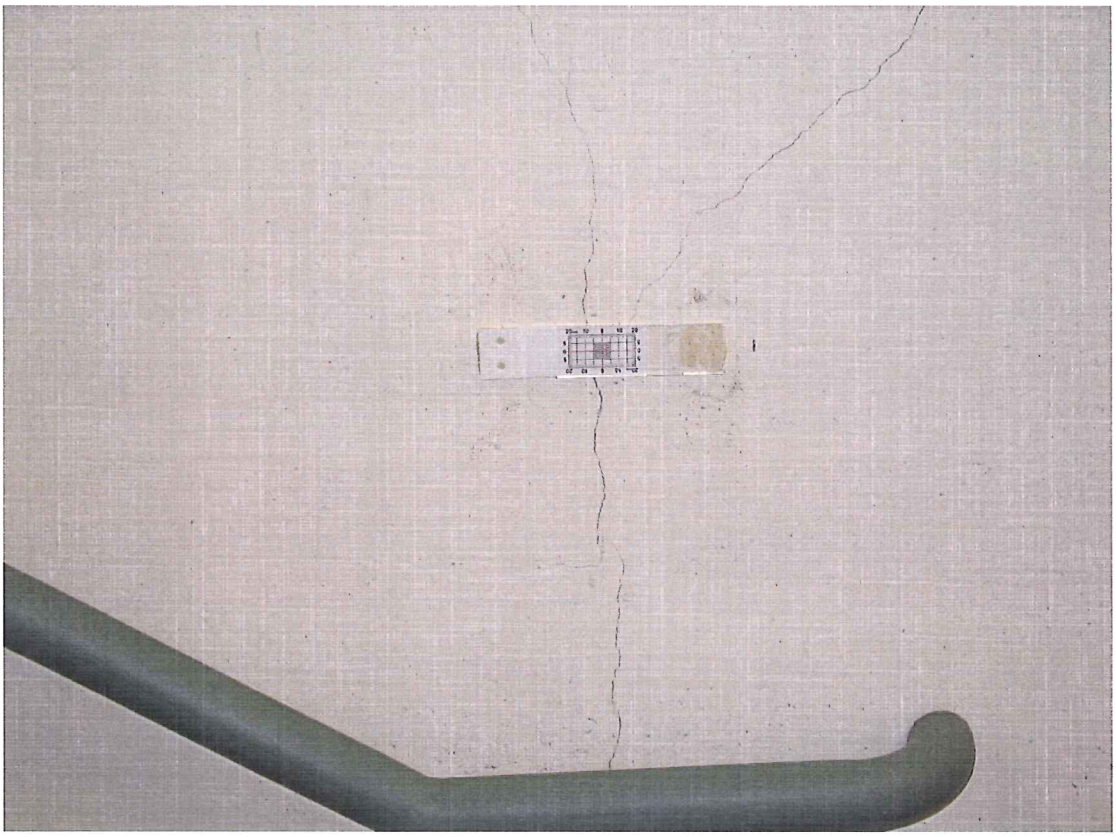


Movement of Upper Hash toward the South
Date: October 13, 2010

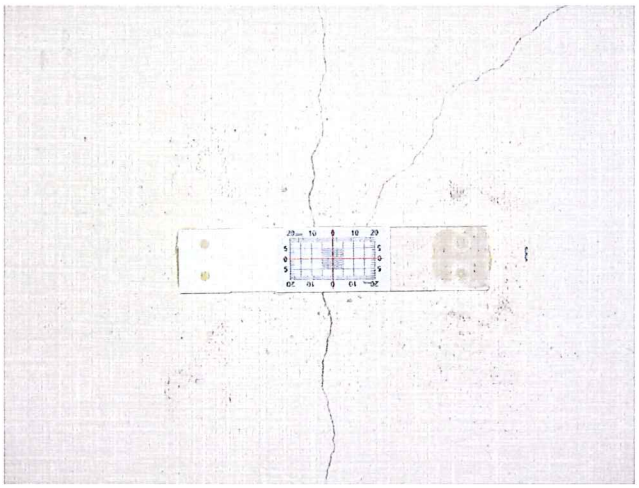


Movement of Upper Hash toward the South
Date: January 5, 2011

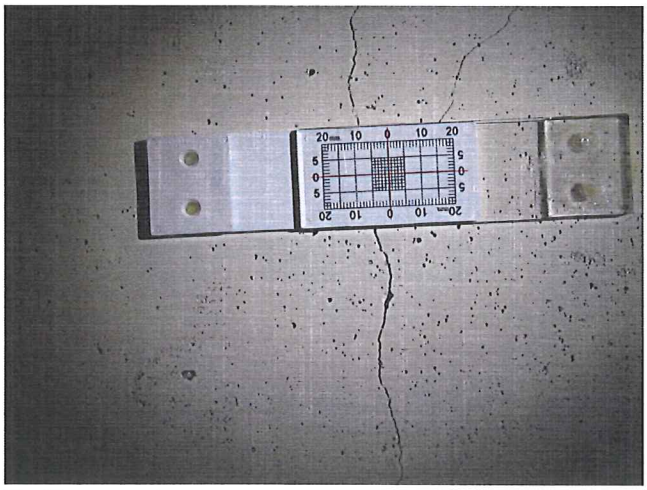
1.2 Building West Stair Tower, Fourth Floor on South Wall



No Movement
Date: April 14, 2010



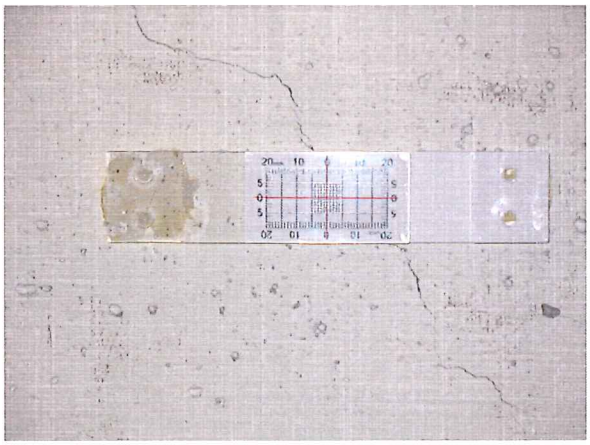
No Movement
Date: October 13, 2010



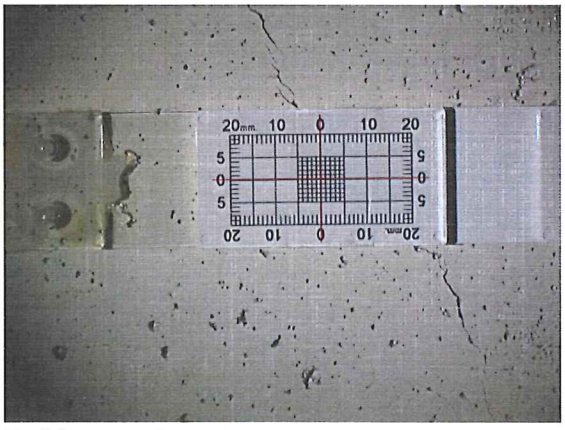
No Movement
Date: January 5, 2011

1.3 Building West Stair Tower, Third Floor on North Wall

No Movement
Date: April 14, 2010

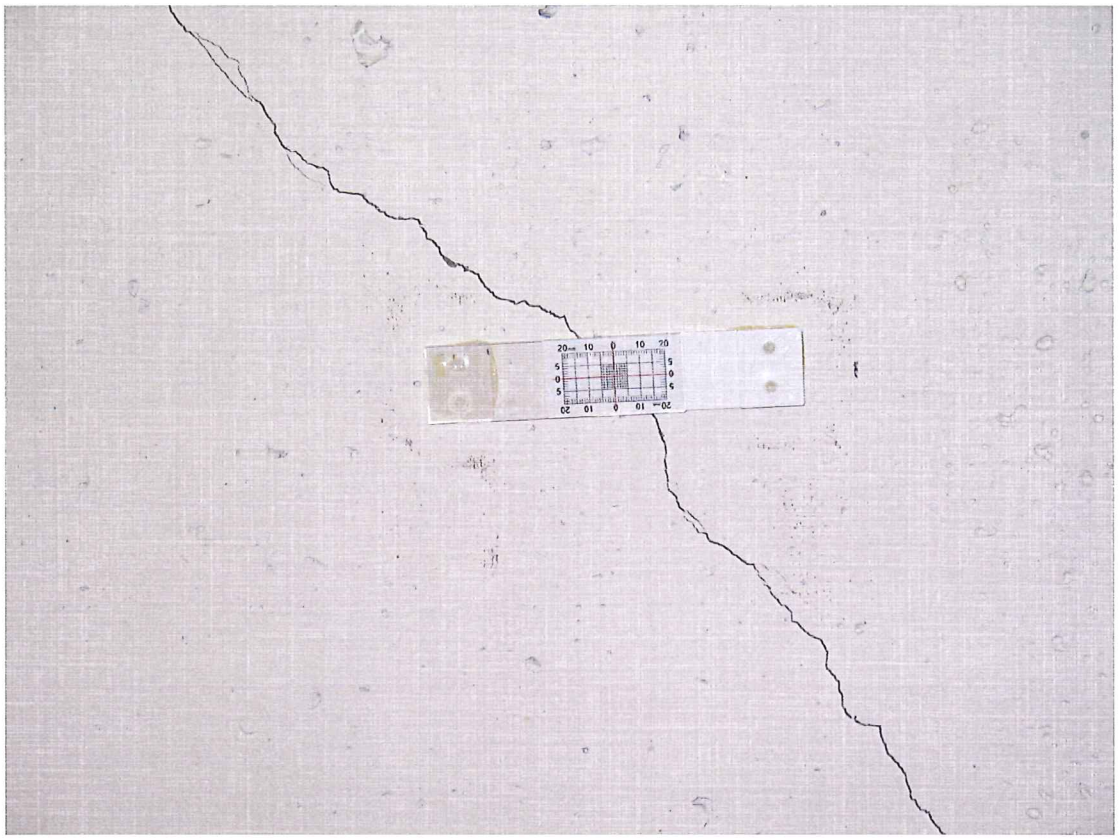


No Movement
Date: October 13, 2010

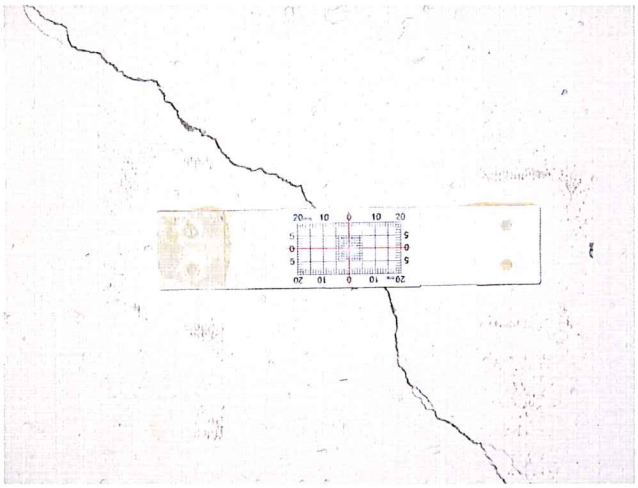


No Movement
Date: January 5, 2011

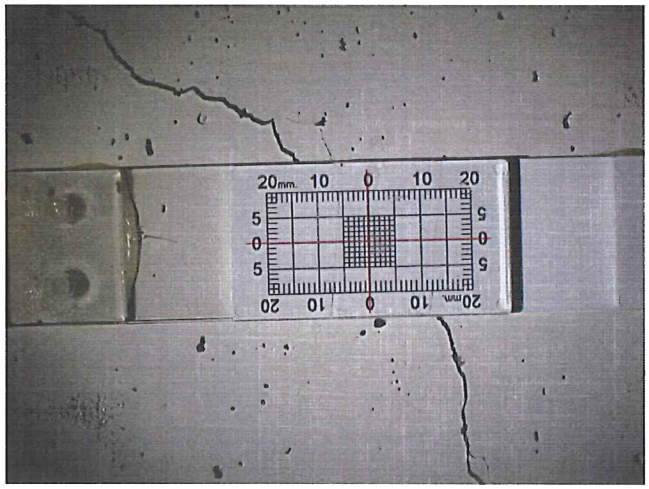
1.4 Building West Stair Tower, First Floor on North Wall



No Movement
Date: April 14, 2010



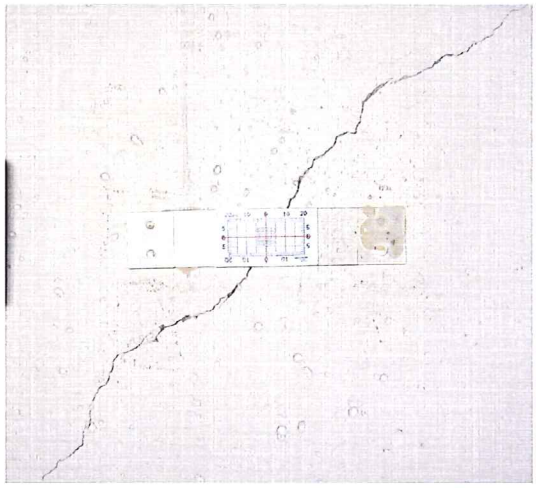
No Movement
Date: October 13, 2010



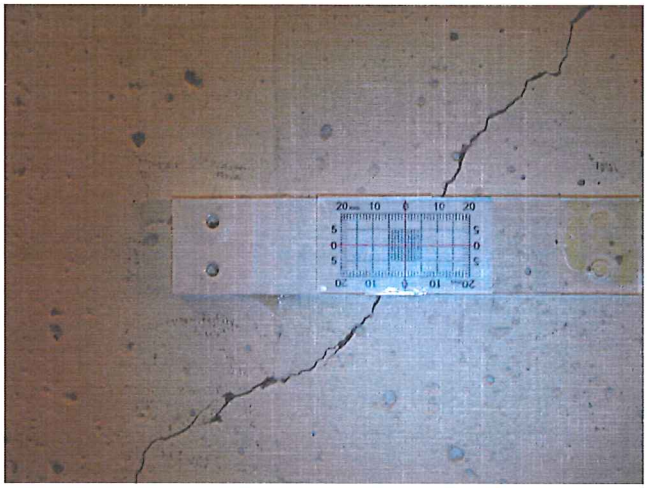
No Movement
Date: January 5, 2011

1.5 Building East Stair Tower, Fifth Floor on South Wall

No Movement
Date April 14, 2010

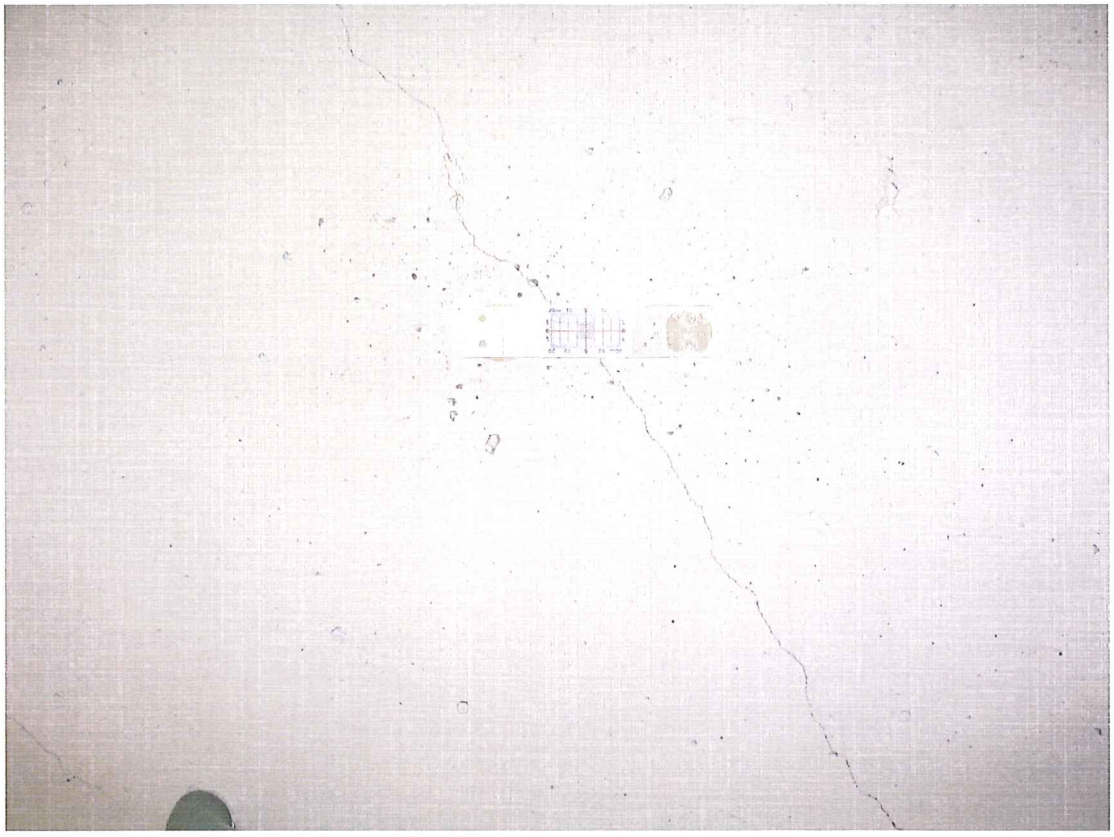


No Movement
Date: October 13, 2010

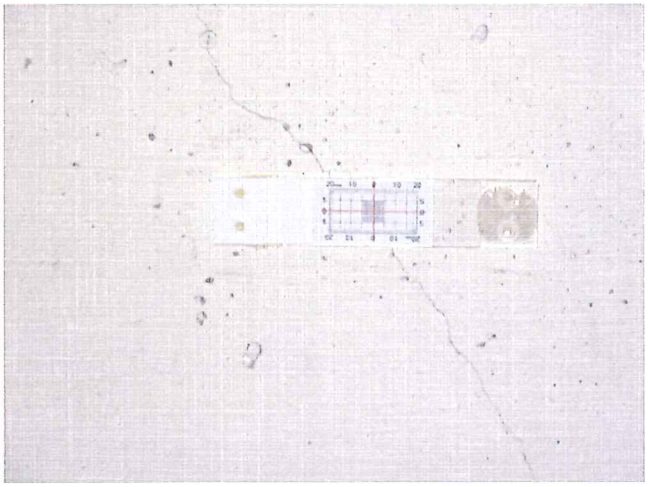


No Movement
Date: January 5, 2001

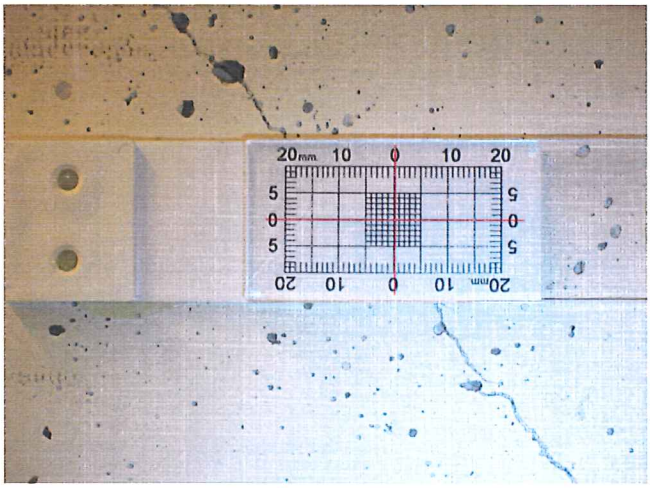
1.6 Building East Stair Tower, Third Floor on South Wall



Movement on Bottom Hash toward the West
Date: April 14, 2010

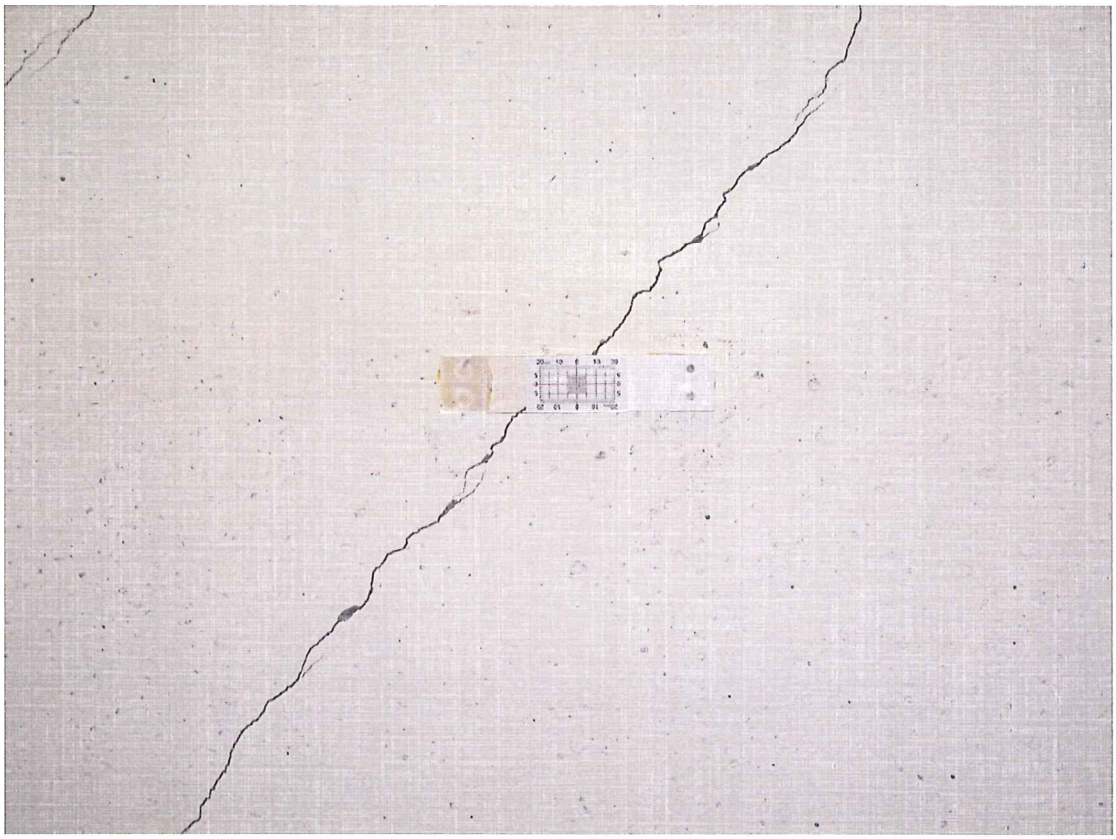


Movement of Bottom Hash toward the West
Date: October 13, 2010

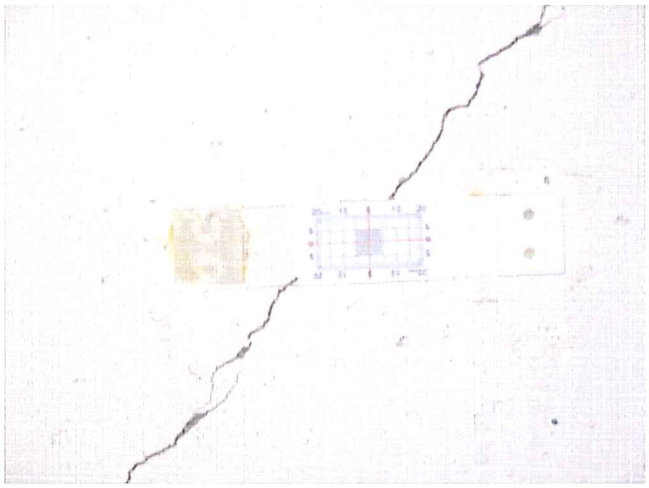


Movement of Bottom Hash toward the West
Date: January 5, 2011

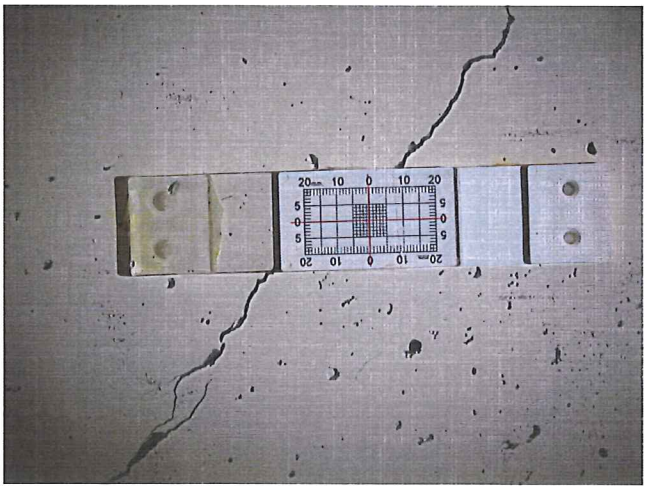
1.7 Building East Stair Tower, Basement on North Wall



No Movement
Date: April 14, 2010

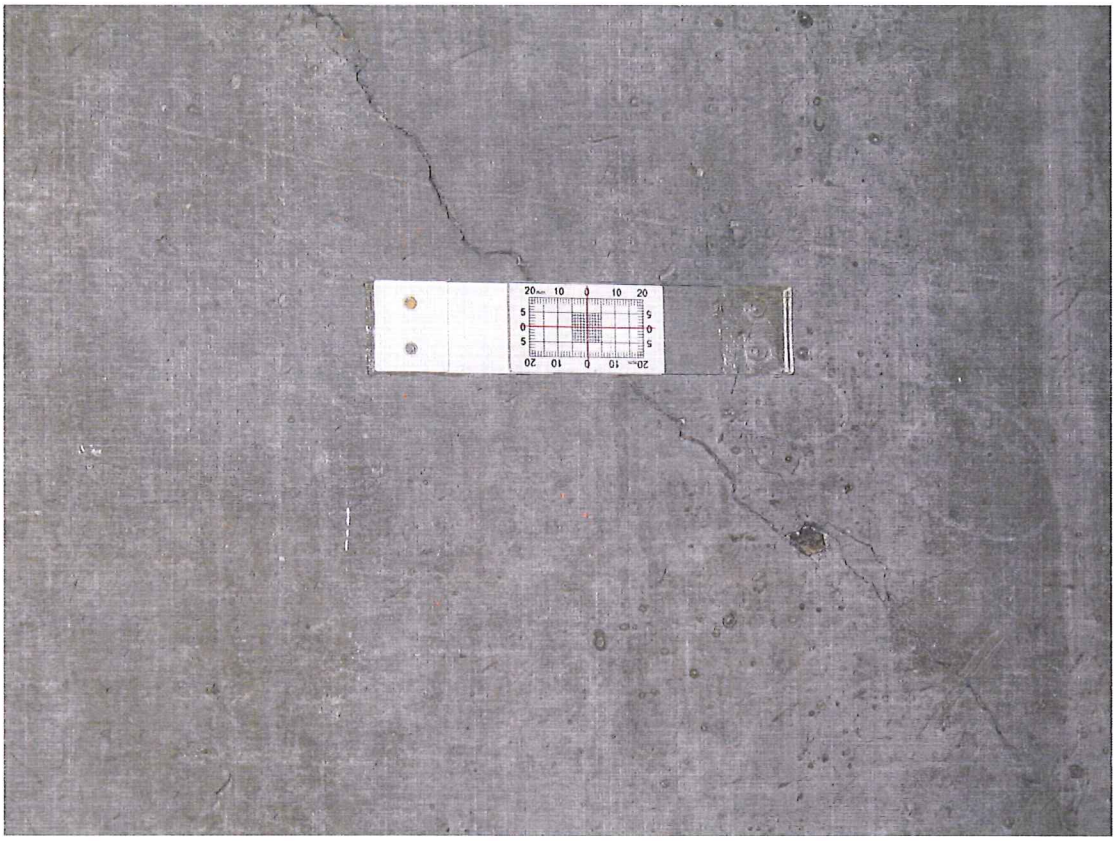


No Movement
Date: October 13, 2010

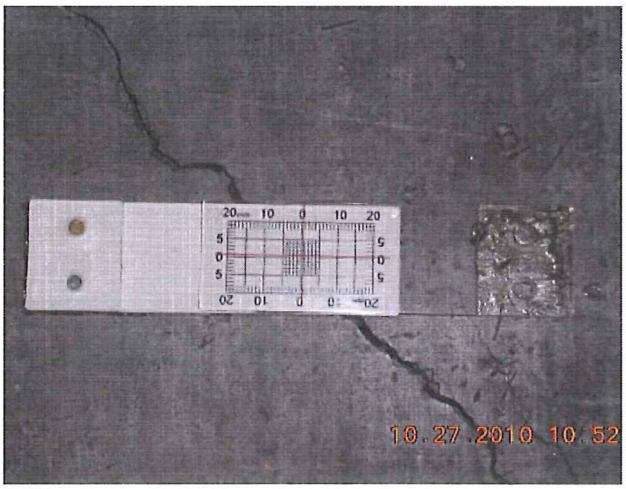


No Movement
Date: January 5, 2011

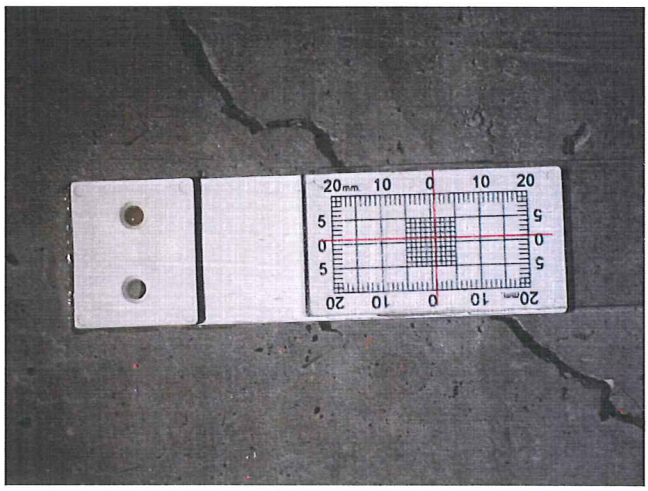
1.8 Room P298 South Wall at Grid M-3



Movement of bottom Hash toward the West
Date: April 14, 2010

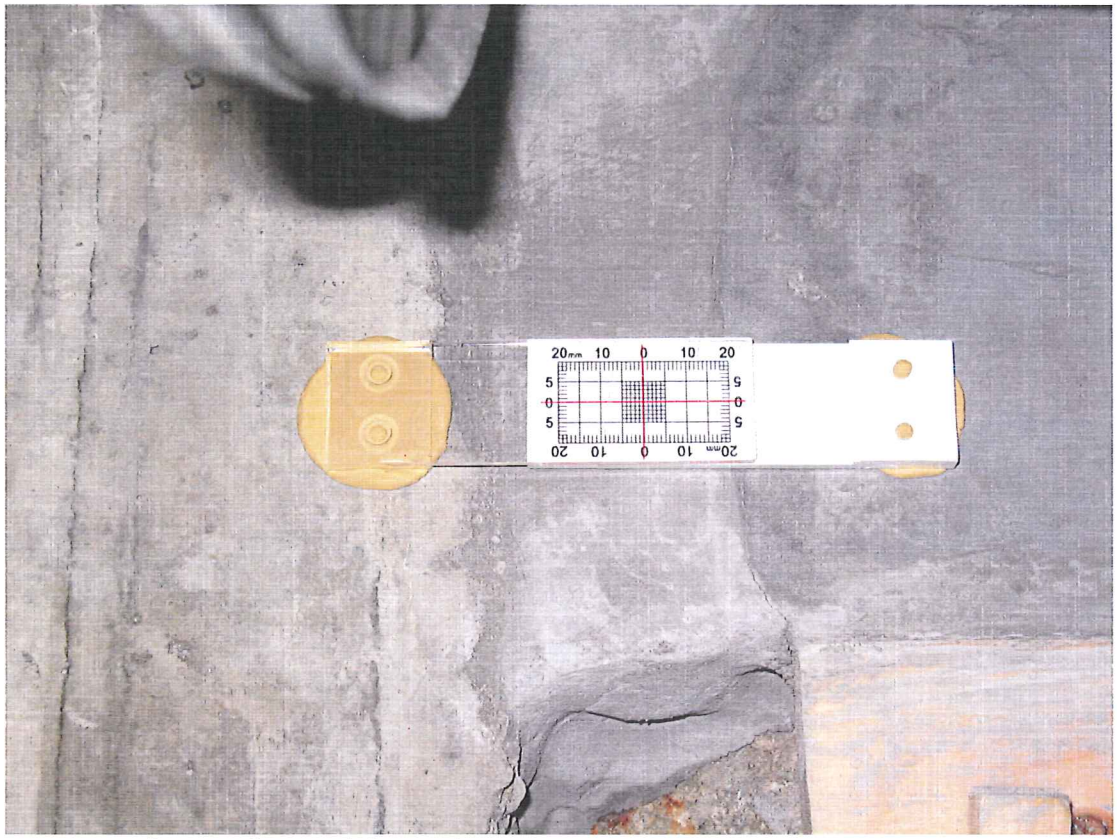


0.75 mm movement toward west
0.60 mm vertical movement
Date: October 27, 2010



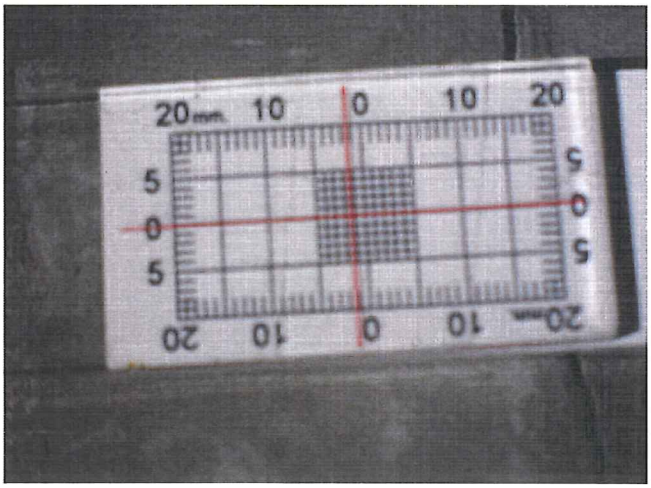
1 mm movement toward West;
1 mm vertical movement
Date: January 5, 2011

