



# Gavilan College

## Canopy Assessment



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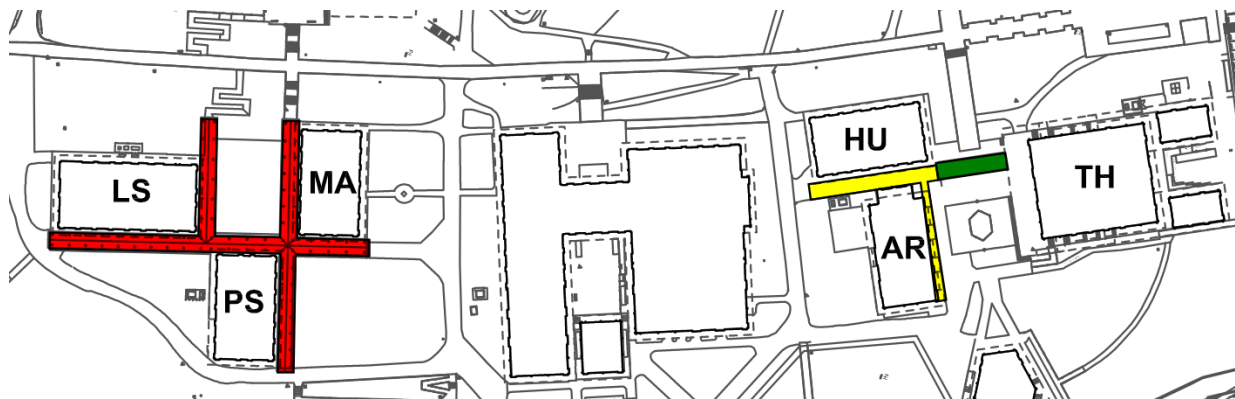


## BACKGROUND

Gavilan College is assessing current issues with existing canopies between buildings. Structural review of the canopies was previously completed to assess what is required for the repairs.

P2S has been requested to review mechanical, electrical and plumbing systems to determine what is required to relocate these systems to allow the canopy repair.

For the purpose of our discussion, we have labeled the canopies in the following method:



Canopy #1 is located near South entrance of Campus.

Canopy interconnects Life Sciences, Physical Sciences and Math building (here in is shown in red).

Canopy #2 is located near North entrance of Campus, South of parking lot A.

Canopy interconnects Humanities and Arts building (here in is shown in yellow).

Canopy #3 is immediately North of Canopy #2.

Canopy interconnects Canopy #2 and Theater building (here in is shown in green).

The following discussion is based on our findings.

## MECHANICAL DISCUSSION

### Canopy #1

#### Heating Hot Water

The Campus does not have a central heating plant; Instead, buildings are grouped together, and are connected to a centrally located boiler. The cooling demand for each building is being addressed at the building level for all buildings. During our survey our team documented two boilers serving the Math building. The hot water generated by these boilers then is being pumped to the Physical Sciences and Life Sciences buildings to meet their heating demands. The piping between the three buildings is routed within canopy number 1. The piping location with respect to the canopy varies, but generally it runs above the canopy roof near the connections to the building and under the canopy roof (strapped to the beams) as it travels between the buildings. The above-mentioned heating hot water lines are generally in poor condition. In multiple locations along the piping the insulation is missing, in some locations there are signs of leakage. Being that the existing insulations on the piping below the canopy roof do not have any protection shielding, the insulation canvas has deteriorated through time as it has been exposed to environmental stresses.

In order to replace the existing canopies, in any extent, shape, or form, the current piping would have to be removed first. Nonetheless, the existing condition of the heating hot water distribution piping is such that by itself, it warrants a replacement of the system. We recommend that the existing heating hot water piping system be replaced with a new piping system adequately insulated and properly installed. These upgrades will result in loss of heating system for the three aforementioned buildings. We recommend that the replacement project to commence during warm seasons or alternative means of heating may need to be provided.



FIG 1-1



FIG 1-2



FIG 1-3



FIG 1-4

## Split System Condensers

As mentioned above, the cooling demand of each building is being addressed at the building level. During the site walk our team documented three separately located condensing units installed on top of canopy roof number 1. These units are all manufactured by EMI. Two units are located adjacent to Life Sciences building, one unit is located adjacent to south wall of the Math building. The condensing unit mounted on the north side of the Life Sciences building is labeled as CU4-2. This unit serves the ceiling cassette packaged evaporator inside the office space behind the women's restroom. The condensing unit on the east side of the Life Science building is labeled as CU4-1 and it serves the heat pump HP4-1 inside classroom LS106. The third condensing unit, south of the Math building, serves classroom M115.



