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BUILD STRONG.



THE VISION TO CHANGE.
THE INTEGRITY TO SUSTAIN.

CSU San Bernardino – Palm Desert Campus

MEP Utilities Master Plan

January 13, 2017

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EXECUTIVE SUMMARY

Background and Scope

Founded in 1960, California State University, San Bernardino is a 430-acre campus set at the foothills of the San Bernardino in inland Southern California. Currently, the main campus is composed of 66 buildings, totaling almost 2.6 million gross square feet of campus building space. The Palm Desert campus is composed of 5 buildings, totaling approximately 100,000 gross square feet of campus building space. The University is home to about 20,000 students.

The proposed implementation of the master plan at the Palm Desert Campus will add approximately 1.0million of academic and lab spaces and approximately 200,000 sqft of residential and support spaces. A total of approximately 1.2 million square feet of gross space is being added to the campus existing inventory excluding parking structures. A campus map and table showing the proposed master planned facilities that are being added at the campus is provided at the end of the chapter. The map also indicates buildings that are being replaced under the proposed plan.

P2S Engineering Inc. was contracted to evaluate the existing utilities currently serving the campus and provide specific recommendations to alter/upgrade/modify the existing utility infrastructure to support the facilities proposed as part of the master plan and provide an updated utility master plan for the campus.

The utilities evaluated as part our utility master plan update are:

- Chilled Water Distribution System
- Heating Hot Water Distribution System
- Natural Gas Systems
- Electrical Service and Distribution System
- Critical Data/Telecommunications for Security

The utilities within the campus boundaries are comprised of domestic and fire water, sewer, storm drain, irrigation water, gas, electrical and telecommunications systems, and are all owned and operated by the campus. Southern California Gas & Southern California Edison provide gas and power to the campus respectively.

The University has its own electrical distribution system which receives 12kV service from Southern California Edison and distributes to each building on campus.

The University does not currently have a centralized central heating and cooling plant and the cooling and heating needs of the facilities are currently met by packaged HVAC systems and dedicated boilers in each of the buildings. The downstream system comprises of VAV system.

The University receives gas from Southern California Gas Company and is distributed to each of the buildings on campus.

Objective

The objective of this utility master plan study is to evaluate the existing utilities currently serving the existing CSUSB Palm Desert Campus and provide cost-effective and specific recommendations to alter/upgrade/modify the existing utility infrastructure to support new buildings, major renovations, and building replacements that form part of the proposed master plan.

Methodology

The following methodology was adopted in formulating our utility infrastructure master plan.

A critical aspect in the evaluation of the existing utility systems serving a facility is a detailed and accurate field investigation of the current systems. A detailed survey of the existing utility systems that currently serve the facilities at the CSUSB Palm Desert campus was undertaken, and existing conditions, together with potential problems were identified. The surveyed information was verified through available record drawings and meetings with the campus facilities management staff.

Each utility system was then evaluated for capacity, functionality, reliability, ease of maintenance, age, and its ability to serve the present and future needs of the campus.

Alterations/upgrade/modifications necessary to support new buildings, major renovations, and building replacements that form part of the proposed master plan were identified.

Report Overview

Our following Utility Infrastructure Master Plan update report provides an analysis of the existing utilities currently serving the facilities, identifies alterations/upgrade/modifications necessary to support new buildings, major renovations, and building replacements that form part of the proposed master plan and outlines recommended solutions and costs to implement the same. The utility systems that were evaluated and included in our report are: Chilled and Heating Hot Water Systems, Electrical Systems, Telecommunication Systems and Natural Gas System.

Summary of Our Analysis and Recommendations

The following report summarizes our analysis and our recommended solutions for each of the existing utility systems to support the proposed master plan development. The table below provides the new facilities being provided as part of the proposed master plan.

NEW / EXPANDED ACADEMIC FACILITIES					
Bld.No.	Building Name or Type	Campus Facility or Type	ASF	Floors	GSF
0	Classroom Expansion Wing	Classrooms	12,300	3.00	36,900
1	Administration or Special Academic Program	Office	25,600	3.00	78,800
2	Student Union	Student Union	24,900	4.00	74,400
3	CEL Building	Classrooms	20,500	4.00	76,000
4	Physical Education Center Courts	Gymnasium Facility	24,500	3.00	73,500
4	Physical Education Center Lockers	Gymnasium Facility	10,500	3.00	31,500
5	Western Signature Lab Building	Lab	21,600	3.00	59,200
6	Library + Media Center	Library	21,700	4.00	71,000
7	Academic Building	Classrooms	19,400	4.00	72,600
8	Academic Building	Classrooms	21,400	3.00	64,200
9	Academic Building	Classrooms	18,900	3.00	56,700
10	Academic Building	Classrooms	21,400	3.00	64,200
11A	Production Program Classrooms (Adjoining Studio)	Classrooms	11,200	3.00	33,600
11B	Production Program Studio	Lab	16,500	1.00	16,500
12	Production Class Building (Across the Promenade)	Classrooms	21,400	3.00	64,200
13	Childcare Center	Classrooms	5,200	2.00	10,400
14	Police and Transportation Office	Office	10,000	2.00	20,000
15A	Facilities 1	Shop/Storage	17,800	1.00	17,800
15B	Facilities 2	Shop/Storage	12,600	1.00	12,600
16	Plant Footprint	Facilities Plant	7,200	1.00	7,200
17	Student Amenity	Café	1,600	1.00	1,600
18	Recreation Center	Gymnasium Facility	19,700	3.00	48,900
19	Community Athletics Amenity	Gymnasium Facility	4,315	2.00	8,630
20	Theater Expansion	Theater/Assembly	1,300	1.00	1,300
					1,001,730

