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THE INTEGRITY TO SUSTAIN.

## Santa Monica College

### HVAC Upgrade Options for Six Buildings

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## **Executive Summary**

The scope of this study is to provide Santa Monica College with two options to provide air conditioning to six existing buildings. Five of the buildings are located on the main campus, and one of the buildings is located on a satellite campus. The existing buildings are currently equipped with heating only, and in some cases, partial building cooling. The buildings under the scope of this study are the following: Science Building West, Letters and Science, Liberal Arts, Counseling, Cayton Center, and the satellite Music Building.

## **Project Background**

Santa Monica College, established in 1929, is a two-year community college recognized for transferring students to four-year universities, preparing students in the field of nursing and health care, solar technology, entertainment technology, computer technology, early childhood education, business, graphic design and other occupations. The campus has approximately 34,000 students across a 38 acre main campus and several nearby satellite campuses.

Several buildings on campus currently do not have cooling equipped HVAC systems. With recent summers reaching extreme temperatures, safety concerns have arisen for faculty and students and have escalated the desire to provide these buildings with cooling. The college wishes to provide temporary solutions for buildings being slated for demolition within 10 years, and permanent solutions for buildings that are not planned to be demolished.

Table 1 below summarizes the buildings within the scope of this project.

**Table 1 – Building Summary**

Building #	Building Name	Year Built	Year of Alteration(s)	Stories	Approximate Gross Square Footage	Temporary or Permanent HVAC Solution
2, 24, or 43	Counseling	1956	1958 1983	1	9,800	Temporary
10	Liberal Arts	1950	1976	2	26,400	Temporary
11	Letters & Science	Prior to 1958	1958	2 (Partial)	20,900	Temporary
19	Cayton Center	Prior to 1976	1976,'78, '83,'87,'89	2 (Partial)	38,200	Temporary
20	Science West	Prior to 1981	1995	2	22,400	Permanent
35	Madison (Music)	Prior to 1935	2007	2	36,200	Permanent

## Existing Conditions

The majority of the buildings have heating by either baseboard radiator, heating and ventilating units, or wall furnaces. Most buildings also have at least some spaces cooled either by split systems or evaporative coolers. None of the buildings have chilled water (CHW) systems in place except Science West. However, the chillers located in the basement of the Science building that serve portions of the Science West are not in serviceable condition. Based on a discussion with facilities, one of the two chillers is completely non-operational while the other cannot operate to full capacity. Both are nearing the end of their useful life.

The existing electrical system serving the main campus originates from the Main Campus High Voltage 600A, 5kV, 3Ø, 3W Switchgear “MSH” which serves the following buildings:

- Student Center (Building 19),
- Radio Station (Building 19),
- Gym & PE (Building 8 & 14),
- Little Theater/Main Stage (Building 13),
- Administration (Building 1),
- Concert Hall (Building 15),
- Amphitheater (Building 4)

- Art (Building 3)
- Liberal Arts & Admissions (Building 10).

See Table 2 below for a summary of the existing conditions.

**Table 2 – Existing Conditions Summary Table**

Building #	Building Name	Existing Electrical Service	Existing HVAC Description
2, 24, or 43	Counseling	208/120V Panelboards serving local power in the building (Source Distribution Board Unknown)	Heating & Ventilating Unit Radiators Some Split System Fan Coil Units Operable Windows
10	Liberal Arts	208/120V Panelboards serving local power in the building (Source Distribution Board Unknown)	Baseboard Radiators Heating & Ventilating Unit Some Window A/C Units Operable Windows
11	Letters & Science	208/120V Panelboards serving local power in the building (Source Distribution Board Unknown)	Variable Volume Multi-zone Heating & Ventilating Unit Constant volume Rooftop Package-Unit for Media Lab Operable Windows
19	Cayton Center	208/120V, 3Ø, 4W Distribution Board (Substation "5A")	Heating & Ventilating Unit Evaporative Coolers Ceiling Fans Operable Windows
20	Science West	277/480V, 3Ø, 4W Switchboard "MSB" and 120/208V, 3Ø, 4W Distribution Board "LD/C1" via 225kVA Transformer	Natural Ventilation Baseboard Convectors Operable Windows
35	Madison (Music)	277/480V, 3Ø, 4W Switchboard "MS" and 208/120V, 3Ø, 4W Distribution Board "DB1" via 225kVA Transformer	Wall Furnaces Some Heat Pumps Operable Windows

## **Counseling – Building 2, 24, or 43**

The Counseling building is a 1-story building built around 1950 that is slated for demolition. Construction consists of a slab on grade foundation, a mix of concrete exterior walls and curtain walls with ¼" clear glazing. Interior finishes include concealed spline finish ceilings.



### **Existing HVAC**

Cooling is currently provided by natural ventilation and ceiling fans. Boilers located in an adjacent basement supply heating hot water (HHW) to baseboard radiators located throughout the building. A heating and ventilating unit serving the majority of the building is believed to have been removed at some point.

### **Existing Electrical System**

The existing panelboard inside the Counseling Center is a 208/120V, 3Ø, 4W labeled "Counseling #1", located in the hallway. The panelboard serves receptacle power and lighting inside the building.

## **Liberal Arts – Building 10**

The Liberal Arts building is a 2-story building built in 1952 that is slated for demolition. Construction consists of a slab over basement foundation, and concrete exterior walls. Interior finishes include exposed concrete walls and suspended acoustical tile ceilings.



### **Existing HVAC**

Cooling is currently provided by operable windows and portable fans. Some exterior rooms are equipped with window A/C units. Boilers located in an adjacent basement supply HHW to baseboard radiators located throughout the building as well as the heating coil in a heating and ventilating unit serving the first and second floor offices on the southwest side of the building. The insulation wrapping the ducts of the heat vent system does not contain a vapor barrier and it is not conducive for cooling.

### **Existing Electrical System**

The existing panelboards in Liberal Arts Building are 208/120V, 3Ø, 4W lighting labeled "A1AA" and "A1AE" on the first floor and "A2A" and "A2D" located on the second floor. The panelboard serves receptacle power and lighting inside the building.

## **Letters & Science – Building 11**

The Letters & Science building is a partial 2-story building built prior to 1958 that is slated for demolition. It was previously a library building that has since been converted to classrooms and offices. Construction consists of a slab on grade foundation, and concrete exterior walls. Interior finishes include exposed concrete walls as well as plaster finish walls, and plaster ceilings along with concealed spline finish ceilings.



### **Existing HVAC**

Cooling is currently provided primarily by operable windows and portable fans. A Variable Volume and Temperature (VVT) rooftop package unit with a bypass damper provides heating and cooling to the Media Lab area. A constant volume multi-zone heating and ventilating unit serves the rest of the building. Boilers located in an adjacent basement supply HHW to baseboard radiators located throughout the building as well as the heating coil in a heating and ventilating unit serving the majority of the building. The insulation wrapping the ducts of the heat vent system does not contain a vapor barrier and it is not conducive for cooling.

## Existing Electrical System

The existing panelboards in Liberal Arts Building are 208/120V, 3Ø, 4W labeled "B1AA", "B1A", "B2C" and "PB". The panelboard serves receptacle power and lighting inside the building.

## Cayton Center – Building 19

The Cayton Center is comprised of multiple buildings including the Bookstore, Health & Psychological Services, the Cafeteria, KCRW Radio Station Studios, and the Student Activities Center. It is mostly a 1-story building with KCRW Studios in the basement and Student Activities Center being the only 2-story part of the building. All of Cayton Center is slated for demolition. Construction materials and year of construction and renovation varies between the buildings.



## Existing HVAC

Heating and ventilating units serve the majority of the Cayton Center. Some cooling is provided in the kitchen areas by evaporative coolers. Ceiling fans throughout the cafeteria provide some relief from the peak summer days. Boilers located in the basement supply HHW to the heating coils in a heating and

ventilating units. KCRW studios is already provided with cooling and is therefore out of the scope of this study.

### **Existing Electrical System**

The existing electrical source at Cayton Center is via existing 5kV into Substation "5A", with 1000A, 208/120V, 3Ø, 4W distribution board located in the basement of Cayton Center (The electric room was barricaded and not accessible due to repairs). The distribution board serves the cafeteria, Student Activities and Health Center.

### **Science Building West – Building 20**

The Science Building West is a 2-story building built prior to 1981 that is not slated for demolition. Construction consists of a slab on grade foundation, CMU exterior walls with cement plaster and aluminum wall panels with tinted glazing. Interior finishes include hard lid plaster ceilings in the corridor and suspended acoustical tiles in offices and classrooms.



## **Existing HVAC**

Cooling is currently provided by natural ventilation. Boilers located in an adjacent basement supply HHW to baseboard convectors located throughout the building. Per the occupants the natural ventilation system does not operate well, even in mild weather, and the convector heating system is either too hot or too cold.

## **Existing Electrical System**

The existing electrical source at Science West originates from an existing 3000A, 277/480V, 3Ø, 4W Switchboard "MS/B" located in the basement of the Science Building.

## **Music Building – Building 35**

The Music Building at the Performing Arts Campus is a two story building on a crawl space with total of 36,200 square foot area that is not slated for demolition. Construction consists of a slab on crawl space foundation, and pressed brick with cement plaster exterior walls. Interior finishes include plaster walls, some plaster ceilings and some suspended ceilings. The building was built prior to 1935, and was formerly known as James Madison Elementary School. Americans with Disabilities Act (ADA) improvements were completed in 1997. A Madison Campus Renovation was completed in 2007.

The scope of work is limited to the north side of the Performing Arts Center, located along Arizona Avenue between 10th Street and 11th Street.



## Existing HVAC

Cooling is currently provided by natural ventilation. Some portions of the building have heat pumps providing both heating and cooling. The areas that already have cooling are the practice rooms on the west side, the Edge auditorium, Room 115 – Guitar Classroom, and the 2<sup>nd</sup> floor Music Department Offices. Natural gas wall furnaces provide heating to the classrooms and offices throughout the building. These furnaces were at some point converted from steam heating to gas heating. Therefore, space for piping may be available where it once existed.

## Existing Electrical System

The existing electrical system at the Performance Arts Campus' main service originate from an existing 3000A, 480V, 3Ø, 4W switchboard "MS" located on the north west of the Performing Arts Building on 10th Street and Arizona Avenue. Distribution boards originates from switchboard "MS" throughout the buildings.

# Proposed Solutions

The majority of the buildings under the scope of the study are slated for demolition. Therefore, temporary solutions have been considered for these buildings. For the two buildings not being demolished, more permanent solutions have been considered. Table 3 below summarizes the cooling loads for each building to help put into perspective the proposed solutions.

Table 3 – Building Tonnage Table

Building #	Building Name	Tonnage
2, 24, or 43	Counseling	20 Tons
10	Liberal Arts	82 Tons
11	Letters & Science	40 Tons
19	Cayton Center	125 Tons
20	Science West	50 Tons
35	Music (Madison)	90 Tons
<b>Total Tons</b>		<b>417 Tons</b>

## Temporary Buildings

The following section applies to those buildings identified as temporary buildings or those slated for demolition. Solutions were determined considering that the buildings will only be functional for approximately another 10 years, the Division of State Architect (DSA) process takes almost 2 years, and cooling is desperately needed at these buildings for safety reasons.

### Alternative 1 – Chilled Water From Central Plant

#### HVAC

The proposed solution is to supply CHW from the central plant loop through temporary plastic piping (copper piping is more expensive, and may entice thieves since it will be mounted to the outside of the building) to portable fan coil units (FCU) on rollers. These FCUs could be used for four months out of the year in the summer to provide cooling, and then they could be disconnected and stored away if necessary. Flexible piping at the FCUs will provide for mobility. The piping will have to be submitted to DSA for approval. Per DSA, as long as the purchasing of FCUs is below \$40,000 it does not need a DSA Submittal. This is also because the FCUs are proposed to be temporary on a rolling cart and plugged in with no permanent connections.

The CHW would be routed to the Counseling building and distributed to the other buildings above grade with plastic piping. The only below grade temporary piping will be between Liberal Arts and Letters and Sciences. Branches for each room will be placed in a removed window pane with either Plexiglas or plywood, and quick connections.

For the Student Activities building at the Cayton Center, the heating and ventilating unit could be retrofitted with a CHW coil at the supply ductwork on the roof. Since the ductwork is internally lined, condensation in the building should not be an issue. However, this is not the case for other heating and ventilating units at the other buildings. Therefore, Student Activities is the only case where this is possible.

As buildings are demolished they will be removed from the temporary CHW lines. If new buildings will be built in the demolished building's place, provisions for integration into the main campus CHW loop should be put into place.

Because the central plant on the main campus is not slated to be complete for another two years, Vaults 5 and 6 and the piping in between would have to be constructed now, along with the branch connections to Science and Counseling. Because the Chillers at Science are failing, it is proposed a 450 ton water cooled temporary chiller and cooling tower be installed in the walkway outside of the OSA grate down to the chiller room. The chiller and cooling tower will be rented for only the summer months deemed necessary for cooling to save money. Power for the rental systems will have to come from the Science building's distribution board. Pumps will have to be installed in the airway to feed the temporary buildings, while two distribution pumps are installed in the chiller room of Science to serve Science West. The approximate cost of rental is \$11,000 for setup, and \$23,000 per month. Once the new Central Plant is operational the temporary building pumps can be removed and the need for the temporary chiller can be removed.

