

# North Carolina Department of Administration

Michael F. Easley, Governor  
Britt Cobb, Secretary

State Construction Office  
Gregory A. Driver, P.E., Director

May 3, 2007

## MEMORANDUM

**TO:** Angaza Laughinghouse  
State Property Office

**FROM:** Michael Hughes, PE  
Assistant Director, FCAP Section  
State Construction Office

**SUBJECT:** Assessment of Eagle Landing - Private Dormitory for NCCU  
408 Brant Street  
Durham, NC

At your request, a re-assessment of the condition of Eagle Landing private residence hall in Durham was performed by an FCAP team on April 23 and 24, 2007. Also present at this inspection were staff from the Department of Insurance and NC Central University.

Since the original assessment by the FCAP team on September 12 and 14, 2006, several repairs have been completed, and credit for those repairs is reflected in this report. Unfortunately the condition of the heating and air conditioning system has further deteriorated in the past seven months, and the recommended replacement of HVAC equipment now falls within the six-year time period of FCAP deficiencies. Refrigerant leaks and frozen coils were observed during the inspection, causing the HVAC systems to malfunction. Frozen coils and a deficient HVAC condensate system have resulted in water damage to the building interior, as shown in the attached photos. Therefore the HVAC system needs to be replaced within six years to protect the building interior and relieve the burden on the maintenance staff. This deficiency adds substantially to the total cost estimate.

Attached is a description of major deficiencies confirmed at this site, along with recommended corrections, time priorities and cost estimates. Recommendations from the Department of Insurance pertaining to life safety are included in these items.

Following is a summary list of the major deficiencies and the estimated cost to correct the items.

<b>Provide a complete, forensic building survey of structure</b>	<b>\$ 65,000</b>
<b>Provide life safety code corrections</b>	<b>\$ 587,000</b>
<b>Replace deficient interior and exterior doors, frames and hardware</b>	<b>\$ 517,000</b>
<b>Modify stair riser heights in exit stairs</b>	<b>\$ 25,000</b>

**Mailing Address:**  
1307 Mail Service Center  
Raleigh, NC 27699-1307

**Telephone: (919) 807-4100**  
Fax (919) 807-4110  
State Courier #56-02-01

**Location:**  
301 N. Wilmington St., Suite 450  
Raleigh, NC 27601

*An Equal Opportunity / Affirmative Action Employer*

Upgrade outside air intake	\$ 350,000
Upgrade condensate drain system	\$ 330,000
Provide ducted return air system	\$ 275,000
Replace thermostats	\$ 45,000
Replace HVAC equipment	\$3,750,000
Upgrade storm drain system	\$ 240,000
Replace shower and tub fixtures	\$ 590,000
Repair sprinkler system	\$ 285,000
Modify plumbing vents	\$ 60,000
Install and replace exit and emergency egress lights	\$ 58,000
Upgrade fire alarm system	\$ 40,000
Miscellaneous electrical system items	\$ 28,000
Install an emergency generator	\$ 75,000
Install lighting in mechanical rooms	<u>\$ 18,000</u>

**CONSTRUCTION COST OF ITEMS ABOVE:** **\$7,338,000 \***

Project Contingency @ 5 %	\$ 367,000
Design Fee @ 10 %	\$ 770,000
Escalation Cost: 12 Months. @ 0.67 %	<u>\$ 678,000</u>

**TOTAL PROJECT COST ESTIMATE:** **\$9,153,000**

(\* ) Note that the actual construction cost estimate could be higher, contingent on the findings of the forensic building survey recommended. This survey may lead to the presence of mold and other areas damaged by moisture and water intrusion, due to the inaccessibility of areas behind walls and ceilings. Also, note that a complete study of ADA compliance throughout the building is recommended.

It is hoped that this report and findings will meet your requirements, and will aid in the evaluation of and feasibility of purchasing this facility. If you have any questions, feel free to contact this office.