NEW / EXPANDED CAMPUS LIFE FACILITIES						
Group or Bldg. No.	Project Name or Location Description	Dwelling Unit Type	Phase	Floorplate	Floors	GSF
H1	Housing 1	Residence Halls	16,800	4.00	69,000	16,800
H2	Housing 2	Residence Halls	13,400	4.00	53,600	13,400
H3	Housing 3	Residence Halls	21,700	4.00	86,800	21,700
						209,400

PARKING FACILITIES				
Fac. No.	Building Name or Type	Sqft/Space	Total Spaces	Total Sqft
	Indian Wells Theater Lot	300	70.00	21,000
	Corner Parking Structure Ground Level	300	165.00	49,500
	Corner Parking Structure	300	204.00	61,200
	North Corridor Parking Lot	300	298.00	89,400
	South Corridor Parking Lot	300	601.00	180,300
	South Parking Structure	300	873.00	261,900
	Veterans Memorial Surface Lot	300	13.00	3,900
	Athletics Surface Lot	300	554.00	166,200
	Sports Park Remote Lot	300	75.00	22,500
	North Parking Structure Ground Level	300	254.00	76,200
	Facilities and Police Parking	300	51.00	15,300
	North Parking Structure	300	849.00	254,700
				1,202,100

DESCRIPTION OF EXISTING SYSTEMS

Domestic Fire & Water System

Founded in 1960, California State University, San Bernardino is a 430-acre campus set at the foothills of the San Bernardino in inland Southern California. Currently, the main campus is composed of 66 buildings, totaling almost 2.6 million gross square feet of campus building space. The Palm Desert campus is composed of 5 buildings, totaling approximately 100,000 gross square feet of campus building space. The University is home to about 20,000 students.

The proposed implementation of the master plan at the Palm Desert Campus will add approximately 1.0million of academic and lab spaces and approximately 200,000 sqft of residential and support spaces. A total of approximately 1.2 million square feet of gross space is being added to the campus existing inventory excluding parking structures.

The Coachella Valley Water District which provides domestic and fire water service, also takes care of sanitary sewer and storm drainage service for the area.

The University has dedicated domestic and fire water mains for each of the existing buildings with separate connections to CVWD mains in Berger Circle Drive and Entrance Road. Double Check Detector Assemblies are provided after each of the connections to the main lines in the street. The main and lateral lines are composed of PVC lines and are in good condition.

Network Evaluation

Domestic and fire water is provided to the campus by the Coachella Valley Water District. Irrigation water is also provided through a backflow preventer to meet the needs of each of the buildings. The water demand for each building was calculated by analyzing the previous 12-months of water usage along with a water/sewer demand analysis based on building type and use. The only buildings not included in the analysis were the two parking structures. A summary of the buildings and the water demands applied to each building is included in the appendix. A fire flow demand of 4,500 gallons per minute (gpm) was determined to satisfy the requirements of the buildings on campus. A residual pressure of 20 pounds per square inch (psi) is required in the domestic water network while a fire flow demand was occurring. In the three different scenarios a total fire flow demand of 4,500 gpm was assigned to be drawn from three adjacent fire hydrants or buildings, at a rate of 1,500 gpm each.

Redundancy

The University's domestic water system does not have adequate redundancy or looping, as dedicated water laterals serve each of the buildings.

Sanitary Sewer

The sanitary sewer system on campus comprises of connections to main sewer lines located south of Berger Circle Drive. The sanitary sewer system primarily operates or drains by gravity and drains south through a network of 8" and 12" pipes and manholes. The sewer lines comprise of plastic SDR-35 plastic sewer pipe.

Network Evaluation

The existing sanitary sewer system was reviewed and evaluated by reviewing existing mapping. The system has no issues.

Storm Drain

California State University San Bernardino Palm Desert campus storm drain system comprises of a network of storm drain pipes in the central portions of campus, that flow to the south side of the site.

