

## STRUCTURAL ASSESSMENT – Baranoff ES (BLDG-182A and BLDG-182B)

Building Purpose	Administrative, Classrooms, Gymnasium, and Cafeteria
Inspection Date	December 07, 2016 (Morning)
Inspection Conditions	45° - Sunny & Damp

### **Building Description / Reported Structural Concern**

**Brief Description of Existing Structure:** Baranoff Elementary is a single-story school. Building A was built in 1998 and is composed of both suspended and grade-supported foundation systems. The 100, 200, 300, and 400 classroom wings on the south side of the building have a suspended floor system and the north wing (admin, café, kitchen, gym) is constructed with slab-on-grade, stiffened grade beams and spread footings below concentrated loads. The suspended floor system under the classroom wings is composed of drilled piers and cast-in-place columns supporting cast-in-place suspended interior and exterior beams with cast-in-place pan joist slabs. According to the existing plans, the piers could be constructed two different ways: if the piers were founded in clay then they were required to be under-reamed and if they were founded in rock then they could have straight-sided shafts. Building B was added in 2006 and has a grade-supported foundation system similar to the original building.

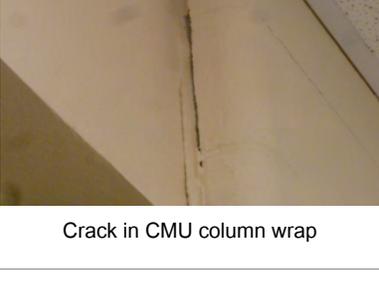
**Reported Structural Concern:** Cracks in the walls have developed throughout the main building (Building A) and in the annex (Building B). The annex was reported to have recent new cracks and the old cracks have worsened.

### **Structural Assessment Site Observations**

While at the facility we made the following observations:

- Interior Observations for Building B:** Multiple cracks and wall separations were observed at both perimeter and interior walls. Most of the wall cracks/separations in the walls occurred in the walls with drywall sheathing or at the transitions between drywall sheathing and CMU walls. Cracks/separations were also commonly seen at intersections of abutting walls. The cracks/separations in the CMU walls typically occurred at wall intersections or at control joints in the CMU wall. Cracks were also found in the hallway where CMU pilasters wrap around steel columns. The same cracking pattern was found throughout all classrooms, with the exception of classroom 501 which did not have any visible cracks. Cracks/separations were generally vertical and typically occurred near the top of wall.