Attachments

Copy: David McCoy, OSBM  
Speros Fleggas, Dept. of Admin.  
Greg Driver, State Construction Office  
Dean Andrews, Dept. of Insurance  
Susan Gentry, Dept. of Insurance  
Jack Cooke, Dept. of Insurance  
Dr. James Ammons, NCCU Chancellor  
Zack Abegunrin, NCCU Associate Vice Chancellor  
Terry Feravich, UNC General Admin.  
Rob Nelson, UNC General Admin.  
Alton Phillips & June Michaux, State Property Office

## On-Site Survey 4-23-07 and 4-24-07 - State Construction Office

### **Eagle Landing, NCCU Private Dormitory, 408 Brant Street, Durham, N.C.**

Following is a list of major deficiencies for the building observed at the time of inspection. Due to the construction of the interior building finishes, including gypsum board walls and ceilings as well as a lack of access and inspection panels, numerous areas were inaccessible for observation. This list does not contain telecommunication deficiencies.

#### **A. Site**

The structure is bordered by city streets on three sides, with parking areas and a short driveway to the trash removal area at the east side of the building. The structure is basically a U-shape with a center open-air courtyard.

#### **B. Private dormitory (five-story structure)**

Eagle Landing Dormitory is a five-story, slab on grade, metal framed structure with brick veneer exterior. Stairwells and elevator shaft walls are of masonry construction. Lounge area at northeast side is steel framed with masonry walls. The majority of roof area is a hip, sloped metal roof with gutters and downspouts. The remainder of the buildings roof is a single ply, non-ballasted with the majority containing HVAC equipment. There are two elevators with adjoining elevator equipment rooms and two stairwells. The stairwell at the north side has roof access.

The building layout (Level 1) consists of entry-way/lobby, small offices, computer labs, conference rooms, student apartments, laundry and equipment rooms. Levels 2 through 5 consist of student apartments, study, vending, laundry and lounge areas.

There are 108 apartments. A typical apartment has three or four bedrooms, with a central kitchen (complete with range, microwave, refrigerator, dishwasher and sink), living area as well as two bathrooms. The bathrooms have fiberglass/vinyl tub and shower enclosures. The building is 170,000 square feet and was constructed in 2004.

**G-1 Provide a complete, forensic, invasive building survey to investigate extent of moisture damage related to condensate drainage, excessive moisture at baths and suspect moisture intrusion related to exterior perimeter and roof drainage**

**Estimated Cost: \$ 65,000**

**Priority: Immediate**

Note: The estimated cost is for the survey only and does not include any remediation.

Eagle Landing private residence hall has evidence of extreme moisture migration associated with leaking and overflowing condensate terminations and drainage. Evidence of excessive moisture at bathroom fixtures was noted, apparently due to poor quality showers and tub enclosures, and exposed adjoining absorbent materials. Shower units (typical) do not appear to be grouted under base, and front edge is reverse sloped, without being sealed to gypsum wall board or to vinyl composition floor tile.

Fold down handicap seating at showers do not appear to be solidly secured to shower walls. In addition, handicap rails at water closets were not anchored properly.

Carpet is wet/stained at corridors and apartments from condensate leaks at nearby mechanical rooms. Leaks were noted at both walls and ceilings at several apartments.

In addition to the items listed above, the majority of weep holes at exterior brick veneer wall were concealed and/or below grade level. The graveled areas (at perimeter of building at courtyard) are several inches lower than surrounding landscaped yard, with no visible means of drainage. Construction joints at exterior brick veneer walls were not properly sealed. Flat (non-sloping) exterior brick window ledges were noted at courtyard and west side windows. Lack of proper thru-wall flashing and sheathing vapor barrier (as observed from exposed tear at sheathing in attic) may very well be the norm.

