

**ASSESSMENT AND RECOMMENDATIONS
FOR THE
MECHANICAL, PLUMBING, ELECTRICAL
AND FIRE PROTECTION SYSTEMS
AT THE BROOKDALE COMMUNITY COLLEGE
AUTOTECH CENTER / WEST MONMOUTH CLASSROOM BLDG.**

To: George Hibbs, AIA
Clarke-Caton-Hintz Architects

Prepared By: Mark P. Hershman, PE

Date: March 20, 2008

On Tuesday, March 11, 2008, I met with Bill Globulins to evaluate the existing HVAC, plumbing and electrical systems serving the Autotech Center at the Lincroft Campus and the Four Story Classroom Building at the West Monmouth Campus. We are pleased to offer the following assessment and recommendations.

AUTOTECH CENTER – LINCROFT CAMPUS

Existing Conditions:

The Autotech Center is a 20,000 square foot facility which provides automobile service training to the students. The mechanical requirements are similar to that of an automobile service agency.

HVAC

The building is heated by means of unit heaters, air handling units and baseboard radiation all of which are supplied with Campus District hot water entering the building through the adjacent Natural and Applied Science Building.

Air conditioning is provided in the classroom side of the building by means of air handling units which are supplied with Campus District chilled water entering the building through the adjacent Natural and Applied Science Building. There also was one direct expansion split air conditioning unit which provides cooling only to one classroom and one service bay.

There is no introduction of ventilation air into the building.

There is a carbon monoxide exhaust system consisting of a grade mounted exhaust fan, an underground exhaust duct, and terminal floor connections; hoses can extend from the connections to the individual auto exhaust pipes.

It was reported that the building was neither heated or cooled properly during the colder and warmer days respectively.

Many pieces of equipment were reported as not properly operating

Plumbing

The drawings indicate 2-1/2" domestic water main servicing the building, an unsized hot water

main and a ½" hot water return, all entering the building through the adjacent Natural and Applied Science Building.

In addition to the conventional sanitary leaving the building, there is a drain from a lengthy trench drain which empties into an oil separator prior to reconnecting to the campus sanitary system. That system is alarmed to notify users of high oil levels.

Fire Protection

The building is fully sprinklered and is serviced by a 6" main. Pressure at the alarm check valve was 100 psig.

Electrical

The incoming service comes from an on site distribution system. The main breaker is 600 amps, 208volt/3ph/60Hz. It was reported to me that this size service was marginal for the facility as currently configured and occupied.

Other services

A **natural gas** main of unknown size is piped though the building entering the building through the adjacent Natural and Applied Science Building.

Compressed air is produced at a large air compressor which is distributed throughout the Autotech Building. It was suggested that this may be reused for the new project, however, the current location appears to be inadequate and unventilated.

Recommendations for the MEP/FP Systems at the Proposed Autotech Center

We have reviewed your proposed usage plans for this approximate 20,000 square foot facility and 10,000 square foot addition and will address the issues associated with each discipline:

HVAC

The proposed plans call for heating and air conditioning all spaces. The existing HAVC systems should be demolished due to the following reasons:

- All equipment is beyond its average useful service life.
- Some equipment is inoperable.
- None of the equipment has ventilation air introduce and certainly was not sized for that requirement.

It was requested that the underground carbon monoxide system be replaced with an above ground system.

Since the entire heating and air conditioning system will be new, there are two main options to pursue. These options are driven by the existing district heating and cooling plants. The plant apparently does not heat or cool the building adequately now.

Air Conditioning:

The combined 30,000 square foot facility would require 100 tons of air conditioning (plus or minus depending on the final occupancy population and building envelope

improvements). The Schoor DePalma report dated November 29, 2005, states, "The operating capacity of the chiller plant is approximately 2,100 tons and therefore, is not sufficient to meet present and future demand requirements."

Thus we have two approaches to this project:

1. Assume that the chiller plant shall be upgraded to provide sufficient chilled water to properly cool the new project. The chilled water would feed an indoor or rooftop variable air volume unit with a duct distribution system and VAV boxes throughout.
2. Assume that the chiller plant is not upgraded and a separate cooling plant be employed in the form of:
 - a. A chilled water plant shall be provided for the new Autotech facility. This would be an air-cooled chiller mounted on the roof of the 10,000 square foot addition. It would feed indoor or rooftop variable air volume unit with a duct distribution system and VAV boxes throughout, or,
 - b. A package direct expansion rooftop variable air volume unit shall be provided with duct distribution system and VAV boxes throughout.

Should the first approach be employed, for purposes of budget pricing I would assume that the sufficient chilled water be brought into the building as part of an independent project and that the chilled water distribution from that point be included in our project.

