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Broad Institute Expansion: 75 Ames Street

Cambridge, Massachusetts

Technical Report Three:

[Mechanical Systems Existing Conditions Evaluation]

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Figures and Tables

Executive Summary

The purpose of technical report three is to provide a summary of the mechanical equipment, and operations for 75 Ames Street. Included in this report is an investigation into design considerations, objectives and conditions for this particular project. An analysis of equipment operations and cost is also conducted within this report. 75 Ames Street Building hosts a multitude of different spaces from administration, to research and development labs, a vivarium and a restaurant tenant on the first floor. 75 Ames Street is owned by The Broad Institute and shall bring all their offices to one central location. The projected started January 2012 with an estimated building cost of $170,883,188.00 and is set to be finished in early 2014.

75 Ames Street is heated, cooled and ventilated by 5 air handlers located on the three mechanical floors. Air handlers 1-4 serve the majority of the building, from the basement to level 11, in a ganged ring duct design, to support future changes to the building program, and provide some redundancy. Air handling unit 5 supplies cooling, heating and ventilation to level 12, a vivarium. Since the air handling units are dealing with sensitive spaces that require 100% outside air, and because they are designed in the ganged duct design, each air handling unit is a 100% outside air unit. Cooling and heating is supplied to the air handlers and the rest of the building through the heating and cooling plants located in the mechanical rooms.

The mechanical system for the core/shell and fit out of 75 Ames has a total cost of $26,693,790.00 totaling 16% of the entire cost of the building. 5% of the total building cost comes from the major mechanical equipment such as the boilers, chillers and air handling units. It will cost The Broad Institute $2,360,127.50 to operate 75 Ames year round, which operates 26% better than the base case from ASHRAE 90.1.

75 Ames is set to meet the requirements for a USGBC LEED Silver certificate. Overall 75 Ames is a good system for what the owners specify. There could be more possible energy savings through the use of return air in places designated as offices and administration. The analysis supplied below will help in greater understanding of how the building currently operates, and of any possible adjustments that could be made to the system.

Building Overview

75 Ames Street is a new 250,000 sq. ft., 15-story high-rise addition to Kendal Square in Cambridge, Massachusetts (figure1 below). This building is designed to bring together the multiple Broad institute offices around the Cambridge area into one location attached to their main office at 7 Cambridge Center.

This structure is set to finish the Ames Street frontage and add to the current pedestrian walk space. This is done with a new pedestrian entrance to a 5-floor garage attached to Ames Street as well as 4000 sq. ft. of retail and restaurant space on the ground floor. The primary design is for offices and research & development labs, which use a majority of the area. Some other notable areas of the 75 Ames are a vivarium on the 12th floor and 3 mechanical rooms making up the penthouse.

The exterior is mainly composed of a mixture of stone, terra cotta, Viracon vision glass and spandrel glass. The penthouse is primarily constructed of aluminum louvers and metal panels. The front façade adds to the vibrant community on Ames Street while the other three facades connect 75 Ames to the current Broad Institute main office next door at 7 Cambridge Center.

Figure 1: A look at the location of 75 Ames Street in Cambridge (courtesy of ELKUS|MANFREDI ARCHITECTS)

Mechanical System Overview

Level M2 hosts the heating plant consisting of two 500 BHP preheat fire tube boilers, four 120 BHP Reheats with one standby, two 215 BHP MPS boilers for humidification and process steam loads, and finally a pressure reducing LPS for humidifiers. Also on M2 is the chiller plant consisting of three 1000-ton chillers for cooling air handing units 1 through 4. Two 450-ton chillers to serve vivarium (AHU-5) and fan coil units, which serve freezer rooms, tell/data, electrical, and the penthouse for spot cooling. Each chiller has a corresponding cooling tower located on the roof.

The ducting on each floor was taken with future floor plan changes in mind. In order to achieve this, air-handling units 1 through 4 each connect to a main ring on each floor. This can be seen in the following figures 2 & 3, which show the supply and exhaust duct respectively. These rings then supply air to each zone on their floor. Since they are serving both labs and offices together return air cannot be utilized since labs call for 100 % outside air. The only return air used in this building is 16000 CFM of air from the connector of 75 Ames Street to 7 Cambridge Center to level M1.

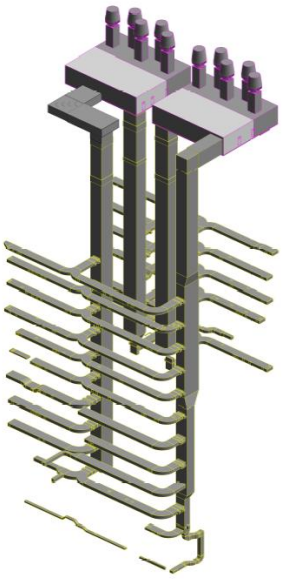

Figure 3: Exhaust Ganged Duct

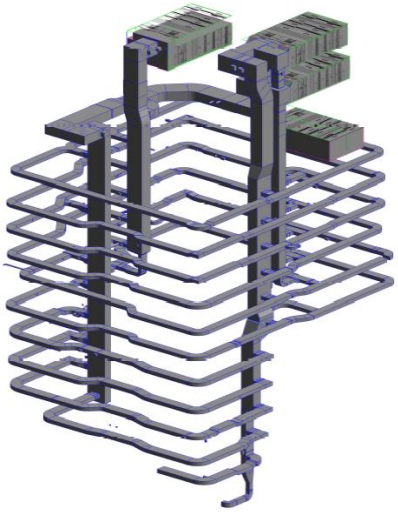

Figure 2: Suppy Ganged Duct

Mechanical System Design Requirements

This section is an in depth report of the mechanical design objectives, requirements and modeled conditions for 75 Ames Street. It will also look into energy usage and costs for these conditions.

Design Objectives

75 Ames's mechanical design objective is to build a state of the art facility incorporating sustainable design principals of energy conservation that will achieve a United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Silver Certification. The HVAC system must be designed and built to support the present building program but maintain flexibility for changes of this program in the future. Spaces to be supported are chemistry wet labs, tissue culture spaces, sequencing spaces, a vivarium on level 12, administration areas, restaurant tenant on level one, and positions of possible future vivarium expansion.

All systems will be designed in accordance with Massachusetts State Building Code, City of Cambridge Ordinances, ASHRAE and other recognized standards, NFPA Standards and good engineering practices. As well an effort shall be put forward to design, layout and place equipment in areas of easy access to encourage routine maintenance. The use of isolation valves shall be implemented to enable easy servicing as well as expansion or renovation of any part of the existing facility without interrupting adjacent areas. Air Handling unit cross connection, ring duct or ganged duct, are used to provide redundancy throughout the facility to ensure environmental comfort to each space with in the building

Design Conditions

Exterior Design Conditions

For External conditions, 75 Ames Street is located in Cambridge Massachusetts, which is in the 5A weather region for ASHRAE. Below an exterior design winter and summer condition can be found in Table 1.

Table 1: Exterior Design Conditions

Temperature		
	Winter (°F)	**Summer (°F)**
Exterior Design Temperature	0°	91 db/73 wb

Interior Design Conditions

The mechanical system in this project needs to meet the following criteria specified by the mechanical engineer to maintain comfortable conditions throughout the many spaces within 75 Ames Street. Interior design temperatures for the primary spaces are shown in table 2 and table 3 shows the relative humidity required.

Each space must use 30% MERV-8 pre-filters and 80-85% MERV 13 final filters for this project. In the Vivarium it is required that HEPA filtration is used for the AHU's the final filtration. Also in table 4 is the various air capacity allowances to each space type in the building.

Table 2: Interior Design Temperatures

Temperature		
	Winter (°F)	Summer (°F)
Offices/Conference Rooms/Lobbies	72	75
Laboratories	72	75
General spaces	72	75
Vivarium	72	68-75(ADJ)
Shell/Mech/ Elec. Spaces	60	Ventilation Only
Loading Dock	60	Ventilation Only

Table 3: Interior Design Humidity

HUMIDITY		
	Winter (%RH)	Summer (%RH)
Offices	25% (±5)	50 (+/-5)
Laboratories	25% (±5)	50 (+/-5)
General Spaces	25% (±5)	50 (+/-5)
Vivarium	25-40%(+/-5)	50 (+/-5)

Table 4: Interior Design Air Capacity Allowances

	Air capacity Allowance
Laboratories	2.0 CFM/SF
Vivarium	2.5 CFM/SF
Chemistry	3.25 CFM/SF
Office	1.25 CFM/SF

Ventilation

In Appendix A, a spreadsheet for the 5 air-handling units results for minimum outdoor air intake using the calculations for ASHRAE Standard 62.1-2010 Section 6 for ventilation. Air handling units one through four are modeled as one unit in the spreadsheet due to the ganged duct design. Air handling unit 5 is modeled on its own since it only serves the vivarium on floor 12. A summary of what was found can be found in table 5 below.

Table 5: ASHRAE 62.1 Ventilation Compliance Summary

ASHRAE 62.1 Ventilation Compliance Summary						
Air Handing Unit	Location	Floors Served	Design CFM	Design Min OA CFM	ASHRAE 62.1 Min OA CFM	Comply?
1,2,3,4	M2&M3	M2&M3	460,000	460,000	74,213	Y
5	M1	12	60,000	60,000	3,191	Y

As seen by table 5, 75 Ames Street is designed as a 100% outside air and completely complies with ASHRAE 62.1 Ventilation requirements. This is due to the fact that the ganged duct serves both laboratories and administration spaces, and each requiring different levels of ventilation. If it was ever desired to change this setup and design a return air system the following ventilation rates in Table 6 would be used.

Table 6: Interior Design Ventilation Rates

Ventilation Rates	
Space	Ventilation
Laboratories	100% outside air, 6 -12 ACH (Occupied), reduced ACH during unoccupied
Tissue Culture Rooms	100% outside air, 8-15 ACH
Office Areas	20 cfm/occupant minimum
Auditorium/Seminar/Conference/Classrooms	15 cfm/occupant minimum
Cage wash/Glass wash/Bottle wash	100% outside air, 15 – 20 ACH
Equipment/Instrument Rooms	100% outside air, 10-20 ACH
Animal Rooms	100% outside air
Animal Imaging Rooms	20 cfm/person
Toilets/Janitor Closets/Darkrooms/Lockers	100% outside air
Mechanical Spaces	100% outside air (heated and ventilated)

Heating and Cooling Loads

Heating and cooling loads for 75 Ames Street was found using by taking each rooms design conditions, and construction and putting them in TRANE TRACE software. Below describes the heating and cooling system, and their size. Table 7 also provides a detailed summary of the cooling and heating load calculations from trace and compares them to the loads calculated in Equest by the mechanical engineers at BR+A . 75 Ames is going to primarily have a heating load due to Cambridge Massachusetts being a colder environment.

Heating

The heating of 75 Ames is handled with three 500 Bhp gas fired hot water boilers on the upper mechanical penthouse level with one of the three functioning as stand-by. The hot water pumping system utilizes variable speed drives and shunt pumps for boilers to maintain minimum flow.

Cooling

The cooling load is handled with three 1000-ton electrical centrifugal chillers to support chilled water system and then two 400-ton electrical centrifugal chillers to support the process chilled water system. These are all located on the upper mechanical penthouse level. These chillers each have a corresponding induced draft-cooling tower on the roof. A plate and frame heat exchanger is to be utilized in the winter to provide support to the processed chilled loads.

Table 7: Heating and Cooling Loads

	AHU	Area	Supply Air Per Unit Area (CFM/SF)		TOTAL CFM		Capacity Per Area		Total	
			Cooling	Heating	Cooling	Heating	Heating (Btuh/sf)	Cooling (tons/SF)	Heating (Btuh)	Cooling (Tons)
Calculated	**1-2-3-4**	244,902	1.608	0.4217	393,868	103,283	15.86	.0095	388,300	2,325.4
	5	20,817	1.57	0.538	32,716	11,199	18.379	.0098	382,600	204.7
From Engineers BR+A					458,821	359,690			27,970 MBTU	3,125

Annual Energy Consumption & Cost Information

Below in Table 8 is the estimated annual energy consumption for 75 Ames Street this project is still under construction so no measured data is available. The engineers at Bard, Rao and Athanas came up with a comprehensive Equest energy model that provides the most insight into building performance against a base line designed building created in accordance with ASHRAE 90.1 minimum standards. The Equest model can be compared against another energy performance model designed in Trane Trace.

Table 8:Annual Energy Consumption and Cost

	Electricity (kWh)	Natural Gas (Therms)	Electricity Cost Per Year	Natural Gas Cost Per year	Total Cost per Year
TRACE	8,954,124	150,597	$1,799,778.92	$240,503.49	$2,040,282.41
BR+A	8,973,000	348,500	$1,803,573.00	$556,554.50	$2,360,127.50
ASHRAE 90.1	11,490,000	421,600	$ 0.201	$ 1.597	$2,982,785.00

From Table 8 it can be seen that 75 Ames Street will perform around 20% better than the baseline ASHRAE 90.1 model. In comparing the two energy models electrical use seems to agree but natural gas usage differs by more than half which is a concern and the Trace Model shall be troubleshot to find the variable causing this difference.

Mechanical Operation and Schematics

In this section of the report is a summary of mechanical equipment and single line drawings explaining system operations. There is also a discussion about the lost useable spaces due to duct chutes, and mechanical spaces and a discussion on the total first cost of the all the mechanical equipment used in the 75 Ames Project.

Major Equipment

Airside

Below are two tables (table 9 and table 10) and two schematics (Figure 4 and figure 5) describing the airside system for supply and exhaust air. Air handling units 1-4 and exhaust units 1-2 provide ventilation and air conditioning to the basement through to level 11. These spaces include labs, offices and administration, and retail restaurant tenant on the first floor.

Supply

Air handlers are equipped with variable frequency drives and flow measuring stations to ensure the correct supply to each space. Figure 4 shows the typical flow of air from the air handing units to a space. Air

handlers 1 through 4 each have a total of 115,000 CFM supply and are located on mechanical level 1 below the vivarium on level 12. 100% outside air is taken from louvers on the side of the building on level M1, to the air handlers. The air handlers are equipped with snow melt coils, cooling coils, hot water preheat/heat recovery coils, a humidifier, fans and filters. From here, since these four air handlers are ganged together by the duct system, the total supply to the building from the basement to floor 11 is 460,000 CFM. And the vivarium on floor 12 is served entirely by air handing unit 5 with 60,000CFM. These air-handling units are than ducted to various variable volume and constant volume terminal boxes to supply each space.

Table 9: Air Handling Units

Air Handling Units									
AHU	Location	CFM	Fans			Cooling		Heating	
			Quantity	RPM	Min SP	MBH	LDB F	MBH	LDB F
1	M1	115,000	4	1750	7.5	6650	51.6	6650	52
2	M1	115,000	4	1750	7.5	6650	51.6	6650	52
3	M1	115,000	4	1750	7.5	6650	51.6	6650	52
4	M1	115,000	4	1750	7.5	6650	51.6	6650	52
5	M2	60,000	4	1750	7.5	3370	49.5	3370	52

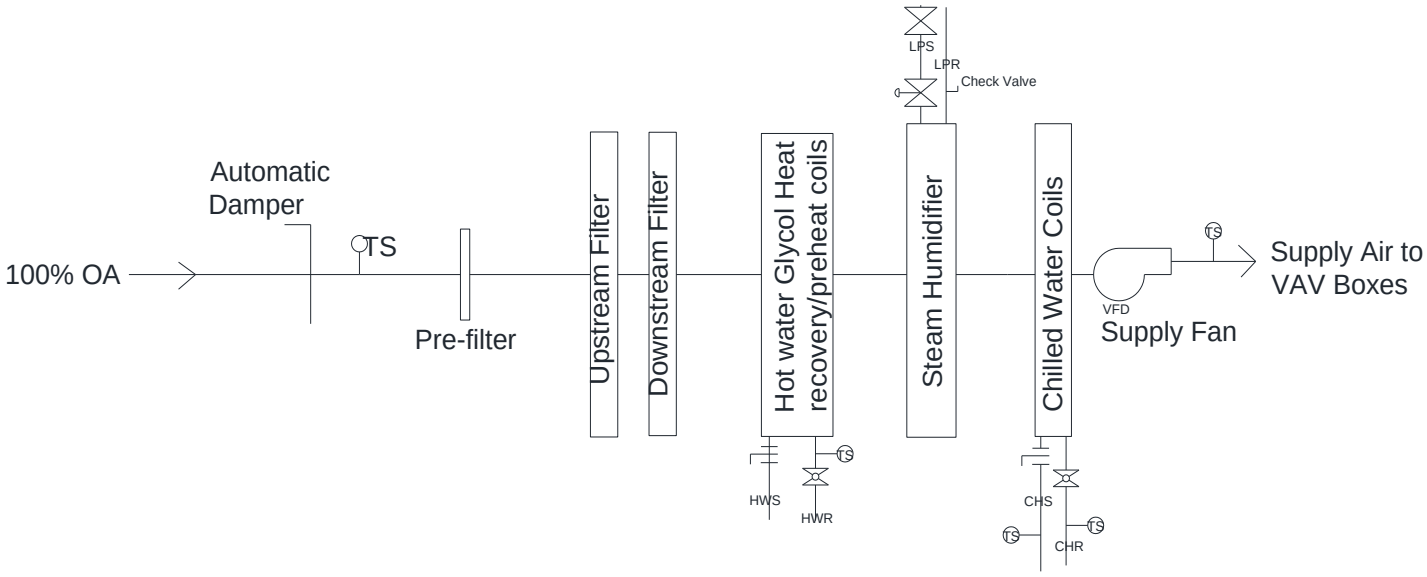

Figure 4: Typical air handling unit flow diagram

Exhaust

The Exhaust system shall also be designed in a ganged design, same as the air-handling units. Exhaust units include a coil-to-coil heat recovery system, variable frequency drives, filters and fans. The exhaust units are located on the roof and discharge at a safe distance above the roof to minimize recirculation. The exhaust ducts use variable volume return boxes at the room level then rise up to the roof exhaust units for general exhaust. Dedicated exhausts are used in places where processes generate an airstreams incompatible with the ganged exhaust for example, radioactive hood or wet exhaust systems.

Table 10: Exhaust Air Handling Units

Exhaust Handling Units						
EAHU	Location	CFM	Fans			Heating Recovery
			Quantity	RPM	Min SP	Capacity MBH
1	Roof	23000	5	770	5.3	7600
2	Roof	23000	5	770	5.3	7600
3	M3	60,000	3	1132	4.5	1620

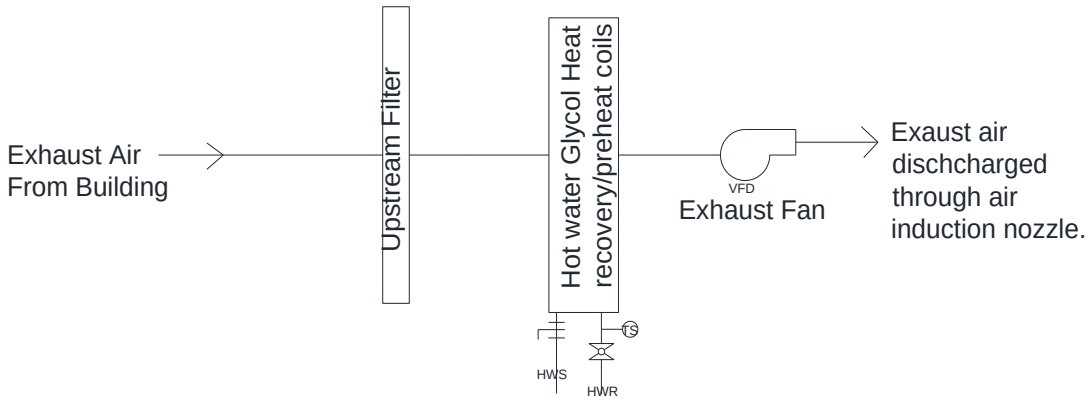

Figure 5: Typical exhaust air handling unit flow diagram

Water Side

Chilled Water

The chilled water system for 75 Ames Street is composed of 3 1000-ton centrifugal electric water chillers with one being on standby and 2 450-ton centrifugal electric water chillers with one being standby. The 1000-ton chillers in parallel serve air handlers 1 through 4 and the 450-ton chiller serves chilled water to air handling unit 5.

Each chiller has corresponding chilled water pumps and condenser water pumps shown in table 12. Each chilled water pump is on a variable frequency drive. The flow through the chiller depends on the load demanded by the air-handling units. Water enters the evaporator at 56 °F, this is measured by a temperature sensor before entering. The water leaves the evaporator at 42°F and again the pressure and temperature are measured. Before heading to the cooling coils in the air-handling units the chilled water passes a minimum flow bypass assembly to insure that the minimum flow is supplied to each chiller.

The condenser pumps, seen in table 12, each pump the condenser water to the condenser. For chillers 1 through 3 the condenser water is then pumped to cooling towers 1 through 3, which are connected in parallel. A plate and frame heat exchanger is used with chillers 4 and 5 between condenser water return water and process chilled water return.

A flow diagram is provided below in figure 6 to show this process in more detail.