Compounding the potential for moisture infiltration, the low-sloped, non-ballasted, single ply roofs are drained using thru-wall scuppers and downspouts, with roof overflows emptying directly onto exterior brick veneer walls. Some downspouts terminate onto splash blocks at lower single ply roofs. There is no visible ridge vent in the standing seam, metal, hip roof design. Only soffit vents were noted. Lack of proper flashing was also noted at roof, notably coping terminations dependent solely on caulk for a weather-tight seal. Absence of walk stones/mats at roof top equipment requiring routine preventive maintenance also increases the likelihood for future roof leaks.

Roof note: Plans called for ballast at single ply roofs, but no ballast was installed.

**G-2 Provide life safety code corrections**  
**Estimated Cost: \$ 587,000**  
**Priority: Immediate**

The Department of Insurance identified several items of concern:

The trash chute now appears (as observed from attic access area) to have a 2-hour fire rated shaft as required by code, but it was noted that the chute termination at the first floor at hopper has not been properly sealed. Fire suppression system was noted at trash chute but protective cap over sprinkler head is still in place. The trash chute doors are presently fastened shut with screws. Should the system be reactivated, positive latching would be required at doors and fire suppression system should be properly installed and tested. Repair or retrofit trash chute and the doors to provide a positive latch at inlets. Repair existing or install a new fire suppression system and seal and install proper terminations. (\$65,000)

Conference Room B when separated by the movable walls does not have two remote exits as required by code. It is recommended that either the movable wall be removed, or an additional remote means of egress (new exit to the exterior, including accessible ramp to grade) be installed. Estimated cost is for installation of additional means of egress. (\$78,000)

As currently configured, neither exit stair meets the minimum code for exit discharge (NCBC 1006). Therefore, only the first floor of the building should be occupied. In addition, stair doors are not closing and latching properly. Fire exit hardware mounted on gated exits appears to exceed the maximum unlatching force of 15 pounds when opened.

It is recommended that a protected, rated means of egress be constructed from the southwest stairway (stair 140) to the exterior. Construction would likely involve reconfiguration and loss of one housing space, as well as exterior rework. (\$ 125,000)

It is recommended that a protected, rated means of egress be constructed from the northeast stairway (stair 104) to the exterior. Construction would likely involve reconfiguration and loss of one office area, as well as extensive exterior rework. (\$ 175,000)

As a suggested means to further improve egress (at stair 104), recommend that Breezeway gates be relocated to provide direct egress from the stairway to exterior of structure. Gates should have appropriate (accessible) exit devices and closers installed.

It is recommended that additional gates (at west side of building) also be modified to comply with code. (\$ 24,000)

It is recommend that stairwell door assemblies be replaced (hollow metal door frame, metal door and rated exit devices). (\$ 43,000)

Penetrations of fire rated partitions have not been properly sealed to maintain the necessary fire rating, as required by applicable sections of the NC Building Code. Fire rated partitions are not labeled. It is recommended that all fire rated partitions be properly sealed and labeled. (\$73,000)

Walls adjacent to handicap shower stalls in dormitory rooms are showing signs of moisture damage; and they do not appear to have a non absorbent surface and waterproof joints as required by Sections 1209.3 and 1209.4 of the NC Building Code. Please refer to item G-1 for recommendation related to excessive moisture damage. Height of toilet paper dispensers in men's restroom do not comply with mounting height specified in the NC Accessibility Code, Chapter 11, and Section 11.6.1 (5). Wall mounted sinks in women's restroom are loose and need securing. It is recommended that wall-mounted sinks be removed, and wall blocking be added/installed at both men and women's rooms. Reinstall sinks and patch and repair damaged gypsum board and finishes. (\$ 3,500)

**G-3 Remove and replace deficient corridor doors, frames and hardware. Replace exterior doors and hardware.**

**Estimated Cost: \$ 517,000**

**Priority: Immediate**

Corridor and apartment interior doors were 20 minute rated wood door jambs (residential type) with lightweight 90 minute rated metal doors (rating information gleaned from tags on doors) with residential-style wood door casings. Hardware consists of light duty cylindrical locksets with spring hinges for closure function. Few doors had door mounted closers. The majority of doors showed evidence of extreme wear and poor fit and finish. Hinge screws have pulled loose and spring hinges have lost the ability to close and latch the doors properly.