The second approach should include additional structural and electrical elements to support the new HVAC systems.

Heating:

Similarly, the Schoor DePalma report does not feel that the existing heating plant has the capability or is of adequate condition to handle additional loads.

This also leads to two approaches:

1. Assume that the heating plant shall be upgraded to provide sufficient heating hot water to properly heat the new project. The hot water would feed an indoor or rooftop variable air volume unit with a duct distribution system and VAV boxes throughout. The hot water would also feed the reheat coils in the VAV boxes.
2. Assume that the heating plant is not upgraded and a heating plant be employed in the form of:
 - a. Providing a hot water boiler plant utilizing high efficiency gas fired boilers (similar to Lochinvar) for the new Autotech facility. The hot water would feed an indoor or rooftop variable air volume unit with a duct distribution system and VAV boxes throughout. The hot water would also feed the reheat coils in the VAV boxes. or,
 - b. A package rooftop with gas fired furnace and variable air volume units with hot water reheat coils provided with hot water from Lochinvar boilers similar to above.

Should the first approach be employed, for purposes of budget pricing I would assume that the sufficient hot water be brought into the building as part of an independent project and that the hot water distribution from that point be included in our project.

The second approach should include additional architectural elements to support a new boiler room.

Carbon Monoxide Exhaust System:

The existing carbon monoxide system shall be demolished/abandoned. The new recommended system is to be provided into all classrooms which will have potential vehicle exhaust emissions as well and the entire service bay addition.

For purposes of this report we are recommending a system shall be delivered and installed as a pneumatic Sliding Balancer Track system, as manufactured by PlymoVent Corporation. The new carbon monoxide exhaust system including the detail engineering furnishing, installing and testing of the system with the associated ductwork, compressed air piping, valves, control and power wiring, new gravity roof ventilator with control and other appurtenances required for a complete and operational system.

General exhaust with carbon monoxide sensors shall also be required.

Bathroom Exhaust System:

New bathroom exhaust systems will be required for all of the new bathrooms.

Air Compressor Room Exhaust System:

New air compressor room exhaust/ventilation systems will be required for the new air compressor room.

PLUMBING

Provide new sanitary systems per the new architectural layouts. Any new trench drains or waste from potential area which oil may be present should be piped through the existing oil separator.

We suspect that the existing domestic cold water mains are sufficient to be extended to all new plumbing fixtures as shown on the architectural plans.

We recommend that the domestic hot water be generated through a new gas-fired domestic water heater rather than tying into the existing central system.

FIRE PROTECTION

The existing sprinkler system shall be modified to properly protect the building, based on the new architectural layout. All required devices, such as, alarm check valve, fire department connections and all other required appurtenances shall be checked and refurbished as required.

ELECTRICAL

Provide new lighting, power, fire alarm, emergency lighting and exit signage as required for the new layout. Provide power wiring for the HVAC and other new mechanical equipment.

The existing 600 amp service will need to be upgraded to accommodate new air conditioning, lighting and power requirements.

NATURAL GAS

Per the Schoor DePalma report, there appears to be sufficient natural gas to support any of the concepts contained herein. However, the size and pressure of the existing main within the existing building is unknown at this time. For purposes of this estimate, assume it is sufficient.

The natural gas piping shall be extended to the equipment described in the various options listed herein to require same.

COMPRESSED AIR

For purposes of this report, we are assuming that the existing air compressor is of sufficient capacity and adequate condition to be reused for the new facility. Provide a new air compressor room with proper lighting, clearances and ventilation for the air compressor to be serviced and provide an environment for safe and proper operation

The compressed air piping shall to be extended to all the rooms and location indicated to required compressed air.

WEST MONMOUTH CLASSROOM BUILDING

Existing Conditions:

The West Monmouth Classroom Building is an approximate 72,000 square foot facility which originally was a full business occupancy, but it is currently used for classrooms for the Brookdale Community College's West Monmouth Campus.

This report specifically is for the retrofit of the first and third floors, though some global improvements may affect the entire building.

HVAC

The building's HVAC system is a four pipe chilled and hot water system with 2 – 837 MBH input, natural gas fired Cleaver-Brooks Boilers and 2 – 80 ton Trane Chillers with remote air-cooled condensers.

The air is distributed to the building through (5) Trane, VAV, air handling units, three in the basement mechanical room and two in the 4th floor mechanical room. They all have inlet vane dampers for air capacity control. The five units individually control the basement, 1st, 2nd, 3rd, and 4th floors.

Terminally there exists approximately 20 fan powered induction VAV units per floor which then feed the ceiling supply diffusers.

There is a hot water baseboard radiation system which is single zone for the entire building controlled by means of an outside air temperature reset controller.

All of the equipment listed above is original equipment installed in 1987.

