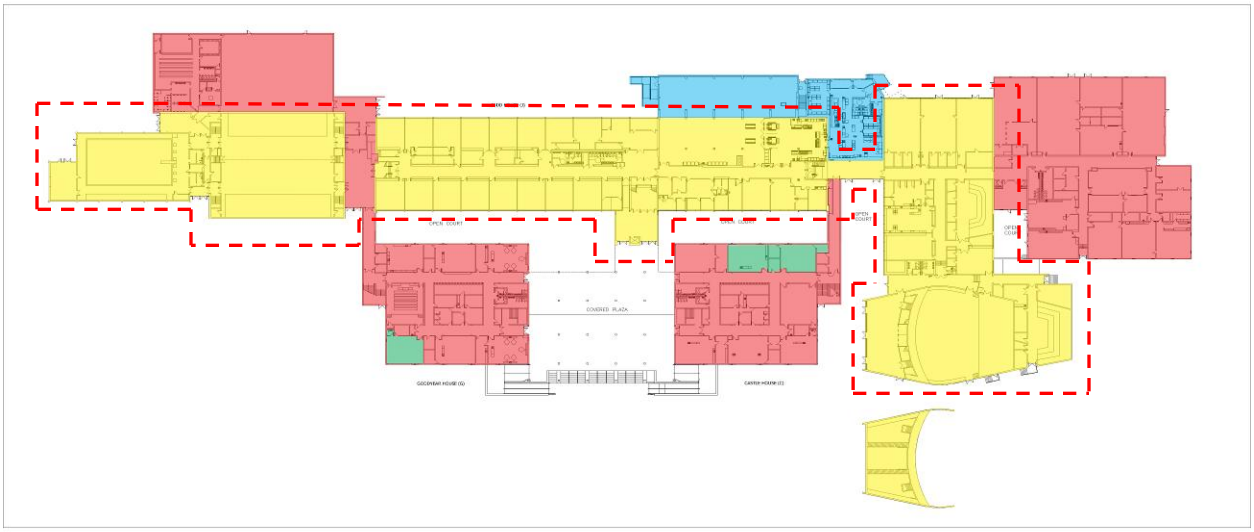
Structural Report

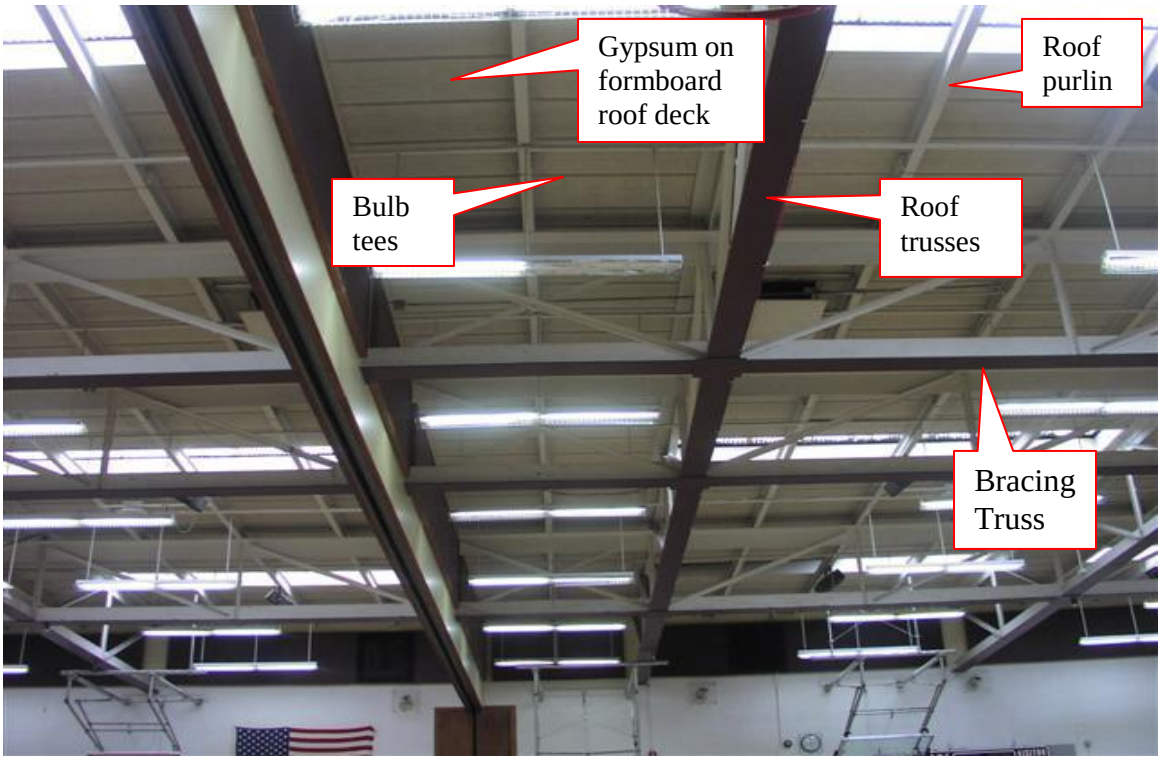
1959 Original Building



Description

The original school building consists of a steel framed structure supported on reinforced concrete foundations. The two story classroom structure was constructed with poured gypsum on formboard roof deck supported by steel joists that span between wide flange beams. The Upper Level floor is a concrete floor slab on metal deck that is also supported by steel joist spanning between wide flange steel beams. The wide flange beams at the roof and floors are connected to wide flange columns. The exterior columns on both the east and west faces of the building are encased in concrete and project beyond the face of the building. The columns are anchored to the reinforced concrete piers, walls and footings. Utility tunnels begin at the Boiler Room that is located in the Basement Level beneath the Cafeteria and continue around the perimeter of the building.

The Gymnasium is a two story building with steel trusses spanning the Gymnasium floor and bearing on steel wide flange columns. Steel purlins span between the trusses and support bulb tees and support the cementitious fiber reinforced roof deck.



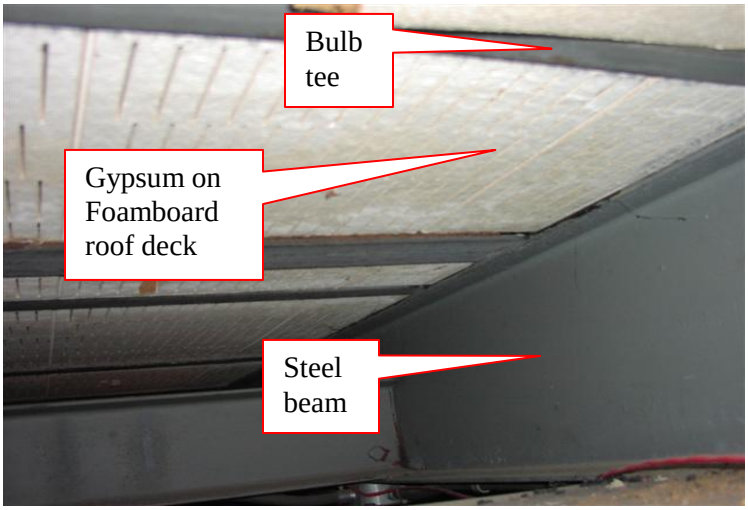
Original Gymnasium Roof Framing

The structure for the Lower Level consists of steel framed beams and columns which support the concrete Gymnasium slab.

Adjacent to the Gymnasium is the Natatorium Building. This structure was constructed with precast concrete tees that support the roof deck. The precast tees are supported on the exterior masonry bearing walls. The masonry bearing walls are supported on reinforced concrete foundation walls and footings. The pool walls and slab are also constructed of reinforced concrete.

Natatorium Roof Framing

The structure for the Auditorium consists of steel framed trusses spanning the Auditorium seating and framing into wide flange columns that are located on the perimeter. Similar to the Gym, purlins span between the trusses and support the roof deck. The attached Music Rooms are framed with steel roof beams supporting steel joists and roof deck. The beams are attached to wide flange columns.