Network Evaluation

To evaluate the existing storm drainage system for the CSUSB Pal Desert campus, the As-Built site plans of the campus were reviewed. Using the Modified Rational method provided in hydrology manual, the discharge (Q) was calculated for all the subareas on campus. These calculations were done for a 10-year storm. These discharge values were used in hydraulic studies (Using Hazen-Williams and Manning's equation) to check the sizes of pipes and catch basins for the respective subareas.

Based on the Hydrologic and Hydraulic studies, recommendations were made whether as to which of the existing pipes and catch basins should be kept in place which needed to be replaced with larger pipes and catch basins.

Usage and Cost

Similar to sanitary sewer, well-functioning storm drain systems are a basic necessity of any micro-community such as a campus like CSU San Bernardino usage can be considered passive as there is no switch or gate valve to put it into service. When properly designed; when it rains the water drains to lower ground, and is

collected into catch basins and area drains or sheet flows off-site to city street, where it eventually enters the Coachella Valley system.

Age and Reliability

Most of the storm drain system was built during the original building construction for the University in the early 2000, and expanded along with the campus.

Redundancy/Capacity

Because the storm drain operates by gravity, redundancy is not built into to the system, and instead capacity is the primary measure of how well the utility is functioning. Full capacity for storm drains is considered for pipes to be flowing full for a 10-year storm, and based on our analysis the campus system is at 50% of capacity and well able to meet current drainage demands.

Chilled Water and Heating Hot Water Systems

The campus facilities cooling and heating needs are currently met by dedicated HVAC package units and boilers located in each of the facilities. Air is distributed and controlled through a variable volume system (VAV) in each of the facilities.

Natural Gas Systems

Natural gas is supplied to the campus by The Southern California Gas Company (SCG) and is distributed underground to each of the buildings on campus.

Electrical System

The campus is currently served from a 12kV distribution system. The campus derives its power from Southern California on the north side of the campus. The service serves 12kV switchgear located in an enclosure on the north side of the campus. The switchgear is located inside an enclosure. 15kV feeder originating from the switchgear serves substation(s) in each building on campus that meet the power demands of the building. The switchgear is in good condition.

Electrical Distribution System

The campus main 15kV distribution system is comprised of 15kV, '3' conductor EPR cables installed in concrete encased duct banks that traverse through conduits and manholes to serve each building's substation.

Age and Reliability

The main 15kV switchgear and majority of the associated medium voltage cables that form part of the distribution system are in good condition.

Telecommunications

The Palm Desert campus derives its service from the telecom provider from the main MPOE (Main Point of Entrance) located on the north side of the campus.