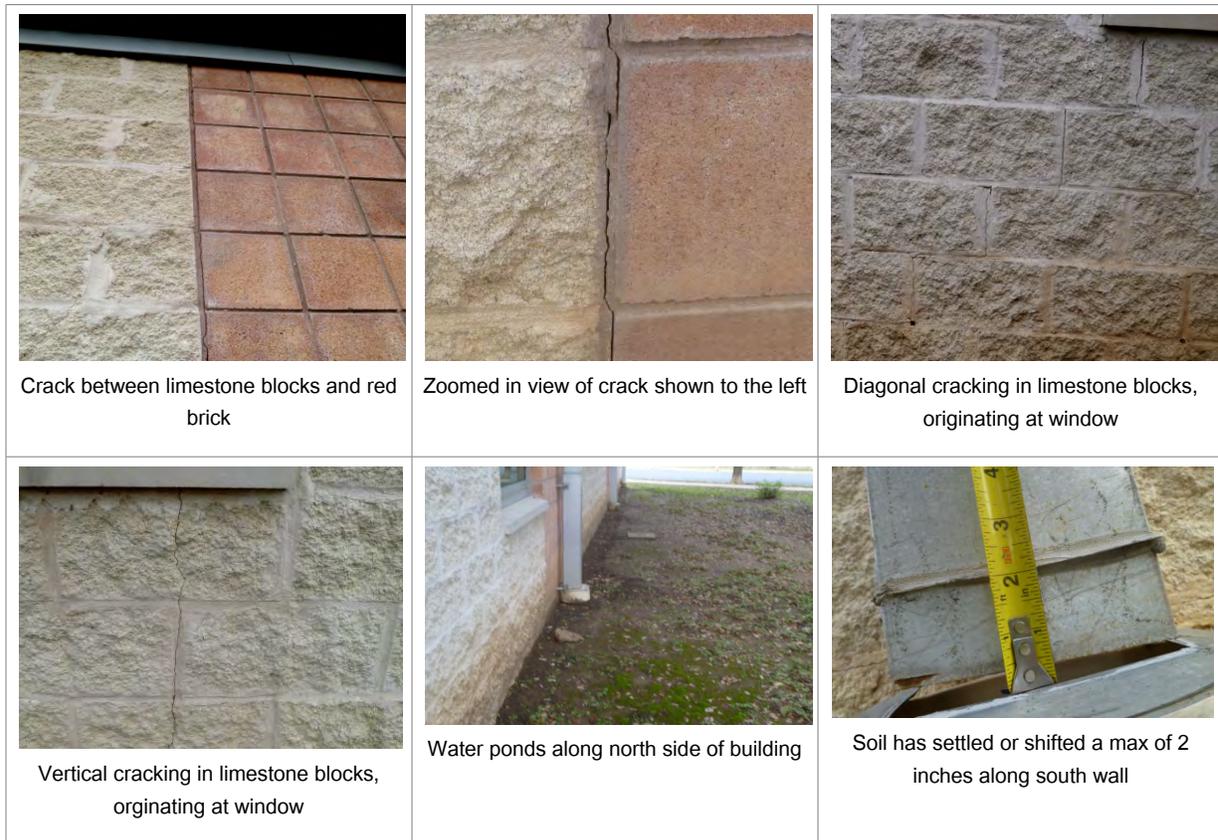
Slab cracks could not be observed because the floor slab was concealed by floor finishes. Small water stains were found in the ceiling tiles of Room 508 near the north corner indicating potential roof leaks.

		
<p>Separation at intersection of abutting walls</p>	<p>Separation at transition joint between CMU and sheet rock walls</p>	<p>Separation at joint between CMU wall and intersecting furr down</p>
		
<p>Control joint in CMU wall has opened</p>	<p>Separation between intersecting CMU walls</p>	<p>Crack sheet rock wall over door</p>
		
<p>Crack in CMU column wrap</p>	<p>Water stains on ceiling of Room 508</p>	

- Exterior Observations for Building B:** Multiple vertical cracks were observed in the masonry veneer along the exterior of the building. The cracks typically occurred in the vertical mortar joints between the tan limestone blocks and the red square tiles. Diagonal and vertical cracks are also prevalent at corners below window openings around the building.

There are several area drains in the ground around the building. However, surface water around the building does not appear to be flowing directly to the area drains: along the north side of the building the existing grade is either flat, slopes down toward the building, or the flow path to the area drain takes the water next to the building. Along the south building perimeter the soil appears to have settled and/or shifted, because the downspouts from the roof are vertically separated from and no longer laterally aligned with the storm sewer collector pipes at ground level. Existing grade along this face of

the building has a somewhat steep slope away from building and then steps down at a block retaining wall along the nearby sidewalk, and we suspect that the soil may be sliding downhill at this location. Monitoring, however, would be needed in order to fully understand soil movement around the building.



- Interior Observations for Building A:** The observations for the interior of Building A are divided into two discussion sections, one for the slab-on-grade wing and one for the suspended wings.

**Slab-on-Grade Wing:** The slab-on-grade system had similar problems to that of Building B, with wall cracks/separations at corners and joints. Large cracks on both sides of the north exit door ran from the ceiling to the top of the door on the right side and from the ceiling to the floor on the left side. Cracking was also present at the corners of the gymnasium and ran from the top of the CMU to the floor. Minor cracks starting at doorway corners were present at the northern end of the main building hallway.