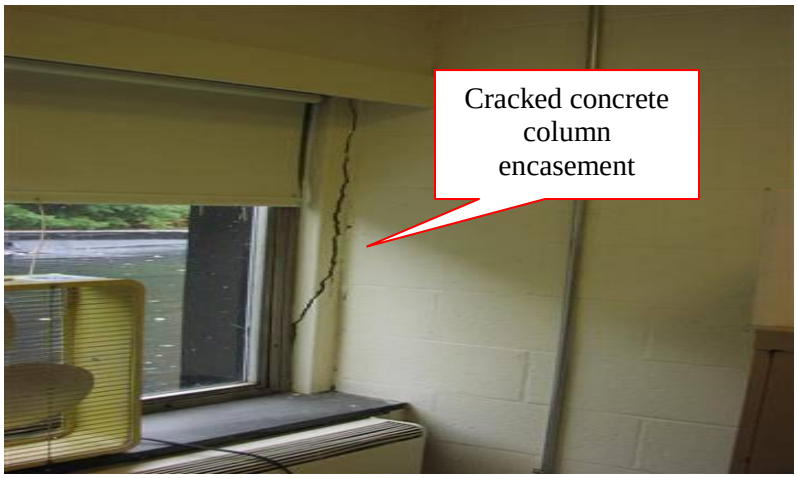


Auditorium Roof Framing

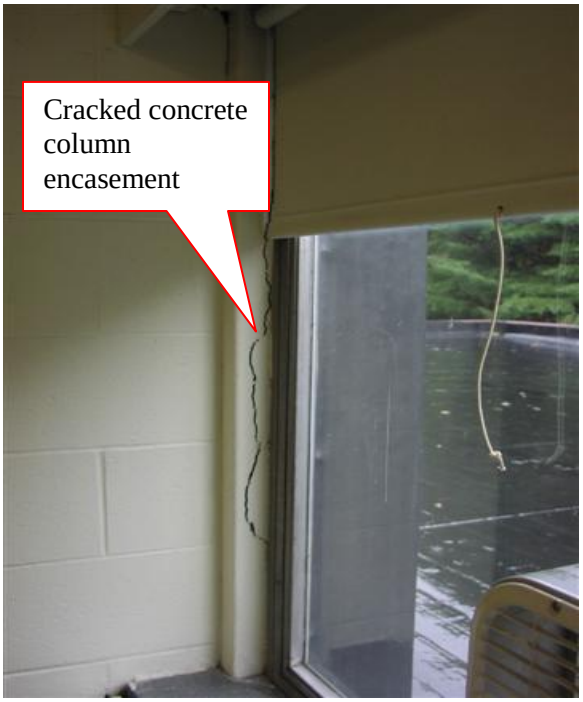
Existing Conditions Assessment

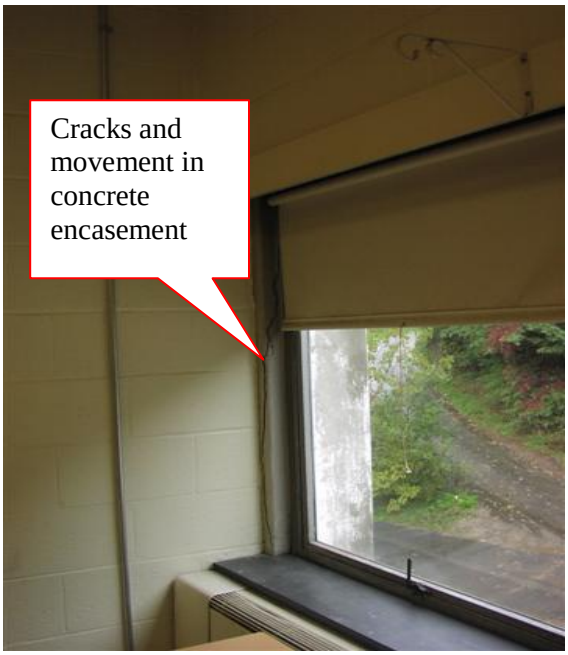
Structural deficiencies and deterioration observed in the original building are noted at locations below. There are two major areas of concern in the original school and three lesser issues that will require remedial action.

- The first item involves the exposed condition of the concrete incased steel columns at the two story classroom wing. The columns are exposed directly to the elements and are subjected to freeze / thaw cycles and water intrusion as well as heating from the interior. Typically, the concrete encasement has exhibited cracks and spalling with large vertical cracks occurring alongside the window frames on the inside. Typically the exterior cracks are hairline to 1/8" in width, traveling vertically.