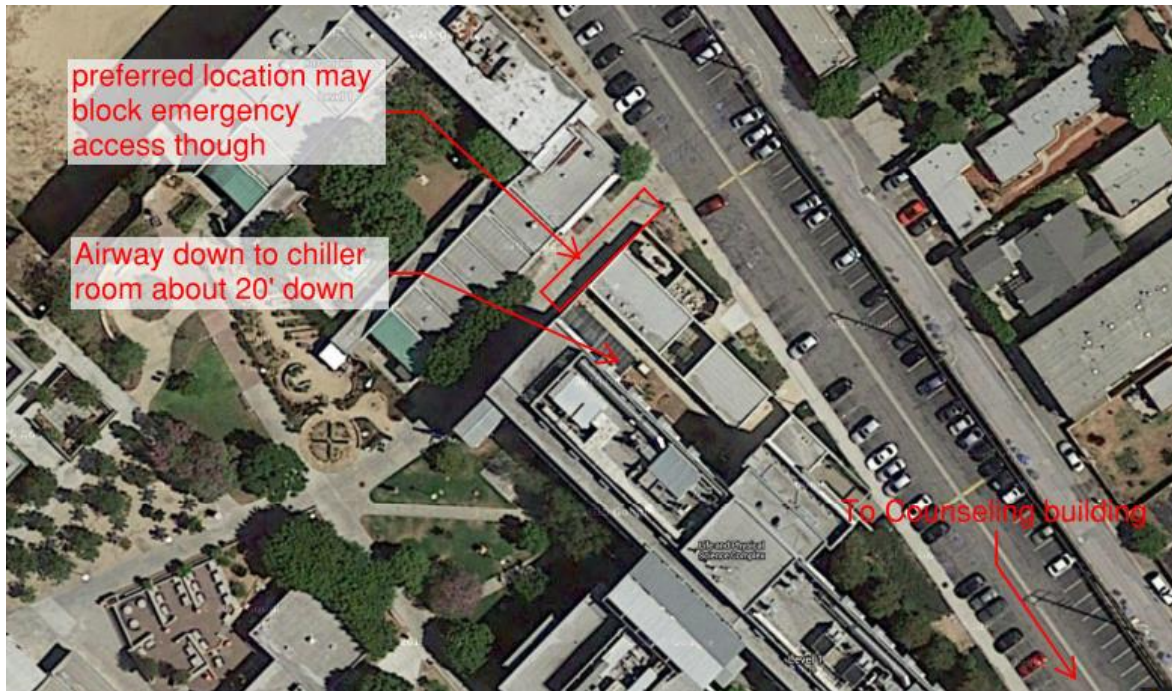


Figure 1 – Alternative 1 Temporary Equipment Layout Options

Figure 2 below helps visualize the following recommendations:

1. Provide underground piping from Vault 6 to Counseling Building. Provide piping within building to temporary fan coils.
2. Chilled water piping shall be routed outside of both Liberal Arts and Letters and Sciences routed to each window. The piping from Liberal Arts to Letters and Science will be routed underground. Piping to Cayton Center from Letters and Sciences will be routed along the breezeway between the two buildings. The Piping in Cayton Center will be routed to the various units in the Building.
3. New chilled water supply and return lines will be routed from the new distribution pumps in the basement of the Science building chiller room to Science West building and proposed mini air handlers.
4. Provide underground piping from Vault 5 to the chiller room of the Science Building.
5. Vaults 5 & 6 and piping in between will have to be installed ahead of schedule.

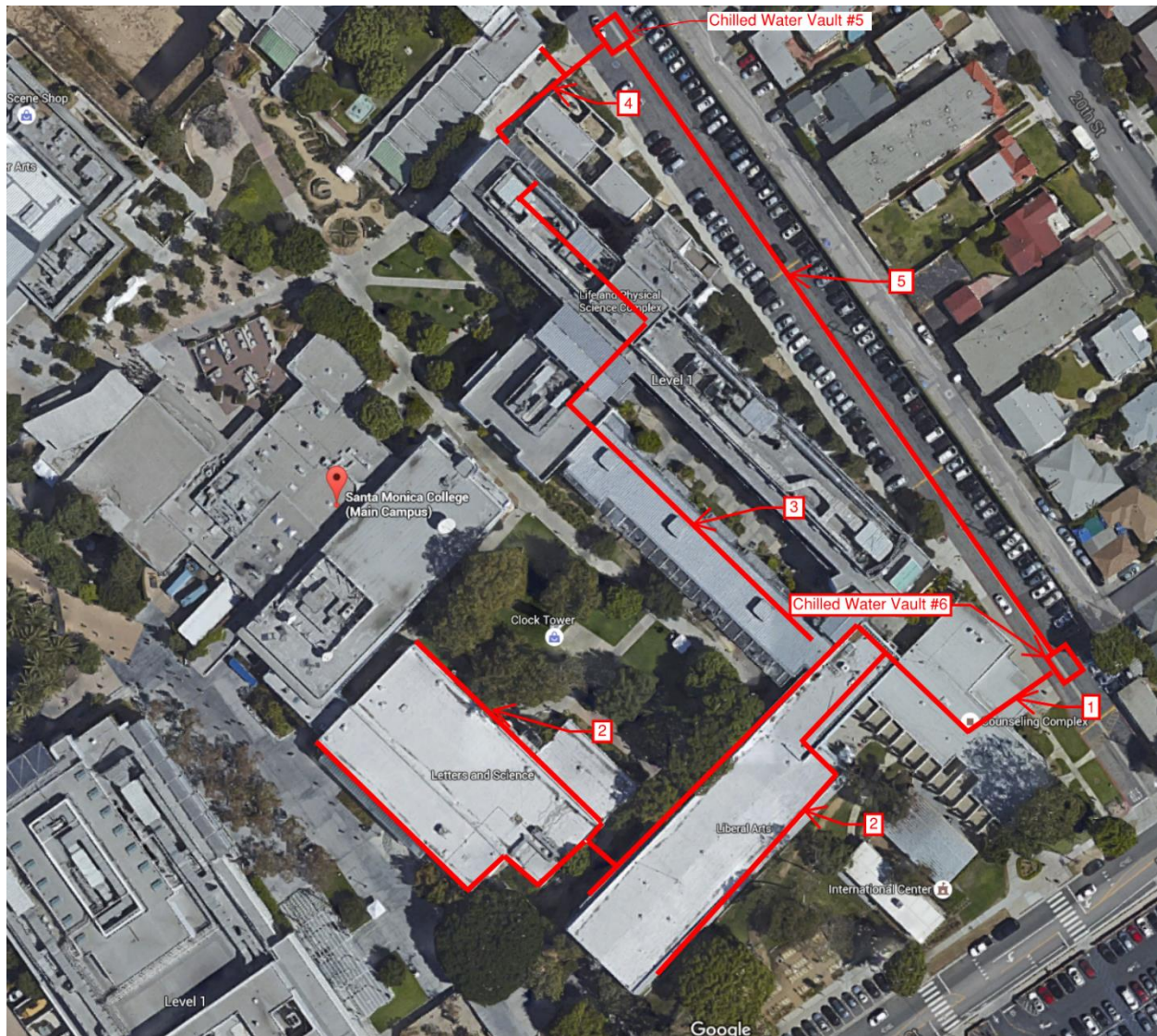


Figure 2 – Alternative 1 CHW Piping Layout

### Electrical

The 450-ton temporary chilled water system that will serve the Science, Science West, Liberal Arts, Letters & Science and Counseling Center will require an electrical service feeder and branch circuit breaker from the existing Distribution Board “MS/B” located in the basement of the Science building. A new 600A, 480V, 3P circuit breaker installed in Distribution Board “MS/B” to serve the new chilled water system and (2) 40A, 480V, 3P circuit breaker for associated VFD/pumps. The existing room receptacles in the temporary buildings will be sufficient to support the fan coils.

## **Alternative 2 – Window Air Conditioning Units**

### **HVAC**

Another alternative for providing the temporary buildings with cooling is to install window air conditioning units in each space requiring cooling. The spaces would be limited to normally occupied exterior rooms such as offices and classrooms. In order to conserve costs, restrooms, storage, utility and custodial rooms could be left unconditioned. For rooms requiring cooling capacities beyond that which one window unit can provide, multiple units would be installed.

This alternative provides perhaps a more practical solution from an installation perspective. It would be relatively simple to install the units in the window because it would only require some carpentry work to remove windows, install and support the unit. However, it would not require any chilled water infrastructure expansion or underground piping. For internal rooms portable AC units could be used with temporary flex duct routing the condenser heat outside or into the corridors with temporary fans pulling the hot air out of the corridor. This option will trigger DSA upgrades at all associated buildings.

### **Electrical**

Alternative #2 options for the temporary buildings will be based on providing a new 400A, 208/120V, 3Ø, 4W distribution via new 150kVA transformer from the existing Distribution Board "MS/B" in the basement of Science building. The new 400A distribution board will serve the (7) new 208/120V, 3Ø, 4W panelboards at Liberal Arts, Letters & Science, Science West, Counseling Center and Cayton Center.

The 208/120V, 3Ø, 4W panelboards in each temporary building will provide power exclusively for the temporary 208V, 1Ø, receptacles for window air conditioning installed in all required rooms of the temporary buildings.

This alternative would require dedicated 20A amp, 1P, 120V receptacles and , 20A, 2P, 230 volt receptacles for units above 1 ton. This option will trigger DSA upgrades at all associated buildings.

### **Permanent Buildings**

The permanent buildings consist of the Science West building located on the main campus, and Madison Music building located on the Performing Arts campus. Since the performing arts campus is remote from the main campus, Madison's solution must be separate from the Science West solution.

## HVAC

### Science West

Since this building is permanent, it is ultimately planned to be served by the main campus CHW loop. The proposed solution is to utilize the same Science chillers and temporary chillers and cooling towers used for the temporary buildings until this building can be integrated into the campus loop. It is recommended to use small in-ceiling air handling units (AHUs) with CHW coils to provide cooling throughout the building. Insulated CHW piping will have to be installed throughout the building to supply the CHW coils in the AHUs. Once the Science complex is ready for integration into the campus loop, the chillers and temporary chiller for the Science complex can be connected and served by the campus plant.

Split systems are not a practical option for Science West because of refrigerant line length, and the inability to install equipment on the roof. Therefore, if this option is to go forward, the condensing units will have to go on the ground. Multiple unit VRF would also not be recommended for the offices on the second floor due to the size of room and the amount of refrigerant in a multiple unit VRF system.

### Madison Music Building

Madison Music Building is a permanent building that is located remote from the main campus. Therefore, tying this campus into the main campus CHW loop is not feasible. The proposed solution is to provide a new local CHW and HHW plant to serve 4-pipe FCUs in the location of the existing wall furnaces. CHW and HHW piping can be installed in the same place as where the steam piping for the furnaces use to be.

Another possible solution is to Split Unit Variable Refrigerant Flow (VRF) units. Two 26 ton condensing units located on the roof can serve the first floor, and one 26-ton condensing unit can serve the second floor. Fan coils will serve the individual rooms. The refrigeration piping could follow the same chases the CHW & HHW piping is utilizing, but the overall piping will be longer because each of the units will have to go back to a branch selector box, rather than just daisy chain from unit to unit.

In general the CHW & HHW option would be better for the campus since you would have the less risk of a refrigerant leak, (including a refrigerant leak of a relatively large amount of refrigerant into a relatively small office. Also a CHW & HHW system will last longer than a VRF solution 25 years vs 15 years.

## Electrical

For Science West, a new 208/120V, 3Ø, 4W panelboard from a new 400A, 208/120V, 3Ø, 4W distribution via new 150kVA transformer from the existing Distribution Board "MS/B" in the basement of Science building. This panelboard will serve the small air handling units as recommended by the mechanical engineer. On either option, a new panelboard is required.

For the Madison Music building, based on the existing as-builts, there is sufficient capacity in the existing 400A, 480V, 3Ø, 4W Distribution Board "DB4" to add a panelboard to serve the proposed HVAC upgrades. The existing panelboards in the Music building cannot support the proposed HVAC upgrades without the new proposed panelboard. A chilled water system or Aircooled Variable Refrigerate Flow (VRF) that will serve the Music Building will require a new panelboard.

## Conclusion

Two alternatives have been discussed to provide cooling to four temporary buildings in this study. Alternative 1 for the temporary buildings consists of utilizing portable fan coil units on rolling wheels that are connected to temporary chilled water service.

Alternative 2 for the temporary buildings consists of installing window air conditioning units in all normally occupied exterior spaces.

For the Science West building, mini air handling units will be utilized connected to temporary chilled water service until this building can be integrated into the main campus loop.

Two alternatives have been discussed to provide cooling for the Madison Music Building in this study. Alternative 1 for Madison Music Building will utilize 4-pipe fan coils supported by new local chilled water and heating hot water plants.

Alternative 2 for Madison Music Building will utilize a VRF system to provide the heating and cooling for the building.

**Table 4 – Proposed Solutions Summary**

Buildings	Building Name	Alternative	Electrical Service	HVAC Description	ROM Cost Estimate
All Temporary Buildings	Counseling Liberal Arts Letters & Science Cayton Center	1	500A Circuit Breaker for Chiller and Cooling Tower	Portable 2-Pipe Fan Coil Units	\$1.8 million
		2	(N) 150kVA Transformer and (N) 400A, 3Ø, 4W Dist Iboard and 7 (N) 225A, 208/120V,3Ø, 4W Panelboard	Window AC Units	\$3.2 million
20	Science West	1	(N) 225A, 480V/277V,3Ø, 4W Panelboard Circuit Breakers for AHU and pumps	Ceiling Mounted Mini Air Handlers	\$2.2 million
35	Music (Madison)	1	(N) 225A, 208/120V Panelboard, circuit breakers for Chiller & pumps	CHW & HHW	\$3.4 million
		2	(N) 400A, 208/120V Panelboard, branch circuit breakers	Variable Refrigerant Flow	\$3.2 million

Appendix A – Trane Trace 700 Reports

## 7909 - SMC HVAC Study

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Location	<b>Santa Monica</b>
Building owner	<b>SMC</b>
Program user	<b>Dan Sebastian</b>
Company	<b>P2S Engineering</b>
Comments	
By	<b>P2S ENGINEERING, INC</b>
Dataset name	<b>C:\Users\Daniel Sebastian\Documents\TRACE 700 Projects\7909 - SMC HVAC Upgrade\7909-COUNSELING.TRC</b>
Calculation time	<b>04:41 PM on 12/17/2015</b>
TRACE® 700 version	<b>6.3.1</b>
Location	<b>Los Angeles, California</b>
Latitude	<b>34.0 deg</b>
Longitude	<b>118.0 deg</b>
Time Zone	<b>8</b>
Elevation	<b>312 ft</b>
Barometric pressure	<b>29.6 in. Hg</b>
Air density	<b>0.0752 lb/cu ft</b>
Air specific heat	<b>0.2444 Btu/lb·°F</b>
Density-specific heat product	<b>1.1022 Btu/h·cfm·°F</b>
Latent heat factor	<b>4,851.9 Btu·min/h·cu ft</b>
Enthalpy factor	<b>4.5092 lb·min/hr·cu ft</b>
Summer design dry bulb	<b>85.0 °F</b>
Summer design wet bulb	<b>67.0 °F</b>
Winter design dry bulb	<b>44.0 °F</b>
Summer clearness number	<b>0.85</b>
Winter clearness number	<b>0.85</b>
Summer ground reflectance	<b>0.20</b>
Winter ground reflectance	<b>0.20</b>
Carbon Dioxide Level	<b>400 ppm</b>
Design simulation period	<b>January - December</b>
Cooling load methodology	<b>RTS (Heat Balance)</b>
Heating load methodology	<b>UATD</b>



# SYSTEM SUMMARY

## DESIGN COOLING CAPACITIES

By P2S ENGINEERING, INC

### Alternative 1

#### Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time Of Peak mo/hr	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton								Desic Cond ton	Desic Cond ton		
Unassigned Cooling Loads		19.8	0.0	0.0	0.0	0.0	0.0	0.0	19.8	10/15	13.1	0.0	0.0	0.0	0.0	0.0	0.0	13.1
	System - 001	19.8	0.0	0.0	0.0	0.0	0.0	0.0	19.8	10/15	13.1	0.0	0.0	0.0	0.0	0.0	0.0	13.1
Building totals		19.8	0.0	0.0	0.0	0.0	0.0	0.0	19.8		13.1	0.0	0.0	0.0	0.0	0.0	0.0	13.1

Building peak load is 19.8 tons.