It appears that door frames were not sufficiently secured (originally) in wall openings. Door gaps are not consistent, and heavy use has shifted door frames and doors out-of-plumb, causing doors to bind and stick. Some doors have missing casing.

On doors with surface mounted door closers, some attachment bolts had pulled through the lightweight doors.

Some double doors (notably at storage and mechanical closets) lacked proper head and foot bolt hardware as well as center seal (astragal) at door intersections. The majority of storage and mechanical room doors were not closing properly. Most doors dragged on corridor carpeting.

In addition to the interior doors, exterior doors, frames and hardware exhibited the same maintenance, fit and finish concerns. Most doors did not seal properly and hardware (exit devices) was no longer securely fastened.

It is recommend that corridor and apartment interior doors, frames and hardware be removed and replaced with properly set and secured, hollow metal door frames (rated as required) with commercial/institutional grade solid core wood doors, hinges, mortise locksets (with ADA compliant lever handles) and surface mounted door closers.

It is recommend that exterior doors and hardware be removed and replaced with properly set and secured, commercial/institutional doors (rated as required) and hardware. Reuse exit hardware as is feasible.

**G-4 Modify (grind and sand) stair treads and stair well floors to provide dimensionally uniform riser heights within flights**  
**Estimated Cost: \$ 25,000**  
**Priority: Immediate**

Stairway risers appear to be inconsistent within flights, notably at/and between landings and corresponding steps. It is recommend that riser heights be modified (grind and sand) to provide uniform heights within flights, as required per Section 1003.3.3.3.1 of the NC Building Code.

**M-1 Upgrade Outside Air Intake**  
**Estimated Cost: \$ 350,000**  
**Priority: Immediate**

The existing outside air intake system does not provide adequate ventilation for the health of the occupants. According to NCMC 403.3, the ventilation system should supply at least 15 cfm per person in a dormitory, and the existing equipment provides less than 5 cfm per person.

The existing outdoor ventilation system does not provide sufficient positive pressure on the building to prevent infiltration. Without positive pressure in the building, humid air from outdoors is drawn in and condenses on cooler surfaces in the building and causes mold growth. Evidence of condensation and mold growth is present on several of the first floor supply diffusers in the hallways.

It is therefore recommended that a new system for outdoor air ventilation be installed, including new air handling equipment to condition the outdoor air and distribute it into the building to maintain a positive pressure and prevent infiltration.

**M-2 Upgrade Condensate Drain System**  
**Estimated Cost: \$ 330,000**  
**Priority: Immediate**

The existing condensate drain system malfunctions frequently, resulting in water damage to the building, unsanitary conditions and mold growth. The primary condensate piping clogs frequently, causing water to back up into the water heater drain pans and overflow into the mechanical rooms and flood that area of the building. The condensate piping supports do not meet NCPC Section 308.

The secondary condensate drain system is poorly designed and does not meet NCMC 307.2.3 which states that the secondary drain must discharge to a conspicuous point to alert occupants in the event of a stoppage of the primary drain. The float switches installed on these pans, designed to shut off the unit in the event of secondary condensate flow, did not appear to be operational and have allowed condensate water to flood sections of the building.

It is therefore recommended that the primary and secondary condensate removal system be renovated to provide a reliable system that will not become clogged and flood the building, and meets NCMC Section 307.

**M-3 Provide Ducted Return Air**  
**Estimated Cost: \$ 275,000**  
**Priority: Immediate**

The air handling units have an open return duct at each unit, using the mechanical room as a plenum. Some of the materials in the mechanical rooms are not rated for a return air plenum, such as the wiring and television cable, which is in violation of NCMC 602.2.1. Floor drains connected to the sanitary sewer system are present in many mechanical rooms, with the potential for sewer gases to enter the air distribution system and harm the health of the occupants.