Table 11: Centrifugal Chillers

Centrifugal Chiller						
Unit Number	Nom tons	Electrical Volts	Evaporator		Condenser	
			LWT(F)	GPM	LWT(F)	GPM
CH-1	1,000	460	42	1712.3	94.37	3000
CH-2	1,000	460	42	1712.3	94.37	3000
CH-3	1,000	460	42	1712.3	94.37	3000
CH-4	450	460	42	770	94.37	1350
CH-5	450	460	42	770	94.37	1350

Table 12: Chilled Water and Condenser Water Pumps

Chilled and Condenser Water Pumps						
Unit Number	Location	Service	Type	GPM	TOTAL HEAD (FT, H2O)	VFD?
CHP-1	M2	CHILLED WATER	SPLIT CASE	1712.3	100	Y
CHP-2	M2	CHILLED WATER	SPLIT CASE	1712.3	100	Y
CHP-3	M2	CHILLED WATER	SPLIT CASE	1712.3	100	Y
CHP-4 (STAND-BY)	M2	CHILLED WATER	SPLIT CASE	1712.3	100	Y
CHP-5	M2	PROCESSED CHILLED WATER	SPLIT CASE	770	100	Y
CHP-6	M2	PROCESSED CHILLED WATER	SPLIT CASE	770	100	Y
CHP-7 (STAND-BY)	M2	PROCESSED CHILLED WATER	SPLIT CASE	770	100	Y
CWP-1	M2	CONDENSER WATER	SPLIT CASE	3000	75	N
CWP-2	M2	CONDENSER WATER	SPLIT CASE	3000	75	N
CWP-3	M2	CONDENSER WATER	SPLIT CASE	3000	75	N
CWP-4 (STAND- BY)	M2	CONDENSER WATER	SPLIT CASE	3000	75	N
CWP-5	M2	CONDENSER WATER	SPLIT CASE	1350	75	N
CWP-6	M2	CONDENSER WATER	SPLIT CASE	1350	75	N
CWP-7 (STAND-BY)	M2	CONDENSER WATER	SPLIT CASE	1350	75	N

Table 13: Plate and Frame Heat Exchanger

Plate and Frame Heat Exchanger						
Unit	Location	Service	Chilled Water Side		Condenser Water Side	
			EWT (F)	LWT (F)	EWT (F)	LWT (F)
HEX-1	M2	FREE COOLING	56	42	54	48

Table 14: Cooling Towers

Cooling Towers						
Unit Number	Nom. Tons	EWT	LWT	GPM	Size	
					L	H
CT-1	1000	95	85	3000	22	14
CT-2	1000	95	85	3000	22	14
CT-3	1000	95	85	3000	22	14
CT-4	450	95	85	1350	21	11.9
CT-5	450	95	85	1350	21	11.9

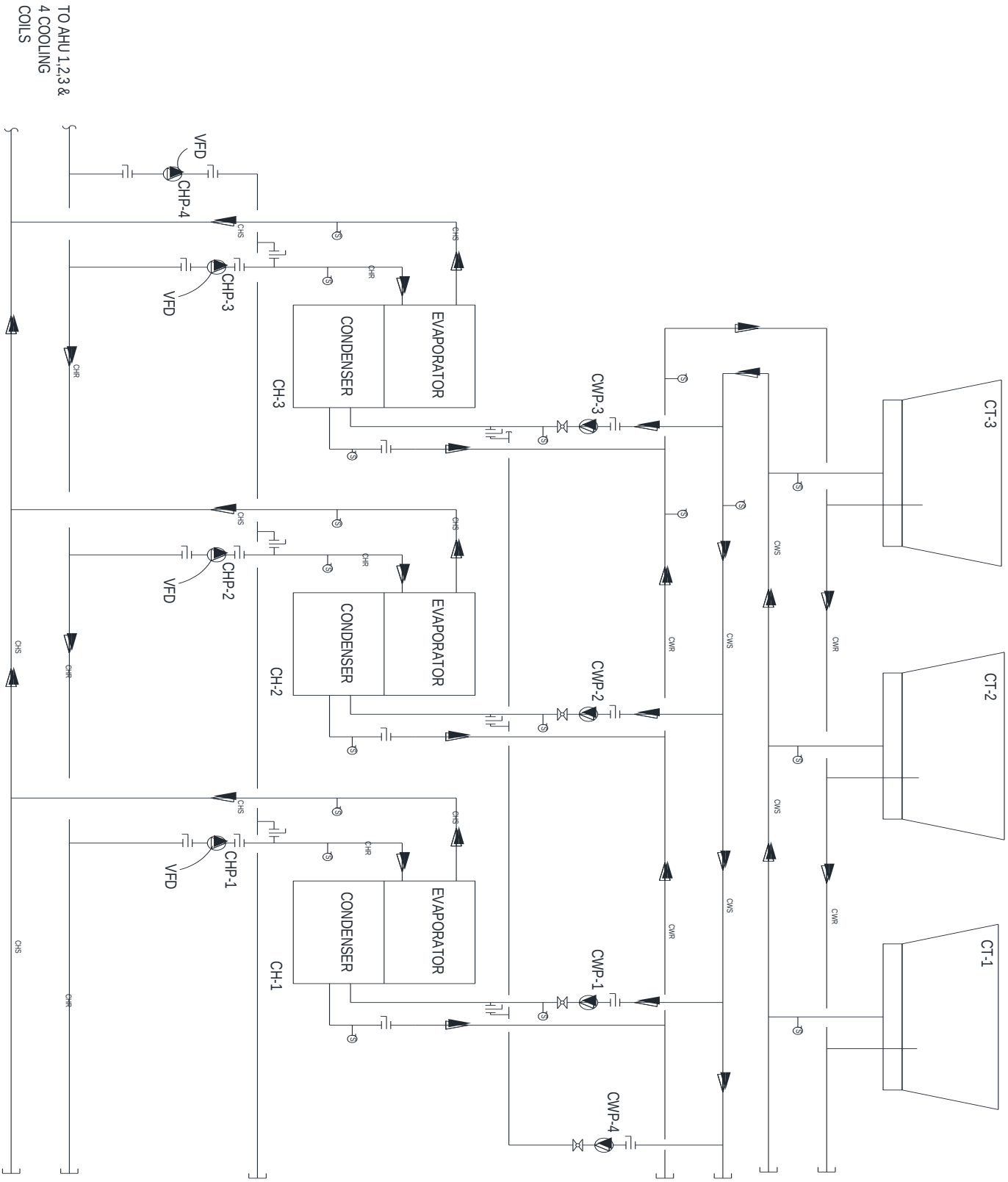

Figure 6: CHILLER 1, 2, &3 FLOW DIAGRAM

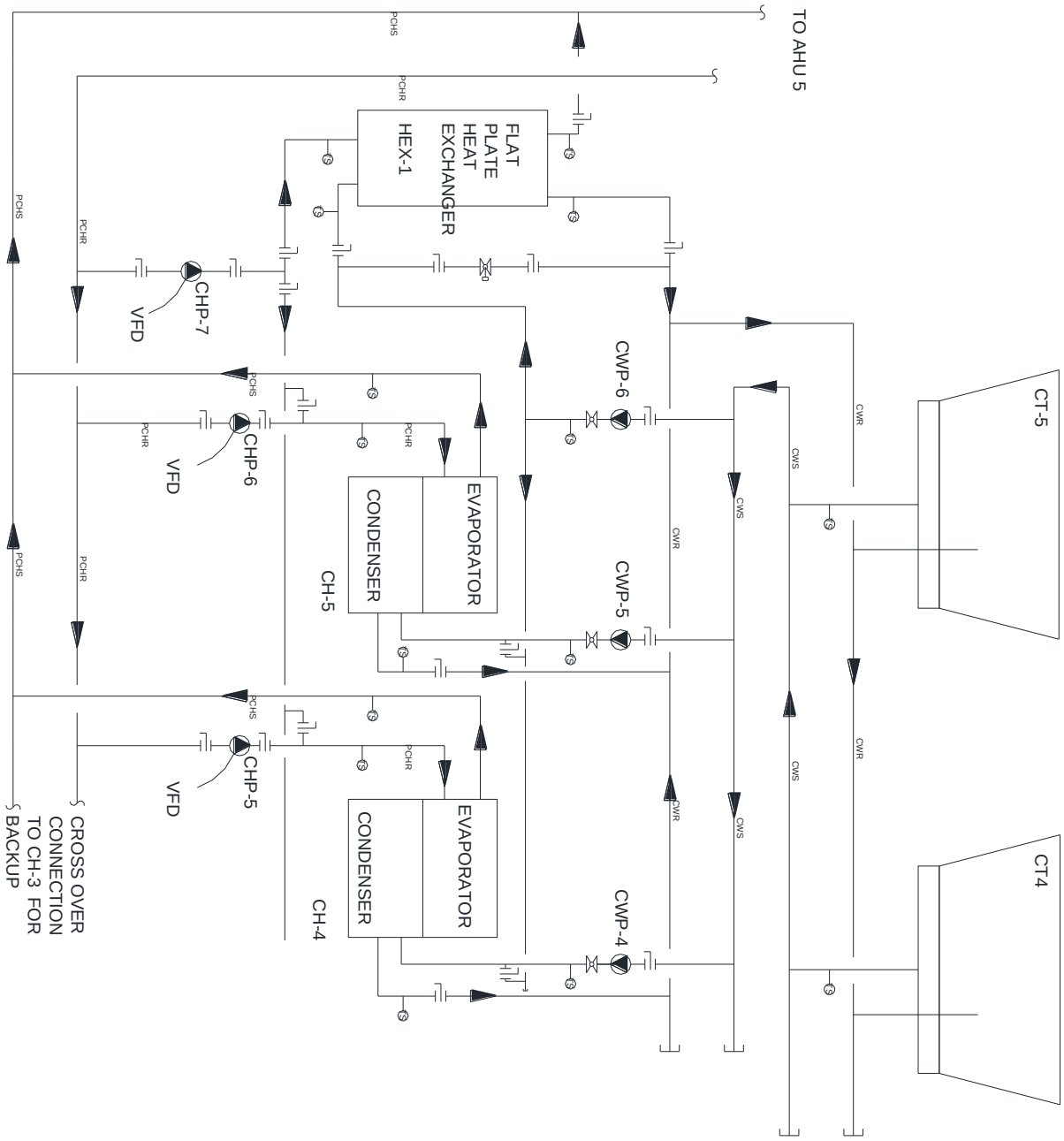

Figure 7: CHILLER 4 & 5 FLOW DIAGRAM

Hot Water

The hot water system is located on level M2. Two 500 BHP fire tube boilers (table 15) are used in parallel for preheat or heat recovery of each air handling unit and heating and ventilating units in the mechanical penthouses. Four 116 BHP hot water condensing boilers (table 16) are used for reheat to supply the building terminal reheat.

For the hot water preheat boilers three pumps in parallel on variable frequency drives are used. Two shunt pumps are also used for each boiler to maintain a minimum flow. Temperature and pressure are measured before entering the boiler then leaving the boiler the hot water supply passes pressurized differential bypass sized for 25% of total flow. After passing this the hot water supply is taken to the heating and ventilating units, and air-handling units alighted in parallel. The temperature and pressure is again taken before reaching the units. The hot water return then passes an air eliminator before reaching the hot water boiler pumps once again.

The four hot water condensing boilers located in the mechanical room are arranged in parallel. Two hot water pumps on variable frequency drives are used to pull the hot water supply through an air eliminator through to the building terminal reheat loads. A 4" pressure differential bypass sized for 25% of the total flow.

Figure 7&8 gives a visual representation for the hot water preheat flow and hot water reheat flow discussed in the paragraphs above.

Table 15: Hot Water Boilers

Hot Water Boiler						
Unit Number	Service	Output			Input	
		HP	MBH	LWT	Primary Fuel	Secondary
B-1	PREHEAT	500	16738	180	NAT. GAS	#2 OIL
B-2	PREHEAT	500	16738	180	NAT. GAS	#2 OIL

Table 16: Hot water Condernsing Boilers

Hot Water Condensing Boiler						
Unit Number	Service	Output			Input	
		HP	MBH	LWT	Primary Fuel	Secondary
B-3	RE-HEAT	116	3,880	140	NAT. GAS	#2 OIL
B-4	RE-HEAT	116	3,880	140	NAT. GAS	#2 OIL
B-5	RE-HEAT	116	3,880	140	NAT. GAS	#2 OIL
B-6	RE-HEAT	116	3,880	140	NAT. GAS	#2 OIL

Table 17:Hot water Pumps

Hot Water Pumps						
UNIT	LOCATION	SERVICE	TYPE	GPM	TOTAL HEAD FT, H2O	VFD?
HWP-1	M2	HOT WATER (BOILER)	END SUCTION	850	50	Y
HWP-2	M2	HOT WATER (BOILER)	END SUCTION	850	50	Y
HWP-3 (STAND-BY)	M2	HOT WATER (BOILER)	END SUCTION	850	50	Y
HWP-4	M2	HOT WATER (RE-HEAT-RAD)	SPLIT CASE	975	50	Y
HWP-5 (STAND-BY)	M2	HOT WATER (RE-HEAT-RAD)	SPLIT CASE	975	50	Y
HWP-6 A&B	M2	HW B-2 SHUNT PUMPS	IN-LINE	135	-	N
HWP-7 A&B	M2	HW B-1SHUNT PUMPS	IN-LINE	135	-	N

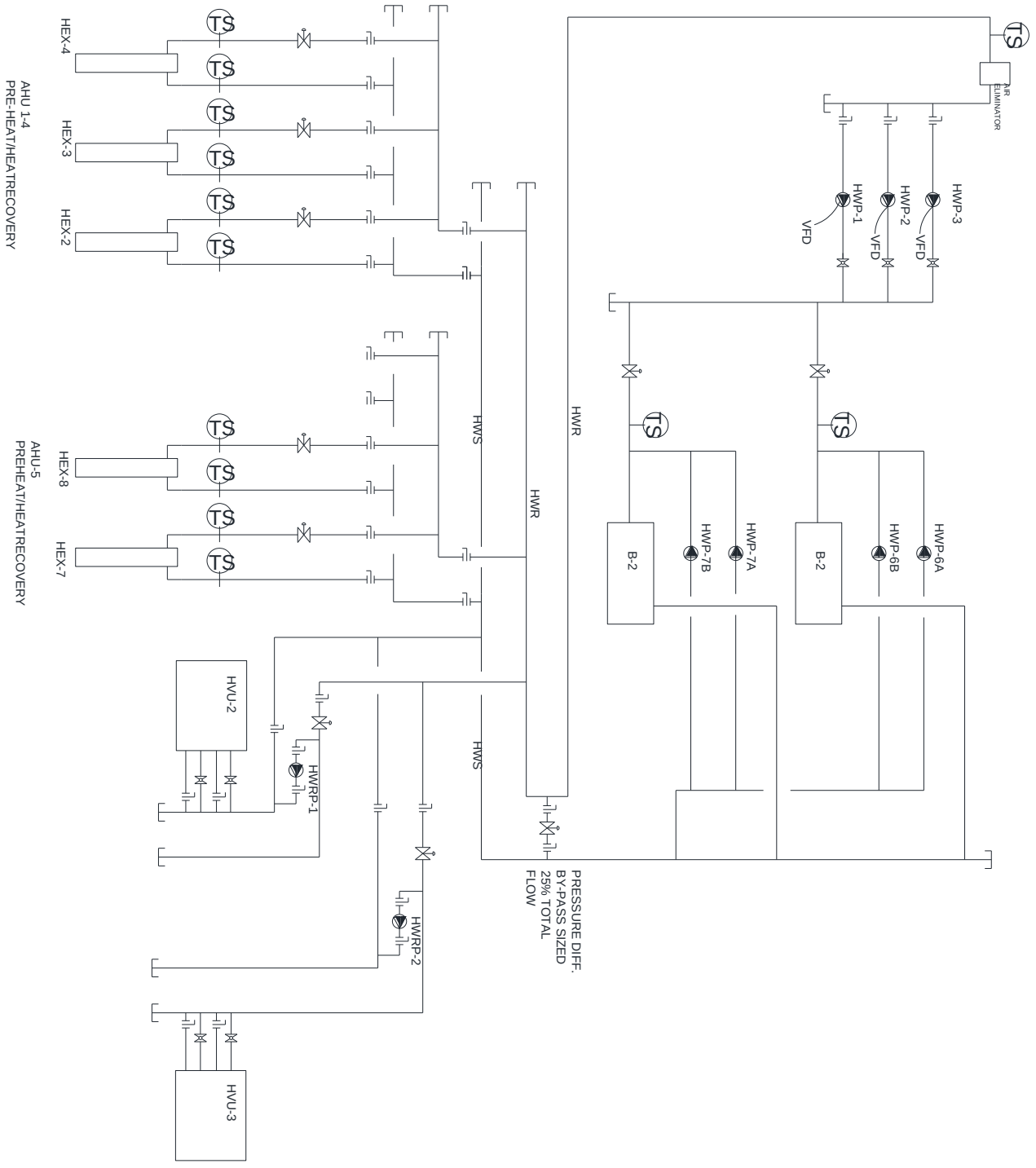

Figure 8: Hot Water Boiler Flow Diagram

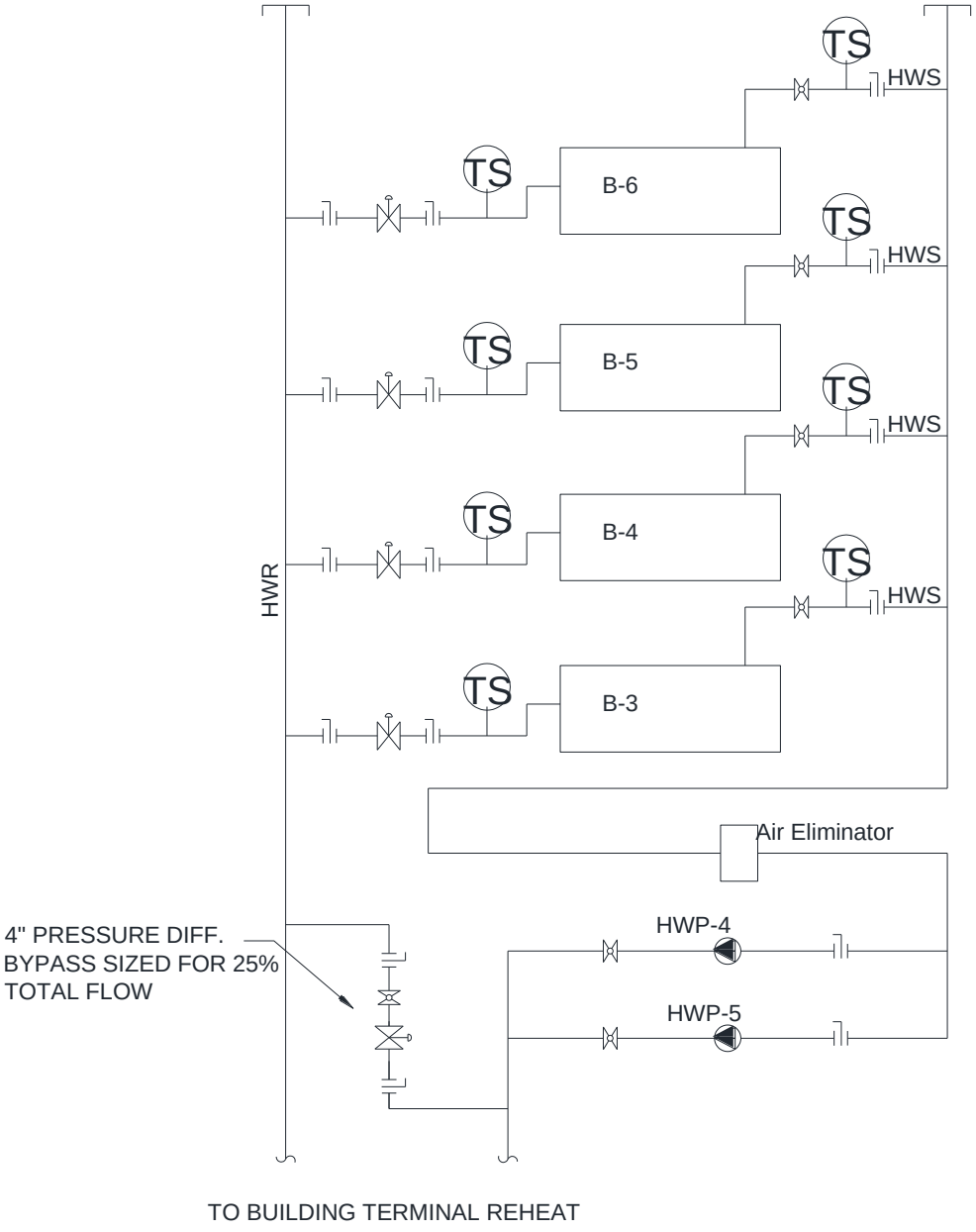

Figure 9: Hot Water Condensing Boiler Flow Diagram

Mechanical System Space

Mechanical rooms and duct chutes can take up valuable square footage in a building. This section of the report shall provide a discussion on the 118,144 square feet of lost space for 75 Ames Street, which can be seen in more detail in Table 18 below.

Figure 10 below shows the basement. The areas shaded blue are the utility areas, which inclube mechanical, electrical, plumbing and security rooms. As can be seen, the basement is primarially for utilities. The fuel tank on this floor is used to feed the backup generators aswell as the gas fired boilers with natural gas.

Figure 11 provides a view of the typical floor plan for floors above level 5 again the darker blue is utility rooms and the red marks space lost to duct risers. And Finaly there is the three mechanical rooms to support all the mechanical equipment for the building. These three floors make up 79,841 square feet of the enire project.

