C&S Engineers, Inc.

MAHAR HALL HVAC REHABILITATION STUDY
STATE UNIVERSITY OF NEW YORK AT OSWEGO

PREPARED FOR
STATE UNIVERSITY OF NEW YORK AT OSWEGO

PROGRAMMING STUDY

FEBRUARY 1999

C&S FILE NO. 671.003.001

REPORT

SUNY OSWEGO

MAHAR HALL

AIR CONDITIONING FEASABILITY STUDY

PREPARED BY

C&S ENGINEERS, INC.
1099 AIRPORT BOULEVARD
NORTH SYRACUSE, NEW YORK 13212

FEBRUARY 23, 1999

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SUNY OSWEGO REPORT

1.0 INTRODUCTION

1.1

C&S Engineers, Inc., was hired to evaluate several options for air-conditioning SUNY Oswego's Mahar Hall. The options were evaluated for installed cost, maintainability, and feasibility. The three most viable options are discussed below. The first option represents a complete replacement approach, the second maximizes the conditioned area per dollar, and the third describes what can be done for the allotted budget of $500,000.

Though no record drawings are available, it appears the overall system parameters are similar to the design drawings, which were available.

1.2 EXISTING EQUIPMENT

Mahar Hall, located on the SUNY Oswego Campus, was built in 1966 and originally incorporated only a partial air conditioning system. The existing system, which is no longer operational, was designed to cool interior space on Floors 1 through 3 and lab space in the basement. Perimeter space and the entire 4th Floor utilize operable windows for cooling. The building is of concrete construction and has approximately 85,000 square feet of gross floor area (not including the maintenance stock room). Floors 1,2, and 3 are mainly occupied with classrooms and the 4th Floor mostly consists of staff offices. A mechanical penthouse contains the cooling tower and two exhaust fans.

The existing HVAC equipment consists of two air conditioning units, AC-1 (12,700 cfm) and AC-2 (2,890 cfm), a 60-ton chiller, a 52-ton cooling tower, a return fan (35,000 cfm), and a single 49,500 cfm air handling unit for ventilation, (HV-1). The HVAC equipment, with the exception of the cooling tower, is housed in two mechanical rooms located in the basement. Make-up air is drawn in through areaways located beside the mechanical rooms. Though no longer used for cooling, AC-1 and AC-2 are used for ventilation and heating.

Mahar Hall is equipped with a steam heated hot water system for perimeter heating. Hot water coils in AC-1, AC-2, and HV-1 preheat the make-up air. The heating system is presently functioning without major complaints. It was observed that the pneumatic controls compressor was cycling frequently which may indicate leaks in the

system. It is recommended that the heating controls system be inspected and repaired. The control system should also be reviewed for compatibility with any proposed cooling system.

2.0 SYSTEM PROPOSALS

2.1 SYSTEM SIZING REQUIREMENTS

Computer modeling of the building indicates a requirement of approximately 300 tons of cooling. The existing chiller is rated at 60 tons and appears to be beyond economical repair. The existing cooling tower is rated at 52 tons, far below the total cooling requirements of Mahar Hall. Though the tower appears to be operable. A chiller replacement project would necessarily include new refrigeration machinery, pumps, piping, cooling tower(s), and controls. Any mechanical room containing the chiller will also require updates to comply with ASHRAE 15, including refrigerant leak detection, ventilation, and a vestibule.

Estimates of probable cost for the upgrades and replacement of equipment assumes that adequate electrical power exists within the building.

2.2 SYSTEM ONE

The first option investigated for this report is complete removal and replacement of the existing ventilation and air conditioning system with all new components. In all proposals, the existing steam/hot water perimeter heating system is to be retained.

A 200 ton chiller would replace the existing 60 ton unit, with new pumps piping and a new cooling tower. All of the ductwork would be replaced and 2 new air handling units would be installed. Ceilings would be repaired or replaced as necessary.

This system would meet all of the desired performance criteria at a cost commensurate with the amount of work. The costs are far beyond the proposed budget for the project, but serve to illustrate the value that may be obtained through creative engineering.

2.3 SYSTEM TWO

The second system combines a new 200-ton air cooled rooftop chiller with 100 tons of chilled water from Tyler Hall. AC-1 and AC-2 would be overhauled and reconfigured to deliver 10-15% more CFM. New coils in the units will utilize the Tyler Hall chilled water for cooling. This would provide cooling to the basement and the interior of Floors 1 through 3.

Cooling for the perimeter classrooms would be provided by modifying or replacing HV-1. The rooftop chiller would provide 40°F water to coil(s) located within HV-1 or in coil boxes in the main distribution ducts of HV-1. The low temperature air will enable utilization of the existing ductwork. A 10-15% increase of HV-1's output will be required.