Building maximum block load of 13.1 tons occurs in October at hour 15 based on system simulation.

## 7909 - SMC HVAC Study

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Location	<b>Santa Monica</b>
Building owner	<b>SMC</b>
Program user	<b>Dan Sebastian</b>
Company	<b>P2S Engineering</b>
Comments	

By	<b>P2S ENGINEERING, INC</b>
Dataset name	<b>C:\Users\Daniel Sebastian\Documents\TRACE 700 Projects\7909 - SMC HVAC Upgrade\7909 - LIB ARTS.TRC</b>

Calculation time	<b>04:46 PM on 12/17/2015</b>
TRACE® 700 version	<b>6.3.1</b>

Location	<b>Los Angeles, California</b>	
Latitude	<b>34.0</b>	<b>deg</b>
Longitude	<b>118.0</b>	<b>deg</b>
Time Zone	<b>8</b>	
Elevation	<b>312</b>	<b>ft</b>
Barometric pressure	<b>29.6</b>	<b>in. Hg</b>
Air density	<b>0.0752</b>	<b>lb/cu ft</b>
Air specific heat	<b>0.2444</b>	<b>Btu/lb·°F</b>
Density-specific heat product	<b>1.1022</b>	<b>Btu/h·cfm·°F</b>
Latent heat factor	<b>4,851.9</b>	<b>Btu·min/h·cu ft</b>
Enthalpy factor	<b>4.5092</b>	<b>lb·min/hr·cu ft</b>
Summer design dry bulb	<b>85.0</b>	<b>°F</b>
Summer design wet bulb	<b>67.0</b>	<b>°F</b>
Winter design dry bulb	<b>44.0</b>	<b>°F</b>
Summer clearness number	<b>0.85</b>	
Winter clearness number	<b>0.85</b>	
Summer ground reflectance	<b>0.20</b>	
Winter ground reflectance	<b>0.20</b>	
Carbon Dioxide Level	<b>400</b>	<b>ppm</b>
Design simulation period	<b>January - December</b>	
Cooling load methodology	<b>RTS (Heat Balance)</b>	
Heating load methodology	<b>UATD</b>	



# SYSTEM SUMMARY

## DESIGN COOLING CAPACITIES

By P2S ENGINEERING, INC

### Alternative 1

#### Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton			Of Peak mo/hr					Desic Cond ton	Desic Cond ton		
Unassigned Cooling Loads		81.3	0.0	0.0	0.0	0.0	0.0	0.0	81.3	7/17	78.8	0.0	0.0	0.0	0.0	0.0	0.0	78.8
	System - 001	81.3	0.0	0.0	0.0	0.0	0.0	0.0	81.3	7/17	78.8	0.0	0.0	0.0	0.0	0.0	0.0	78.8
Building totals		81.3	0.0	0.0	0.0	0.0	0.0	0.0	81.3		78.8	0.0	0.0	0.0	0.0	0.0	0.0	78.8

Building peak load is 81.3 tons.

Building maximum block load of 78.8 tons occurs in July at hour 17 based on system simulation.

## 7909 - SMC HVAC Study

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Location	<b>Santa Monica</b>
Building owner	<b>SMC</b>
Program user	<b>Dan Sebastian</b>
Company	<b>P2S Engineering</b>
Comments	

By	<b>P2S ENGINEERING, INC</b>
Dataset name	<b>C:\Users\Daniel Sebastian\Documents\TRACE 700 Projects\7909 - SMC HVAC Upgrade\7909 - L AND S.TRC</b>

Calculation time	<b>04:47 PM on 12/17/2015</b>
TRACE® 700 version	<b>6.3.1</b>

Location	<b>Los Angeles, California</b>	
Latitude	<b>34.0</b>	<b>deg</b>
Longitude	<b>118.0</b>	<b>deg</b>
Time Zone	<b>8</b>	
Elevation	<b>312</b>	<b>ft</b>
Barometric pressure	<b>29.6</b>	<b>in. Hg</b>
Air density	<b>0.0752</b>	<b>lb/cu ft</b>
Air specific heat	<b>0.2444</b>	<b>Btu/lb·°F</b>
Density-specific heat product	<b>1.1022</b>	<b>Btu/h·cfm·°F</b>
Latent heat factor	<b>4,851.9</b>	<b>Btu·min/h·cu ft</b>
Enthalpy factor	<b>4.5092</b>	<b>lb·min/hr·cu ft</b>
Summer design dry bulb	<b>85.0</b>	<b>°F</b>
Summer design wet bulb	<b>67.0</b>	<b>°F</b>
Winter design dry bulb	<b>44.0</b>	<b>°F</b>
Summer clearness number	<b>0.85</b>	
Winter clearness number	<b>0.85</b>	
Summer ground reflectance	<b>0.20</b>	
Winter ground reflectance	<b>0.20</b>	
Carbon Dioxide Level	<b>400</b>	<b>ppm</b>
Design simulation period	<b>January - December</b>	
Cooling load methodology	<b>RTS (Heat Balance)</b>	
Heating load methodology	<b>UATD</b>	



# SYSTEM SUMMARY

## DESIGN COOLING CAPACITIES

By P2S ENGINEERING, INC

### Alternative 1

#### Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time Of Peak mo/hr	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton								Desic Cond ton	Desic Cond ton		
Unassigned Cooling Loads		39.7	0.0	0.0	0.0	0.0	0.0	0.0	39.7	9/16	38.3	0.0	0.0	0.0	0.0	0.0	0.0	38.3
	System - 001	39.7	0.0	0.0	0.0	0.0	0.0	0.0	39.7	9/16	38.3	0.0	0.0	0.0	0.0	0.0	0.0	38.3
Building totals		39.7	0.0	0.0	0.0	0.0	0.0	0.0	39.7		38.3	0.0	0.0	0.0	0.0	0.0	0.0	38.3

Building peak load is 39.7 tons.

Building maximum block load of 38.3 tons occurs in September at hour 16 based on system simulation.

## 7909 - SMC HVAC Study

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Location	<b>Santa Monica</b>
Building owner	<b>SMC</b>
Program user	<b>Dan Sebastian</b>
Company	<b>P2S Engineering</b>
Comments	
By	<b>P2S ENGINEERING, INC</b>
Dataset name	<b>C:\Users\Daniel Sebastian\Documents\TRACE 700 Projects\7909 - SMC HVAC Upgrade\7909-CAYTON.TRC</b>
Calculation time	<b>04:43 PM on 12/17/2015</b>
TRACE® 700 version	<b>6.3.1</b>
Location	<b>Los Angeles, California</b>
Latitude	<b>34.0 deg</b>
Longitude	<b>118.0 deg</b>
Time Zone	<b>8</b>
Elevation	<b>312 ft</b>
Barometric pressure	<b>29.6 in. Hg</b>
Air density	<b>0.0752 lb/cu ft</b>
Air specific heat	<b>0.2444 Btu/lb·°F</b>
Density-specific heat product	<b>1.1022 Btu/h·cfm·°F</b>
Latent heat factor	<b>4,851.9 Btu·min/h·cu ft</b>
Enthalpy factor	<b>4.5092 lb·min/hr·cu ft</b>
Summer design dry bulb	<b>85.0 °F</b>
Summer design wet bulb	<b>67.0 °F</b>
Winter design dry bulb	<b>44.0 °F</b>
Summer clearness number	<b>0.85</b>
Winter clearness number	<b>0.85</b>
Summer ground reflectance	<b>0.20</b>
Winter ground reflectance	<b>0.20</b>
Carbon Dioxide Level	<b>400 ppm</b>
Design simulation period	<b>January - December</b>
Cooling load methodology	<b>RTS (Heat Balance)</b>
Heating load methodology	<b>UATD</b>



# SYSTEM SUMMARY

## DESIGN COOLING CAPACITIES

By P2S ENGINEERING, INC

### Alternative 1

#### Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time Of Peak mo/hr	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton								Desic Cond ton	Desic Cond ton		
Unassigned Cooling Loads		124.2	0.0	0.0	0.0	0.0	0.0	0.0	124.2	9/16	75.9	0.0	0.0	0.0	0.0	0.0	0.0	75.9
2nd Floor		24.6	0.0	0.0	0.0	0.0	0.0	0.0	24.6	9/16	11.2	0.0	0.0	0.0	0.0	0.0	0.0	11.2
1st Floor		99.6	0.0	0.0	0.0	0.0	0.0	0.0	99.6	9/16	64.6	0.0	0.0	0.0	0.0	0.0	0.0	64.6
Building totals		124.2	0.0	0.0	0.0	0.0	0.0	0.0	124.2		75.9	0.0	0.0	0.0	0.0	0.0	0.0	75.9

Building peak load is 124.2 tons.

Building maximum block load of 75.9 tons occurs in September at hour 16 based on system simulation.

## 7909 - SMC HVAC Study - Science West

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Location	<b>Santa Monica</b>
Building owner	<b>SMC</b>
Program user	<b>Dan Sebastian</b>
Company	<b>P2S Engineering</b>
Comments	

By	<b>P2S ENGINEERING, INC</b>
Dataset name	<b>C:\Users\Daniel Sebastian\Documents\TRACE 700 Projects\7909 - SMC HVAC Upgrade\7909 - SCIENCE.TRC</b>

Calculation time	<b>04:43 PM on 12/17/2015</b>
TRACE® 700 version	<b>6.3.1</b>

Location	<b>Los Angeles, California</b>	
Latitude	<b>34.0</b>	<b>deg</b>
Longitude	<b>118.0</b>	<b>deg</b>
Time Zone	<b>8</b>	
Elevation	<b>312</b>	<b>ft</b>
Barometric pressure	<b>29.6</b>	<b>in. Hg</b>
Air density	<b>0.0752</b>	<b>lb/cu ft</b>
Air specific heat	<b>0.2444</b>	<b>Btu/lb·°F</b>
Density-specific heat product	<b>1.1022</b>	<b>Btu/h·cfm·°F</b>
Latent heat factor	<b>4,851.9</b>	<b>Btu·min/h·cu ft</b>
Enthalpy factor	<b>4.5092</b>	<b>lb·min/hr·cu ft</b>
Summer design dry bulb	<b>85.0</b>	<b>°F</b>
Summer design wet bulb	<b>67.0</b>	<b>°F</b>
Winter design dry bulb	<b>44.0</b>	<b>°F</b>
Summer clearness number	<b>0.85</b>	
Winter clearness number	<b>0.85</b>	
Summer ground reflectance	<b>0.20</b>	
Winter ground reflectance	<b>0.20</b>	
Carbon Dioxide Level	<b>400</b>	<b>ppm</b>
Design simulation period	<b>January - December</b>	
Cooling load methodology	<b>RTS (Heat Balance)</b>	
Heating load methodology	<b>UATD</b>	



# SYSTEM SUMMARY

## DESIGN COOLING CAPACITIES

By P2S ENGINEERING, INC

### Alternative 1

#### Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton			Of Peak mo/hr					Desic Cond ton	Desic Cond ton		
Unassigned Cooling Loads		49.4	0.0	0.0	0.0	0.0	0.0	0.0	49.4	7/17	48.4	0.0	0.0	0.0	0.0	0.0	0.0	48.4
	System - 001	49.4	0.0	0.0	0.0	0.0	0.0	0.0	49.4	7/17	48.4	0.0	0.0	0.0	0.0	0.0	0.0	48.4
Building totals		49.4	0.0	0.0	0.0	0.0	0.0	0.0	49.4		48.4	0.0	0.0	0.0	0.0	0.0	0.0	48.4

Building peak load is 49.4 tons.

Building maximum block load of 48.4 tons occurs in July at hour 17 based on system simulation.

## 7909 - SMC HVAC Study

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Location	<b>Santa Monica</b>
Building owner	<b>SMC</b>
Program user	<b>Dan Sebastian</b>
Company	<b>P2S Engineering</b>
Comments	

By	<b>P2S ENGINEERING, INC</b>
Dataset name	<b>C:\Users\Daniel Sebastian\Documents\TRACE 700 Projects\7909 - SMC HVAC Upgrade\7909 - MADISON.TRC</b>

Calculation time	<b>03:51 PM on 12/17/2015</b>
TRACE® 700 version	<b>6.3.1</b>

Location	<b>Los Angeles, California</b>	
Latitude	<b>34.0</b>	<b>deg</b>
Longitude	<b>118.0</b>	<b>deg</b>
Time Zone	<b>8</b>	
Elevation	<b>312</b>	<b>ft</b>
Barometric pressure	<b>29.6</b>	<b>in. Hg</b>
Air density	<b>0.0752</b>	<b>lb/cu ft</b>
Air specific heat	<b>0.2444</b>	<b>Btu/lb·°F</b>
Density-specific heat product	<b>1.1022</b>	<b>Btu/h·cfm·°F</b>
Latent heat factor	<b>4,851.9</b>	<b>Btu·min/h·cu ft</b>
Enthalpy factor	<b>4.5092</b>	<b>lb·min/hr·cu ft</b>
Summer design dry bulb	<b>85.0</b>	<b>°F</b>
Summer design wet bulb	<b>67.0</b>	<b>°F</b>
Winter design dry bulb	<b>44.0</b>	<b>°F</b>
Summer clearness number	<b>0.85</b>	
Winter clearness number	<b>0.85</b>	
Summer ground reflectance	<b>0.20</b>	
Winter ground reflectance	<b>0.20</b>	
Carbon Dioxide Level	<b>400</b>	<b>ppm</b>
Design simulation period	<b>January - December</b>	
Cooling load methodology	<b>RTS (Heat Balance)</b>	
Heating load methodology	<b>UATD</b>	



# SYSTEM SUMMARY

## DESIGN COOLING CAPACITIES

By P2S ENGINEERING, INC

### Alternative 1

#### Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time Of Peak mo/hr	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton								Desic Cond ton	Desic Cond ton		
Unassigned Cooling Loads		88.9	0.0	0.0	0.0	0.0	0.0	0.0	88.9	7/17	88.5	0.0	0.0	0.0	0.0	0.0	0.0	88.5
	System - 001	88.9	0.0	0.0	0.0	0.0	0.0	0.0	88.9	7/17	88.5	0.0	0.0	0.0	0.0	0.0	0.0	88.5
Building totals		88.9	0.0	0.0	0.0	0.0	0.0	0.0	88.9		88.5	0.0	0.0	0.0	0.0	0.0	0.0	88.5

Building peak load is 88.9 tons.

