

CENTRAL PLANT:

MECHANICAL

Component	Details
SIMULTANEOUS HEATING/COOLING	Up to four (4) Trane Agility water-cooled chillers and three (3) Trane Screw water-cooled chillers operate in simultaneous heating and cooling by rejecting condenser water heat from the chilled water loop into the hot water loop to minimize heating energy and maximize energy recovery.
GROUND SOURCE HEATING	All seven (7) water-cooled chillers are also equipped to recover heat from a 280-borehole geothermal wellfield located beneath A/V Studio in a high efficiency heating mode.
GROUND SOURCE COOLING	All seven (7) water-cooled chillers can reject heat into the ground to efficiently supplement cooling loads without increasing equipment quantity.
COMMERCIAL KITCHEN COOLER/FREEZER HEAT RECOVERY	Campus CHW (Chilled Water) will be used for heat rejection, recovering waste heat from commercial freezers and coolers.

RESIDENTIAL BUILDINGS (MODEL A/B/C/D):

ARCHITECTURAL

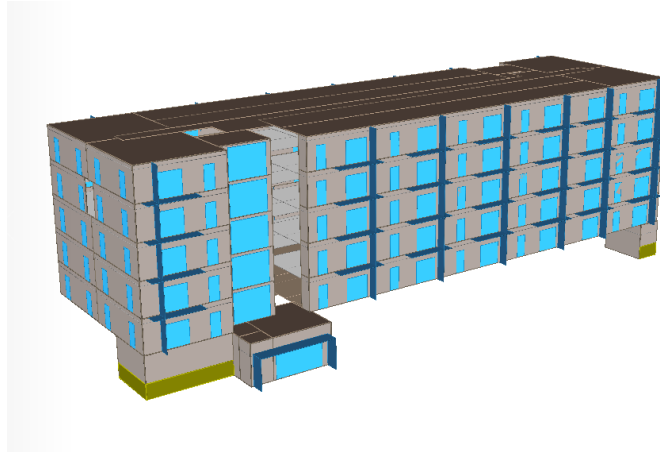
Component	Details
EXPOSED OPAQUE WALL	High performing R-22 + R-17 ci insulation thermally-broken exterior wall construction. U-value: 0.021 Btu/hr-ft ² -°F
ROOF	Fully adhered roof construction assembly with effective R-74 insulation. U-value: 0.015 Btu/hr-ft ² -°F
GLASS SELECTION	High performance glazing Assembly U-Value: 0.18 Btu/hr-ft ² -°F, SHGC: 0.325
VAPOR AND AIR BARRIER	Self-adhered air barrier sheet, vapor permeable, water resistive Air permeance: 0.004 cfm/ ft ²
SHADING	Vertical shading on balconies

MECHANICAL

Component	Details
SENSIBLE LOAD	Fan coil units with EC Motors in all spaces with high sensible loads and low ventilation rates such as electrical rooms, mechanical rooms, and IT rooms.
DOAS + FCU + ERW	Dedicated Outdoor Air System with an enthalpy energy recovery wheel serving fan coil units

DOMESTIC HOT WATER

Component	Details
CENTRAL CAMPUS HEATING LOOP	Domestic hot water heated using central utility plant heat pumps, and central campus heating loop.
PASSIVE HEAT RECOVERY	Passive heat recovery on shower drainpipes.



Residences

END USE	SOURCE	Proposed Model + Waterside
PUMPS	ELECTRICITY	682 MMBtu
FANS	ELECTRICITY	3,447 MMBtu
COOLING	PURCHASED	7,593 MMBtu
HEATING	PURCHASED	1,698 MMBtu
DHW	PURCHASED	23,303 MMBtu

OFFICE BUILDING:

ARCHITECTURAL

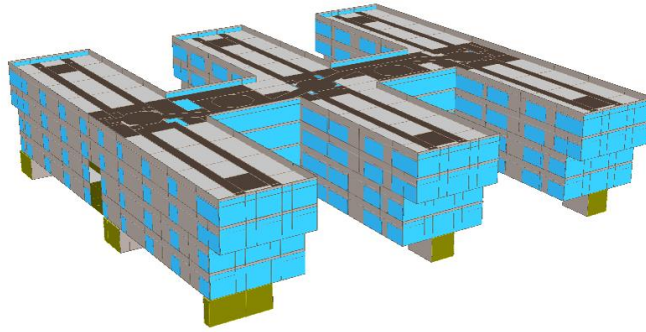
Component	Details
EXPOSED OPAQUE WALL	High performing R-30 insulation thermally-broken exterior wall construction. U-value: 0.033 Btu/hr-ft ² -°F
SPANDREL WALL	Spandrel glass with insulation at the curtain wall. U-value: 0.1 Btu/hr-ft ² -°F
SLAB	Effective R-20 insulated slab. U-value: 0.050 Btu/hr-ft ² -°F
ROOF	Fully adhered roof construction assembly with effective R-50 insulation. U-value: 0.020 Btu/hr-ft ² -°F
GLASS SELECTION	Thermally broken, triple-pane glazing. Assembly U-value: 0.21 Btu/hr-ft ² -°F - SHGC: 0.25

MECHANICAL

Component	Details
SENSIBLE LOAD	Fan coil units with EC Motors in all spaces with high sensible loads and low ventilation rates such as electrical rooms, mechanical rooms, and IT rooms.
DOAS + CHB	Dual-Wheel Dedicated Outdoor Air System with an enthalpy energy recovery wheel and CDQ desiccant wheel serving fan powered units to chilled beams.