Conditioning of the 4th Floor will be achieved by fan coil boxes piped to the rooftop chiller. Ceiling mounted units can be utilized where insufficient space exists for ductwork.

The existing supply ductwork will require insulation to prevent sweating. This ductwork can be accessed through the ceiling in Floors B-3. The 4th Floor will require a new ceiling.

2.4 SYSTEM THREE

The third system investigated utilizes the chilled water from Tyler Hall for basement and interior space cooling (as per System 2). Packaged rooftop units would provide cooling for the 4th Floor offices. The system will be controlled with thermostatically actuated diffusers in each space. Where limited ceiling space precludes the installation of ductwork, the ducts can be located on the roof.

This system is within the proposed budget, but does not address perimeter cooling for Floors 1 through 3. Multiple compressor units and roof penetrations have the potential to increase maintenance costs.

3.0 RECOMMENDATIONS

System two offers the most value system for the Mahar Hall HVAC upgrade. This system will meet the conditioning requirements at a cost below that of new construction. The rooftop air-cooled chiller will eliminate the need for a cooling tower and ASHRAE 15 upgrades to the mechanical room(s). The use of low temperature water/glycol mixture will allow the existing ductwork to be reused for substantial savings.

State University Construction Fund

REHABILITATION ESTIMATE DETAIL SHEET

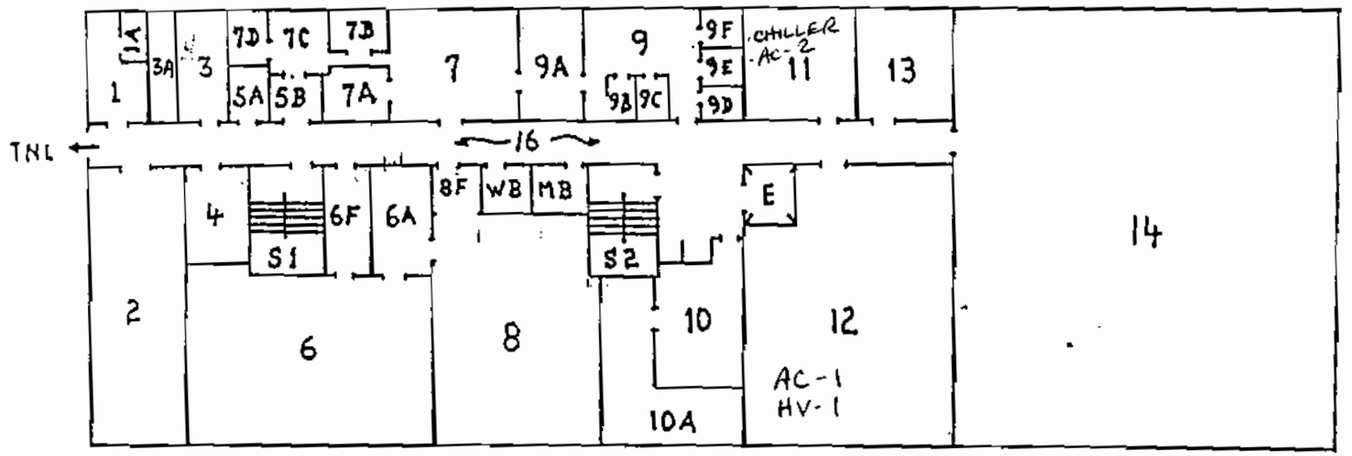
DIVISION 15 - MECHANICAL

PHASE REPORT MAHAR HALL HVAC STUDY **DATE** 02/22/99

CAMPUS SUNY OSWEGO **BUILDING** MAHAR HALL **PROJECT NO.** 671.003.001

TITLE SYSTEM ONE COMPLETE REPLACEMENT

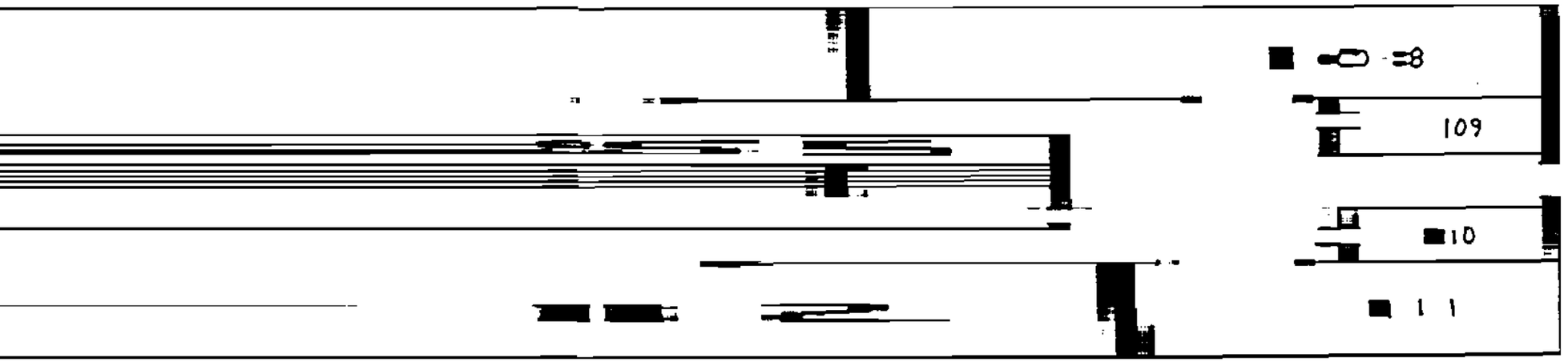
DESCRIPTION	QUANTITY	UNITS	LABOR	MATERIAL	TOTAL
200 TON CHILLER	1	EA	$25,000.00	$60,000.00	$85,000.00
60000 CFM AHU'S	2	EA	$100,000.00	$100,000.00	$400,000.00
DUCTWORK	1	LS	$65,000.00	$65,000.00	$130,000.00
167 TON COOLING TOWER	1	LS	$30,000.00	$35,000.00	$65,000.00
CHILLED WATER PUMPS AND PIPE	1	LS	$20,000.00	$20,000.00	$40,000.00
COOLING WATER PUMPS AND PIPI	1	LS	$20,000.00	$20,000.00	$40,000.00
TYLER HALL PIPING	1000	LF	$32.00	$18.00	$50,000.00
CEILING REPLACEMENT	50000	SF	$2.50	$2.00	$225,000.00
MECHANICAL ROOM MODS.	1	LS	$15,000.00	$15,000.00	$30,000.00
CONTROLS	1	LS	$25,000.00	$25,000.00	$50,000.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
SUBTOTAL					$1,115,000.00
OVERHEAD & PROFIT		20%			$223,000.00
TOTAL					$1,338,000.00



LOWER LEVEL
MAHAR HALL
S. U. C. O.
Scale: $\frac{1}{32}$" = 1'0"

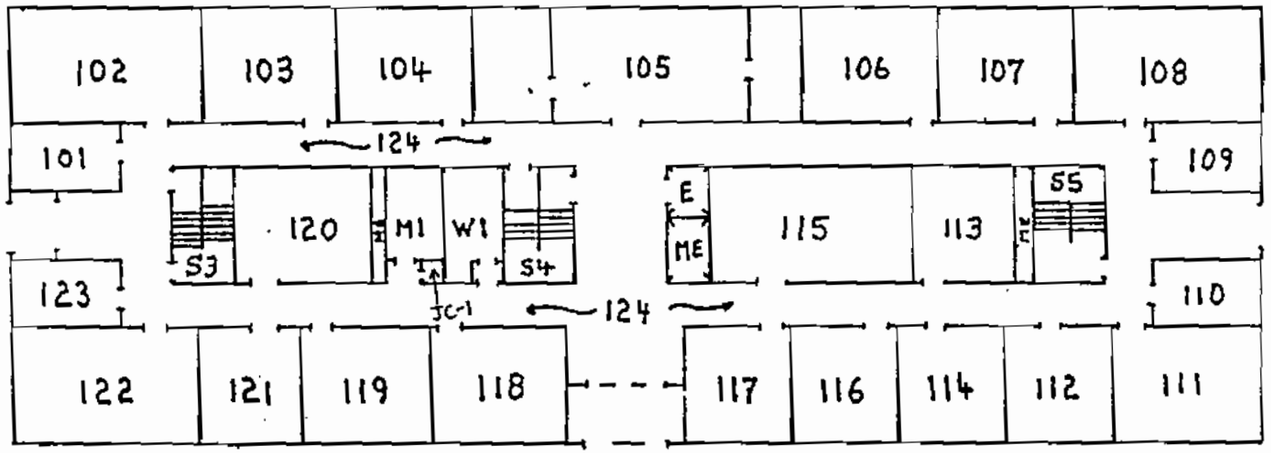
Update: 6/30/85
Germán Patiño
- INVENTORY -

#13
MAH-13



FIRST FLOOR
MAHAR HALL
S.U.C.O.
Scale: $\frac{1}{32}$" = 1'0"