Building maximum block load of 88.5 tons occurs in July at hour 17 based on system simulation.

Appendix B – Rough Order of Magnitude (ROM) Cost Estimates

<b>Project:</b>	<b>Est. By</b> Sebastian/Borja	<b>Company</b>	<b>City Cost Index</b>
SMC HVAC Upgrade	<b>Checked By:</b> C. Miller	P2S	Mat. 0.992
Temporary Buildings CHW Option	<b>Phase:</b> Study	P2S	Inst. 1.175
<b>Opinion of Probable Construction Cost</b>	<b>Date</b> 16-Dec-2015		Total 1.072

**Estimate Summary Sheet**

<b>Subtotals by Division</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Division 1 - General Requirements	\$0	\$0	\$0
Division 2 - Sitework	\$0	\$0	\$0
Division 3 - Concrete	\$0	\$0	\$0
Division 5 - Metals	\$10,000	\$10,000	\$20,000
Division 6 - Wood & Plastics	\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection	\$0	\$0	\$0
Division 8 - Doors and Windows	\$0	\$0	\$0
Division 9 - Finishes	\$30,000	\$30,000	\$60,000
Division 10 - Specialties	\$0	\$0	\$0
Division 15 - Mechanical	\$607,585	\$348,692	\$956,277
Division 16 - Electrical	\$24,000	\$39,200	\$63,200
<b>Subtotal</b>	<b>\$671,585</b>	<b>\$427,892</b>	<b>\$1,099,477</b>
Sales Tax	10.00%	\$67,159	\$67,159
Architecture & Engineering Drawings	10.00%		\$109,948
General Conditions, Bonds, Insurance. @	15.0%		\$191,487
Contingency	20.0%		\$293,614
DSA Project Management by EOR	0.25%		\$4,404
<b>Opinion of Total Project Construction Cost</b>			<b>\$1,766,088</b>

<b>Additive Alternatives</b>	<b>Total</b>
1	
2	
3	

**Note: Alternate costs do not include sales tax, general conditions, bonds, insurance, etc...**

This opinion of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing on construction, changed conditions, labor rate changes or other factors beyond the control of P2S Engineering, Inc.

<b>Division 1 - General Requirements</b>					
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Temporary Facilities:					
1 Office trailer		Wks.			\$0
2 Office supplies		Wks.			\$0
3 Phone		Wks.			\$0
4 Sanitary facilities		Wks.			\$0
5 Clerical support		Wks.			\$0
6 Connect temporary power service		Ea.			\$0
7 Connect temporary water service		Ea.			\$0
8 Mobilization & demobilization		Ea.			\$0
9 Project superintendent		Wks.			\$0
10 Project engineer		Wks.			\$0
11 Project scheduling		L.S.			\$0
12 Commissioning		L.S.			\$0
<b>Total Division 1</b>			<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

<b>Division 2 - Abatement</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 2</b>				\$0	\$0	\$0
<b>Division 3 - Concrete</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1			LS			\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1			LS			\$0
<b>Total Division 3</b>				\$0	\$0	\$0
<b>Division 5 - Metals</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Structural Demo		LS			\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Structural for Piping	1	LS	\$10,000.00	\$10,000.00	\$20,000
<b>Total Division 5</b>				\$10,000	\$10,000	\$20,000
<b>Division 6 - Woods &amp; Plastics</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 6</b>				\$0	\$0	\$0
<b>Division 7 - Thermal &amp; Moisture Protection</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 7</b>				\$0	\$0	\$0
<b>Division 8 - Doors and Hardware</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 8</b>				\$0	\$0	\$0

<b>Division 9 - Finishes</b>					
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
<b>Demolition</b>					
1					\$0
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Remove Glass and provide piping interface	1	LS	\$30,000.00	\$30,000.00	\$60,000
<b>Total Division 9</b>			\$30,000	\$30,000	\$60,000
<b>Division 10 - Specialties</b>					
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
<b>Demolition</b>					
1					\$0
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1					\$0
<b>Total Division 10</b>			\$0	\$0	\$0

**Division 15 - Mechanical**

<b>Demolition</b>					
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Science Building MISC Piping in Chiller room	1	LS		\$20,000.00	\$20,000
<b>Renovation</b>					
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
<b>Liberal Arts Piping</b>					
1 6" Main to Clayton	600	If	\$27.50	\$21.50	\$29,400
2 6" Elbows	6	Ea	\$60.00	\$76.00	\$816
3 6" Tees	2	If	\$94.00	\$114.00	\$416
3 6"x3" Bushing	2	If	\$28.50	\$69.50	\$196
4 6" Tee	6	If	\$94.00	\$114.00	\$1,248
5 6"x1.5" Bushings	4	If	\$28.50	\$69.50	\$392
6 3" Pipe along Building	650	If	\$12.60	\$15.95	\$18,558
7 3" Elbows	10	Ea	\$10.50	\$37.00	\$475
8 3" Tees	14	Ea	\$15.45	\$55.50	\$993
9 3"x1-1/2" Bushing	14	If	\$11.45	\$42.50	\$755
10 1-1/2" Pipe	200	If	\$6.85	\$13.05	\$3,980
11 1-1/2" Tees	14	Ea	\$2.45	\$35.50	\$531
12 1-1/2"x1" Bushings	28	Ea	\$1.31	\$21.50	\$639
13 1" Pipe	2,000	If	\$5.85	\$10.20	\$32,100
14 1" Elbows	60	ea	\$0.97	\$18.80	\$1,186
15 1" Valves	80	ea	\$48.00	\$20.50	\$5,480
16 1" Quick Connects	120	ea	\$40.00	\$30.00	\$8,400
17 Drywells	8	Ea	\$100.00	\$300.00	\$3,200
18 Allowance for Supports	1	LS	\$3,000.00	\$7,000.00	\$10,000
19 6" Pipe Insulation with All Service Jacket & Aluminum Cover	600	If	\$10.00	\$13.00	\$13,800
20 3" Pipe Insulation with All Service Jacket & Aluminum Cover	650	If	\$8.00	\$10.00	\$11,700
21 1-1/2" Pipe Insulation with All Service Jacket & Aluminum Cover	200	If	\$6.00	\$8.00	\$2,800
22 1" Pipe Insulation with All Service Jacket & Aluminum Cover	2,000	If	\$5.00	\$7.00	\$24,000
<b>Letters &amp; Sciences</b>					
23 6" Preinsulated Underground from LA to L&S with Trenching	80	If	\$100.00	\$100.00	\$16,000
24 6" Main to Clayton	400	If	\$27.50	\$21.50	\$19,600
25 6" Elbows	4	Ea	\$60.00	\$76.00	\$544
26 6" Tees	2	If	\$94.00	\$114.00	\$416
27 6"x3" Bushing	2	If	\$28.50	\$69.50	\$196
28 6" Tee	4	If	\$94.00	\$114.00	\$832
29 6"x1.5" Bushings	2	If	\$28.50	\$69.50	\$196
30 3" Pipe along Building	550	If	\$12.60	\$15.95	\$15,703
31 3" Elbows	6	Ea	\$10.50	\$37.00	\$285
32 3" Tees	1	Ea	\$15.45	\$55.50	\$71
33 3"x1-1/2" Bushing	2	If	\$11.45	\$42.50	\$108
34 1-1/2" Pipe	100	If	\$6.85	\$13.05	\$1,990
35 1-1/2" Tees	8	Ea	\$2.45	\$35.50	\$304
36 1-1/2"x1" Bushings	16	Ea	\$1.31	\$21.50	\$365
37 1" Pipe	1,000	If	\$5.85	\$10.20	\$16,050
38 1" Elbows	35	ea	\$0.97	\$18.80	\$692
39 1" Valves	50	ea	\$48.00	\$20.50	\$3,425
40 1" Quick Connects	75	ea	\$40.00	\$30.00	\$5,250
41 Drywells	4	Ea	\$100.00	\$300.00	\$1,600
42 Allowance for Supports	1	LS	\$2,000.00	\$5,000.00	\$7,000
43 6" Pipe Insulation with All Service Jacket & Aluminum Cover	400	If	\$10.00	\$13.00	\$9,200
44 3" Pipe Insulation with All Service Jacket & Aluminum Cover	550	If	\$8.00	\$10.00	\$9,900

45	1-1/2" Pipe Insulation with All Service Jacket & Aluminum Cover	100	If	\$6.00	\$8.00	\$1,400
46	1" Pipe Insulation with All Service Jacket & Aluminum Cover	1,000	If	\$5.00	\$7.00	\$12,000
<b>Counseling</b>						
47	6" Preinsulated Underground from Vault to Counseling with Trenching	120	If	\$100.00	\$100.00	\$24,000
48	6" Main to Clayton	250	If	\$27.50	\$21.50	\$12,250
49	6" Elbows	8	Ea	\$60.00	\$76.00	\$1,088
50	6" Tees	4	If	\$94.00	\$114.00	\$832
51	6"x1.5" Bushings	4	If	\$28.50	\$69.50	\$392
52	1-1/2" Pipe	100	If	\$6.85	\$13.05	\$1,990
53	1-1/2" Tees	8	Ea	\$2.45	\$35.50	\$304
54	1-1/2"x1" Bushings	16	Ea	\$1.31	\$21.50	\$365
55	1" Pipe	500	If	\$5.85	\$10.20	\$8,025
56	1" Elbows	35	ea	\$0.97	\$18.80	\$692
57	1" Valves	24	ea	\$48.00	\$20.50	\$1,644
58	1" Quick Connects	36	ea	\$40.00	\$30.00	\$2,520
59	Drywells	4	Ea	\$100.00	\$300.00	\$1,600
60	Allowance for Supports	1	LS	\$2,000.00	\$5,000.00	\$7,000
61	6" Pipe Insulation with All Service Jacket & Aluminum Cover	120	If	\$10.00	\$13.00	\$2,760
62	1-1/2" Pipe Insulation with All Service Jacket & Aluminum Cover	100	If	\$6.00	\$8.00	\$1,400
63	1" Pipe Insulation with All Service Jacket & Aluminum Cover	500	If	\$5.00	\$7.00	\$6,000
<b>Student Health/Activites (Cayton)</b>						
64	6" Main	460	If	\$27.50	\$21.50	\$22,540
65	6" Elbows	8	Ea	\$60.00	\$76.00	\$1,088
66	6" Tees	4	If	\$94.00	\$114.00	\$832
67	6"x3" Bushing	4	If	\$28.50	\$69.50	\$392
68	3" Pipe along Building	550	If	\$12.60	\$15.95	\$15,703
69	3" Elbows	6	Ea	\$10.50	\$37.00	\$285
70	3" Tees	1	Ea	\$15.45	\$55.50	\$71
71	3"x1-1/2" Bushing	2	If	\$11.45	\$42.50	\$108
72	1-1/2" Pipe	100	If	\$6.85	\$13.05	\$1,990
73	1-1/2" Tees	8	Ea	\$2.45	\$35.50	\$304
74	1-1/2"x1" Bushings	16	Ea	\$1.31	\$21.50	\$365
75	1" Pipe	2,000	If	\$5.85	\$10.20	\$32,100
76	1" Elbows	35	ea	\$0.97	\$18.80	\$692
77	1" Valves	50	ea	\$48.00	\$20.50	\$3,425
78	1" Quick Connects	75	ea	\$40.00	\$30.00	\$5,250
79	Drywells	8	Ea	\$100.00	\$300.00	\$3,200
80	Allowance for Supports	1	LS	\$4,000.00	\$10,000.00	\$14,000
81	6" Pipe Insulation with All Service Jacket & Aluminum Cover	460	If	\$10.00	\$13.00	\$10,580
82	3" Pipe Insulation with All Service Jacket & Aluminum Cover	550	If	\$8.00	\$10.00	\$9,900
83	1-1/2" Pipe Insulation with All Service Jacket & Aluminum Cover	100	If	\$6.00	\$8.00	\$1,400
84	1" Pipe Insulation with All Service Jacket & Aluminum Cover	2,000	If	\$5.00	\$7.00	\$24,000
85	Science Building Piping Modification Allowance	1	LS	\$20,000.00	\$30,000.00	\$50,000
86	Variable Speed CHW Pumps	2	Ea	\$10,000.00	\$3,000.00	\$26,000
87	Variable Speed Drives	2	Ea	\$3,000.00	\$1,500.00	\$9,000

88 Temporary Fan Coil Rolling Carts with Condensate pump and hoses - Counseling	11	Ea	\$4,000.00	\$44,000
89 Temporary Fan Coil Rolling Carts with Condensate pump and hoses - Liberal Arts	24	Ea	\$4,000.00	\$96,000
90 Temporary Fan Coil Rolling Carts with Condensate pump and hoses - Letters and	27	Ea	\$4,000.00	\$108,000
91 Temporary Fan Coil Rolling Carts with Condensate pump and hoses - Clayton	22	Ea	\$4,000.00	\$88,000

<b>Total Division 15</b>			<b>\$607,585</b>	<b>\$348,692</b>	<b>\$956,277</b>
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**Division 16 - Electrical**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Demolition	1	LS		\$15,000.00	\$15,000
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Basic Materials/Disconnect switches/Starters	1	LS	\$15,000.00	\$20,000.00	\$35,000
2	500A, 480V , 3P MCC circuit breaker for Chiller & Cooling Tower	1	Ea	\$3,800.00	\$1,000.00	\$4,800
3	40A, 480V, 3P MCC CKT Breaker for 30HP pumps	2	Ea	\$1,000.00	\$1,000.00	\$4,000
4	60A, 480V, 3P NEMA 3R Disconnect Switch	2	Ea	\$1,600.00	\$600.00	\$4,400
<b>Total Division 16</b>				\$24,000	\$39,200	\$63,200