1.9 East Basement (Grid O-10)



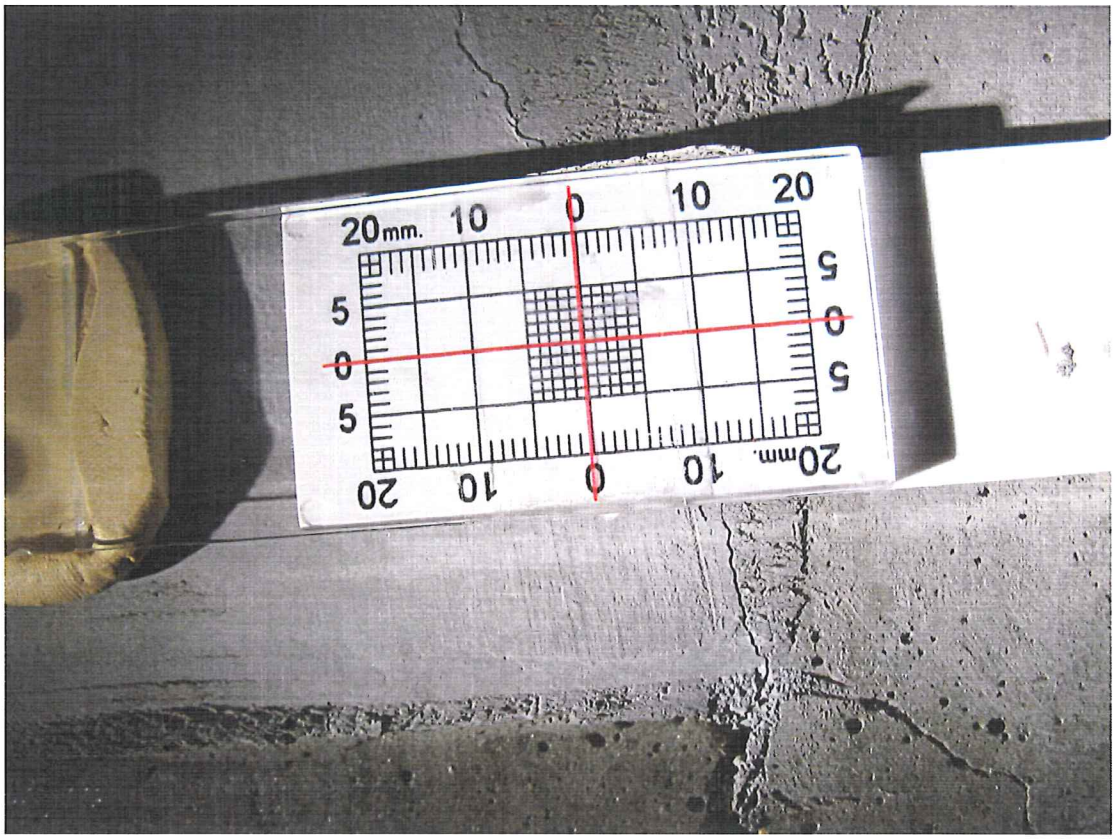
Movement of Top Hash toward the North
Date: October 13, 2010

Initial Crack Gauge Installation
Date: June 3, 2010

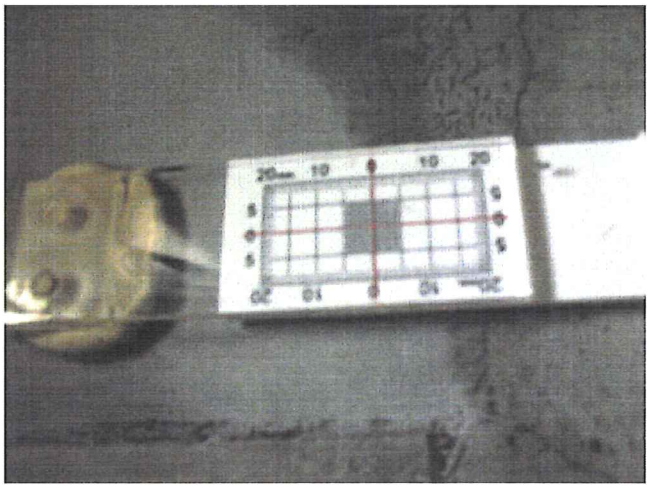


1.5 mm movement toward the north
Date: January 5, 2011

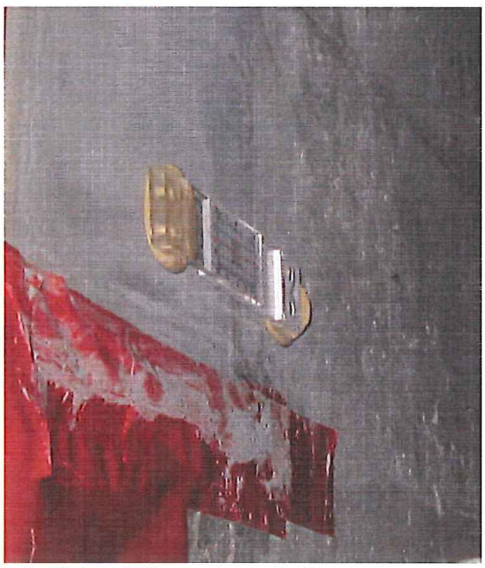
1.10 West Basement (Grid A-10)



No Movement
Date: January 5, 2011

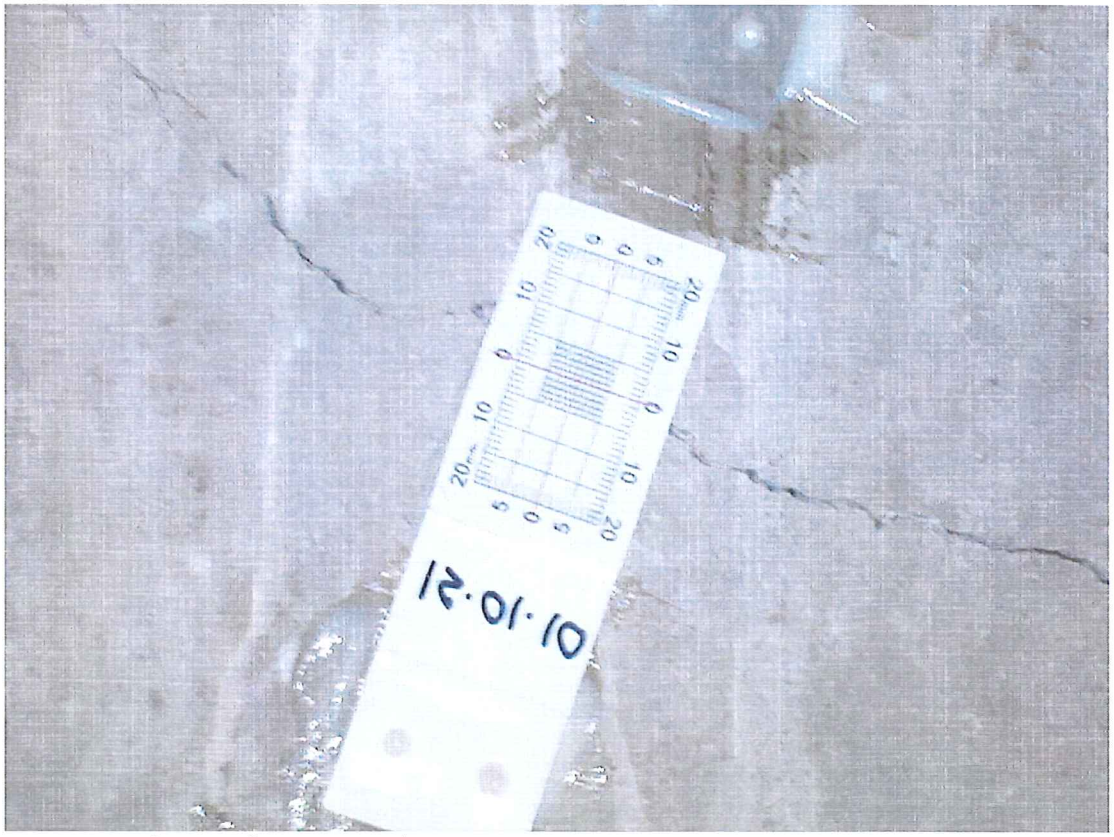


No Movement
Date: October 13, 2010



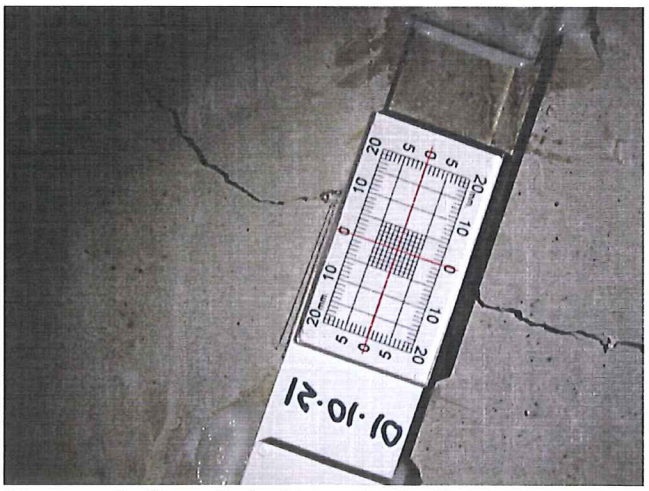
Initial Crack Gauge Installation
Date: June 3, 2010

1.11 Column at Grid N-10 (North Face)



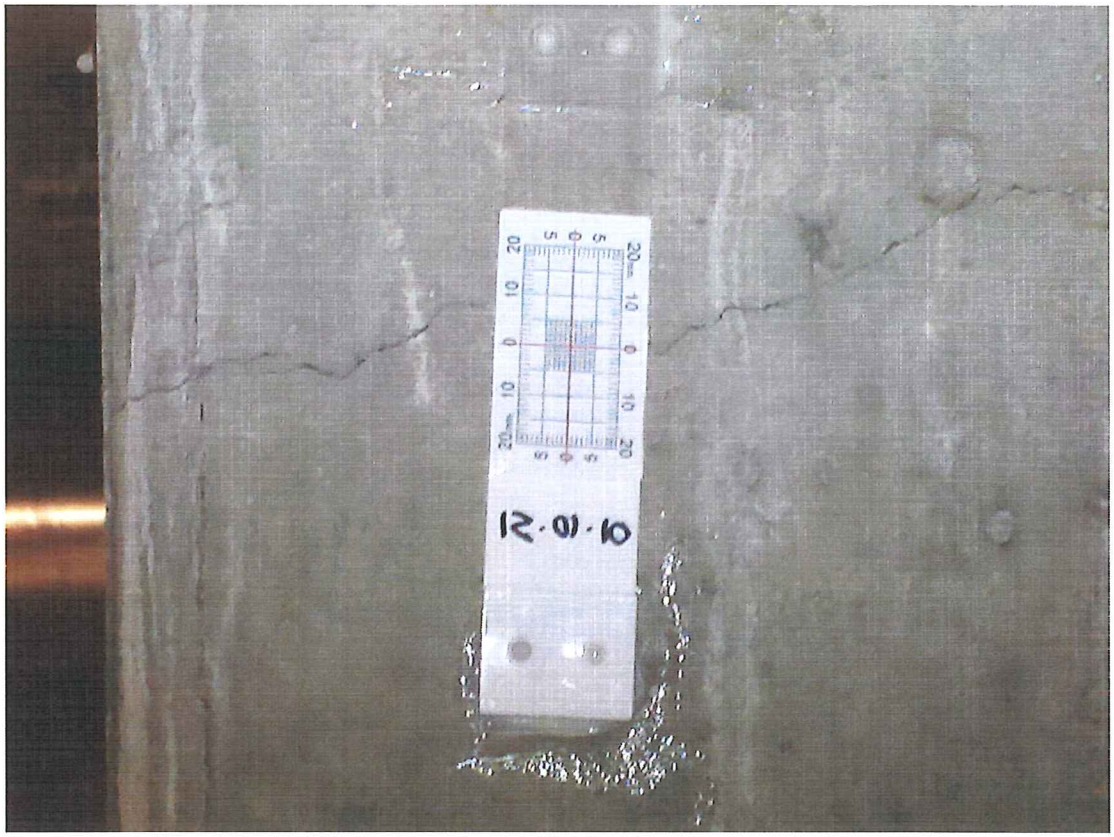
Movement of Top Hash .01 mm to the east
Date: December 22, 2010

Initial Installation of Crack Gauge
Date: December 1, 2010

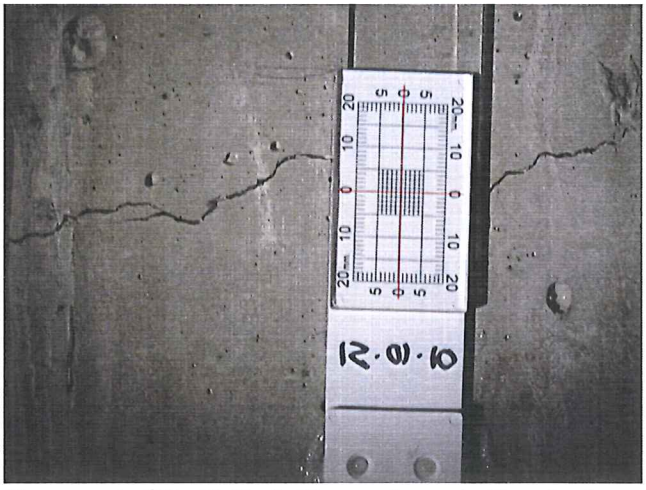


Movement of Top Hash .01 mm to the East
Date: January 5, 2011

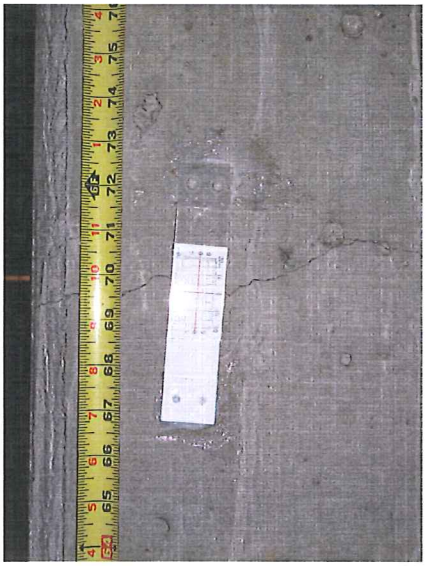
1.12 Column at Grid N-10 (West Face)



Movement of North Hash .01 mm down; bottom hash .01 mm east
Date: December 22, 2010

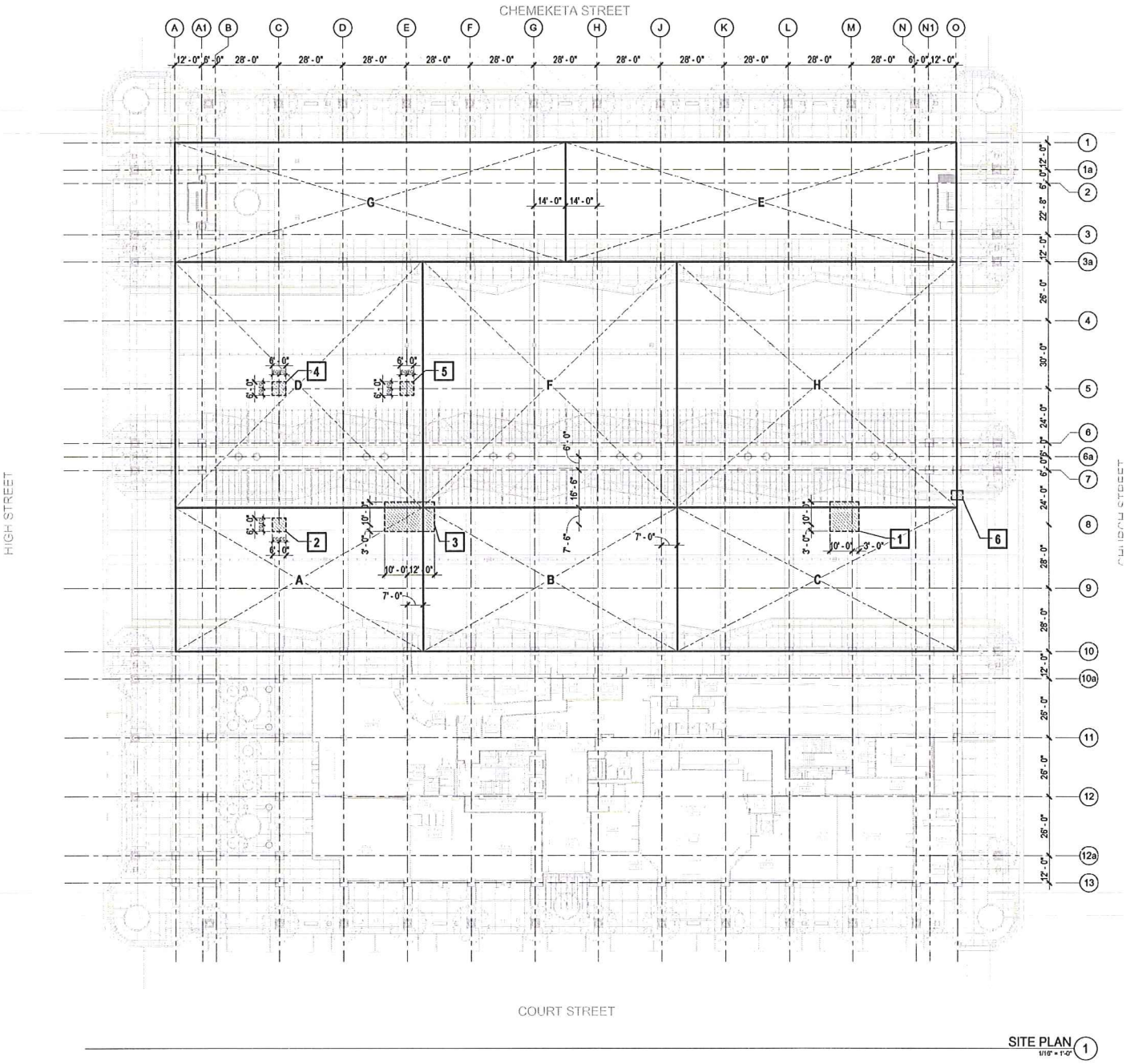


Movement of North Hash .01 mm down; bottom hash .01 mm east
Date: January 5, 2011



Initial Crack Gauge Installation
Date: December 1, 2010

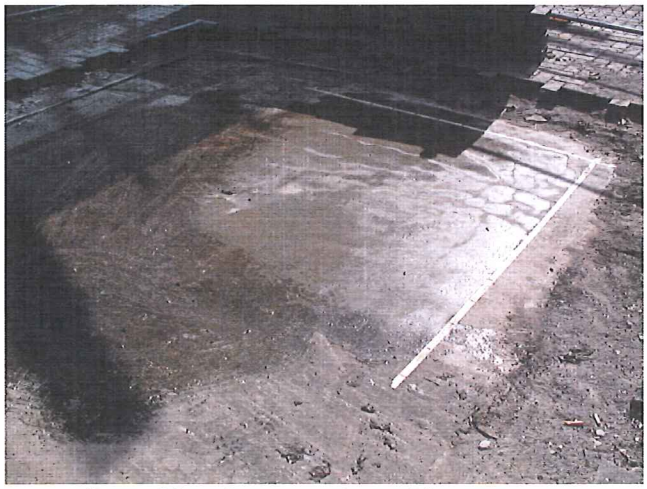
2. Bus Mall Punching Shear Concerns



(Plan of Slab Observation Locations provided by SERA Architects)

2.1 Evaluation Location #1 (Grid M-8)

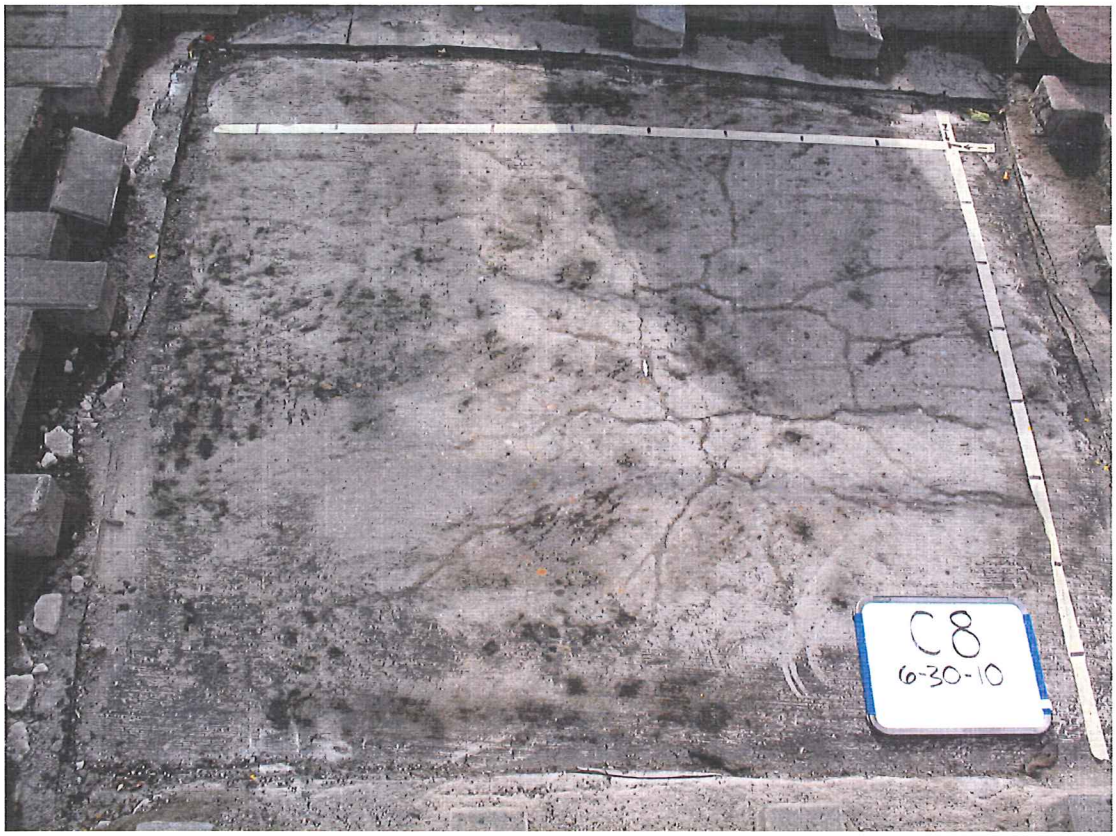
Bus Mall Punching Shear Location Grid M-8
Date: June 30, 2010



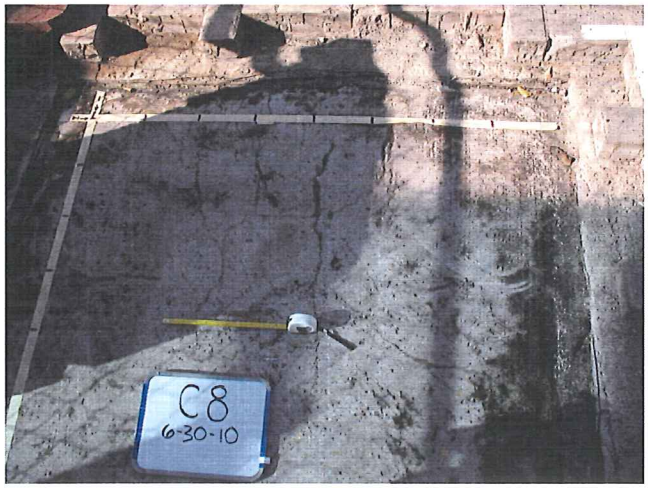
Bus Mall Punching Shear Location Grid M-8
Date: June 30, 2010

Bus Mall Punching Shear Location Grid M-8
Date: June 30, 2010

2.2 Evaluation Location #2 (Grid C-8)



Bus Mall Punching Shear Location C-8
Date: June 30, 2010

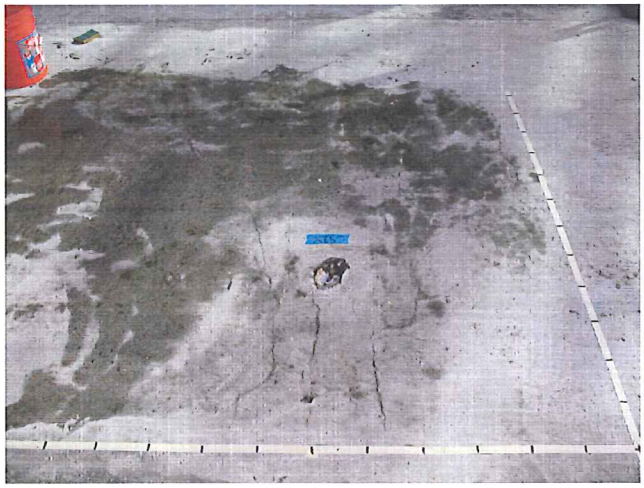


Bus Mall Punching Shear Location C-8
Date: June 30, 2010

Bus Mall Punching Shear Location C-8
Date: June 30, 2010

2.3 Evaluation Location #3 (Grid E-8)

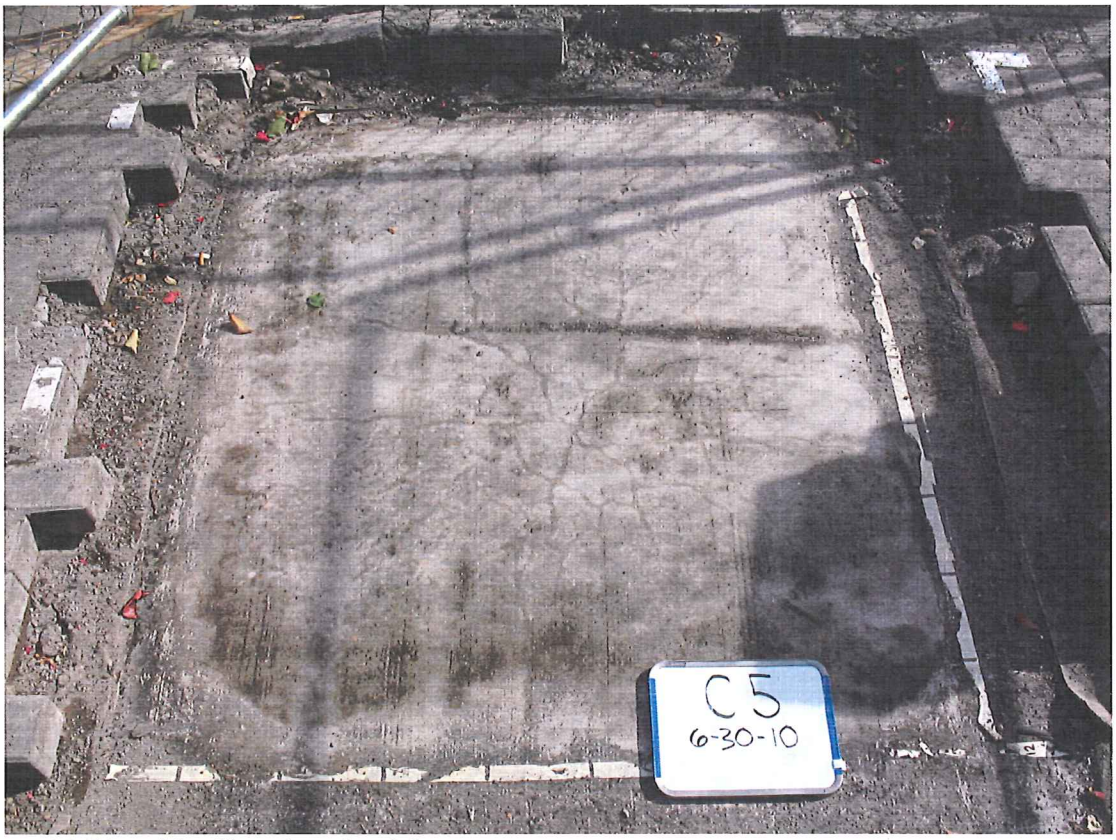
Bus Mall Punching Shear Location E-8
Date: June 30, 2010