**Suspended Wings:** Separation of joints and cracking at wall corners was also found in all four classroom wings. The areas with the most significant signs of distress were typically found near the expansion joints between wings. At these locations the vertical and horizontal movement was visible in the metal plates covering the wall expansion joints. The floor cover plates did not showing signs of distress but the difference in elevation from one side of the joint to the other could be felt. Additional minor cracking in walls was found around doorways in the form of small vertical and horizontal cracks at corners of the openings.



Cracking on either side of the north exit doors.



Cracking in the CMU joint in the gym



Expansion joint cover plate between slab-on-grade wing and 100-200 wings has pulled away from wall (indicating differential movement)



Expansion joint cover plate between 100-200 wings and 300-400 wings has pulled away from wall (indicating differential movement)



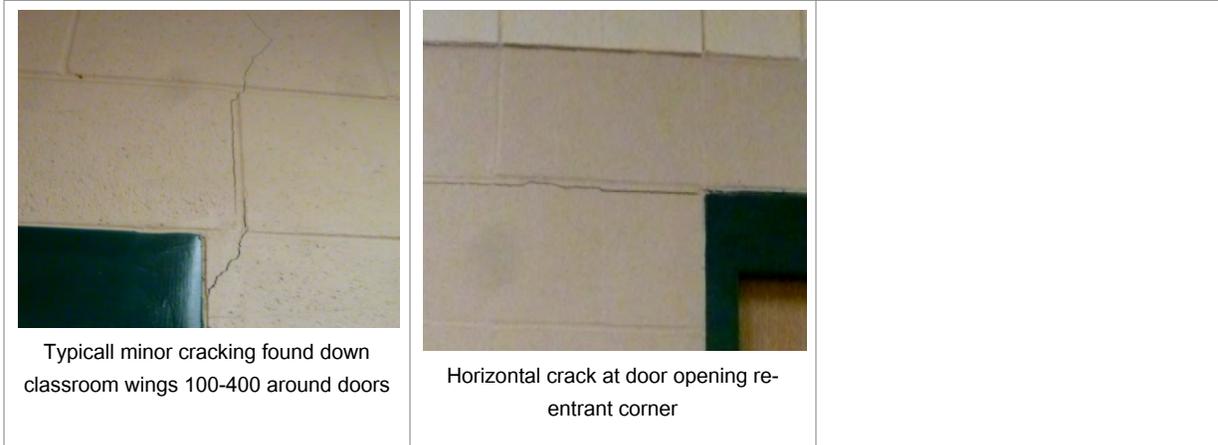
Previously installed metal angle to hide crack in CMU wall



Previously installed metal plate covering crack has pulled away from wall (indicating differential movement)



Vertical cracks typically found at ends of classroom wings 100-400 above exterior door



- Exterior Observations for Building A:** Cracks were observed on the north perimeter wall of Building A. The cracking was near a leak in the gutter. Three areaways around the 100 and 200 wings were filled in with gravel and were no longer providing ventilation for the crawl space below. Site grading around the 200 and 400 classroom wings typically sloped down toward the building instead of away from the building and several locations had eroded soil adjacent to the building due to poor drainage.





**Conclusions**

The cracks in the walls and exterior masonry veneer are most likely due to differential soil movement. According to the existing plans, some portions of the building are constructed on expansive clay soils (although it cannot be ascertained from the existing plans which portions of the building are founded in expansive soils and which are founded in rock). The portions of the building supported on clay soils are subjected to differential movement as the exposed soils surrounding the building perimeter expand and contract as the soil moisture content changes, while the protected soils below the building slab do not experience changes in water content and therefore do not expand or contract. Building B and the north wing of Building A are grade-supported and as such are particularly perceptible to soil movement. Even though the classroom wings are suspended and are intended to be isolated from soil movement, the drilled piers that support the suspended wings are likely not deep enough to completely bypass the active zone of the clay soils or were not properly constructed with underreamed ends, and these suspended wings are also subjected to soil movements as the water content of the soil in the crawl space changes (although soil movements should be to a lesser degree than the grade-supported areas).