The first floor classroom is served by four air handling units. The return air system for two of the air handling units contains smoke detectors mounted on the louvered door of the mechanical room. The room is designed to be divided by a partition, which would leave the other two air handling systems unprotected by the smoke detectors.

It is therefore recommended that the return air system for each air handler be modified by providing ductwork connecting the air handler to the return ductwork above the ceiling in each apartment.

**M-4 Replace Thermostats**  
**Estimated Cost: \$ 45,000**  
**Priority: Immediate**

The existing manual thermostats do not properly control temperature and humidity in the building. Thermostats have been damaged by vandalism in many locations, and are not used properly by the occupants. Many thermostats have been set at unreasonable temperatures, resulting in damage to cooling equipment and uncomfortable space conditions. It is therefore

recommended that the manual thermostats be replaced with new programmable electronic thermostats.

**M-5 Replace HVAC Equipment**  
**Estimated Cost: \$ 3,750,000**  
**Priority: 6 years**

The existing HVAC system consists of heat pumps, with outdoor units on the roof and indoor air handling units in closets accessed from the hallways. The equipment is of residential quality and does not perform well in an institutional setting.

The refrigerant piping to each heat pump on the roof appears to be more than 150 feet in length, which is excessive. The connections at the heat pumps indicate that the refrigerant piping has not been oversized to account for excessive length. The long stretches of piping strain the equipment and cause coil freezing and premature failure of the heat pumps.

The outdoor heat pump units on the roof appear to be of residential quality, and the maintenance budget must account for frequent replacement of these units. The roof of the building houses more than 125 of these heat pumps, creating a burden for the staff in long-term operation of this building.

The refrigerant piping routed through the attic space is very poorly supported. At many locations, the copper refrigerant piping is in direct contact with the galvanized steel structure of the attic, resulting in corrosion of the piping. This corrosion was observed in several locations, and will become a severe burden for university maintenance in tracing and repairing the leaks. At least two refrigerant leaks in the attic were identified by sound during the inspections, and many more are likely. The piping routed from the attic down through the walls to air handling units below is also subject to leaks from galvanic corrosion and will become a hardship for the maintenance staff in identifying and repairing leaks.

Refrigerant leaks and excessive lengths of refrigerant piping have contributed to poor performance of the HVAC system. During the recent inspection, several air handling unit coils were frozen, such that the equipment could not condition the rooms and moisture damage to the structure occurred during thawing.

The building uses only electricity as an energy source for heating, air conditioning and heating of domestic water. The reported energy costs for operating this building are approximately 25% higher per square foot than a comparable State dormitory building.

It is therefore recommended that the HVAC equipment be replaced. The existing heat pumps, air handling units and refrigerant piping should be removed. The new system should consist of a new gas-fired boiler, electric chiller, and four-pipe chilled water and hot water piping system. This system will be more energy efficient and greatly reduce maintenance costs.

**M-6 Upgrade Storm Drain System**  
**Estimated Cost: \$ 240,000**  
**Priority: Immediate**

The existing storm drain system, including piping, catch basins and a retention ditch, does not function properly. Standing water remains in the ditch and on the ledge above the ditch near the building. It is therefore recommended that the storm drain system be upgraded to allow better drainage from the ditch and drainage from the ledge above.