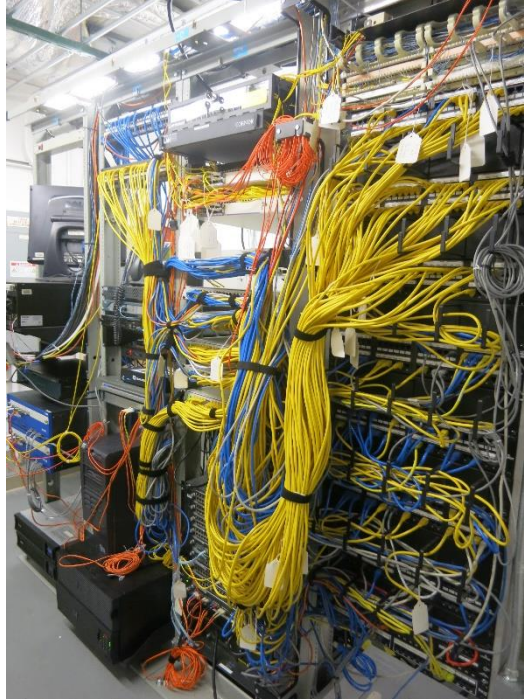
Telecommunications Applications

VOICE TELEPHONE SYSTEM

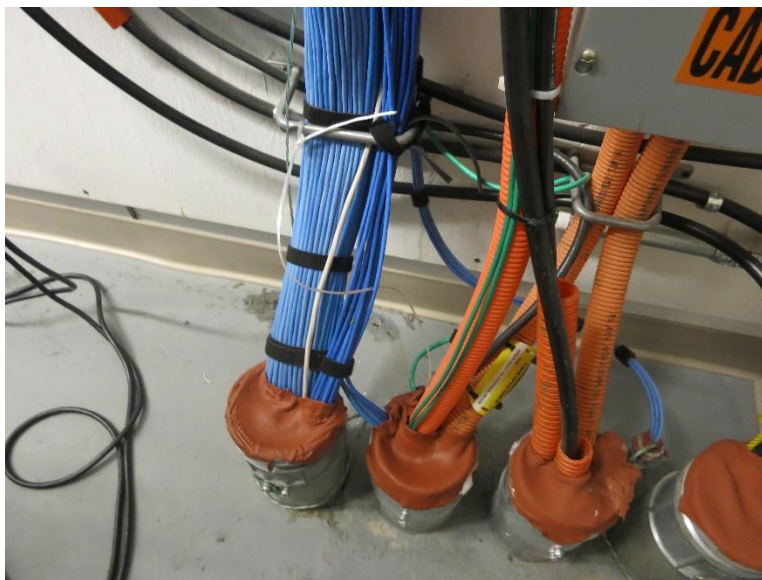
The main MPOE (Main point of Entrance) is located in an enclosure on the north side of the campus. Voice and data services are provided to all campus buildings over a copper and fiber backbone cable system. The cable network connects the voice and data services in each campus building to the main MDF/Server room located in the Mary Stuart Rogers Gateway Building.

Each of the buildings have dedicated telecom equipment room/s that house cabling terminations and equipment that provide voice, data and security services. Rooms are typically adequate in size to support some requirements and have a minimum of 10% expansion space.

The main MDF room located in the Mary Stuart Rogers Gateway Building is near capacity and is in need of cable management installations between the equipment racks to provide proper cable support and containment. See picture below for main racks in MDF for reference.



Each building is connected to the main server room with backbone copper and fiber cabling (multimode and single mode). Backbone cabling is routed in existing conduit duct bank pathways. See picture below of backbone conduit/cabling entering server room.



Most of the telecom rooms are also used for spare equipment and cabling storage. The telecom rooms would gain proper clearances and future expansion space if the non-active equipment, spare equipment and cabling was removed.

The MDF and Data Center areas are connected to the campus electrical system that provides AC power to the telecommunications equipment and support systems.

INTERBUILDING PATHWAYS

The campus has a underground conduit system that was constructed as part of individual buildings projects that interconnects the MDF with the campus buildings.

ANALYSIS OF FUTURE NEEDS

This chapter provides an overview of the campus future growth, impact of the growth on the existing utilities that currently serve the campus and the modifications required to the utility system to accommodate the proposed new buildings on campus. Information from this chapter was collected from general demand projections, review of proposed building uses, and review of proposed master plan.

Campus Future Growth

The proposed implementation of the master plan will add approximately 1.01 million of academic and lab spaces and approximately 200,000 sqft of residential and support spaces. A total of approximately 1.2 million square feet of gross space is being added to the campus existing inventory excluding parking structures. A campus map showing the proposed master planned facilities that are being added at the campus is provided at the end of the chapter. Table below provides a list of new facilities and associated square footage being added to the campus as part of the proposed master plan.

NEW / EXPANDED ACADEMIC FACILITIES					
Bld. No.	Building Name or Type	Campus Facility or Type	ASF	Floors	GSF
0	Classroom Expansion Wing	Classrooms	12,300	3.00	36,900
1	Administration or Special Academic Program	Office	25,600	3.00	78,800
2	Student Union	Student Union	24,900	4.00	74,400
3	CEL Building	Classrooms	20,500	4.00	76,000
4	Physical Education Center Courts	Gymnasium Facility	24,500	3.00	73,500
4	Physical Education Center Lockers	Gymnasium Facility	10,500	3.00	31,500
5	Western Signature Lab Building	Lab	21,600	3.00	59,200
6	Library + Media Center	Library	21,700	4.00	71,000
7	Academic Building	Classrooms	19,400	4.00	72,600
8	Academic Building	Classrooms	21,400	3.00	64,200
9	Academic Building	Classrooms	18,900	3.00	56,700
10	Academic Building	Classrooms	21,400	3.00	64,200
11A	Production Program Classrooms (Adjoining Studio)	Classrooms	11,200	3.00	33,600
11B	Production Program Studio	Lab	16,500	1.00	16,500
12	Production Class Building (Across the Promenade)	Classrooms	21,400	3.00	64,200
13	Childcare Center	Classrooms	5,200	2.00	10,400
14	Police and Transportation Office	Office	10,000	2.00	20,000
15A	Facilities 1	Shop/Storage	17,800	1.00	17,800
15B	Facilities 2	Shop/Storage	12,600	1.00	12,600
16	Plant Footprint	Facilities Plant	7,200	1.00	7,200
17	Student Amenity	Café	1,600	1.00	1,600
18	Recreation Center	Gymnasium Facility	19,700	3.00	48,900
19	Community Athletics Amenity	Gymnasium Facility	4,315	2.00	8,630
20	Theater Expansion	Theater/Assembly	1,300	1.00	1,300
					1,001,730