<b>Project:</b>	<b>Est. By</b> Sebastian/Borja	<b>Company</b>	<b>City Cost Index</b>
SMC HVAC Upgrade	<b>Checked By:</b> C. Miller	P2S	Mat. 0.992
Window AC Units for Temporary Buildings	<b>Phase:</b> Study	P2S	Inst. 1.175
<b>Opinion of Probable Construction Cost</b>	<b>Date</b> 16-Dec-2015		Total 1.072

**Estimate Summary Sheet**

<b>Subtotals by Division</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Division 1 - General Requirements	\$57,200	\$0	\$57,200
Division 2 - Site work	\$0	\$0	\$0
Division 3 - Concrete	\$0	\$0	\$0
Division 5 - Metals	\$0	\$0	\$0
Division 6 - Wood & Plastics	\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection	\$0	\$0	\$0
Division 8 - Doors and Windows	\$0	\$0	\$0
Division 9 - Finishes	\$0	\$0	\$0
Division 10 - Specialties	\$0	\$0	\$0
Division 15 - Mechanical	\$434,707	\$279,480	\$714,187
Division 16 - Electrical	\$728,525	\$443,271	\$1,246,796
<b>Subtotal</b>	<b>\$1,220,432</b>	<b>\$722,751</b>	<b>\$2,018,183</b>
Sales Tax	10.00%	\$122,043	\$122,043
Architecture & Engineering Drawings	10.00%		\$201,818
General Conditions, Bonds, Insurance. @	15.0%		\$351,307
Contingency	20.0%		\$538,670
DSA Project Management by EOR	0.25%		\$8,080
<b>Opinion of Total Project Construction Cost</b>			<b>\$3,240,101</b>

<b>Additive Alternatives</b>	<b>Total</b>
1	
2	
3	

**Note: Alternate costs do not include sales tax, general conditions, bonds, insurance, etc...**

This opinion of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing on construction, changed conditions, labor rate changes or other factors beyond the control of P2S Engineering, Inc.

<b>Division 1 - General Requirements</b>					
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Temporary Facilities:					
1 Office trailer		Wks.			\$0
2 Office supplies		Wks.	\$105.00		\$0
3 Phone		Wks.	\$65.00		\$0
4 Sanitary facilities		Wks.	\$52.00		\$0
5 Clerical support		Wks.	\$880.00		\$0
6 Connect temporary power service		Ea.	\$196.00		\$0
7 Connect temporary water service		Ea.	\$392.00		\$0
8 Mobilization & demobilization		Ea.	\$5,000.00		\$0
9 Project superintendent	10	Wks.	\$4,320.00		\$43,200
10 Project engineer	10	Wks.	\$1,400.00		\$14,000
11 Project scheduling		L.S.	\$12,000.00		\$0
12 Commissioning		L.S.			\$0
<b>Total Division 1</b>			<b>\$57,200</b>	<b>\$0</b>	<b>\$57,200</b>

<b>Division 2 - Abatement</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 2</b>				\$0	\$0	\$0
<b>Division 3 - Concrete</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 3</b>				\$0	\$0	\$0
<b>Division 5 - Metals</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Structural Demo					0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Structural Reinforcement		LS			\$0
<b>Total Division 5</b>				\$0	\$0	\$0
<b>Division 6 - Woods &amp; Plastics</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 6</b>				\$0	\$0	\$0
<b>Division 7 - Thermal &amp; Moisture Protection</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 7</b>				\$0	\$0	\$0
<b>Division 8 - Doors and Hardware</b>						
	<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
	<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Total Division 8</b>				\$0	\$0	\$0

Division 9 - Finishes						
	Quantity	Unit	Material	Labor	Total	
Demolition						
1					\$0	
Renovation						
1					\$0	
<b>Total Division 9</b>			\$0	\$0	\$0	
Division 10 - Specialties						
	Quantity	Unit	Material	Labor	Total	
Demolition						
1					\$0	
Renovation						
1					\$0	
<b>Total Division 10</b>			\$0	\$0	\$0	

**Division 15 - Mechanical**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1			Ea.			\$0
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Window Unit AC, 0.5 tons (15 amp 125V groundec	105	Ea.	\$337.28	\$55.23	\$41,213
2	Window Unit AC, 1.0 tons (15 amp 125V groundec	51	Ea.	\$719.20	\$96.94	\$41,623
3	Window Unit AC, 1.5 tons (15 amp 230V groundec	29	Ea.	\$962.24	\$129.25	\$31,653
4	Window Unit AC, 2.0 tons (15 amp 230V groundec	36	Ea.	\$1,165.60	\$193.88	\$48,941
5	Window Unit AC, 2.5 tons (15 amp 230V groundec	31	Ea.	\$1,314.40	\$193.88	\$46,757
6	Remove Glass at each Location add Plywood, paint & provide structural supports.	252	Ea.	\$1,000.00	\$1,000.00	\$504,000
<b>Total Division 15</b>				<b>\$434,707</b>	<b>\$279,480</b>	<b>\$714,187</b>

**Division 16 - Electrical**

<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Demolition	1	LS		\$10,000.00	\$10,000
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Basic Materials/Disconnect switches/Starters	1	LS	\$25,000.00	\$35,000.00	\$60,000
2 150kVA, 480V-208/120V Transformer	1	Ea	\$15,000.00	\$35,000.00	\$50,000
3 400A, 3 $\phi$ , 4W Distribution Board "THVAC"	1	Ea	\$5,175.00	\$1,900.00	\$7,075
4 2" PVC conduit	100	LF	\$6.30	\$7.95	\$1,425
5 2" RGS conduit	500	LF	\$7.90	\$9.70	\$8,800
6 #4/O conductors	1,000	LF	\$4.30	\$1.90	\$6,200
7 #3/O conductors (400A Panelboard)	3,000	LF	\$3.40	\$1.51	\$14,730
8 #1/O conductors (400A Gnd)	700	LF	\$2.50	\$1.33	\$2,681
9 225A, 3 $\phi$ , 4W Panelboards (at Temporary	7	Ea	\$2,500.00	\$1,575.00	\$28,525
10 20A, 120V, 1P circuit breaker	260	Ea	\$17.00	\$44.00	\$15,860
11 #300 Kcmil conductors	5,000	LF	\$7.00	\$2.30	\$46,500
12 3" EMT conduit	1,000	LF	\$10.60	\$8.75	\$19,350
13 1" EMT conduit	45,000	LF	\$1.60	\$3.81	\$243,450
14 3/4" EMTconduit	15,000	LF	\$0.94	\$3.37	\$64,650
15 #12 conductors	700,000	LF	\$0.73	\$0.12	\$592,550
16 Trenching, Concrete Saw Cut, Core Drill, X-ray, Repair	1	LS			\$75,000
<b>Total Division 16</b>			<b>\$728,525</b>	<b>\$443,271</b>	<b>\$1,246,796</b>

<b>Project:</b>	<b>Est. By</b> Sebastian/Borja	<b>Company</b>	<b>City Cost Index</b>
SMC HVAC Upgrade	<b>Checked By:</b> C. Miller	P2S	Mat. 0.992
Science Building CHW Cooling	<b>Phase:</b> Study	P2S	Inst. 1.175
<b>Opinion of Probable Construction Cost</b>	<b>Date</b> 16-Dec-2015		Total 1.072

**Estimate Summary Sheet**

<b>Subtotals by Division</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Division 1 - General Requirements	\$57,200	\$0	\$57,200
Division 2 - Sitework	\$0	\$0	\$0
Division 3 - Concrete	\$0	\$0	\$0
Division 5 - Metals	\$110,000	\$110,000	\$220,000
Division 6 - Wood & Plastics	\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection	\$0	\$0	\$0
Division 8 - Doors and Windows	\$0	\$0	\$0
Division 9 - Finishes	\$33,500	\$33,500	\$67,000
Division 10 - Specialties	\$0	\$0	\$0
Division 15 - Mechanical	\$437,000	\$504,750	\$941,750
Division 16 - Electrical	\$15,000	\$45,000	\$104,231
<b>Subtotal</b>	<b>\$652,700</b>	<b>\$693,250</b>	<b>\$1,390,181</b>
Sales Tax	10.00%	\$65,270	\$65,270
Architecture & Engineering Drawings	10.00%		\$139,018
General Conditions, Bonds, Insurance. @	15.0%		\$239,170
Contingency	20.0%		\$366,728
DSA Project Management by EOR	0.25%		\$5,501
<b>Opinion of Total Project Construction Cost</b>			<b>\$2,205,868</b>

<b>Additive Alternatives</b>	<b>Total</b>
1	
2	
3	

**Note: Alternate costs do not include sales tax, general conditions, bonds, insurance, etc...**

This opinion of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing on construction, changed conditions, labor rate changes or other factors beyond the control of P2S Engineering, Inc.

<b>Division 1 - General Requirements</b>					
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Temporary Facilities:					
1 Office trailer		Wks.	\$30.00		\$0
2 Office supplies		Wks.	\$105.00		\$0
3 Phone		Wks.	\$65.00		\$0
4 Sanitary facilities		Wks.	\$52.00		\$0
5 Clerical support		Wks.	\$880.00		\$0
6 Connect temporary power service		Ea.	\$196.00		\$0
7 Connect temporary water service		Ea.	\$392.00		\$0
8 Mobilization & demobilization		Ea.	\$5,000.00		\$0
9 Project superintendent	10	Wks.	\$4,320.00		\$43,200
10 Project engineer	10	Wks.	\$1,400.00		\$14,000
11 Project scheduling		L.S.	\$12,000.00		\$0
12 Commissioning		L.S.	\$28,200.00		\$0
<b>Total Division 1</b>			<b>\$57,200</b>	<b>\$0</b>	<b>\$57,200</b>

Division 2 - Abatement						
		Quantity	Unit	Material	Labor	Total
1	Demolition					\$0
1	Renovation					\$0
<b>Total Division 2</b>				\$0	\$0	\$0
Division 3 - Concrete						
		Quantity	Unit	Material	Labor	Total
1	Demolition		LS			\$0
1	Renovation		LS			\$0
<b>Total Division 3</b>				\$0	\$0	\$0
Division 5 - Metals						
		Quantity	Unit	Material	Labor	Total
1	Structural Demo		LS			0
		Quantity	Unit	Material	Labor	Total
1	Structural Supports of AHU's	9	Ea	\$10,000.00	\$10,000.00	\$180,000
2	Supports of Piping	1	LS	\$20,000.00	\$20,000.00	\$40,000
<b>Total Division 5</b>				\$110,000	\$110,000	\$220,000
Division 6 - Woods & Plastics						
		Quantity	Unit	Material	Labor	Total
1	Demolition					\$0
1	Renovation					\$0
<b>Total Division 6</b>				\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection						
		Quantity	Unit	Material	Labor	Total
1	Demolition					\$0
1	Renovation					\$0
<b>Total Division 7</b>				\$0	\$0	\$0
Division 8 - Doors and Hardware						
		Quantity	Unit	Material	Labor	Total
1	Demolition					\$0
1	Renovation					\$0
<b>Total Division 8</b>				\$0	\$0	\$0

<b>Division 9 - Finishes</b>					
<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1					\$0
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Removal and installation of the ceiling for AHU's	9	Ea	\$1,500.00	\$1,500.00	\$27,000
1 Removal and installation of the ceiling Piping	1	LS	\$20,000.00	\$20,000.00	\$40,000
<b>Total Division 9</b>			<b>\$33,500</b>	<b>\$33,500</b>	<b>\$67,000</b>
<b>Division 10 - Specialties</b>					
<b>Demolition</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1					\$0
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1					\$0
<b>Total Division 10</b>			<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

**Division 15 - Mechanical**

<b>Demolition</b>						
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>	
1	Remove existing Convectors and Natural Ventilation	1	LS.	\$50,000.00	\$50,000	
<b>Renovation</b>						
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>	
1	Rm. 151 Life Science Classroom 3,000 CFM Air Handler	1	Ea.	\$25,000.00	\$25,000.00	\$50,000
2	Rm. 153 Phys Science Classroom 2,500 CFM Air Handler	1	Ea.	\$22,000.00	\$22,000.00	\$44,000
3	Rm. 155 Phys Science Classroom 2,000 CFM Air Handler	1	Ea.	\$20,000.00	\$20,000.00	\$40,000
4	Rm. 157 Phys Science Classroom 2,000 CFM Air Handler	1	Ea.	\$20,000.00	\$20,000.00	\$40,000
5	Rm. 169 Life Science Classroom 2,000 CFM Air Handler	1	Ea.	\$20,000.00	\$20,000.00	\$40,000
6	Second Floor Air Handlers 2,500 CFM AHU's	4	Ea.	\$22,000.00	\$22,000.00	\$176,000
7	VAV Boxes	29	Ea.	\$750.00	\$1,750.00	\$72,500
8	Ductwork	1	LS	\$40,000.00	\$40,000.00	\$80,000
9	Booster Pumps	2	Ea.	\$6,000.00	\$2,000.00	\$16,000
10	Piping, Insulaton & Accessories	1,500	Ft.	\$70.00	\$70.00	\$210,000
11	EMS	1	LS	\$63,250.00	\$60,000.00	\$123,250
<b>Total Division 15</b>			\$437,000	\$504,750	\$941,750	

**Division 16 - Electrical**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Demolition	1	LS		\$10,000.00	\$10,000
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Conduit/Wiring/J-Boxes/Basic Materials	1	LS	\$15,000.00	\$35,000.00	\$50,000
4	2" PVC conduit	100	LF	\$6.30	\$7.95	\$1,425
6	#4/O conductors	1,000	LF	\$4.30	\$1.90	\$6,200
9	200A, 480V, 3Ø, 4W Panelboard (Science West)	1	Ea	\$2,500.00	\$1,575.00	\$4,075
2	20A, 480V, 3P circuit breaker for AHU	9	Ea	\$1,150.00	\$89.50	\$11,156
3	30A, 480V, 3P NEMA 1 Disconnect Switch for AHU & (2) booster pumps	11	Ea	\$200.00	\$190.00	\$4,290
4	3/4" EMTconduit	2,000	LF	\$0.94	\$3.37	\$8,620
5	#12 conductors	10,000	LF	\$0.73	\$0.12	\$8,465
<b>Total Division 16</b>				<b>\$15,000</b>	<b>\$45,000</b>	<b>\$104,231</b>