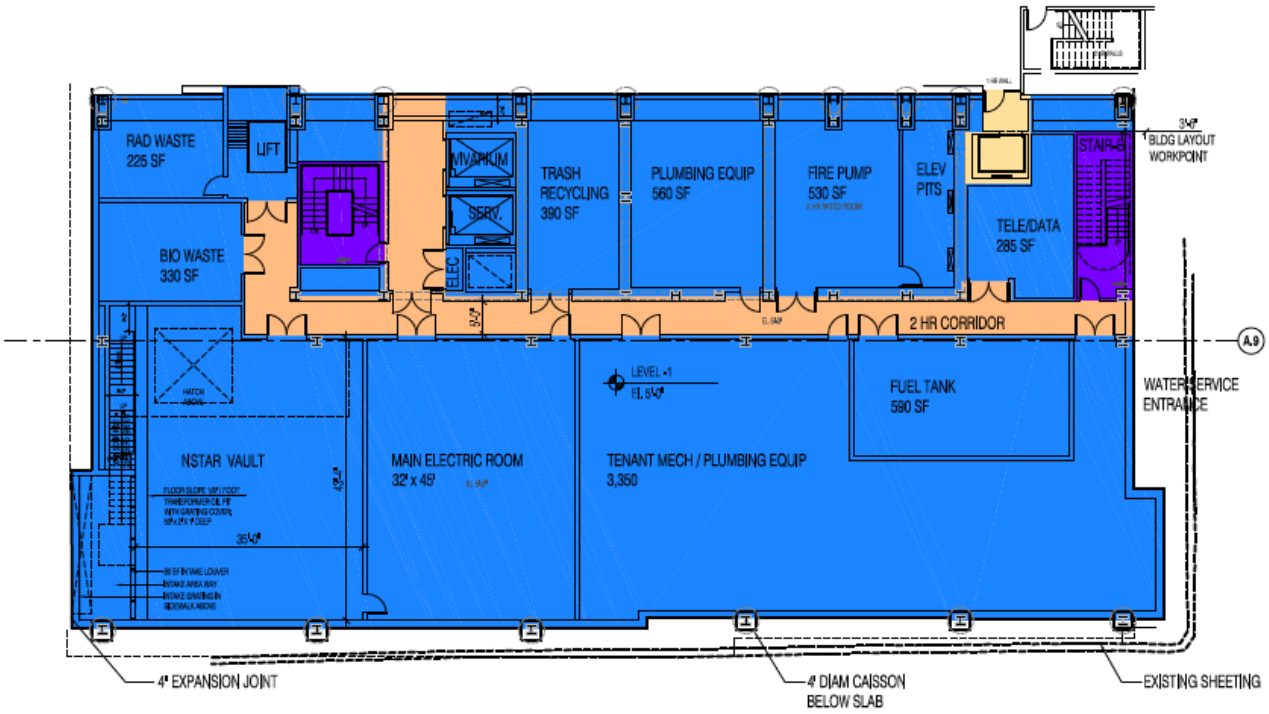

Figure 10: Basement Floor Area Breakdown

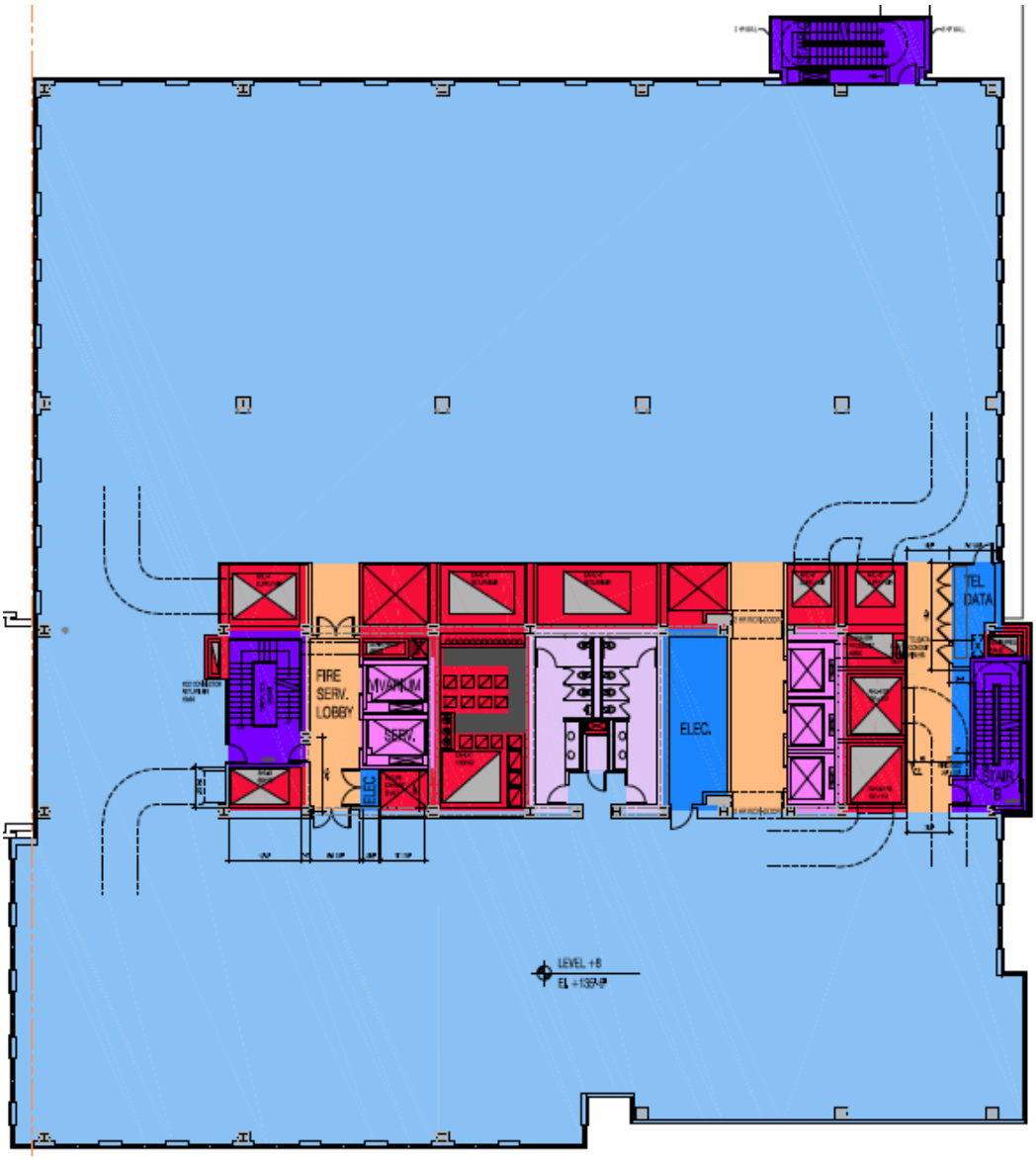

Figure 11: Upper Floors Area Breakdown

Table 18: Lost Space Due To Mechanical Spaces

Mechanical And Utility Space					
	GFA (SF)	M-Shaft	Percent Total Area	Utility	Percent Total Area
0B	13183	0	0%	11331	86%
1	13808	290	2%	1348	10%
2	15854	1030	6%	618	4%
3	15759	1093	7%	537	3%
4	15693	990	6%	651	4%
5	15693	990	6%	651	4%
6	31298	2150	7%	532	2%
7	29590	2150	7%	532	2%
8	28420	2150	8%	532	2%
9	28420	2150	8%	532	2%
10	28420	2150	8%	532	2%
11	28420	2150	8%	532	2%
M1	28763	0	0%	28763	100%
12	28182	2150	8%	532	2%
M2	28492	0	0%	28492	100%
M3	22586	0	0%	22586	100%
TOTAL	**372581**	**19443**	**5%**	**98701**	**26%**

Economic Analysis

75 Ames Street building cost is estimated to be $170,883,188 in total. Below are the total costs of any mechanical, electrical, plumbing and fire protection, for both the core and shell of the building and the fit out.

Figure 12 shows the breakdown of the MEP, fire protection and then everything else for the core and shell. From this image it is easy to see that the cost of this equipment is over a quarter of the total cost for the core and shell of the building. For greater information on the actual prices table 19 shows all the costs. In table 19 there is also a breakdown of the primary mechanical equipment such as chillers, boilers and air handling units figure 13 helps to visualize that all this primary equipment make up for over half of the total HVAC costs.

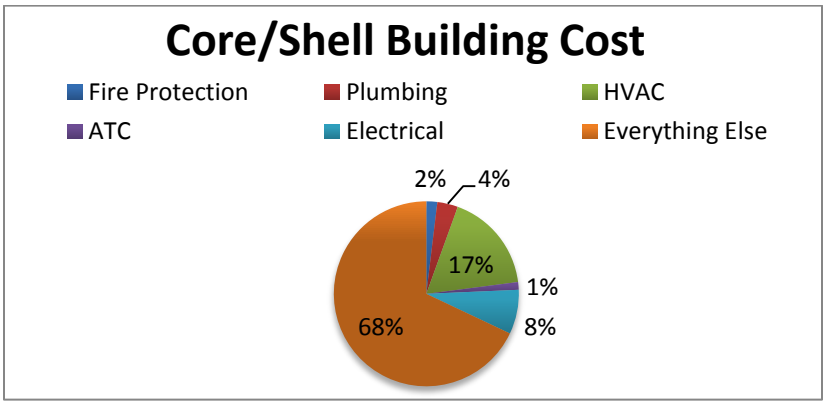

Figure 12: Core/Shell Building Cost

Table 19: Core/Shell Building Cost

Core/Shell			
Service	***Equipment***	**Equipment Cost $**	**Total Cost $**
Fire Protection			$1,668,514.00
Plumbing			$3,148,944.00
HVAC			$15,204,006.00
	Major HVAC Equipment		
	Hot water fire tube boilers	$665,215.00	
	Steam fire tube boiler 250 hp	$223,166.00	
	Steam fire tube hp boiler 50 hp	$110,374.00	
	Centrifugal chiller 400 ton carrier	$262,860.00	
	Centrifugal chiller 1000 ton carrier	$964,973.00	
	Cooling Tower 400 ton	$116,511.00	
	Cooling Tower 1000 ton	$424,590.00	
	AHU5	$364,716.00	
	AHU1	$640,815.00	
	AHU2	$640,815.00	
	AHU 3	$640,815.00	
	AHU 4	$640,815.00	
	EAHU 60000	$273,120.00	
	EAHU 230000	$1,046,960.00	
	EAHU 230000	$1,046,960.00	
	Everything Else	$7,141,301.00	
	Total	$8,062,705.00	
ATC			$1,173,052.00
Electrical			$6,758,542.00
Everything Else			$59,249,314.00
		Total Shell/Core Cost	**$87,202,372.00**

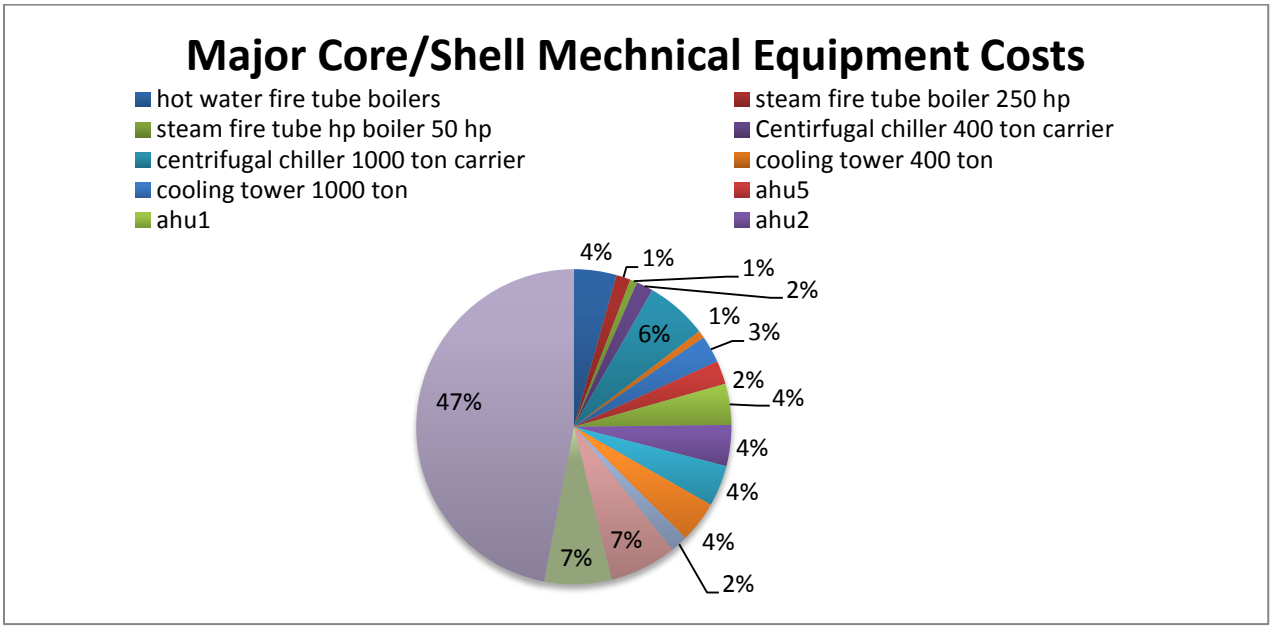

Figure 13: Core/Shell Equipment Cost

The Next area of costs to discuss is the fit out and Vivarium. Tables 20 and 21 show the cost of accessories for the MEP, fire protection and everything else in the fit out and vivarium respectively. Figures 14 and 15 show these accessories cost more visually. As seen in these images below these accessories make up a good portion of the costs for this building.

Table 20; Fitout Building Cost

Fit Out	
Fire Protection	$402,508.00
Plumbing	$3,561,456.00
HVAC	$9,583,860.00
ATC	$3,058,002.00
Electrical	$11,238,120.00
Everything Else	$27,055,444.00
Total	$54,899,390.00

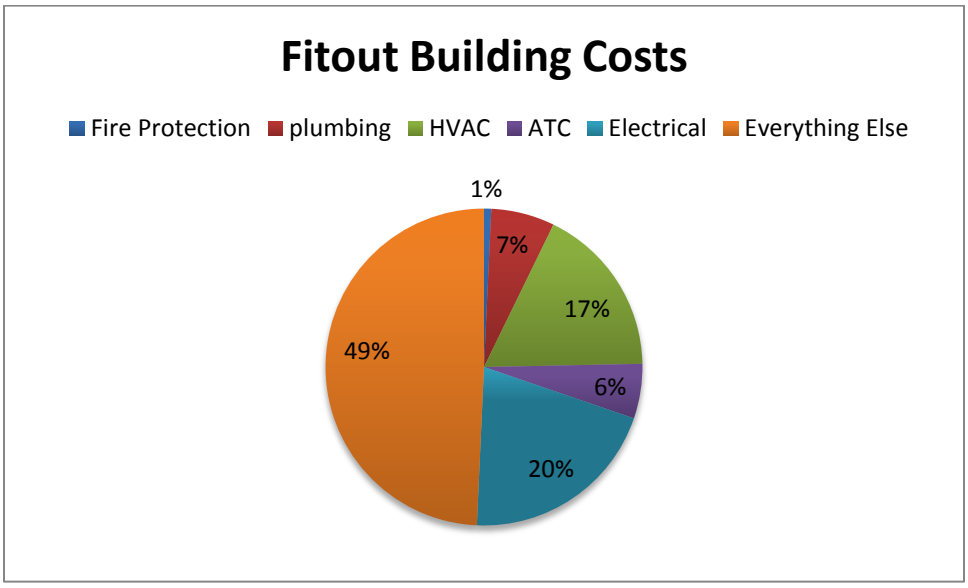

Figure 14; Fitout Building Cost

Table 21:Vivarium Building Cost

Vivarium Building Cost	
Fire protection	$54,934.00
Plumbing	$833,268.00
HVAC	$1,905,924.00
ATC	$734,161.00
Electrical	$859,280.00
Electrical Else	$10,054,619.00
Total	$14,442,186.00

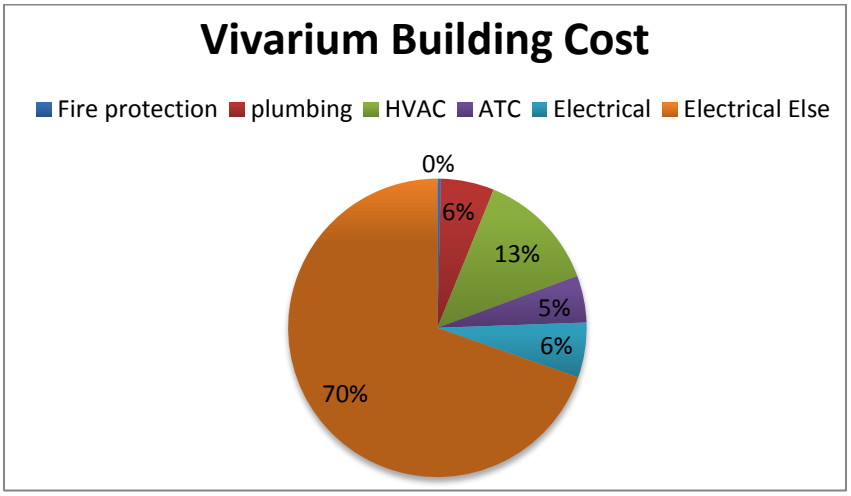

Figure 15: Vivarium Building Cost

Finally in table 22 is the total cost of the core/shell, fit out and vivarium put together for HVAC only and then for MEP, and fire protection only. It can be taken from this table that selection of mechanical equipment is very important to total building cost, accounting for 16% of it. Even more so the selection of all MEP, and fire protection equipment should be analyzed carefully to make sure best choices were made in a cost efficient manner.

Table 22:Core/Shell, Fitout, Vivarium, and Total Costs

	Cost	Percent Total
CORE/Shell, Fit out, Vivarium HVAC ONLY	$26,693,790.00	16%
CORE/Shell, Fit out, Vivarium	$60,184,571.00	35.22%
Total Direct Cost	$170,883,188.00	

LEED Analysis

LEED, standing for Leadership in Energy and Environmental Design, is an internationally recognized program that sets a standard for rating the design, construction and operation of high performance green buildings. Buildings can apply for LEED certifications of certified, silver, gold, and platinum. The certifications are achieved by satisfying various credits and prerequisites each rewarding the project with a set number of points. The minimum number of points to be certified is 40 out of a total of 110-points.

It is very desirable to achieve LEED status on buildings to lead the way to a more sustainable future. LEED lowers operating costs of a building, conserves energy and water, reduces waste, is healthier for the building occupants, and lastly qualifies for tax rebates and other incentives.

At 75 Ames Street The Broad Institute is on route to achieving a LEED Silver status with 56 estimated points. Below you will find the various credits and prerequisites for LEED 2009 New Construction and Major Renovations with a summary of their intent. Below you will also find the number of points achieved for each credit 75 Ames is perusing. A 2009 LEED checklist is also provided in APPENDIX B.

Sustainable Sites

SS Prerequisite 1: Construction Activity Pollution Prevention

Required

Intent: Reduce the pollution that results from the construction.

Loss of soil during construction, sedimentation of storm sewers and receiving drains, and pollution of the air with dust and particulate matter were all prevented.

SS Credit 1: Site Selection

Achieved: 1 of 1 point

Intent: To make sure the development is not on an inappropriate site and to reduce the environmental impact of the building location

75 Ames Street meets this credit by its location in Cambridge, there area no special areas to which this requirement would need to take effect.

SS Credit 2: Development Density and Community Connectivity

Achieved: 5 of 5 points

Intent: To channel development to more urban areas with existing infrastructure, protect greenfields and preserve habitat and natural resources

This development is located in Kendal Square in Cambridge Massachusetts. This site is located on a previously developed area within half a mile from a residential area and from at least ten basic services. And finally there is pedestrian access. Therefor this construction meets the following requirements for this credit.

SS Credit 3: Brownfield Redevelopment

Achieved: 1 of 1 Point

Intent: SS Credit 3 is intended to rehabilitate damaged sites where development is complicated by environmental contamination and to reduce pressure on undeveloped land.

This site was documented as contaminated by means of an ASTM E 1903-97 Phase II Environmental Site Assessment.

SS Credit 4.1: Alternative Transportation—Public Transportation Access

Achieved: 6 of 6 Points

Intent: To reduce automobile use and thus the pollution and land development effects.

75 Ames Street is located roughly 500ft from the local Kendal/MIT train and bus stop. This is less than the ½ mile proximity denoted in the requirements for this credit.

SS Credit 4.2: Alternative Transportation—Bicycle Storage and Changing Rooms

Achieved: 0 of 1 Point

Intent: To reduce automobile use and thus the pollution and land development effects.

No showers or changing facilities were provided for building occupants thus no points could be awarded.

SS Credit 4.3: Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles

Achieved: 3 of 3 Points

Intent: To reduce automobile use and thus the pollution and land development effects.

Preferred location parking was provided for low emitting/fuel efficient vehicles equal to 5% of parking capacity.

SS Credit 4.4: Alternative Transportation—Parking Capacity

Achieved: 2 of 2 Points

Intent: To reduce automobile use and thus the pollution and land development effects.

The parking does not exceed local zoning requirements. And preferred parking is given to carpools for 5% of the total parking.

SS Credit 5.1: Site Development—Protect or Restore Habitat

Achieved: 0 of 1 Point

Intent: To conserve existing natural areas and restore damaged areas to provide biodiversity.

This credit was unable to be achieved for the Ames Street project. A minimum of 20% of the total site including the building footprint was not restored or protected with native or adaptive vegetation.

SS Credit 5.2: Site Development—Maximize Open Space

Achieved: 0 of 1 Point

Intent: To provide a high ratio of open space to development footprint in order to promote biodiversity.

A vegetative roof area was unable to be utilized in the design of this building to allow the building to comply with 20% vegetated open space of the project open site.

SS Credit 6.1: Storm water Design—Quantity Control

Achieved: 1 of 1 Point

Intent: To limit disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from storm water runoff and eliminating contaminants

Storm water management systems were put in place to achieve this credit. The pre and post site runoff rates are to be monitored to determine that the post peak discharge rate and quality does not exceed the predevelopment peak discharge rate and quality.

SS Credit 6.2: Storm water Design—Quality Control

Achieved: 1 of 1 Point

Intent: To limit the disruption and the pollution of natural water flows by managing the storm water runoff.

75 Ames is on track to achieve this credit by having a storm water management plan that reduces the impervious cover, promotes infiltration and captures and treats the storm water runoff from 90% of the average annual rainfall. The best management practices are to be put in place capable of removing 80% of the average annual post development total suspended solids load based on existing monitoring reports.

SS Credit 7.1: Heat Island Effect—Non-roof

Achieved: 1 of 1 Point

Intent: To reduce heat islands, minimizing the impacts on microclimates and human and wildlife habitats.

More than the minimum of 50% of parking spacing are under cover in a parking garage attached to 75 Ames Building. The roof SRI has a SRI of at least 29.

SS Credit 7.2: Heat Island Effect—Roof

Achieved: 1 of 1 Point

Intent: To reduce heat islands, minimizing the impacts on microclimates and human and wildlife habitats.

75% of the roof has a solar reflectance index (SRI) greater than or equal to a value of 78 for low-sloped roofs.

SS Credit 8: Light Pollution Reduction

Achieved: 0 of 1 Point

Intent: To minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction and reduce development impact from lighting on nocturnal environments.

This credit was unable to be achieved for this project.

Water Efficiency

WE Prerequisite 1: Water Use Reduction

Required

Intent: Reduce the burden on municipal water supply and wastewater systems by increasing the water efficiency within the building.

A baseline and design model of water use was designed and the current design building is set to use 20% less water than the baseline. The Baseline conditions are shown below.

Table 23: Baseline Condition for Water Reduction

Commercial Fixtures, Fittings, and Appliances	Current Baseline (Imperial Units)
Commercial toilets	1.6 gallons per flush (gpf) Except blow-out fixtures: 3.5 (gpf)
Commercial Urinals	1.0(gpf)
Commercial Lavatory (restroom) faucets	2.2 gallons per minute (gpm) at 60 pounds per square inch (psi), private applications only (hotel or motel guest rooms, hospital patient rooms) 0.5 (gpm) at 60 (psi) all others except private applications 0.25 gallons per cycle for metering faucets
Showerheads	2.5 (gpm) at 80 (psi) per shower stall
For projects with commercial pre-rinse spray valves, the flow rate must comply with the ASME A112.18.1 standard of 1.6 gpm or less.	

WE Credit 1: Water Efficient Landscaping

Achieved: 0 of 2–4 Points

Intent: To limit or eliminate the use of potable water or other natural surface or subsurface water resources available on or near the project site for landscape irrigation.

This credit was not sought after for 75 Ames Street because there is no need for an irrigation system.

WE Credit 2: Innovative Wastewater Technologies

Achieved: 0 of 2 Points

Intent: Increasing the local aquifer recharge and reducing wastewater generation and potable water demand.

No points were achieved for this credit. Potable water use for the building sewage conveyance could not be cut by 50%.

WE Credit 3: Water Use Reduction

Achieved: 2 of 2–4 Points

Intent: To further increase water efficiency within buildings to reduce the burden on municipal water supply and waste water systems

Strategies have been implemented by 75 Ames that in aggregate use 30% less water than the water use baseline with the design shown in WE Prerequisite 1: Water Use Reduction.

Energy & Atmosphere

EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems

Required

Intent: This prerequisite verifies that the project's energy-related systems are all installed, and calibrated to preform to the owner's project requirements, basis of design and construction documents.

Commissioning processes and activities were completed by a project team to reduce energy use, lower operating costs, have fewer contractor callbacks, have better building documentation, have improved occupant productivity and verify that the system is operating in accordance with the owner's project requirements.