These units will need to be removed to allow canopy repairs. Rooms being served by these units will not have cooling during canopy repairs phasing. These units may remain in the new location indefinitely and should be reinstalled post canopy repairs.

Alternatively, if the College wishes to maintain cooling during canopy repairs, we recommend that the existing condensing units be relocated to a permanent location that is not accessible by unauthorized individuals. According to the manufacturer recommendation, the maximum distance between the condensing unit and the evaporator package inside the building shall be 100 ft. In order to provide a perspective for the Owner, the length of the Life Sciences building is 135 ft. Hence, the condensing unit cannot be relocated to the south side of building footprint. However, there is plenty of vegetated spaces available on the East and West side of the building that can be considered as an alternate location.

## Canopy #2

### Heating Hot Water

Similar to canopy number 1, canopy number 2 houses some heating hot water piping. The existing heating hot water piping serves Humanities, Arts and Music building. The boilers and pumps feeding this system appear to be located in the Business building across the campus's main walking path, on the east side of Humanities building. Heating hot water is pumped from the Business building to underground piping that run between that building and Humanities. The supply and return pipes then rise on the east side of Humanities building (See FIG2-1 below) and travel through this building to serve this building. These pipes then continue through the building and exit on the west side, above canopy roof number 2 (See FIG2-2). From that point the heating hot water supply and return pipes travel south to wrap around the south and west sides of the Arts building (See FIG 2-3 and FIG 2-4). These pipes feed the Arts building from the south side (See FIG 2-5), pipes travel east along building, then the supply and return pipes drop underground, at east end, and travel underground to Music building (See FIG 2-6).

During our survey multiple locations where documented to have damage or missing insulation. The pipe supports on top of the canopy appeared to be adequate.

If the College decides to replace canopy number 2, the portion of the existing heating hot water supply and return piping that lays above the roof of the canopy shall be replaced. We recommend that repairs be completed to piping insulation on portion even beyond canopy footprint.



FIG 2-1



FIG 2-2



FIG 2-3



FIG 2-4



FIG 2-5



FIG 2-6

### Exhaust Fan for Restrooms

It appears that canopy #2 and the roof of the Arts building restrooms is part of one roofing system. During the survey an existing exhaust fan was documented to be above the restroom roofing. If the restroom roof needs to be replaced as part of the canopy replacement, the existing exhaust fan serving the restrooms shall be removed and reinstalled after the new roof is in place. The existing bathrooms will not be occupiable during this period.





**FIG 2-7**

### Canopy #3

There is no mechanical work anticipated for canopy number 3.

Overall replacement costs for all three canopies is approximately \$150,000.

## PLUMBING DISCUSSION

### Canopy #1

#### Storm Drainage System

Storm drainage system for canopy number 1 consists of a gutters system with downspouts located in various locations throughout the canopy. The gutter system appeared to be in working condition in some areas, but in other locations it needed to be cleaned out. For the gutters at the Life Sciences building, the gutter system has a lip that prevents stormwater from getting into the gutter. This condition has caused a small amount of water to stagnate on the roof and resulted in vegetation growing near the roof's edge.

Downspouts on canopy number 1 consist of galvanized pipes running from gutters down alongside the columns and discharge to the ground at the foot level. These pipes are supported mainly by the canopy's structure using pipe clamps. Overall, the gutter and downspout systems provided for this canopy are undersized for the area of the roof they cover. We recommend that when the canopies are being replaced, a new adequately sized drainage system be provided for the new canopies.



**FIG 1-1**



**FIG 1-2**

## Natural Gas Piping

There is a 2-inch natural gas distribution piping that runs from north to south alongside the Life Sciences building to feed both the Life Sciences building and the Physical Sciences building. This pipe is attached to the columns supporting the canopy.

A branch of this gas pipe runs along the east wall of the Life Sciences building to connect to the gas pressure regulator in that location. The gas pipe then travels towards the south to serve the Physical Sciences building.