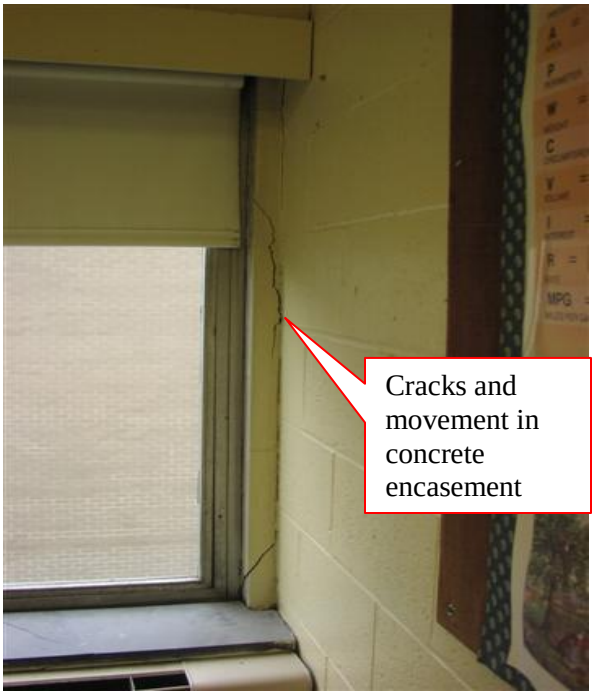


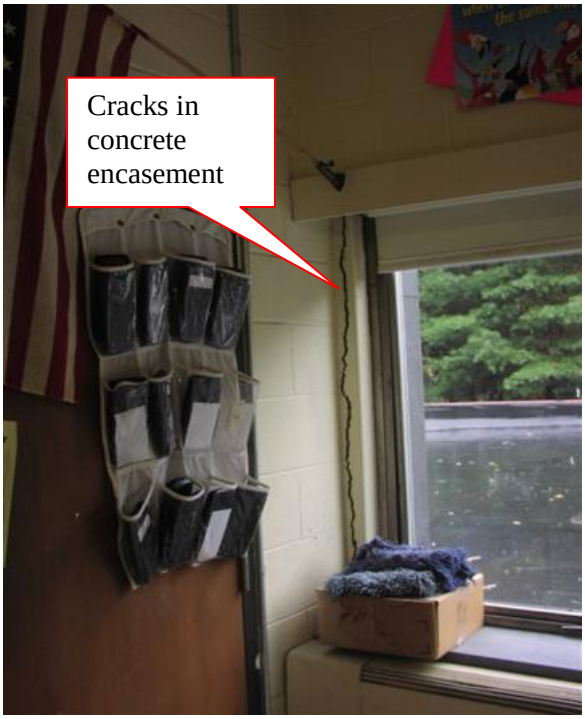
Condition at Column Encasement



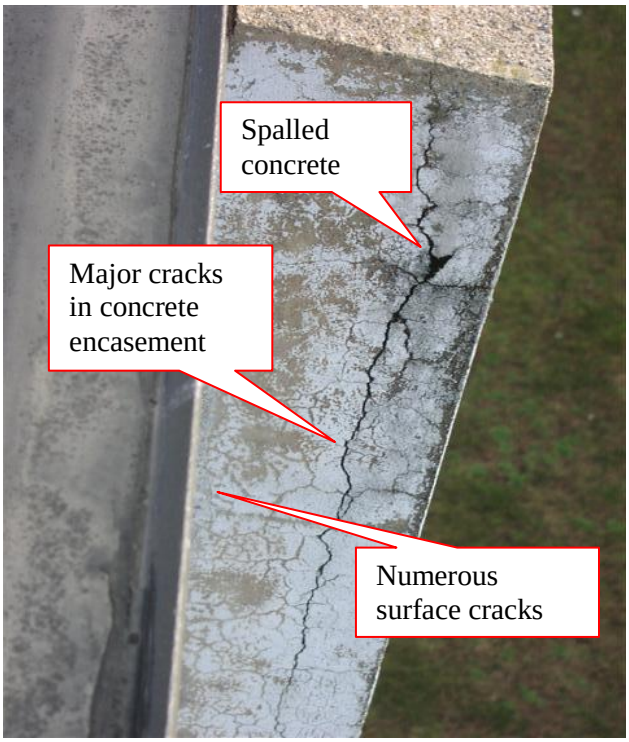


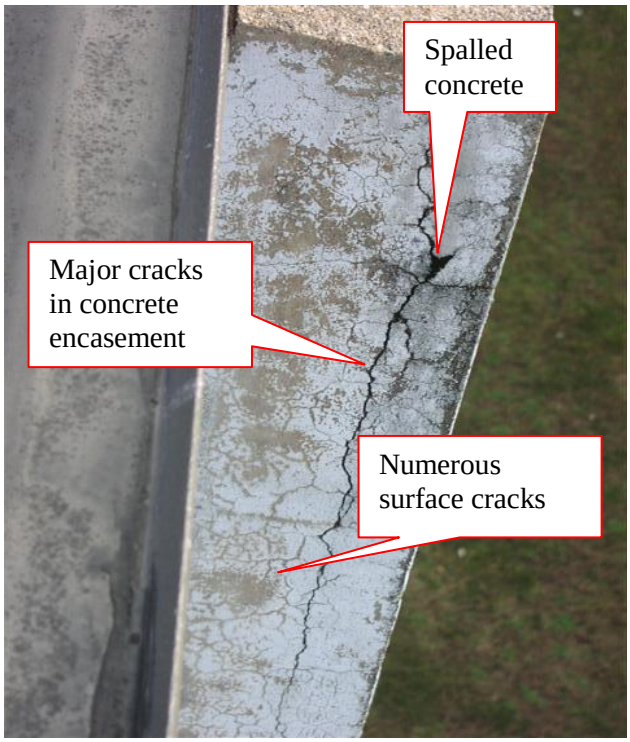
Interior Conditions at Column Encasement





Interior Conditions at Column Encasement

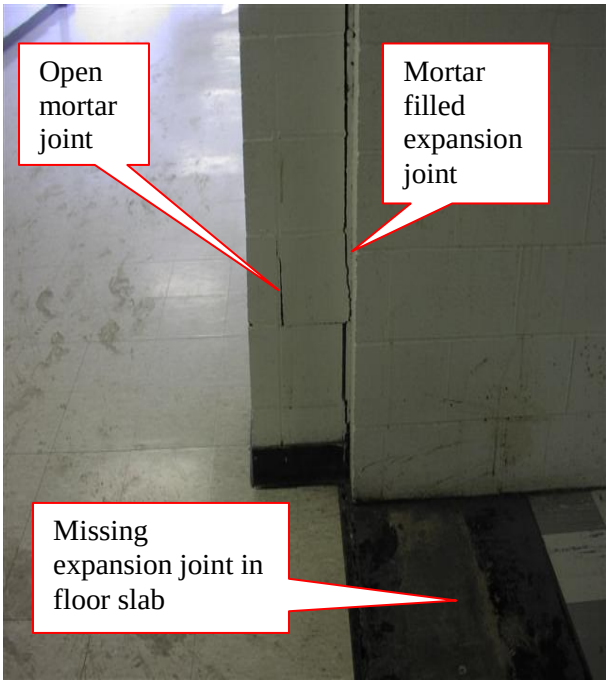




Numerous Cracks in Concrete Column Encasement – Exterior View

These cracks are allowing water to enter into the concrete encasement and the freeze / thaw cycle increases the amount of damage. The lack of any insulation and waterproofing to protect the concrete encasement from the cold and rain is aggravating the condition and it will continue to deteriorate.

- Cracks and movement in the concrete block walls and pilasters at the corridor connecting the 1974 addition to the original school on the east side of the building. The joint that has opened varies in width from ½" to 1". The floor slab also has opened at the joint between the buildings. Expansion joints are not present between the buildings. A condition is similar on the west connection between the two buildings.



Mortared Expansion Joint in East Connector

Close up of Joint at Column Enclosure in Upper Level of East Connector

Close up of Mortared Joint at North Wall of East Connector

Cracks and Movement at West Stair in Original Building

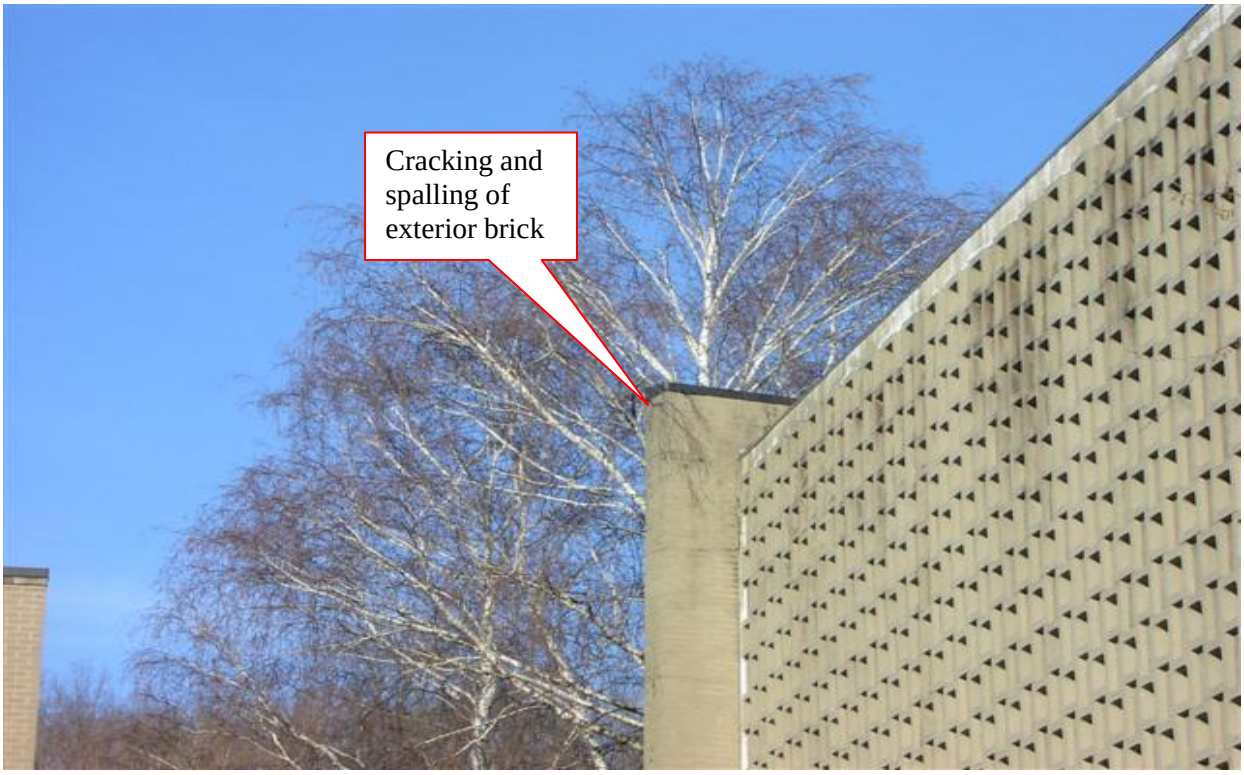
- Spalling of the concrete tees is visible from the exposed underside of the roof deck on the exterior of the south face of the Natatorium Building. The spalling has occurred around the precast concrete column located at the southwest corner of the building. The cause has not been determined.