#F 13
MAH-13



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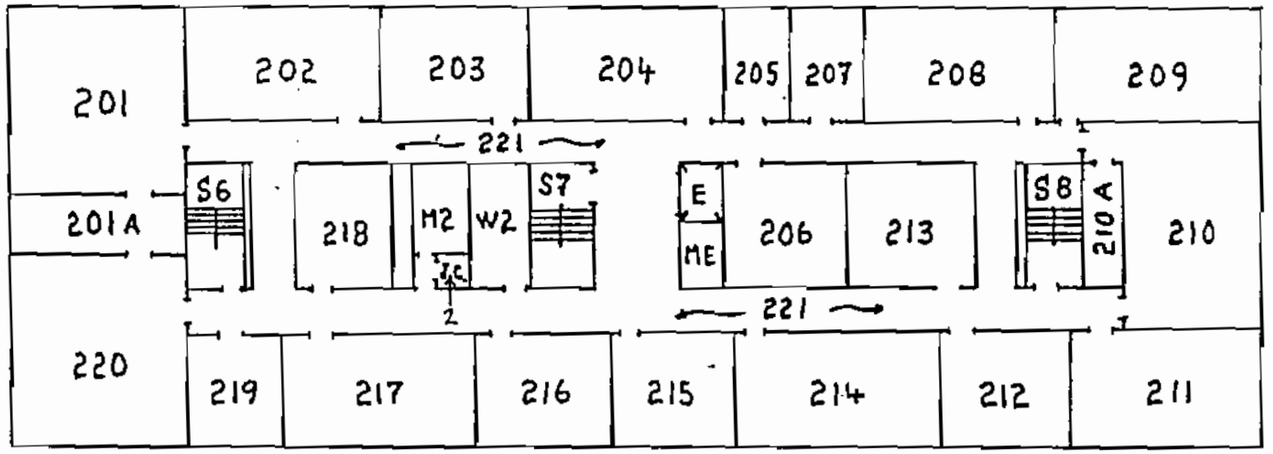
FIRST FLOOR
MAHAR HALL
S. U. C. O.
Scale : $\frac{1}{32}$" = 1' 0"

#F 13
MAH-13



SECOND FLOOR
MAHAR HALL
S. U. C. O.
Scale: $\frac{1}{32}$" = 1' 0"

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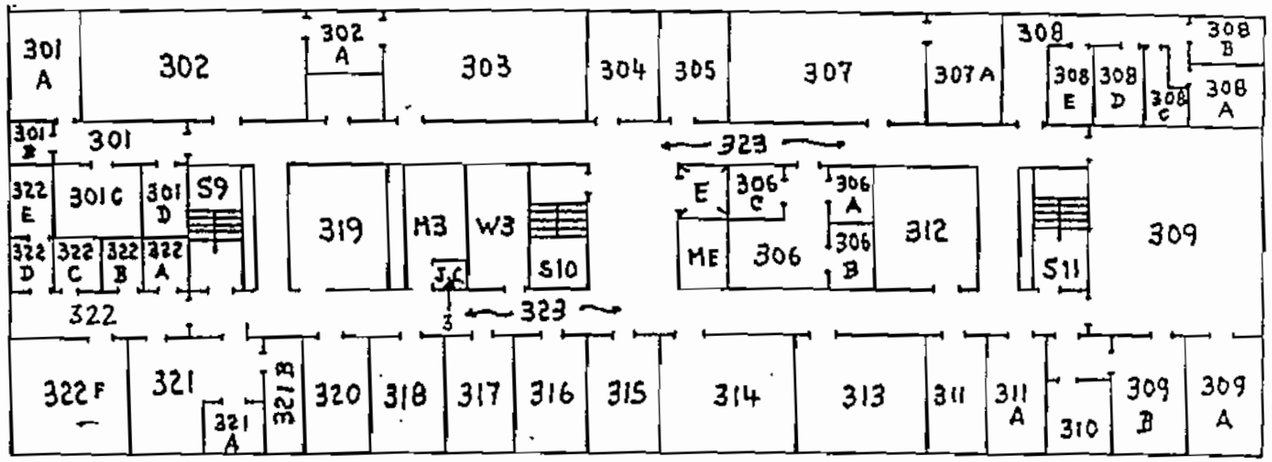
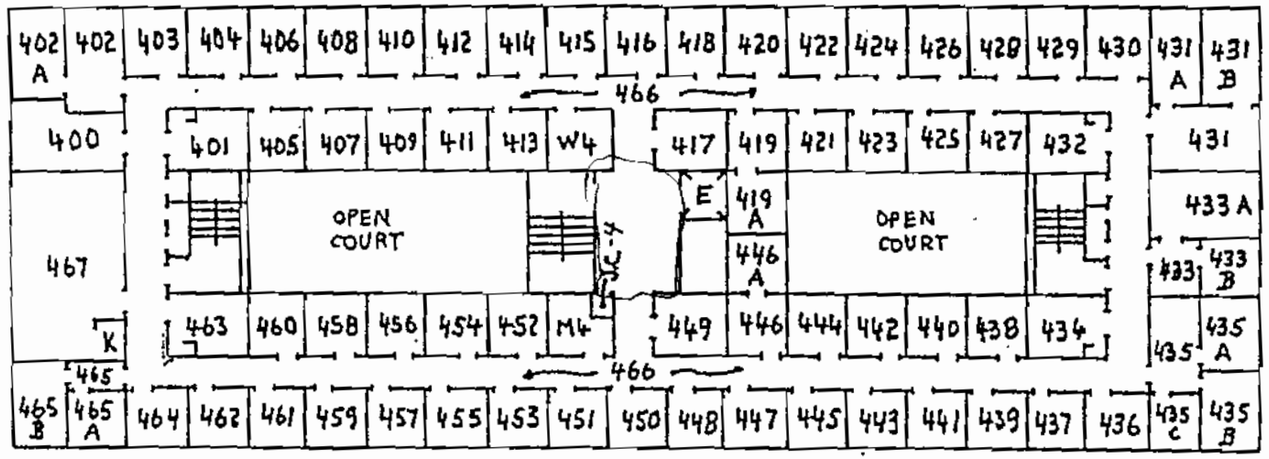
MAH-1E