NEW / EXPANDED CAMPUS LIFE FACILITIES						
Group or Bldg. No.	Project Name or Location Description	Dwelling Unit Type	Phase	Floorplate	Floors	GSF
H1	Housing 1	Residence Halls	16,800	4.00	69,000	16,800
H2	Housing 2	Residence Halls	13,400	4.00	53,600	13,400
H3	Housing 3	Residence Halls	21,700	4.00	86,800	21,700
						209,400

PARKING FACILITIES				
Fac. No.	Building Name or Type	Sqft/Space	Total Spaces	Total Sqft
	Indian Wells Theater Lot	300	70.00	21,000
	Corner Parking Structure Ground Level	300	165.00	49,500
	Corner Parking Structure	300	204.00	61,200
	North Corridor Parking Lot	300	298.00	89,400
	South Corridor Parking Lot	300	601.00	180,300
	South Parking Structure	300	873.00	261,900
	Veterans Memorial Surface Lot	300	13.00	3,900
	Athletics Surface Lot	300	554.00	166,200
	Sports Park Remote Lot	300	75.00	22,500
	North Parking Structure Ground Level	300	254.00	76,200
	Facilities and Police Parking	300	51.00	15,300
	North Parking Structure	300	849.00	254,700
				1,202,100

Domestic Fire & Water System

To meet the demands of the proposed facilities planned as part of the master plan, water demands were calculated for each of the facilities based on the function and square footage of each of the buildings. A spreadsheet providing water demands for each of the facilities is provided in Appendix.

Based on a review of the water model, two 12" connections from the Coachella Valley Water District should be installed to form a loop system at the campus. The loop system will provide redundancy and will provide the required fire water pressures to meet the demands of the proposed master plan development. The connections should be made at Cook Street and Berger Circle Drive. New service laterals shall be constructed to connect the new buildings to meet their fire and domestic water needs. Service laterals shall be sized based on the function and size of the proposed buildings planned as part of the master plan. A few of the domestic water lines are in conflict with the proposed buildings and will need to be relocated to accommodate the proposed buildings. The relocated lines shall be C-900 and shall replace the existing piping that is in the way of the proposed building.

A detailed fire flow model should be developed in the future to confirm the exact pipe sizes needed to serve the fire flow and domestic water needs of each of the planned buildings.

Sanitary Sewer

To meet the demands of the proposed facilities planned as part of the master plan, sewer demands were calculated for each of the facilities based on the function and square footage of each of the buildings.

Based on a review of the demands, new service laterals shall be constructed to connect the new buildings to meet their sewer needs. As the master plan develops, capacities of existing lines shall be evaluated and new service laterals shall be sized based on the function and size of the proposed buildings planned as part of the master plan. Necessary coordination with the CVWD should be undertaken to verify upstream system as new facilities are being added as part of the proposed master plan development. A few of the sewer lines are in conflict with the proposed buildings and will need to be relocated to accommodate the proposed buildings. The relocated lines shall be SDR-35 and shall replace the existing piping that is in the way of the proposed building.

Storm Drain

An analysis of the existing storm drain system was conducted to support the proposed development at the campus. Based on a review of the demands, new storm drain piping extensions shall be constructed to connect the new buildings to meet their drainage needs. Service laterals shall be sized based on the function and size of the proposed buildings planned as part of the master plan. A few of the storm drain lines are in conflict with the proposed buildings and will need to be relocated to accommodate the proposed buildings.

Water Quality

The campus must also adopt BMP for all new construction. The primary objectives of BMP are to:

- Effectively prohibit non-storm water discharges, and
- Reduce the discharge of pollutants from storm water conveyance systems to the maximum extent practicable.
- The Best Management Practices (BMPs) include, but are not limited to:
- Provide reduced width sidewalks and incorporate a landscape buffer between sidewalks and streets.
- Design streets for minimum required pavement widths.
- Use permeable materials for private sidewalks, driveways, parking lots, or interior roadway surfaces (e.g. hybrid lots, parking groves, permeable overflow parking, etc.).
- Use open space development that incorporates smaller lot sizes (e.g. multi-story construction)
- Use green roofs on top of buildings
- Reduce overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas.
- Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway or the storm water conveyance system.
- Vegetated swales and strips
- Extended/dry detention basins

- Infiltration basins
- Infiltration trenches
- Wet ponds
- Constructed wetlands
- Oil/water separators
- Catch basin and/or storm drain inserts
- Continuous flow deflection/separation systems
- Media filtration
- Bioretention facility
- Dry-wells
- Cisterns
- Foundation planting
- Normal flow storage/separation systems
- Clarifiers
- Filtration systems
- Primary waste water treatment systems BMP features shall be incorporated into existing buildings during remodeling when possible. In some cases it may be feasible to redirect rooftop drains to existing landscape areas. However in many cases it may be too costly or impractical to retrofit existing buildings.