South Face of Natatorium

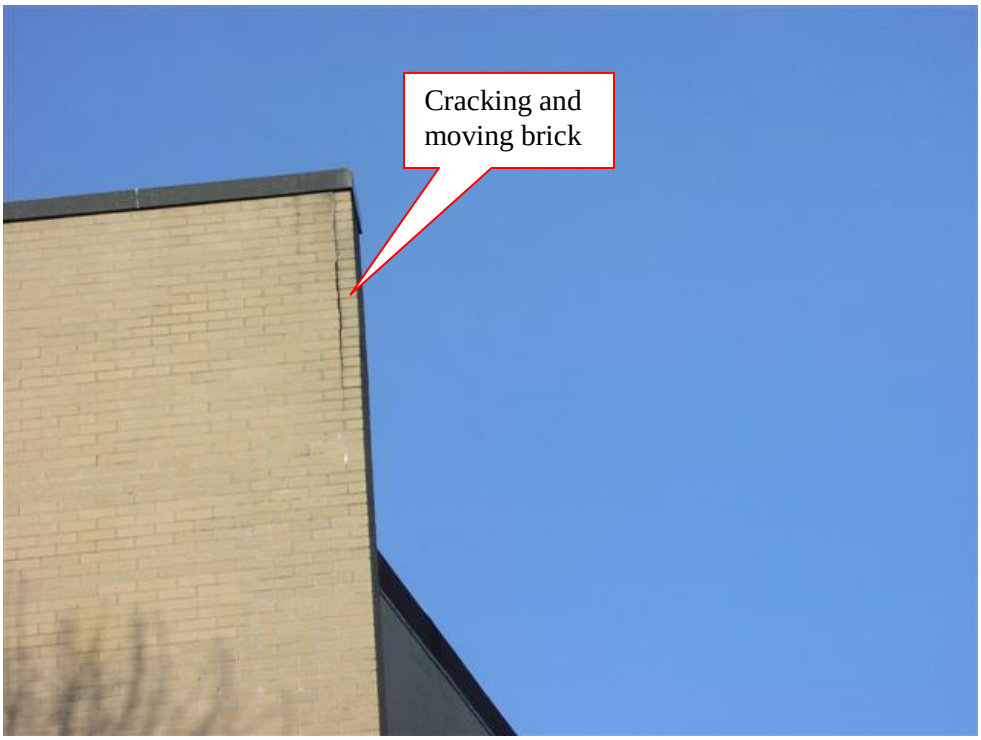
Close up of Spalling Condition

- The exterior brick wing walls at the Auditorium entrance are exhibiting movement and cracking. The cracking and movement is vertically between the outermost course of brick and the adjacent wall.

Condition of Exterior Masonry on South Wall of Auditorium

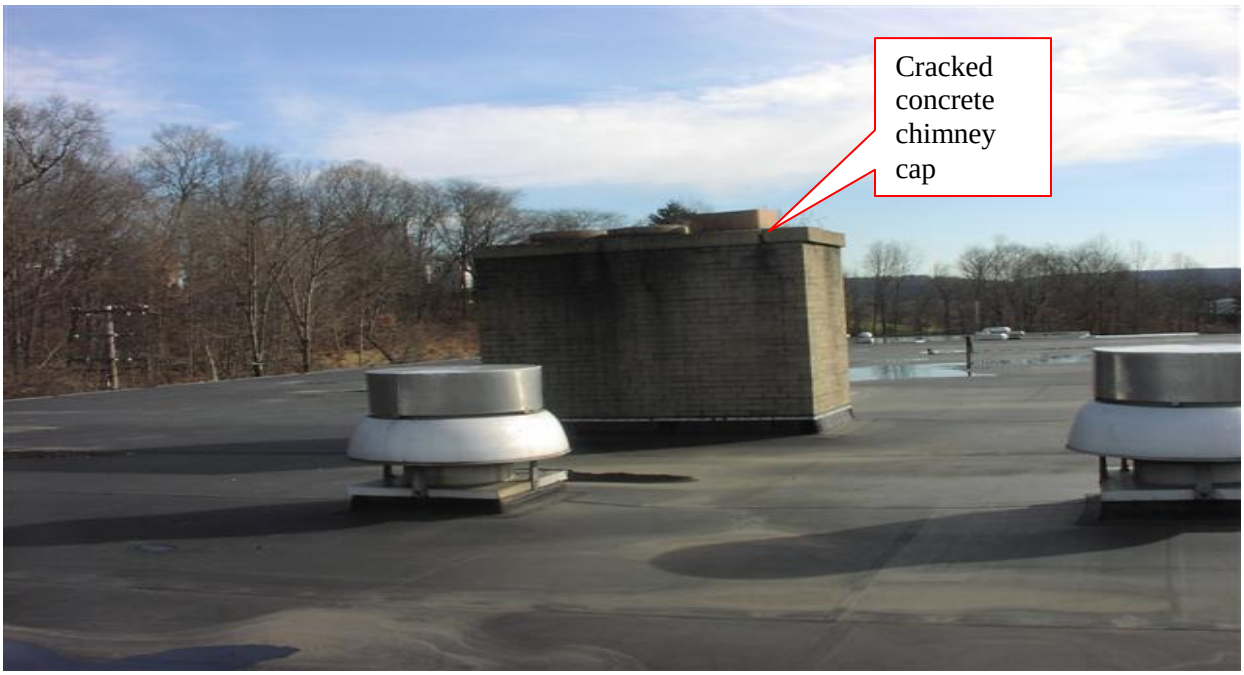


Condition of Exterior Masonry on South Face of North Wall of Auditorium



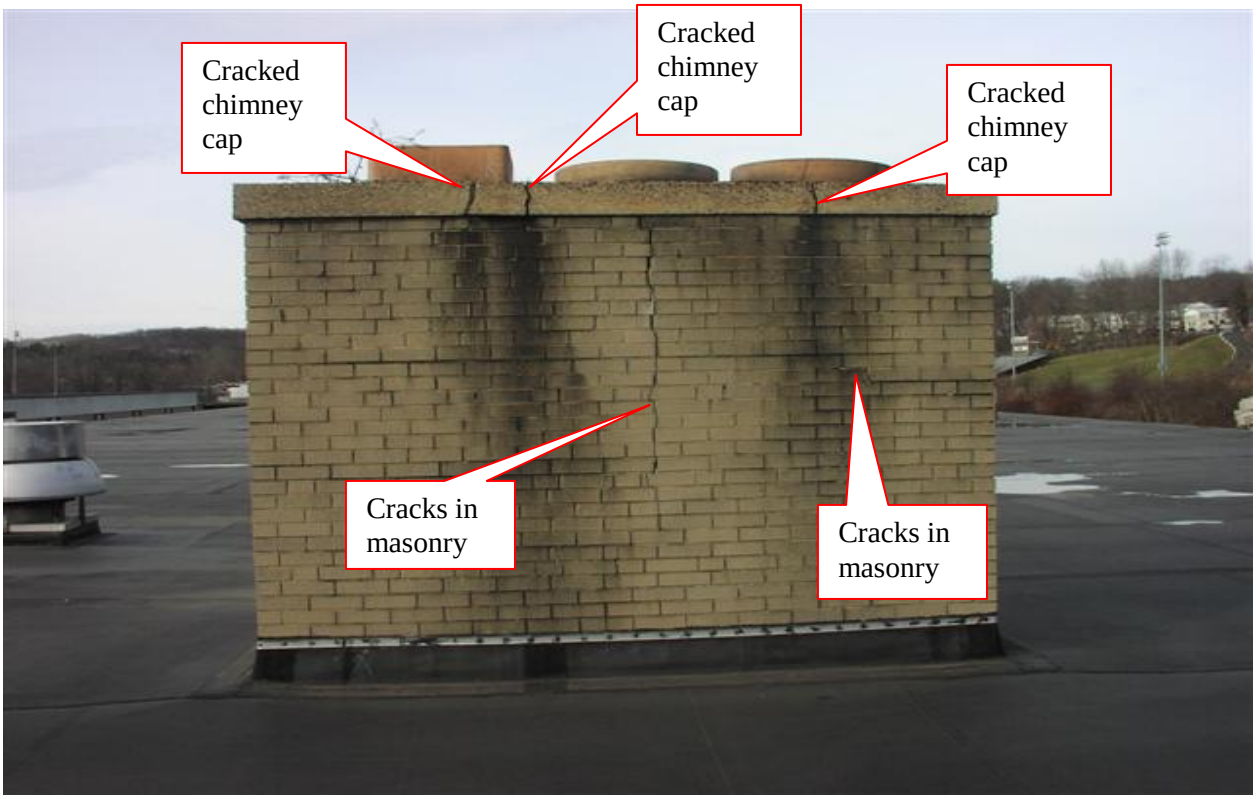
Condition of Exterior Masonry at Southeast corner of Auditorium

- The chimney projecting above the roof line is exhibiting considerable movement and cracking especially on the east face and the concrete cap. The bricks have shifted horizontally and vertically and the cap contains several large vertical cracks.



