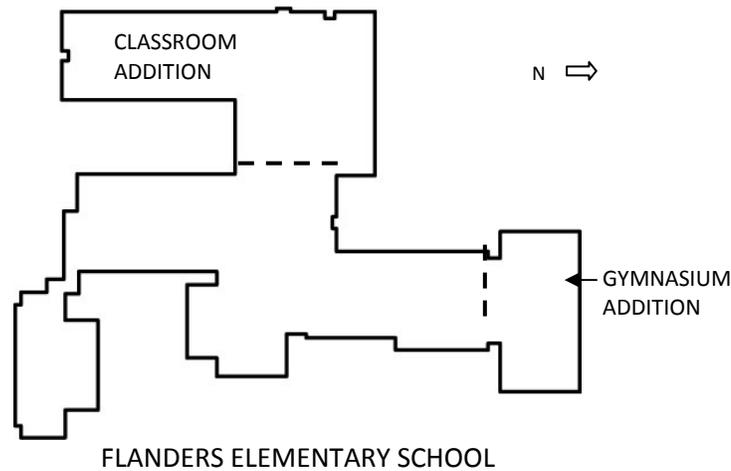


Description:



The Flanders Elementary School consists of the original single story building and two 1974 single story additions. The typical structure for the original building is steel wide flange roof beams that support metal roof deck. The steel beams span between concrete block bearing walls which separate the classrooms. The bearing walls are anchored to and supported by reinforced continuous concrete footings and foundation walls. The Multi Purpose Room is constructed with metal roof deck supported by 10” deep steel purlins that span between 24” deep girders. The girders are attached to the top of wide flange columns located in the exterior walls of the Multi Purpose room. The columns are attached to the reinforced concrete buttresses which are a composite part of the foundation walls and footings.

The structure for the 1975 classroom addition consists of steel joists spanning between exterior brick and block masonry bearing walls and supporting metal roof deck. The masonry bearing walls are supported by reinforced concrete foundation walls and footings. The Multi Purpose Room is constructed of steel joists spanning the floor and supported by steel beams along the perimeter of the roof. The steel beams are connected to wide flange columns. At the west end of the Multi Purpose room the top of roof elevation is lower than the Multi Purpose Room roof. The lower roof spans between the west exterior wall and the west wall of the Multi Purpose Room. The steel joists that support the low roof metal roof deck bears in the concrete block walls. The foundation walls and footings for the addition are constructed with reinforced concrete.

Existing Conditions Assessment:

At the original building movement and spalling of the exterior brick and mortar is occurring at various locations on the exterior of the building. The most visible areas are along the south wall of the Cafeteria/Multi Purpose, the exterior wall of the electrical room and the north and east wing walls to the connector that ties the original building to the Central Office.