DOMESTIC HOT WATER

Component	Details
CENTRAL CAMPUS HEATING LOOP	Domestic hot water heated using central utility plant heat pumps, and central campus heating loop.



Office

END USE	SOURCE	Proposed Model + Waterside
PUMPS	ELECTRICITY	219 MMBtu
FANS	ELECTRICITY	1,759 MMBtu
COOLING	PURCHASED	4,271 MMBtu
HEATING	PURCHASED	1,014 MMBtu
DHW	PURCHASED	210 MMBtu

EVENTS FACILITY:

ARCHITECTURAL

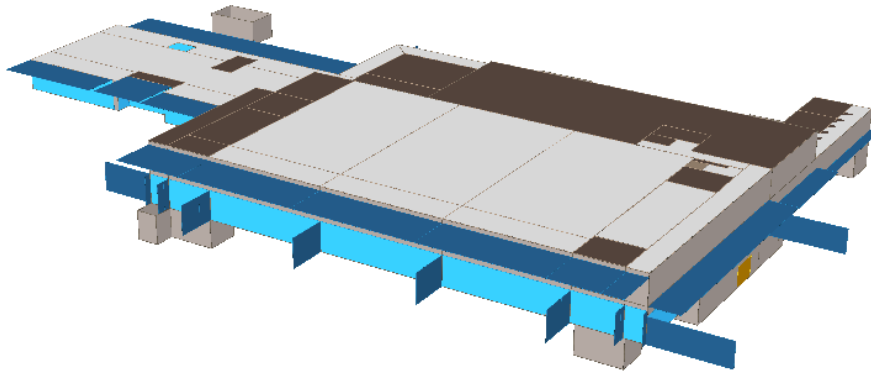
Component	Details
EXPOSED OPAQUE WALL	High performing R-30 insulation thermally-broken exterior wall construction. U-value: 0.033 Btu/hr-ft ² -°F
ROOF	Fully adhered roof construction assembly with effective R-50 insulation. U-value: 0.020 Btu/hr-ft ² -°F
GLASS SELECTION	Thermally broken, triple-pane glazing. Assembly U-value: 0.21 Btu/hr-ft ² -°F - SHGC: 0.25
SHADING	Vertical shading fins on glazing + horizontal overhangs

MECHANICAL

Component	Details
SENSIBLE LOAD	Fan coil units with EC Motors in all spaces with high sensible loads and low ventilation rates such as electrical rooms, mechanical rooms, and IT rooms.
VENTILATION ENERGY RECOVERY	Enthalpy wheels in the AHUs serving the main spaces.
COMMERCIAL KITCHEN EXHAUST HEAT RECOVERY	Recover heat from commercial kitchen exhaust hoods and return to central CHW loop to optimize simultaneous heating and cooling load. The load is transferred to the loop using a water source heat pump.

DOMESTIC HOT WATER

Component	Details
CO2 AIR SOURCE HEAT PUMP	Air source CO2 heat pump provides domestic hot water heating for the Events Facility, especially the commercial kitchen needs.
PASSIVE HEAT RECOVERY	Passive heat recovery on drain pipes.



Events Facility

END USE	SOURCE	Proposed Model + Waterside
PUMPS	ELECTRICITY	120 MMBtu
FANS	ELECTRICITY	799 MMBtu
COOLING	PURCHASED	2338 MMBtu
HEATING	PURCHASED	1471 MMBtu
DHW	PURCHASED	N/A

AUDIO VIDEO STUDIOS:

ARCHITECTURAL

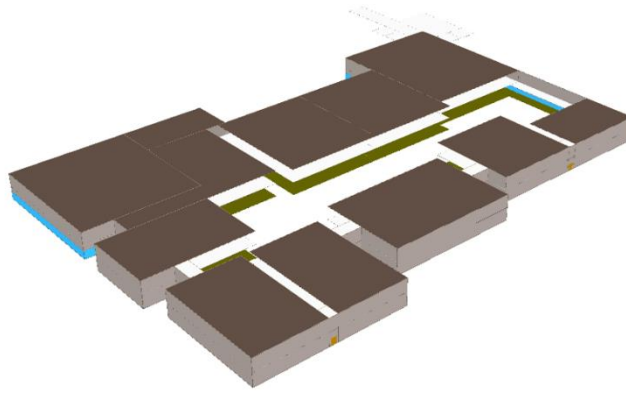
Component	Details
EXPOSED OPAQUE WALL	High performing R-40 insulation thermally-broken exterior wall construction. U-value: 0.025 Btu/hr-ft ² -°F
ROOF	Fully adhered roof construction assembly with effective R-60 insulation. U-value: 0.017 Btu/hr-ft ² -°F
GLASS SELECTION	Thermally broken, triple-pane glazing. Assembly U-value: 0.21 Btu/hr-ft ² -°F - SHGC: 0.25