Condition of West Face of Chimney

Close Up of Cracks and Movement in West Face of Chimney



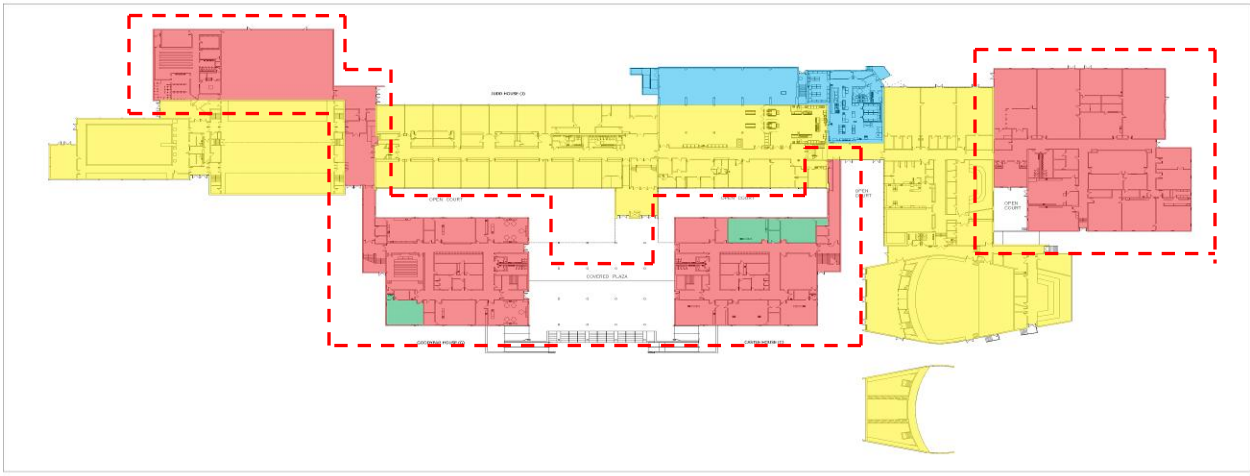
Condition of East Face of Chimney

Close Up of Cracks and Movement in East Face of Chimney

Recommendations

Generally, the additions appear to be structurally sound but additional investigating will be required at some of the noted locations and repairs are strongly suggested for all of the items.

- The concrete column encasement cracking must be addressed by insulating the exposed concrete and protecting the concrete from water intrusion. The installation of insulation and weatherproofing materials will require that the windows be removed and replaced to allow additional space for the insulation and wood blocking necessary for the installation.
- The exposed interior portions of the concrete encasement must be patched with materials that are compatible with the existing concrete. All loose concrete must be removed as part of the repair procedures.
- The masonry chimney must be demolished and rebuilt from the roof line. The masonry for the rebuilt portion must be anchored to the existing chimney below the roof.
- All interior joints at each of the Connectors must be cleaned of mortar and proper expansion joint closures installed. This would include creating joints in the connecting floor slabs. The joint must sawcut through the slab and expansion joint covers installed over the expansion joints to allow for common movement between buildings.
- The spalled precast tee surface at the Natatorium must be cleaned of all loose concrete material and repaired with proper restoration materials to be determined.
- The cracks that have developed in the exterior brick of the Auditorium walls must be further investigated to determine the cause of the movement and cracking. Recommended repairs will be based upon the findings.

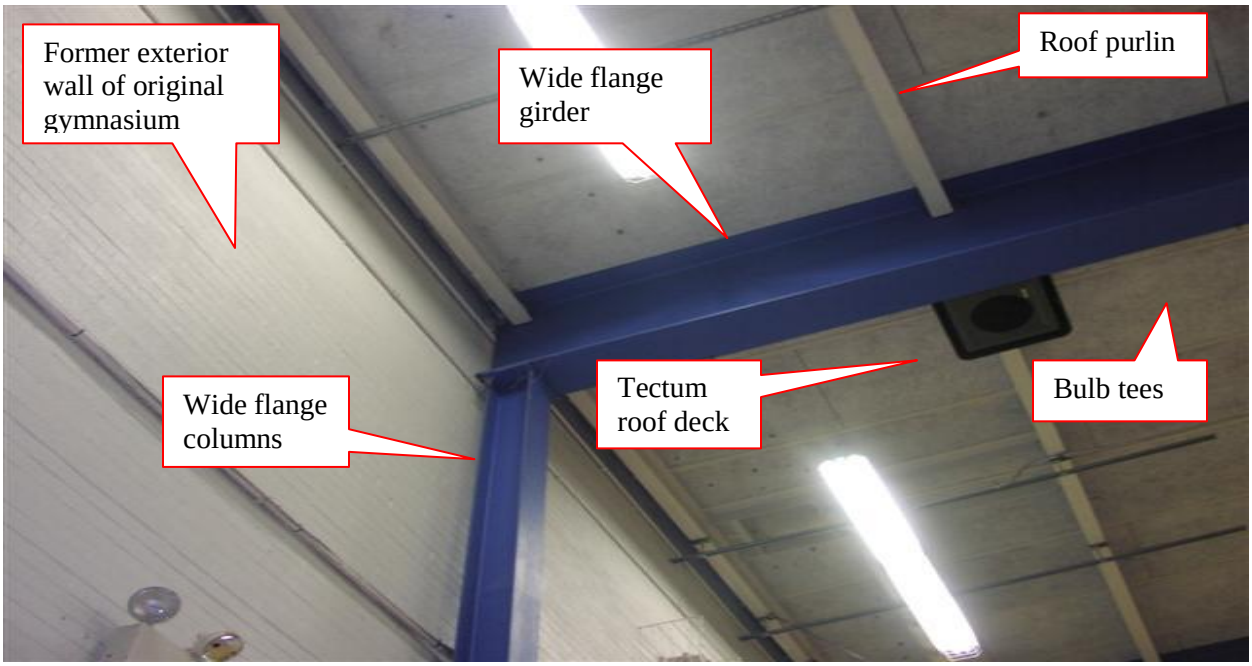


1974 Building Addition

Description

The 1974 additions consist of a two story classroom wing structure, a single story Auxiliary Gymnasium adjacent to the north side of the original Gymnasium and single story Industrial Arts classrooms adjacent to the existing Choral Room.
The classroom structure is constructed with a combination of materials. Reinforced concrete footings support concrete columns which span between the footings and the Upper Level floor construction. The Upper Level floor construction in the classroom areas consist of cast-in-place concrete joist which span between cast-in-place concrete beams that are supported by the concrete columns. The floor construction between the classroom areas at the exposed terrace is a concrete waffle slab with perimeter concrete beams. The waffle floor slab and beams frame into concrete columns. At the Upper Level floor the construction changes to wide flange steel columns which support the roof beams and metal deck. At the roof elevation, Mechanical Rooms are constructed with 4½" thick reinforced concrete slabs on metal deck that is supported on steel beams. The roof structure consists of steel joists spanning the floor and supported on wide flange beams at the perimeter. The beams frame into the wide flange columns that extend up from the Upper Level floor framing.

The Auxiliary Gymnasium is a single story structure with steel girders spanning the gym floor and supported on tube columns that are located in the walls. Purlins span between the girders and support bulb tees and fiber reinforced cementitious roof deck. The foundations consist of reinforced concrete buttresses, walls and footings.