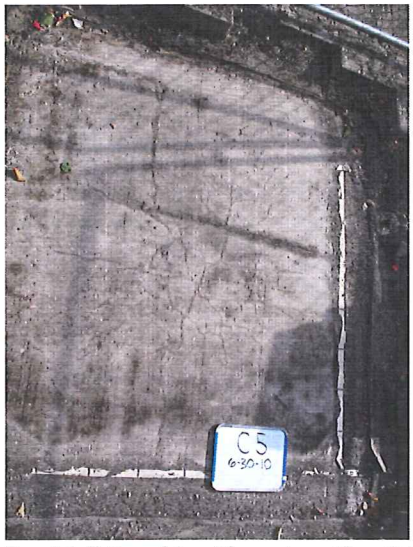
Bus Mall Punching Shear Location E-8
Date: June 30, 2010

Bus Mall Punching Shear Location E-8
Date: June 30, 2010

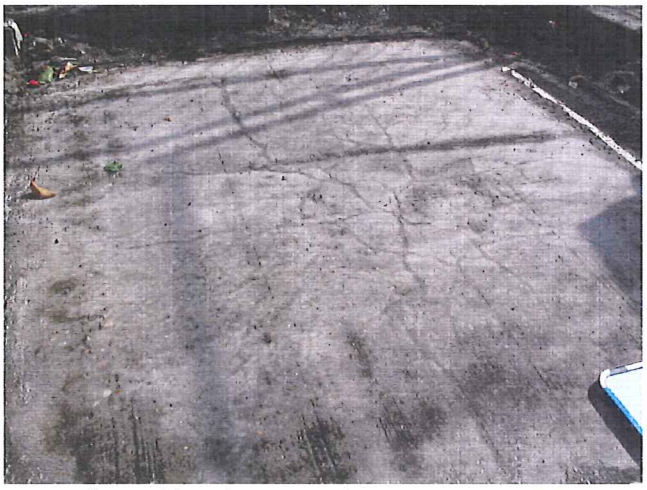
2.4 Evaluation Location #4 (Grid C-5)



Bus Mall Punching Shear Location C-5
Date: June 30, 2010

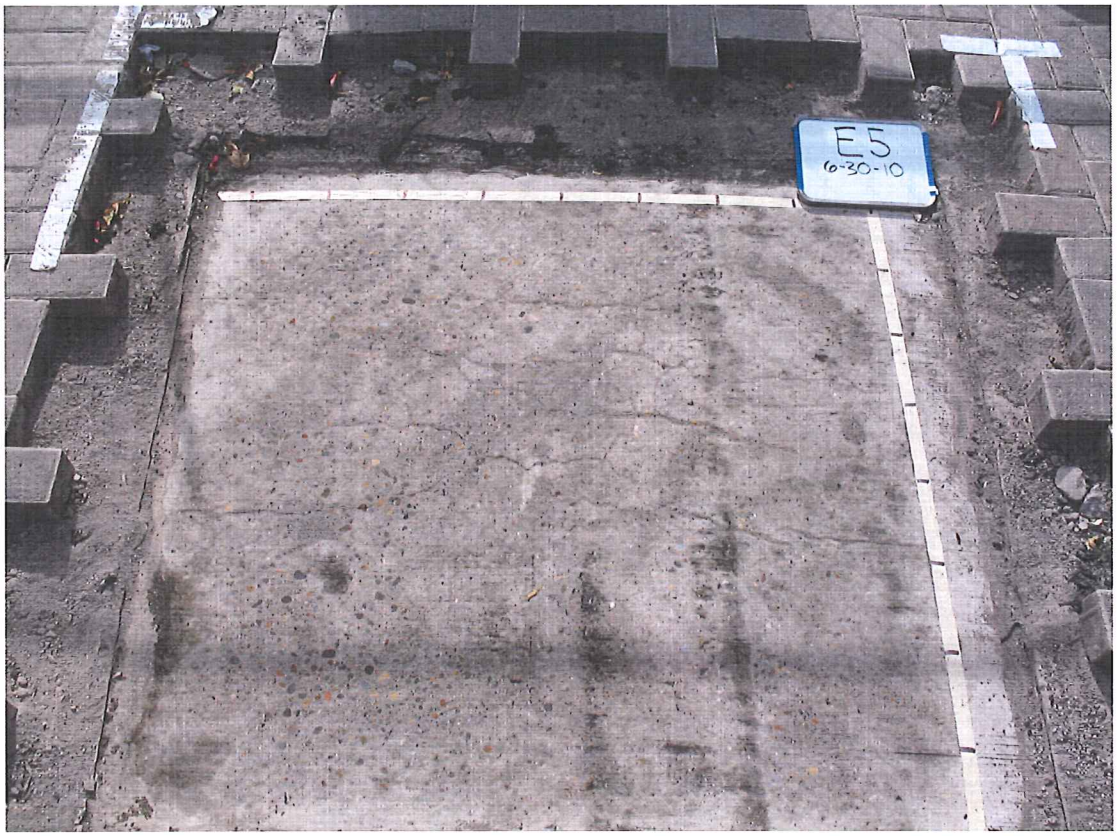


Bus Mall Punching Shear Location C-5
Date: June 30, 2010



Bus Mall Punching Shear Location C-5
Date: June 30, 2010

2.5 Evaluation Location #5 (Grid E-5)

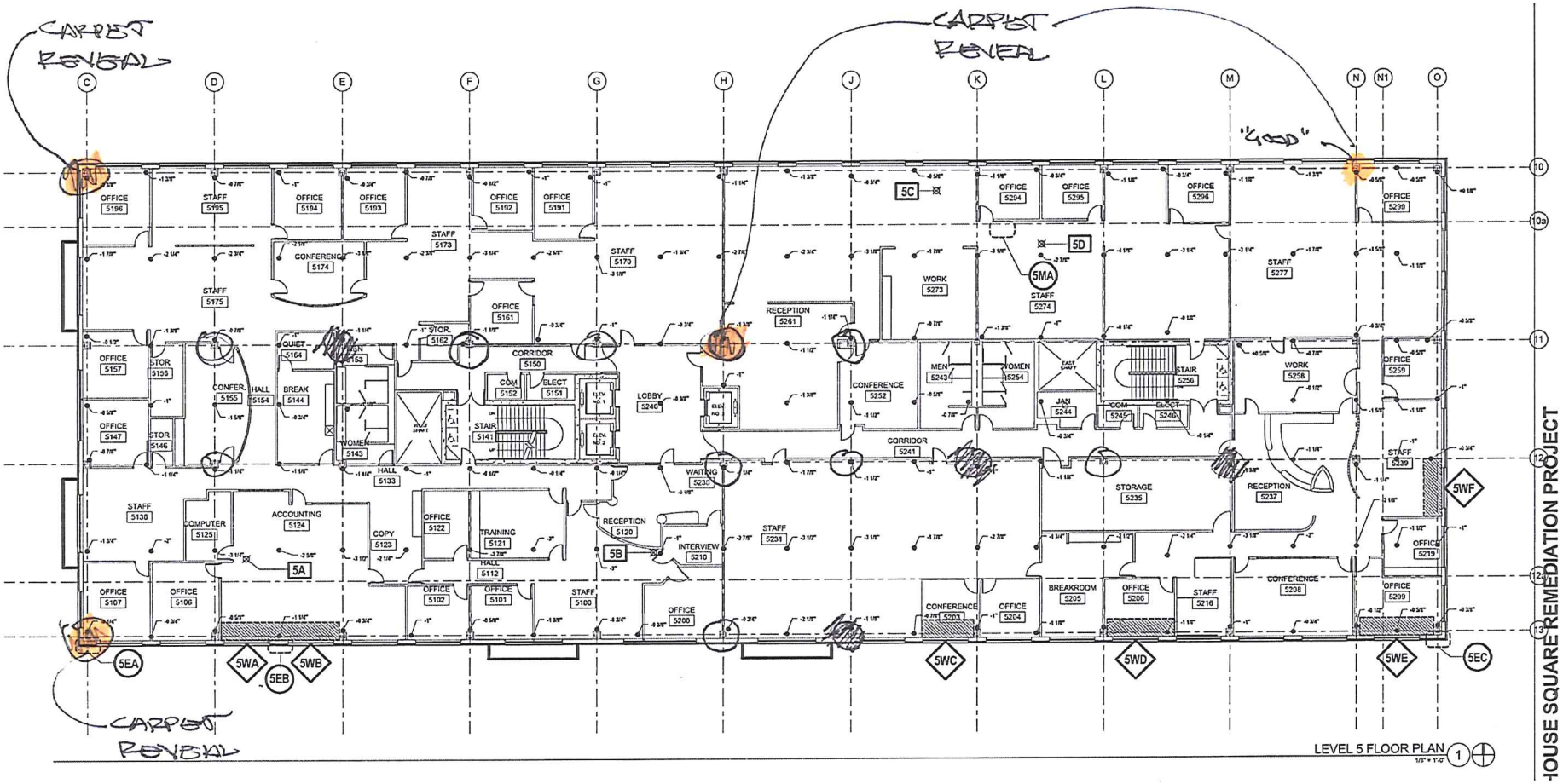


Bus Mall Punching Shear Location E-5
Date: June 30, 2010

Bus Mall Punching Shear Location E-5
Date: June 30, 2010

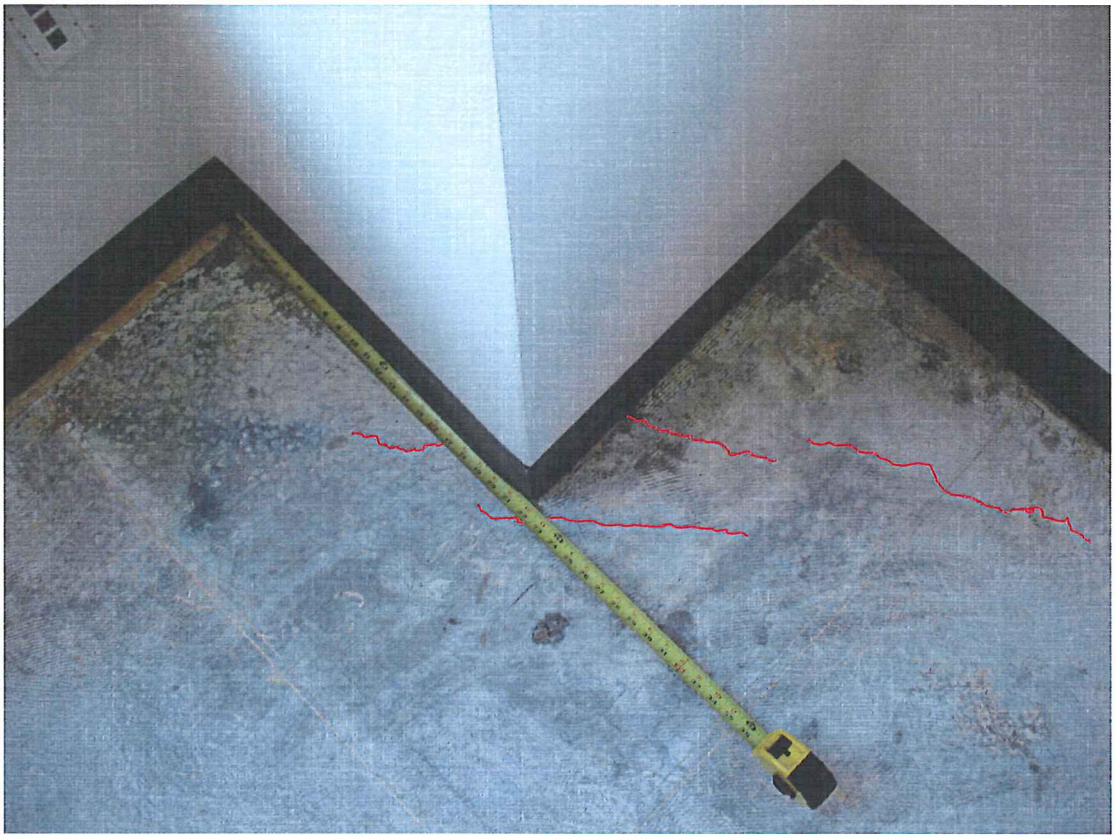
3. Courthouse Building Punching Shear Concerns

3.1 Punching Shear Concerns at Courthouse Building, Level 5



Column Top Reveal Locations – Level 5 (Plan by SERA Architects)

3.1.1 Punching Shear Concerns at Courthouse Building, Level 5



Level 5, Grid C-10
Date: July 24, 2010

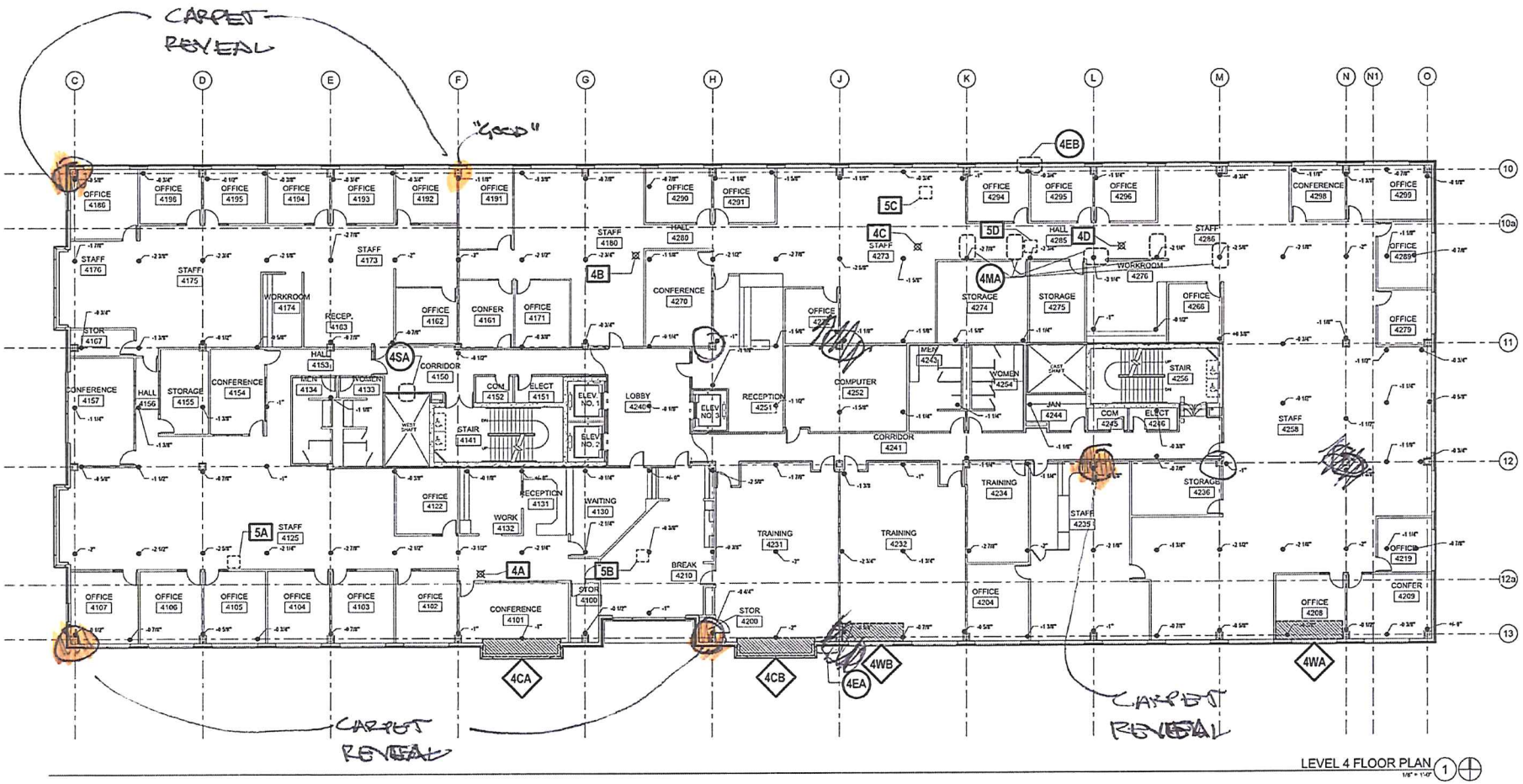
Level 5, Grid C-10
Date: July 24, 2010

Notes:

1. Typically observed diagonal cracking across the corner at corner columns.
2. Additional cracking was observed beyond the column parallel with the slab edge on each side.

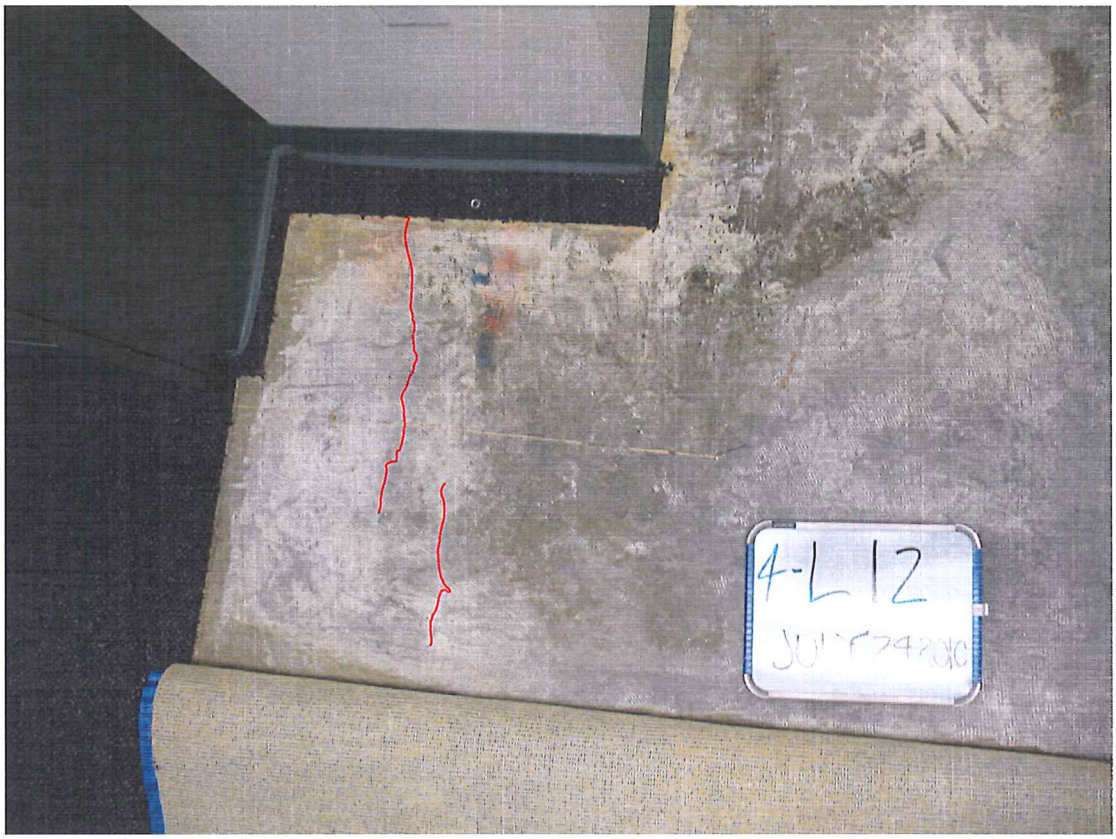
GENERAL NOTE:
Cracks are highlighted for ease of viewing.

3.2 Punching Shear Concerns at Courthouse Building, Level 4

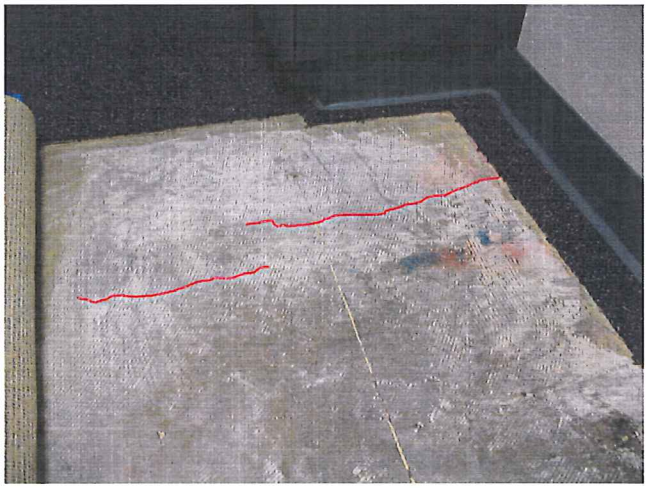


Column Top Reveal Locations – Level 4 (Plan by SERA Architects)

3.2.1 Punching Shear Concerns at Courthouse Building, Level 4 (Grid L-12)



Level 4, Grid L-12
Date: July 24, 2010

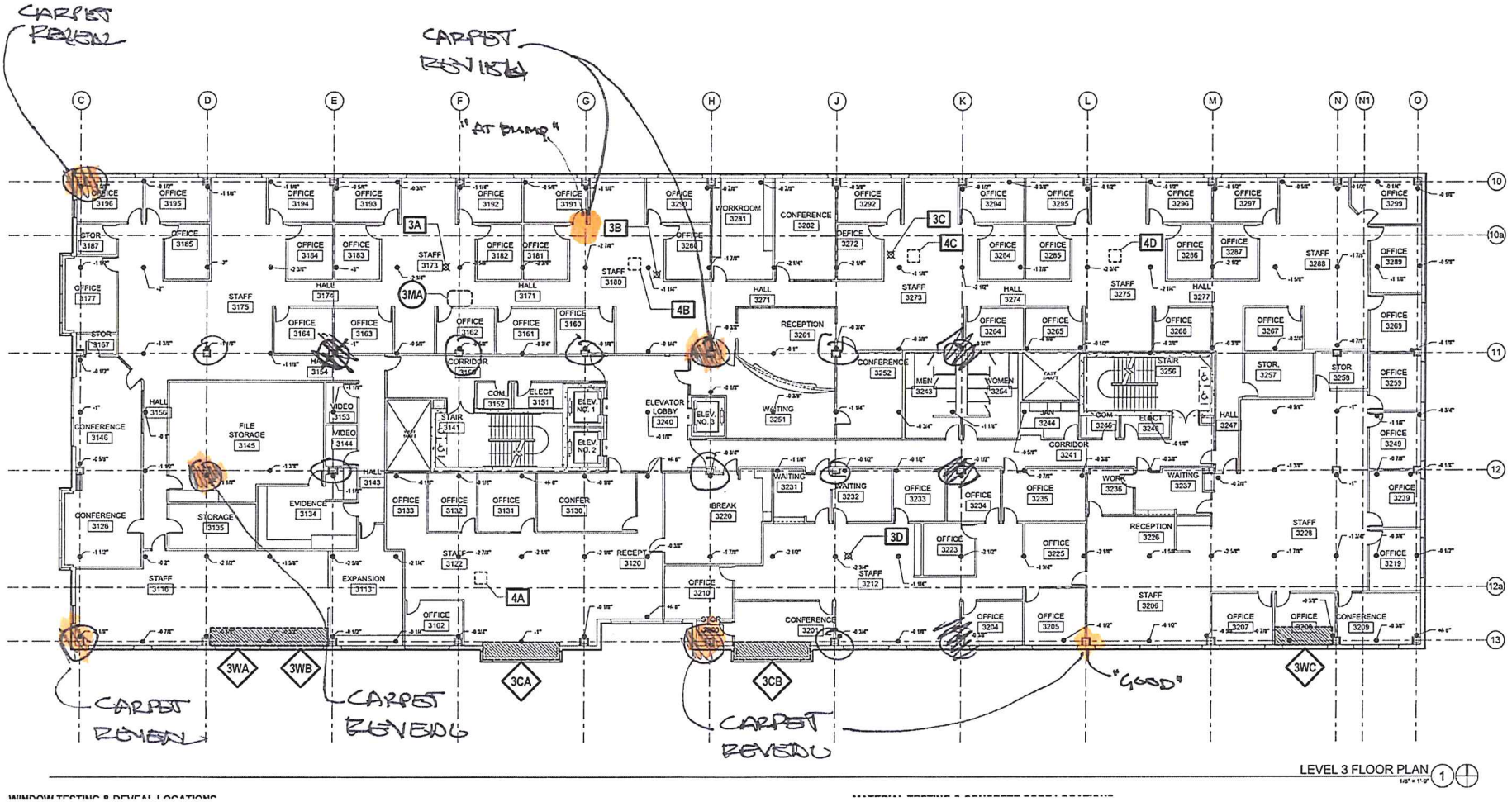


Level 4, Grid L-12
Date: July 24, 2010

Notes:

1. At the interior columns, cracking was observed in the north–south direction.

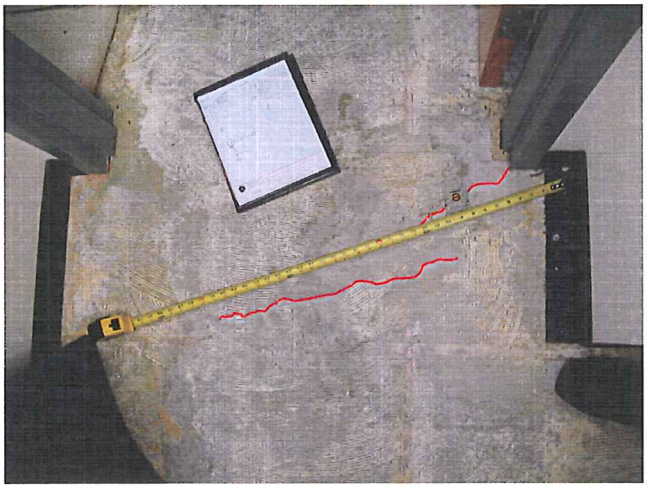
3.3 Punching Shear Concerns at Courthouse Building, Level 3



Column Top Reveal Locations – Level 3 (Plan by SERA Architects)

3.3.1 Punching Shear Concerns at Courthouse Building, Level 3

Level 3, Grid H-13
Date: July 24, 2010

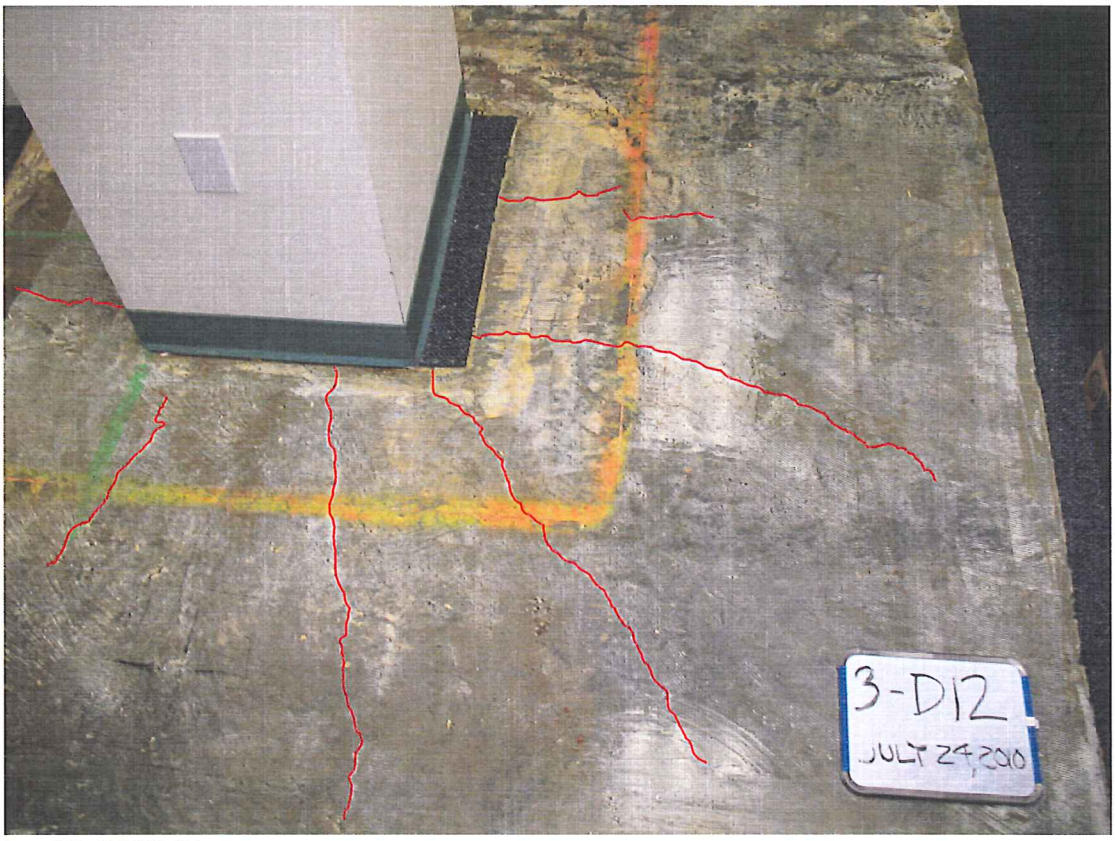


Level 4, Grid H-13
Date: July 24, 2010

Notes:

1. At the reentrant corner, some diagonal cracking was observed similar to the corner column locations.
2. Additional cracking was observed at Grid H-13 (on both the 3rd & 4th level) in the north-south direction similar to interior columns.