Near the Physical Sciences building, the gas pipe turns east and runs under the structure. In this location, the gas piping material changes from steel to copper. This can cause corrosion in the gas piping and result in gas leaks and fire hazards. We recommend this issue be immediately addressed by providing a dielectric union on the piping to protect piping from any galvanic reaction.

Based on the extent of the canopy replacement project, the existing gas piping may need to be removed to accommodate the structural upgrades. The gas piping is currently attached to the beams holding the roof structure. If the intent is to replace the entire roof framing, the gas piping shall be removed, and new piping shall be provided. This will cause interruption to the gas service at Life Sciences and Physical Sciences buildings.





**FIG 1-3**



**FIG 1-4**



**FIG 1-5**



**FIG 1-6**



**FIG 1-7**



**FIG 1-8**

## Canopy #2

### Storm Drainage System

Canopy number 2 only contains one roof drain located near the restrooms at the exterior of the Arts building. The existing roof drain is 3 inches in size. Based on our initial observations, it appears that this roof drain only covers the roof area above the restrooms and the portion of the canopy in front of the restrooms. Based on the observations above, the size of the roof drain is considered to be adequate; however, the downspout was observed to be damaged, and it needs to be repaired.

The rest of the canopy does not have any means of collecting stormwater from the roof. The storm will sheet flow to one edge and drip from the edge of the roof.

Based on the observations reported above, If the canopies are to be replaced, the existing roof drain would have to be replaced to go with the new roofing system. We recommend that the existing rain leader (that is currently damaged) be replaced with the new roof drain.

We also recommend additional means of roof drainage be provided to convey stormwater from the roof down to the walking surface.



**FIG 2-1**



**FIG 2-2**

## Canopy #3

### Storm Drainage System

Canopy number 3 extends from the south side of the Theater building and connects to canopy number 2. This canopy was observed to be at least 10 inches higher than the adjacent canopy #2. Canopy #3 has two separate drainage points. Both drains are 3-inches in size, and they connect to two separate 3 inch



cast iron rain leaders. Each rain leader runs next to an adjacent column and discharges into a dedicated receptor in the pavement.

One of the roof drains was documented to be missing the gravel stopping mesh.

Based on our observation, we recommend that in case the roof of this canopy is being replaced, a new roof drain be provided that will be compatible with the roof structure. The new roof drain shall have a gravel stop feature to prevent any gravel from getting into the storm drainage system.

Overall plumbing costs for all three canopies is approximately \$70,000.



**FIG 3-1**



**FIG 3-2**

## ELECTRICAL DISCUSSION

### General Conditions

The existing canopies are utilized to route building feeders, lighting circuits, fire alarm, technology conduits, and miscellaneous conduits.

In general, all these items will need to be removed to allow repair of the existing canopies. After the canopies are repaired the conduit will need to be reinstalled.

In addition, all canopies have lighting that will need to be removed and reinstalled.

### Canopy #1

Canopy #1 provides unique issues as it appears both the electrical services and technology services are routed on top of the canopies.

Two options are available to allow the canopies to be repaired.

#### Option 1 – Replace in kind

New temporary data and power need to be provided. It is anticipated that temporary overhead poles are required to allow these services. Installing temporary services will require shut down of both power and technology services to these buildings to allow installation.

After the cutover, the existing conduit and wire would be demolished to allow the repairs to the canopy to be made.

After the canopies have been repaired, permanent conduit and wire would be installed on the canopies in a similar manner as currently installed. This would require an additional power and technology shutdown to allow a cutover to permanent services.

The benefit to this option is that it maintains the existing condition and does not require demolition of existing hardscape.

The downside to this option, is it does require multiple service shutdowns to the building. In addition, the cost is anticipated to be more expensive as you will be installing the services twice.

The anticipated cost to underground the work is approximately \$350,000.

#### Option 2 – Underground the services

The second option would be to underground the existing power and technology services to the building.

Existing concrete will be removed in the courtyard to allow new vaults and conduit for the power and technology services. Where the buildings currently connect from the canopy to the building (see figures 1-7B, 1-7C, 1-8B for examples of crossings) the new services would route surface from below grade, surface up the wall to the existing connection point. A service outage for both power and technology is required to allow the cutover.

Once the permanent underground services are established, the existing conduit and wire will be demolished, and the canopies can be repaired.