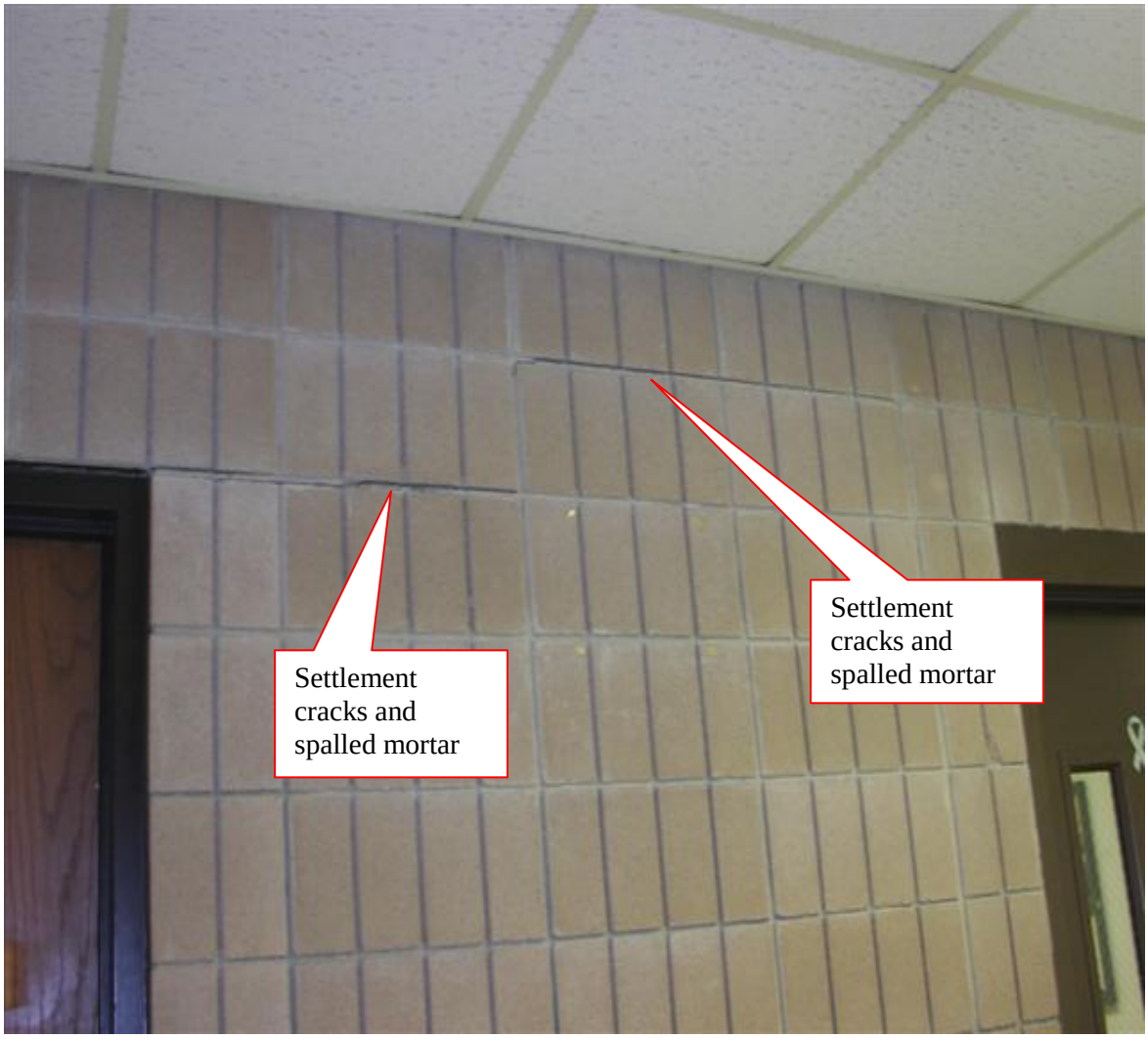


Auxiliary Gym Construction Adjacent to the Original Gymnasium

Overview of Auxiliary Gym Construction

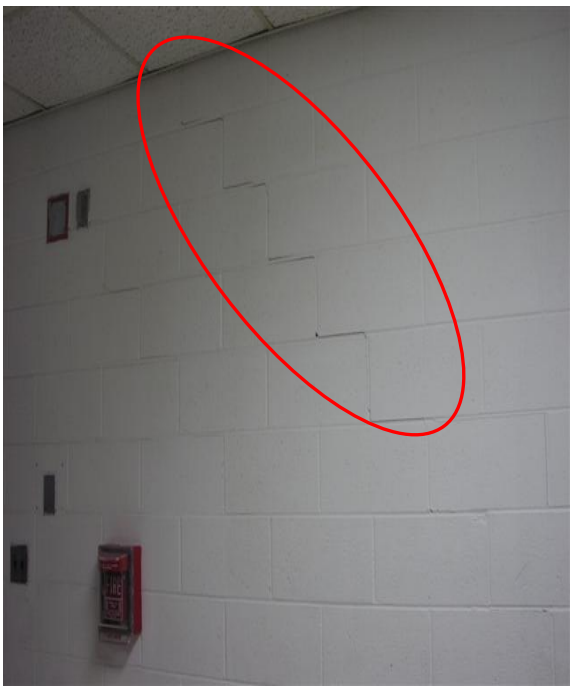
The structures for the two single story additions on the east side of the original building were constructed with wide flange beams and columns that support steel roof joists and metal roof deck. The columns and exterior walls bear on reinforced concrete walls and footings.

- Typically the additions appear to be structurally sound but some movement has been observed in the classroom wing and the connectors to the original building. Cracked interior block walls are visible in the south Corridor of the Goodyear House. The block wall bears on the slab-on-grade. The movement may be caused by settlement in the subgrade and slab-on-grade. The concrete block wall that forms the stairwell located on the east end of the Goodyear House contains numerous areas where diagonal cracks have developed. The cracks vary in width from hairline to 1/16". Cracks are also visible in the east and west walls of the Media Center on the Upper Level. These cracks are vertical and appear to occur where control joints were not constructed.



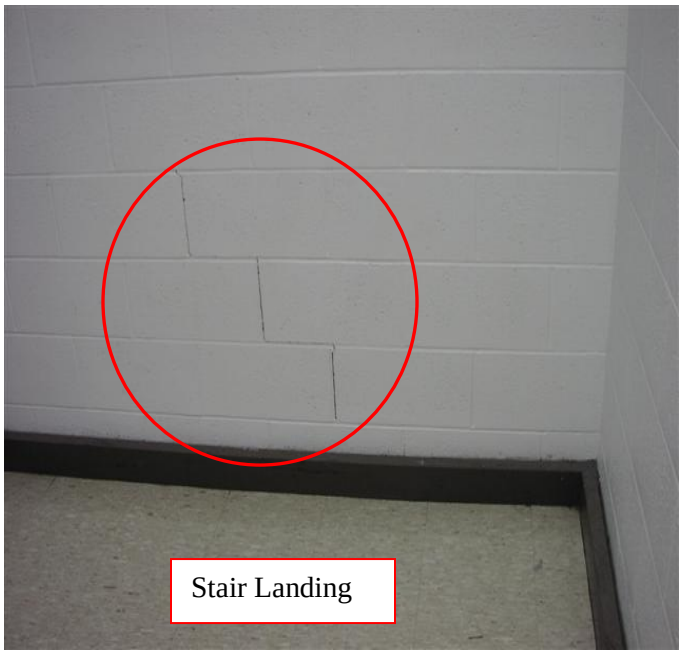
Goodyear House Main Level South Corridor

Crack in Media Center Wall



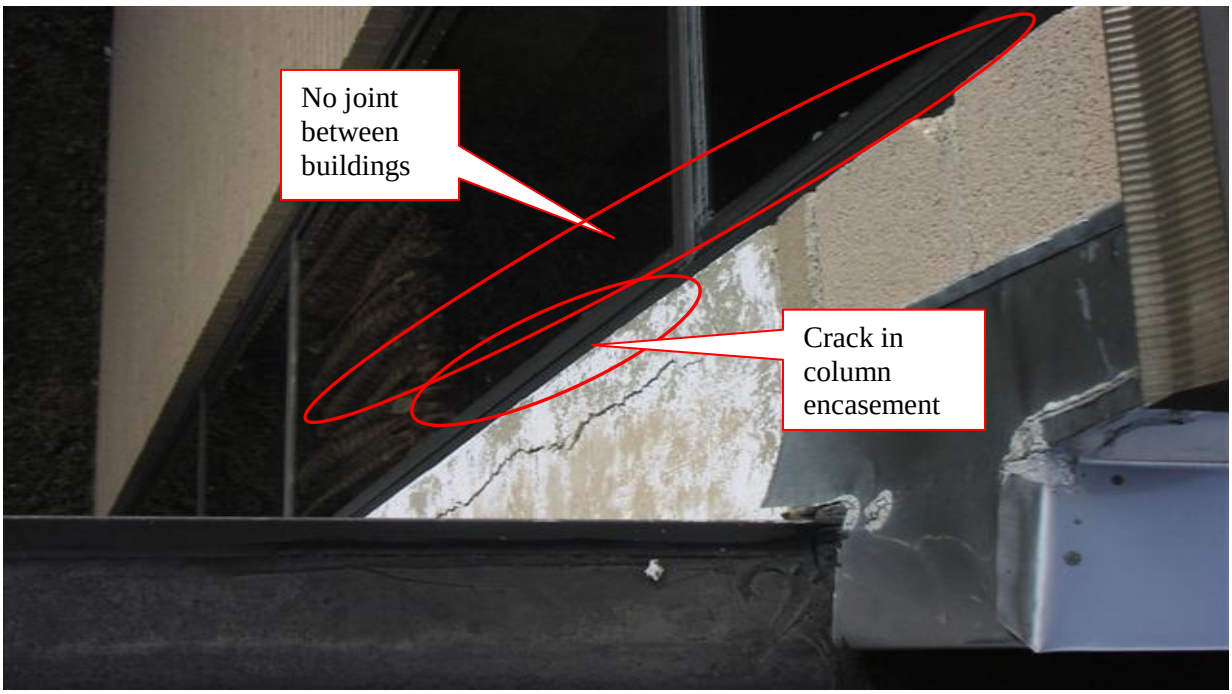
Cracks and Movement in the East Goodyear House Stairwell