The damage to the walls and exterior masonry veneer can be limited significantly by controlling the water content of the soils around the building and in the crawl space. Providing positive site drainage away from the building and directing surface runoff to be quickly collected by the area drains will help. Concrete flumes around the building can also help control the flow path of surface runoff and prevent it from seeping into the soils.

## Baranoff ES – Summary of Structural Repair Recommendations

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This document is based on current conditions observed during fieldwork and provides recommendations for corrective actions.

### **Baranoff ES Structural Repair Recommendations**

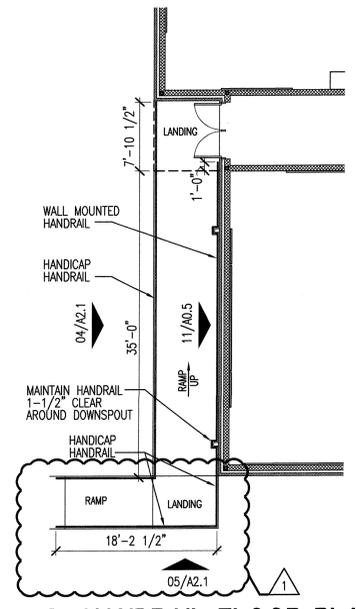
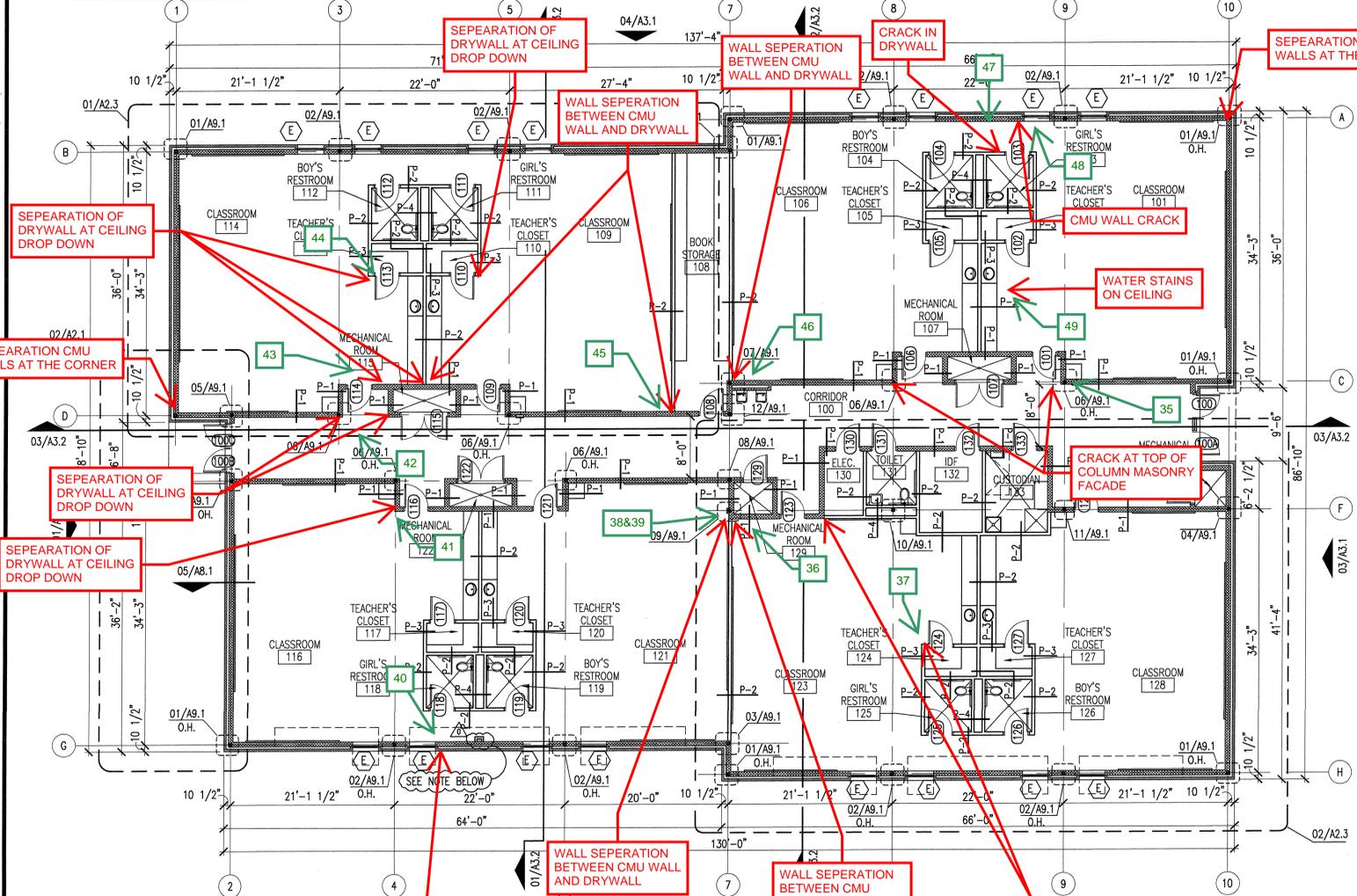
- 1) Monitor the soils on the south side of Building B to determine whether it is sliding downhill. If it is determined that the soil is sliding, then countermeasures should be implemented to stabilize the slope, such as replacing the block retaining wall with a deeper, stiffer cast-in-place retaining wall or holding the slope in place using tiebacks or soil nails.
- 2) Re-grade site around the building so that surface water drains quickly away from the building and into the surrounding area drains before soaking into the soils. Construct concrete flumes if needed.
- 3) If site re-grading does not satisfactorily reduce the cracking, consider adding a 6ft to 8ft wide continuous concrete apron around the building perimeter so that soil immediately adjacent to the building is not exposed to surface water.
- 4) At Building B exterior veneer, replace vertical mortar joints with a flexible sealant and/or sawcut new vertical joints along the crack lines between the tan limestone blocks and red square bricks.
- 5) If cosmetically desired, repair interior wall cracks:
  - a. Repair cracked drywall sheathing and repoint cracked CMU mortar joints. Note that this effort may be a continual maintenance item, as small cracks may still develop in the walls over time.
  - b. Another option to repair wall cracks at joints that may require less maintenance is to clean and fill the wall cracks with an expansive caulk/filler material. This would allow the existing cracks to continue to expand and contract as the soil expands and contracts in the future, and hopefully would prevent new cracks from developing.
- 6) Find and repair roof leaks and, if desired, replace stained ceiling tiles.