The benefit to this option is there is only one power outage and the canopies can be constructed without further electrical/technology involvement. This option removes the conduit permanently from the canopy, allowing future repair without having to do this exercise. In addition, this option appears to be less expensive as the installation is only done once.

The downside to this option is that it will require demolishing the existing hardscape in the courtyard area.

The anticipated cost to provide temporary and then permanent in kind is approximately \$500,000.

## Canopy #2

Canopy #2 has a combination of small feeders and larger feeders. In some cases, the circuit (lighting) could be disconnected while construction is occurring.

We recommend that temporary wiring be provided for the smaller circuits to be maintained during construction.



There is a 3" conduit that currently routes under the canopy (Fig 2-5B). Our recommendation is to protect this conduit in place and build the canopy over this.

In addition, the existing lighting will need to be removed and reinstalled.

An existing fire alarm horn may need to be removed and reinstalled to allow the canopy repair.

Anticipated cost for this work is approximately \$75,000.

### Canopy #3

Canopy three is relatively simple in comparison to Canopies 1 and 2.

Existing lighting will need to be removed and replaced.

Anticipated cost for this work is approximately \$15,000.

## Electrical Illustrations

### Canopy #1 – Illustrations



FIG 1-1

Multiple 4' linear wraparound fixtures are located between canopy pillars.

1. 33 sections – (3) 4' fixtures along outer end of canopy
2. 2 sections – (2) 4' fixtures at center pillars, where canopy branches out



FIG 1-2

Conduit and boxes are located below canopy roofing. There is no indication conduits contain any live branch circuits. Boxes have been capped, appears conductors and raceway have been abandoned in place.



A. South East Electrical Yard



**FIG 1-3**



**FIG 1-4**

An electrical 480V service, South East of Canopy#1, feeds Life Sciences, Physical Sciences and Math building. (6)3"C and (1)1"C are stubbed up and routed up and surface to canopy roof.