Cracks and Movement in the East Goodyear House Stairwell

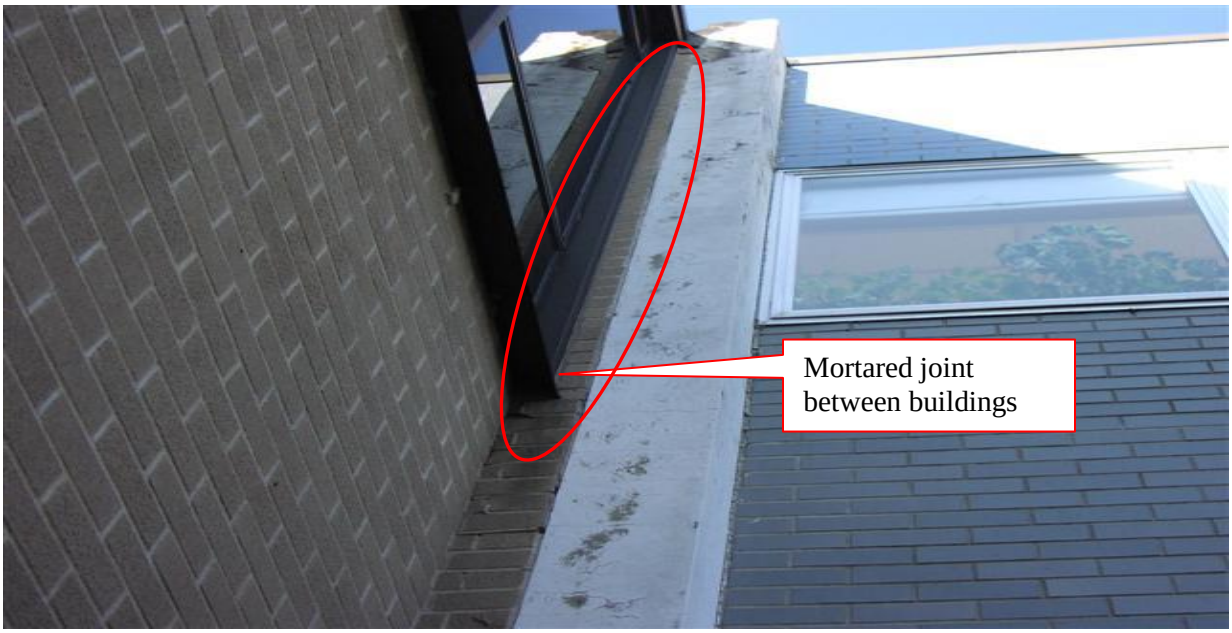


Cracks and Movement in the East Goodyear House Stairwell

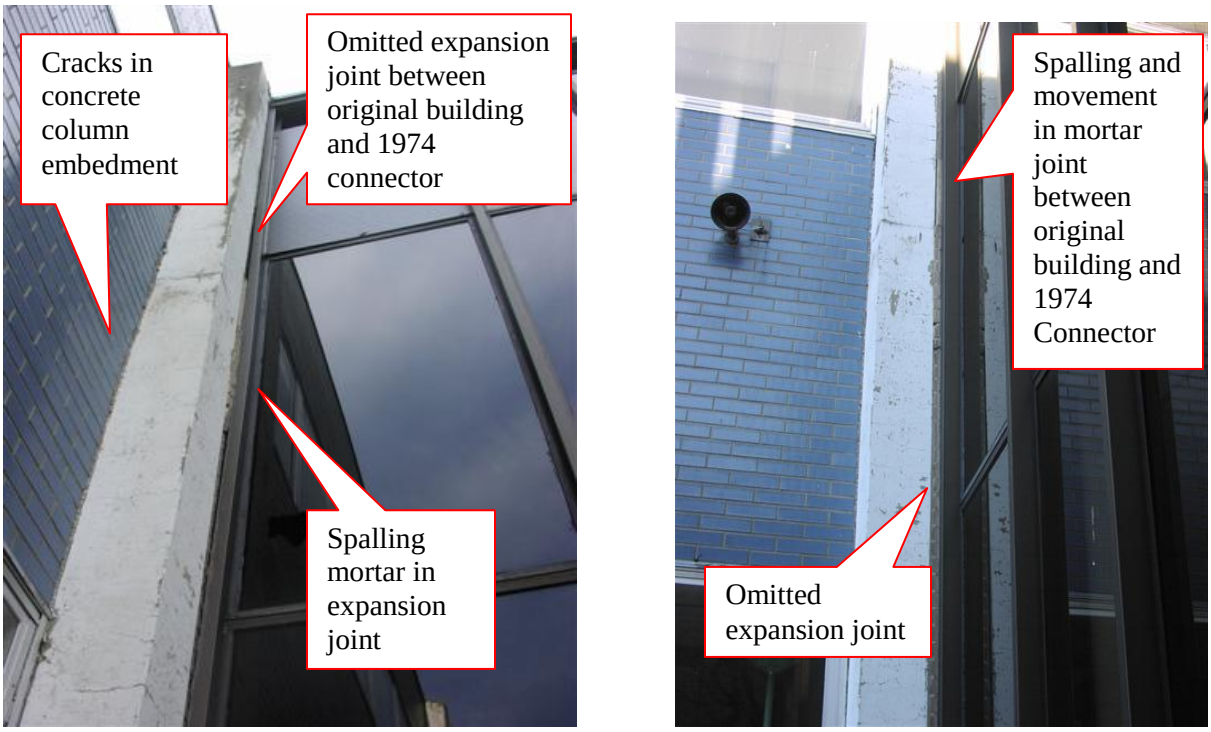
- At each of the 1974 connectors it appears that expansion joints were not provided where the exterior walls are abutting the original building. Due to the lack of expansion joints the differential movement between the buildings has caused cracking and spalling of mortar and masonry.



Lack of Expansion Joint between the Original Building and the 1974 Main Connector

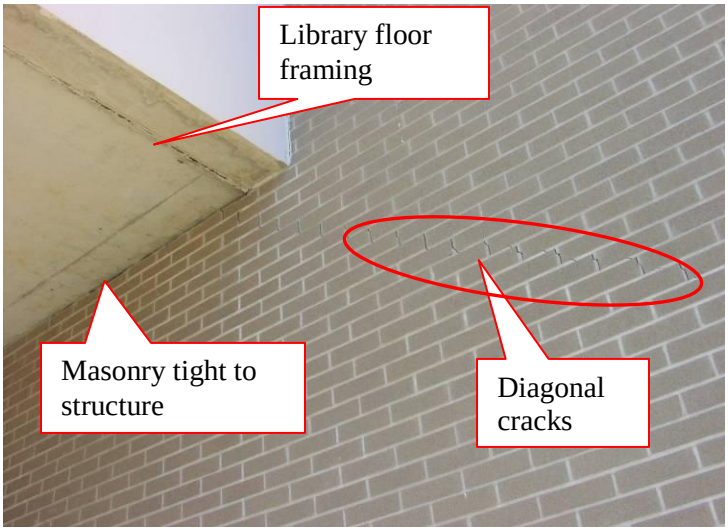


Mortared Expansion Joint between West Connector and Original Building

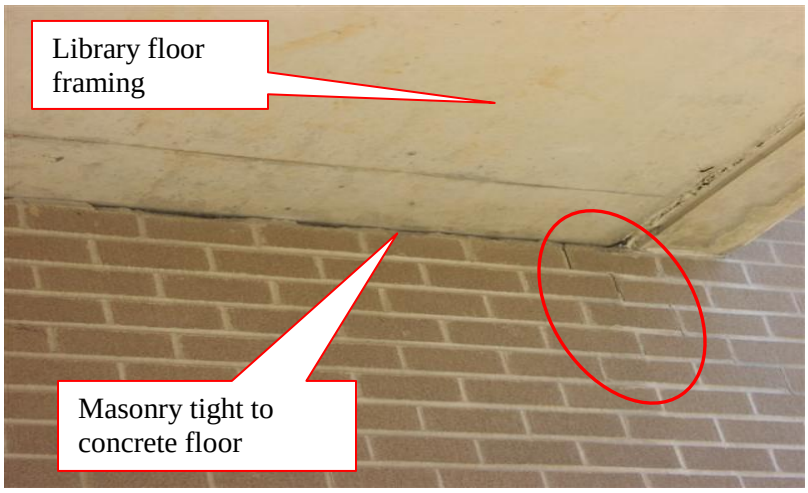


Views of the Intersecting Exterior Walls of the East Connector to the Original Building

- Considerable cracking and movement have occurred between the exterior brick and Upper Level waffle slab in the Goodyear House at the Terrace. It appears that the brick was constructed tight to the underside of the concrete framing without a soft joint to allow for movement in dissimilar materials. The damage is more prevalent at the south entrance.