Spalled Mortar at the Existing Steel Angle Lintels

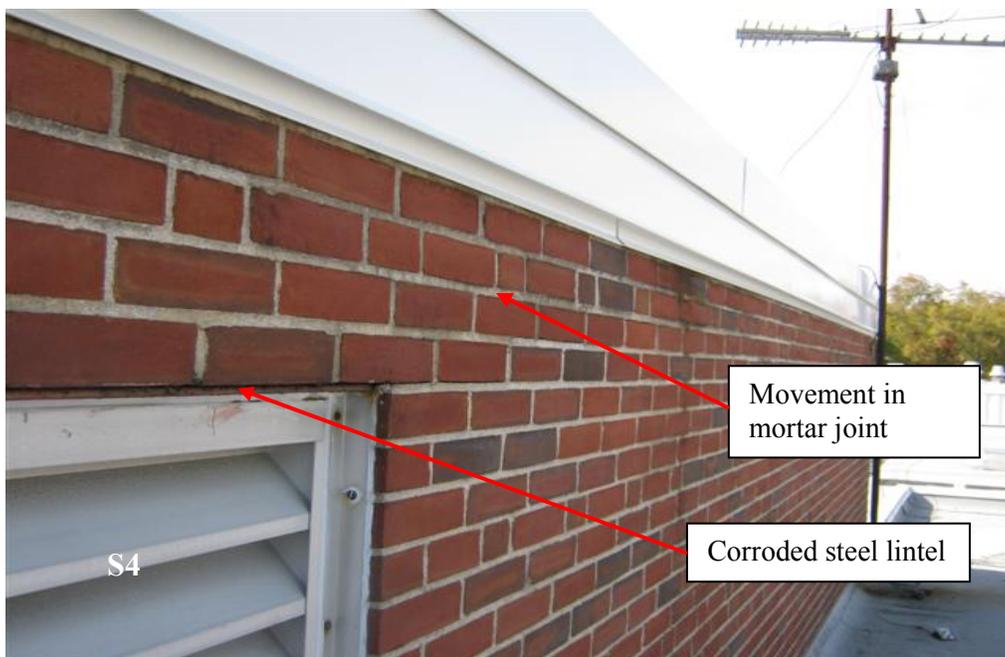


Spalled Mortar at Door Opening



Movement in Brick above the Door

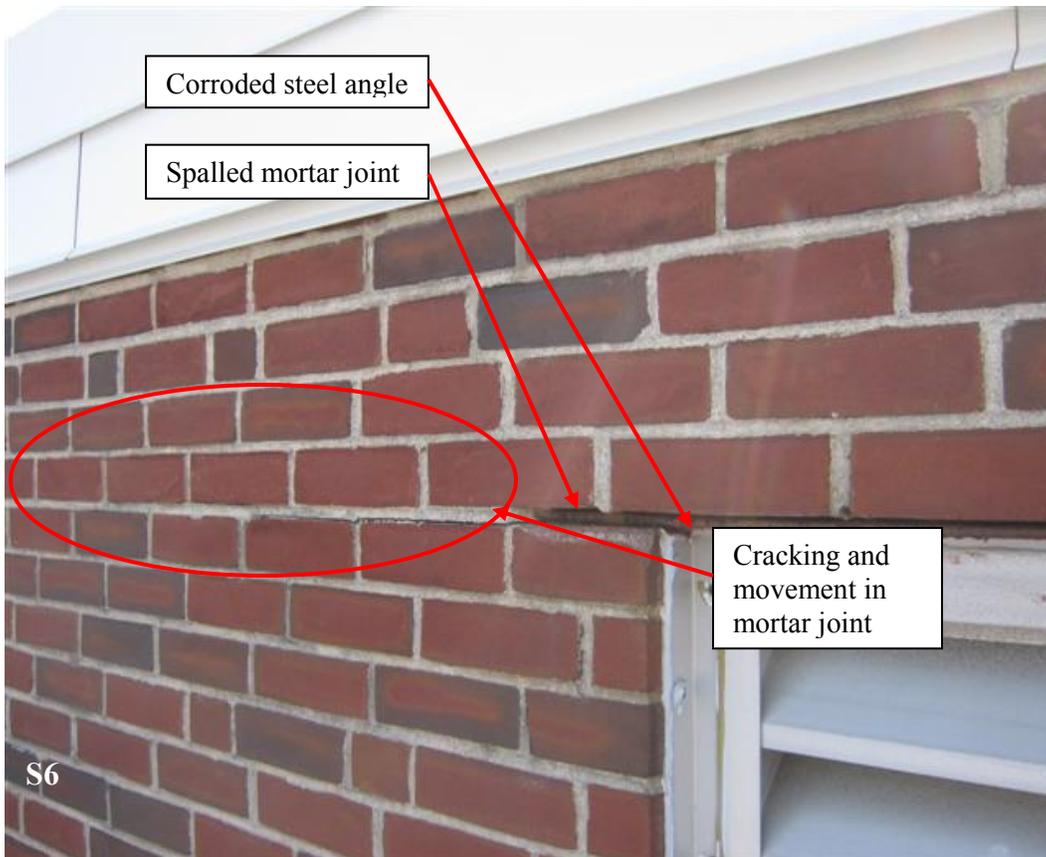
The outer brick wythe on the north side of the exterior wall of the Cafeteria is exhibiting movement and spalling mortar. The movement and spalling are visible at the elevation of the steel lintel and beyond. Where the steel angle lintel bears in the mortar joint, corrosion is occurring to the lintel and the rust combined with the freeze / thaw damage has spalled the mortar and cracked some of the bricks. Weep holes were installed in the walls above the low roof flashing but many of them are clogged with debris and not functioning to drain the wall.