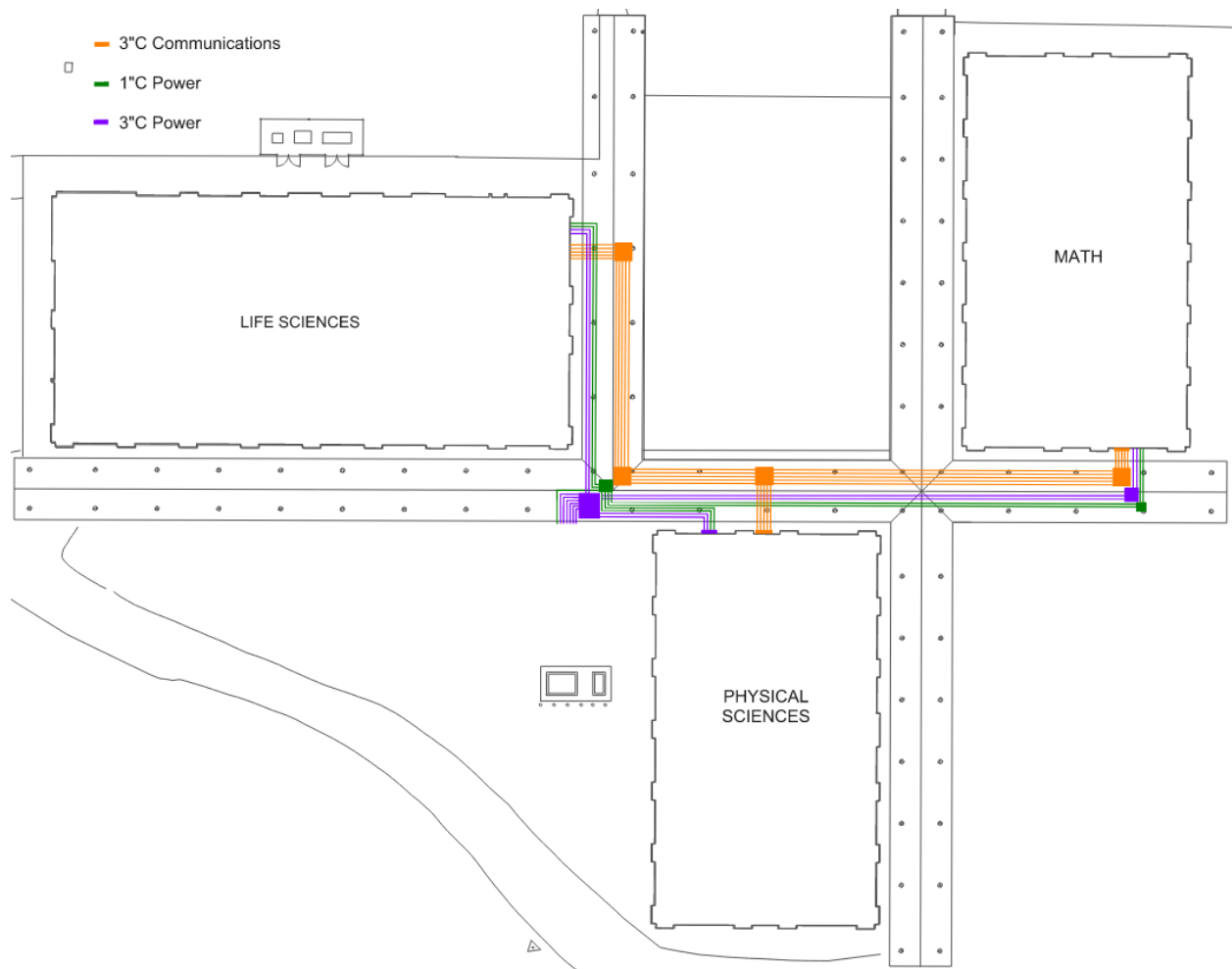


**FIG 1-5**



**FIG 1-6**

## B. Canopy Conduits



**FIG 1-7**

(2)3"C and (2)1"C are distributed to each building along the canopy roof. There are three additional 3'x3' boxes on roof, with (5) 3"C for the telecom distribution system.



C. Physical Sciences Building



**FIG 1-7A**



**FIG 1-7B**



**FIG 1-7C**

D. Life Sciences Building



**FIG 1-8A**



**FIG 1-8B**

E. Math Building



**FIG 1-9A**



**FIG 1-9B**

Canopy #2 – Illustrations

A. Electrical Yard



**FIG 2-1**

480V service appears to feed two 208/120V system, located South of Arts Building.

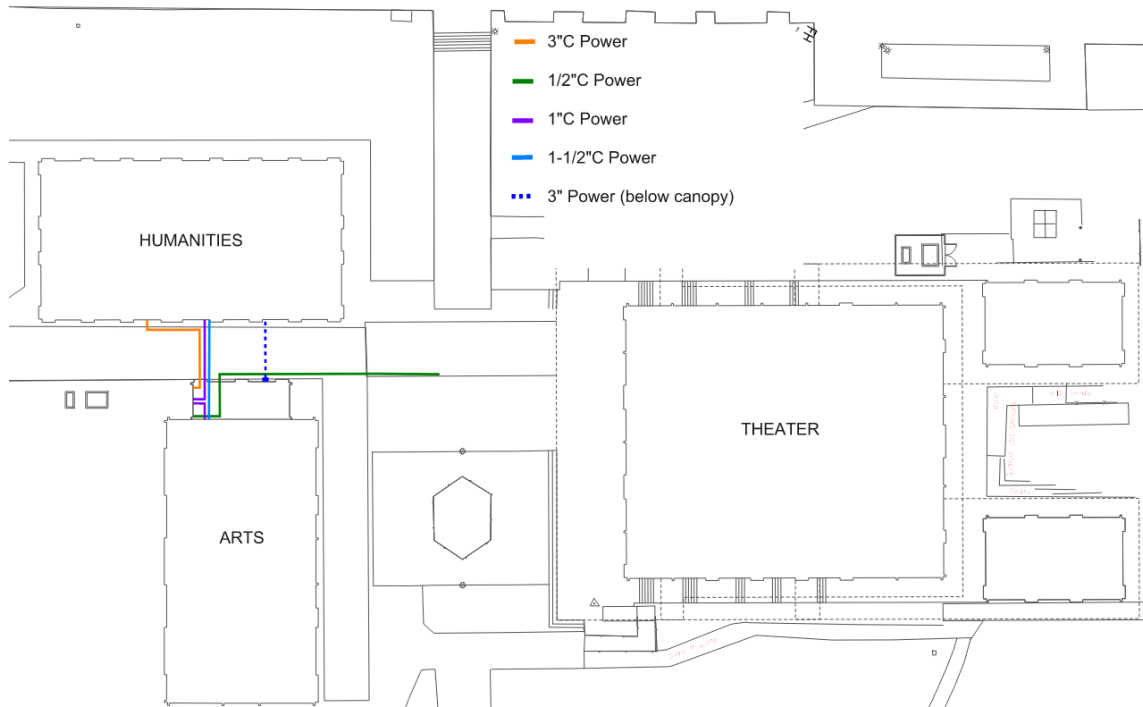
Canopy #2 appears to be a continuous structure, and part of the Arts' restroom roof.