EA Prerequisite 2: Minimum Energy Performance

Required

Intent: Prerequisite 2 establishes the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use.

A whole building energy simulation was run to determine 75 Ames Streets performance when compared to ASHRAE Standard 90.1 baseline. An energy model indicates a 24% energy savings compared to the baseline.

EA Prerequisite 3: Fundamental Refrigerant Management

Required

Intent: To prevent stratospheric ozone depletion.

Refrigerants R-134A and R-123 are used in this project in place of CFC refrigerants.

EA Credit 1: Optimize Energy Performance

Achieved: 5 of 1–19 Points

Intent: To reduce environmental and economic impacts associated with excessive energy use by incentivizing buildings to be designed at increasing levels of energy performance beyond the prerequisite standard.

In the whole building energy simulation showed at least 20% better performance than the baseline design. From the table supplied by the LEED 2009 Rating for New Construction this corresponds with 5 points.

EA Credit 2: On-site Renewable Energy

Achieved: 0 of 1–7 Points

Intent: To encourage, recognize and incentivize increasing levels of on-site renewable energy self-supply to reduce environmental and economical impacts associated with fossil fuel energy use.

There are no designs for on-site renewable energy for this project.

EA Credit 3: Enhanced Commissioning

Achieved: 2 of 2 Points

Intent: To begin the commissioning process early in the process and execute additional activities after systems performance verification is complete.

In addition to EA Prerequisite 1 additional commissioning processes were added. Such as prior to the start of construction documents phase an independent commissioning authority was designated to lead, review, and oversee the completion of all commissioning process surfaces. This commissioning authority is documented as having commissioning authority experience in at least 2 building projects. More info can be found in the LEED Reference Guide For Green Building Design and Construction 2009.

EA Credit 4: Enhanced Refrigerant Management

Achieved: 2 of 2 Points

Intent: To reduce ozone depletion and support early compliance with the Montreal Protocol and minimize the direct contributions to climate change.

Look too Appendix for detailed analysis of refrigeration management analysis.

EA Credit 5: Measurement and Verification

Achieved: 1 of 3 Points

Intent: To provide for the ongoing accountability of building energy consumption over time.

An account was registered for this project on ENERGY STAR's Portfolio Manager Tool and the project is shared with the USGBC master account to meet MPR 6

EA Credit 6: Green Power

Achieved: 0 of 2 Points

Intent: To encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

It was not sought after to engage in a 2-year renewable energy contract to provide 35% of the building's electricity from renewable resources. So this credit is not met.

Materials & Resources

MR Prerequisite 1: Storage and Collection of Recyclables

Required

Intent: To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills by providing recycling.

75 Ames complies with this Prerequisite. There will be dedicated recycling areas for collection and storage in the entire building. The recyclable materials include paper, cardboard, glass, plastics, and metals.

MR Credit 1.1: Building Reuse—Maintain Existing Walls, Floors and Roof

Achieved: 0 of 1–3 Points

Intent: To extend the lifecycle of existing buildings, conserve resources, retain cultural resources, reduce wastes, and reduce the environmental impact of new buildings as they relate to materials manufacturing and transport.

An existing structure was not used for this project thus there were no existing walls, floors or roofs to reuse and this credit is not passed.

MR Credit 1.2: Building Reuse—Maintain Interior Nonstructural Elements

Achieved: 0 of 1 Point

Intent: To extend the lifecycle of existing buildings, conserve resources, retain cultural resources, reduce wastes, and reduce the environmental impact of new buildings as they relate to materials manufacturing and transport.

An existing structure was not used for this project thus there were no existing nonstructural interior elements could be reused.

MR Credit 2: Construction Waste Management

Achieved: 2 of 1–2 Points

Intent: To redirect recyclable materials from construction and demolition away from landfills and incineration facilities, and back to the manufacturing process and redirect the reusable materials to the appropriate sites.

75 Ames Street is planning on recycling/recovering 75% or the materials from construction and demolition.

MR Credit 3: Materials Reuse

Achieved: 0 of 1–2 Points

Intent: To reuse building materials and products to reduce demand for virgin materials and reduce waste, thereby lessening impacts associated with the extraction and processing of virgin resources.

The reuse of building materials is not an option for 75 AMES and thus the requirements for this credit cannot be met.

MR Credit 4: Recycled Content

Achieved: 1 of 1–2 Points

Intent: To increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

The sum of the post-consumer recycled content plus one half of the pre-consumer content constitutes 10%, based on cost, of the total value of materials in the project. This makes 75 Ames eligible for 1 point.

MR Credit 5: Regional Materials

Achieved: 1 of 1–2 Points

Intent: To increase the demand for building materials and products that are extracted and manufactured close to the building and thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from the transportation of resources.

10%, based on cost, of the materials for 75 Ames are extracted, harvested, or recovered, as well as manufactured within 500 miles.

MR Credit 6: Rapidly Renewable Materials

Achieved: 0 of 1 Point

Intent: To reduce use of and depletion of finite raw materials and long-cycle renewable materials. This is achieved by replacing these materials with rapidly renewable ones.

This project was unable to use 2.5% of the total value of building materials and products on rapidly renewable resources.

MR Credit 7: Certified Wood

Achieved: 0 of 1 Point

Intent: To encourage environmentally responsible forest management.

50% wood, based on cost, was unable to be obtained in accordance with certified Forest Stewardship Council's principles and criteria.

Indoor Environmental Quality

IE Q Prerequisite 1: Minimum Indoor Air Quality Performance

Required

Intent: To establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.

The minimum requirements of ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality are met for the design of this building. Therefore 75 Ames passes this prerequisite.

IE Q Prerequisite 2: Environmental Tobacco Smoke (ET S) Control

Required

Intent: To prevent or minimize exposure of building occupants, indoor air distribution systems to environmental tobacco smoke.

Smoking is prohibited in the building and within 25 feet of entries, outdoor air intakes and operable windows. Signage is provided to allow smoking in designated areas, prohibit smoking in designated areas.

IE Q Credit 1: Outdoor Air Delivery Monitoring

Achieved: 1 of 1 Point

Intent: To provide capacity for ventilation system monitoring to help promote occupant comfort and well-being.

A building automated system is used along with CO2 sensors to maintain design minimum requirements throughout the building. 75 Ames Street is a 100% outdoor air system therefore it complies with all ventilation regulations stated in ASHRAE Standard 62.1.

IE Q Credit 2: Increased Ventilation

Achieved: 1 of 1 Point

Intent: To provide additional outdoor air ventilation to improve indoor air quality (IAQ) and promote occupant well-being and comfort.

Ventilation calculations were made and 75 Ames far surpasses the ventilation needs being a 100% outside air building. The outdoor air ventilation sheet and a LEED summary Report are provided in APPENDIX A.

IE Q Credit 3.1: Construction Indoor Air Quality Management Plan—During Construction

Achieved: 1 of 1 Point

Intent: To reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants.

75 Ames is to follow the control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction. On site and installed absorptive materials are to be are protected from moisture. And permanently installed air handlers used during construction have a filtration media with a minimum efficiency reporting value (MERV) of 8 at each return grille. Filters are to be replaced before building occupancy.

IE Q Credit 3.2: Construction Indoor Air Quality Management Plan—Before Occupancy

Achieved: 1 of 1 Point

Intent: To reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants.

A management plan is to be put in place prior to occupancy with all interior finishes installed. New filtration medial shall be installed and a building flush out is to be performed by supplying a total air volume of 14,000 cubic feet per minute of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 F and a relative humidity of 60%.

IE Q Credit 4.1: Low-Emitting Materials—Adhesives and Sealants

Achieved: 1 of 1 Point

Intent: To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Adhesives and sealants used on the interior of 75 Ames Street Building comply with the following requirements in table 24

Table 24: Low Emitting Materials-Adhesives and Sealants

Architectural Applications	VOC Limit (g/L less water)	Specialty Applications	VOC Limit (g/L less water)
Indoor carpet adhesives	50	PVC welding	510
Carpet pad adhesives	50	CPVC welding	490
Wood flooring adhesives	100	ABS welding	325
Rubber floor adhesives	60	Plastic cement welding	250
Subfloor adhesives	50	Adhesive primer for plastic	550
Ceramic tile adhesives	65	Contact adhesive	80
VCT and asphalt adhesives	50	Special purpose contact adhesive	250
Drywall and panel adhesives	50	Structural wood member adhesive	140
Cove base adhesives	50	Sheet applied rubber lining operations	850
Multipurpose construction adhesives	70	Top and trim adhesive	250
Structural glazing adhesives	100		
Substrate Specific Applications	**VOC Limit (g/L less water)**	**Sealants**	**VOC Limit (g/L less water)**
Metal to metal	30	Architectural	250
Plastic foams	50	Roadway	250
Porous material (except wood)	50	Other	420
Wood	30		
Fiberglass	80		
Sealant Primers	**VOC Limit (g/L less water)**		
Architectural, nonporous	250		
Architectural, porous	775		
Other	750		

Aerosol Adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements. The limit can be seen in table 25 below.

Table 25: Low Emitting Materials- Areosol Adhesives and Sealants

Aerosol Adhesives	VOC Limit
General purpose mist spray	65% VOCs by weight
General purpose web spray	55% VOCs by weight
Special purpose aerosol adhesives (all types)	70% VOCs by weight

IE Q Credit 4.2: Low-Emitting Materials—Paints and Coatings

Achieved: 1 of 1 Point

Intent: To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Paints used within the building do not exceed the volatile organic compound content limits established in the Green Seal Standard GS-11, Paints, 1st edition. Any anti corrosive and anti-rust materials will not exceed VOC content limit of 250 g/L and clear wood finishes, floor coatings, stains, primers, sealers, and shellacs will not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.

IE Q Credit 4.3: Low-Emitting Materials—Flooring Systems

Achieved: 1 of 1 Point

Intent: To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

This project achieves this credit by following the Carpet and Rug Institute Green Label program's testing and product requirements for installed carpets and requirements for carpet cushions. The carpet adhesives meet IEQ Credit 4.1 Adhesives and Sealants. The FloorScore standard is met for hard surface flooring. Any concrete, wood, bamboo and cork floor finishes (sealer, stain, and finish) meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113). Lastly all tile setting adhesives and grout meet SCAQMD Rule u68.

IE Q Credit 4.4: Low-Emitting Materials—Composite Wood and Agrifiber Products

Achieved: 0 of 1 Point

Intent: To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

75 Ames building does not pass this credit. Composite wood and agrifiber products used in the building contain added urea-formaldehyde resin that disqualifies this project for the credit.

IE Q Credit 5: Indoor Chemical and Pollutant Source Control

Achieved: 1 of 1 Point

Intent: To minimize occupant exposure to potentially hazardous particulates and chemical pollutants.

Cross contamination of regularly occupied areas by chemical pollutants is minimized. A MERV 13 is installed for all regularly occupied spaces. A permanent entryway system is

to be provided. And Spaces with hazardous gases or chemicals are exhausted. In appendix D are the calculations for indoor chemical & pollutant source control.

IE Q Credit 6.1: Controllability of Systems—Lighting

Achieved: 1 of 1 Point

Intent: To provide a high level of lighting systems control by individual occupants or groups in multi-occupant spaces and promote their productivity, comfort and well-being.

Individual lighting controls are provided to at least 90% of the building occupants to enable the adjustments to suit individual task needs and preferences. Lighting controls are also supplied to all shared spaces to make adjustments for group needs.

IE Q Credit 6.2: Controllability of Systems—Thermal Comfort

Achieved: 0 of 1 Point

Intent: To provide a high level of lighting systems control by individual occupants or groups in multi-occupant spaces and promote their productivity, comfort and well-being.

Individual comfort controls were unable to be supplied for at least 50% of building occupants. Therefore this credit is not awarded.

IE Q Credit 7.1: Thermal Comfort—Design

Achieved: 1 of 1 Point

Intent: To provide a comfortable thermal environment that promotes occupant productivity and well-being.

Heating ventilation and air conditioning are designed to comply with ASHRAE 55 – 2004 Thermal Comfort Conditions for Human Occupancy. A detailed narrative provided by the HVAC engineers at BR+A is provided in appendix E

IE Q Credit 7.2: Thermal Comfort—Verification

Achieved: 0 of 1 point in addition to IE Q credit 7.1

Intent: To provide for the assessment of building occupant thermal comfort over time.

A permanent monitoring system will not be installed to track the building performance and ensure it meets desired comfort criteria as determined by IE Q 7.1 Thermal Comfort – Design. Therefore this credit is not met.

IE Q Credit 8.1: Daylight and Views—Daylight

Achieved: 0 of 1 Point

Intent: To provide building occupants with a connection between indoors and outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

The applicable spaces of 75 Ames do not meet the day lighting criteria set by this credit of minimum daylight illuminance levels of 10 foot-candles and a maximum of 500 foot-candles in clear sky conditions.

IE Q Credit 8.2: Daylight and Views—Views

Achieved: 0 of 1 Point

Intent: To provide building occupants a connection to the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

A direct line of sight to the outdoor environment via glazing between 30 inches and 90 inches above the finish floor for 90% of the building occupants could not be achieved for this project.

Innovation in Design

ID Credit 1: Innovation in Design

Achieved: 3 of 1–5 Points

Intent: To provide design teams and projects the opportunity to achieve exceptional performance above the requirements set by LEED Green Buildings Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED Green Building Rating System.

There are three ideas this project is looking at towards this credit though the use of pilot credits.

1) A comprehensive transport management plan is to be in place
2) Dispersion analysis as part of chemical management plan. A comprehensive approach will be taken to cover spills, access to the building, and handling protocols.
3) This building shall be used as an educational tool to provide public education focusing on green building strategies and solutions.

ID Credit 2: LEE D Accredited Professional

Achieved: 1 of 1 Point

Intent: To support and encourage the design integration required by LEED to streamline the application and certification process.

At least one principal participant of the project team is a LEED Accredited Professional.

Regional Priority

RP Credit 1: Regional Priority

Achieved: 4 of 1–4 Points

Intent: To provide an incentive for the achievement of credits that address geographically specific environmental priorities.

75 Ames Street has met the regional priority credit by complying with credits SSc3, SSc6.1, SSc7.1 and SSc7.1. This qualifies the project for 4 regional priority credits.

Overall Evaluation

75 Ames's mechanical system was designed well and met the requirements for the project type well. The total mechanical system has a cost of $26,693,790.00 which is 16% of the total building cost. The main contributors to this cost were all the large mechanical equipment for the heating, and cooling plants, and the air handlers. This building is set to run relatively efficiently, 20% better than the ASHRAE Baseline Standard, and costing only $2,360,127.50 per year to operate. Three floors were dedicated to the mechanical equipment, and mechanical shafts only took up 19,443 SF of the entire high-rise.

Being a 100% outside air building 75 Ames easily met the ASHRAE 62.1 Standards for ventilation. Although using return air from not critical spaces could be looked into to help more with energy savings. One dilemma with this would have to add in extra return duct risers to the structure, taking up more valuable square footage.

Another idea for energy savings could come from the use of an Aircuity Optinet System. This is a unique system which takes samples of air remotely throughout a buildings space and routes them to a centralized sensor. By sampling the air quality the Optinet system can determine the needed ventilation rates throughout the building and allow for labs and other critical areas to be turned down in times where contamination is low. This may have an added up front cost to the entire system, but potentially this could lead to more energy savings and end up paying for itself over time.

75 Ames does a good job with it's mechanical design and is making a great effort to be LEED Silver. The idea of designing the building for future changes to the program limits the energy savings potential of the building. If instead 75 Ames was designed for day one the changes could result in less total cost per year. Also the use of an Aircuity Optinet system would be very helpful in lab areas to turn down ventilation rates but maintain comfort ability in the areas.

Works Cited

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Appendix A: ASHRAE 62.1 Ventilation Compliance Spreadsheet

AHU'S 1-4 %OA ANALYSIS

Building:				75 AMES St.						
System Tag/Name:	Delete Zone			AHU-1-2-3-4						
Operating Condition Description:	Add Zone			Occupied Operation						
Units (select from pull-down list)				IP						
					w/o diversity					w/ diversity
Inputs for System		**Name**	**Units**		**System**		**Diversity**			**System**
	Floor area served by system	As	sf		176713.6994					
	Population of area served by system	Ps	P		2,185	D	100%			2,185
	Design primary supply fan airflow rate	Vpsd	cfm		321,250	D	100%			321,250
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.09					
	OA req'd per person for system area (Weighted average)	Rps	cfm/p		6.7					
	Does system have Outdoor Air Economizer		Select from pull-down list							No
	Outdoor air intake provided for system	OA	cfm		**460,000**					
Inputs for Potentially Critical zones										
	Show Values per Zone									
	Zone Name									
				Zone title turns purple italic for critical zone(s)						
	Zone Tag									
	Occupancy Category			Select from pull-down list:						
	Floor Area of zone	Az	sf							
	Design population of zone	Pz	P	(default value listed; may be overridden)						
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm							
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:							
	Frac. of local recirc. air that is representative of system RA	Er								
Inputs for Operating Condition Analyzed										
	Percent of total design airflow rate at conditioned analyzed	Ds	%							57%
	Air distribution type at conditioned analyzed		Select from pull-down list:					Show codes for Ez		
	Zone air distribution effectiveness at conditioned analyzed	Ez								
	Primary air fraction of supply air at conditioned analyzed	Ep								
Inputs for Systems with Outdoor Air Economizers										
	Outdoor air Temperature	Toa	Deg F							
	Supply Air Temperature	Tp	Deg F							
	Return Air Temperature	Tr	Deg F							
	Supply Fan Heat Gain	dTsf	Deg F							
	Return Fan Heat Gain	dTrf	Deg F							
Results of Minimum ASHRAE 62.1 Ventilation Rate Procedure (EQp1)										
	System Ventilation Efficiency	Ev								0.41
	Outdoor air intake required for system (EQp1)	Vot	cfm							**74,213**
	Outdoor air per unit floor area	Vot/As	cfm/sf							0.42
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p							34.0
	Outdoor air as a % of design primary supply air	Ypd	%							23%
Results of 30% increase beyond ASHRAE 62.1 Ventilation Rate Procedure (EQc2)										
	System Ventilation Efficiency with 30% increase (EQc2)	Evz30								0.23
	Outdoor air intake required for system with 30% increase (EQc2)	Vot30	cfm							169,091
	Outdoor air per unit floor area for system with 30% increase (EQc2)	Vot30/As	cfm/sf							0.96
	Outdoor air per person served by system (including diversity) (EQc2)	Vot30/Ps	cfm/p							77.4
	Outdoor air as a % of design primary supply air (EQc2)	Ypd30	%							53%
Detailed Calculations										
Initial Calculations for the System as a whole										
	System primary supply air flow at conditioned analyzed	Vps	cfm	= Vpsd Ds					=	182815
	Uncorrected OA intake flow req'd for system	Vou	cfm	= Rps Ps + Ras As					=	30522
	30% increase Uncorrected OA intake flow req'd for system (EAc2)	Vou30	cfm	= (Rps Ps + Ras As)*1.3					=	39678
	Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps					=	0.17
	30% increase Uncorrected OA req'd as a fraction of primary SA	Xs30		= Vou30 / Vps					=	0.22
Initial Calculations for individual zones										
	Area outdoor air rate	Ra	cfm/sf							
	People outdoor air rate	Rp	cfm/p							
	Total supply air to zone (at condition being analyzed)	Vdz	cfm	Vdzd Ds						
	Primary airflow to zone (at condition being analyzed)	Vpz	cfm	= Vdz Ep					=	
	Breathing zone outdoor airflow	Vbz	cfm	= Rp Pz + Ra Az					=	
	Breathing zone outdoor airflow with 30% increase (EAc2)	Vbz30	cfm	= (Rp Pz + Ra Az)*1.3					=	
	Zone outdoor airflow	Voz	cfm	= Vbz / Ez					=	
	Zone outdoor airflow with 30% increase (EAc2)	Voz30	cfm	= Vbz30/Ez					=	
	Fraction of zone supply not directly recirc. from zone	Fa		= Ep + (1-Ep) Er					=	
	Fraction of zone supply from fully mixed primary air	Fb		= Ep					=	
	Fraction of zone OA not directly recirc. from zone	Fc		= 1-(1-Ez)(1-Ep)(1-Er)					=	
	OA fraction required in the supply air to the zone	Zd		= Voz / Vdz					=	
	OA fraction required in the primary air to the zone	Zpz		= Voz / Vpz					=	
	OA fraction required in the supply air to the zone for EAc2	Zd30		= Voz30 / Vdz					=	
	OA fraction required in the primary air to the zone for EAc2	Zpz30		= Voz30/ Vpz					=	
System Ventilation Efficiency										
	Zone Ventilation Efficiency (App A Method)	Evz		= (Fa+FbXs-FcZpzEp)/Fa					=	
	Zone Ventilation Efficiency with 30% increase (EAc2) (App A)	Evz30		= (Fa+FbXs-FcZpz30Ep)/Fa					=	
	System Ventilation Efficiency (App A Method)	Ev		= min (Evz)					=	0.41
	System Ventilation Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3					=	n/a
	System Ventilation Efficiency w/ 30% increase (EAc2) (App A)	Ev30		= min (Evz30)					=	0.23
	System Ventilation Efficiency w/ 30% increase (EAc2) (Table 6.3)	Ev30		= Value from Table 6.3					=	n/a
Minimum outdoor air intake airflow (EQp1)										
	Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev					=	74213
	OA intake req'd as a fraction of primary SA	Y		= Vot / Vps					=	0.41
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	= Vou / Ev					=	n/a
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps					=	n/a
Time-averaging										
	Time period with high occupancy	Th	min							
	Room height	h	ft	=						
	Time period over which averaging can take place	T	min	= 3 v / Vbz					=	
	Error - sum of all values above will show error									
	Error flag									FALSE
30% increase beyond Minimum Outdoor air intake airflow (EQc2)										
	Outdoor Air Intake Flow required to System	Vot30	cfm	= Vou / Ev					=	169091
	OA intake req'd as a fraction of primary SA	Y30		= Vot / Vps					=	0.92
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot30	cfm	= Vou / Ev					=	n/a
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y30		= Vot / Vps					=	n/a
OA Temp at which Min OA provides all cooling										
	OAT below which OA intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)*(Tr+dTrf)}/Y					=	30