North Face of Cafeteria Wall Looking Southwest



Close up of Cracks and Movement



North Face of Cafeteria Wall Looking Southeast



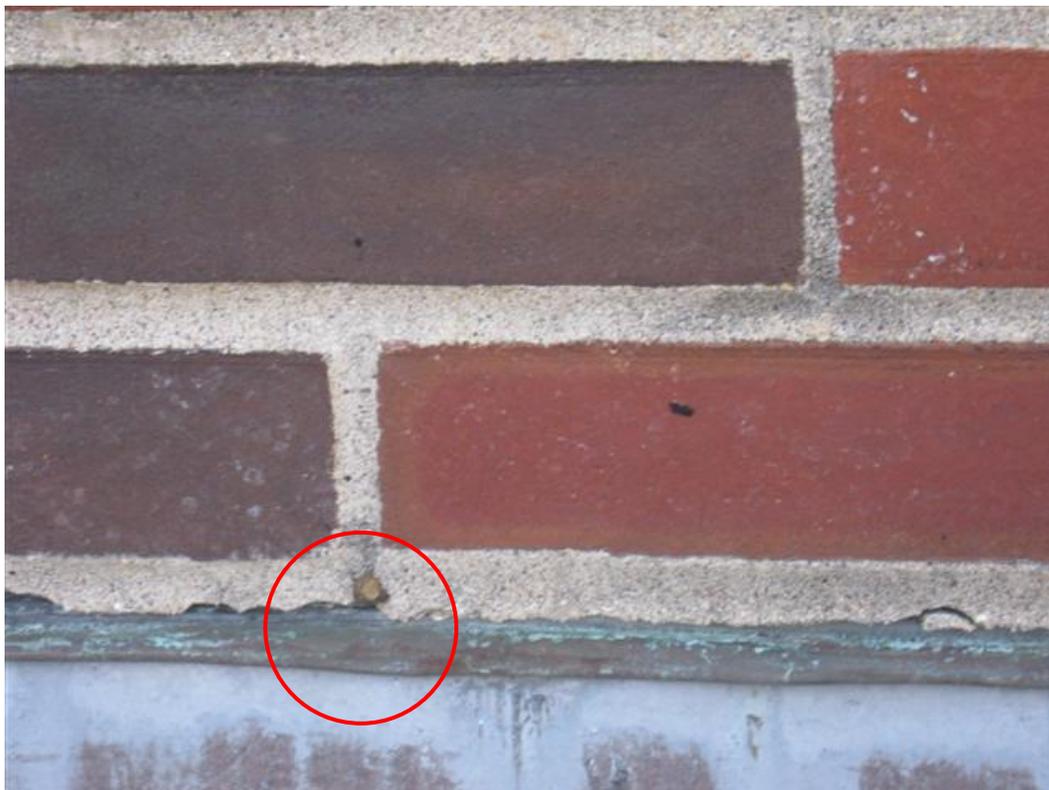
Cracked and Spalled Mortar and Bricks on North Face of Cafeteria