THIRD FLOOR
MAHAR HALL
S. U. C. O.
Scale : $\frac{1}{32}$" = 1' 0"



FOURTH FLOOR
MAHAR HALL
S. U. C. O.
Scale : $\frac{1}{32}$" = 1' 0"

State University Construction Fund

REHABILITATION ESTIMATE DETAIL SHEET

DIVISION 15 - MECHANICAL

PHASE REPORT MAHAR HALL HVAC STUDY **DATE** 02/22/99

CAMPUS SUNY OSWEGO **BUILDING** MAHAR HALL **PROJECT NO.** 671.003.001

TITLE SYSTEM TWO

DESCRIPTION	QUANTITY	UNITS	LABOR	MATERIAL	TOTAL
200 TON AIR COOLED CHILLER	1	EA	$20,000.00	$60,000.00	$80,000.00
600 GPM PUMPS	2	EA	$2,000.00	$5,000.00	$14,000.00
8" CHILLED WATER PIPING	200	LF	$60.00	$40.00	$20,000.00
AC-1 REPAIRS	1	LS	$10,000.00	$10,000.00	$20,000.00
AC-2 REPAIRS	1	LS	$7,500.00	$5,000.00	$12,500.00
MODIFY/REPLACE HV-1	1	LS	$50,000.00	$150,000.00	$200,000.00
4" C. WATER PIPING FROM TYLER	1000	LF	$32.00	$18.00	$50,000.00
BOOSTER PUMPS	2	EA	$2,000.00	$5,000.00	$14,000.00
FAN COIL UNITS (CEILING)	10	EA	$500.00	$2,500.00	$30,000.00
FAN COIL UNITS (ABOVE CEILING)	5	EA	$800.00	$2,800.00	$18,000.00
INSULATE EXISTING DUCTWORK	1	LS	$25,000.00	$25,000.00	$50,000.00
CEILING REPAIR FLOOR B THRU 3	30,000	SF	$1.00	$0.50	$45,000.00
CEILING REPLACEMENT 4TH FLOOI	18000	SF	$2.50	$2.00	$81,000.00
DUCTWORK 4TH FLOOR	1	LS	$8,000.00	$8,000.00	$16,000.00
CONTROLS	1	LS	$25,000.00	$25,000.00	$50,000.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
SUBTOTAL					$700,500.00
OVERHEAD & PROFIT		20%			$140,100.00
TOTAL					$840,600.00