3.3.2 Punching Shear Concerns at Courthouse Building, Level 3



Level 3, Grid D-12
Date: July 24, 2010

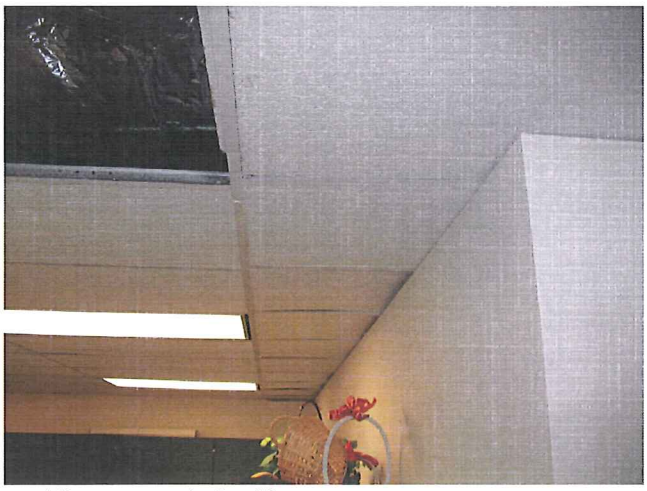
Level 3, Grid D-12
Date: July 24, 2010

Notes:

1. At Grid D-12 approximately a dozen diagonal cracks were observed emanating from the column in all directions.

4. General Observations, Marion County Courthouse Building

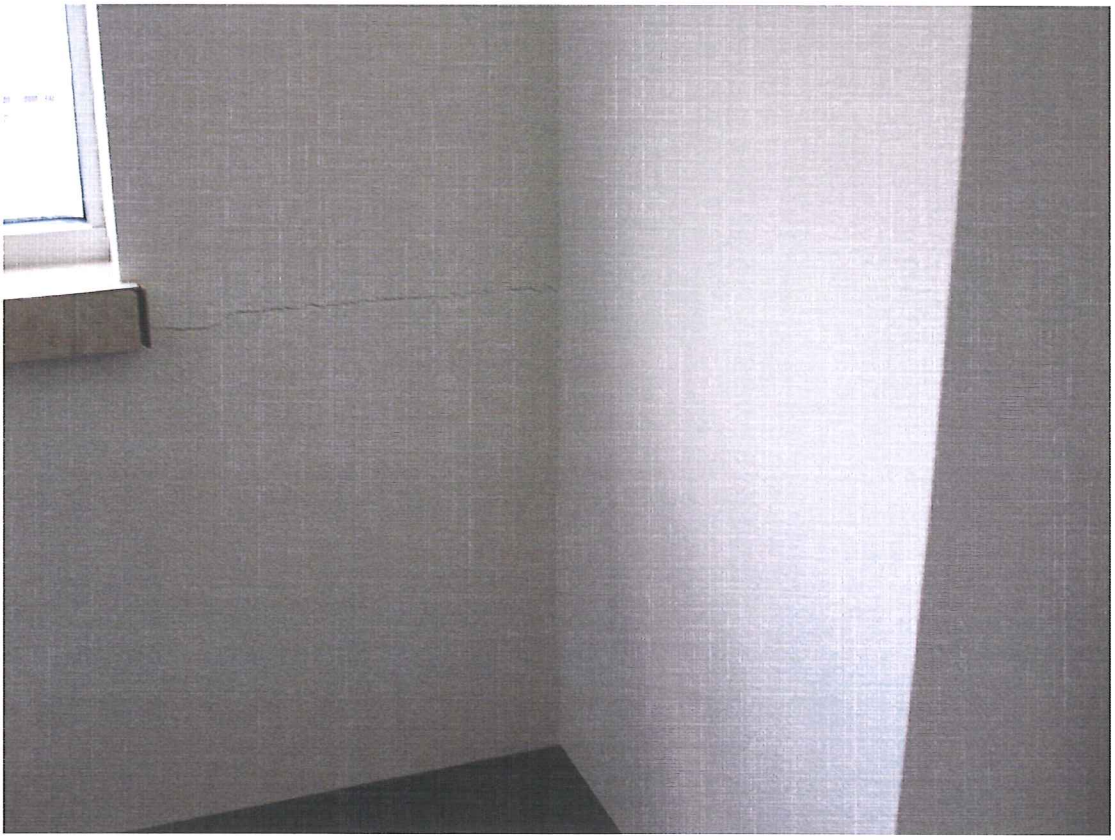
Interior partition walls pulling away from exterior wall with up to 1¼ inch movement measured on the fifth floor
Date: April 14, 2010



Buckling suspended ceiling system
Date: April 14, 2010

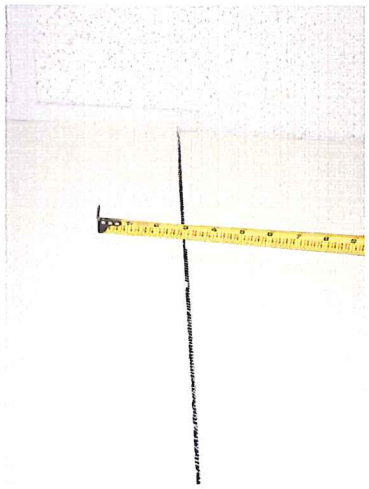
Sloping floors with up to 3/8" per 4 feet measured on the fifth floor
Date: April 14, 2010

4. General Observations, Marion County Courthouse Building



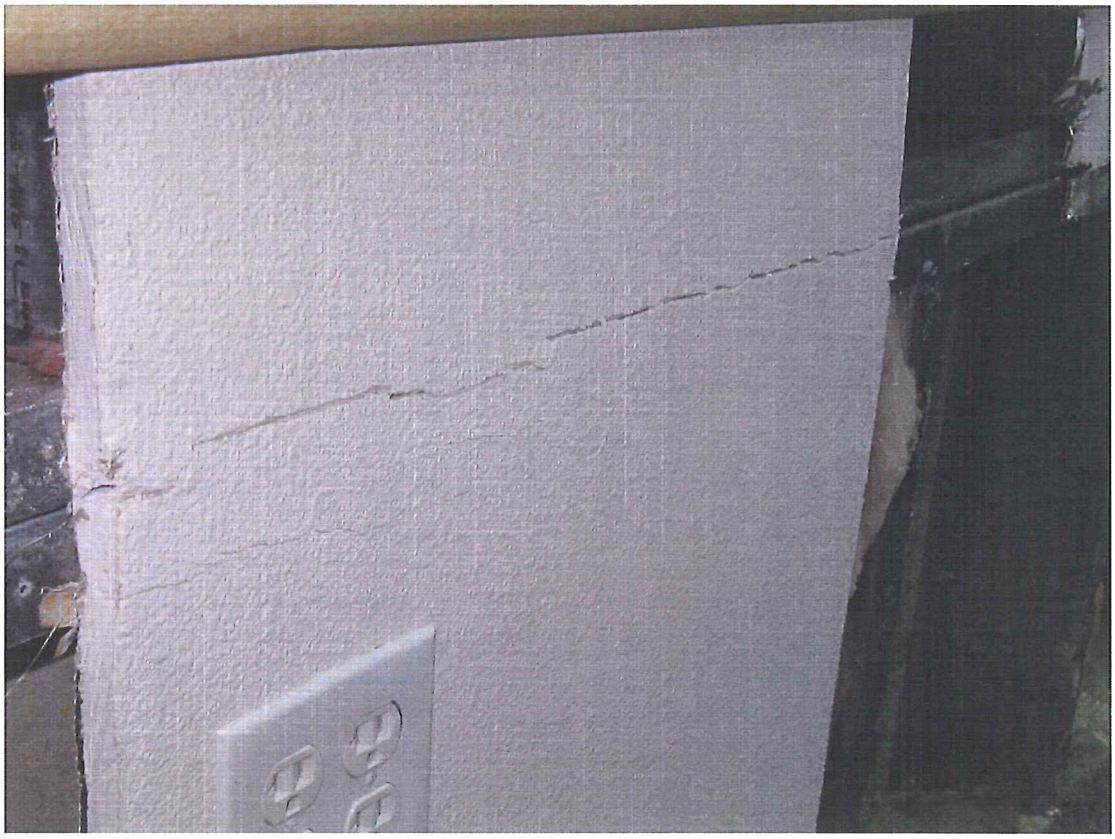
Horizontal crack at the base of the windows, which was observed on the third, fourth and fifth floors.
Date: April 14, 2010

Racking of door frames and cracking of the wall finish
Date: April 14, 2010



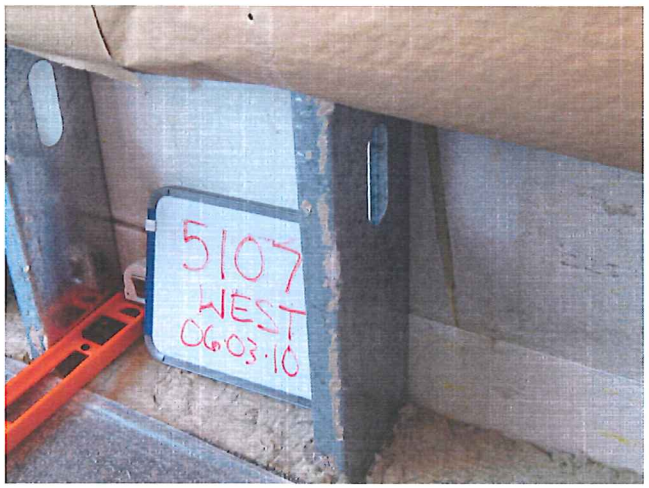
Mid-span cracking of interior partition walls
Date: April 14, 2010

4. General Observations, Marion County Courthouse Building



The framing at the horizontal crack is revealed
Date: June 3, 2010

Separation between the exterior structural light gauge steel stud and connection plate
Date: June 3, 2010



Twisting of the exterior structural light gauge steel studs
Date: June 3, 2010

4. General Observations, Marion County Courthouse Building

Elevator Hoistway – Stabilizing bar installation at floor slab (excess drop-in anchors visible to the left)
Date: April 14, 2010

Elevator Hoistway – Diagonal crack near a floor slab
Date: April 14, 2010

Elevator Hoistway – Installation of a drop-in anchor (Reinforcement is visible as a result of previous anchor installation attempts)
Date: April 14, 2010

4. General Observations, Marion County Courthouse Building

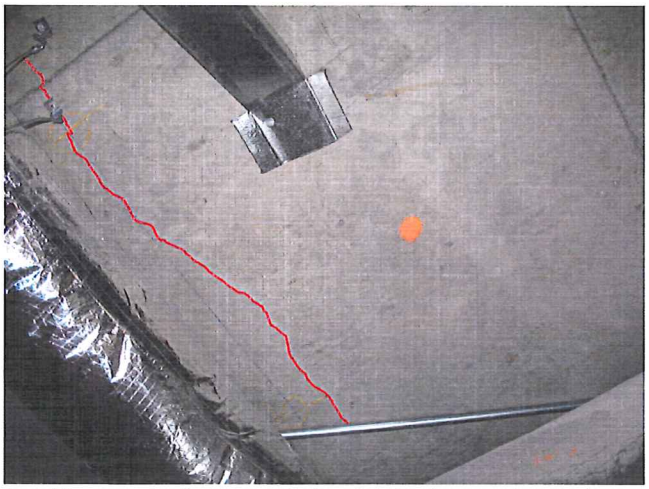
Screwdriver penetrating 2 inches into the concrete column
Date: April 14, 2010

Wood fibers cast into the concrete column
Date: April 14, 2010

Debris inside slab
Date: April 14, 2010

4. General Observations, Marion County Courthouse Building

Cracking on outside face of column at the fifth floor
Date: April 14, 2010

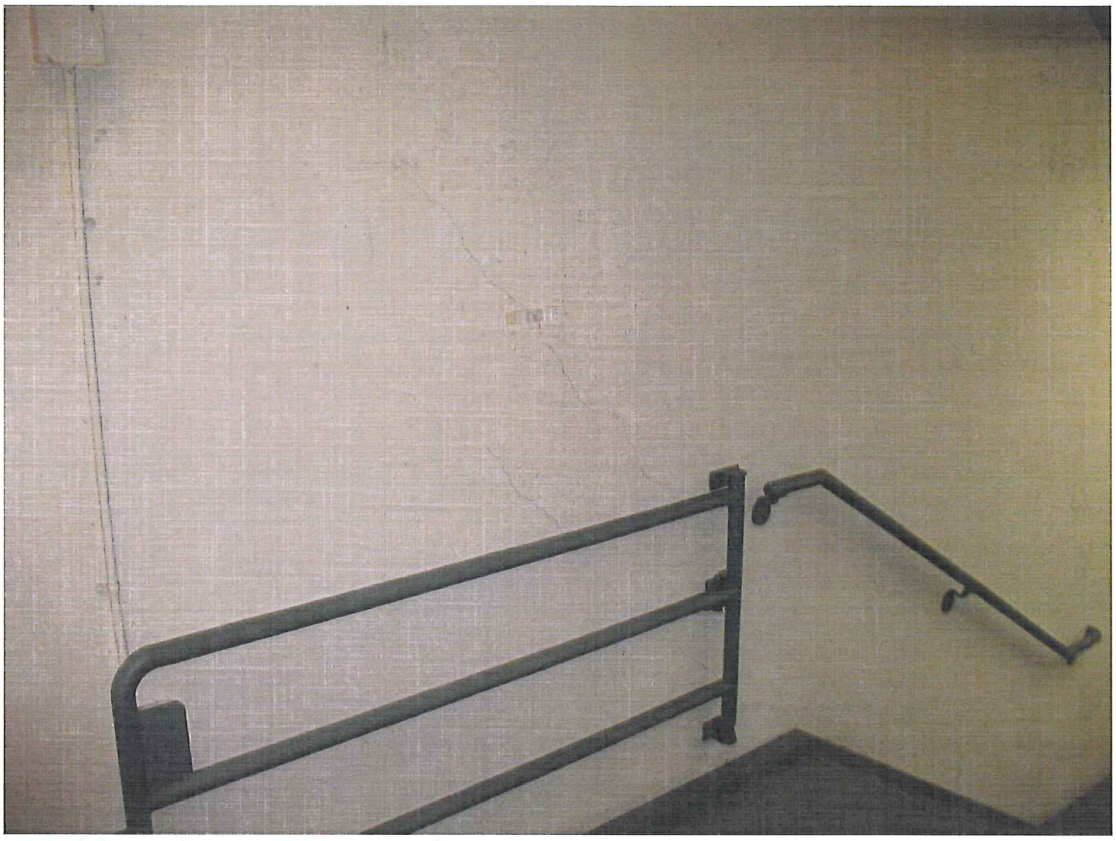


Cracking on the bottom of the slab in the north-south direction at the fourth floor
Date: April 14, 2010

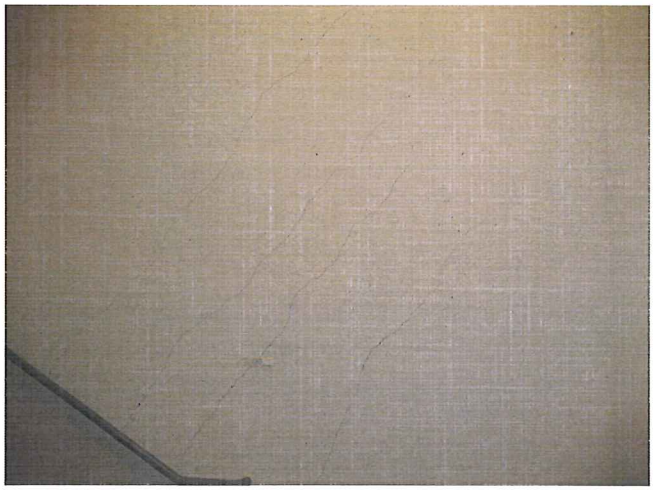
Notes:

1. Cracking was observed at the top of the concrete columns. At the lower floors, the cracking was observed in the inside face. However, at the fifth floor, the cracking was observed on the outside face.
2. At the bottom of the slab, north-south cracking was observed along column gridlines, which is parallel with the banded tendons.

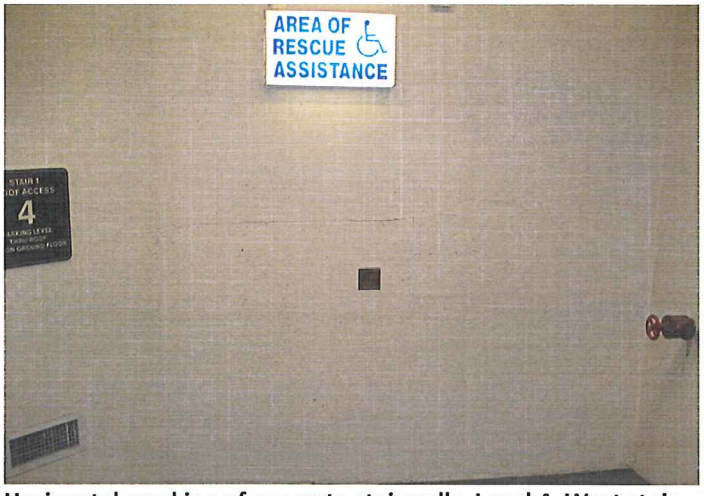
4. General Observations, Marion County Courthouse Building



Several diagonal cracks on the ground floor on the north wall of the west stair tower
Date: April 14, 2010



Several diagonal cracks at base of East stair tower at North wall on basement level
Date: April 14, 2010



Horizontal cracking of concrete stairwells, Level 4, West stair tower
Date: April 14, 2010

5. Bus Mall Column Observations

(Bus Mall plan provided by SERA Architects)

5. Bus Mall Column Observations

GRID:	O	N	M	L	K
10	Pilaster in the Basement Wall Visible Repair Patch Excessive Cracking Movement to the NW	No Visible Patch Excessive Cracking (0.80mm) Movement to North and West	No Visible Patch Typical Cracking (0.35mm) Movement to the North	No Visible Patch Typical Cracking (0.35mm) Movement to the North	No Visible Patch Typical Cracking (0.35mm) Movement to the North
9	Basement Wall	No Visible Patch Excessive Cracking (0.40mm) Movement to West and North	No Visible Patch Minimal Cracking Movement to the NW	No Visible Patch Minimal Cracking Movement to the NW	Visible Repair Patch Typical Cracking (0.25mm) Movement to the North*
8	Basement Wall	No Visible Patch Typical Cracking (0.35mm) Movement to West and North	Visible Repair Patch Typical Cracking Movement to the NW	Visible Repair Patch Typical Cracking Movement to the NW	No Visible Patch Typical Cracking (0.33mm) Movement to the North*
4	Basement Wall	No Visible Patch Typical Cracking (0.23mm) Movement to West and South	No Visible Patch Typical Cracking (West 0.23mm and South 0.33mm) Movement to West and South	No Visible Patch Typical Cracking (0.23mm) Movement to West and South	No Visible Patch Typical Cracking Movement to SW
3	Basement Wall Visible Repair Patch Excessive Cracking Movement to the SW	Basement Wall No Visible Patch Excessive Cracking Movement to the SW	Basement Wall No Visible Patch Excessive Cracking Movement to the SW	No Visible Patch Typical Cracking Movement to the SW	No Visible Patch Typical Cracking Movement to West and South

*Column repaired during construction period according to construction documents

5. Bus Mall Column Observations

GRID:	J	H	G	F	E
10	No Visible Patch Typical Cracking Movement to the North	No Visible Patch Typical Cracking Movement to the North	No Visible Patch Minimal Cracking (0.20mm) Movement to the North	No Visible Patch Minimal Cracking Movement to the North	No Visible Patch Typical Cracking (0.25mm) Movement to the North
9	Visible Repair Patch Typical Cracking (0.30mm) Movement to the North*	Visible Construction Patch Typical Cracking (0.30mm) Movement to the North*	No Visible Patch Typical Cracking Movement to the North*	No Visible Patch Typical Cracking Movement to the North*	Visible Repair Patch Typical Cracking Movement to the NE
8	No Visible Patch Excessive Cracking (0.80mm) Movement to the South*	No Visible Patch Minimal Cracking (Midheight) Movement to the North	Visible Repair Patch Minimal Cracking (Midheight) Movement to the North	No Visible Patch Minimal Cracking (0.18mm Midheight) Movement to the North	Visible Repair Patch Typical Cracking (0.23mm) Movement to North and East
4	No Visible Patch Typical Cracking Movement to the South	No Visible Patch Typical Cracking Movement to the South	No Visible Patch Minimal Cracking Movement to the South	No Visible Patch Minimal Cracking Movement to the South	No Visible Patch Typical Cracking Movement to the South
3	No Visible Patch Minimal Cracking Movement to West and South	No Visible Patch Minimal Cracking Movement to the SW	No Visible Patch Minimal Cracking Movement to the South	No Visible Patch Minimal Cracking Movement to the South	No Visible Patch Typical Cracking (0.18mm) Movement to the SE

*Column repaired during construction period according to construction documents

5. Bus Mall Column Observations

GRID:	D	C	B	A
10	No Visible Patch Minimal Cracking Movement to the North	No Visible Patch Typical Cracking (0.35mm) Movement to the East & North	No Visible Patch Typical Cracking Movement to the East & North	Pilaster in the Basement Wall Visible Repair Patch Excessive Cracking Movement to the NE
9	Visible Repair Patch Typical Cracking Movement to the NE	Visible Repair Patch Typical Cracking (0.20mm) Movement to the East	Visible Construction Patch Typical Cracking (0.20mm) Movement to the East	Basement Wall
8	Visible Repair Patch Typical Cracking (0.24mm) Movement to the East	Visible Repair Patch Typical Cracking Movement to the East	Visible Construction Patch Typical Cracking Movement to the East	Basement Wall
4	No Visible Patch Typical Cracking Movement to SE	Visible Repair Patch Typical Cracking (0.25mm) Movement to East and South	No Visible Patch Typical Cracking Movement to the East	Basement Wall
3	Visible Repair Patch Excessive Cracking (0.55mm) Movement to the South*	Basement Wall No Visible Patch Typical Cracking	Basement Wall No Visible Patch Typical Cracking	Basement Wall

*Column repaired during construction period according to construction documents

6. General Observations, Bus Mall

Between Marion County Courthouse Building and Bus Mall
Column leans to the North 1½" at the top along Gridline 10
Date: April 14, 2010

6. General Observations, Bus Mall

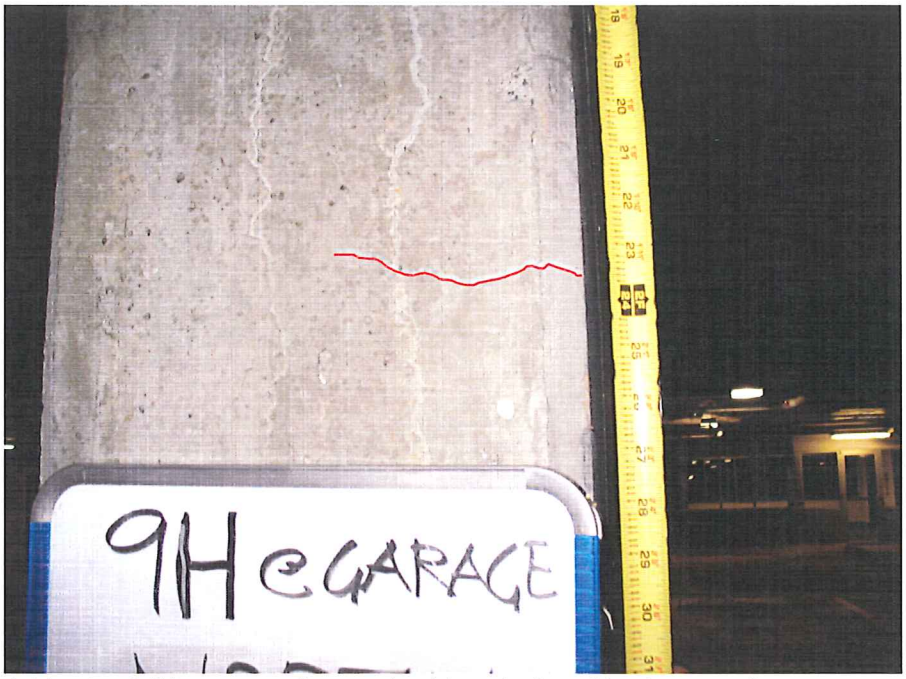
Between Marion County Courthouse Building and Bus Mall (Grid E-3a)
Column leans to the South 1½" at the top along Gridline 3a
Date: April 14, 2010

6. General Observations, Bus Mall

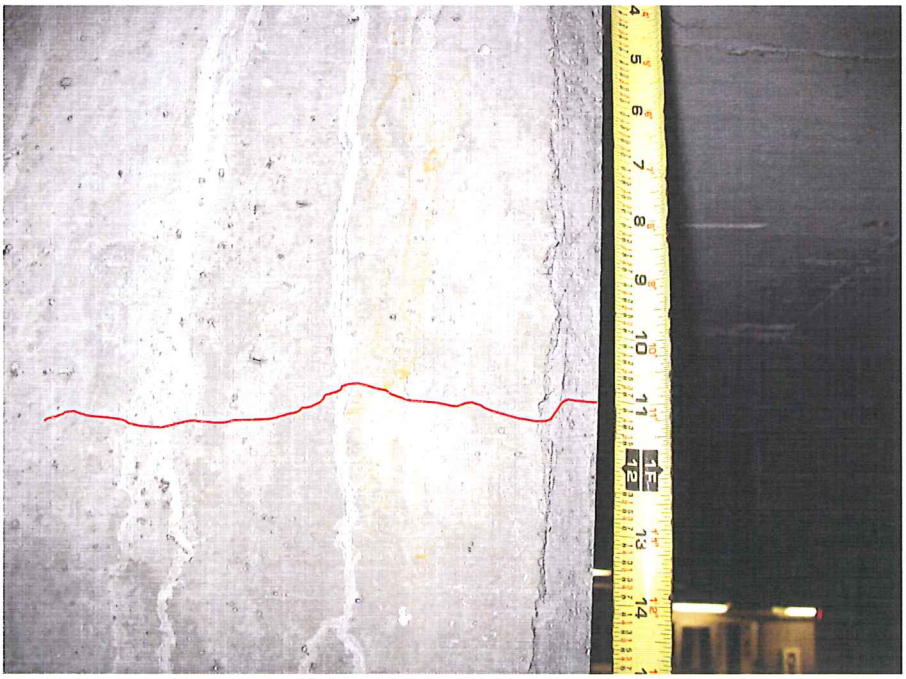
Grid B-9: Visible construction patch with typical cracking (0.20 mm)
Movement to the East
Column not repaired during construction
Date: December 10, 2010

Grid B-9: Visible construction patch with typical cracking (0.20 mm)
Movement to the East
Column not repaired during construction
Date: December 10, 2010

6. General Observations, Bus Mall



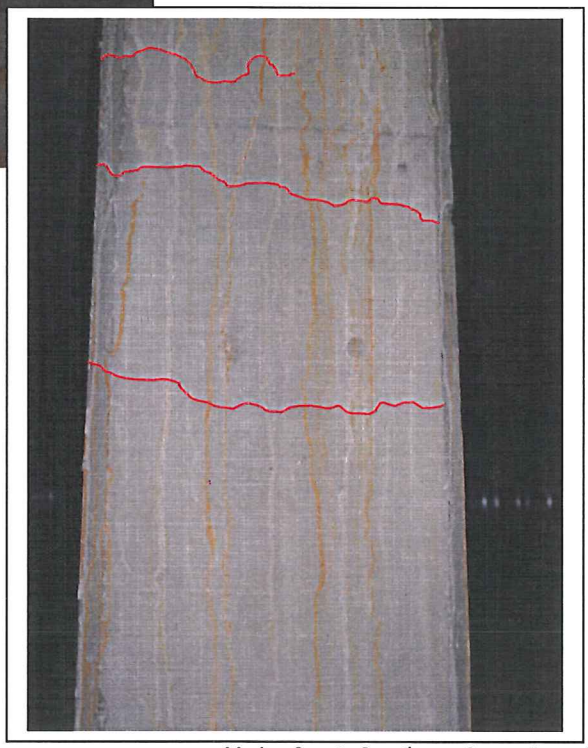
Grid H-9: Visible construction patch with typical cracking (0.30 mm)
Column repaired during construction period.
Movement to the North
Date: November 10, 2010



Grid H-9: Visible construction patch with typical cracking (0.30 mm)
Column repaired during construction period.
Movement to the North
Date: November 10, 2010

6. General Observations, Bus Mall

Grid N-9: No visible patch; excessive cracking (0.40 mm)
Movement to the West and North at top of column
Date: December 1, 2010



Grid N-9: No visible patch; excessive cracking (0.40 mm)
Movement to the West and North at top of column
Date: December 1, 2010

6. General Observations, Bus Mall

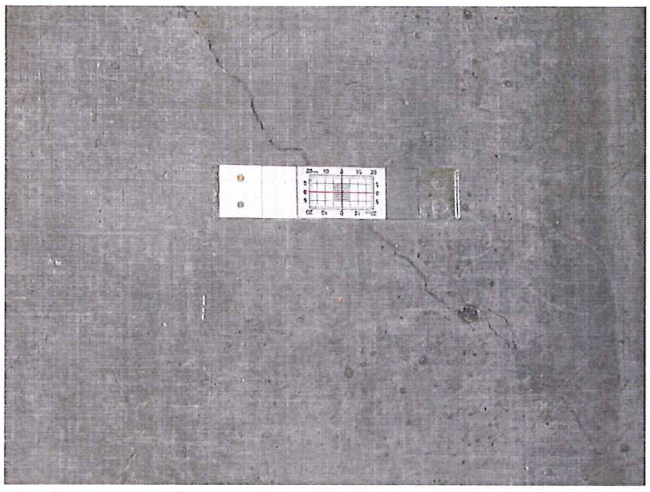
Tendon grout pockets with spalling of the grout pockets visible as a result of moisture penetration
North edge of the bus mall slab
Date: April 14, 2010

Close-up of grout pockets at Bus Mall
Date: April 14, 2010

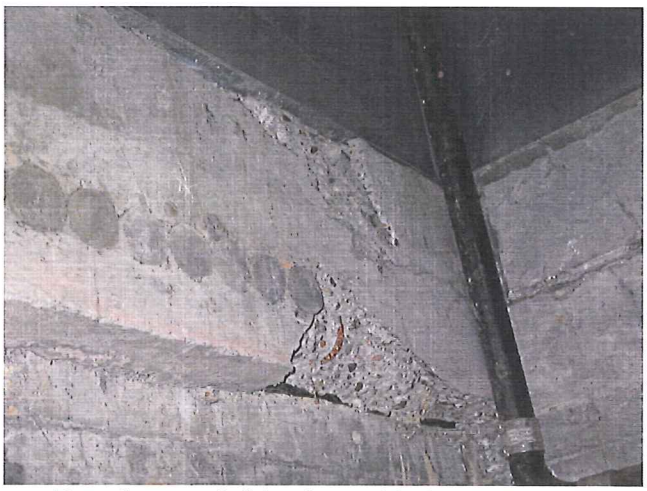
Close-up of grout pockets at Bus Mall
Date: April 14, 2010