**M-7 Replace Shower and Tub Fixtures**  
**Estimated Cost: \$ 590,000**  
**Priority: Immediate**

The showers and tubs are of substandard residential-grade construction and not suitable for a college dormitory. The grouting below the fixtures does not properly support the weight, allowing the fixtures to flex and create cracks in the fixture and leaks in the piping connections. Evidence of water damage is apparent at many of the shower and tub fixtures. Shower units have reversed slope sills allowing water to run out on the VCT floor. Both the fiberglass shower units as well as the tub units have no transition piece (flange or lip) to the adjacent drywall. The drywall adjacent to the shower and tub fixtures does not meet Sections 1209.3 and 1209.4 of the NC Building Code, which requires a non-absorbent surface and waterproof joints. It is therefore recommended that the shower and tub fixtures be replaced with institutional-grade fixtures. Tile should be installed in the bathroom areas adjacent to the shower and tub fixtures to protect the interior finishes from moisture damage. (It is further recommended to upgrade the tank toilet fixtures with flush valve fixtures, during any renovation project.)

**M-8 Repair Sprinkler System**  
**Estimated Cost: \$ 285,000**  
**Priority: Immediate**

NFPA documents from the original construction still have not been provided, and a functional test could not be performed on the system during this inspection. The sprinkler system in this building uses plastic piping suspended from hangers. According to NFPA 13 and standard UL listings, plastic piping for sprinkler systems must be protected from the covered space or run along a smooth, flat, horizontal ceiling. The existing plastic pipe suspended from hangers does not meet NFPA 13 requirements and UL listings.

Fire sprinkler heads appear to be inoperable at several locations. Plastic tabs from original construction cover many of the links, paint has been splattered on heads, heads designed to be exposed have been mounted recessed into the ceiling, and escutcheon plates are missing on many heads. The sprinkler standpipes in the stairwells are not properly supported as required by NCPC Section 308 and NFPA 14. The main sprinkler risers and piping need to be evaluated for seismic support according to the NCPC 308.2. A sprinkler head needs to be installed at the top of the trash chute, which is a high risk location for a potential fire.

The sprinkler system for this building provides only light hazard protection. According to State standards for institutional buildings, ordinary hazard should be used. A fire pump was originally designed for the first floor pump room, but was not installed. If the city water pressure becomes

lower due to future development in this area, the building might not have adequate water pressure for fire protection.

It is therefore recommended that the routing of sprinkler piping be modified to run flush against ceilings. Existing sprinkler heads should be repaired and new heads added, such as for the trash chute enclosure, as needed to provide proper coverage for the building. All sprinkler piping in the building should be adequately supported, including seismic restraints as required by code.

**M-9 Modify Plumbing Vents**  
**Estimated Cost: \$ 60,000**  
**Priority: Immediate**

The existing plumbing vent system for all toilets in the building uses air admittance valves installed in the attic space. This installation violates NCPC 917.3, which states that air admittance valves shall only vent fixtures that are on the same floor level and connect to a horizontal branch drain. It is therefore recommended that the air admittance valves in the attic be removed, and that all vent stacks be routed outdoors through the roof.

**Miscellaneous Mechanical Maintenance Items**

1. Firewall penetrations need to be sealed at numerous locations throughout the building. Of particular concern are the trash chute enclosure shaft and the elevator shafts. The ventilation ductwork above the elevator shaft needs a fire damper.
2. The electric water heaters serving the apartments are missing devices in some locations such as shut-off valves, dielectric unions, vacuum breakers, and drip pans. Copper pipe should extend at least 4" at the top of the water heater.

**E-1 Install and Replace Exit and Emergency Egress Lights**  
**Estimated Cost: \$58,000**  
**Priority: Immediate**

Additional exit and emergency egress lights are required. Safety exits from the building should be marked and illuminated, and all exit and egress lighting should be connected to a generator.

**E-2 Upgrade Fire Alarm System**  
**Estimated Cost: \$40,000**  
**Priority: Immediate**

The building has no smoke detectors in mechanical rooms and questionable smoke detection coverage in corridors. Install smoke detectors in all mechanical rooms, and ensure that hallways are properly covered for smoke detection.