*Note: This report is based on and limited to the observations and information noted above. This is not a guarantee. Additional deficiencies may exist which were not observed and which may require additional remedial work which is not listed here.*









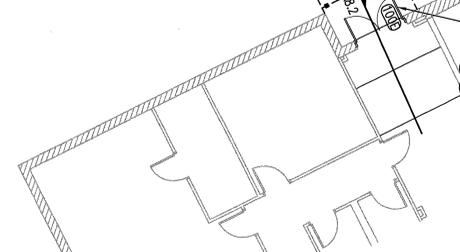
**LEGEND:**

- Red arrow: DAMAGE ON INTERIOR OF BUILDING
- Blue arrow: DAMAGE ON EXTERIOR OF BUILDING
- Green arrow: PHOTO IDENTIFICATION

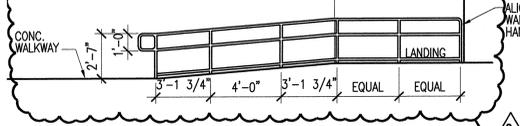
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**ARCHITECT**  
REGISTERED ARCHITECT STATE OF TEXAS  
1/18/07

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REMOVE EXIST. DOOR, HARDWARE AND FRAME. REMOVE EXISTING CMU LINTEL AND STEEL LINTEL AND ADD NEW CMU AND STEEL LINTEL PER DETAIL 11S4.0. INSTALL NEW DOOR FRAME - FIELD VERIFY FRAME WIDTH AND HEIGHT. INSTALL NEW DOORS TYPE D. FIELD VERIFY DOOR WIDTH AND HEIGHT. INSTALL DOORS USING EXISTING HARDWARE. EXISTING CARD READER SHALL REMAIN AND SHALL OPERATE NEW DOORS TO MATCH EXISTING DOORS. DOOR DETAILS SIMILAR TO 06 & 11A2.4. E



**RENOVATIONS AND ADDITION TO BARANOFF ELEMENTARY SCHOOL AUSTIN INDEPENDENT SCHOOL DISTRICT AID PROJECT NO. P06-0002-BARNF**  
12009 BUCKINGHAM GATE RD. AUSTIN, TEXAS 78748

SHEET TITLE: **FLOOR PLAN AND CANOPY PLAN**

REVISIONS:

0 FOR CONSTR.	01/08/07
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PROJECT NO.: 05-360  
DATE: 27 OCTOBER 2006  
DRAWN BY: S.H.  
CHECKED BY: D.K.T.

SHEET NO.: **A2.1**  
OF 1

SEQUENCE NO.:

AS-BUILT

182-0425

LEGEND:

- ← DAMAGE ON INTERIOR OF BUILDING
- ← DAMAGE ON EXTERIOR OF BUILDING
- ← PHOTO IDENTIFICATION

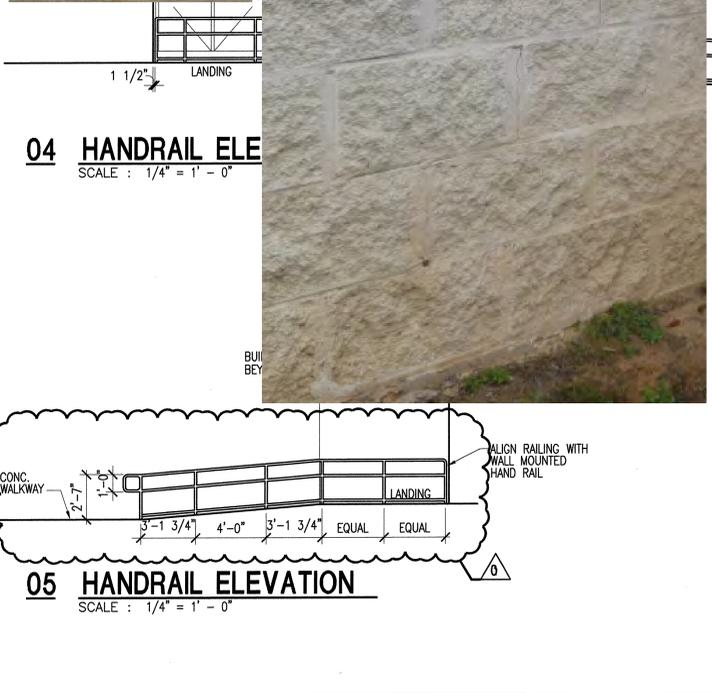
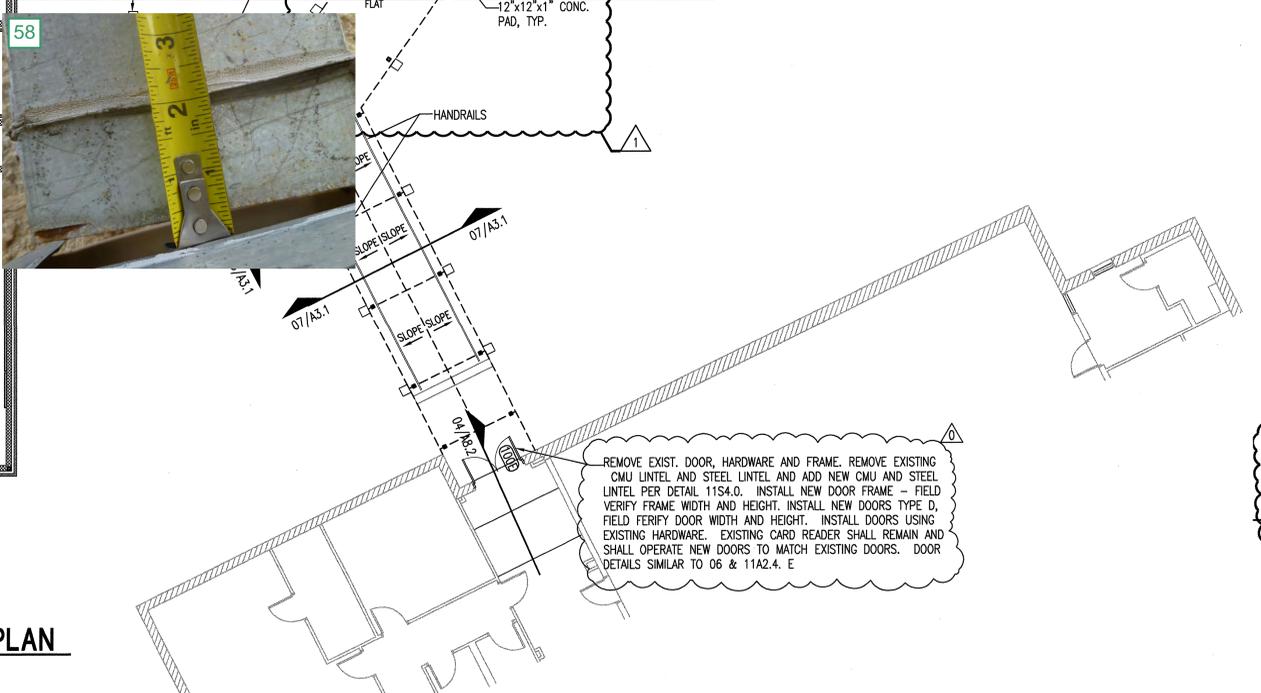