<b>Project:</b>	<b>Est. By</b> Sebastian/Borja	<b>Company</b>	<b>City Cost Index</b>
Santa Monica College - HVAC Upgrade	<b>Checked By:</b> C. Miller	P2S	Mat. 0.992
Performing Arts CHW & HHW Option	<b>Phase:</b> Study	P2S	Inst. 1.175
<b>Opinion of Probable Construction Cost</b>	<b>Date</b> 16-Dec-2015		Total 1.072

**Estimate Summary Sheet**

<b>Subtotals by Division</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Division 1 - General Requirements	\$57,200	\$0	\$57,200
Division 2 - Sitework	\$0	\$0	\$0
Division 3 - Concrete	\$69,000	\$79,000	\$148,000
Division 5 - Metals	\$29,000	\$29,000	\$58,000
Division 6 - Wood & Plastics	\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection	\$0	\$0	\$0
Division 8 - Doors and Windows	\$0	\$0	\$0
Division 9 - Finishes	\$30,500	\$42,750	\$73,250
Division 10 - Specialties	\$0	\$0	\$0
Division 15 - Mechanical	\$995,200	\$672,200	\$1,667,400
Division 16 - Electrical	\$58,854	\$68,810	\$127,664
<b>Subtotal</b>	<b>\$1,239,754</b>	<b>\$891,760</b>	<b>\$2,131,514</b>
Sales Tax	10.00%	\$123,975	-
Architecture & Engineering Drawings	10.00%		\$213,151
General Conditions, Bonds, Insurance. @	15.0%		\$370,296
Contingency	20.0%		\$567,787
DSA Project Management by EOR	0.25%		\$8,517
<b>Opinion of Total Project Construction Cost</b>			<b>\$3,415,241</b>

<b>Additive Alternatives</b>	<b>Total</b>
1	
2	
3	

**Note: Alternate costs do not include sales tax, general conditions, bonds, insurance, etc...**

This opinion of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing on construction, changed conditions, labor rate changes or other factors beyond the control of P2S Engineering, Inc.

<b>Division 1 - General Requirements</b>					
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Temporary Facilities:					
1 Office trailer		Wks.	\$30.00		\$0
2 Office supplies		Wks.	\$105.00		\$0
3 Phone		Wks.	\$65.00		\$0
4 Sanitary facilities		Wks.	\$52.00		\$0
5 Clerical support		Wks.	\$880.00		\$0
6 Connect temporary power service		Ea.	\$196.00		\$0
7 Connect temporary water service		Ea.	\$392.00		\$0
8 Mobilization & demobilization		Ea.	\$5,000.00		\$0
9 Project superintendent	10	Wks.	\$4,320.00		\$43,200
10 Project engineer	10	Wks.	\$1,400.00		\$14,000
11 Project scheduling		L.S.	\$12,000.00		\$0
12 Commissioning		L.S.	\$28,200.00		\$0
<b>Total Division 1</b>			<b>\$57,200</b>	<b>\$0</b>	<b>\$57,200</b>

Division 2 - Abatement					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 2</b>			\$0	\$0	\$0
Division 3 - Concrete					
Demolition	Quantity	Unit	Material	Labor	Total
1		LS			\$0
Renovation	Quantity	Unit	Material	Labor	Total
1 Slab	1,000	SQFT	\$5.00	\$15.00	\$20,000
2 CMU Wall	128	LF	\$500.00	\$500.00	\$128,000
<b>Total Division 3</b>			\$69,000	\$79,000	\$148,000
Division 5 - Metals					
Demolition	Quantity	Unit	Material	Labor	Total
1 Structural Demo		LS			0
Renovation	Quantity	Unit	Material	Labor	Total
1 Structural Fan Coil Units	55	Ea	\$500.00	\$500.00	\$55,000
2 Structural Boiler and Chiller Plant	1	LS	\$1,500.00	\$1,500.00	\$3,000
<b>Total Division 5</b>			\$29,000	\$29,000	\$58,000
Division 6 - Woods & Plastics					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 6</b>			\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 7</b>			\$0	\$0	\$0
Division 8 - Doors and Hardware					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 8</b>			\$0	\$0	\$0

**Division 9 - Finishes**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Demolition of enclosure of existing wall heater	55	Ea		\$150.00	\$8,250
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Renovation of enclosure of new vertical Fan Coil and Piping	55	Ea	\$500.00	\$500.00	\$55,000
2	Ceiling Demolition / Renovation of Ceiling for new piping	1	LS	\$3,000.00	\$7,000.00	\$10,000

<b>Total Division 9</b>				\$30,500	\$42,750	\$73,250
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**Division 10 - Specialties**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0

<b>Total Division 10</b>				\$0	\$0	\$0
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**Division 15 - Mechanical**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Remove Wall Furnances	1	Ls		\$50,000.00	\$50,000
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Vertical four pipe fan coil with Economizer	55	Ea.	\$4,000.00	\$4,000.00	\$440,000
2	Piping, Insulation & Accessories	4,000	lf	\$40.00	\$40.00	\$320,000
3	100 Ton Air Cooled Chillers	2	Ea.	\$200,000.00	\$50,000.00	\$500,000
4	Chilled Water Pumps	2	Ea.	\$15,300.00	\$5,100.00	\$40,800
5	Air Mist System (precool Air for Chillers)	2	Ea.	\$20,000.00	\$20,000.00	\$80,000
6	1,000 MBH Boiler System	2	Ea.	\$32,000.00	\$15,900.00	\$95,800
7	Hot Water Pumps	2	Ea.	\$15,300.00	\$5,100.00	\$40,800
8	EMS Controls	1	LS	\$50,000.00	\$50,000.00	\$100,000
<b>Total Division 15</b>				<b>\$995,200</b>	<b>\$672,200</b>	<b>\$1,667,400</b>

**Division 16 - Electrical**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Demolition	1	LS		\$10,000.00	\$10,000
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Conduit/Wiring/J-Boxes/Basic Materials	1	LS	\$15,000.00	\$35,000.00	\$50,000
2	225A, 480V, 3P circuit breaker for 100 ton Chiller	2	Ea	\$1,725.00	\$137.00	\$3,724
3	40A, 480V, 3P circuit breaker for 20HP Pumps	4	Ea	\$1,150.00	\$89.50	\$4,958
4	60A, 480V, 3P NEMA 1 Disconnect Switch for Pum	4	Ea	\$200.00	\$190.00	\$1,560
5	3/4" EMTconduit	2,000	LF	\$0.94	\$3.37	\$8,620
6	#12 conductors	20,000	LF	\$0.73	\$0.12	\$16,930
7	20A, 120V, 1P circuit breakers	42	Ea	\$17.00	\$44.00	\$2,562
8	225A, 208/120V, 3Ø, 4W Panelboard, 42 circuit (From Dist Bd "DB1")	1	Ea	\$2,500.00	\$1,575.00	\$4,075
9	#4/O conductors (225A Panelboard)	500	LF	\$4.30	\$1.90	\$3,100
10	#4/O conductors (100 ton Chiller)	1,000	LF	\$4.30	\$1.90	\$6,200
11	#6 conductors (20HP Pumps)	800	LF	\$7.00	\$2.30	\$7,440
12	2" EMT conduit	600	LF	\$4.20	\$5.45	\$5,790
13	1" EMT conduit	500	LF	\$1.60	\$3.81	\$2,705
<b>Total Division 16</b>				<b>\$58,854</b>	<b>\$68,810</b>	<b>\$127,664</b>

<b>Project:</b>	<b>Est. By</b> Sebastian/Borja	<b>Company</b>	<b>City Cost Index</b>
Santa Monica College - HVAC Upgrade	<b>Checked By:</b> C. Miller	P2S	Mat. 0.992
Performing Arts VRF Option	<b>Phase:</b> Study	P2S	Inst. 1.175
<b>Opinion of Probable Construction Cost</b>	<b>Date</b> 16-Dec-2015		Total 1.072

**Estimate Summary Sheet**

<b>Subtotals by Division</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>	
Division 1 - General Requirements	\$57,200	\$0	\$57,200	
Division 2 - Sitework	\$0	\$0	\$0	
Division 3 - Concrete	\$69,000	\$79,000	\$148,000	
Division 5 - Metals	\$29,000	\$29,000	\$58,000	
Division 6 - Wood & Plastics	\$0	\$0	\$0	
Division 7 - Thermal & Moisture Protection	\$0	\$0	\$0	
Division 8 - Doors and Windows	\$0	\$0	\$0	
Division 9 - Finishes	\$30,500	\$42,750	\$73,250	
Division 10 - Specialties	\$0	\$0	\$0	
Division 15 - Mechanical	\$770,000	\$820,000	\$1,590,000	
Division 16 - Electrical	\$45,814	\$67,994	\$113,808	
<b>Subtotal</b>	<b>\$1,001,514</b>	<b>\$1,038,744</b>	<b>\$2,040,258</b>	
Sales Tax	10.00%	\$100,151	-	\$100,151
Architecture & Engineering Drawings	10.00%			\$204,026
General Conditions, Bonds, Insurance. @	15.0%			\$351,665
Contingency	20.0%			\$539,220
DSA Project Management by EOR	0.25%			\$8,088
<b>Opinion of Total Project Construction Cost</b>				<b>\$3,243,409</b>

<b>Additive Alternatives</b>	<b>Total</b>
1	
2	
3	

**Note: Alternate costs do not include sales tax, general conditions, bonds, insurance, etc...**

This opinion of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing on construction, changed conditions, labor rate changes or other factors beyond the control of P2S Engineering, Inc.

<b>Division 1 - General Requirements</b>					
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
Temporary Facilities:					
1 Office trailer		Wks.	\$30.00		\$0
2 Office supplies		Wks.	\$105.00		\$0
3 Phone		Wks.	\$65.00		\$0
4 Sanitary facilities		Wks.	\$52.00		\$0
5 Clerical support		Wks.	\$880.00		\$0
6 Connect temporary power service		Ea.	\$196.00		\$0
7 Connect temporary water service		Ea.	\$392.00		\$0
8 Mobilization & demobilization		Ea.	\$5,000.00		\$0
9 Project superintendent	10	Wks.	\$4,320.00		\$43,200
10 Project engineer	10	Wks.	\$1,400.00		\$14,000
11 Project scheduling		L.S.	\$12,000.00		\$0
12 Commissioning		L.S.	\$28,200.00		\$0
<b>Total Division 1</b>			<b>\$57,200</b>	<b>\$0</b>	<b>\$57,200</b>

Division 2 - Abatement					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 2</b>			\$0	\$0	\$0
Division 3 - Concrete					
Demolition	Quantity	Unit	Material	Labor	Total
1		LS			\$0
Renovation	Quantity	Unit	Material	Labor	Total
1 Slab	1,000	SQFT	\$5.00	\$15.00	\$20,000
2 CMU Wall	128	LF	\$500.00	\$500.00	\$128,000
<b>Total Division 3</b>			\$69,000	\$79,000	\$148,000
Division 5 - Metals					
Demolition	Quantity	Unit	Material	Labor	Total
1 Structural Demo		LS			0
Renovation	Quantity	Unit	Material	Labor	Total
1 Structural Fan Coil Units	55	Ea	\$500.00	\$500.00	\$55,000
2 Structural Boiler and Chiller Plant	1	LS	\$1,500.00	\$1,500.00	\$3,000
<b>Total Division 5</b>			\$29,000	\$29,000	\$58,000
Division 6 - Woods & Plastics					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 6</b>			\$0	\$0	\$0
Division 7 - Thermal & Moisture Protection					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 7</b>			\$0	\$0	\$0
Division 8 - Doors and Hardware					
Demolition	Quantity	Unit	Material	Labor	Total
1					\$0
Renovation	Quantity	Unit	Material	Labor	Total
1					\$0
<b>Total Division 8</b>			\$0	\$0	\$0

**Division 9 - Finishes**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Demolition of enclosure of existing wall heater	55	Ea		\$150.00	\$8,250
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1	Renovation of enclosure of new vertical Fan Coil and Piping	55	Ea	\$500.00	\$500.00	\$55,000
2	Ceiling Demolition / Renovation of Ceiling for new piping	1	LS	\$3,000.00	\$7,000.00	\$10,000

<b>Total Division 9</b>				\$30,500	\$42,750	\$73,250
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**Division 10 - Specialties**

<b>Demolition</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0
<b>Renovation</b>		<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1						\$0