The use of catch basin inserts is possible, but maintenance requirements would be substantial. Therefore, use of basins or ponds is considered the most cost effective approach when feasible. In-fill development on the developed portion of the existing campus is constrained by the lack of space and by the configuration of the existing infrastructure.

New buildings shall incorporate BMP features where possible, such as minimizing impermeable areas, the use of cisterns, and directing rooftop runoff to pervious areas.

Chilled Water and Heating Hot Water Systems

An analysis of the existing colling and heating systems was conducted to support the proposed master plan development at the campus. The following is an analysis of the proposed buildings and our proposed plan to meet the cooling and heating demands of the proposed facilities planned as part of the master plan.

The campus currently does not have centralized cooling and heating systems at the campus. Based on an analysis of the existing systems and an evaluation of the proposed buildings being added, an additional 1900-2000tons of cooling and approximately 16MMBH BTU of heating load being added to the system with the proposed building additions and new buildings.

To meet the cooling demands of the facilities being added as part of the proposed master plan efficiently, a central cooling plant is recommended on the south west side of the campus. The central plant will comprise ultimately of (4) 500tons. However these chillers will be added in phases as the proposed buildings will be added to the campus with (2) 500ton chillers added in Phase 1.

To meet the peak demand of the proposed facilities and offset the peak demand of the campus during the months of June-through October, a thermal energy storage system will be provided. We recommend that a 12,000ton hours thermal energy storage tank be added adjacent to the proposed central plant to meet the peak demands of the proposed buildings.

A chilled water distribution comprising of pre insulated HDPE piping will be provided to provide chilled water to each of the buildings.

An evaluation of the heating system revealed that the campus would greatly benefit from provision of dedicated boilers in each of the proposed buildings to meet their heating needs. Centralizing the boilers do not provide any advantage to the campus in terms of diversity or an increase in efficiency. Higher efficiencies are achieved by providing condensing boilers at each of the buildings. The campus should plan on providing dedicated boilers in each of the buildings to meet their heating needs as they are planned and built at the campus.

NEW / EXPANDED ACADEMIC FACILITIES						Cooling Demand Tons	Heating Demand Btu
Bld. No.	Building Name or Type	Campus Facility or Type	ASF	Floors	GSF		
0	Classroom Expansion Wing	Classrooms	12,300	3.00	36,900	67	553,500
1	Administration or Special Academic Program	Office	25,600	3.00	78,800	143	1,182,000
2	Student Union	Student Union	24,900	4.00	74,400	135	1,116,000
3	CEL Building	Classrooms	20,500	4.00	76,000	138	1,140,000
4	Physical Education Center Courts	Gymnasium Facility	24,500	3.00	73,500	134	1,102,500
4	Physical Education Center Lockers	Gymnasium Facility	10,500	3.00	31,500	57	472,500
5	Western Signature Lab Building	Lab	21,600	3.00	59,200	108	888,000
6	Library + Media Center	Library	21,700	4.00	71,000	129	1,065,000
7	Academic Building	Classrooms	19,400	4.00	72,600	132	1,089,000
8	Academic Building	Classrooms	21,400	3.00	64,200	117	963,000
9	Academic Building	Classrooms	18,900	3.00	56,700	103	850,500
10	Academic Building	Classrooms	21,400	3.00	64,200	117	963,000
11A	Production Program Classrooms (Adjoining Studio)	Classrooms	11,200	3.00	33,600	61	504,000
11B	Production Program Studio	Lab	16,500	1.00	16,500	30	247,500
12	Production Class Building (Across the Promenade)	Classrooms	21,400	3.00	64,200	117	963,000
13	Childcare Center	Classrooms	5,200	2.00	10,400	19	156,000
14	Police and Transportation Office	Office	10,000	2.00	20,000	36	300,000
15A	Facilities 1	Shop/Storage	17,800	1.00	17,800	32	267,000
15B	Facilities 2	Shop/Storage	12,600	1.00	12,600	23	189,000
16	Plant Footprint	Facilities Plant	7,200	1.00	7,200	13	108,000
17	Student Amenity	Café	1,600	1.00	1,600	3	24,000
18	Recreation Center	Gymnasium Facility	19,700	3.00	48,900	89	733,500
19	Community Athletics Amenity	Gymnasium Facility	4,315	2.00	8,630	16	129,450
20	Theater Expansion	Theater/Assembly	1,300	1.00	1,300	2	19,500
					1,001,730	1,540	12,702,000

NEW / EXPANDED CAMPUS LIFE FACILITIES						Cooling Demand Tons	Heating Demand Btu
Group or Bldg. No.	Project Name or Location Description	Dwelling Unit Type		Floors	GSF		
H1	Housing 1	Residence Halls	16,800	4.00	69,000	125	1,035,000
H2	Housing 2	Residence Halls	13,400	4.00	53,600	97	804,000
H3	Housing 3	Residence Halls	21,700	4.00	86,800	158	1,302,000
					209,400	381	3,141,000

Natural Gas System

The existing natural gas system was analyzed to support the proposed master plan development at the campus. The natural gas load was estimated based on the domestic hot water demand using the instantaneous method. The domestic hot water demand was calculated by determining the amount of fixture units based on the number of occupants in the building. The table below provides a summary of the proposed new buildings and their estimated load in CFH on the existing natural gas distribution system.