Close up of Spalled and Cracking Mortar



Clogged Weep Holes

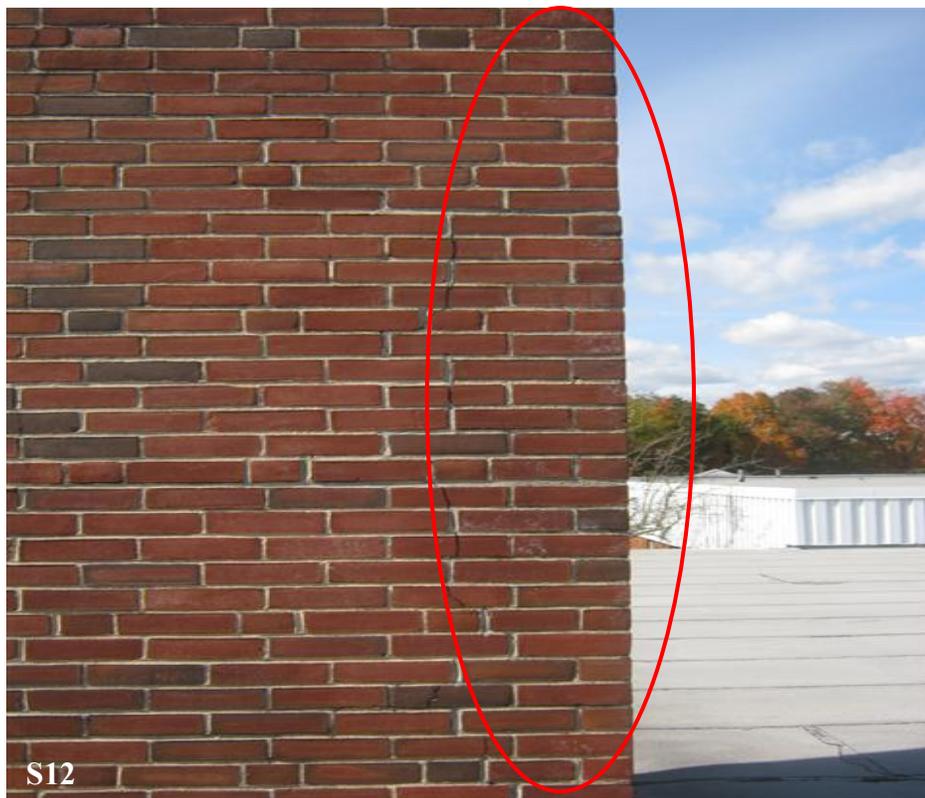


Close up of Clogged Weep Holes

At the chimney there are several vertical cracks and movement is evident. Water is able to enter into the cracks and spalled mortar and cause further deterioration and damage.



Cracking Mortar Joints



Vertical Crack in North Face of Chimney

Cracking, movement and efflorescence is present in the wing wall at the connector entrance. The cause of the cracking is not apparent. However, water is entering into the wall as noted by the efflorescence on the face of the brick.