State University Construction Fund

REHABILITATION ESTIMATE DETAIL SHEET

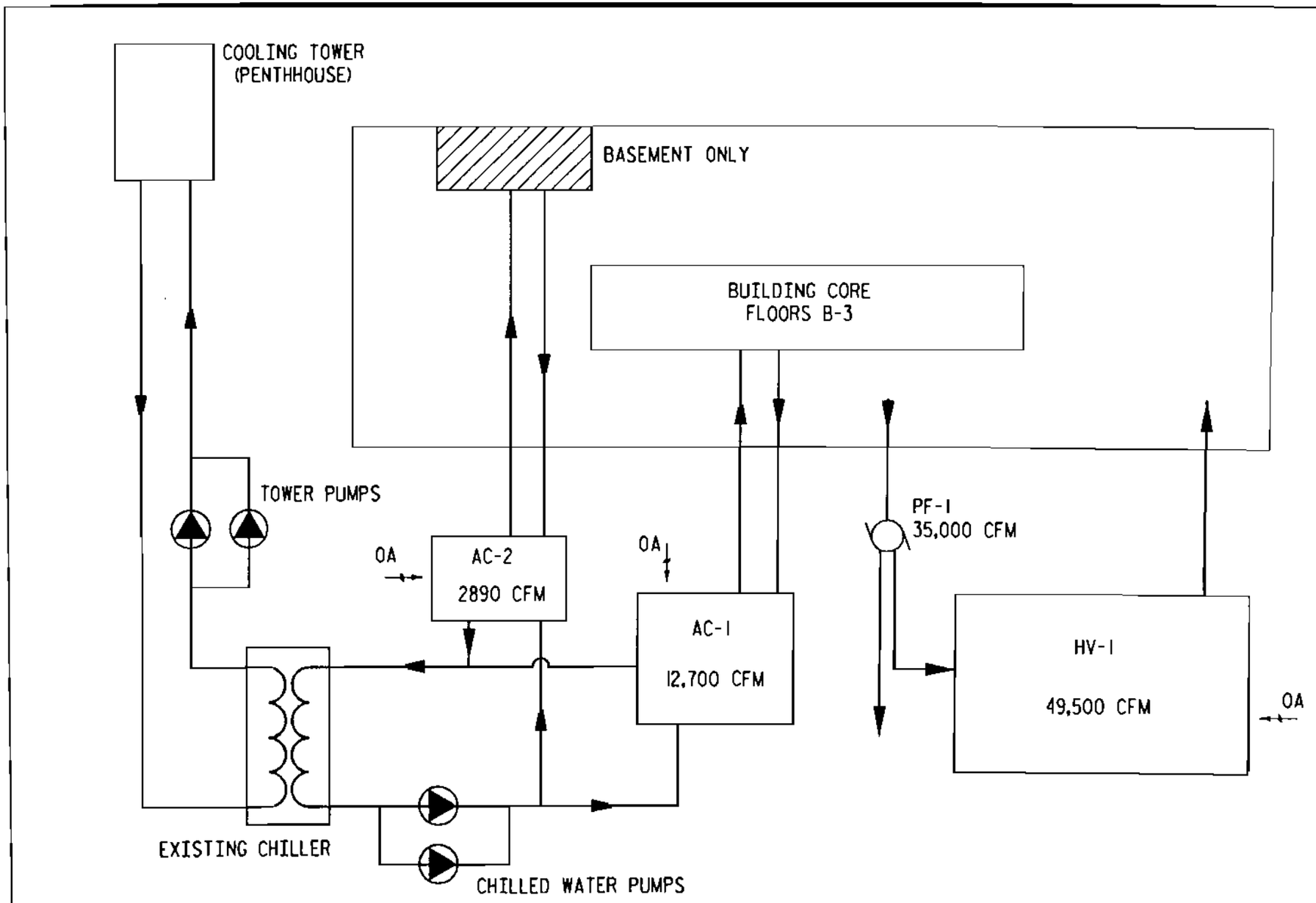
DIVISION 15 - MECHANICAL

PHASE REPORT MAHAR HALL HVAC STUDY **DATE** 02/25/99

CAMPUS SUNY OSWEGO **BUILDING** MAHAR HALL **PROJECT NO.** 671.003.001

TITLE SYSTEM THREE: MULTIPLE ROOFTOPS

DESCRIPTION	QUANTITY	UNITS	LABOR	MATERIAL	TOTAL
4" PIPING FROM TYLER HALL	1000	LF	$32.00	$18.00	$50,000.00
REPAIR OF AC-1 & AC-2	1	LS	$17,500.00	$15,000.00	$32,500.00
ROOFTOP AC UNITS INCLUDING	4	EA	$42,500.00	$18,000.00	$242,000.00
DUCTWORK & INSULATION					
CEILING REPLACEMENT	17000	SF	$2.50	$2.00	$76,500.00
CONTROLS	1	LS	$10,000.00	$15,000.00	$25,000.00
BOOSTER PUMPS AND VALVING	1	LS	$10,000.00	$15,000.00	$25,000.00
					$0.00
LIGHTING	1	LS	$10,000.00	$20,000.00	$30,000.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
SUBTOTAL					$481,000.00
OVERHEAD & PROFIT		20%			$96,200.00
TOTAL					$577,200.00



MAHAR HALL HVAC DIAGRAM (EXISTING)

4.0 EXECUTIVE SUMMARY

Mahar Hall can be air conditioned for a cost far below that of new construction if the following steps are taken.

- Use of rooftop air-cooled chiller providing 43°F water/glycol to cooling coils.
- Rehabilitation of AC-1, AC-2, and HV-1 to provide an additional 10-15% capacity.
- Re-use existing ductwork, insulating where feasible.
- Pipe 100 tons of chilled water from Tyler Hall to AC-1 and AC-2.
- Use of fan coil units to minimize the installation space required for ductwork.
- Reuse ceiling grids and tiles to the extent possible.