NEW / EXPANDED ACADEMIC FACILITIES						Gas Demand in CFH
Bld. No.	Building Name or Type	Campus Facility or Type	ASF	Floors	GSF	
0	Classroom Expansion Wing	Classrooms	12,300	3.00	36,900	185
1	Administration or Special Academic Program	Office	25,600	3.00	78,800	394
2	Student Union	Student Union	24,900	4.00	74,400	372
3	CEL Building	Classrooms	20,500	4.00	76,000	380
4	Physical Education Center Courts	Gymnasium Facility	24,500	3.00	73,500	368
4	Physical Education Center Lockers	Gymnasium Facility	10,500	3.00	31,500	158
5	Western Signature Lab Building	Lab	21,600	3.00	59,200	296
6	Library + Media Center	Library	21,700	4.00	71,000	355
7	Academic Building	Classrooms	19,400	4.00	72,600	363
8	Academic Building	Classrooms	21,400	3.00	64,200	321
9	Academic Building	Classrooms	18,900	3.00	56,700	284
10	Academic Building	Classrooms	21,400	3.00	64,200	321
11A	Production Program Classrooms (Adjoining Studio)	Classrooms	11,200	3.00	33,600	168
11B	Production Program Studio	Lab	16,500	1.00	16,500	83
12	Production Class Building (Across the Promenade)	Classrooms	21,400	3.00	64,200	321
13	Childcare Center	Classrooms	5,200	2.00	10,400	52
14	Police and Transportation Office	Office	10,000	2.00	20,000	100
15A	Facilities 1	Shop/Storage	17,800	1.00	17,800	89
15B	Facilities 2	Shop/Storage	12,600	1.00	12,600	63
16	Plant Footprint	Facilities Plant	7,200	1.00	7,200	36
17	Student Amenity	Café	1,600	1.00	1,600	8
18	Recreation Center	Gymnasium Facility	19,700	3.00	48,900	245
19	Community Athletics Amenity	Gymnasium Facility	4,315	2.00	8,630	43
20	Theater Expansion	Theater/Assembly	1,300	1.00	1,300	7
					1,001,730	4,234

NEW / EXPANDED CAMPUS LIFE FACILITIES						Gas Demand in CFH
Group or Bldg. No.	Project Name or Location Description	Dwelling Unit Type	Floorplate	Floors	GSF	CFH
H1	Housing 1	Residence Halls	16,800	4.00	69,000	345
H2	Housing 2	Residence Halls	13,400	4.00	53,600	268
H3	Housing 3	Residence Halls	21,700	4.00	86,800	434
					209,400	1,047

An analysis of the existing natural gas distribution system revealed that the existing system capacity will need to be upgraded to support the proposed master planned buildings. New meters will be provided at each building to monitor consumption.

Electrical System

The existing electrical distribution system was analyzed to support the proposed master plan development at the campus.

A review of the proposed master plan revealed that the campus would add an additional demand of approximately 4300-4400kVA to the current demand of the campus.

A review of the existing electrical distribution system revealed that additional 15kV feeders will be required to feed the proposed buildings provided as part of the master plan. New 15kV feeders originating from the main 15kV switchgear should be added as facilities are added to the campus to meet their power demands. Additional 5" concrete encased conduit duct banks should be added and extended to new facilities to route the new feeders to each of the facilities. 15kV selector switches should be added in the vicinity of the proposed facilities to serve the new facilities. Dual feeders originating from the new 15kV main switchgear will form a loop system around the campus and radial feeder originating from each of these selector switches will serve the proposed facilities.

The table below provides a summary of the proposed new buildings and their estimated load and demand in kVA on the existing electrical distribution system.