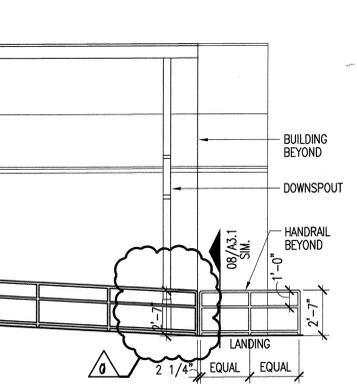
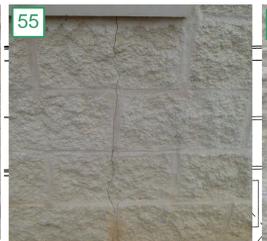
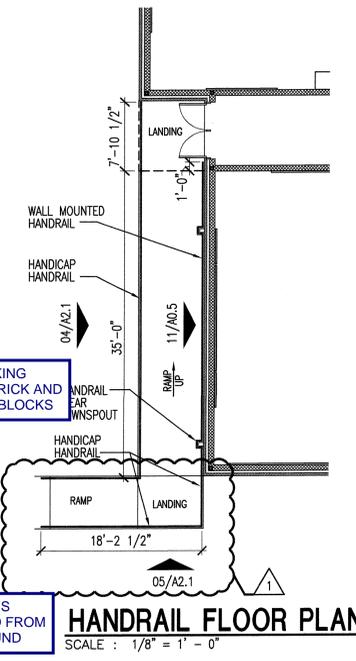
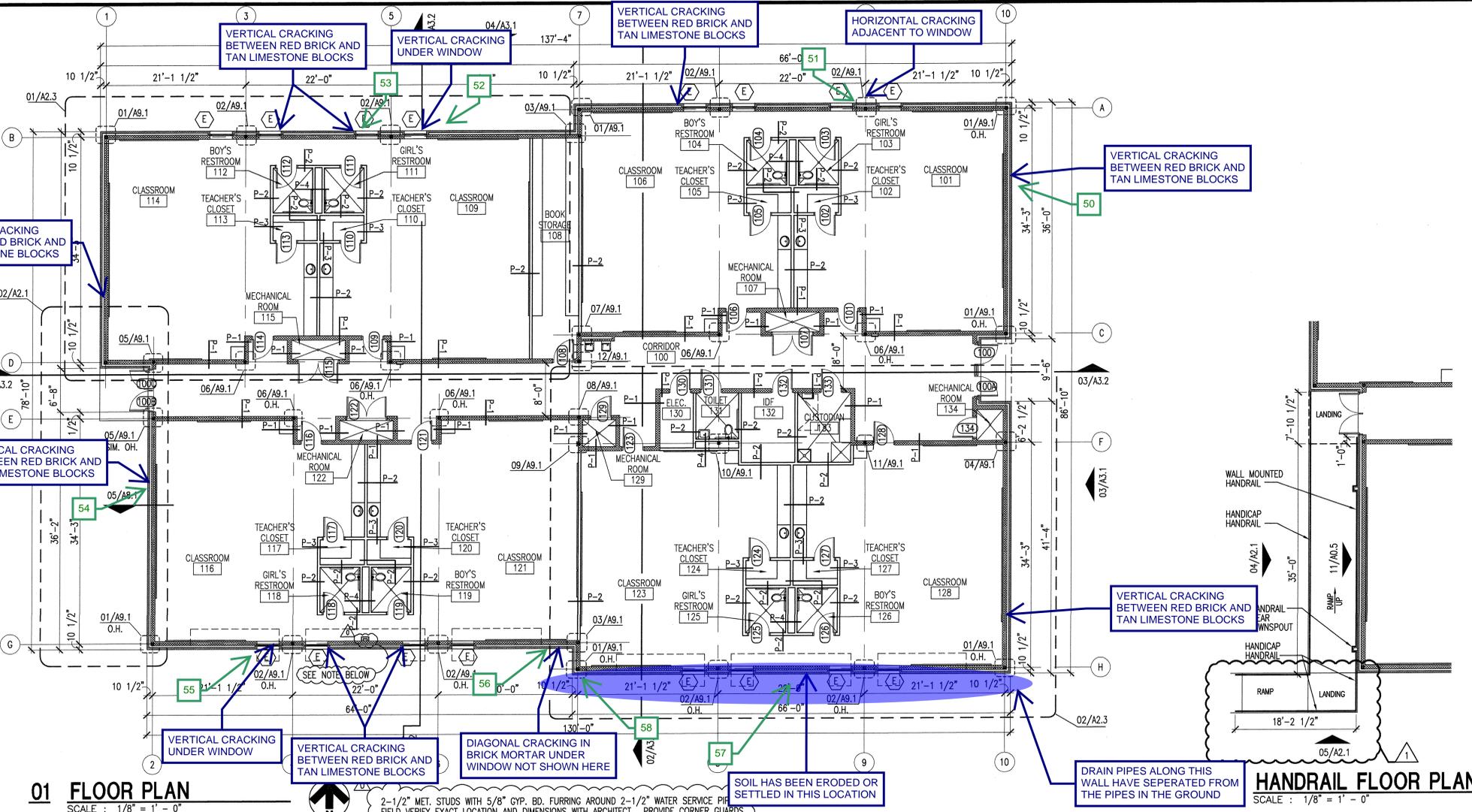
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