<b>Total Division 10</b>				\$0	\$0	\$0
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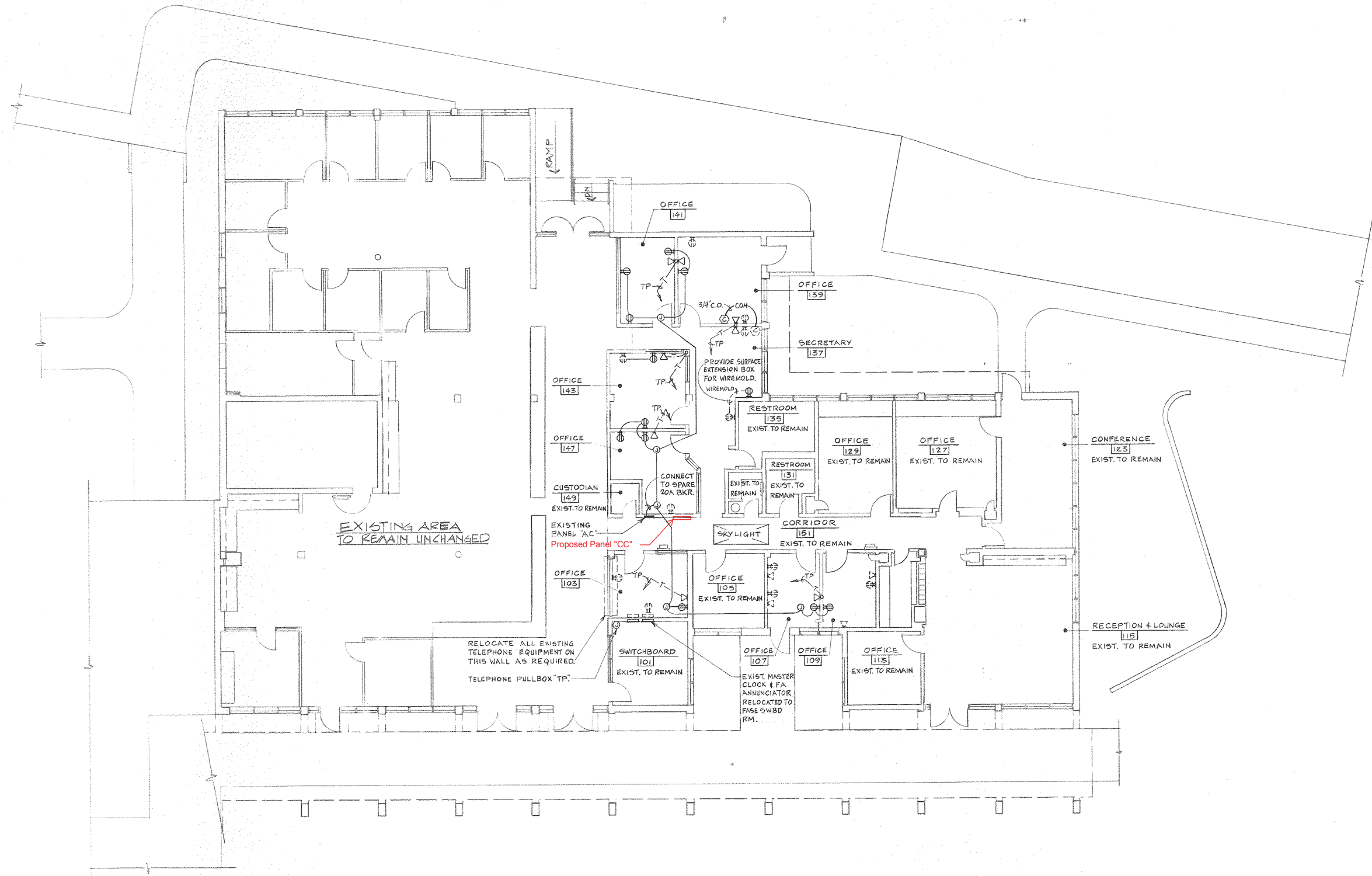
**Division 15 - Mechanical**

<b>Demolition</b>					
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Remove Wall Furnances	1	Ls		\$50,000.00	\$50,000
<b>Renovation</b>					
	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 VRF System	1	LS	\$300,000.00	\$300,000.00	\$600,000
2 Piping, Insulation & Accessories	7,000	If	\$60.00	\$60.00	\$840,000
3 EMS Controls	1	LS	\$50,000.00	\$50,000.00	\$100,000
<b>Total Division 15</b>			<b>\$770,000</b>	<b>\$820,000</b>	<b>\$1,590,000</b>

**Division 16 - Electrical**

	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
<b>Demolition</b>					
1 Demolition	1	LS		\$10,000.00	\$10,000
<b>Renovation</b>	<b>Quantity</b>	<b>Unit</b>	<b>Material</b>	<b>Labor</b>	<b>Total</b>
1 Conduit/Wiring/J-Boxes/Basic Materials	1	LS	\$15,000.00	\$35,000.00	\$50,000
2 110A, 240V, 3P circuit breaker for Condensing Uni	3	Ea	\$1,100.00	\$117.00	\$3,651
3 30A, 240V, 3P NEMA 3R Disconnect Switch for (3)	3	Ea	\$200.00	\$190.00	\$1,170
4 3/4" EMTconduit	3,000	LF	\$0.94	\$3.37	\$12,930
5 #12 conductors	20,000	LF	\$0.73	\$0.12	\$16,930
6 20A, 120V, 1P circuit breakers	42	Ea	\$17.00	\$44.00	\$2,562
7 225A, 208/120V, 3 $\phi$ , 4W Panelboard, 42 circuit (From Dist Bd "DB1")	1	Ea	\$2,500.00	\$1,575.00	\$4,075
8 #4/O conductors (225A Panelboard)	800	LF	\$4.30	\$1.90	\$4,960
9 2" EMT conduit	500	LF	\$4.20	\$5.45	\$4,825
10 1" EMT conduit	500	LF	\$1.60	\$3.81	\$2,705
<b>Total Division 16</b>			<b>\$45,814</b>	<b>\$67,994</b>	<b>\$113,808</b>

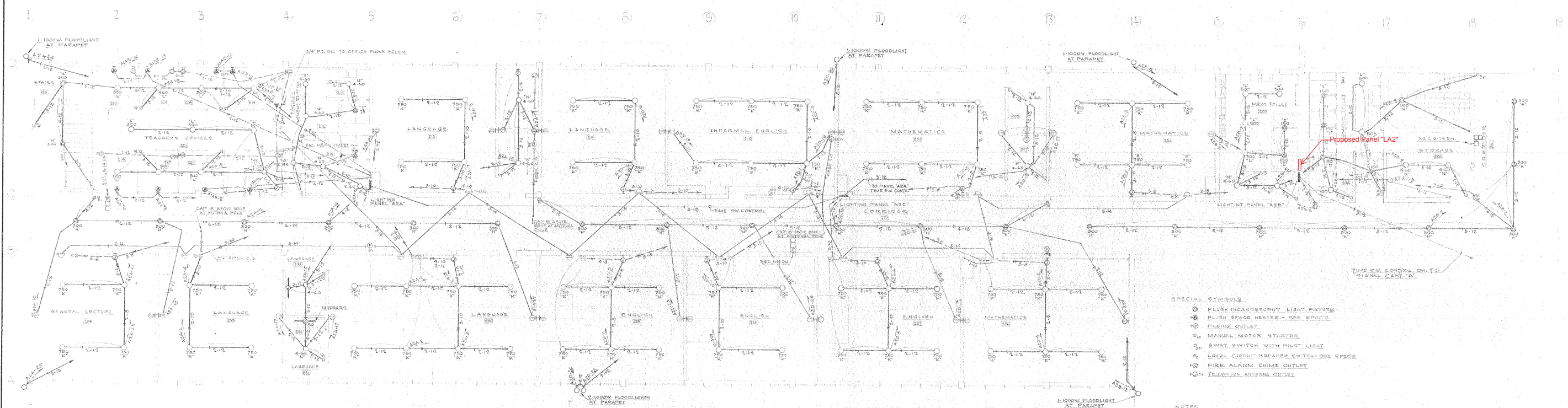
Appendix C – Proposed Panel Locations



POWER & SIGNAL FLOOR PLAN  
SCALE 1/8" = 1'-0"



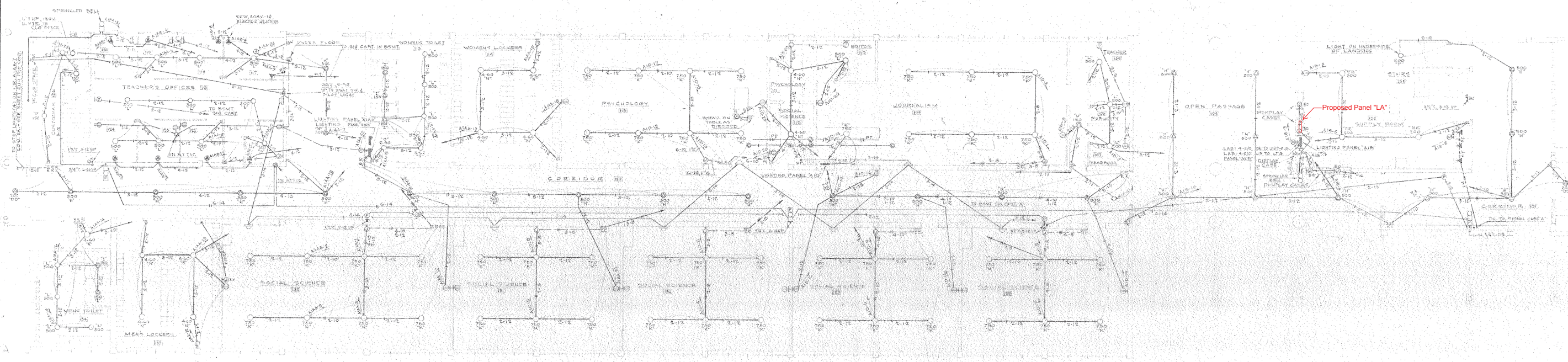
COUNSELING CENTER



SECOND FLOOR PLAN  
SCALE: 1/8" = 1'-0"

- SPECIAL SYMBOLS
- ELKIN INCANDESCENT LIGHT FIXTURE
  - ⊗ ELKIN SPACE HEATER - SEE SPEC.
  - ⊕ FLOORING OUTLET
  - ⊖ MANUAL MOTOR STARTER
  - ⊙ SWAY SWITCH WITH PHOTO LIGHT
  - ⊕ LOCAL CIRCUIT BREAKER SWITCH - ONE SPACE
  - ⊖ FIRE ALARM CHIME OUTLET
  - ⊙ TELEVISION ANTENNA OUTLET

NOTES:  
SEE BASEMENT PLAN SHEET E-1 FOR LIGHTING PANEL SCHEDULES



FIRST FLOOR PLAN  
SCALE: 1/8" = 1'-0"



LIBERAL ARTS BUILDING

CLASSROOM BLDG.  
SANTA MONICA CITY COLLEGE  
SANTA MONICA HIGH SCHOOL DISTRICT  
SANTA MONICA CALIFORNIA  
FIRST AND SECOND FLOOR PLANS

THE E-L-E-C-O.  
CONSULTING ENGINEERS  
4121 SANTA MONICA BOULEVARD  
LOS ANGELES 27, CALIFORNIA

STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS  
DIVISION OF ARCHITECTURE  
2861 APPROVED JUN 20 1950  
APPROVED BY *Henry W. Hill*

JOB NO. 1166	DRAWN BY TRACED	DATE MAR. 1950	CHECKED BY	SHEET NO. E-2
ARCHITECTS MARSH, SMITH & POWELL				OF 212 DWGS.
300 LANE MORTGAGE BUILDING - LOS ANGELES, CALIFORNIA				

AS BUILT DRAWING

BLOCK A  
UNIT NO. 2

PANEL "BIAA"					
BRKR	OUTLETS	LOAD		DESCRIPTION	
P A	O	L1	L2	L3	
1	9	1400			FOYER
2	11	1550			CORR. & CIR. OFFICE
3	4		700		" " STORAGE
4	8				TOILET & OFFICE
5	12			1280	TYPING & TOILET
6	4			1100	AUDIO VISUAL
7	4	700			OFFICES
8	9	950			CORR. & LISTENING
9	8		1050		OFFICES
10	4		900		" "
11	4			700	" "
12	4			800	FOYER
13		180			SPARE
14	6	950			EXIST.
15			180		SPARE
16				180	" "
17				180	" "
18				500	HEV. CONTR. PNL.
19	20	4	720		RECT.
20	5		900		OFFICES RECPT.
21	5		900		AUDIO VISUAL
22	6		1050		OFFICES RECPT.
23	7			1280	WORK RM.
24	15	5	450		OFFICES RECPT.
25	20	5	900		EXIT (4 EXIST.)
26	20	5	900		EXIST. TO STAY
27	5		900		EXIST.
28	6		1080		2 EXIST. 4 NEW
29	5			900	EXIST.
30	5				SPACE
31					
32					
33					
34					
Phase Load		8500	8270	7300	

Total load 24KW = 67A At 120/208V - 3 $\phi$  long cont. load = 84A. Exist panel, "BIAA", to be reworked according to this schedule.

PANEL "BIA"					
BRKR	OUTLETS	LOAD		DESCRIPTION	
P A	O	L1	L2	L3	
1	15	1100	1100	1100	EXISTING
2	11	1100	1100	1100	" "
3	6	800	800	800	" "
4	7	700	700	700	" "
5	7	700	700	700	" "
6	7	700	700	700	" "
7	8	1200	1200	1200	" "
8	8	1200	1200	1200	" "
9	8	1200	1200	1200	" "
10	11	1000	1000	1000	PERIODICAL READ RM.
11	10		1000	1000	" "
12	10		1000	1000	" "
13	10	1000	1000	1000	" "
14	10	1000	1000	1000	WORK ROOM
15	11	1050	1000	1000	" "
16	18	900			STACK ROOM
17			430	430	DUMMWATER HOT. HP
18			180	180	SPARE
Phase Load		13650	12110	12010	

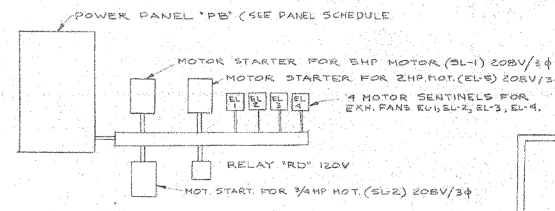
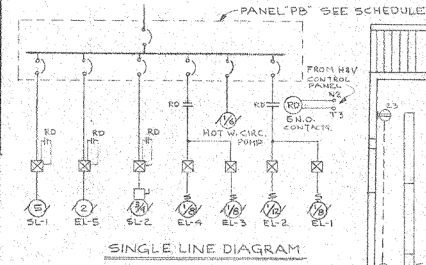
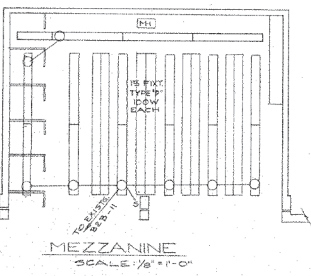
Total load 37.5 KW = 105A. At 120/208V - 3 $\phi$  long cont. load = 130A. Exist. panel, "BIA" to be reworked according to this schedule.