Originally, there was a computer room with dedicated computer room air conditioning. Several years ago, that tenant left and took the CRAC equipment with them. The building owners installed 4 gas-fired packaged rooftop units (reported all to be of 5 tons or lower). This provided the heating and air conditioning for the vacated computer room area.

There are Barber Colman control panels, but they seem to handle just basic function of the systems and do not appear to have the capabilities of modern DDC Systems.

During our walk through on March 11, 2008, the occupant shared with us that the building was having a global problem both heating and cooling.

In addition, there is significant infiltration when the wind persists on a given side of the building.

Plumbing

As the plumbing facilities are not significantly changing, the sanitary, domestic cold water, domestic hot water, and domestic hot water return services should be satisfactory. The new bathroom locations will require new sanitary and domestic water distribution risers through the building.

Fire Protection

The building is fully sprinklered and is serviced by a 6" main and fire pump. Pressure at the alarm check valve was 60 psig.

Recommendations for the MEP/FP Systems at the West Monmouth Classroom Building

We have reviewed your proposed usage plans for the first and third floors and will address the issues associated with each discipline. While the charge is to upgrade 1st and 3rd floors, some of the recommendations necessarily will also impact the rest of the building as we are considering replacing some central equipment.

Considering the reported infiltration problem, improvements to the building envelope should be evaluated.

HVAC

The proposed plans call for heating and air conditioning all spaces. The existing HVAC systems should have major renovations due to the following reasons:

- The building was reported to have heat and cooling problems throughout the building.
- The VAV boxes are induction type, in questionable condition and limited control capabilities.
- There is no individual room or exposure zoning on the baseboard heating system.
- It has been reported to be significant infiltration on the windward side of the building.
- The original design occupancy was significantly lower than the project total occupancy load. This increases the outside air requirements and subsequent heating and air conditioning loads.
- There is no energy management system for the building.
- The inlet vane dampers in the air handling units are old technology. Variable frequency drives are the method of choice in newer VAV systems.

Heating and Air Conditioning:

Chilled water plant - The facility's overall heat gain is increased due to the occupancy loads and outside air requirements. For budget purposes, we assume that the 2–80 ton

chillers and condensers be replaced with 2–100 ton chillers and condensers. While the feasibility of fitting this equipment within the existing mechanical room is questionable, an alternative would be to install a 200 air-cooled chiller outside the building near the location of the existing condensers, chilled water pumps may also need to be replaced. This would require site work and screening as directed by the Owner/Architect.

We anticipate utilizing low temperature chilled water techniques so that additional tonnage may be produced by the existing air handling units.

Air handling units – We recommend removing the existing inlet vane damper within the units serving the 1st and 3rd floors. To produce variable flow, we would have the fan motor replaced (supply and return) with high efficiency motors with variable frequency drive (VFD) control. These would speed or slow the motors down based of a signal from a static pressure controller within the duct system.

For the 3rd floor only, integrate the 4 small existing rooftop units with the modified VAV system.

Duct Distribution and VAV Boxes – The ductwork on the two floors would need to be modified to meet the new duct layout along with new fan-powered parallel flow VAV boxes. The exterior units would also have hot water reheat coils.

Baseboard Radiation – Change pipe circuiting for the 1st and 3rd floor to allow for individual room control or at a minimum zone control for each exposure.

Energy Management System – Provide a new DDC system to supplement or replace the existing Barber Colman control panel to control all of the systems as described above. The system shall have full capabilities with graphical user interface, temperature range control for each thermostat/sensor, day night scheduling, fan optimization, morning warm-up, etc. The outside air shall have demand control ventilation with carbon dioxide sensors overridden by full economizer control.

I recommend a system such as the Carrier Comfort Network. The system shall be expandable to control the other three floors in a like manner.

Bathroom Exhaust System:

New or modified bathroom exhaust systems will be required for all of the new bathrooms and janitor's closets.

Mechanical Refrigeration Safety System:

As an Alternate budget price, should the chillers be replaced with new indoor chillers, provide a refrigeration exhaust and control system in accordance with ASHRAE Standard 15.

PLUMBING

Provide new sanitary systems per the new architectural layouts.

The existing domestic cold water mains are sufficient to be extended to all new plumbing fixtures as shown on the architectural plans.

The domestic hot water heater should be sufficient for the revised bathroom layout.

FIRE PROTECTION

The existing sprinkler system shall be modified to properly protect the building, based on the new architectural layout.

ELECTRICAL

Provide new lighting, power, fire alarm, emergency lighting and exit signage as required for the new layout. Provide power wiring for the HVAC and other new mechanical equipment.

The existing service should be sufficient to accommodate new air conditioning, lighting and power requirements.