B0018 - EHS STORAGE	B0013 - FUEL OIL STORAGE	B0011 - MECH/PLUM BING	B0012 - HOLDING	B0010 - FIRE PUMP	B000LA - FIRE SERVICE ACCESS LOBBY	B0001 - FACILITIES	B0005 - MICROBULK NIT4 CO2	B0003 - BIO WASTE	VESIBULE	1000CB - PASSAGE
0-1	0-3	0-5A, 0-5B	0-7	0-9	0-11	0-13	0-15	0-17	0-19	1-1
Storage rooms	Storage rooms	Elec/mech equipment rooms	Storage rooms	Elec/mech equipment rooms	Corridors	Storage rooms	Unocc / Not Used	Storage rooms	Corridors	Corridors
101	690	2,647	320	501	211	75	203	195	86	82
0	0	0	0	0	0	0	0	0	0	0
300	1,950	2,600	325	525	300	200	200	750	200	200
1600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
50%	100%	56%	46%	48%	50%	50%	50%	50%	100%	100%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.06	0.06
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	1950	1450	150	250	150	100	100	375	200	200
150	1950	1450	150	250	150	100	100	375	200	200
0	0	0	0	0	13	0	0	0	5	5
0	0	0	0	0	16	0	0	0	7	6
0	0	0	0	0	13	0	0	0	5	5
0	0	0	0	0	16	0	0	0	7	6
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.03	0.02
0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.03	0.02
0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.03	0.03
1.17	1.17	1.17	1.17	1.17	1.08	1.17	1.17	1.17	1.14	1.14
1.22	1.22	1.22	1.22	1.22	1.11	1.22	1.22	1.22	1.18	1.19
9										
27270000										
27272320										
FALSE										

1015 - FCC	1011 - LOBBY	1007 - MANAGER	1003 - LOADING DOCK	1000LV - VIVARIUM ELEV LOBBY	1000LA - SERVICE ELEV LOBBY	1012 - PH NEUT	1000LB - ELEVATOR LOBBY	1010 - SECURITY	1008 - VIRGIN CHEM STORAGE (H-2)	1006 - WASTE CHEM STORAGE (H-2)	2000CA - BREAKOUT CONNECTOR	2001 - MULTIPURPOSE CONFERENCE	2001 - MULTIPURPOSE CONFERENCE
1-3	1-5	1-9	1-11, 1-13	1-15	1-17	1-19	1-21	1-23	1-25	1-27	2-1, 2-3	2-5	2-7
Unocc / Not Used	Main entry lobbies	Office space	Unocc / Not Used	Corridors	Corridors	Unocc / Not Used	Corridors	Telephone closets	Storage rooms	Storage rooms	Corridors	Conference/ meeting	Conference/ meeting
186	876	84	1,966	82	131	135	163	94	116	173	2,100	788	788
0	8.76	0.42	0	0	0	0	0	0	0	0	0	39.375	39.375
300	1,200	200	2,200	400	400	1,300	400	850	650	600	2,100	1,500	1,500
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
50%	100%	100%	100%	100%	100%	100%	100%	41%	50%	50%	50%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.06	0.06	0.00	0.06	0.06	0.00	0.06	0.00	0.00	0.00	0.06	0.06	0.06
0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
150	1200	200	2200	400	400	1300	400	350	325	300	1050	750	750
150	1200	200	2200	400	400	1300	400	350	325	300	1050	750	750
0	96	7	0	5	8	0	10	0	0	0	126	244	244
0	125	9	0	6	10	0	13	0	0	0	164	317	317
0	96	7	0	5	8	0	10	0	0	0	126	244	244
0	125	9	0	6	10	0	13	0	0	0	164	317	317
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.08	0.04	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.12	0.33	0.33
0.00	0.08	0.04	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.12	0.33	0.33
0.00	0.10	0.05	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.16	0.42	0.42
0.00	0.10	0.05	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.16	0.42	0.42
1.17	1.09	1.13	1.17	1.15	1.15	1.17	1.14	1.17	1.17	1.17	1.05	0.84	0.84
1.22	1.11	1.17	1.22	1.20	1.19	1.22	1.19	1.22	1.22	1.22	1.06	0.79	0.79

2007 - FREEZER ROOM	2011 - PRE PCR	2006 - WARM ROOM	2008 - COLD ROOM	2005 - RNAi LAB	2015 - RNAi LAB	2035 - DNA CLEAN LAB	2025 - CLONE PRODUCTION CLEAN LAB	2053 - OFFICE	2051 - LAB DESKS	2058E - ELEC	2000LB - ELEVATOR LOBBY
2-9	2-11	2-13	2-13	2-15A, 2-15B	2-17A, 2-17B	2-19	2-21	2-23	2-25	2-27	2-29
Storage rooms	Science laboratories	Storage rooms	Storage rooms	Science laboratories	Science laboratories	Science laboratories	Science laboratories	Office space	Office space	Elec/mech equipment rooms	Corridors
998	186	112	151	1,345	1,374	237	273	159	448	236	379
0	3	0	0	24	19	5	6	1	2.2382	0	0
925	400	25	50	3,600	3,600	600	750	250	1,100	850	400
51%	63%	100%	100%	35%	35%	100%	100%	50%	50%	41%	100%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.18	0.00	0.00	0.18	0.18	0.18	0.18	0.06	0.06	0.00	0.06
0.00	10.00	0.00	0.00	10.00	10.00	10.00	10.00	5.00	5.00	0.00	0.00
475	250	25	50	1250	1250	600	750	125	550	350	400
475	250	25	50	1250	1250	600	750	125	550	350	400
0	63	0	0	482	437	93	109	15	38	0	23
0	82	0	0	627	568	121	142	19	49	0	30
0	63	0	0	482	437	93	109	15	38	0	23
0	82	0	0	627	568	121	142	19	49	0	30
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.25	0.00	0.00	0.39	0.35	0.15	0.15	0.12	0.07	0.00	0.06
0.00	0.25	0.00	0.00	0.39	0.35	0.15	0.15	0.12	0.07	0.00	0.06
0.00	0.33	0.00	0.00	0.50	0.45	0.20	0.19	0.15	0.09	0.00	0.07
0.00	0.33	0.00	0.00	0.50	0.45	0.20	0.19	0.15	0.09	0.00	0.07
1.17	0.91	1.17	1.17	0.78	0.82	1.01	1.02	1.05	1.10	1.17	1.11
1.22	0.89	1.22	1.22	0.72	0.76	1.02	1.03	1.07	1.13	1.22	1.14

2040 - MEN, 2044 - WOMEN, 2000CB - CORRIDOR, 2000LA - FIRE SERVICE ACCESS LOBBY	3000CA - BREAKOUT/CONNECTOR	3001 - LARGE CONFERENCE	3005 - COPY	3007 - OFFICE, 3011 - OFFICE, 3009 - OFFICE	3013 - OFFICE	3000CC - CORRIDOR	3008 - OFFICE, 3022 - OFFICE	3010 - OFFICE, 3020 - OFFICE	3015 - OFFICE, 3017 - OFFICE, 3019 - OFFICE	3026 - LAB SUPPORT	3029 - TISSUE CULTURE ROOM	3035 - NOVEL THERAPEUTICS/ CHEM BIO	3053 - LAB DESKS
2-31, 2-33	3-1, 3-3	3-5	3-7	3-9	3-11	3-13	3-15	3-17	3-19	3-21	3-25	3-27A, 3-27B, 3-27C, 3-27D, 3-27E, 3-27F, 3-27G	3-27H
Corridors	Corridors	Conference/ meeting	Corridors	Office space	Office space	Corridors	Office space	Office space	Office space	Storage rooms	Science laboratories	Science laboratories	Office space
1,460	1,352	626	167	449	268	234	419	274	254	148	314	3,163	782
0	0	31.2855	0	9	1	0	8	6	5	0	4	27	3.91
1,600	2,400	1,280	150	525	300	125	400	350	525	500	1,500	21,000	1,650
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
100%	50%	50%	100%	48%	50%	100%	50%	50%	48%	50%	100%	17%	11%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.18	0.18	0.06
0.00	0.00	5.00	0.00	5.00	5.00	0.00	5.00	5.00	5.00	0.00	10.00	10.00	5.00
1600	1200	640	150	250	150	125	200	175	250	250	1500	3500	180
1600	1200	640	150	250	150	125	200	175	250	250	1500	3500	180
88	81	194	10	72	21	14	65	46	40	0	97	839	66
114	105	252	13	94	27	18	85	60	52	0	125	1091	86
88	81	194	10	72	21	14	65	46	40	0	97	839	66
114	105	252	13	94	27	18	85	60	52	0	125	1091	86
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.05	0.07	0.30	0.07	0.29	0.14	0.11	0.33	0.27	0.16	0.00	0.06	0.24	0.37
0.05	0.07	0.30	0.07	0.29	0.14	0.11	0.33	0.27	0.16	0.00	0.06	0.24	0.37
0.07	0.09	0.39	0.09	0.37	0.18	0.15	0.42	0.34	0.21	0.00	0.08	0.31	0.48
0.07	0.09	0.39	0.09	0.37	0.18	0.15	0.42	0.34	0.21	0.00	0.08	0.31	0.48
1.11	1.10	0.86	1.10	0.88	1.03	1.05	0.84	0.90	1.01	1.17	1.10	0.93	0.80
1.15	1.13	0.82	1.13	0.84	1.03	1.07	0.79	0.87	1.01	1.22	1.13	0.91	0.74

3000LB - ELEVATOR LOBBY	3058E - ELEC	3044 - WOMEN, 3040 - MEN, 3000CE - CORRIDOR, 3000LA - FIRE SERVICE ACCESS LOBBY	4007 - OFFICE, 4009 - OFFICE,4011 - OFFICE	4013 - OFFICE	4015 - OFFICE	4017 - OFFICE	4010 - OFFICE, 4012 - OFFICE	4008 - OFFICE, 4016 - OFFICE	4023 - OFFICE, 4021 - OFFICE, 4019 - OFFICE	4020 - OFFICE, 4024 - OFFICE, 4022 - OFFICE	4018 - OFFICE, 4034 - OFFICE, 4014 - OFFICE	4032 - OFFICE	4031 - MEDIUM CONFERENCE ROOM	4036 - OFFICE	4047 - LAB SUPPORT
3-33	3-35	3-37, 3-39	4-1	4-3	4-5	4-7	4-9	4-11	4-13	4-15	4-17	4-19	4-21	4-23	4-25
Corridors	Elec/mech equipment rooms	Corridors	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Conference/ meeting	Office space	Storage rooms
360	249	1,347	392	275	170	135	260	320	465	390	475	156	251	154	281
0	0	0	8	1	3	3	6	8	6	9	12	4	12.55	4	0
400	850	1,600	525	300	400	400	400	400	800	525	600	200	525	200	600
100%	41%	100%	48%	50%	50%	100%	50%	50%	50%	48%	50%	50%	48%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
0.00	0.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.00
400	350	1600	250	150	200	400	200	200	400	250	300	100	250	100	300
400	350	1600	250	150	200	400	200	200	400	250	300	100	250	100	300
22	0	81	64	22	25	23	46	59	58	68	89	29	78	29	0
28	0	105	83	28	33	30	59	77	75	89	115	38	101	38	0
22	0	81	64	22	25	23	46	59	58	68	89	29	78	29	0
28	0	105	83	28	33	30	59	77	75	89	115	38	101	38	0
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.05	0.00	0.05	0.25	0.14	0.13	0.06	0.23	0.30	0.14	0.27	0.30	0.29	0.31	0.29	0.00
0.05	0.00	0.05	0.25	0.14	0.13	0.06	0.23	0.30	0.14	0.27	0.30	0.29	0.31	0.29	0.00
0.07	0.00	0.07	0.33	0.19	0.16	0.08	0.30	0.38	0.19	0.36	0.38	0.38	0.40	0.38	0.00
0.07	0.00	0.07	0.33	0.19	0.16	0.08	0.30	0.38	0.19	0.36	0.38	0.38	0.40	0.38	0.00
1.11	1.17	1.12	0.91	1.02	1.04	1.11	0.94	0.87	1.02	0.89	0.87	0.87	0.86	0.87	1.17
1.15	1.22	1.15	0.89	1.03	1.05	1.14	0.92	0.83	1.03	0.86	0.83	0.84	0.81	0.84	1.22

4038 - PRE PCR LAB	4045 - POST PCR LAB BL2	4053 - LAB DESKS	4058E - ELEC	4000LB - ELEVATOR LOBBY	4040 - MEN, 4044 - WOMEN, 4000CE - CORRIDOR, 4000LA - FIRE SERVICE ACCESS LOBBY	4000CA - BREAKOUT/CONNECTOR	4005 - COPY	4001 - LARGE CONFERENCE
4-27	4-29A, 4-29B	4-31	4-33	4-35	4-37, 4-39	4-41, 4-43	4-45	4-47
Science laboratories	Science laboratories	Office space	Elec/mech equipment rooms	Corridors	Corridors	Corridors	Corridors	Conference/ meeting
283	1,366	630	248	522	1,413	1,226	147	622
6	23	3.15	0	0	0	0	0	31.1
800	2,800	1,500	850	400	1,600	2,400	150	1280
50%	45%	50%	41%	100%	100%	88%	100%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.18	0.18	0.06	0.00	0.06	0.06	0.06	0.06	0.06
10.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00
400	1250	750	350	400	1600	2100	150	640
400	1250	750	350	400	1600	2100	150	640
111	476	54	0	31	85	74	9	193
144	619	70	0	41	110	96	11	251
111	476	54	0	31	85	74	9	193
144	619	70	0	41	110	96	11	251
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.28	0.38	0.07	0.00	0.08	0.05	0.04	0.06	0.30
0.28	0.38	0.07	0.00	0.08	0.05	0.04	0.06	0.30
0.36	0.49	0.09	0.00	0.10	0.07	0.05	0.08	0.39
0.36	0.49	0.09	0.00	0.10	0.07	0.05	0.08	0.39
0.89	0.79	1.10	1.17	1.09	1.11	1.13	1.11	0.87
0.86	0.72	1.12	1.22	1.12	1.15	1.17	1.14	0.83

4001 - LARGE CONFERENCE	5007 - OFFICE, 5009 - OFFICE, 5011 - OFFICE	5013 - OFFICE	5008 - WORKSTATIONS	5012 - WORKSTATIONS	5000CC - CORRIDOR	5019 - OFFICE, 5017 - OFFICE, 5015 - OFFICE	5021 - MEDIUM CONFERENCE	5022 - LAB DESKS, 5030 - LAB DESKS, 5028 - LAB DESKS	5036 - COLD ROOM	5038 - FREEZER ROOM	5045 - RNAi BL2+ LAB	5035 - RNAi BL2+ LAB	5058E - ELEC	5000LB - ELEVATOR LOBBY	5000CE - CORRIDOR, 5000LA - FIRE SERVICE ACCESS LOBBY, 5040 - MEN, 5044 - WOMEN
4-47	5-1	5-3	5-5	5-7	5-9	5-11	5-13	5-15	5-17	5-19	5-23A, 5-23B, 5-25	5-27A, 5-27B, 5-27C, 5-27D	5-39	5-41	5-43
Conference/ meeting	Office space	Office space	Office space	Office space	Corridors	Office space	Conference/ meeting	Office space	Storage rooms	Storage rooms	Science laboratories	Science laboratories	Elec/mech equipment rooms	Corridors	Corridors
622	429	179	276	457	276	339	252	466	107	255	1,509	2,077	247	348	1,456
31.1	6	1	4	8	0	5	12.6	18	0	0	12	12	0	0	0
1280	525	300	400	1,000	300	475	400	450	35	800	3,850	5,250	850	400	1,700
50%	48%	50%	50%	50%	100%	53%	50%	50%	100%	100%	90%	100%	100%	100%	100%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.00	0.18	0.18	0.00	0.06	0.06
5.00	5.00	5.00	5.00	5.00	0.00	5.00	5.00	5.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
640	250	150	200	500	300	250	200	225	35	800	3450	5250	850	400	1700
640	250	150	200	500	300	250	200	225	35	800	3450	5250	850	400	1700
193	56	16	37	67	17	45	78	118	0	0	392	494	0	21	87
251	72	20	48	88	22	59	102	153	0	0	509	642	0	27	114
193	56	16	37	67	17	45	78	118	0	0	392	494	0	21	87
251	72	20	48	88	22	59	102	153	0	0	509	642	0	27	114
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.30	0.22	0.10	0.18	0.13	0.06	0.18	0.39	0.52	0.00	0.00	0.11	0.09	0.00	0.05	0.05
0.30	0.22	0.10	0.18	0.13	0.06	0.18	0.39	0.52	0.00	0.00	0.11	0.09	0.00	0.05	0.05
0.39	0.29	0.14	0.24	0.18	0.07	0.24	0.51	0.68	0.00	0.00	0.15	0.12	0.00	0.07	0.07
0.39	0.29	0.14	0.24	0.18	0.07	0.24	0.51	0.68	0.00	0.00	0.15	0.12	0.00	0.07	0.07
0.87	0.94	1.06	0.98	1.03	1.11	0.99	0.78	0.64	1.17	1.17	1.05	1.07	1.17	1.11	1.12
0.83	0.93	1.08	0.98	1.04	1.15	0.98	0.71	0.54	1.22	1.22	1.07	1.09	1.22	1.15	1.15

5000CA - BREAKOUT/CONNECTOR	5001 - LARGE CONFERENCE	5005 - COPY	6007 - OFFICE, 6009 - OFFICE, 6011 - OFFICE, 6013 - OFFICE	6013 - OFFICE	6008 - OFFICE, 6020 - OFFICE	6010 - OFFICE, 6012 - OFFICE	6015 - OFFICE, 6017 - OFFICE	6019 - OFFICE, 6021 - OFFICE	6014 - OFFICE, 6016 - OFFICE, 6028 - OFFICE	6018 - OFFICE, 6024 - WORKSTATIONS	6023 - OFFICE, 6029 - OFFICE	6026 - OFFICE, 6030 - OFFICE	6040 - MEN, 6044 - WOMEN, 6000CA - CORRIDOR, 6000LB - ELEVATOR LOBBY, 6000LA - FIRE SERVICE ACCESS LOBBY	6031 - LARGE CONFERENCE
5-45, 5-47	5-49	5-51	6-1	6-3	6-7	6-9	6-11	6-13	6-15	6-17	6-23	6-25	6-27, 6-43	6-29
Corridors	Conference/ meeting	Corridors	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Corridors	Conference/ meeting
1,365	635	151	649	266	358	218	249	250	348	474	403	316	1,889	419
0	31.75	0	8	1	4	1	5	4	5	7	4	6	0	20.95
2,400	1,250	200	525	300	400	400	375	400	525	600	400	400	1,600	900
50%	50%	100%	52%	50%	50%	50%	53%	50%	48%	50%	50%	50%	100%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.00	5.00
1200	625	200	275	150	200	200	200	200	250	300	200	200	1600	450
1200	625	200	275	150	200	200	200	200	250	300	200	200	1600	450
82	197	9	79	21	41	18	40	35	46	63	44	49	113	130
106	256	12	103	27	54	24	52	46	60	82	57	64	147	169
82	197	9	79	21	41	18	40	35	46	63	44	49	113	130
106	256	12	103	27	54	24	52	46	60	82	57	64	147	169
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.07	0.31	0.05	0.29	0.14	0.21	0.09	0.20	0.18	0.18	0.21	0.22	0.24	0.07	0.29
0.07	0.31	0.05	0.29	0.14	0.21	0.09	0.20	0.18	0.18	0.21	0.22	0.24	0.07	0.29
0.09	0.41	0.06	0.37	0.18	0.27	0.12	0.26	0.23	0.24	0.27	0.29	0.32	0.09	0.38
0.09	0.41	0.06	0.37	0.18	0.27	0.12	0.26	0.23	0.24	0.27	0.29	0.32	0.09	0.38
1.10	0.85	1.12	0.88	1.03	0.96	1.08	0.97	0.99	0.98	0.96	0.95	0.92	1.10	0.88
1.13	0.81	1.16	0.84	1.04	0.95	1.10	0.96	0.99	0.98	0.94	0.93	0.90	1.12	0.84

6032 - SCIENTIFIC LIVING ROOM	6048 - OFFICE, 6050 - OFFICE	6055 - OFFICE, 6057 - OFFICE, 6053 - OFFICE	6053 - OFFICE	6047 - OFFICE, 6049 - OFFICE	6091 - OFFICE	6095 - OFFICE, 6093 - OFFICE	6099 - OFFICE, 6101 - OFFICE, 6097 - OFFICE	6103 - OFFICE	6109 - OFFICE, 6107 - OFFICE, 6105 - OFFICE	6111 - OFFICE, 6113 - OFFICE	6106 - OFFICE, 6108 - OFFICE	6080 - OFFICE, 6082 - OFFICE, 6084 - OFFICE	6092 - OFFICE, 6094 - OFFICE	6060E1 - ELEC, 6058E2 - ELEC
6-31	6-33	6-35	6-37	6-39	6-47	6-49	6-51	6-53	6-55	6-57	6-59	6-61	6-63	6-65
Break rooms	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Elec/mech equipment rooms
323	262	518	254	261	235	255	384	264	421	274	397	397	394	227
6	6	3	2	5	4	6	9	1	8	2	9	9	8	0
1,000	350	375	400	350	350	350	575	275	625	400	525	525	350	1,350
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
50%	50%	47%	50%	50%	50%	50%	52%	55%	48%	50%	52%	52%	50%	26%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.00
500	175	175	200	175	175	175	300	150	300	200	275	275	175	350
500	175	175	200	175	175	175	300	150	300	200	275	275	175	350
49	46	46	25	41	34	45	68	21	65	26	69	69	64	0
64	59	60	33	53	44	59	88	27	85	34	89	89	83	0
49	46	46	25	41	34	45	68	21	65	26	69	69	64	0
64	59	60	33	53	44	59	88	27	85	34	89	89	83	0
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.10	0.26	0.26	0.13	0.23	0.19	0.26	0.23	0.14	0.22	0.13	0.25	0.25	0.36	0.00
0.10	0.26	0.26	0.13	0.23	0.19	0.26	0.23	0.14	0.22	0.13	0.25	0.25	0.36	0.00
0.13	0.34	0.34	0.16	0.30	0.25	0.34	0.29	0.18	0.28	0.17	0.33	0.33	0.47	0.00
0.13	0.34	0.34	0.16	0.30	0.25	0.34	0.29	0.18	0.28	0.17	0.33	0.33	0.47	0.00
1.07	0.91	0.90	1.04	0.93	0.97	0.91	0.94	1.03	0.95	1.03	0.92	0.92	0.80	1.17
1.09	0.88	0.87	1.05	0.91	0.96	0.88	0.92	1.04	0.93	1.05	0.89	0.89	0.74	1.22