6. General Observations, Bus Mall

Significant cracking at the expansion joint between Bus Mall and North Block (Grid O-3a)
Date: April 14, 2010

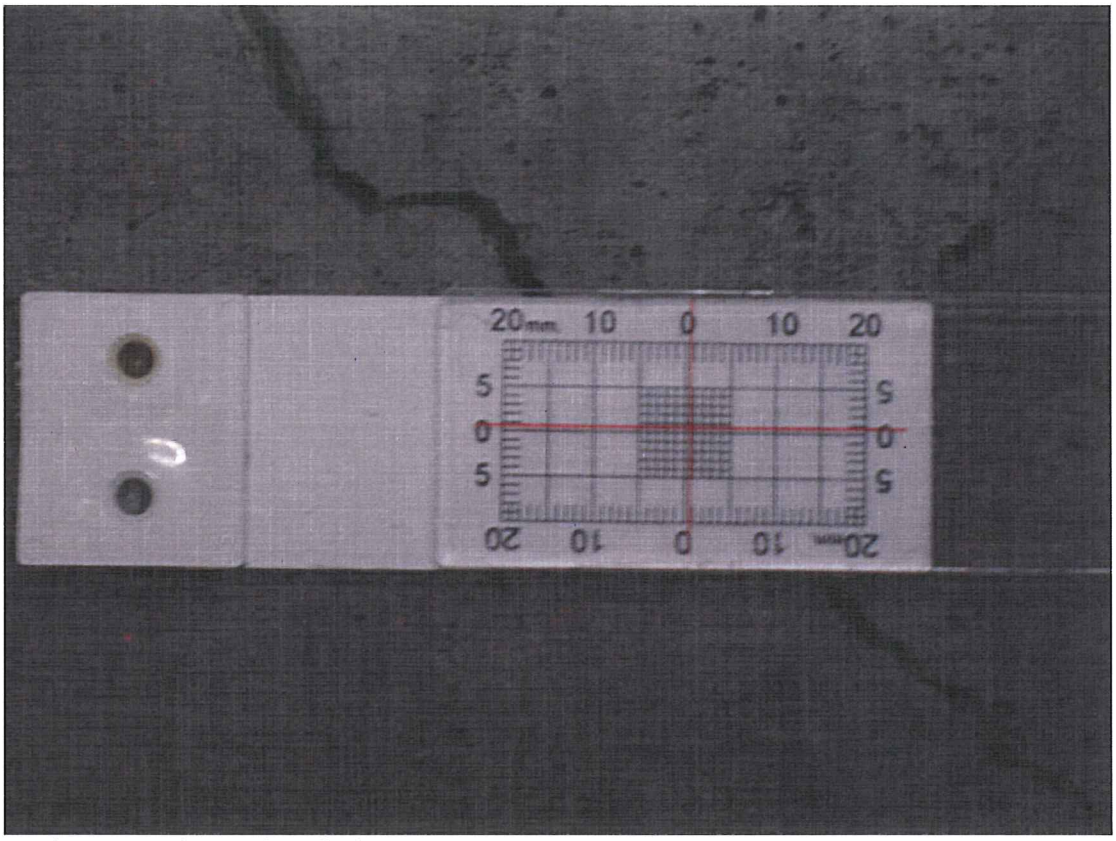


Crack gauge at the south wall of room 298
Date: April 14, 2010



Cracking of Bus Mall slab edge visible from the North Block along Gridline 3a
Date: April 14, 2010

6. General Observations, Bus Mall



Crack gauge at the south wall of room 298
Date: December 1, 2010

Significant cracking at the expansion joint between the Bus Mall and the North Block
Date: December 1, 2010

Cracking of the Bus Mall slab edge visible from the North Block along Gridline 3a
Date: December 1, 2010

7. General Observations, North Block

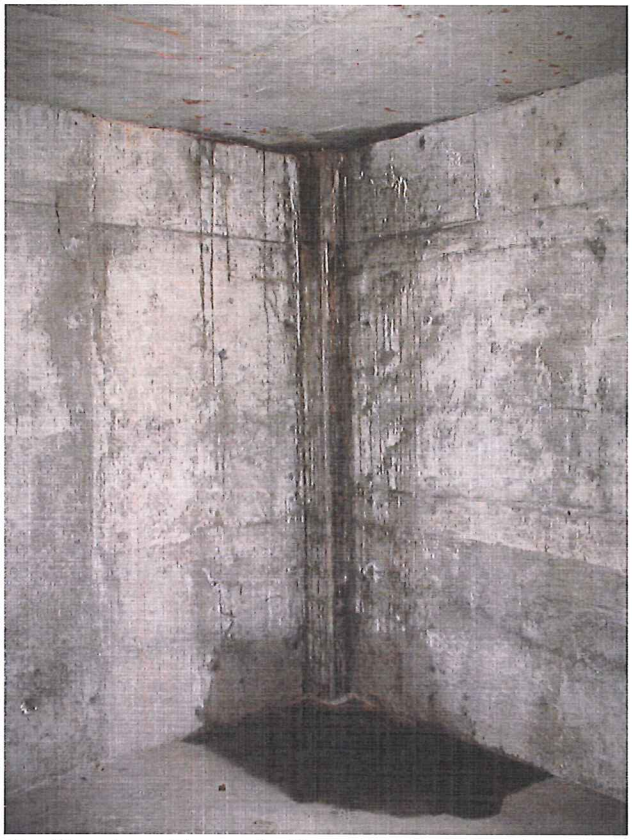
Significant cracking and efflorescence coming through concrete at Northeast corner column (Grid N1-1)
Date: April 14, 2010

Significant cracking and efflorescence coming through concrete at Northeast corner column (Grid N1-1)
Date: April 14, 2010

Notes:

1. Cracking was observed at the top of the wall at the northeast and northwest corners
2. Signs of moisture penetrating through the waterproof barrier

7. General Observations, North Block



Significant cracking and efflorescence coming through concrete at Northeast corner column (Grid N1-1)
Date: December 1, 2010

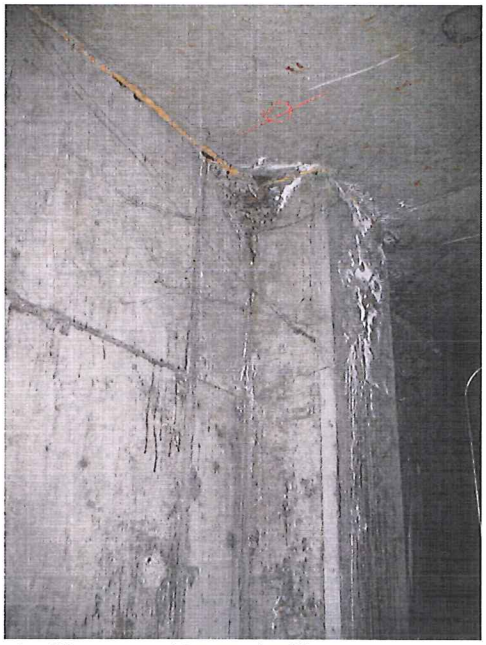
Significant cracking and efflorescence coming through concrete at Northeast corner column (Grid N1-1)
Date: December 1, 2010

Significant cracking and efflorescence coming through concrete at Northeast corner column (Grid N1-1)
Date: December 1, 2010

7. General Observations, North Block

Significant cracking and efflorescence coming through Concrete column at Grid M-1
Date: April 14, 2010

Significant cracking and efflorescence coming through Concrete column at Grid M-1
Date: April 14, 2010



Significant cracking and efflorescence coming through concrete column at Grid M-1
Date: April 14, 2010

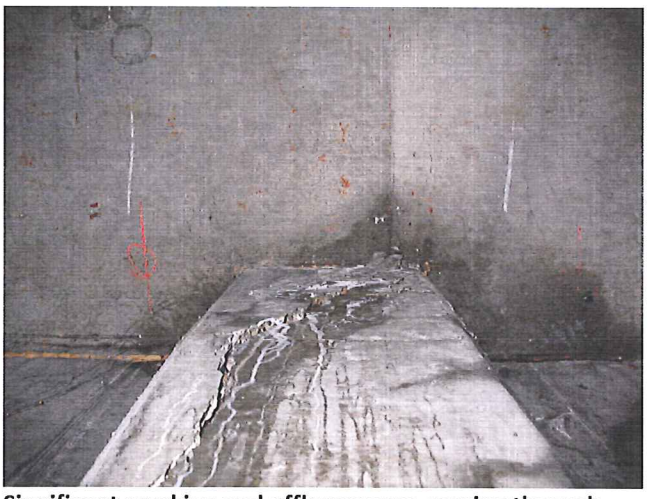
Notes:

1. This column was the only column in the North Block in this condition.

7. General Observations, North Block

Significant cracking and efflorescence coming through
Concrete column at Grid M-1
Date: January 5, 2011

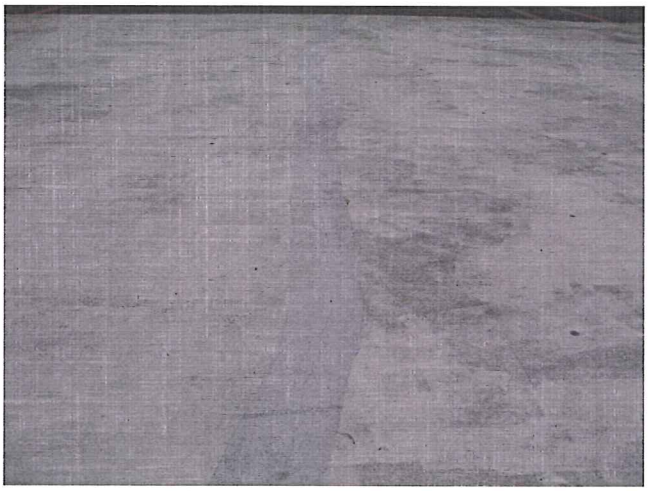
Significant cracking and efflorescence coming through
Concrete column at Grid M-1
Date: December 1, 2010



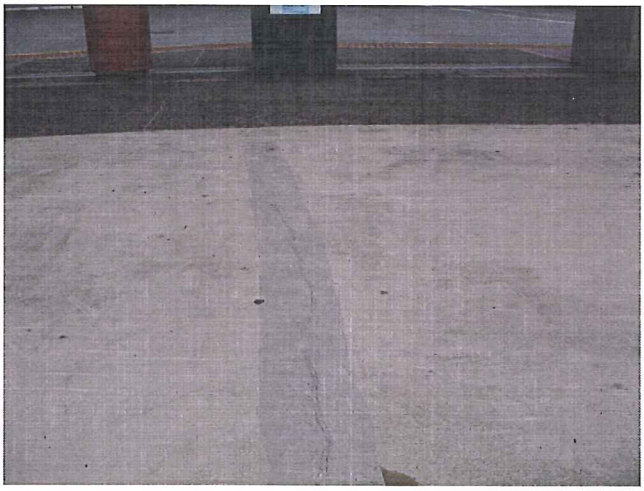
Significant cracking and efflorescence coming through
Concrete column at Grid M-1
Date: December 1, 2010

7. General Observation, North Block

Cracking at midspan between columns as a result of thermal expansion of the exposed PT slab
Date: April 14, 2010



Painted repair of the top of the PT slab
Date: June 1, 2010



Jointed repair at the top of the PT slab
Date: June 1, 2010

308 SW FIRST AVE #300
PORTLAND OR 97204
TEL 503 243 6222
FAX 503 243 5052
POR@RDHBE.COM
WWW.RDHBE.COM

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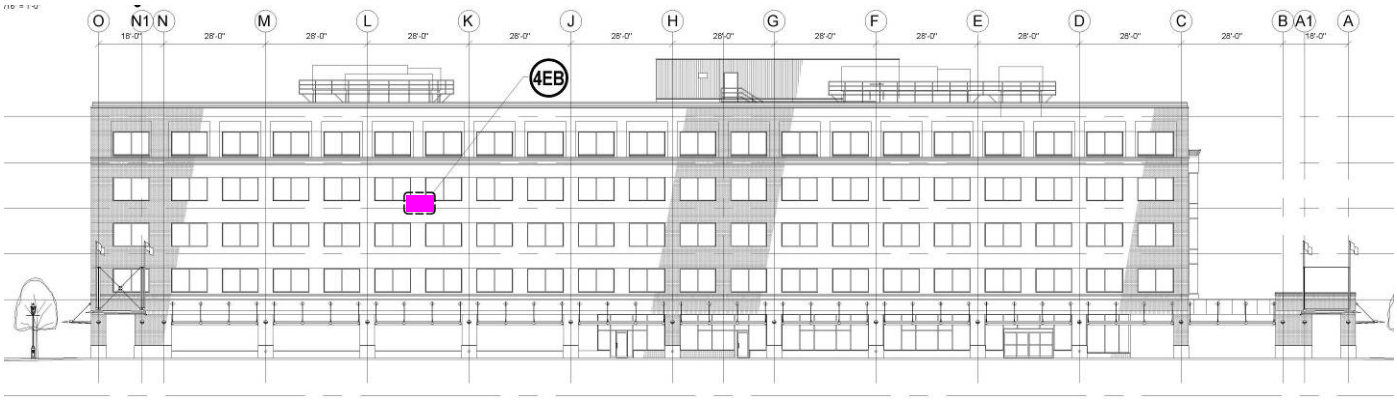
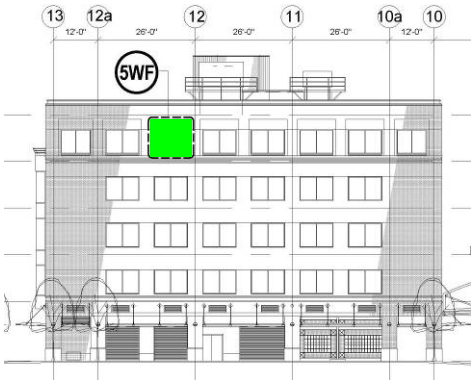
1 Exploratory Opening Locations

1.1 South Elevation

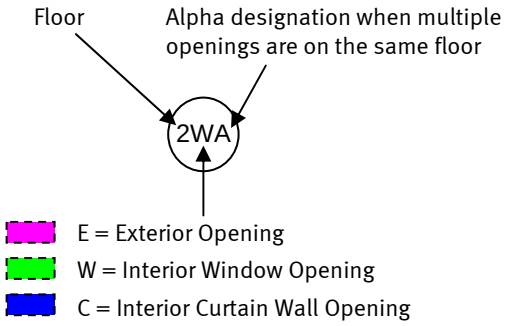
1.2 North Elevation



1.3 East Elevation



Legend:



Note: "4213" is an Interior Window Opening

2 Exterior Openings

2.1 Brick Opening 4EA

Date: May 26, 2010

Location: 4EA, South Elevation, Grid J

Observations:

We removed the soldier course brick, Tyvek WRB, and gypsum sheathing at this location.

- The brick cavity is less than 2” wide behind the soldier course.
- Tyvek staples are unsealed.
- A brick at the top of the opening is cracked.

2.2 Brick Opening 4EB

Date: May 22, 2010

Location: 4EB, North Elevation, Grid L-K

Observations:

We removed brick at the left jamb and sill interface of the window. Self adhered membrane is installed over the Tyvek WRB and wraps into the window rough opening. The window is located in the plane of the brick cladding exterior of the wall framing.

- The window sill pan is located outside of the metal surround & wall framing.
- A large pin hole exists in the self adhered membrane at the jamb and sill intersection.
- There is a large discontinuity at the jamb membrane.
- Tyvek joints are not taped.

2.3 Brick Opening 5EA

Date: May 25, 2010

Location: 5EA, Southwest corner, Grid C

Observations:

We removed brick above and below the shelf angle and from the corner to the nearest control joint on each elevation. We also removed the Tyvek WRB and the exterior gypsum sheathing at the upper opening.

- There is a large gap below shelf angle between the sheathing and the shelf angle.
- The Tyvek butts up to bottom of shelf angle. The joint is not sealed.
- The shelf angle spans across the control joint to the brick reveal at the window.

Brick Opening 5EB

Date: May 26, 2010

Location: 5EB, South Elevation, Grid D-E

Observations:

We removed brick, Tyvek, and sheathing between windows and below the shelf angle.

- The Tyvek butts up to bottom of shelf angle. The joint is not sealed.
- Sheathing is out of plumb.
- Minor corrosion is present on sheathing fasteners.

2.4 Brick Opening 5EC

Date: May 22, 2010

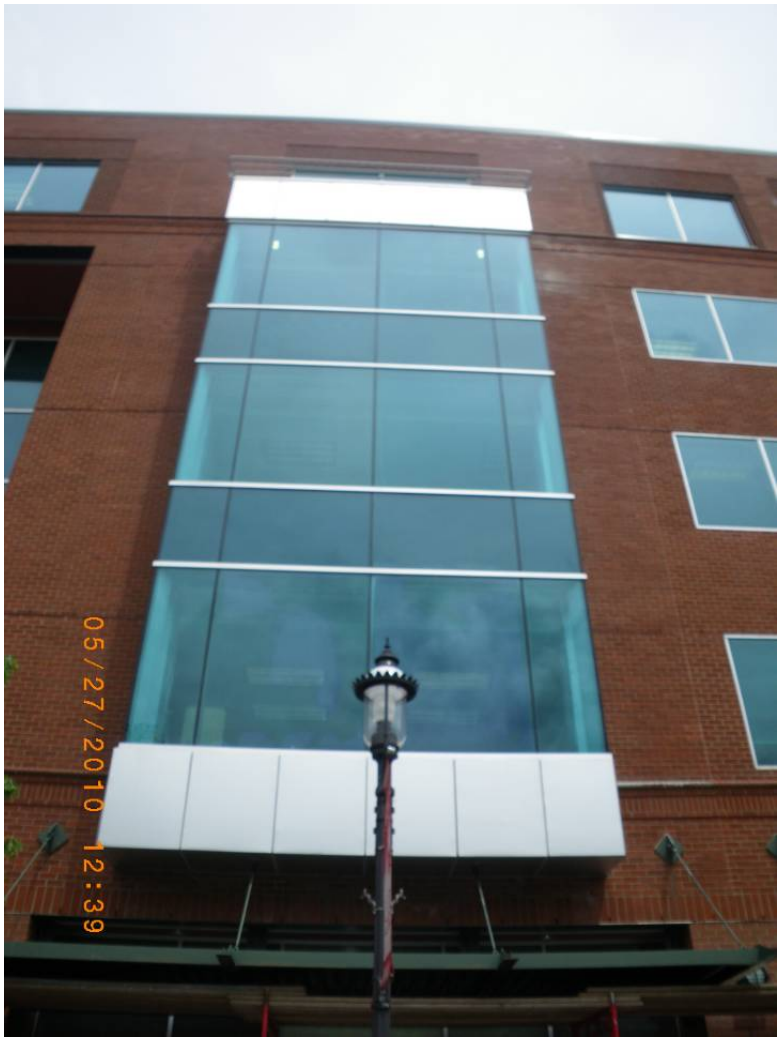
Location: 5EC, Southeast Corner, Grid O

Observations:

We removed brick above and below the shelf angle and from the corner to the nearest control joint on each elevation. We removed Tyvek and the exterior gypsum sheathing at the upper opening. We removed Tyvek at the lower opening.

- Minor corrosion is present on Tyvek staples. The staple penetrations through the Tyvek are unsealed.
- On the East elevation brick at the corner has shifted outward approximately ¾".
- The brick cavity is less than 2" on the South elevation.
- Tyvek butts up to the underside of the shelf angle. The joint is not sealed.
- Efflorescence is present on the underside of the shelf angle at the joint near the corner. The shelf angles are back sloped.
- The brick cladding is not plumb on either elevation. The exterior sheathing is plumb on the South elevation but not on the East elevation.

2.5 East Curtain Wall Bay Exterior



Date: May 27, 2010

Location: 2CB-4CB, East Curtain Wall at South Elevation, Grid H-J

Observations:

We removed several horizontal pressure plates on the curtain wall.

- A pressure plate screw is missing left of curtain wall center line at level 3.
- No end blocks are present where the curtain wall terminates and interfaces with the main wall at level 3.
- Fasteners are corroded near center line of curtain wall. The weep in the pressure plate near this location has been installed too high.

Observations are continued on the next page.

Observations continued:

- Condensation is present on the bottom of an IGU at Level 2.
- We identified a failed bead seal and a potential leak point of the failed IGU at Level 2.
- There is a large sealant discontinuity at the back of the IGU.
- The Low-E coating is not ground away from the edge of glass.

3 Interior Openings

3.1 Interior Opening 2CB – East Curtain Wall Level 2

Date: May 24, 2010

Location: 2CB, Suite 2201

Observations:

A small metal framed wall is built inboard of the curtain wall assembly at each floor. The wall is filled with batt insulation and finished with gypsum board and a wood sill assembly. We removed the interior finishes at each jamb and on the interior wall inboard of the curtain wall.

- Interior gypsum generally appears dry.
- Tyvek is present on the back side of the composite metal panel.
- Sealant is between the composite metal panel and the brick cladding at each end of the assembly.

3.2 Interior Opening 3CB – East Curtain Wall Level 3

Date: May 24, 2010

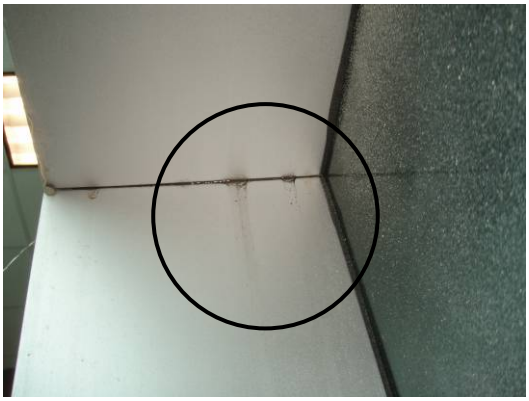
Location: 3CB, Suite 3201

Observations:

We removed the interior finishes at each jamb and on the interior wall inboard of the curtain wall.

- Black staining is present on the backside of the interior gypsum at the left jamb.
- Interior gypsum removed from the wall assembly at the sill generally appears dry.
- Mineral wool insulation is installed at the slab edge.
- Metal support brackets at the slab edge are corroded.
- Interior finishes above the left jamb area are heavily stained.

3.3 Interior Opening 4CB – East Curtain Wall Level 4



Date: May 24, 2010

Location: 4CB, Suite 4231/4211

Observations:

We removed the interior finishes at each jamb and on the interior wall inboard of the curtain wall.

- Interior gypsum generally appears dry.
- Stains are present on the inboard side of the exterior sheathing at the left jamb. The stain starts at the exposed end of the metal brick support angle.
- Ceiling tiles and interior finishes are heavily stained above the opened areas.
- Water was present prior to testing below the window sill at the East (left) jamb area.

3.4 Interior Opening 3CA – West Curtain Wall Level 3

Date: May 25, 2010

Location: 3CA, Suite 3120

Observations:

We removed the interior finishes at each jamb and on the interior wall inboard of the curtain wall.

- Interior gypsum generally appears dry.
- White staining is present on the inboard side of the composite metal panel below the window sill.
- The self adhered membrane at the East end of the curtain wall assembly is not set consistently in the shoulder of the curtain wall.
- Rust is present on top of the head framing member in the ceiling plenum area.

3.5 Interior Opening 4CA – West Curtain Wall Level 4

Date: May 25, 2010

Location: 4CA, Suite 4101

Observations:

We removed the interior finishes at each jamb and on the interior wall inboard of the curtain wall.

- Interior gypsum generally appears dry.
- Heavy staining is present on the ceiling finishes above the left jamb area.
- Rust is present on the horizontal frame member of the curtain wall below the slab edge. Staining is present on the vertical frame member above the rust. The curtain wall support bracket at the slab edge is corroded.

3.6 Interior Opening 5WA – Punched Window

Date: May 24, 2010

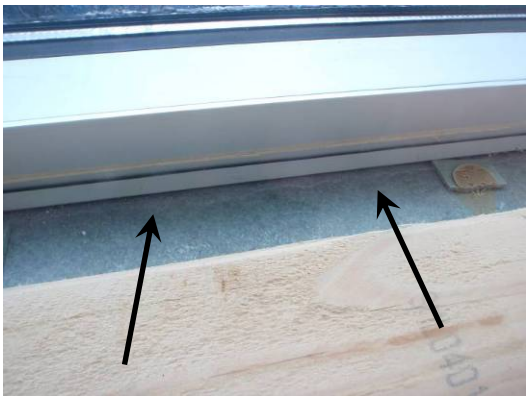
Location: 5WA, Suite 5124

Observations:

We removed ceiling tiles and interior gypsum finishes at the jamb and sill areas. Batt insulation is typically installed in the wall cavity. Mineral wool insulation is typically installed at the slab edge.

- Interior gypsum generally appears dry.
- Minor stains are present on the back side of the interior gypsum at the left jamb area.
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.
- Studs under the sill framing are slightly twisted. The bottom of each stud is turned to the left relative to the top of the stud.
- Stains are present on the underside of the slab above. The end of the stain on the slab is directly above the stained ceiling tile.
- White staining is present on the interior side of the foil backed exterior insulation in the ceiling plenum.
- White staining is present on the vertical studs behind the insulation.

3.7 Interior Opening 5WB – Punched Window



Date: May 24, 2010

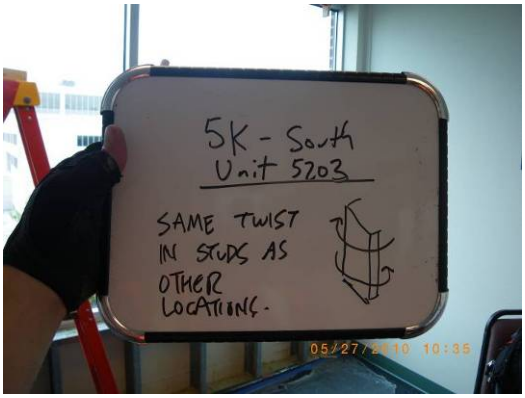
Location: 5WB, Suite 5124

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- White stains are present on the back side of the interior gypsum below the left third of the sill and at the right jamb.
- Black growth and staining are present on the back side of the interior gypsum below the left jamb area adjacent to the floor. The carpet appears dry and is not stained. Rust is present on the curtain wall support bracket at the slab edge next to this area.
- White stains are present under the window pan flashing on top of the sheet metal surround on top of the interior wall/sill framing.

3.8 Interior Opening 5WC – Punched Window



Date: May 27, 2010

Location: 5WC, Suite 5203

We removed ceiling tiles and interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- White staining is present on the interior side of the foil backed insulation in the ceiling area.
- Studs under the sill framing are slightly twisted. The bottom of each stud is twisted to the right relative to the top of the stud.

3.9 Interior Opening 5WD – Punched Window

Date: May 20, 2010

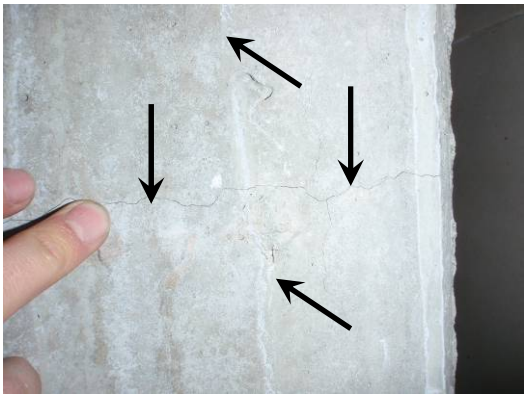
Location: 5WD, Suite 5206

Observations:

We removed ceiling tiles and interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.
- Stains are present on the underside of slab above. The stains terminate directly above the stained ceiling tile.

3.10 Interior Opening 5WE – Punched Window



Date: May 21, 2010

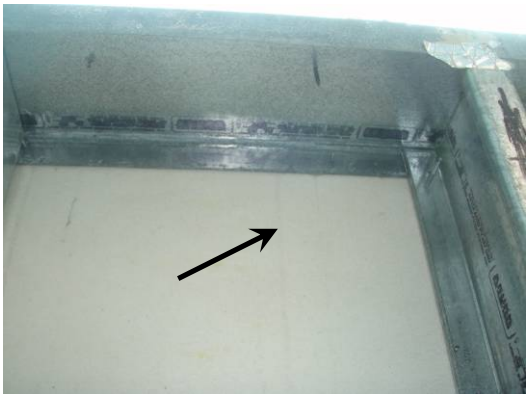
Location: 5WE, Suite 5209

Observations:

We removed interior gypsum finishes at the jamb and sill areas and the wall around the concrete column to the left of the window.

- Interior gypsum generally appears dry.
- White staining is present on the surface of the concrete column.
- Many small horizontal cracks are present on the concrete column.
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.

3.11 Interior Opening 5WF – Punched Window



Date: May 22, 2010

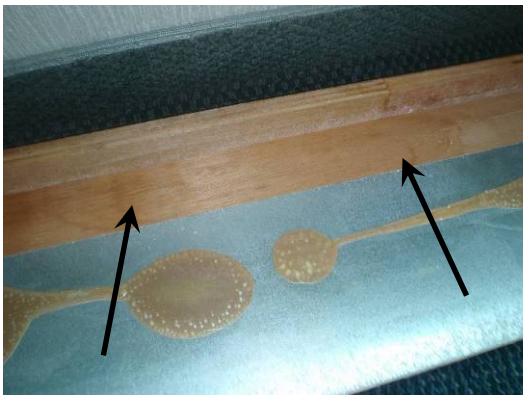
Location: 5WF, Suite 5239

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Minor pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.

3.12 Interior Opening 4213 – Punched Window



Date: May 26, 2010

Location: Suite 4213

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Heavy pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.
- Minor staining is present on the underside of the wood sill stool.

3.13 Interior Opening 4WA – Punched Window

Date: May 24, 2010

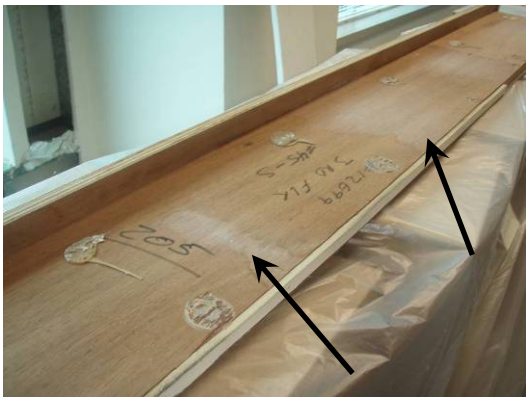
Location: 4WA, Suite 4208

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.
- Brick mortar is present in the Perm-A-Barrier membrane lap at the right jamb and sill.
- The Perm-A-Barrier membrane is unsupported where it transitions from the horizontal sill framing to the vertical wall framing in the brick cavity.
- Studs under the sill framing are slightly twisted. The bottom of each stud is twisted to the right relative to the top of the stud.
- Daylight is visible between the window sill frame and the brick veneer 16” to 32” from the right jamb.