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State University Construction Fund

REHABILITATION ESTIMATE DETAIL SHEET

DIVISION 15 - MECHANICAL

PHASE REPORT MAHAR HALL HVAC STUDY **DATE** 02/22/99

CAMPUS SUNY OSWEGO **BUILDING** MAHAR HALL **PROJECT NO.** 671.003.001

TITLE SYSTEM ONE COMPLETE REPLACEMENT

DESCRIPTION	QUANTITY	UNITS	LABOR	MATERIAL	TOTAL
200 TON CHILLER	1	EA	$25,000.00	$60,000.00	$85,000.00
60000 CFM AHU'S	2	EA	$100,000.00	$100,000.00	$400,000.00
DUCTWORK	1	LS	$65,000.00	$65,000.00	$130,000.00
167 TON COOLING TOWER	1	LS	$30,000.00	$35,000.00	$65,000.00
CHILLED WATER PUMPS AND PIPE	1	LS	$20,000.00	$20,000.00	$40,000.00
COOLING WATER PUMPS AND PIPI	1	LS	$20,000.00	$20,000.00	$40,000.00
TYLER HALL PIPING	1000	LF	$32.00	$18.00	$50,000.00
CEILING REPLACEMENT	50000	SF	$2.50	$2.00	$225,000.00
MECHANICAL ROOM MODS.	1	LS	$15,000.00	$15,000.00	$30,000.00
CONTROLS	1	LS	$25,000.00	$25,000.00	$50,000.00
					$0.00
					$0.00
					$0.00
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					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
SUBTOTAL					$1,115,000.00
OVERHEAD & PROFIT		20%			$223,000.00
TOTAL					$1,338,000.00

State University Construction Fund

REHABILITATION ESTIMATE DETAIL SHEET

DIVISION 15 - MECHANICAL

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CAMPUS SUNY OSWEGO **BUILDING** MAHAR HALL **PROJECT NO.** 671.003.001

TITLE SYSTEM TWO

DESCRIPTION	QUANTITY	UNITS	LABOR	MATERIAL	TOTAL
200 TON AIR COOLED CHILLER	1	EA	$20,000.00	$60,000.00	$80,000.00
600 GPM PUMPS	2	EA	$2,000.00	$5,000.00	$14,000.00
8" CHILLED WATER PIPING	200	LF	$60.00	$40.00	$20,000.00
AC-1 REPAIRS	1	LS	$10,000.00	$10,000.00	$20,000.00
AC-2 REPAIRS	1	LS	$7,500.00	$5,000.00	$12,500.00
MODIFY/REPLACE HV-1	1	LS	$50,000.00	$150,000.00	$200,000.00
4" C. WATER PIPING FROM TYLER	1000	LF	$32.00	$18.00	$50,000.00
BOOSTER PUMPS	2	EA	$2,000.00	$5,000.00	$14,000.00
FAN COIL UNITS (CEILING)	10	EA	$500.00	$2,500.00	$30,000.00
FAN COIL UNITS (ABOVE CEILING)	5	EA	$800.00	$2,800.00	$18,000.00
INSULATE EXISTING DUCTWORK	1	LS	$25,000.00	$25,000.00	$50,000.00
CEILING REPAIR FLOOR B THRU 3	30,000	SF	$1.00	$0.50	$45,000.00
CEILING REPLACEMENT 4TH FLOOI	18000	SF	$2.50	$2.00	$81,000.00
DUCTWORK 4TH FLOOR	1	LS	$8,000.00	$8,000.00	$16,000.00
CONTROLS	1	LS	$25,000.00	$25,000.00	$50,000.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
SUBTOTAL					$700,500.00
OVERHEAD & PROFIT	20%				$140,100.00
TOTAL					$840,600.00