6074 - OFFICE, 6078 - OFFICE	6062 - OFFICE, 6064 - OFFICE	6068 - OFFICE, 6070 - OFFICE, 6072 - OFFICE	6116 - SMALL CONFERENCE	6000CP - CORRIDOR	6112 - OFFICE, 6114 - OFFICE	6115 - GSAP LAB	6130 - COLD ROOM	6133 - LAB DESKS	6135 - LAB DESKS, 6137 - LAB DESKS	6139 - LAB DESKS	6141 - MEETING	6128 - TISSUE CULTURE	6132 - CLEAN ROOM
6-67	6-69	6-73	6-75	6-79	6-77	6-83A, 6-83B, 6-85, 6-87A	6-89	6-91	6-93	6-95	6-95	6-99	6-101
Office space	Office space	Office space	Conference/ meeting	Corridors	Office space	Science laboratories	Storage rooms	Office space	Office space	Office space	Conference/ meeting	Science laboratories	Storage rooms
245	270	383	148	546	239	3,375	134	112	277	141	131	211	152
5	4	9	7.4	0	4	60	0	3	10	5	4	2	0
350	350	525	350	400	350	7,500	35	200	400	200	200	1,200	300
50%	50%	52%	50%	100%	50%	49%	100%	50%	75%	75%	75%	100%	67%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.18	0.00	0.06	0.06	0.06	0.06	0.18	0.00
5.00	5.00	5.00	5.00	0.00	5.00	10.00	0.00	5.00	5.00	5.00	5.00	10.00	0.00
175	175	275	175	400	175	3700	35	100	300	150	150	1200	200
175	175	275	175	400	175	3700	35	100	300	150	150	1200	200
40	36	68	46	33	34	1208	0	22	67	33	28	58	0
52	47	88	60	43	45	1570	0	28	87	43	36	75	0
40	36	68	46	33	34	1208	0	22	67	33	28	58	0
52	47	88	60	43	45	1570	0	28	87	43	36	75	0
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.23	0.21	0.25	0.26	0.08	0.20	0.33	0.00	0.22	0.22	0.22	0.19	0.05	0.00
0.23	0.21	0.25	0.26	0.08	0.20	0.33	0.00	0.22	0.22	0.22	0.19	0.05	0.00
0.29	0.27	0.32	0.34	0.11	0.26	0.42	0.00	0.28	0.29	0.29	0.24	0.06	0.00
0.29	0.27	0.32	0.34	0.11	0.26	0.42	0.00	0.28	0.29	0.29	0.24	0.06	0.00
0.94	0.96	0.92	0.90	1.09	0.97	0.84	1.17	0.95	0.94	0.94	0.98	1.12	1.17
0.92	0.95	0.90	0.88	1.11	0.96	0.79	1.22	0.93	0.93	0.93	0.98	1.15	1.22

6122 - FREEZER ROOM	6124 - BL2+ VIRAL PREP	6000CR - CORRIDOR	6120 - PRE PCR	6118 - GEL ROOM	6143 - MEDIUM CONFERENCE	6145 - BREAK AREA, UNAMED SPACE NEXT TO 6145	6000 - ATRIUM	7001 - BREAK AREA	7011 - MEDIUM CONFERENCE	7015 - OFFICE, 7017 - OFFICE, 7019 - OFFICE	7025 - OFFICE, 7027 - OFFICE	7003 - OPEN OFFICE
6-107	6-103	6-105	6-109	6-111	6-113	6-115	6-117A, 6-117B, 6-121	7-1	7-3	7-5	7-7	7-9, 7-11, 7-15, 7-19
Storage rooms	Science laboratories	Corridors	Science laboratories	Science laboratories	Conference/ meeting	Break rooms	Multi-use assembly	Break rooms	Conference/ meeting	Office space	Office space	Office space
483	225	325	173	155	183	301	1,347	574	368	383	255	3,776
0	2	0	3	3	9.15	10	125	14.35	18.4	1.915	1.275	18.88
200	1,200	250	375	375	400	600	3,300	750	500	525	350	4,725
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
100%	100%	60%	53%	53%	50%	50%	45%	50%	50%	52%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.18	0.06	0.18	0.18	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.00	10.00	0.00	10.00	10.00	5.00	5.00	7.50	5.00	5.00	5.00	5.00	5.00
200	1200	150	200	200	200	300	1475	375	250	275	175	2375
200	1200	150	200	200	200	300	1475	375	250	275	175	2375
0	61	20	61	58	57	68	1018	106	114	33	22	321
0	79	25	79	75	74	88	1324	138	148	42	28	417
0	61	20	61	58	57	68	1018	106	114	33	22	321
0	79	25	79	75	74	88	1324	138	148	42	28	417
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.05	0.13	0.31	0.29	0.28	0.23	0.69	0.28	0.46	0.12	0.12	0.14
0.00	0.05	0.13	0.31	0.29	0.28	0.23	0.69	0.28	0.46	0.12	0.12	0.14
0.00	0.07	0.17	0.40	0.38	0.37	0.29	0.90	0.37	0.59	0.15	0.16	0.18
0.00	0.07	0.17	0.40	0.38	0.37	0.29	0.90	0.37	0.59	0.15	0.16	0.18
1.17	1.12	1.04	0.86	0.88	0.88	0.94	0.48	0.88	0.71	1.05	1.04	1.03
1.22	1.15	1.05	0.82	0.84	0.85	0.92	0.32	0.85	0.62	1.06	1.06	1.04

7031 - SMALL CONFERENCE	7000CC - CORRIDOR, 7000LB - ELEVATOR LOBBY	7045 - R&D	7000LA - FIRE SERVICE ACCESS LOBBY	706000 - ELEC, 70580 - ELEC	7076 - REAGENT PREP	7055 - ION DETECTION	7065 - ILLUMINA	7075 - SAMPLE PREP	7057 - BREAKING RM	7059 - GOWNING RM
7-13	7-17	7-21A, 7-21B	7-23	7-25	7-27	7-29	7-31	7-33A, 7-33B, 7-33C, 7-33D, 7-35A, 7-35B, 7-35C, 7-35D	7-37	7-39
Conference/ meeting	Corridors	Science laboratories	Corridors	Elec/mech equipment rooms	Occupiable storage rooms for dry materials	Science laboratories	Science laboratories	Science laboratories	Science laboratories	Corridors
181	1,150	1,510	237	300	129	1,132	1,831	3,326	248	218
9.05	0	20	0	0	0.258	20	4	26	4	0
225	750	2,950	400	1,350	1,000	1,025	1,650	7,800	1,900	800
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
67%	100%	54%	100%	26%	100%	100%	100%	38%	100%	25%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.18	0.06	0.00	0.06	0.18	0.18	0.18	0.18	0.06
5.00	0.00	10.00	0.00	0.00	5.00	10.00	10.00	10.00	10.00	0.00
150	750	1600	400	350	1000	1025	1650	3000	1900	200
150	750	1600	400	350	1000	1025	1650	3000	1900	200
56	69	472	14	0	9	404	370	859	85	13
73	90	613	18	0	12	525	480	1116	110	17
56	69	472	14	0	9	404	370	859	85	13
73	90	613	18	0	12	525	480	1116	110	17
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.37	0.09	0.29	0.04	0.00	0.01	0.39	0.22	0.29	0.04	0.07
0.37	0.09	0.29	0.04	0.00	0.01	0.39	0.22	0.29	0.04	0.07
0.49	0.12	0.38	0.05	0.00	0.01	0.51	0.29	0.37	0.06	0.09
0.49	0.12	0.38	0.05	0.00	0.01	0.51	0.29	0.37	0.06	0.09
0.79	1.07	0.87	1.13	1.17	1.16	0.77	0.94	0.88	1.12	1.10
0.73	1.10	0.83	1.17	1.22	1.21	0.70	0.93	0.84	1.16	1.13

7085 - CLEAN SAMPLE 2	7000CF - CORRIDOR	7000CG - CORRIDOR	7095 - CLEAN SAMPLE 1	*7105 - SINGLE CELL PCR*	7115 - BL2	7119 - GOWNING RM	7116 - ANTEROOM	7084 - RODI/GAS MANIFOLD RM	7000CB - PASSAGE	7121 - SMALL CONFERENCE	7000CJ - CORRIDOR	8009 - OFFICE, 8007 - OFFICE, 8011 - OFFICE	8013 - OFFICE
7-43, 7-49	7-45	7-51	7-55, 7-59, 7-61, 7-63	7-67	7-69	7-71	7-73	7-75	7-75	7-77	7-79, 7-81A, 7-81B	8-1	8-3
Science laboratories	Corridors	Corridors	Science laboratories	Science laboratories	Science laboratories	Corridors	Corridors	Storage rooms	Corridors	Conference/ meeting	Corridors	Office space	Office space
914	363	569	1,373	494	240	242	75	93	63	188	649	490	209
13	0	0	20	10	5	0	0	0	0	9.4	0	8	1
2,600	400	400	3,300	800	900	800	200	100	300	300	5,000	525	200
42%	50%	50%	20%	31%	25%	28%	100%	100%	100%	50%	50%	52%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.18	0.06	0.06	0.18	0.18	0.18	0.06	0.06	0.00	0.06	0.06	0.06	0.06	0.06
10.00	0.00	0.00	10.00	10.00	10.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	5.00
1100	200	200	650	250	225	225	200	100	300	150	2500	275	100
1100	200	200	650	250	225	225	200	100	300	150	2500	275	100
295	22	34	447	189	93	15	5	0	4	58	39	69	18
383	28	44	581	246	121	19	6	0	5	76	51	90	23
295	22	34	447	189	93	15	5	0	4	58	39	69	18
383	28	44	581	246	121	19	6	0	5	76	51	90	23
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.27	0.11	0.17	0.69	0.76	0.41	0.06	0.02	0.00	0.01	0.39	0.02	0.25	0.18
0.27	0.11	0.17	0.69	0.76	0.41	0.06	0.02	0.00	0.01	0.39	0.02	0.25	0.18
0.35	0.14	0.22	0.89	0.98	0.54	0.08	0.03	0.00	0.02	0.51	0.02	0.33	0.23
0.35	0.14	0.22	0.89	0.98	0.54	0.08	0.03	0.00	0.02	0.51	0.02	0.33	0.23
0.90	1.06	1.00	0.48	0.41	0.75	1.10	1.14	1.17	1.15	0.78	1.15	0.91	0.99
0.87	1.08	1.00	0.32	0.23	0.68	1.13	1.19	1.22	1.20	0.71	1.20	0.89	0.99

8015 - SMALL CONFERENCE	8008 - OFFICE, 8010 - OFFICE, 8012 - OFFICE	8029 - BSP POST PCR	8014 - TISSUE CULTURE ROOM	8016 - COLD ROOM, 8018 - FREEZER	8028 - RTS ROOM	8026 - LAB DESKS	8025 - BSP PRE LAB	8039 - LAB DESKS	8037 - LAB DESKS	8035 - LAB DESKS	8033 - LAB DESKS
8-5	8-7	8-9	8-11	8-13	8-15	8-17	8-17A, 8-17B, 8-19A	8-21A	8-21B	8-21C	8-21D
Conference/ meeting	Office space	Science laboratories	Science laboratories	Storage rooms	Science laboratories	Office space	Science laboratories	Office space	Office space	Office space	Office space
223	394	350	252	181	489	232	3,160	210	209	186	174
11.15	9	8	3	0	5	6	48	4	8	6	6
350	525	750	1,200	60	350	400	6,250	250	250	250	250
50%	52%	50%	100%	100%	79%	50%	51%	60%	60%	60%	60%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.18	0.18	0.00	0.18	0.06	0.18	0.06	0.06	0.06	0.06
5.00	5.00	10.00	10.00	0.00	10.00	5.00	10.00	5.00	5.00	5.00	5.00
175	275	375	1200	60	275	200	3200	150	150	150	150
175	275	375	1200	60	275	200	3200	150	150	150	150
69	69	143	75	0	138	44	1049	33	53	41	40
90	89	186	98	0	179	57	1363	42	68	54	53
69	69	143	75	0	138	44	1049	33	53	41	40
90	89	186	98	0	179	57	1363	42	68	54	53
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.40	0.25	0.38	0.06	0.00	0.50	0.22	0.33	0.22	0.35	0.27	0.27
0.40	0.25	0.38	0.06	0.00	0.50	0.22	0.33	0.22	0.35	0.27	0.27
0.51	0.32	0.50	0.08	0.00	0.65	0.29	0.43	0.28	0.46	0.36	0.35
0.51	0.32	0.50	0.08	0.00	0.65	0.29	0.43	0.28	0.46	0.36	0.35
0.77	0.92	0.79	1.10	1.17	0.67	0.95	0.84	0.95	0.82	0.89	0.90
0.70	0.89	0.72	1.14	1.22	0.56	0.93	0.79	0.93	0.76	0.86	0.87

8040 - MEN, 8044 - WOMEN, 8000LB - ELEVATOR LOBBY, 8000CC - CORRIDOR, 8000LA - FIRE SERVICE ACCESS LOBBY	8061 - PROJECT MANAGERS OFFICE	8059 - LAB MANAGERS	8063 - LAB DESKS	8065 - POST PCR GAP LAB	8058E2 - ELEC, 8060 - ELEC	8062 - SMALL CONFERENCE	8064 - STORAGE	8070, 8066 COLD ROOM, 8068, 8072 FREEZER	8075 - PRE PCR WHOLE GENOME	8085 - PRE PCR EXPRESSION	8095 - PRE PCR LOWPLEX	8097 - OFFICE	8099 - OFFICE, 8103 - OFFICE	8111 - MEETING	8086 - LAB SUPPORT	8102 - COPY
8-23, 8-61	8-25	8-27	8-29A, 8-29B	8-31A, 8-31B, 8-31C, 8-31D, 8-33B, 8-33C	8-35	8-37	8-39	8-41	8-43A, 8-43B	8-45	8-47A, 8-47B	8-49	8-51	8-51	8-53	8-55
Corridors	Office space	Office space	Office space	Science laboratories	Elec/mech equipment rooms	Conference/ meeting	Storage rooms	Storage rooms	Science laboratories	Science laboratories	Science laboratories	Office space	Office space	Conference/ meeting	Storage rooms	Corridors
1,768	242	389	738	4,451	286	229	162	492	746	312	957	195	260	122	133	120
0	3	6	5	51	0	11.45	0	0	12	4	18	4	6	6.1	0	0
1,600	300	550	1,000	9,325	1,350	400	300	120	1,600	850	1,950	300	400	200	250	250
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
100%	50%	50%	50%	43%	26%	50%	50%	100%	42%	47%	45%	50%	50%	50%	50%	60%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.18	0.00	0.06	0.00	0.00	0.18	0.18	0.18	0.06	0.06	0.06	0.00	0.06
0.00	5.00	5.00	5.00	10.00	0.00	5.00	0.00	0.00	10.00	10.00	10.00	5.00	5.00	5.00	0.00	0.00
1600	150	275	500	4050	350	200	150	120	675	400	875	150	200	100	125	150
1600	150	275	500	4050	350	200	150	120	675	400	875	150	200	100	125	150
106	30	53	69	1311	0	71	0	0	254	96	352	32	46	38	0	7
138	38	69	90	1705	0	92	0	0	331	125	458	41	59	49	0	9
106	30	53	69	1311	0	71	0	0	254	96	352	32	46	38	0	7
138	38	69	90	1705	0	92	0	0	331	125	458	41	59	49	0	9
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.07	0.20	0.19	0.14	0.32	0.00	0.35	0.00	0.00	0.38	0.24	0.40	0.21	0.23	0.38	0.00	0.05
0.07	0.20	0.19	0.14	0.32	0.00	0.35	0.00	0.00	0.38	0.24	0.40	0.21	0.23	0.38	0.00	0.05
0.09	0.26	0.25	0.18	0.42	0.00	0.46	0.00	0.00	0.49	0.31	0.52	0.27	0.30	0.49	0.00	0.06
0.09	0.26	0.25	0.18	0.42	0.00	0.46	0.00	0.00	0.49	0.31	0.52	0.27	0.30	0.49	0.00	0.06
1.10	0.97	0.97	1.03	0.84	1.17	0.81	1.17	1.17	0.79	0.93	0.76	0.96	0.94	0.79	1.17	1.12
1.13	0.96	0.96	1.04	0.80	1.22	0.76	1.22	1.22	0.73	0.90	0.69	0.94	0.92	0.73	1.22	1.15

8084 - THERMO CYCLER, 8082 - CRYOGEN MANIFOLD, 8080 - -80 FREEZER, 8078 - -80 FREEZER	8001 - BREAK AREA	9009 - OFFICE, 9007 - OFFICE, 9011 - OFFICE	9013 - OFFICE	9017 - OFFICE, 9015 - OFFICE	9010 - OFFICE	9012 - BREAKOUT	9022 - OFFICE, 9008 - OFFICE	9021 - OFFICE, 9019 - OFFICE	9014 - OFFICE, 9016 - OFFICE, 9018 - OFFICE	9026 - OFFICE, 9024 - OFFICE, 9020 - OFFICE	9040 - MEN, 9044 - WOMEN, 9000LB - ELEVATOR LOBBY, 9000CA - CORRIDOR, 9000LA - FIRE SERVICE ACCESS LOBBY
8-57	8-59	9-1	9-3	9-5	9-7	9-9	9-11	9-13	9-15	9-17	9-19, 9-97
Storage rooms	Break rooms	Office space	Office space	Office space	Office space	Corridors	Office space	Office space	Office space	Office space	Corridors
1,251	910	390	276	308	109	138	336	260	327	540	1,754
0	22.75	7	1	6	1	0	7	5	3	12	0
800	1,400	525	300	400	200	200	450	350	450	675	1,600
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
100%	50%	48%	50%	50%	50%	50%	50%	50%	50%	48%	100%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.00	5.00	5.00	5.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	0.00
800	700	250	150	200	100	100	225	175	225	325	1600
800	700	250	150	200	100	100	225	175	225	325	1600
0	168	58	22	48	12	8	55	41	35	92	105
0	219	76	28	63	15	11	72	53	45	120	137
0	168	58	22	48	12	8	55	41	35	92	105
0	219	76	28	63	15	11	72	53	45	120	137
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.24	0.23	0.14	0.24	0.12	0.08	0.25	0.23	0.15	0.28	0.07
0.00	0.24	0.23	0.14	0.24	0.12	0.08	0.25	0.23	0.15	0.28	0.07
0.00	0.31	0.30	0.19	0.32	0.15	0.11	0.32	0.30	0.20	0.37	0.09
0.00	0.31	0.30	0.19	0.32	0.15	0.11	0.32	0.30	0.20	0.37	0.09
1.17	0.93	0.93	1.02	0.92	1.05	1.08	0.92	0.93	1.01	0.88	1.10
1.22	0.90	0.91	1.03	0.90	1.07	1.11	0.90	0.92	1.02	0.85	1.13

9023 - OFFICE, 9029 - OFFICE	9028 - OFFICE, 9030 - OFFICE	9031 - LARGE CONFERENCE	9032 - SCIENTIFIC LIVING ROOM	9057 - OFFICE, 9055 - OFFICE	9053 - OFFICE	9047 - OFFICE, 9049 - OFFICE	9048 - OFFICE, 9050 - OFFICE	9077 - TISSUE CULTURE ROOM	9066 - MICROSCOPY IMAGING
9-21	9-23	9-25	9-27	9-29	9-31	9-33	9-35	9-37	9-41
Office space	Office space	Conference/ meeting	Break rooms	Office space	Office space	Office space	Office space	Science laboratories	Office space
355	316	433	322	273	255	270	260	484	188
6	6	21.65	6	2	1	6	6	5	0.94
450	400	1,300	1,200	350	350	400	350	2,500	450
50%	50%	50%	50%	50%	50%	50%	50%	100%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.18	0.06
5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00
225	200	650	600	175	175	200	175	2500	225
225	200	650	600	175	175	200	175	2500	225
51	49	134	49	26	20	46	46	137	16
67	64	174	64	34	26	60	59	178	21
51	49	134	49	26	20	46	46	137	16
67	64	174	64	34	26	60	59	178	21
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.23	0.24	0.21	0.08	0.15	0.12	0.23	0.26	0.05	0.07
0.23	0.24	0.21	0.08	0.15	0.12	0.23	0.26	0.05	0.07
0.30	0.32	0.27	0.11	0.20	0.15	0.30	0.34	0.07	0.09
0.30	0.32	0.27	0.11	0.20	0.15	0.30	0.34	0.07	0.09
0.94	0.92	0.96	1.08	1.02	1.05	0.94	0.91	1.11	1.10
0.92	0.90	0.95	1.11	1.02	1.07	0.92	0.88	1.15	1.12

9062 - EPHYS ROOM	9000CJ - CORRIDOR	9060E2 - ELEC, 90580 - ELEC	9070 - BL2 + TISSUE CULTURE ROOM	9064 - H-2 STORAGE	9068 - COLD ROOM	9083 - LAB DESKS, 9081 - LAB DESKS, 9079 - LAB DESKS	9087 - LAB DESKS, 9085 - LAB DESKS	9089 - LAB DESKS	9075 - LAB	9000CL - CORRIDOR	9093 - OFFICE	9099 - OFFICE, 9095 - OFFICE, 9097 - OFFICE
9-43	9-45	9-47	9-49	9-51	9-53	9-55	9-57A	9-57B	9-59A, 9-59B, 9-59C, 9-61A, 9-61B, 9-61C, 9-63A, 9-63B, 9-63C	9-65	9-67	9-69
Corridors	Corridors	Elec/mech equipment rooms	Science laboratories	Storage rooms	Storage rooms	Office space	Office space	Office space	Science laboratories	Corridors	Office space	Office space
180	197	281	421	88	118	460	432	432	6,295	508	208	399
0	0	0	4	0	0	15	10	3	110	0	1	7
600	100	1,350	2,600	250	35	600	400	200	12,700	250	250	550
50%	100%	26%	100%	60%	100%	75%	75%	75%	44%	100%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.00	0.18	0.00	0.00	0.06	0.06	0.06	0.18	0.06	0.06	0.06
0.00	0.00	0.00	10.00	0.00	0.00	5.00	5.00	5.00	10.00	0.00	5.00	5.00
300	100	350	2600	150	35	450	300	150	5625	250	125	275
300	100	350	2600	150	35	450	300	150	5625	250	125	275
11	12	0	116	0	0	103	76	41	2233	30	17	59
14	15	0	151	0	0	133	99	53	2903	40	23	77
11	12	0	116	0	0	103	76	41	2233	30	17	59
14	15	0	151	0	0	133	99	53	2903	40	23	77
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.04	0.12	0.00	0.04	0.00	0.00	0.23	0.25	0.27	0.40	0.12	0.14	0.21
0.04	0.12	0.00	0.04	0.00	0.00	0.23	0.25	0.27	0.40	0.12	0.14	0.21
0.05	0.15	0.00	0.06	0.00	0.00	0.30	0.33	0.35	0.52	0.16	0.18	0.28
0.05	0.15	0.00	0.06	0.00	0.00	0.30	0.33	0.35	0.52	0.16	0.18	0.28
1.13	1.05	1.17	1.12	1.17	1.17	0.94	0.91	0.89	0.77	1.05	1.03	0.95
1.17	1.06	1.22	1.16	1.22	1.22	0.92	0.89	0.86	0.70	1.06	1.04	0.94