PANEL "B2C"					
BRKR	OUTLETS	LOAD		DESCRIPTION	
P A	O	L1	L2	L3	
1	7	1400			READING ROOM 205
2	6	1100			" " 204
3	7		1400		" " 205
4	11				CORRIDOR, TOILET
5	7		1550		READING ROOM 205
6	7		1400		" " " "
7	8	1200			TOILET, EQUIP ROOM,
8	4	540			READING ROOM 205
9	5	720			WORK RM., EQUIP RM.
10	5	900			CORR., TOIL., READ RM.
11	7		1200		WORK ROOM
12				180	SPARE
13				180	" "
14				180	" "
15				180	" "
16				180	" "
17				180	" "
18				180	" "
Phase Load		4600	4730	4540	

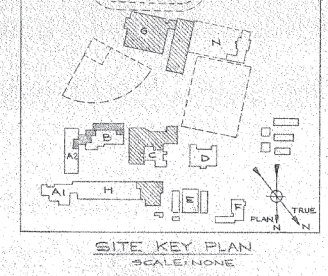
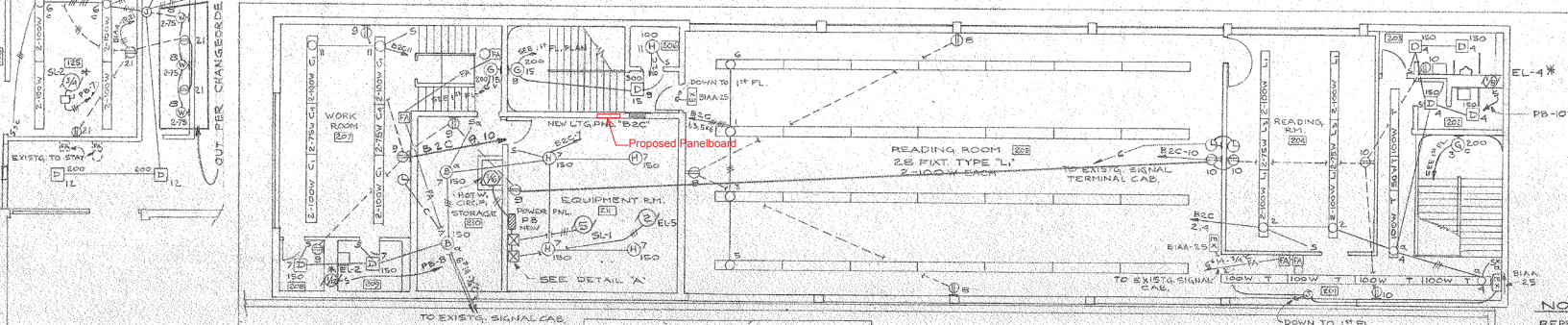
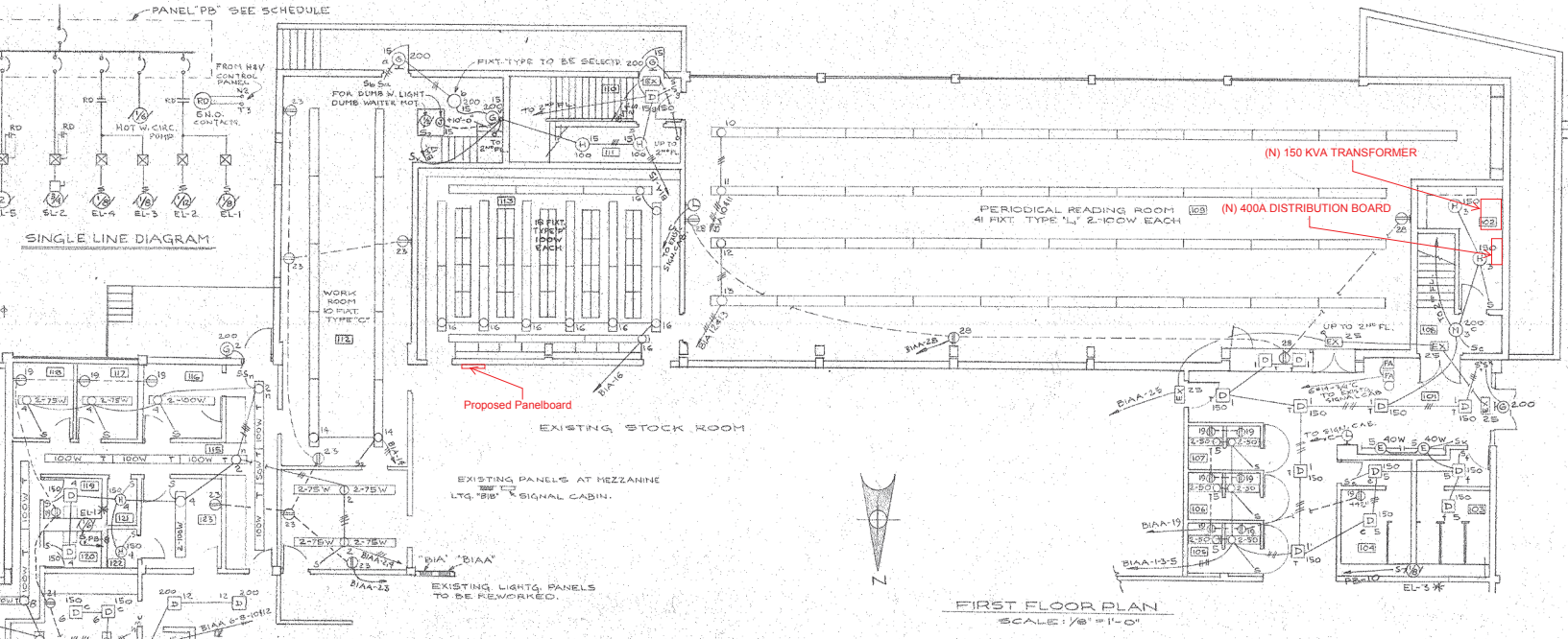
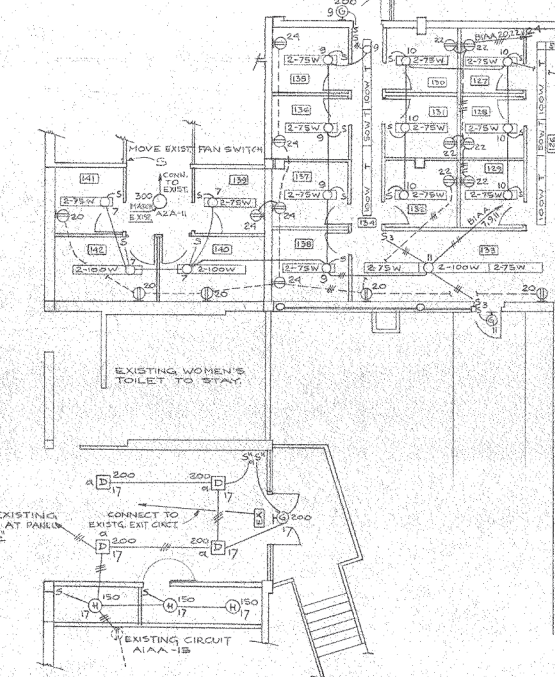
Total load 13.9 KW = 39A. At 120/208V - 3 $\phi$  long cont. load = 49A. New panel with 70A. main breaker.

PANEL "PB"					
BRKR	LOAD	DESCRIPTION			
P A	L1	L2	L3		
1	340	1920			SUPPLY FAN SL-1 SHP
2	30	1140			EXH. FAN EL-5 SHP
3			1920		PART OF CIR. #1
4			1140		" " " "
5				1920	" " " "
6				1140	" " " "
7	15	360			SUPPLY FAN SL-2 VHP
8	120	600			EXH. FAN EL-6 SHP
9			360		PART OF CIR. #7
10	120	720			EXH. FAN EL-4 (VHP) SHP
11				360	PART OF CIR. #7
12	120			500	HOT WATER CIRC. PUMP
13					SPACE ONLY
14					" "
15					" "
16					" "
17					" "
18					" "
Phase Load		4020	4160	3920	

TOTAL LOAD 12.1 KVA = 33.6A AT 120/208V. 100A MAIN BREAKER. NEW PANEL.

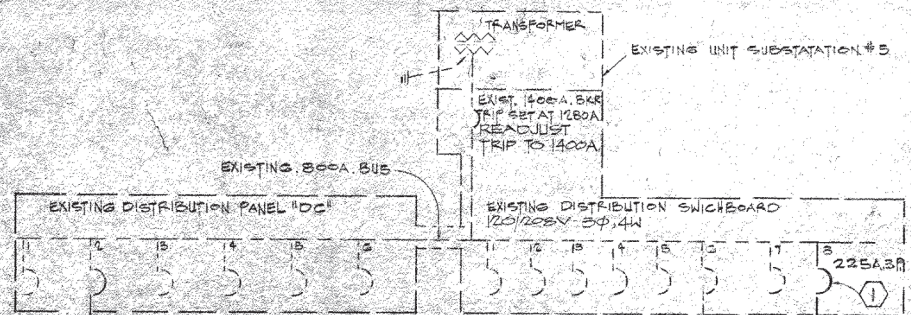


DETAIL 'A' POWER PNL 'PB' SCALE NONE FOR WIRING SEE SINGLE LINE.



NOTES:  
 REPLACE EXISTING B. STATION FOR EXISTING HEV. CONTROL WITH NEW HEV CONTROL PANEL CIRCUIT "BIAA-16" FOR NEW HEV. CONT. PNL. SEE HAV. DRWG. "S BLOCK C"  
 \* LOCATED ON ROOF WITH WEATHER PROOF DISCONNECT SWITCH.  
 FLUORESCENT FIXTURES: TYPE "C" UNLESS NOTED OTHERWISE.

<b>HINKSTON AND NORCROSS INC.</b> CONSULTING ENGINEERS 8613 WASHIRE BLVD. LOS ANGELES 26, CALIFORNIA WE. 8-2033	<b>ADDITIONS TO LIBRARY BUILDING</b> AS BUILT CORRECTIONS, 11/12/60 STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS DIVISION OF ARCHITECTURE 17 6532 APPROVED DEC 3 - 1958 <i>S. J. May</i>	SANTA MONICA CITY COLLEGE 1938 ADDITION SANTA MONICA UNIFIED SCHOOL DISTRICT SANTA MONICA CALIFORNIA LIGHTING - POWER & SIGNAL JOB DRAWN BY <i>S. J. May</i> DATE DEC. 1958 SHEET 1566 TRACED D. DIBBLE CHECKED <b>SMITH, POWELL &amp; MORGRIDGE</b> 208 WEST EIGHTH ST. LOS ANGELES 14, CALIFORNIA 0P24DWS
	<b>E-1</b> BLOCK B 29	



EXISTING CONNECTED LOAD = 1030 AMPS  
 ADDITIONAL LOAD = 167 AMPS  
 TOTAL NEW LOAD = 1197 AMPS @ 120/208V-3φ (430KW)

**SINGLE LINE DIAGRAM**  
 NOT TO SCALE

**NUMBERED NOTES**

1. ADD NEW 225A, 3 POLE BREAKER IN EXISTING DISTRIBUTION SWITCHBOARD AND EXTEND NEW FEEDER AS SHOWN. BREAKER AIC TO MATCH EXISTING.
2. EXISTING 15 H.P., 208V, 3φ FAN MOTOR IS BEING REPLACED WITH NEW MOTOR SIZE AS SHOWN. DISCONNECT EXISTING MOTOR AND REMOVE EXISTING FEEDER BACK TO EXISTING POWER PANEL "PAC" IN BOILER ROOM.
3. IN EXISTING POWER PANEL ADD A 250A, 3P, BREAKER AND EXTEND NEW FEEDER OVER TO NEW FAN MOTOR AS SHOWN. BREAKER AIC RATING TO MATCH EXISTING.
4. COMBINATION 200A DISCONNECT SWITCH AND MAGNETIC MOTOR STARTER SIZE 4. INTERLOCK FAN WITH EXISTING CONTROL PANEL.

**Drawing E-2, Partial Basement Plan/Existing Building**

1. Refer to Partial Basement Plan Power: Remove electrical equipment associated with removed condensate unit "CU-1". Intercept with junction boxes as shown and extend new conduit and wire unit location on roof.
2. Provide additional spare conduits of same size as existing (Power & Control) between basement and roof for future unit on roof.
3. Conduits between basement and roof shall be routed in duct shaft along column line 4 with HVAC ducts.

EXISTING H&V CONTROL PANEL INTERLOCK WITH EXISTING CONTROLS  
 EXISTING POWER PANEL "PAC" 200A, 120/208V, 3φ, 4W.

EXISTING POWER PANEL "DC" 400A, 120/208V, 3φ, 4W.

FAN (NEW) 40HP, 208V, 3φ

EXISTING FAN R.M.

EXISTING BOILER R.M.

Proposed Panelboard location

EXISTING DISTRIBUTION PANEL "DC" (ZINCO#104222) 200A, 120/208V, 3φ, 4W.

EXISTING SUB STATION #5 200A, 4150V, 10000V, 3φ, 4W.

EXISTING DISTRIBUTION SWITCHBOARD (ZINCO#337649) 200A, 120/208V, 3φ, 4W.

Proposed Panelboard location

EXISTING 5" UNDERGROUND CONDUITS (ADD NEW FEEDER CONDUITS AS SHOWN ON SINGLE LINE)

APPROXIMATE LOCATION OF EXISTING PULL BOX  
 EXTEND NEW FEEDER AS SHOWN SEE SINGLE LINE DIAGRAM THIS SH. VERIFY EXACT ROUTING AT JOB SITE SAWCUT CONCRETE AS REQUIRED

STATE OF CALIFORNIA  
 DEPARTMENT OF GENERAL SERVICES  
 MAY 20 1985  
 ELLIOTT  
 Office of State Architectural Services  
 1000 L Street, Sacramento, CA 95834

OFFICE OF THE STATE ARCHITECT  
 STATE COMPLIANCE SECTION  
 6054 FEB 9 '85  
 APPROVED FOR THE STATE ARCHITECT

UNAPPROVED FOR FIELD INSPECTION  
 STATE FIRE MARSHAL  
 SOUTHERN REGION  
 SUBJECT TO FIELD INSPECTION

UP SEE SH. E-3  
 SAWCUT EXISTING CONCRETE WALL APPROXIMATELY 3'-0" AS NECESSARY TO REVEAL CONDUIT IF WALL, PATCH OVER CONDUIT

CAYTON CENTER

REVISED MAR 6 1987

REGISTERED PROFESSIONAL ELECTRICIAN  
 JAMES T. [Signature]  
 No. E30322

OFFICE OF THE STATE ARCHITECT  
 STRUCTURE SAFETY SECTION  
 46054 MAY 30 1985

APPROVED FOR THE STATE ARCHITECT  
 [Signature]

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**JM**  
 ENGINEERS  
 1000 L STREET  
 SACRAMENTO, CALIFORNIA 95834

SANTA MONICA COLLEGE  
 CAYTON STUDENT CENTER  
 2nd Floor Addition  
 1900 PICO BLVD., SANTA MONICA, CA 90405

PARTIAL BASEMENT PLAN /  
 EXISTING BUILDING

Job No. 86111  
 2-29-85

**PARTIAL BASEMENT PLAN - EXISTING BUILDING**  
 SCALE: 1/8" = 1'-0"



1:2