State University Construction Fund

REHABILITATION ESTIMATE DETAIL SHEET

DIVISION 15 - MECHANICAL

PHASE REPORT MAHAR HALL HVAC STUDY **DATE** 02/25/99

CAMPUS SUNY OSWEGO **BUILDING** MAHAR HALL **PROJECT NO.** 671.003.001

TITLE SYSTEM THREE: MULTIPLE ROOFTOPS

DESCRIPTION	QUANTITY	UNITS	LABOR	MATERIAL	TOTAL
4" PIPING FROM TYLER HALL	1000	LF	$32.00	$18.00	$50,000.00
REPAIR OF AC-1 & AC-2	1	LS	$17,500.00	$15,000.00	$32,500.00
ROOFTOP AC UNITS INCLUDING	4	EA	$42,500.00	$18,000.00	$242,000.00
DUCTWORK & INSULATION					
CEILING REPLACEMENT	17000	SF	$2.50	$2.00	$76,500.00
CONTROLS	1	LS	$10,000.00	$15,000.00	$25,000.00
BOOSTER PUMPS AND VALVING	1	LS	$10,000.00	$15,000.00	$25,000.00
					$0.00
LIGHTING	1	LS	$10,000.00	$20,000.00	$30,000.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
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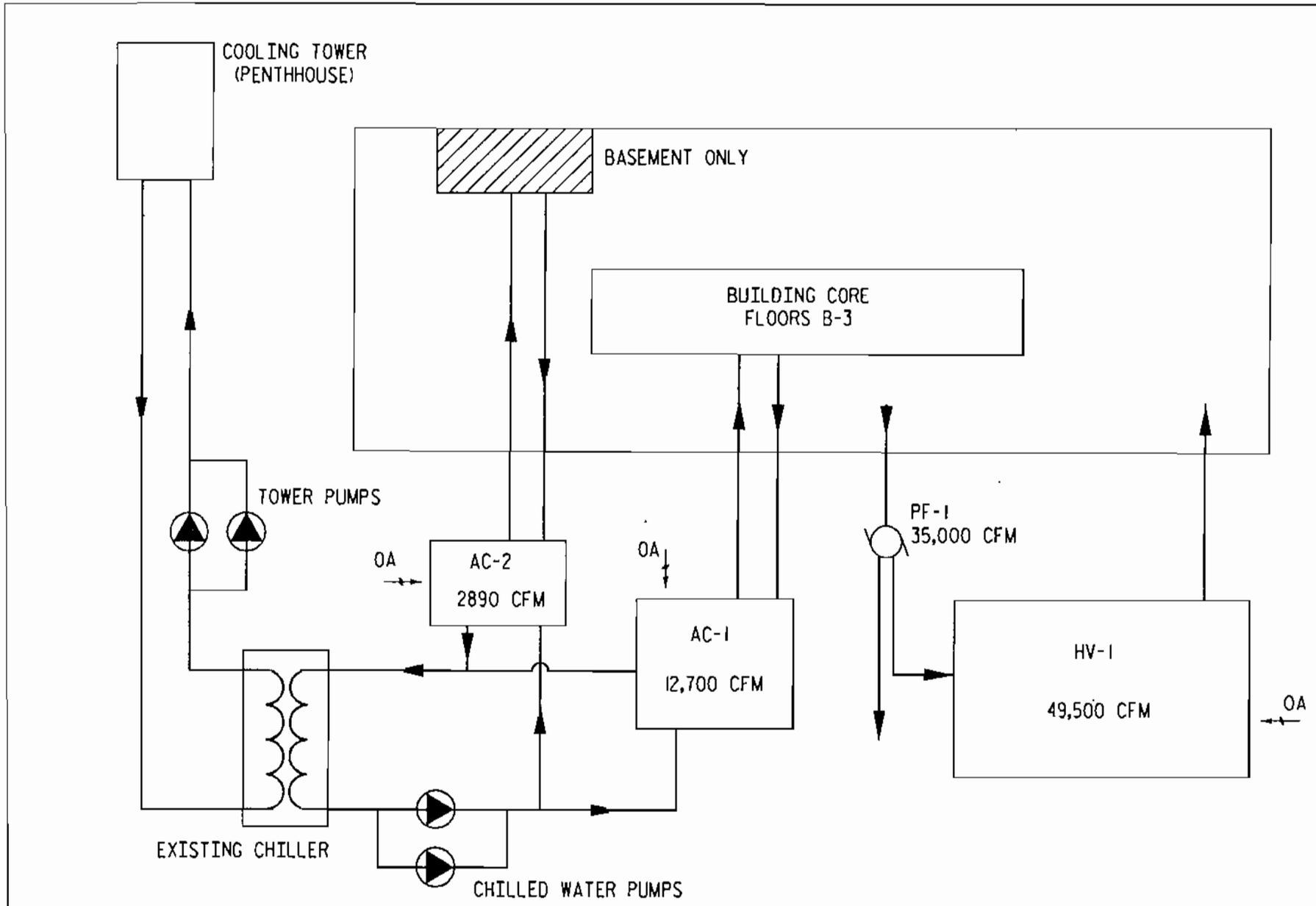
SUBTOTAL					$481,000.00
OVERHEAD & PROFIT		20%			$96,200.00
TOTAL					$577,200.00



MAHAR HALL HVAC DIAGRAM (EXISTING)

4.0 EXECUTIVE SUMMARY

Mahar Hall can be air conditioned for a cost far below that of new construction if the following steps are taken.

- Use of rooftop air-cooled chiller providing 43°F water/glycol to cooling coils.
- Rehabilitation of AC-1, AC-2, and HV-1 to provide an additional 10-15% capacity.
- Re-use existing ductwork, insulating where feasible.
- Pipe 100 tons of chilled water from Tyler Hall to AC-1 and AC-2.
- Use of fan coil units to minimize the installation space required for ductwork.
- Reuse ceiling grids and tiles to the extent possible.