9101 - BREAK	9105 - OFFICE	9090 - FREEZER ROOM	9086 - RADIO ISOTOPE RM	9084 - DARK ROOM	9080 - STORAGE	9088 - LAB MECH RM	9000CK - CORRIDOR	9082 - HOLDING	9078 - PROCEDURE ROOM
9-71	9-73	9-75	9-77	9-79	9-79	9-81	9-83	9-85	9-87
Break rooms	Office space	Storage rooms	Science laboratories	Science laboratories	Storage rooms	Storage rooms	Corridors	Storage rooms	Medical Procedure
270	148	291	121	110	92	92	326	86	224
6.75	1	0	2	1	0	0	0	0	4.48
350	200	150	650	175	100	775	300	250	500
ROOM	ROOM	ROOM	ROOM	ROOM	ROOM	ROOM	ROOM	ROOM	ROOM
50%	50%	100%	100%	100%	100%	13%	100%	100%	80%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.00	0.18	0.18	0.00	0.00	0.06	0.00	0.00
5.00	5.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	15.00
175	100	150	650	175	100	100	300	250	400
175	100	150	650	175	100	100	300	250	400
50	14	0	42	30	0	0	20	0	67
65	18	0	54	39	0	0	25	0	87
50	14	0	42	30	0	0	20	0	67
65	18	0	54	39	0	0	25	0	87
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.29	0.14	0.00	0.06	0.17	0.00	0.00	0.07	0.00	0.17
0.29	0.14	0.00	0.06	0.17	0.00	0.00	0.07	0.00	0.17
0.37	0.18	0.00	0.08	0.22	0.00	0.00	0.08	0.00	0.22
0.37	0.18	0.00	0.08	0.22	0.00	0.00	0.08	0.00	0.22
0.88	1.03	1.17	1.10	1.00	1.17	1.17	1.10	1.17	1.00
0.85	1.04	1.22	1.13	1.00	1.22	1.22	1.13	1.22	1.00

9076 - TISSUE CULTURE ROOM	9108 - COPY	9107 - SMALL CONFERENCE	9001 - BREAK AREA	10011 - OFFICE, 10009 - OFFICE, 10007 - OFFICE	10013 - OFFICE	10017 - OFFICE, 10015 - OFFICE	10010 - OFFICE	10012 - BREAKOUT	10022 - OFFICE, 10008 - OFFICE	10021 - OFFICE, 10019 - OFFICE	10014 - OFFICE, 10016 - OFFICE, 10018 - OFFICE	10026 - OFFICE, 10024 - OFFICE, 10020 - OFFICE	10023 - OFFICE, 10029 - OFFICE
9-89	9-91	9-93	9-95	10-1	10-3	10-5	10-7	10-7	10-9	10-11	10-13	10-15	10-17
Science laboratories	Corridors	Conference/ meeting	Break rooms	Office space	Office space	Office space	Office space	Break rooms	Office space	Office space	Office space	Office space	Office space
280	102	219	1,028	387	257	297	128	138	313	262	390	477	353
3	0	10.95	25.7	8	1	6	3	3	6	5	9	9	4
1,700	175	300	1,200	525	300	350	175	200	400	350	525	600	500
100%	100%	50%	50%	48%	50%	50%	57%	50%	50%	50%	48%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.18	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
10.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1700	175	150	600	250	150	175	100	100	200	175	250	300	250
1700	175	150	600	250	150	175	100	100	200	175	250	300	250
80	6	68	190	63	20	48	23	23	49	41	68	74	41
105	8	88	247	82	27	62	29	30	63	53	89	96	54
80	6	68	190	63	20	48	23	23	49	41	68	74	41
105	8	88	247	82	27	62	29	30	63	53	89	96	54
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.05	0.03	0.45	0.32	0.25	0.14	0.27	0.23	0.23	0.24	0.23	0.27	0.25	0.16
0.05	0.03	0.45	0.32	0.25	0.14	0.27	0.23	0.23	0.24	0.23	0.27	0.25	0.16
0.06	0.05	0.59	0.41	0.33	0.18	0.36	0.29	0.30	0.32	0.30	0.36	0.32	0.21
0.06	0.05	0.59	0.41	0.33	0.18	0.36	0.29	0.30	0.32	0.30	0.36	0.32	0.21
1.12	1.13	0.71	0.85	0.91	1.03	0.89	0.94	0.93	0.92	0.93	0.89	0.92	1.00
1.16	1.17	0.63	0.80	0.89	1.04	0.86	0.92	0.91	0.90	0.91	0.86	0.90	1.00

10028 - OFFICE, 10030 - OFFICE	10040 - MEN, 10044 - WOMEN, 10000LB - ELEVATOR LOBBY, 10000CA - CORRIDOR, 10000LA - FIRE SERVICE ACCESS LOBBY	10031 - LARGE CONFERENCE	10032 - SCIENTIFIC LIVING ROOM	10057 - OFFICE, 10055 - OFFICE	10053 - OFFICE	10047 - OFFICE, 10049 - OFFICE	10048 - OFFICE, 10050 - OFFICE	10077 - -80 FREEZER ROOM	10079 - TISSUE CULTURE	10066 - COLD ROOM	10062 - H-2 STORAGE	10000CJ - CORRIDOR	10064 - EPHYS ROOM	10068 - MICROSCOPY/ IMAGING
10-19	10-21, 10-73	10-23	10-25	10-27	10-29	10-31	10-33	10-35	10-37	10-39	10-41	10-43	10-45	10-47
Office space	Corridors	Conference/ meeting	Break rooms	Office space	Office space	Office space	Office space	Storage rooms	Science laboratories	Storage rooms	Storage rooms	Corridors	Corridors	Office space
314	2,250	433	323	271	247	269	260	464	207	100	92	197	188	184
6	0	21.65	6	3	1	5	6	0	2	0	0	0	0	0.92
400	1,600	1,200	1,200	350	350	400	350	450	950	35	150	100	400	350
50%	100%	50%	50%	50%	50%	50%	50%	100%	100%	100%	100%	100%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.18	0.00	0.00	0.06	0.06	0.06
5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	0.00	10.00	0.00	0.00	0.00	0.00	5.00
200	1600	600	600	175	175	200	175	450	950	35	150	100	200	175
200	1600	600	600	175	175	200	175	450	950	35	150	100	200	175
49	135	134	49	31	20	41	46	0	57	0	0	12	11	16
63	176	174	64	41	26	53	59	0	74	0	0	15	15	20
49	135	134	49	31	20	41	46	0	57	0	0	12	11	16
63	176	174	64	41	26	53	59	0	74	0	0	15	15	20
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.24	0.08	0.22	0.08	0.18	0.11	0.21	0.26	0.00	0.06	0.00	0.00	0.12	0.06	0.09
0.24	0.08	0.22	0.08	0.18	0.11	0.21	0.26	0.00	0.06	0.00	0.00	0.12	0.06	0.09
0.32	0.11	0.29	0.11	0.23	0.15	0.27	0.34	0.00	0.08	0.00	0.00	0.15	0.07	0.12
0.32	0.11	0.29	0.11	0.23	0.15	0.27	0.34	0.00	0.08	0.00	0.00	0.15	0.07	0.12
0.92	1.08	0.94	1.08	0.99	1.05	0.96	0.91	1.17	1.11	1.17	1.17	1.05	1.11	1.08
0.90	1.11	0.93	1.11	0.98	1.07	0.95	0.88	1.22	1.14	1.22	1.22	1.06	1.14	1.10

10068 - MICROSCOPY/ IMAGING	10058E1 - ELEC, 10060E2 - ELEC	10070 - MACHINE SHOP/ELECTRONICS	10083 - LAB DESKS, 10081 - LAB DESKS	10087 - LAB DESKS, 10085 - LAB DESKS, 10089 - LAB DESKS	10075 - LAB	10093 - LAB DESKS, 10095 - LAB DESKS, 10097 - LAB DESKS	10099 - LAB DESKS, 10101 - LAB DESKS, 10103 - LAB DESKS	10105 - OFFICE	10107 - SMALL CONFERENCE	10090 - MICROSCOPY/ IMAGING	10000CK - CORRIDOR	10086 - CELL SORTER	10084 - HOLDING	10082 - PROCEDURE ROOM
10-47	10-49	10-51	10-55	10-57A, 10-57B	10-59A, 10-59B, 10-59C, 10-61A, 10-61B, 10-61C, 10-61D, 10-63A, 10-63B, 10-63C,	10-65A, 10-65B	10-67	10-69A	10-69B	10-79	10-83	10-85	10-87	10-89
Office space	Elec/mech equipment rooms	Storage rooms	Office space	Office space	Science laboratories	Office space	Office space	Office space	Conference/ meeting	Office space	Corridors	Science laboratories	Storage rooms	Medical Procedure
184	286	115	307	432	6,705	391	415	140	205	120	319	113	86	140
0.92	0	0	10	13	42	13	15	3	10.25	0.6	0	1	0	2.8
350	1,350	300	400	600	14,400	600	600	200	275	250	175	300	300	950
50%	26%	50%	75%	75%	42%	75%	75%	75%	55%	50%	100%	50%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.00	0.00	0.06	0.06	0.18	0.06	0.06	0.06	0.06	0.06	0.06	0.18	0.00	0.00
5.00	0.00	0.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00	5.00	0.00	10.00	0.00	15.00
175	350	150	300	450	6100	450	450	150	150	125	175	150	150	475
175	350	150	300	450	6100	450	450	150	150	125	175	150	150	475
16	0	0	68	91	1627	88	100	23	64	10	19	30	0	42
20	0	0	89	118	2115	115	130	30	83	13	25	39	0	55
16	0	0	68	91	1627	88	100	23	64	10	19	30	0	42
20	0	0	89	118	2115	115	130	30	83	13	25	39	0	55
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.09	0.00	0.00	0.23	0.20	0.27	0.20	0.22	0.16	0.42	0.08	0.11	0.20	0.00	0.09
0.09	0.00	0.00	0.23	0.20	0.27	0.20	0.22	0.16	0.42	0.08	0.11	0.20	0.00	0.09
0.12	0.00	0.00	0.30	0.26	0.35	0.26	0.29	0.20	0.55	0.11	0.14	0.26	0.00	0.11
0.12	0.00	0.00	0.30	0.26	0.35	0.26	0.29	0.20	0.55	0.11	0.14	0.26	0.00	0.11
1.08	1.17	1.17	0.94	0.96	0.90	0.97	0.94	1.01	0.74	1.09	1.06	0.96	1.17	1.08
1.10	1.22	1.22	0.92	0.95	0.87	0.96	0.93	1.01	0.67	1.11	1.07	0.95	1.22	1.10

10108 - COPY	10001 - BREAK AREA	11007 - OFFICE, 11009 - OFFICE, 11011 - OFFICE	11000CB - CORRIDOR	11008 - OFFICE, 11010 - OFFICE, 11012 - OFFICE	11013 - OFFICE	11017 - OFFICE, 11019 - OFFICE, 11021 - OFFICE, 11023 - OFFICE	11014 - OFFICE, 11022 - OFFICE	11027 - OFFICE, 11029 - OFFICE	11000CE - CORRIDOR	11024 - OFFICE, 11026 - OFFICE, 11028 - OFFICE, 11030 - OFFICE	11031 - LARGE CONFERENCE	11032 - SCIENTIFIC LIVING ROOM	11048 - OFFICE, 11050 - OFFICE	11055 - OFFICE, 11057 - OFFICE
10-101	10-105	11-1	11-3	11-5	11-7	11-9	11-11	11-13	11-15	11-17	11-19	11-21	11-23	11-25
Corridors	Break rooms	Office space	Corridors	Office space	Office space	Office space	Office space	Office space	Corridors	Office space	Conference/ meeting	Break rooms	Office space	Office space
120	872	426	171	327	172	508	333	359	171	652	433	361	260	277
0	21.8	8	0	5	1	10	7	2	0	11	21.65	6	6	3
175	1,200	550	300	425	225	675	425	450	300	700	450	450	300	325
100%	50%	41%	100%	47%	44%	44%	47%	50%	100%	50%	50%	50%	50%	46%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00
175	600	225	300	200	100	300	200	225	300	350	225	225	150	150
175	600	225	300	200	100	300	200	225	300	350	225	225	150	150
7	161	66	10	45	15	80	55	32	10	94	134	52	46	32
9	210	85	13	58	20	105	71	41	13	122	174	67	59	41
7	161	66	10	45	15	80	55	32	10	94	134	52	46	32
9	210	85	13	58	20	105	71	41	13	122	174	67	59	41
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.04	0.27	0.29	0.03	0.22	0.15	0.27	0.27	0.14	0.03	0.27	0.60	0.23	0.30	0.21
0.04	0.27	0.29	0.03	0.22	0.15	0.27	0.27	0.14	0.03	0.27	0.60	0.23	0.30	0.21
0.05	0.35	0.38	0.04	0.29	0.20	0.35	0.36	0.18	0.04	0.35	0.78	0.30	0.40	0.27
0.05	0.35	0.38	0.04	0.29	0.20	0.35	0.36	0.18	0.04	0.35	0.78	0.30	0.40	0.27
1.13	0.90	0.88	1.13	0.94	1.01	0.90	0.89	1.03	1.13	0.90	0.57	0.94	0.86	0.96
1.16	0.87	0.84	1.17	0.93	1.02	0.87	0.86	1.03	1.17	0.87	0.44	0.92	0.82	0.94

11053 - OFFICE	11047 - OFFICE, 11049 - OFFICE	11000CA - CORRIDOR, 11000LB - ELEVATOR LOBBY, 11040 - MEN, 11044 - WOMEN, 11000LA - FIRE SERVICE ACCESS LOBBY	11081 - MEDIUM CONFERENCE	11083 - OFFICE, 11085 - OFFICE	11074 - OFFICE, 11078 - OFFICE, 11084 - OFFICE	11062 - MEETING	11064 - OFFICE, 11082 - OFFICE	110580 - ELEC, 1106000 - ELEC	11087 - OFFICE, 11089 - OFFICE, 11091 - OFFICE	11093 - OFFICE	11090 - OFFICE, 11098 - OFFICE, 11102 - OFFICE	11000CN - CORRIDOR	11066 - FILES	11068 - OFFICE, 11070 - OFFICE, 11072 - OFFICE
11-27	11-29	11-31, 11-81	11-33	11-35	11-37	11-39	11-39	11-41	11-43	11-45	11-47	11-49	11-57	11-57
Office space	Office space	Corridors	Conference/ meeting	Office space	Office space	Conference/ meeting	Office space	Elec/mech equipment rooms	Office space	Office space	Office space	Corridors	Storage rooms	Office space
262	262	2,202	250	274	361	126	259	283	414	180	391	861	130	380
1	2	0	12.5	5	6	6.3	6	0	8	1	9	0	0	8
325	350	1,600	500	350	450	150	300	1,350	525	225	450	400	150	450
46%	43%	100%	50%	43%	50%	50%	50%	26%	48%	44%	50%	100%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.06	0.06	0.06	0.06	0.00	0.06
5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	0.00	5.00	5.00	5.00	0.00	0.00	5.00
150	150	1600	250	150	225	75	150	350	250	100	225	400	75	225
150	150	1600	250	150	225	75	150	350	250	100	225	400	75	225
21	26	132	78	41	52	39	46	0	65	16	68	52	0	63
27	33	172	101	54	67	51	59	0	84	21	89	67	0	82
21	26	132	78	41	52	39	46	0	65	16	68	52	0	63
27	33	172	101	54	67	51	59	0	84	21	89	67	0	82
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.14	0.17	0.08	0.31	0.28	0.23	0.52	0.30	0.00	0.26	0.16	0.30	0.13	0.00	0.28
0.14	0.17	0.08	0.31	0.28	0.23	0.52	0.30	0.00	0.26	0.16	0.30	0.13	0.00	0.28
0.18	0.22	0.11	0.40	0.36	0.30	0.68	0.39	0.00	0.34	0.21	0.40	0.17	0.00	0.36
0.18	0.22	0.11	0.40	0.36	0.30	0.68	0.39	0.00	0.34	0.21	0.40	0.17	0.00	0.36
1.03	1.00	1.08	0.86	0.89	0.94	0.65	0.86	1.17	0.91	1.01	0.86	1.04	1.17	0.89
1.04	0.99	1.11	0.81	0.86	0.92	0.54	0.82	1.22	0.88	1.01	0.82	1.05	1.22	0.85

11095 - OFFICE, 11097 - OFFICE, 11103 - OFFICE	11076 - OFFICE, 11080 - OFFICE, 11088 - OFFICE	11104 - OFFICE, 11106 - OFFICE, 11108 - OFFICE, 11110 - OFFICE	11105 - OFFICE, 11107 - OFFICE, 11109 - OFFICE, 11111 - OFFICE	11000CS - CORRIDOR	11125 - OFFICE, 11127 - OFFICE, 11129 - OFFICE	11112 - NETWORK OPERATIONS CENTER	11130 - WORKSTATIONS	11133 - OFFICE	11135 - OFFICE, 11137 - OFFICE, 11139 - OFFICE	11142 - OFFICE, 11144 - OFFICE	11122 - IT WORKROOM	11141 - OFFICE, 11143 - OFFICE, 11145 - OFFICE, 11147 - OFFICE	11001 - BREAK AREA	11116 - OFFICE, 11120 - OFFICE	11000CL - CORRIDOR	11148 - COPY	11016 - FILES	11018 - MEETING
11-51	11-53	11-55	11-59	11-61	11-63	11-65	11-67	11-69	11-71	11-73	11-75	11-77	11-79	11-83	11-85	11-87	11-89	11-89
Office space	Office space	Office space	Office space	Corridors	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Office space	Break rooms	Office space	Corridors	Corridors	Storage rooms	Conference/ meeting
418	391	520	576	629	389	309	571	180	412	260	271	553	906	296	955	92	158	158
4	9	12	9	0	6	5	12	1	8	5	4	10	22.65	5	0	0	0	4
575	450	600	600	400	475	350	600	225	450	300	900	600	1,200	300	500	250	200	300
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
48%	50%	50%	50%	100%	47%	50%	50%	44%	50%	50%	56%	50%	50%	50%	100%	50%	50%	50%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.06
5.00	5.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00	5.00
275	225	300	300	400	225	175	300	100	225	150	500	300	600	150	500	125	100	150
275	225	300	300	400	225	175	300	100	225	150	500	300	600	150	500	125	100	150
45	68	91	80	38	53	44	94	16	65	41	36	83	168	43	57	6	0	29
59	89	119	103	49	69	57	123	21	84	53	47	108	218	56	74	7	0	38
45	68	91	80	38	53	44	94	16	65	41	36	83	168	43	57	6	0	29
59	89	119	103	49	69	57	123	21	84	53	47	108	218	56	74	7	0	38
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.16	0.30	0.30	0.27	0.09	0.24	0.25	0.31	0.16	0.29	0.27	0.07	0.28	0.28	0.29	0.11	0.04	0.00	0.20
0.16	0.30	0.30	0.27	0.09	0.24	0.25	0.31	0.16	0.29	0.27	0.07	0.28	0.28	0.29	0.11	0.04	0.00	0.20
0.21	0.40	0.40	0.34	0.12	0.31	0.32	0.41	0.21	0.37	0.35	0.09	0.36	0.36	0.37	0.15	0.06	0.00	0.26
0.21	0.40	0.40	0.34	0.12	0.31	0.32	0.41	0.21	0.37	0.35	0.09	0.36	0.36	0.37	0.15	0.06	0.00	0.26
1.00	0.86	0.86	0.90	1.07	0.93	0.92	0.85	1.01	0.88	0.90	1.09	0.89	0.89	0.88	1.05	1.12	1.17	0.97
1.00	0.82	0.82	0.87	1.09	0.91	0.89	0.81	1.01	0.84	0.87	1.12	0.86	0.85	0.85	1.07	1.16	1.22	0.96

M1000LA - FIRE SERVICE ACCESS LOBBY, M1000LB - ELEVATOR LOBBY	new zone	M1007 - MECHANICAL	M2000LA - FIRE SERVICE ACCESS LOBBY	M3000LA - FIRE SERVICE ACCESS LOBBY	Totals/averages		
M1-1	M1-2	M1-3, M1-4	M2-1	M3-1			
Corridors	Elec/mech equipment rooms	Elec/mech equipment rooms	Corridors	Corridors			
590	553	1,012	230	223	176,714	total sf	
0	0	0	0	0	2184.582	total P	
800	500	2,000	400	400	321,250	total cfm	
					1.00	average	
100%	100%	100%	100%	100%	63%	average	
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW			
1.00	1.00	1.00	1.00	1.00	1.00	average	Primary airflov
					1.00	average	182815
1.00	1.00	1.00	1.00	1.00	*Er* for ITU/TF		57%
1.00	1.00	1.00	1.00	1.00	*Ep* for ITU/DFDD/TF		
0.06	0.00	0.00	0.06	0.06			
0.00	0.00	0.00	0.00	0.00			
800	500	2000	400	400	183455		
800	500	2000	400	400	183455		
35	0	0	14	13	30522		
46	0	0	18	17	39678		
35	0	0	14	13	30522		
46	0	0	18	17	39678		
1.00	1.00	1.00	1.00	1.00			
1.00	1.00	1.00	1.00	1.00			
1.00	1.00	1.00	1.00	1.00			
0.04	0.00	0.00	0.03	0.03	0.76	Maximum Zd	
0.04	0.00	0.00	0.03	0.03	0.76	Maximum *Zpz*	
0.06	0.00	0.00	0.04	0.04	0.98	Maximum Zd30	
0.06	0.00	0.00	0.04	0.04	0.98	Maximum *Zpz30*	
1.12	1.17	1.17	1.13	1.13			
1.16	1.22	1.22	1.17	1.17			