Efflorescence and Cracking in Connector Wing Wall

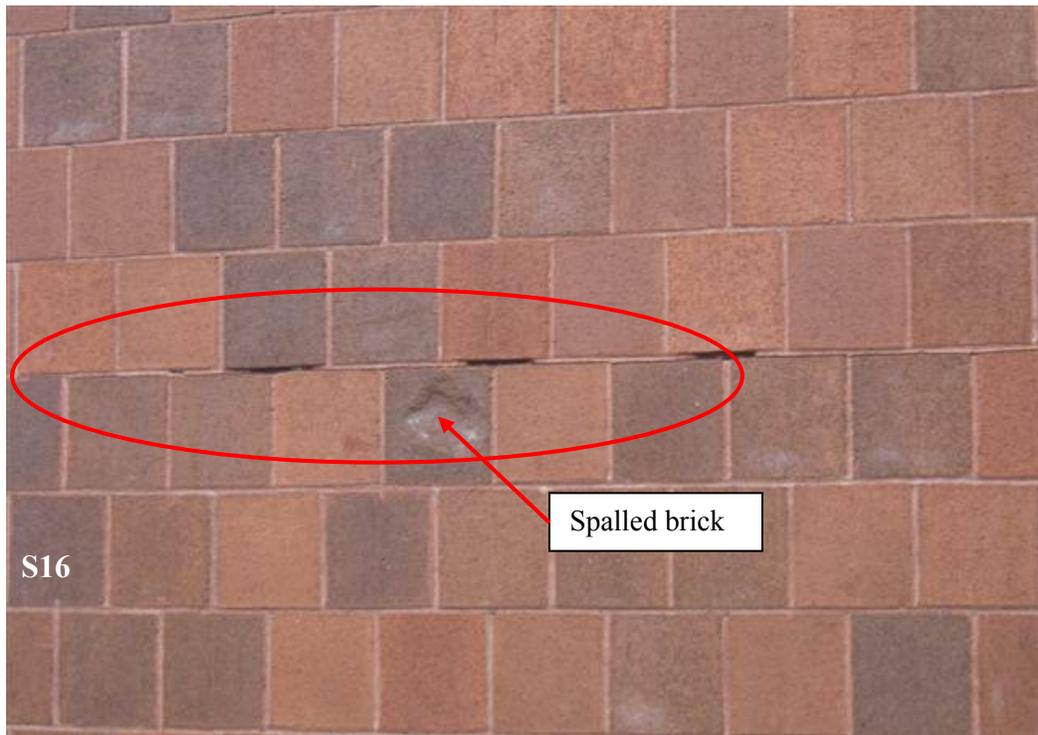


East Face of the Connector Wing Wall with Cracks and Efflorescence

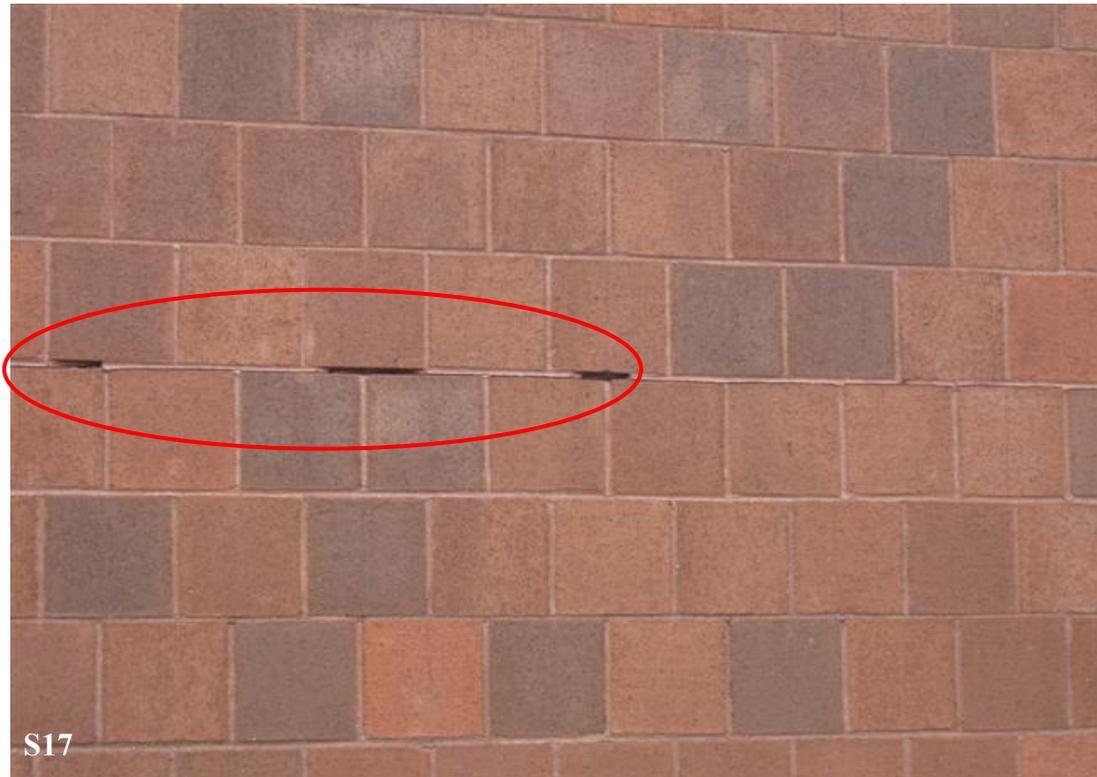
The 1975 additions exhibited freeze / thaw damage to the exterior brick and mortar joints at several locations. Thin layers of the brick surfaces have spalled or are in various degrees of spalling. According to the 1975 Contract Documents, the wall is constructed with 8" concrete block, 2" space for insulation and 4" brick. The ¾" maximum air space is inadequate for proper ventilation of the cavity and is subjecting the brick to wetting from both the exterior and the cavity. In addition, the weep holes are either below grade or many are clogged which will not allow the drainage of the cavity.