3.14 Interior Opening 3WA – Punched Window



Date: May 24, 2010

Location: 3WA, Suite 3116

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Staining is present on the bottom side of the wood sill stool
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing at the left jamb.
- On all punched openings, a piece of sheet metal covers the gap between the interior wall sill framing and the window frame which is installed on top of the brick cladding. The sheet metal is not sealed to either the interior wall framing or the window frame. Air moves freely through the brick cavity past the sheet metal to the interior space.

3.15 Interior Opening 3WB – Punched Window

Date: May 21, 2010

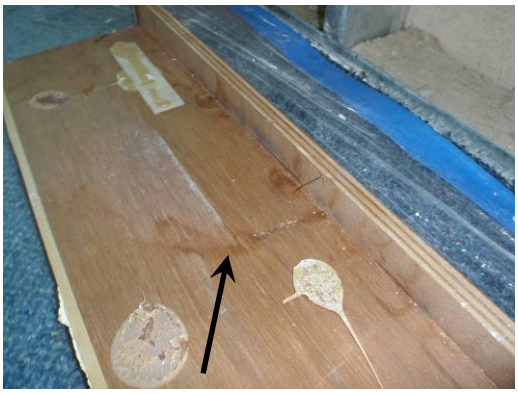
Location: 3WB, Suite 3116

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing and at each jamb area.
- The brick cladding is visible below the window sill frame.

3.16 Interior Opening 3WC – Punched Window



Date: May 26, 2010

Location: 3WC, Suite 3208

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

- Interior gypsum generally appears dry.
- Staining is present on the bottom side of the wood sill stool
- Pink/brown stains and streaks are present on the interior side of the exterior sheathing below the window sill framing.

3.17 Interior Opening 2WA – Punched Window

Date: May 20, 2010

Location: 2WA, Suite 2221

Observations:

We removed interior gypsum finishes at the jamb and sill areas.

⇢ Interior gypsum generally appears dry.

SERA ARCHITECTS OBSERVATION DETAIL

1. General Observations

- Ground Floor 1
- Second Floor 5
- Third Floor 11
- Fourth Floor 19
- Fifth Floor 25
- Bus Mall and North Block 35
- Site 41

2. Exploratory Observations

- Interior 47
- Foundation Wall 53
- Bus Mall 55

General Observations

Ground Floor Spaces

Top left and right : Cracks in masonry block walls

Bottom left: Wall crack can be seen above chair and below sign.

Bottom right: Ceiling grid has shafted and buckled.

Top left: Ceiling crack in a utility space.

Top right: ceiling crack in the ground floor lobby.

Bottom left: Ceiling grid buckling at window head.

Bottom right: Racked door is binding at electrical room.

Top left: Racked electrical room door.

Top right: Wall damage at window jamb.

Bottom left: Wall damage at window jamb.

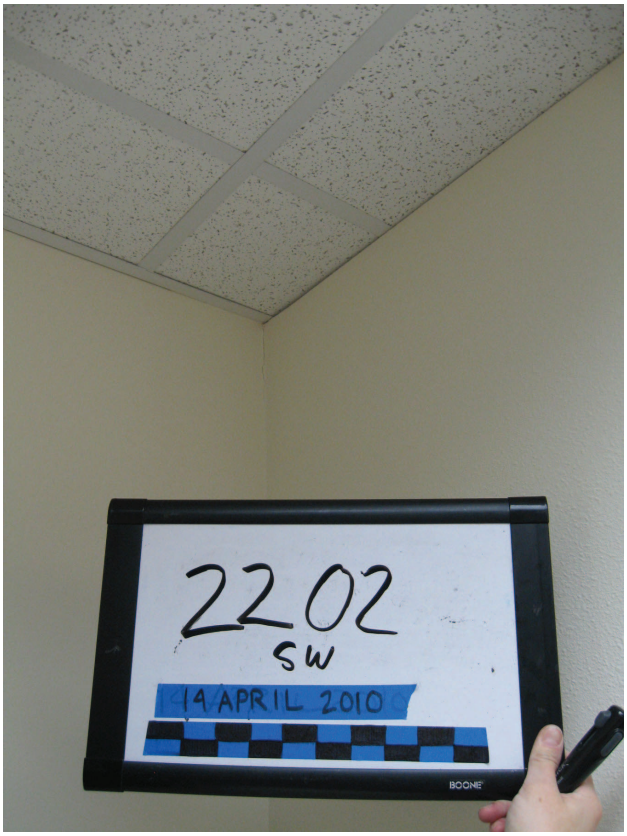
Bottom right: Cracked terrazzo floor at main lobby.

Top left and right: Cracked terrazzo floor at main lobby.

Bottom left and right: Cracked terrazzo floor at main lobby.

General Observations

Second Floor Spaces



Top left and right: Small cracks are visible at some wall intersections.

Bottom left: Wall crack at exterior wall.

Bottom right: Horizontal wall crack at window sill.

Top left: Wall crack with repair attempt.

Top right, bottom left and right: Horizontal wall crack at window sill.

Top left, bottom left: Ceiling grid buckling at system perimeters.

Top right: Buckled ceiling grid.

Bottom right: Shifted ceiling grid can be seen at top of photo.

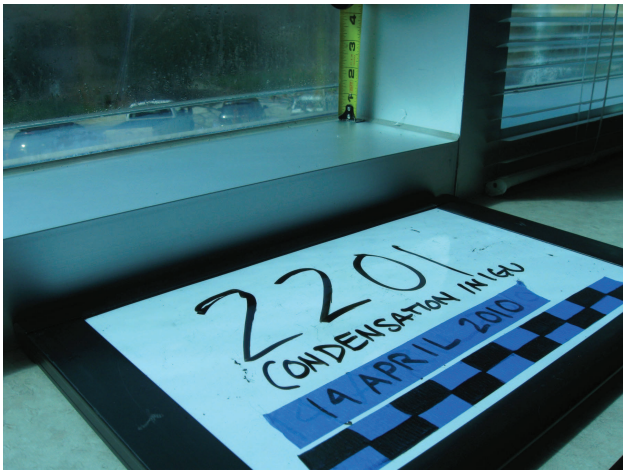
Top left and right: Buckled ceiling system.

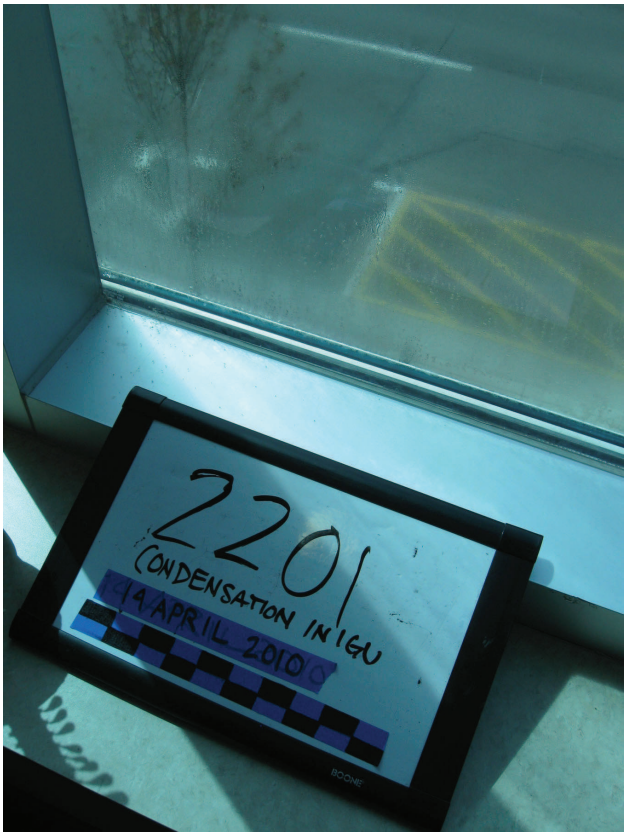
Bottom left and right: Building movement can be seen by twisting door frames. This causes hardware to bind.

Top left: Racked door frame.

Top right: Racked door frame at elevator lobby fire doors causes them to rub. This may prevent proper function.

Bottom left and right: Building movement is causing some doors to damage floor finishes.





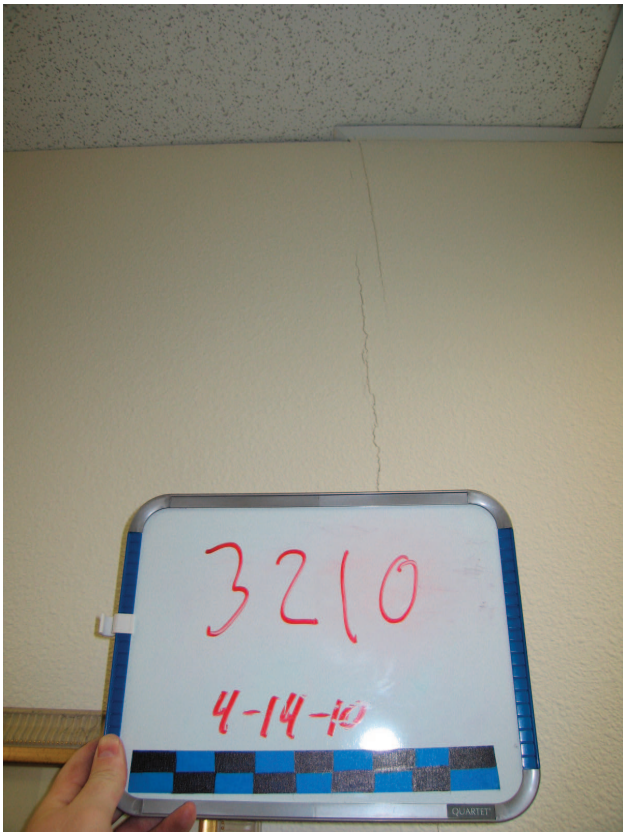
Top left and right: Standing water and condensation in curtain wall window system.

Bottom left and right: Building movement is causing systems furniture to damage walls.

General Observations

Third Floor Spaces

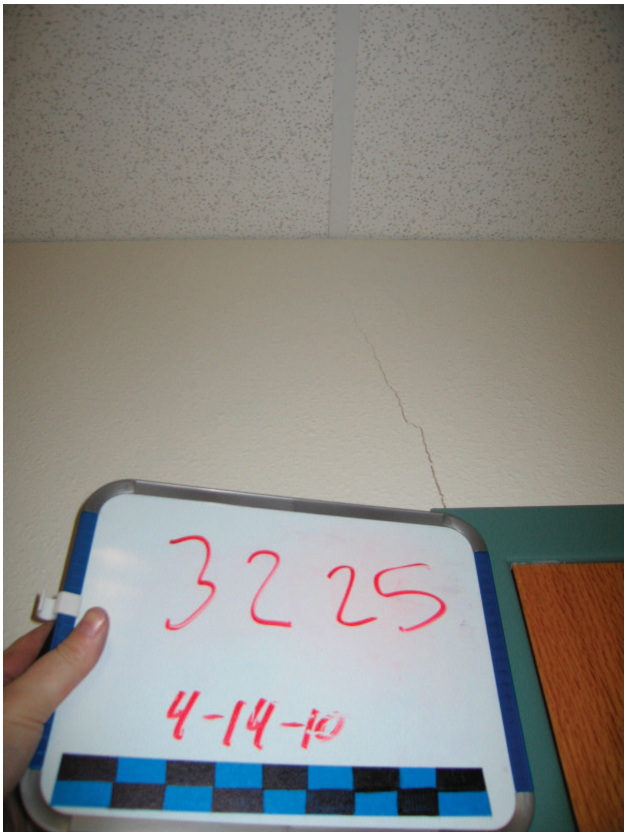
All photos: Cracks at wall intersections is more severe at the Third Floor compared to the Second Floor.

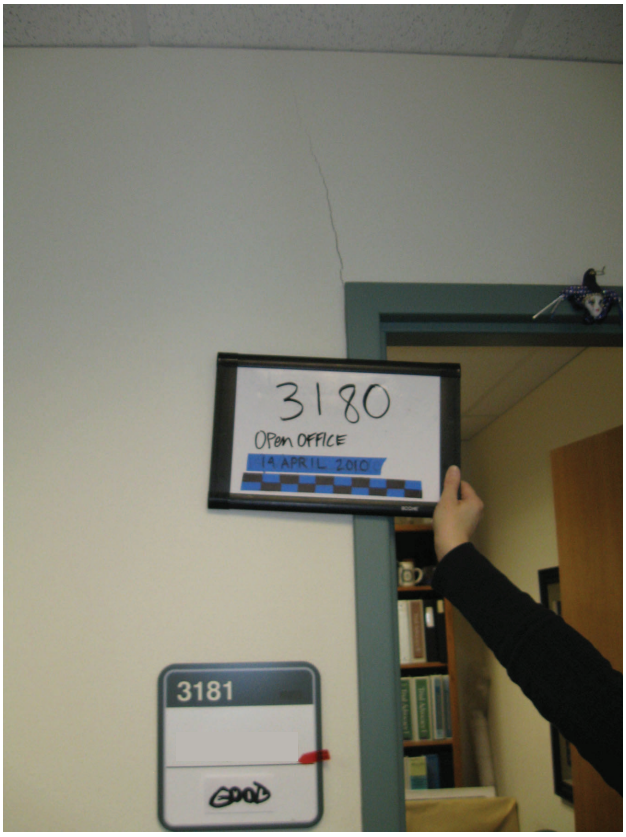


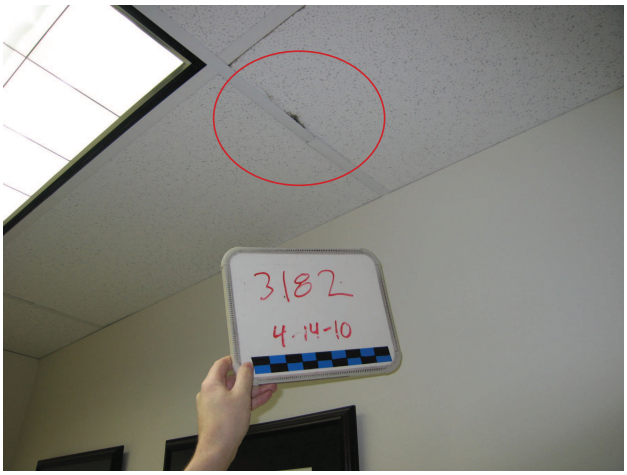
Top left: Wall crack at building column.

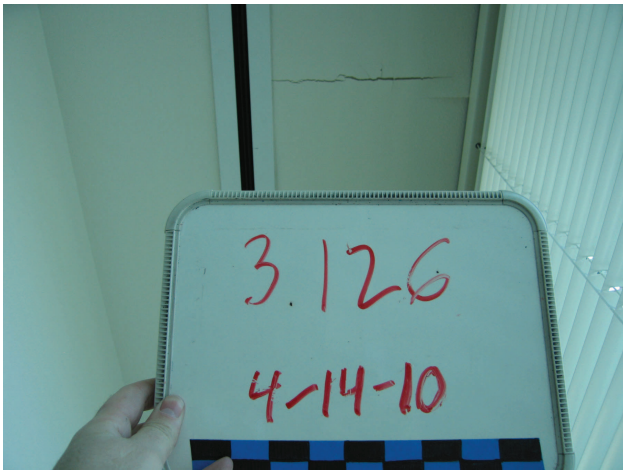
Top right and bottom left: horizontal wall crack at window sills.

Bottom right: Wall crack at door frame.





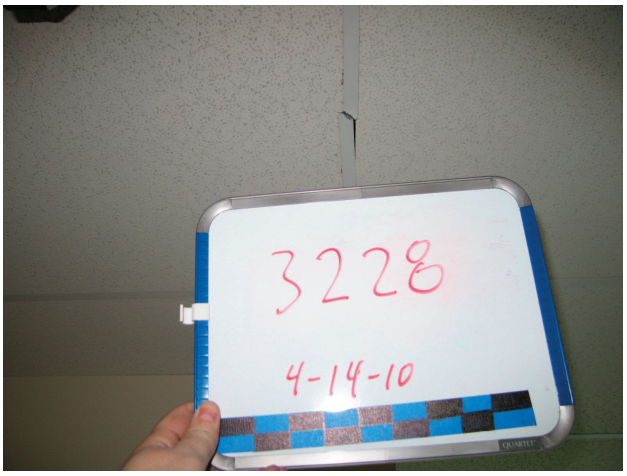




Top left and right: Wall cracks at door frame.

Bottom left: Buckled ceiling grid and ceiling panel damage.

Bottom right: Cracked soffit at curtain wall window head.

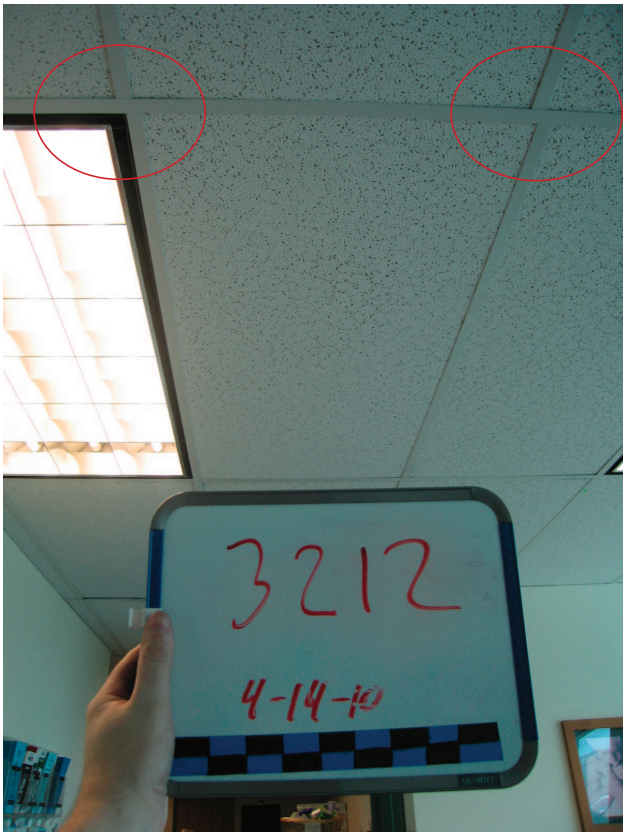


Top left: Buckled ceiling grid and ceiling tile.

Top right: Ceiling grid is buckled on each side of the light fixture.

Bottom left: Ceiling grid has sheared apart.

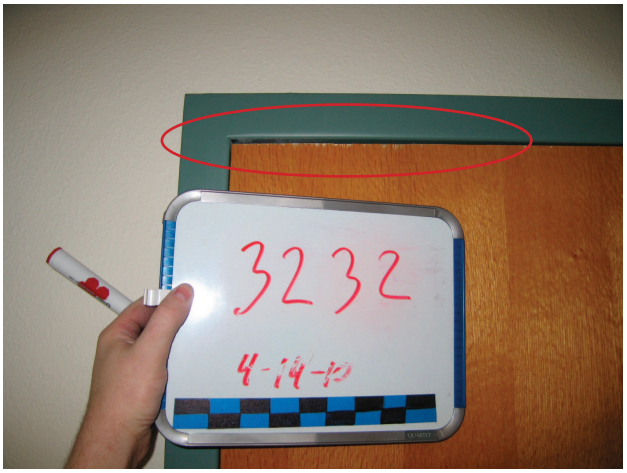
Bottom right: Shifting ceiling grid caused by building movement.

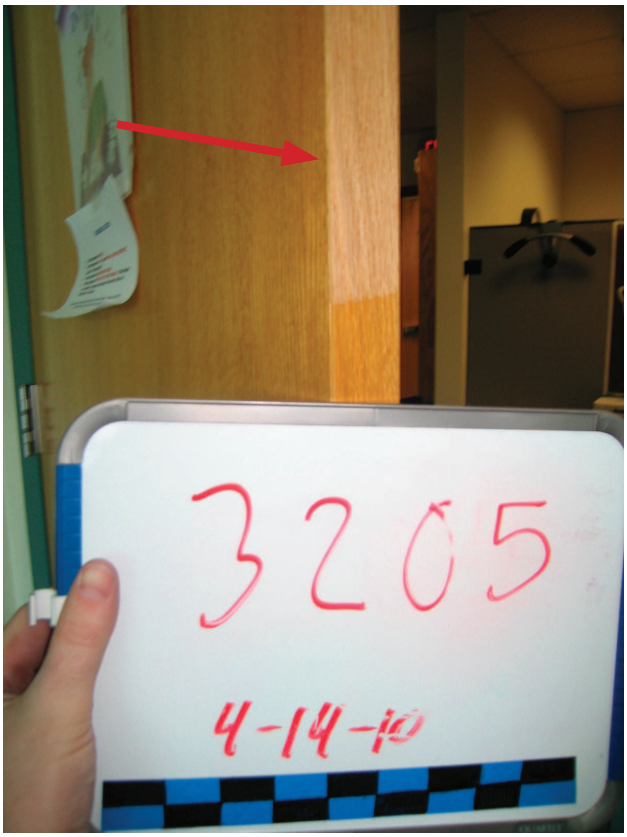


Top left and right: Buckled and shifted ceiling grids.

Bottom left: Damage caused by water infiltration.

Bottom right: Buckled ceiling grid.





Top left and right: Racked door frames causing twisted and binding doors.

Bottom left and right: Doors exhibiting signs of modification in order to keep them functioning properly.

Top left and right: Building movement is causing doors to function improperly.

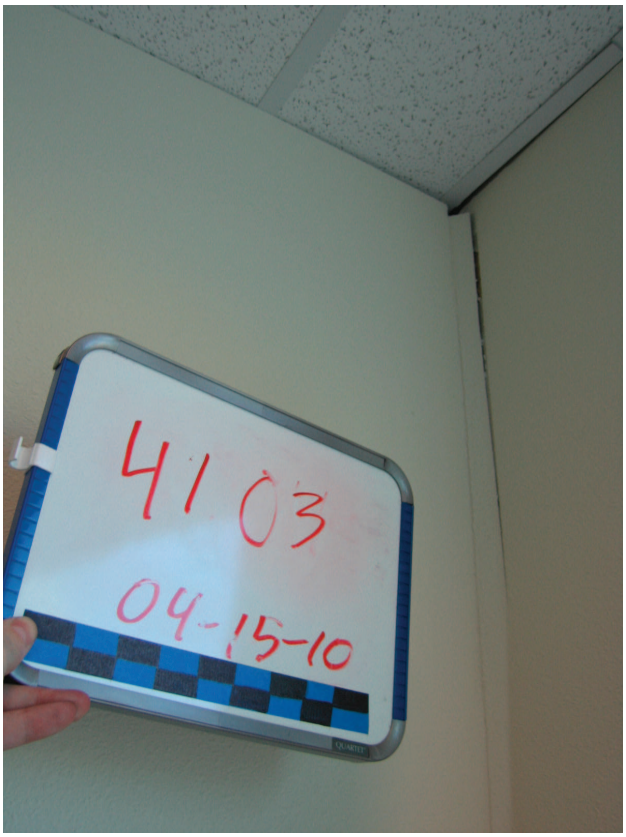
Bottom left and right: Building movement has caused casework and cabinetry functionality issues.

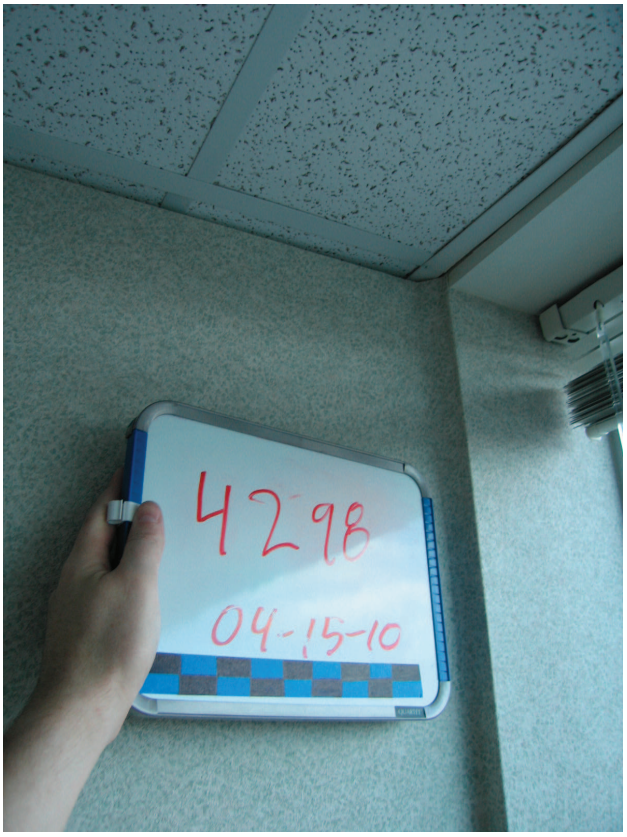
Top left and right: Casework and cabinet functionality to due building movement.

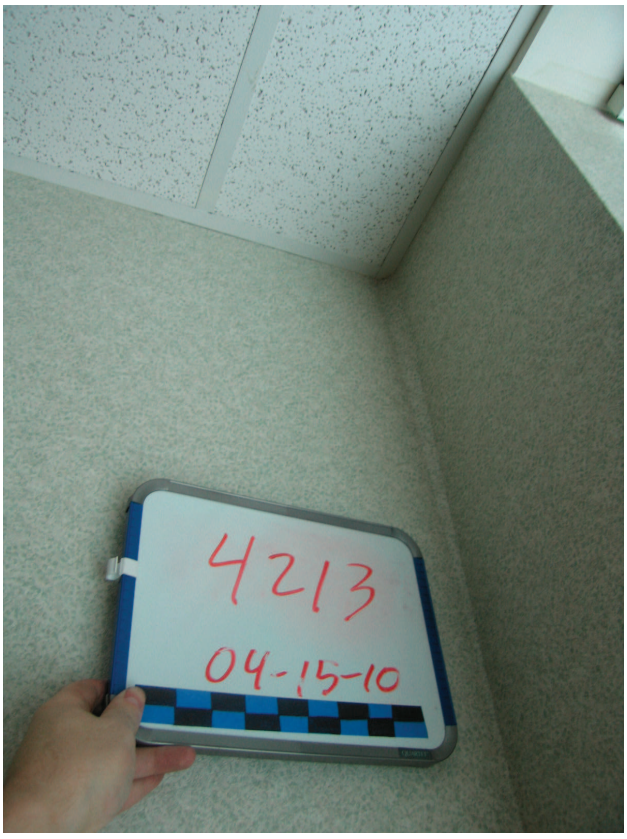
Opposite page: Cracks at wall intersections is more severe when compared to the second or third floor.

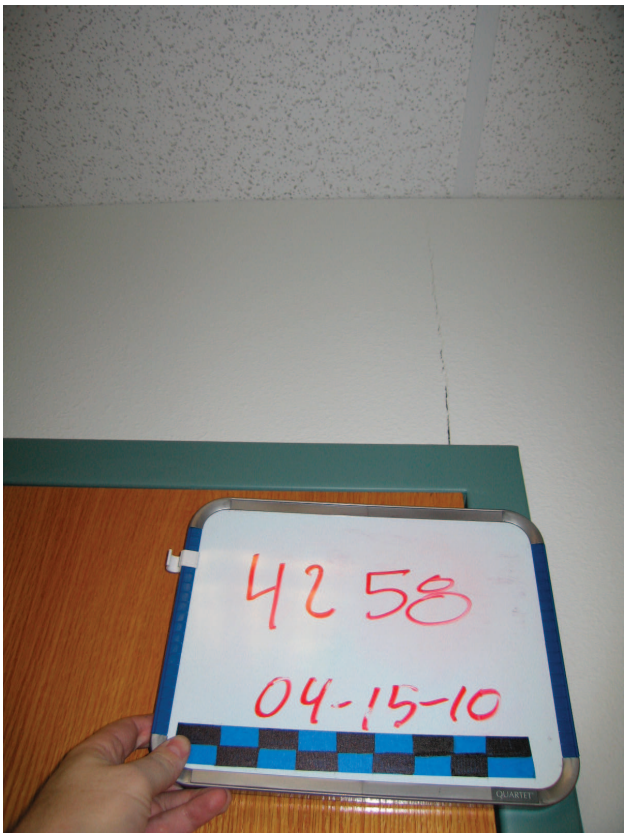
General Observations

Fourth Floor Spaces





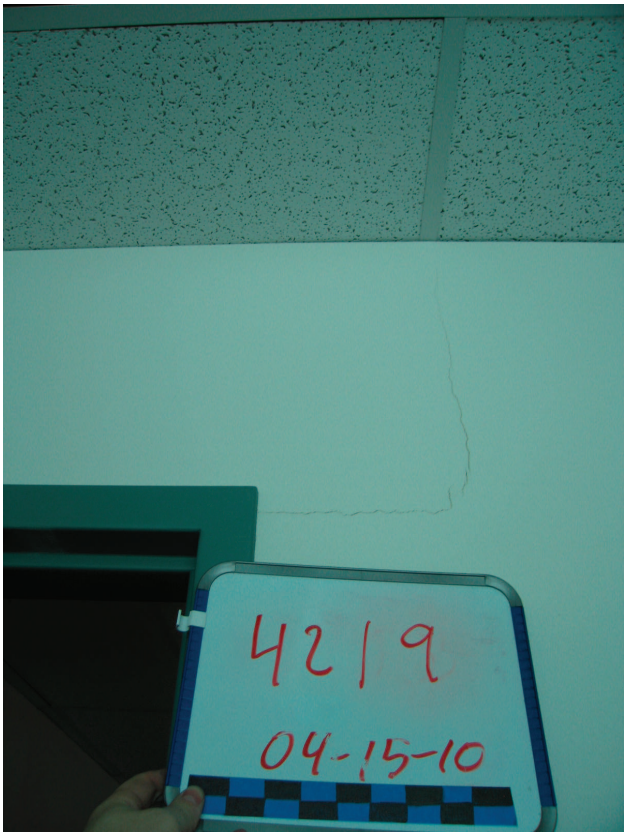


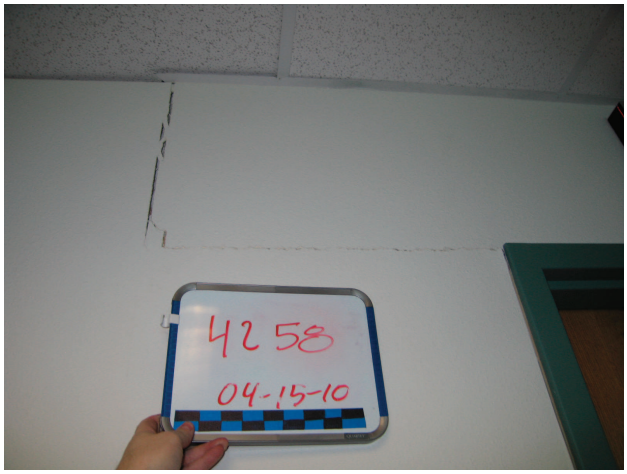


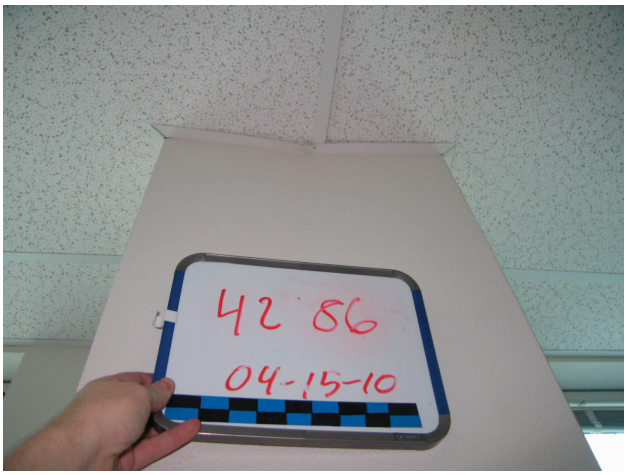
Top left and right: Wall covering conceals wall cracks.