NEW / EXPANDED ACADEMIC FACILITIES						Installed Capacity	Demand
Bld. No.	Building Name or Type	Campus Facility or Type	ASF	Floors	GSF	kVA	kVA
0	Classroom Expansion Wing	Classrooms	12,300	3.00	36,900	554	111
1	Administration or Special Academic Program	Office	25,600	3.00	78,800	1,182	236
2	Student Union	Student Union	24,900	4.00	74,400	1,116	223
3	CEL Building	Classrooms	20,500	4.00	76,000	1,140	228
4	Physical Education Center Courts	Gymnasium Facility	24,500	3.00	73,500	1,103	221
4	Physical Education Center Lockers	Gymnasium Facility	10,500	3.00	31,500	473	95
5	Western Signature Lab Building	Lab	21,600	3.00	59,200	888	178
6	Library + Media Center	Library	21,700	4.00	71,000	1,065	213
7	Academic Building	Classrooms	19,400	4.00	72,600	1,089	218
8	Academic Building	Classrooms	21,400	3.00	64,200	963	193
9	Academic Building	Classrooms	18,900	3.00	56,700	851	170
10	Academic Building	Classrooms	21,400	3.00	64,200	963	193
11A	Production Program Classrooms (Adjoining Studio)	Classrooms	11,200	3.00	33,600	504	101
11B	Production Program Studio	Lab	16,500	1.00	16,500	248	50
12	Production Class Building (Across the Promenade)	Classrooms	21,400	3.00	64,200	963	193
13	Childcare Center	Classrooms	5,200	2.00	10,400	156	31
14	Police and Transportation Office	Office	10,000	2.00	20,000	300	60
15A	Facilities 1	Shop/Storage	17,800	1.00	17,800	267	53
15B	Facilities 2	Shop/Storage	12,600	1.00	12,600	189	38
16	Plant Footprint	Facilities Plant	7,200	1.00	7,200	108	22
17	Student Amenity	Café	1,600	1.00	1,600	24	5
18	Recreation Center	Gymnasium Facility	19,700	3.00	48,900	734	147
19	Community Athletics Amenity	Gymnasium Facility	4,315	2.00	8,630	129	26
20	Theater Expansion	Theater/Assembly	1,300	1.00	1,300	20	4
					1,001,730	12,702	2,540

NEW / EXPANDED CAMPUS LIFE FACILITIES						Installed Capacity	Demand
Group or Bldg. No.	Project Name or Location Description	Dwelling Unit Type	Floorplate	Floors	GSF	kVA	kVA
H1	Housing 1	Residence Halls	16,800	4.00	69,000	1,035	207
H2	Housing 2	Residence Halls	13,400	4.00	53,600	804	161
H3	Housing 3	Residence Halls	21,700	4.00	86,800	1,302	260
					209,400	3,141	628

PARKING FACILITIES					Installed Capacity	Demand
Bld. No.	Building Name or Type	Floorplate	Floors	GSF	kVA	kVA
103.	Indian Wells Theater Lot	300	70.00	21,000	105	21
104.	Corner Parking Structure Ground Level	300	165.00	49,500	248	50
105.	Corner Parking Structure	300	204.00	61,200	306	61
106	North Corridor Parking Lot	300	298.00	89,400	447	89
107.	South Corridor Parking Lot	300	601.00	180,300	902	180
108	South Parking Structure	300	873.00	261,900	1,310	262
	Veterans Memorial Surface Lot	300	13.00	3,900	20	4
	Athletics Surface Lot	300	554.00	166,200	831	166
	Sports Park Remote Lot	300	75.00	22,500	113	23
	North Parking Structure Ground Level	300	254.00	76,200	381	76
	Facilities and Police Parking	300	51.00	15,300	77	15
	North Parking Structure	300	849.00	254,700	1,274	255
				1,202,100	6,011	1,202

Telecommunications System

The following is an analysis of the proposed buildings and the impact they cause to the existing systems. This section describes the future requirements for major telecommunications systems and the requirements for each of the proposed building projects.

Voice and Data Network

The University will continue utilizing the existing MPOE (main point of entrance) and the main MDF over the interbuilding fiber cable system for providing data service to the campus. Data electronics will continue to be upgraded when required for the introduction of new applications or additional capacity to meet the voice and data services requirements of the proposed facilities.

Future Needs

The new buildings will require connections to the campus voice and data network through the campus fiber optic cable systems. The requirements for each building were based on the following criteria:

Underground Conduit

Each typical state-owned building will be provided with a minimum of two, four inch diameter conduits from the serving manhole to the building entrance room. The allocation of the conduits will be as follows: (1) fiber optic cables for voice/data services and copper cables for emergency services, and (2) spare for future dedicated cable networks.

Copper Cable

For a majority of the new buildings the number of copper cable pairs were based emergency services required for each of the facilities.

Fiber Optic Cable

The criteria for a typical building included the current campus standard of a hybrid fiber cable with 24 singlemode optics and 12 multimode optics under one cable sheath. The multimode optics will be the campus standard of 50 micron type. Each fiber cable will be installed in a one inch diameter innerduct to provide cable protection and to maximize the utilization of the underground conduit system. For buildings with a small utilization, the cable size was reduced to 12 singlemode optics and 6 multimode optics. For buildings with a high utilization, the typical forecast was increases to 48 singlemode optics and 24 multimode optics.