Overview of South Wall of 1975 Addition



Close up of Spalled Mortar and Bricks on South Wall



S17

Close up of Spalled Mortar on South Wall

At the 1975 Gymnasium addition similar conditions are occurring with the brick spalling and a vertical crack developed in the brick on the northwest corner. It appears that the spalling and crack is caused by the trapped water in the cavity and the freeze / thaw cycles. The weep holes along a length of the north wall is concealed below a bed of wood chips and soil which further prevents the drainage of water from the masonry cavity.



S18

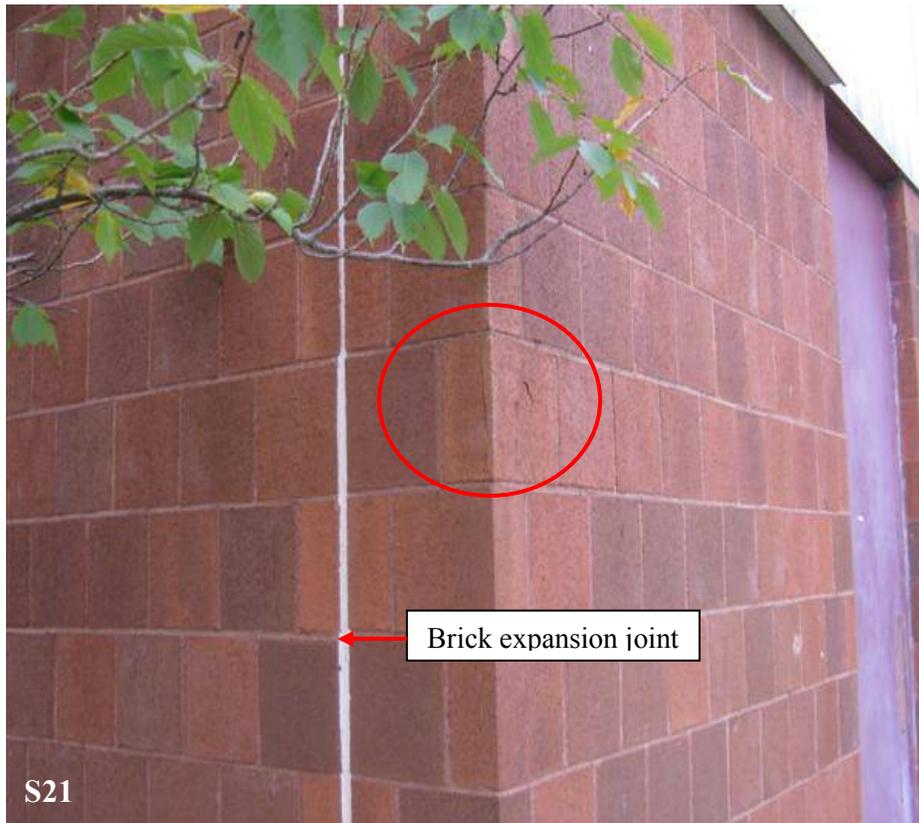
Overview of Northwest Corner of Gymnasium Addition



Vertical Crack in Brick at Northwest Corner



Close up of Spalling Brick



Close up of Spalling Brick



Mulch and Soil above Bottom of Masonry Wall Clogging Weep Holes

There two items requiring repairs for the foundations in the 1975 addition. One item involves the cracked and spalling corners of the exposed foundation wall. This condition occurs at each of the corners in the addition.