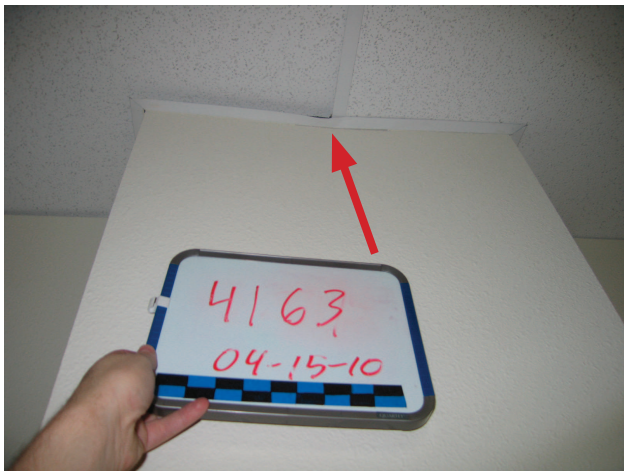
Bottom left: Horizontal wall crack at window sill.

Bottom right: Wall crack at door jamb.



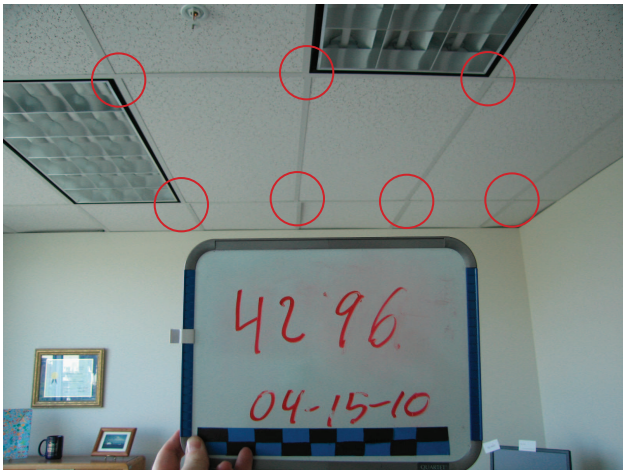


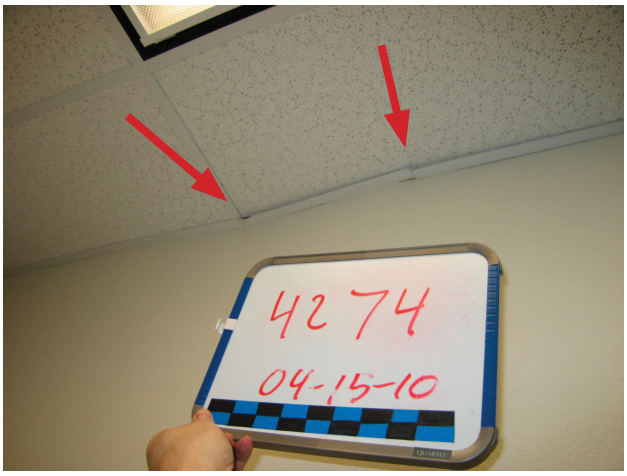




Top left and right: Wall cracks at door jambs.

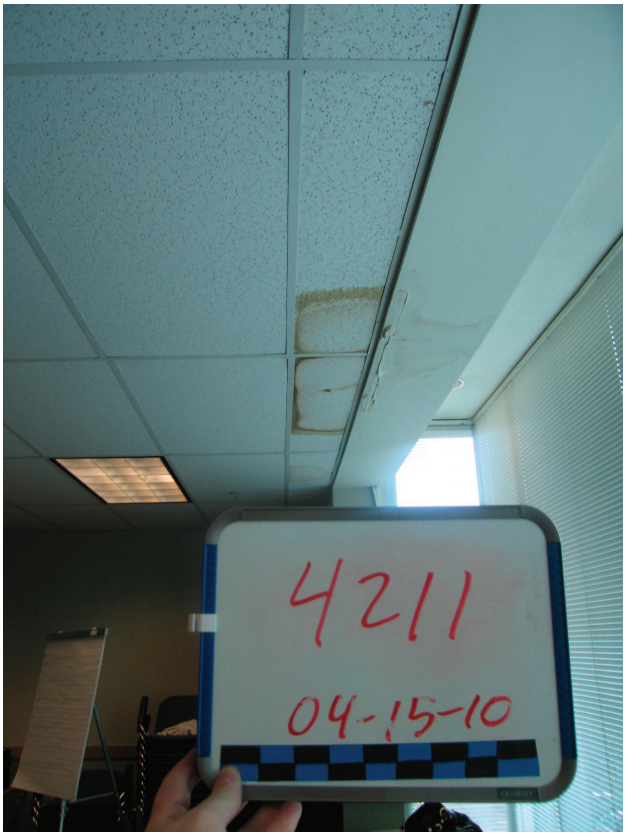
Bottom left and right: Compression stress on the ceiling grid system.

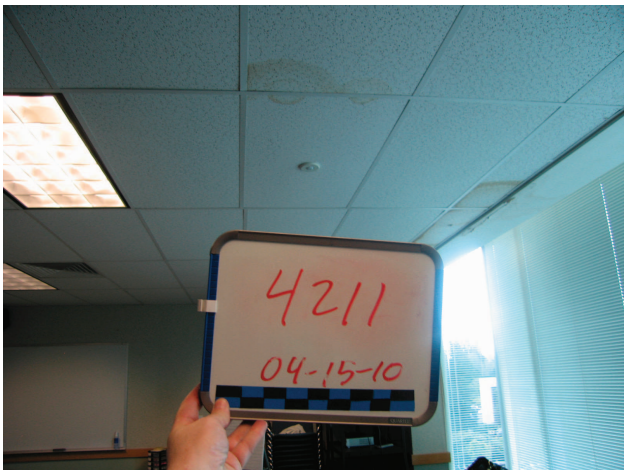




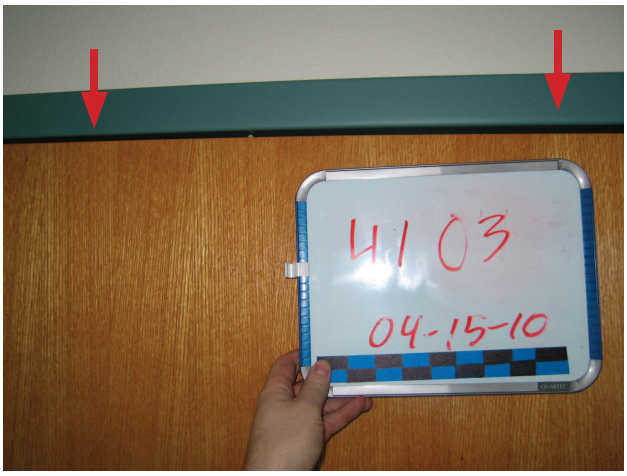
Top left and right: Ceiling grid system has shifted due to building movement.

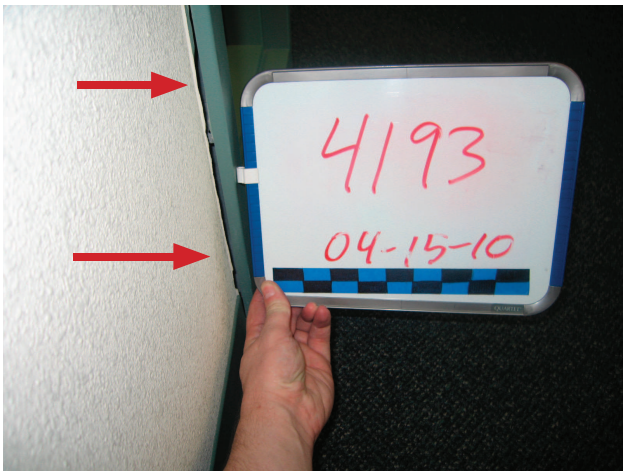
Bottom left and right: Ceiling grid and panels have buckled due to building movement.





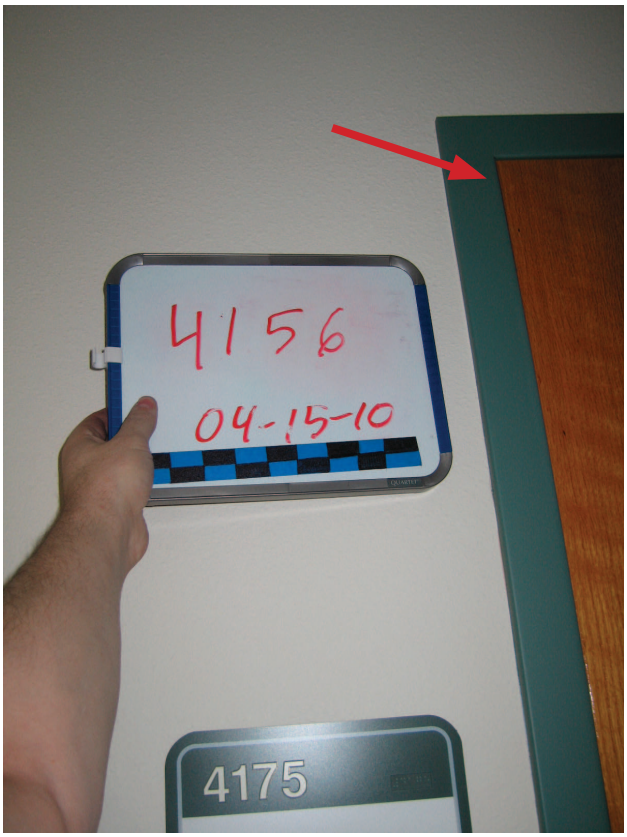
All photos: Damage due to water infiltration is evident at numerous window locations.





All photos: Building movement has caused racked frames resulting in binding doors and other damage.

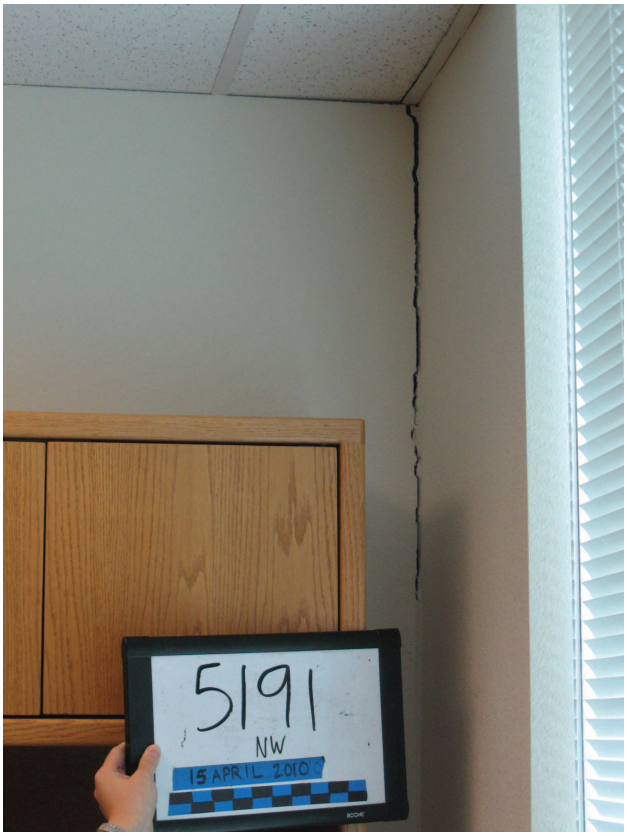
Opposite page: Cracks at wall intersections is most severe at the fifth floor.



General Observations

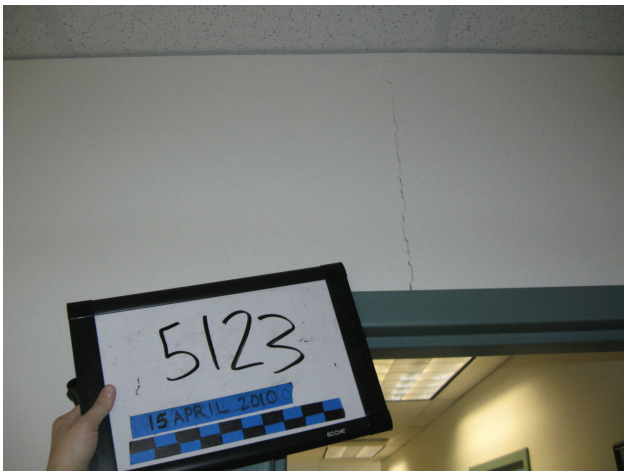
Fifth Floor Spaces


5193
NE
15 APRIL 2010


5191
NW
15 APRIL 2010

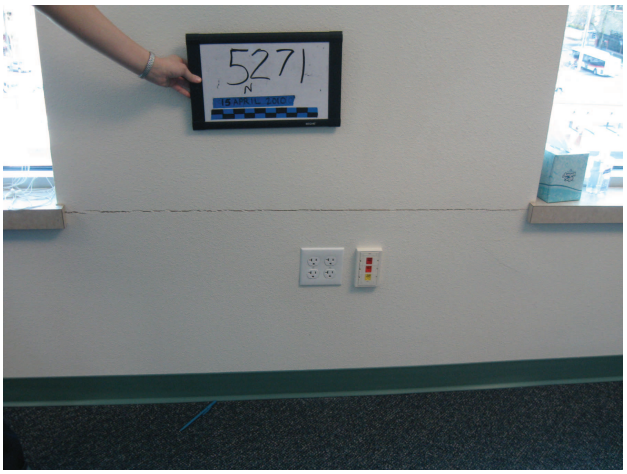

5170
E
15 APRIL 2010


5271
W

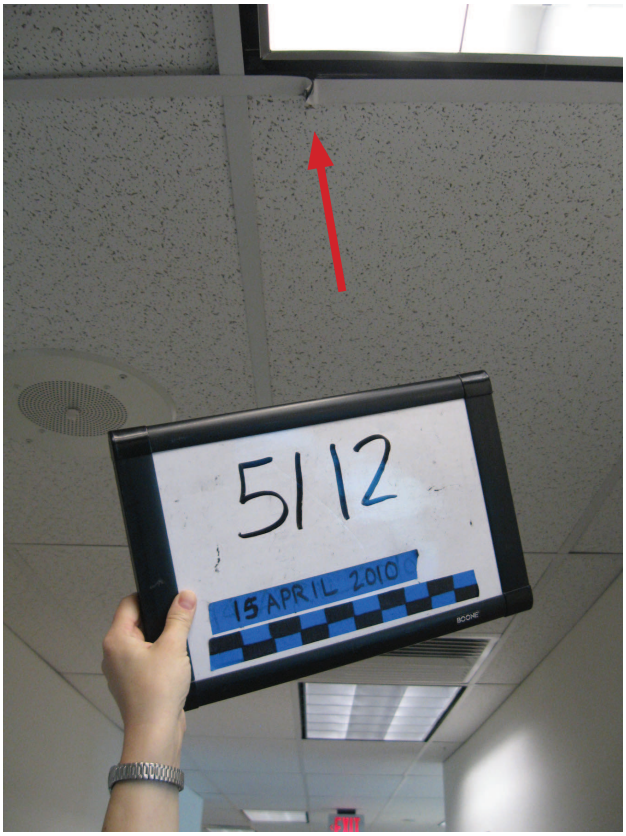


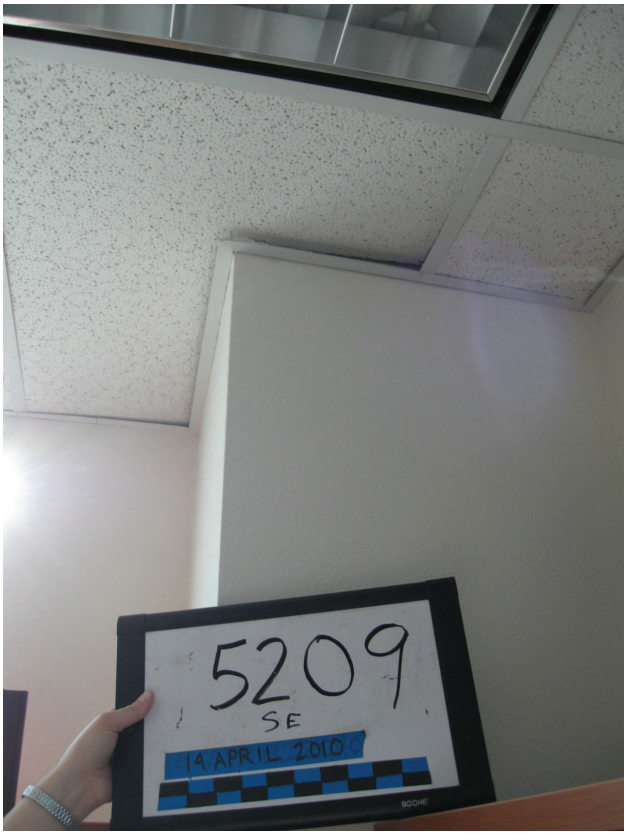
All photos: Wall cracks at door frame.

Opposite Page: Typical wall damage at the Fifth Floor.



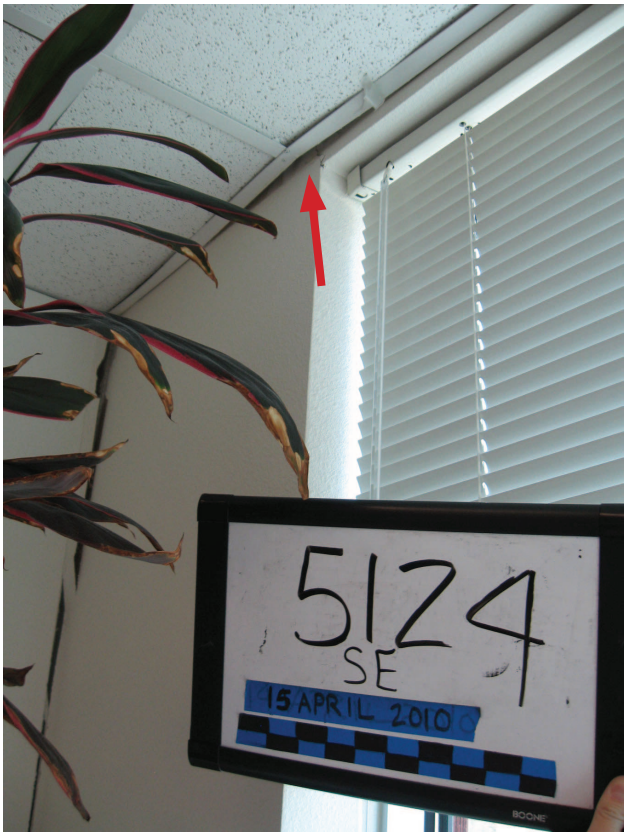
All photos: Horizontal wall crack occurs at nearly all window sills on the Fifth Floor.

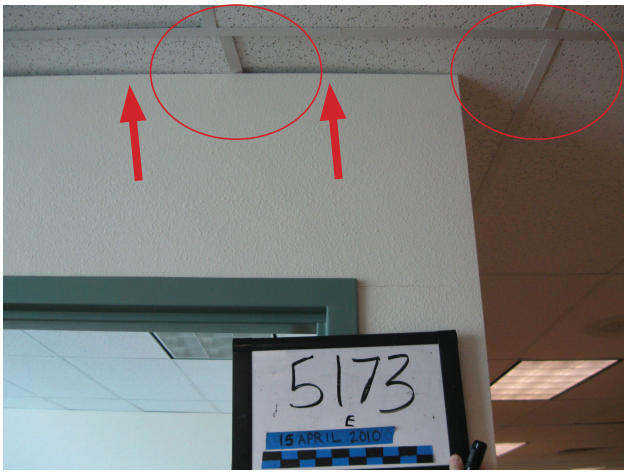




Top left: Building movement resulting in crushed walls.

Top right, bottom left and right: Buckled ceiling grid and panels.

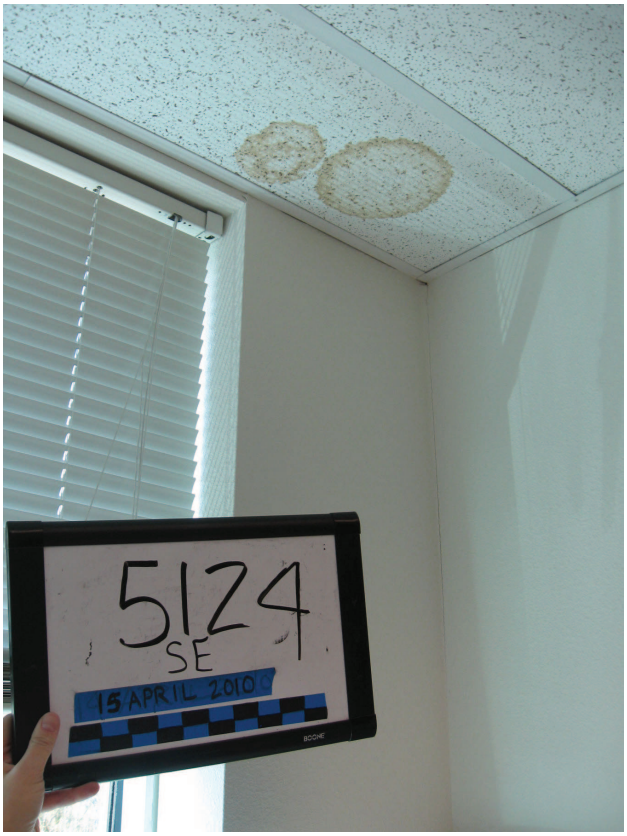




All photos: Buckled ceiling system is most severe at the Fifth Floor.

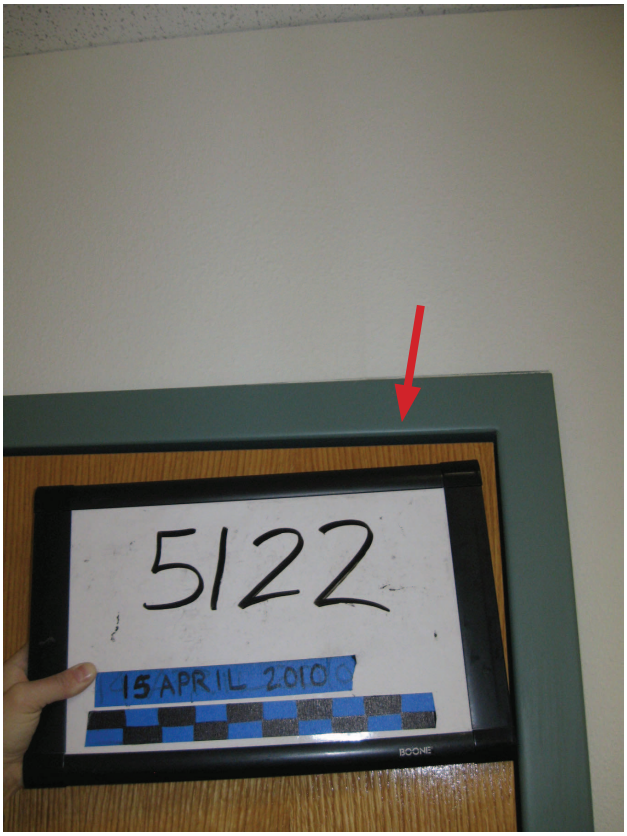
Top left and right: Significant building damage due to building movement.

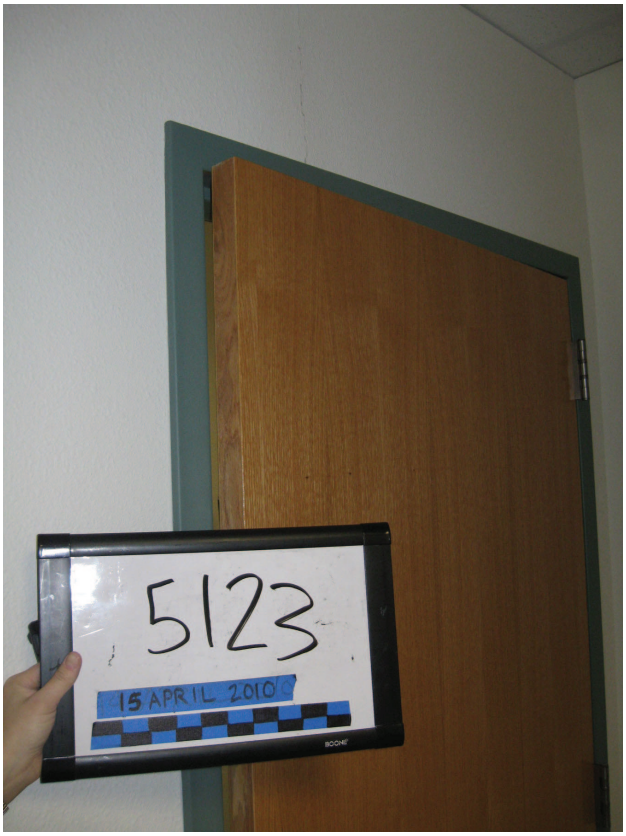
Bottom left and right: Damage due to water infiltration.

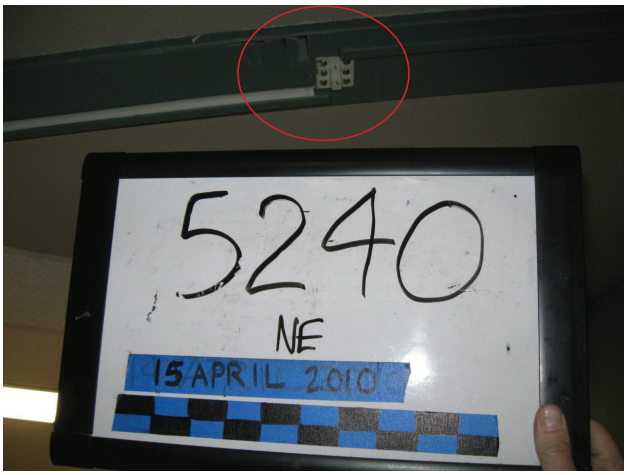


Top left and right: Damage due to water infiltration.

Bottom left and right: Racked door frames causing doors to bind.

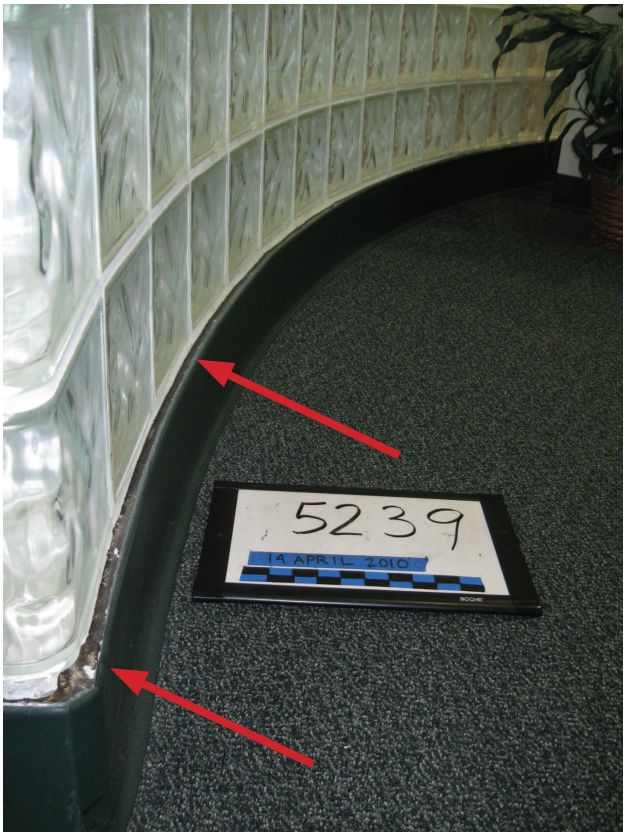






Top left and right, bottom left: Building movement has caused door frames to rack. In some instances, doors can not close completely.

Bottom Right: Building movement has resulted in other damage such as separately window sills.



Top left: Building movement has caused this glass block wall to shift on its base.

Top right: Building movement has caused rigid finishes to separate from walls.

Bottom left: Building movement has caused exterior window frames to rack. In this extreme example, the window frame is separating from the glass. This is noticeable by a sliver of daylight between the glass and window frame.

General Observations

Bus Mall and North Block

NE portion of Bus Mall foundation wall.

SE portion of Bus Mall foundation wall.

SW portion of Bus Mall foundation wall.

NW Portion of Bus Mall foundation wall.

All photos: Parallel cracks point toward the middle of the wall.

All photos: Columns can be measured to determine how much they lean.