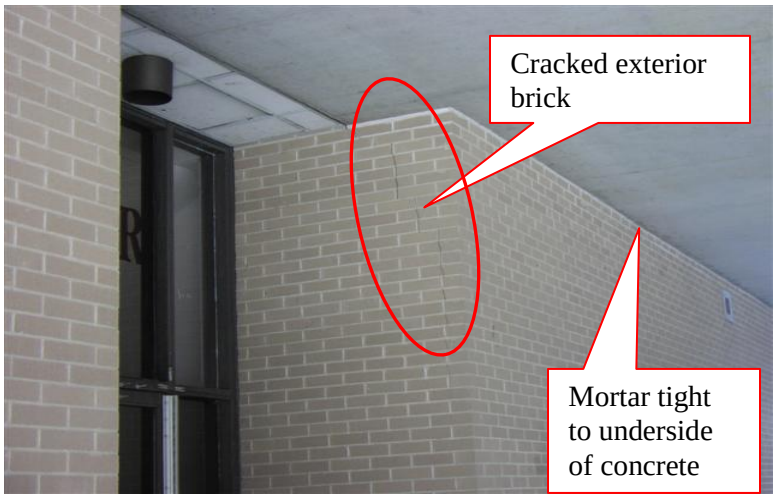


Exterior East Masonry Wall at Goodyear House at the Media Center Slab Structure

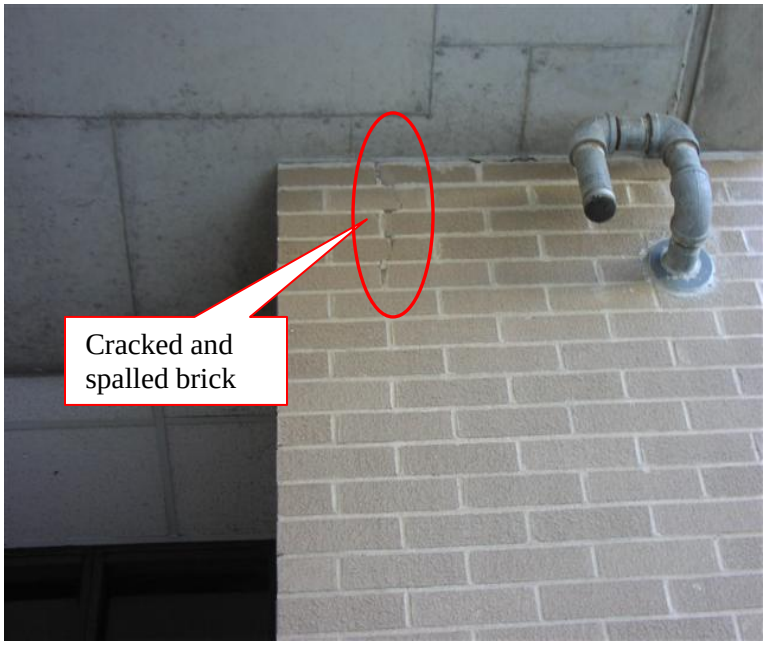


Close up of Exterior East wall of Goodyear House

Southeast Entrance to the Goodyear House



Northeast Entrance to the Goodyear House

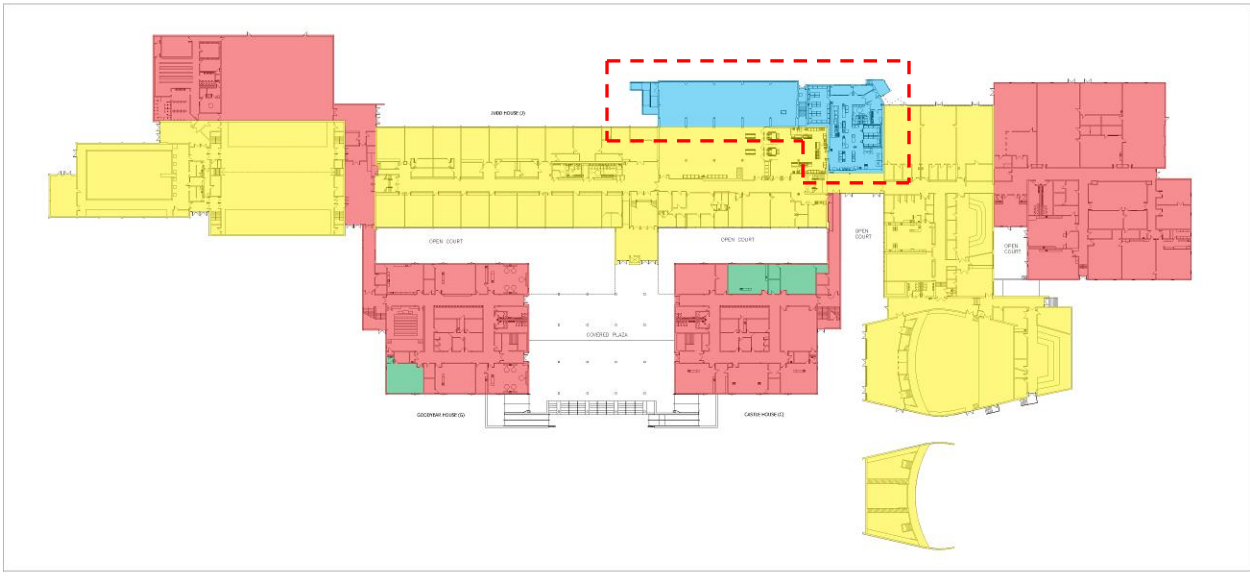


Southwest Entrance to Castle House

Recommendations

The additions appear to be overall structurally sound but cracks and movement observed in interior masonry walls and exterior brick will require further investigating.

- The cracks and movement in the south Corridor and adjoining stairwell must be explored to determine the anchorage and reinforcing in the walls. The movement must be monitored with gauges to verify if the walls are continuing to move. Based on the information gathered from the monitors, recommendations to repair the condition will be developed.
- Similarly on the exterior of the Goodyear House and the Castle House, gauges should be installed to determine if the movement is continuing to occur and the direction of the movement. Based on the information gathered from the monitors, recommendations to repair the condition will be developed.
- An expansion joint must be created between the original building and the 1974 Connectors on the exterior of the structures. Currently the joint is filled with mortar, brick or other building material. A 2" minimum joint must be permitted and opening formed shall be concealed with expansion joint covers to prevent water from entering the building.



2003 Building Addition

Description

The 2003 Addition is a single-story addition to the Cafeteria seating area in the original building and Kitchen and Storage Room that is adjacent to the original Kitchen. The structure consists of wide flange beams supporting metal roof deck. The roof beams are connected to tube columns that are supported by reinforced concrete buttresses and footings. The foundation wall and footing between the column buttresses is constructed of reinforced concrete. The slab on grade is a 4" thick reinforced concrete slab on a vapor barrier.

Existing Conditions Assessment

- The structural integrity of the latest addition is sound with no visible issues.

Summary

Our structural review of the building is based only on the areas which were not concealed by finishes or other obstructions. The items noting action in the *"Recommendations"* portion of this report should be implemented to prevent additional deterioration or damage to the structure.