## B. Canopy Conduits

There are (5) conduits routed above the canopy/ restroom roofing.

An additional conduit stubs out of restroom building and is routed below the canopy.



**FIG 2-2**



**FIG 2-5A**



**FIG 2-5B**



### C. Under Canopy Conditions



**FIG 2-3**



**FIG 2-4**

Multiple 4' linear wraparound fixtures are located between canopy pillars.

1. 14 sections – (3) 4' fixtures along outer end of canopy
2. 2 sections – (2) 4' fixtures at center pillars, where canopy branches out
3. 1 section – (1) 4' fixtures South of center pillars

Two flood lights, facing Theater/Arts quad, are located North of Arts building.



**FIG 3-1**

Multiple 4' linear wraparound fixtures are located between canopy pillars.

1. 3 sections – (3) 4' fixtures along outer end of canopy



**FIG 3-2**



**FIG 3-3**

(1)1/2" C, routed above restroom roof/canopy #2, feeds into (3) boxes on Canopy #3 column. Boxes have been capped, appears conductors and raceway have been abandoned in place.

## SUMMARY

### Mechanical

1. At Canopy Number 1:
  - a. Demolish existing heating hot water supply and return piping and install complete new system with appropriate insulation
  - b. Remove existing condensing units salvage and reinstall in the same location or different location as determined by the Owner
2. At Canopy Number 2:
  - a. Demolish existing heating hot water supply and return piping and install complete new system with appropriate insulation
  - b. Repair existing insulations on portions of the piping system beyond the scope of the canopies.
  - c. Remove, salvage and reinstall existing exhaust fan that serves the restrooms attached to the art building.
3. At Canopy Number 3:
  - a. No scope of work.

### Plumbing

1. At Canopy Number 1:
  - a. Remove existing gutter system and provide new adequately sized storm drains for the entire canopy.
  - b. Remove the existing gas piping and reinstall after the conclusion of construction. Alternatively, we recommend that the gas piping be routed underground for additional safety and better design.

- c. At a minimum, we strongly recommend that the Owner address the connection between different gas pipes to protect them against corrosion.
- 2. At Canopy Number 2:
  - a. Remove existing roof drain and provide a new roof drain that will be compatible with the new roof.
  - b. Replace the existing rain leader.
  - c. Provide means of drainage for the rest of the canopy to avoid stormwater from the roof dripping on the pedestrians.
- 3. At Canopy Number 3:
  - a. Provide new roof drains and piping.
  - b. Electrical

## Electrical

- 1. At Canopy Number 1:
  - a. All abandoned raceway shall be permanently removed.
  - b. All existing light should be carefully removed, stored, and reinstalled in same layout as before. If canopy columns are relocated, the lighting layout may need to be revised.
  - c. (Option 2) Route all services permanently underground, prior to any canopy remodel. This is the recommended option as there will be no cost for temporary raceways and supports.
- 2. At Canopy Number 2:
  - a. All abandoned raceway shall be permanently removed.
  - b. All existing light should be carefully removed, stored, and reinstalled in same layout as before. If canopy columns are relocated, the lighting layout may need to be revised.
  - c. Provide temporary service and supports for branch circuits routed above canopy and restroom roof.
  - d. Provide temporary supports for (3") conduit routed below canopy. This should be protected in place during canopy repairs and shall be permanently fixed to new structure.
  - e. Fire Alarm device located outside restroom building must be protected in place.
- 3. At Canopy Number 3:
  - a. All abandoned raceway shall be permanently removed.
  - b. All existing light should be carefully removed, stored, and reinstalled in same layout as before. If canopy columns are relocated, the lighting layout may need to be revised.