Opposite page

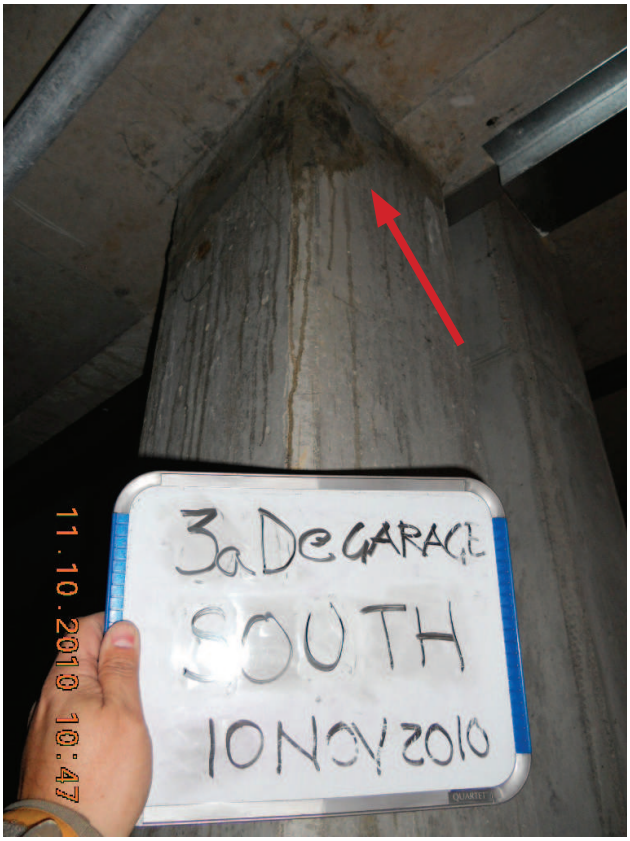
Top left and right: North Block column at grid M-1. Water infiltration is noticeable in the December photo.

Bottom left and right: Columns damaged and repaired during construction.


136|137
14 APRIL 2010


12.01.2010 11:33
136 137
12-01-10


11.10.2010 09:58
9J e GARAGE
NORTH
10 NOV 2010


11.10.2010 10:47
3a De GARAGE
SOUTH
10 NOV 2010


9G GARAGE
10NOV2010
11.10.2010 09:12


NO SMOKING
12.01.2010 12:06


11.10.2010 10:50


11.10.2010 10:50

Opposite Page

Top left: During construction at the time of concrete finishing, workers cleaned brooms by swiping them against columns. This condition was noticed at several locations.

Top right, bottom left and right: Water infiltration has highlighted cracks in columns due to the shortening of the Bus Mall slab.

Top left, right, bottom left: Scaling on underside of Bus Mall slab indicates ponded water on forms during concrete placement.

Bottom left: Reinforcing steel exposed, not properly placed.

Bottom right: Debris on forms during concrete placement.


10.27.2010 10:55

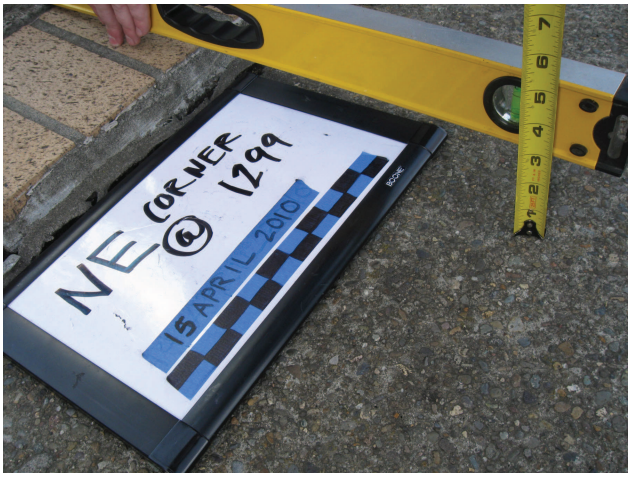

07.24.2010 16:21

General Observations

Site

All photos: Movement of the Bus Mall slab has resulted in cracks of the pre-cast concrete column bases.

Opposite Page: Cracks at the North Block slab have had several repair attempts; efflorescence has stained duct work; water infiltration has entered into electrical conduit.



Top left and right: Building movement has caused cracks at joints.

Bottom left: Settlement of the public sidewalk is most severe at the NE corner.

Bottom right: Migration of the Bus Mall paver surface is evident at painted crosswalks.

Top left: Migration of the Bus Mall paver surface is evident at painted crosswalks.

Top right, bottom left and right: Subsurface conditions at the Bus Mall are causing pavers to heave and move resulting in damaged pavers.

Top left: Subsurface movement produces dips which could lead to ponding of water.

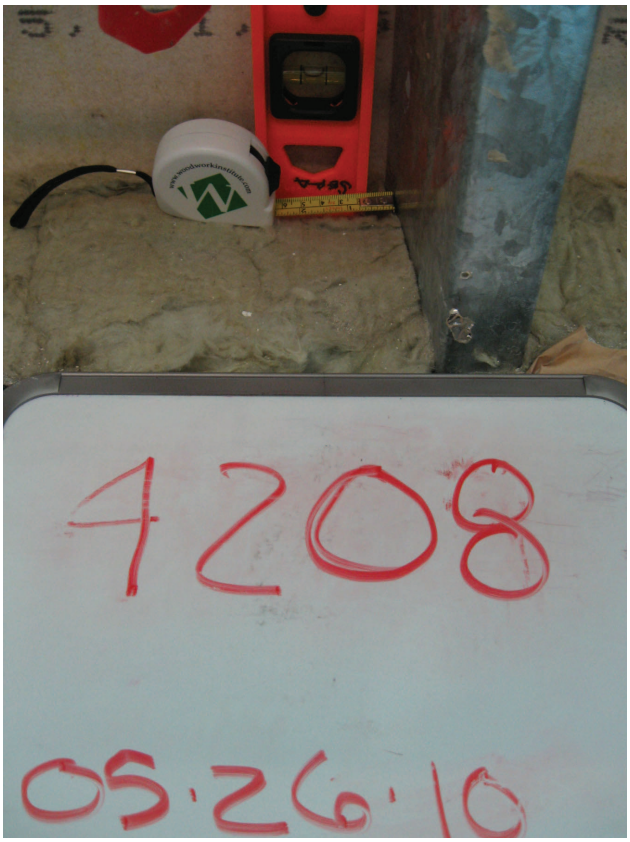
Top right: Settlement at the public sidewalk creates dips at the paver surface.

Bottom left and right: Cracks at the North Block slab span the entire width. Several repairs have been attempted.

All photos: Cracks at the North Block slab.

Exploratory Observations

Interior

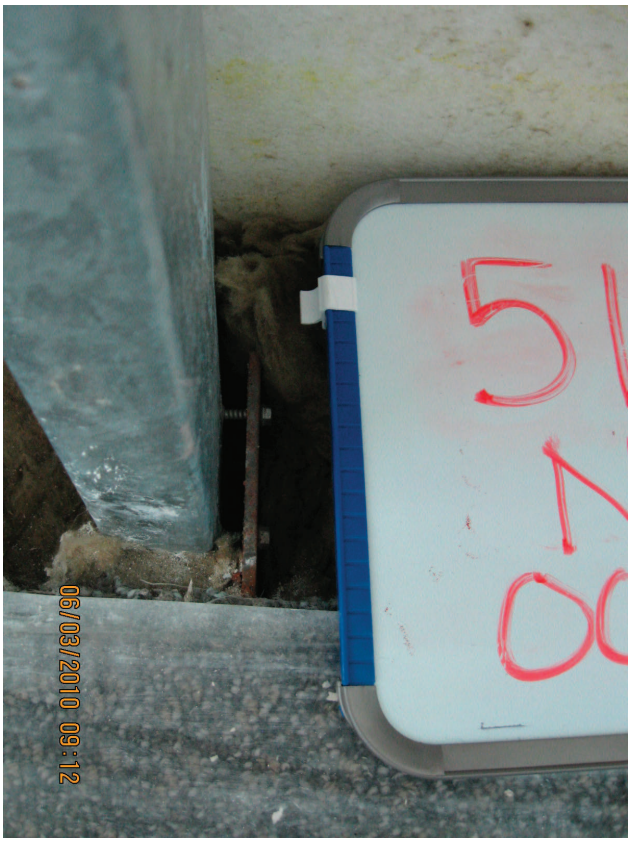


Top left and right, bottom right: Twisting of studs is greatest at the Fifth Floor and at the outer most east and west ends of the north and south walls. Twisting of studs is believed to be caused by floor slab shrinking and shortening.

Bottom left: Some studs have buckled as a result of building movement.

Top left: Slab deflections are forcing construction joints to widen resulting in damage.

Top right, bottom left and right: Twisting studs due to floor slab shrinkage and shortening.



Top left: Twisting of studs is less severe on the east and west walls.

Top right: The most severely twisted studs are approximately 3/4 inches out of plane.

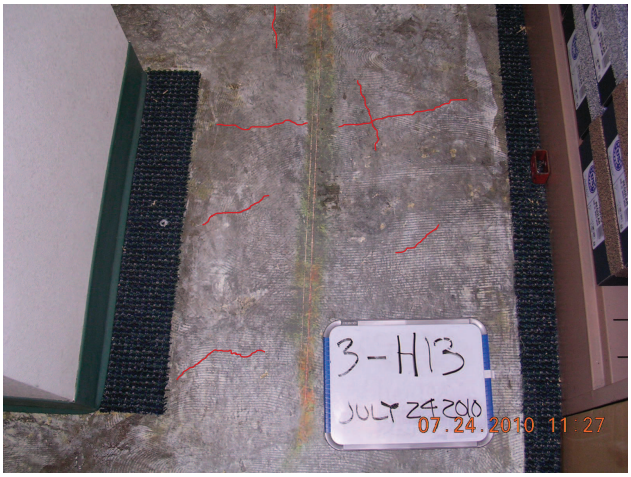
Bottom left: This stud was either not properly installed during construction or has surrendered to the building movement.

Bottom right: This stud has experienced significant twisting.

Top left: All observed studs exhibited some degree of twisting. The sign is mislabeled ; it is the north wall of 5299.

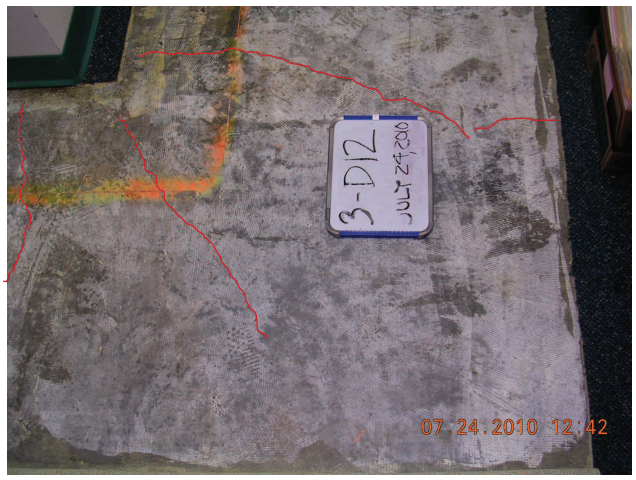
Top right: Twisted metal studs. The sign is mislabeled; it is the east wall of 5299.

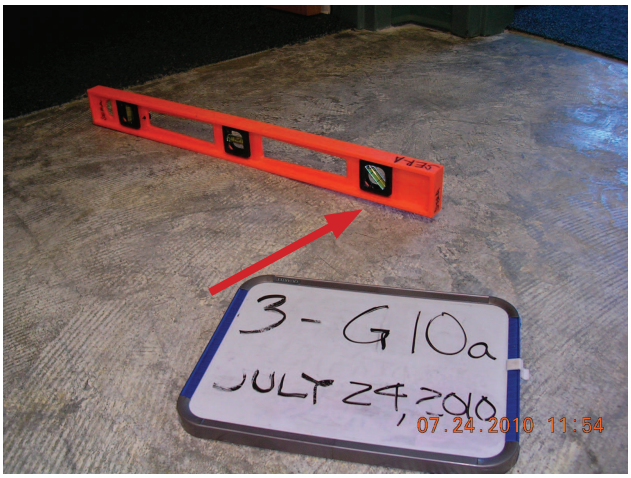
Bottom left and right: Twisted studs.



Top left and right: Cracks at column 0-13 at the Fifth Floor are highlighted. The crack pattern is similar to leaning columns at the Bus Mall.

Bottom left and right: Parallel floor cracks discovered during building punching shear investigation. Note: cracks have been traced for ease of viewing.



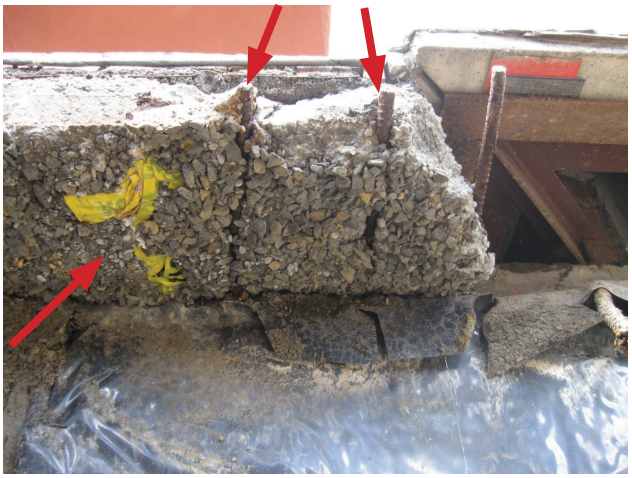


Top left and right, bottom left: Punching shear failure is evident by the presence of radiation cracks from the column.

Bottom right: Bump in the floor indicates installation quality during construction. This is noticeable at the gap between the floor and level.

Exploratory Observations

Foundation Wall



Top left and right: Reinforcing bars not installed properly. Debris is evident in the casting bed during construction.

Bottom left: Installed reinforcing bar bent during construction was not repaired. Bar in background indicated proper installation depth.

Bottom right: Joint between building and Bus Mall slab. Slab shortening ripped apart installed rubber water proofing.

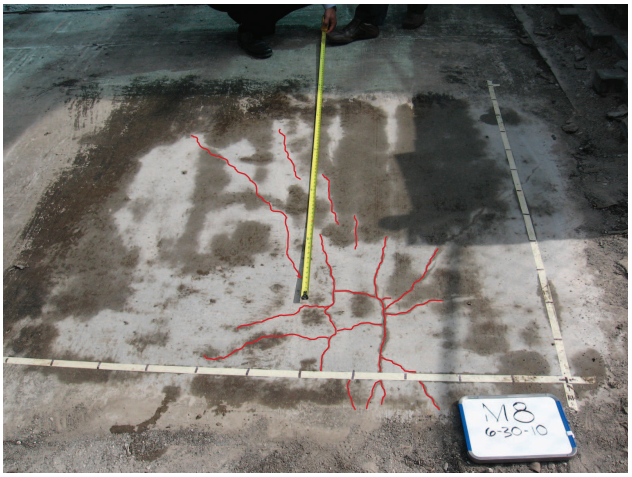
Top left: Joint between building and Bus Mall slab. Slab shortening exacerbated and compounded water infiltration issues from poor design detailing.

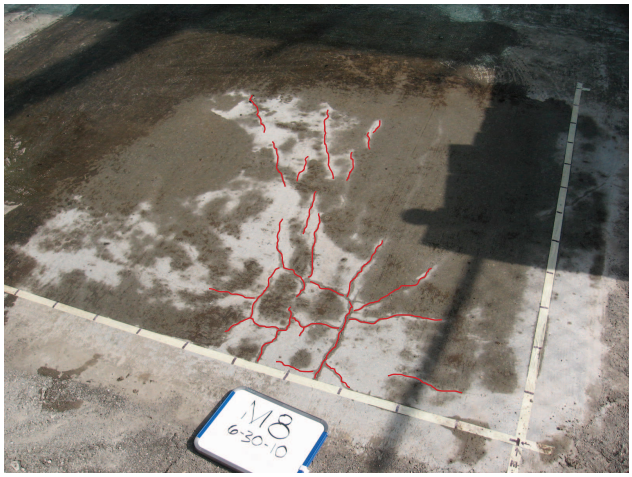
Top right, bottom left: Slab shortening and horizontal movement was not properly accounted for and detailed. This is evident by sheared waterproofing and cracks at the foundation wall/slab interface. The column at this location on the interior is significantly damaged.

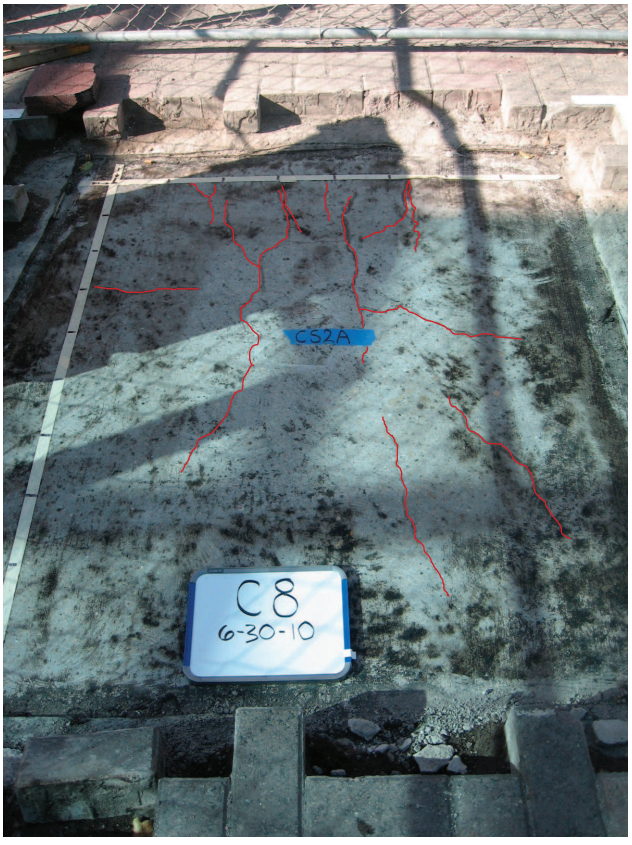
Bottom right: Building slab shortening has resulted in diagonal cracking of the foundation wall.

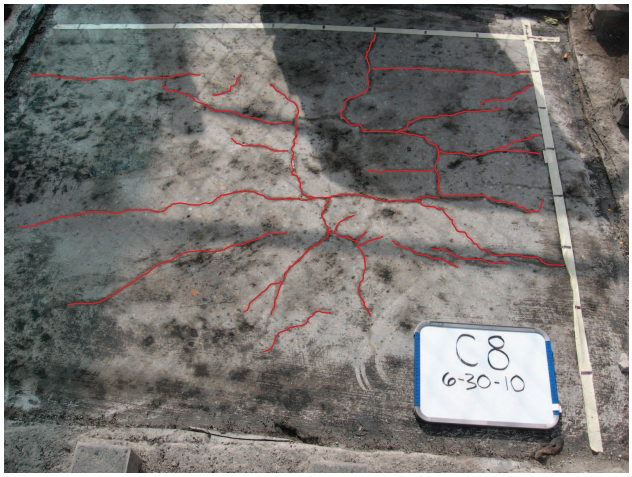
Exploratory Observations

Bus Mall

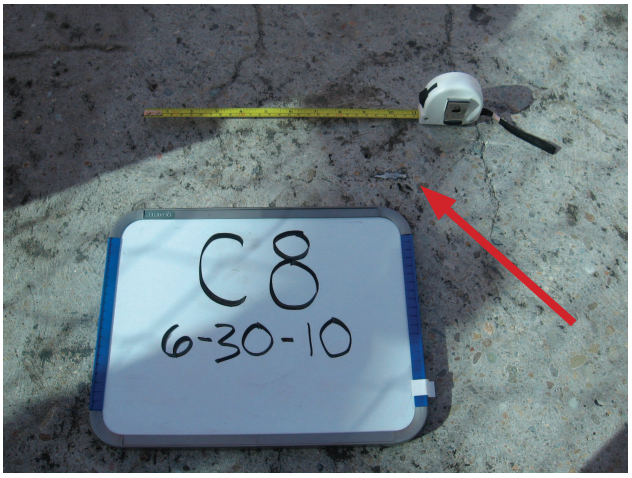


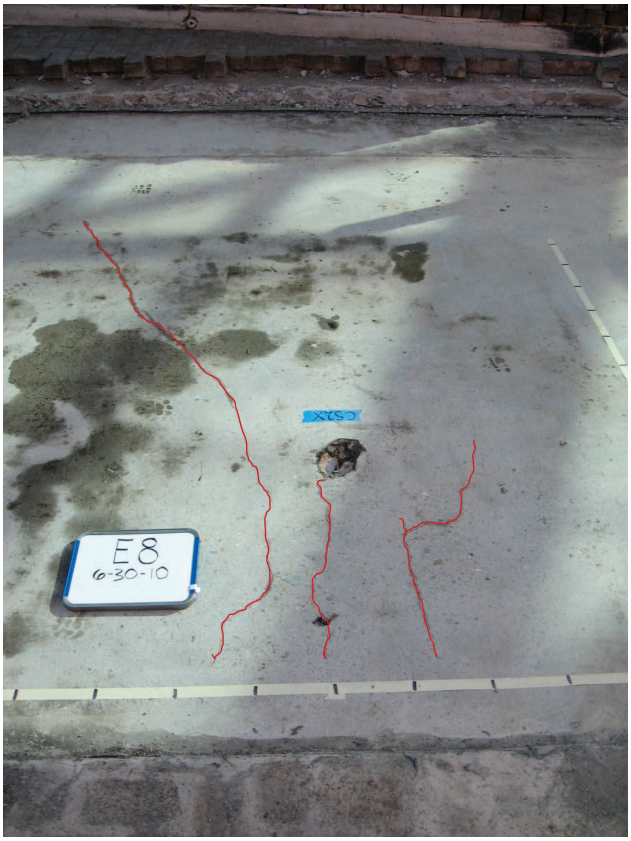


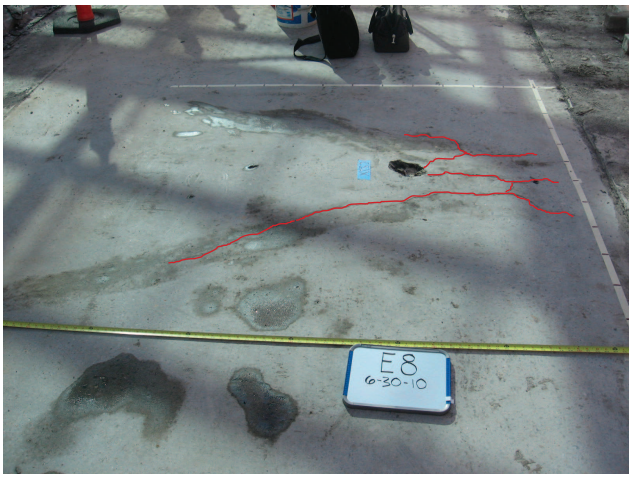


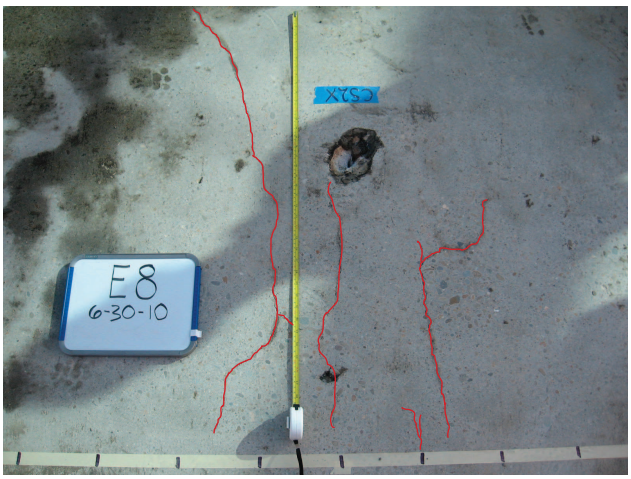


All photos: Evidence of punching shear failure was found at all investigated locations of the Bus Mall slab. Note: Cracks have been traced for ease of viewing.



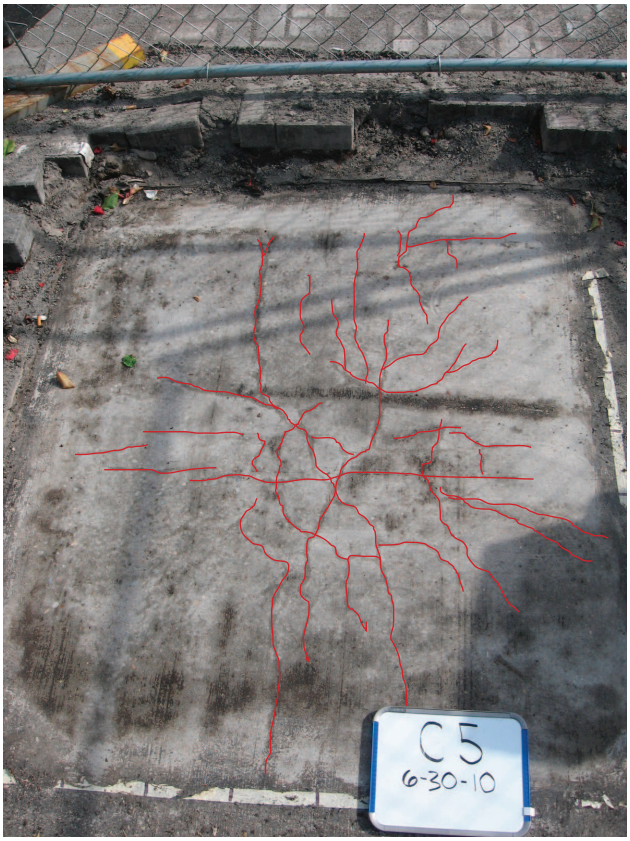


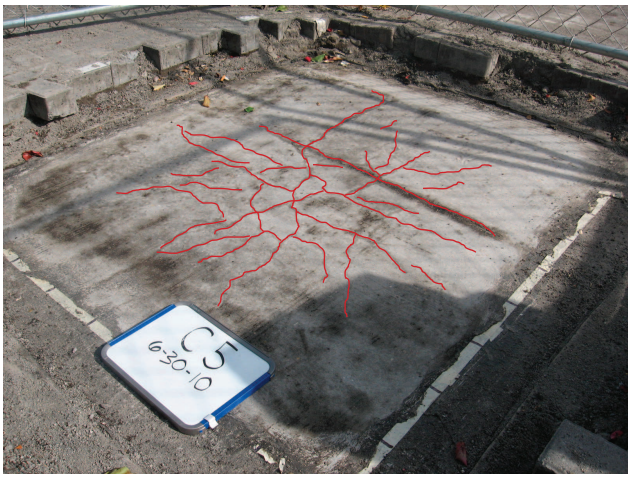


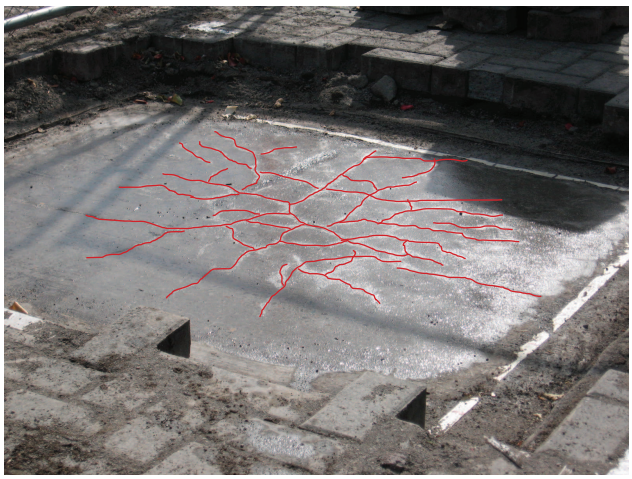


Top left: An improperly installed reinforcing bar can be seen exposed at the top of the Bus Mall slab.

Top right, bottom left and right: Evidence of punching shear failure at gridline E-8. Unrepaired damage from construction was found at this location. Note: Cracks have been traced for ease of viewing.

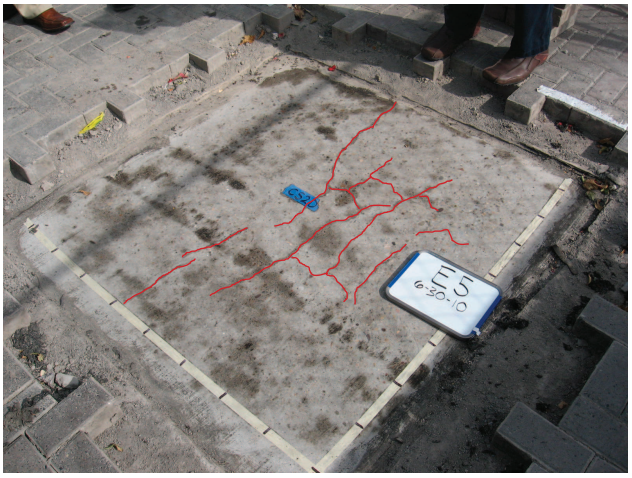


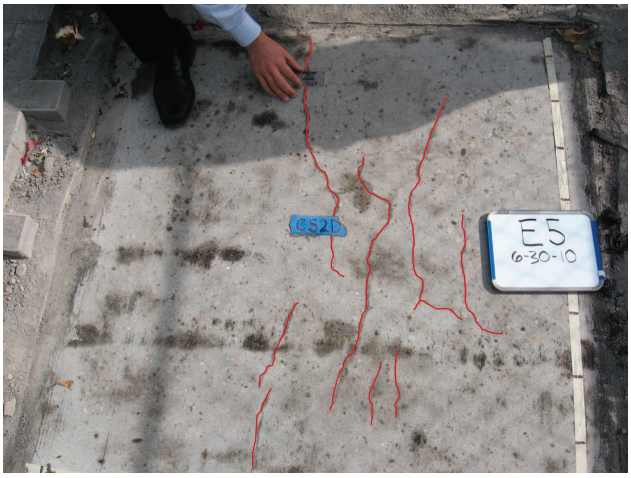




Top left: Location E-8 has a perceptible crown, sloping down and away from the unrepaired hole at a rate of 1/4 inch per foot.

Top right, bottom left and right: Evidence of punching shear failure at gridlines C-5. Note: Cracks have been traced for ease of viewing.





Top left and right: Evidence of punching shear failure at gridline E-5.

Bottom left and right: Thickness of the waterproof/ paver assembly varies from approximately 4-7 inches. Note: Cracks have been traced for ease of viewing.

All photos: Original design record drawings indicate the Bus Mall slab undulated to provide positive drainage for storm water runoff. Actual installation discovered found a uniformly sloping Bus Mall slab with a light weight concrete installed to provide slope to the paver surface.

SERA

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CONSULTING
ENGINEERS, INC.