MECHANICAL

Component	Details
SENSIBLE LOAD	Fan coil units with EC Motors in all spaces with high sensible loads and low ventilation rates such as electrical rooms, mechanical rooms, and IT rooms.
DOAS + FCU + DUAL WHEEL	Dedicated Outdoor Air System with a dual wheel energy recovery wheel serving fan coil units

DOMESTIC HOT WATER

Component	Details
CENTRAL CAMPUS HEATING LOOP	Domestic hot water heated using central utility plant heat pumps, and central campus heating loop.



Audio Video Studios

END USE	SOURCE	Proposed Model + Waterside
PUMPS	ELECTRICITY	477 MMBtu
FANS	ELECTRICITY	1,378 MMBtu
COOLING	PURCHASED	4,784 MMBtu
HEATING	PURCHASED	1,007 MMBtu
DHW	PURCHASED	1,021 MMBtu

FITNESS CENTER:

ARCHITECTURAL

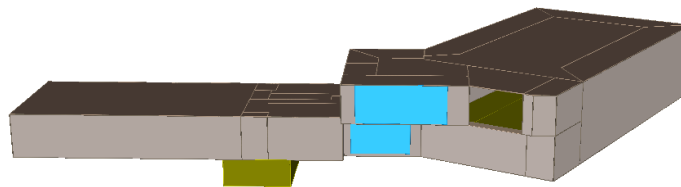
Component	Details
EXPOSED OPAQUE WALL	High performing R-40 insulation thermally-broken exterior wall construction. U-value: 0.025 Btu/hr-ft ² -°F
ROOF	Fully adhered roof construction assembly with effective R-60 insulation. U-value: 0.017 Btu/hr-ft ² -°F
GLASS SELECTION	Thermally broken, triple-pane glazing. Assembly U-value: 0.21 Btu/hr-ft ² -°F - SHGC: 0.25

MECHANICAL

Component	Details
SENSIBLE LOAD	Fan coil units with EC Motors in all spaces with high sensible loads and low ventilation rates such as electrical rooms, mechanical rooms, and IT rooms.
DOAS	Dedicated Outdoor Air System

DOMESTIC HOT WATER

Component	Details
CO2 AIR SOURCE HEAT PUMP	Air-source CO2 heat pump provides domestic hot water heating for the Fitness Center.



Fitness Center

END USE	SOURCE	Proposed Model + Waterside
PUMPS	ELECTRICITY	23 MMBtu
FANS	ELECTRICITY	277 MMBtu
COOLING	PURCHASED	4,285 MMBtu
HEATING	PURCHASED	2,904 MMBtu
DHW	PURCHASED	N/A

VISITOR CENTER:

ARCHITECTURAL

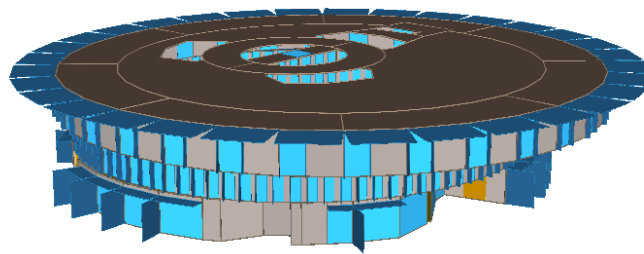
Component	Details
EXPOSED OPAQUE WALL	High performing R-40 insulation thermally-broken exterior wall construction. U-value: 0.025 Btu/hr-ft ² -°F
ROOF	Fully adhered roof construction assembly with effective R-60 insulation. U-value: 0.017 Btu/hr-ft ² -°F
GLASS SELECTION	Thermally broken, triple-pane glazing. Assembly U-value: 0.21 Btu/hr-ft ² -°F - SHGC: 0.25

MECHANICAL

Component	Details
SENSIBLE LOAD	Fan coil units with EC Motors in all spaces with high sensible loads and low ventilation rates such as electrical rooms, mechanical rooms, and IT rooms.
VAV + ERW	VAV HVAC system with enthalpy wheel

DOMESTIC HOT WATER

Component	Details
CO2 AIR SOURCE HEAT PUMP	Air-source CO2 heat pump provides domestic hot water heating for the Visitor Center.



Visitor Center

END USE	SOURCE	Proposed Model + Waterside
PUMPS	ELECTRICITY	43 MMBtu
FANS	ELECTRICITY	1,586 MMBtu
COOLING	PURCHASED	3,841 MMBtu
HEATING	PURCHASED	1,111 MMBtu
DHW	PURCHASED	N/A