Wedge Shaped Crack in Southeast Corner of Foundation Wall of Classroom Addition



Wedge Shaped Cracking and Spalling at Southwest Corner of Classroom Wing Addition



Wedge Shaped Cracking and Spalling at Northwest Corner of Classroom Wing Addition

Along the east wall of the classroom addition there are two locations where the wall reinforcing steel was close to the surface. At these locations, the reinforcing steel had corroded and caused the concrete to spall. This has exposed the reinforcing steel to the elements and will expedite the damage.



Spalled and Exposed Foundation Wall Reinforcing on East Face of Classroom Wing Addition



Spalled and Exposed Foundation Wall Reinforcing on East Face of Classroom Wing Addition



East Face of Classroom Wing Addition

Recommendations:

The brick above and adjacent to the door openings in the original building must be temporarily shored and the steel angles removed and replaced with galvanized angles, proper flashing including end dams and weep holes above the angles to drain the wall. This required at the doors on the south side and door and louver for the electrical room on the original building. The loose bricks especially at the Electrical Room openings could be a safety issue if they began to fall out of the wall.

At the Cafeteria, on the north face of the exterior wall above the low roof portions of the brick above and adjacent to the window and louver openings should be removed. This will allow the evaluation of the extent of the corrosion of the steel angle lintels. Recommendations will be provided based on the conditions exposed. The clogged weep holes must be cleaned of the debris so that the water can drain from the cavity.

Restoration of portions of the chimney should be implemented in the areas where extensive cracking and movement are occurring. This will include removing all damaged bricks and mortar and replacing with new bricks.

The cracking, movement and efflorescence in the exterior masonry wing wall will require additional investigation to determine the cause of the movement. The Owner's mason would be required to remove some of the bricks in the area where the movement is most visible to assess the integrity of the anchors.

We are recommending two possible remedial procedures for repairing the spalling mortar and brick on the classroom and Gymnasium additions. A short term solution would involve replacing any spalled bricks, re-pointing the mortar joints and spraying the exposed surface of the brick walls with a waterproof coating to keep water from infiltrating the brick. This procedure would last approximately 5 years depending on the waterproof coating manufacturer's warranty. This would then be an ongoing maintenance issue for the life of the building similar to painting. A long term but considerably more expensive solution would involve the removal of all of the exterior brick and insulation, install a continuous steel angle that is hot dipped galvanized directly on top of the foundation wall and positioned tight to the inner wythe concrete block. The new angle would contain an 8" horizontal leg to support the brick and provide a 4" cavity with 2" thick insulation and 2" air space for proper ventilation and drainage. New air and water barriers, proper flashing, end dams and weep holes would be installed once the new angle is in place. After that work is completed the new brick could be installed and anchored to the inner wythe block with existing anchors or new ones.

The wedge shaped cracked concrete foundation wall at the corners of the addition and the original building should be removed and replaced. As the existing concrete fails the bricks above will not be supported and movement and cracking in the brick will occur.

The exposed reinforcing on the face of the foundation wall should be removed and the wall patched.

Along the front of the original building and on the north side of the 1975 addition the grade is above the weep holes which will restrict any water from draining out of the cavities. The grade should be revised to allow the weep holes to be exposed. All weep holes must be cleaned

Summary:

Our structural review of the building is based only on the areas which were not concealed by exterior grades, slabs, finishes or other obstructions. Recommended repairs and maintenance procedures should be implemented to eliminate possible future damage to the structure.