At the time of inspection, the fire alarm system was in trouble mode and functional testing on the system was not possible. A complete functional test is needed. An NFPA 72 Fire Alarm

Certificate was submitted, but is incomplete and was not signed by the designer of record. Much of the existing fire alarm wiring is not installed in conduit, which is needed to comply with the NC Department of Insurance Fire Detection and Alarm System requirements for State facilities. Remote monitoring equipment for the fire alarm system needs to be provided at the NCCU Police Station.

**E-3 Miscellaneous Electrical System Items**

**Estimated Cost: \$28,000**

**Priority: Immediate**

Verify and type all panel directories. Install all wiring in mechanical rooms in boxes and conduit. Seal all fire wall penetrations. Repair receptacles as needed. Repair the Blue Light in the rear of the building.

**E-4 Install a Generator**

**Estimated Cost: \$75,000**

**Priority: Immediate**

Life safety items in this building need to be connected to a back-up power supply. Provide a new generator and connect it to the two elevators, exit and egress lights, and any other critical equipment.

**E-5 Install Lighting in Mechanical Rooms**

**Estimated Cost: \$18,000**

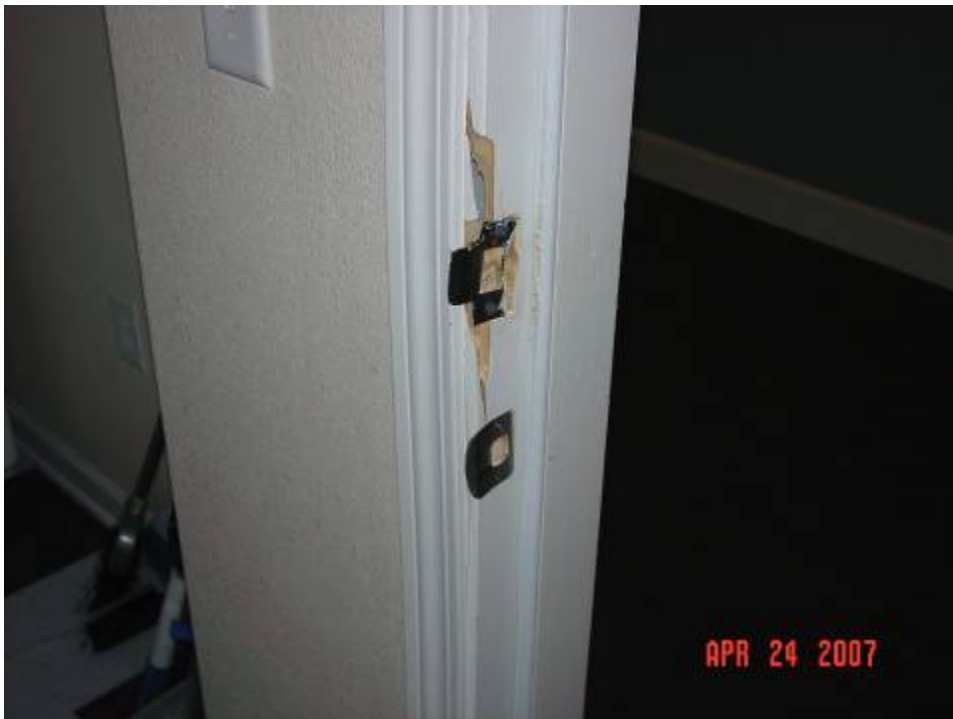
**Priority: Immediate**

There is insufficient lighting in the mechanical rooms. Install lighting in these rooms as required by the NC Building Code.

Eagle Landing NCCU  
Photos from State Construction Office Assessment April 23 and 24, 2007



Bottom of trash chute chase not sealed.



Residential-type wood door jamb and casing.



Water damage to hallway from overflowing condensate drain pan.



Condensate overflow into wall cavity.



Water damage in student suite from plumbing leak.



Moisture damage from shower.



Plastic sprinkler pipe not routed flush to ceiling.



Plastic tab covering sprinkler head fusible link.



Frozen suction line on heat pump.



Frozen suction line at air handling unit.



Fire-rated wall not properly sealed.