AHU-5 OA% ANALYSIS

Building:				75 Ames AHU-5					
System Tag/Name:	Delete Zone			*****IMPORTANT NOTES***** Enable Macros					
Operating Condition Description:	Add Zone			Macros - Secuirty Warning -> Options -> Enable Content					
Units (select from pull-down list)				IP					
				w/o diversity				w/ diversity	
Inputs for System		**Name**	**Units**	**System**		**Diversity**		**System**	
	Floor area served by system	As	sf	20007.01					
	Population of area served by system	Ps	P	81	D	100%		81	
	Design primary supply fan airflow rate	Vpsd	cfm	53,910	D	100%		53,910	
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.09					
	OA req'd per person for system area (Weighted average)	Rps	cfm/p	9.8					
	Does system have Outdoor Air Economizer		Select from pull-down list					No	
	Outdoor air intake provided for system	OA	cfm	**60,000**					
Inputs for Potentially Critical zones									
	Show Values per Zone								
	Zone Name								
			Zone title turns purple italic for critical zone(s)						
	Zone Tag								
	Occupancy Category		Select from pull-down list:						
	Floor Area of zone	Az	sf						
	Design population of zone	Pz	P	(default value listed; may be overridden)					
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm						
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:						
	Frac. of local recirc. air that is representative of system RA	Er							
Inputs for Operating Condition Analyzed									
	Percent of total design airflow rate at conditioned analyzed	Ds	%					80%	
	Air distribution type at conditioned analyzed		Select from pull-down list:						
	Zone air distribution effectiveness at conditioned analyzed	Ez					Show codes for Ez		
	Primary air fraction of supply air at conditioned analyzed	Ep							
Inputs for Systems with Outdoor Air Economizers									
	Outdoor air Temperature	Toa	Deg F						
	Supply Air Temperature	Tp	Deg F						
	Return Air Temperature	Tr	Deg F						
	Supply Fan Heat Gain	dTsf	Deg F						
	Return Fan Heat Gain	dTrf	Deg F						
Results of Minimum ASHRAE 62.1 Ventilation Rate Procedure (EQp1)									
	System Ventilation Efficiency	Ev						**0.83**	
	Outdoor air intake required for system (EQp1)	Vot	cfm					**3,191**	
	Outdoor air per unit floor area	Vot/As	cfm/sf					**0.16**	
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p					**39.5**	
	Outdoor air as a % of design primary supply air	Ypd	%					**6%**	
Results of 30% Increase beyond ASHRAE 62.1 Ventilation Rate Procedure (EQc2)									
	System Ventilation Efficiency with 30% increase (EQc2)	Evz30						**0.78**	
	Outdoor air intake required for system with 30% increase (EQc2)	Vot30	cfm					**4,421**	
	Outdoor air per unit floor area for system with 30% increase (EQc2)	Vot30/As	cfm/sf					**0.22**	
	Outdoor air per person served by system (including diversity) (EQc2)	Vot30/Ps	cfm/p					**54.7**	
	Outdoor air as a % of design primary supply air (EQc2)	Ypd30	%					**8%**	

Detailed Calculations							
Initial Calculations for the System as a whole							
System primary supply air flow at conditioned analyzed	Vps	cfm	=	Vpsd Ds	=	43210	
Uncorrected OA intake flow req'd for system	Vou	cfm	=	Rps Ps + Ras As	=	2648	
30% increase Uncorrected OA intake flow req'd for system (EAc2)	Vou30	cfm	=	(Rps Ps + Ras As)*1.3	=	3442	
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.06	
30% increase Uncorrected OA req'd as a fraction of primary SA	Xs30		=	Vou30 / Vps	=	0.08	
Initial Calculations for individual zones							
Area outdoor air rate	Ra	cfm/sf					
People outdoor air rate	Rp	cfm/p					
Total supply air to zone (at condition being analyzed)	Vdz	cfm		Vdzd Ds			
Primary airflow to zone (at condition being analyzed)	Vpz	cfm	=	Vdz Ep	=		
Breathing zone outdoor airflow	Vbz	cfm	=	Rp Pz + Ra Az	=		
Breathing zone outdoor airflow with 30% increase (EAc2)	Vbz30	cfm	=	(Rp Pz + Ra Az)*1.3	=		
Zone outdoor airflow	Voz	cfm	=	Vbz / Ez	=		
Zone outdoor airflow with 30% increase (EAc2)	Voz30	cfm	=	Vbz30/Ez	=		
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep) Er	=		
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=		
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=		
OA fraction required in the supply air to the zone	Zd		=	Voz / Vdz	=		
OA fraction required in the primary air to the zone	Zpz		=	Voz / Vpz	=		
OA fraction required in the supply air to the zone for EAc2	Zd30		=	Voz30 / Vdz	=		
OA fraction required in the primary air to the zone for EAc2	Zpz30		=	Voz30/ Vpz	=		
System Ventilation Efficiency							
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa+FbXs-FcZpzEp)/Fa	=		
Zone Ventilation Efficiency with 30% increase (EAc2) (App A)	Evz30		=	(Fa+FbXs-FcZpz30Ep)/Fa	=		
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	**0.83**	
System Ventilation Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.92	
System Ventilation Efficiency w/ 30% increase (EAc2) (App A)	Ev30		=	min (Evz30)	=	**0.78**	
System Ventilation Efficiency w/ 30% increase (EAc2) (Table 6.3)	Ev30		=	Value from Table 6.3	=	0.85	
Minimum outdoor air intake airflow (EQp1)							
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	**3191**	
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	**0.07**	
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	2883	
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.07	
Time-averaging							
Time period with high occupancy	Th	min					
Room height	h	ft	=				
Time period over which averaging can take place	T	min	=	3 v / Vbz	=		
Error - sum of all values above will show error							
Error flag							FALSE
30% increase beyond Minimum Outdoor air intake airflow (EQc2)							
Outdoor Air Intake Flow required to System	Vot30	cfm	=	Vou / Ev	=	**4421**	
OA intake req'd as a fraction of primary SA	Y30		=	Vot / Vps	=	**0.10**	
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot30	cfm	=	Vou / Ev	=	4054	
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y30		=	Vot / Vps	=	0.09	
OA Temp at which Min OA provides all cooling							
OAT below which OA Intake flow is @ minimum		Deg F	=	{(Tp-dTsf)-(1-Y)*(Tr+dTrf)}/Y	=	-158	

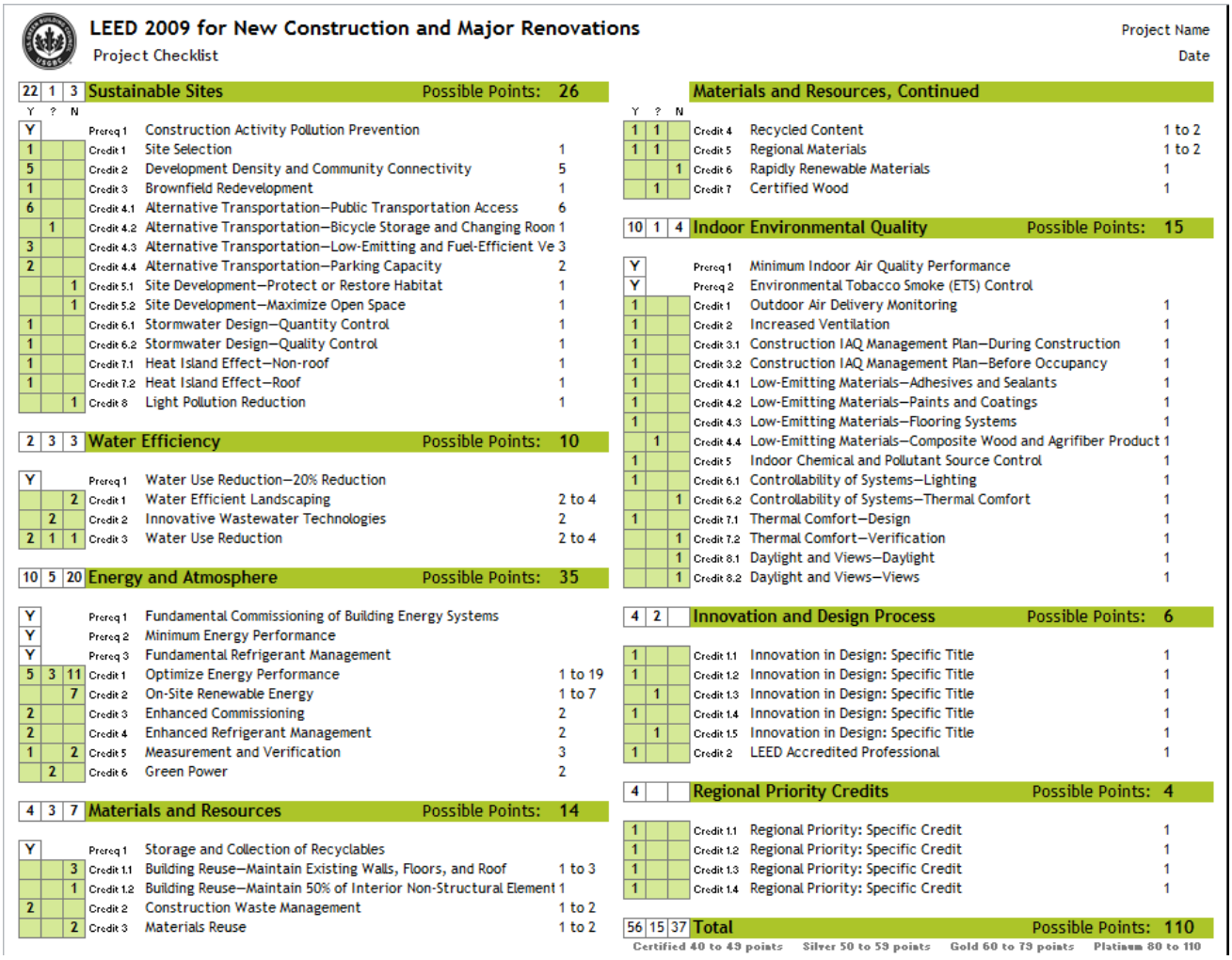
12000CD - CLEAN CORRIDOR	*12000CC - VESTIBULE*	12005 - ANIMAL HOLDING	12007 - ANIMAL HOLDING	12009 - ANIMAL HOLDING	12011 - ANIMAL HOLDING	12013 - ANIMAL HOLDING	12015 - ANIMAL HOLDING	12122 - LOCKERS/BREAK	12017 - ANIMAL HOLDING	12019 - ANIMAL HOLDING
12-1	12-1	12-3	12-5	12-7	12-9	12-11	12-13	12-93	12-15	12-17
Corridors	Corridors	Science laboratories	Science laboratories	Science laboratories	Science laboratories	Science laboratories	Science laboratories	Break rooms	Science laboratories	Science laboratories
1,117	193	381	382	382	383	305	304	300	304	303
0	0	2	2	2	2	2	2	7.5	2	2
1,200	50	1,000	1,000	1,000	1,000	750	750	750	750	750
100%	100%	75%	75%	75%	75%	73%	73%	67%	73%	73%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.06	0.18	0.18	0.18	0.18	0.18	0.18	0.06	0.18	0.18
0.00	0.00	10.00	10.00	10.00	10.00	10.00	10.00	5.00	10.00	10.00
1200	50	750	750	750	750	550	550	500	550	550
1200	50	750	750	750	750	550	550	500	550	550
67	12	89	89	89	89	75	75	56	75	75
87	15	115	115	115	116	97	97	72	97	97
67	12	89	89	89	89	75	75	56	75	75
87	15	115	115	115	116	97	97	72	97	97
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.06	0.23	0.12	0.12	0.12	0.12	0.14	0.14	0.11	0.14	0.14
0.06	0.23	0.12	0.12	0.12	0.12	0.14	0.14	0.11	0.14	0.14
0.07	0.30	0.15	0.15	0.15	0.15	0.18	0.18	0.14	0.18	0.18
0.07	0.30	0.15	0.15	0.15	0.15	0.18	0.18	0.14	0.18	0.18
1.01	0.83	0.94	0.94	0.94	0.94	0.93	0.93	0.95	0.93	0.93
1.01	0.78	0.93	0.93	0.93	0.93	0.90	0.90	0.94	0.90	0.90
308.30										
0.10										
9										
450										
7403										
FALSE										
366.32										
0.08										

12021 - ANIMAL HOLDING	12023 - ANIMAL HOLDING	12025 - ANIMAL HOLDING	12000CE - CLEAN CORRIDOR	12027 - PROCEDURE ROOM	12029 - PROCEDURE ROOM	12031 - PROCEDURE ROOM	12033 - NECROPSY	12035 - NARCOTICS	12037 - BREAK RM	12039 - OFFICE	12048, 12052, 12056 - TESTING
12-19	12-21	12-23	12-25, 12-35	12-27	12-29	12-31	12-33	12-37	12-39	12-41	12-43
Science laboratories	Science laboratories	Science laboratories	Corridors	Medical Procedure	Medical Procedure	Medical Procedure	Science laboratories	Storage rooms	Break rooms	Office space	Science laboratories
349	345	282	958	103	109	84	94	49	193	67	98
2	2	2	0	2.06	2.18	1.68	2	0	4.825	0.335	2
1,000	1,000	750	1,800	300	300	300	1,350	200	400	220	825
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
75%	75%	73%	100%	100%	100%	100%	100%	100%	63%	100%	55%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.18	0.18	0.18	0.06	0.00	0.00	0.00	0.18	0.00	0.06	0.06	0.18
10.00	10.00	10.00	0.00	15.00	15.00	15.00	10.00	0.00	5.00	5.00	10.00
750	750	550	1800	300	300	300	1350	200	250	220	450
750	750	550	1800	300	300	300	1350	200	250	220	450
83	82	71	57	31	33	25	37	0	36	6	38
108	107	92	75	40	43	33	48	0	46	7	49
83	82	71	57	31	33	25	37	0	36	6	38
108	107	92	75	40	43	33	48	0	46	7	49
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.11	0.11	0.13	0.03	0.10	0.11	0.08	0.03	0.00	0.14	0.03	0.08
0.11	0.11	0.13	0.03	0.10	0.11	0.08	0.03	0.00	0.14	0.03	0.08
0.14	0.14	0.17	0.04	0.13	0.14	0.11	0.04	0.00	0.19	0.03	0.11
0.14	0.14	0.17	0.04	0.13	0.14	0.11	0.04	0.00	0.19	0.03	0.11
0.95	0.95	0.93	1.03	0.96	0.95	0.98	1.03	1.06	0.92	1.04	0.98
0.94	0.94	0.91	1.04	0.95	0.94	0.97	1.04	1.08	0.89	1.05	0.97

12050. 12054, 12062 - TESTING	12041 - PROCEDURE ROOM	12043 - PROCEDURE ROOM	12045 - PROCEDURE ROOM	12000CG - CLEAN CORRIDOR	12047 - PROCEDURE ROOM	12000CH - BEHAVIORAL TESTING CORRIDOR	12000CH - BEHAVIORAL TESTING CORRIDOR	12049 - CONTROL AREA	120681 12072, 12076 - TESTING	12061,12063,12065 - IC	12067 - CONTROL AREA	12066, 12070, 12074 - TESTING	12000CJ - SOILED CORRIDOR	12077 - VESTIBULE	12079 - ANIMAL HOLDING
12-45	12-47	12-49	12-51	12-53	12-55	12-57	12-63	12-57	12-59	12-61	12-63	12-65	12-67	12-67	12-69
Science laboratories	Medical Procedure	Medical Procedure	Medical Procedure	Corridors	Medical Procedure	Corridors	Corridors	Corridors	Science laboratories	Science laboratories	Corridors	Science laboratories	Corridors	Unocc / Not Used	Science laboratories
121	107	99	104	228	96	360	360	443	99	37	446	118	356	74	370
2	2.14	1.98	2.08	0	1.92	0	0	0	2	0	0	0	0	0	2
825	300	450	300	650	300	275	275	900	825	150	900	825	200	50	1,000
55%	100%	100%	100%	100%	100%	100%	100%	100%	55%	100%	100%	55%	100%	100%	75%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.18	0.00	0.00	0.00	0.06	0.00	0.06	0.06	0.06	0.18	0.18	0.06	0.18	0.06	0.00	0.18
10.00	15.00	15.00	15.00	0.00	15.00	0.00	0.00	0.00	10.00	10.00	0.00	10.00	0.00	0.00	10.00
450	300	450	300	650	300	275	275	900	450	150	900	450	200	50	750
450	300	450	300	650	300	275	275	900	450	150	900	450	200	50	750
42	32	30	31	14	29	22	22	27	38	7	27	21	21	0	87
54	42	39	41	18	37	28	28	35	49	9	35	28	28	0	113
42	32	30	31	14	29	22	22	27	38	7	27	21	21	0	87
54	42	39	41	18	37	28	28	35	49	9	35	28	28	0	113
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.09	0.11	0.07	0.10	0.02	0.10	0.08	0.08	0.03	0.08	0.04	0.03	0.05	0.11	0.00	0.12
0.09	0.11	0.07	0.10	0.02	0.10	0.08	0.08	0.03	0.08	0.04	0.03	0.05	0.11	0.00	0.12
0.12	0.14	0.09	0.14	0.03	0.12	0.10	0.10	0.04	0.11	0.06	0.04	0.06	0.14	0.00	0.15
0.12	0.14	0.09	0.14	0.03	0.12	0.10	0.10	0.04	0.11	0.06	0.04	0.06	0.14	0.00	0.15
0.97	0.95	1.00	0.96	1.04	0.97	0.98	0.98	1.03	0.98	1.02	1.03	1.01	0.95	1.06	0.95
0.96	0.94	0.99	0.94	1.05	0.95	0.98	0.98	1.04	0.97	1.02	1.04	1.02	0.94	1.08	0.93

12081 - ANIMAL HOLDING	12083 - ANIMAL HOLDING	12000CF - CLEAN CORRIDOR	12112 - OFFICE	12146 - OFFICE	12036 - AIR LOCK	12134 - MEN / LOCKERS, 12128 - WOMEN TOILET	12000LB - ELEVA LOBBY	1206000 - ELEC	120580 - ELEC	12110 - STORAGE	12116 - FEED EXP	12000CL - STREET CORRIDOR	12114 - AIR LOCK	12108 - IRR	12106 - VESTIBULE	12000CA - SOILED CORRIDOR
12-71	12-73	12-75, 12-77	12-79	12-81	12-83	12-85	12-87	12-89	12-89	12-95	12-97	12-101	12-103	12-105	12-105	12-107A, 12-107B
Science laboratories	Science laboratories	Corridors	Office space	Office space	Corridors	Corridors	Corridors	Elec/mech equipment rooms	Elec/mech equipment rooms	Storage rooms	Occupiable storage rooms for dry materials	Corridors	Corridors	Science laboratories	Unocc / Not Used	Corridors
370	370	849	113	111	64	231	241	254	85	237	430	526	59	71	52	897
2	2	0	0.565	0.555	0	0	0	0	0	0	0.86	0	0	1	0	0
1,000	1,000	1,350	220	220	550	600	300	1,250	100	300	600	550	50	150	50	700
600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	50%	50%	100%	100%	100%	100%	100%
CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.18	0.18	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.00	0.00	0.06	0.06	0.06	0.18	0.00	0.06
10.00	10.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00	0.00	0.00
750	750	1350	220	220	550	600	300	1250	100	150	300	550	50	150	50	700
750	750	1350	220	220	550	600	300	1250	100	150	300	550	50	150	50	700
87	87	51	10	9	4	14	14	0	0	0	30	32	4	23	0	54
113	113	66	12	12	5	18	19	0	0	0	39	41	5	30	0	70
87	87	51	10	9	4	14	14	0	0	0	30	32	4	23	0	54
113	113	66	12	12	5	18	19	0	0	0	39	41	5	30	0	70
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.12	0.12	0.04	0.04	0.04	0.01	0.02	0.05	0.00	0.00	0.00	0.10	0.06	0.07	0.15	0.00	0.08
0.12	0.12	0.04	0.04	0.04	0.01	0.02	0.05	0.00	0.00	0.00	0.10	0.06	0.07	0.15	0.00	0.08
0.15	0.15	0.05	0.06	0.06	0.01	0.03	0.06	0.00	0.00	0.00	0.13	0.07	0.09	0.20	0.00	0.10
0.15	0.15	0.05	0.06	0.06	0.01	0.03	0.06	0.00	0.00	0.00	0.13	0.07	0.09	0.20	0.00	0.10
0.95	0.95	1.02	1.02	1.02	1.05	1.04	1.01	1.06	1.06	1.06	0.96	1.00	0.99	0.91	1.06	0.98
0.93	0.93	1.03	1.02	1.02	1.07	1.05	1.02	1.08	1.08	1.08	0.95	1.01	0.99	0.88	1.08	0.98

Appendix B: LEED 2009 Checklist Construction and Major Renovations



LEED 2009 for New Construction and Major Renovations
Project Checklist

Project Name
Date

Y	?	N			
22	**1**	**3**	**Sustainable Sites**	**Possible Points:**	**26**
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
1			Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
	1		Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Roon	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Ve	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
		1	Credit 8	Light Pollution Reduction	1
2	**3**	**3**	**Water Efficiency**	**Possible Points:**	**10**
Y			Prereq 1	Water Use Reduction—20% Reduction	
		2	Credit 1	Water Efficient Landscaping	2 to 4
	2		Credit 2	Innovative Wastewater Technologies	2
2	1	1	Credit 3	Water Use Reduction	2 to 4
10	**5**	**20**	**Energy and Atmosphere**	**Possible Points:**	**35**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
5	3	11	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
1		2	Credit 5	Measurement and Verification	3
	2		Credit 6	Green Power	2
4	**3**	**7**	**Materials and Resources**	**Possible Points:**	**14**
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Element	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Y	?	N			
			Materials and Resources, Continued		
1	1		Credit 4	Recycled Content	1 to 2
1	1		Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
	1		Credit 7	Certified Wood	1
10	**1**	**4**	**Indoor Environmental Quality**	**Possible Points:**	**15**
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
	1		Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Product	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
		1	Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
		1	Credit 7.2	Thermal Comfort—Verification	1
		1	Credit 8.1	Daylight and Views—Daylight	1
		1	Credit 8.2	Daylight and Views—Views	1
4	**2**		**Innovation and Design Process**	**Possible Points:**	**6**
1			Credit 1.1	Innovation in Design: Specific Title	1
1			Credit 1.2	Innovation in Design: Specific Title	1
	1		Credit 1.3	Innovation in Design: Specific Title	1
1			Credit 1.4	Innovation in Design: Specific Title	1
	1		Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1
4			**Regional Priority Credits**	**Possible Points:**	**4**
1			Credit 1.1	Regional Priority: Specific Credit	1
1			Credit 1.2	Regional Priority: Specific Credit	1
1			Credit 1.3	Regional Priority: Specific Credit	1
1			Credit 1.4	Regional Priority: Specific Credit	1
56	**15**	**37**	**Total**	**Possible Points:**	**110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Appendix C: EAc4 Enhanced Refrigerant Management

75 AMES

EAc4 Enhanced Refrigerant Management

LEED NC v3

Equipment Type	Manufacturer	Model	N	Q (tons)	Refrig.	GWPr	ODPr	Rc (lb/ton)	Life (yrs)	Lr (%)	Mr (%)	LCGWP	LCODP x10^5	Refrigerant Impact per ton	Refrigerant Impact Total
Centrifugal Chiller	CARRIER	19XRV5659374KFH64	2	450	R-134A	1320	0	3.5666667	25	2%	10%	113.0	0.0	113.0	101,693
Centrifugal Chiller	CARRIER	19XRV767755EMDH64	3	1000	R-134A	1320	0	2.697	25	2%	10%	85.4	0.0	85.4	256,323

3900 **TOTAL TONS**

TOTAL	91.8	358,016
PASSES		

Legend:	
N	Number of pieces of equipment (multiplier).
Q (tons)	Cooling capacity in tons.
Refrig.	Refrigerant type.
Rc (lb/ton)	Refrigerant charge in lbs/ton. Provide from manufacturer documentation. Adjust for length of refrigerant lines, if applicable.
Lr (%)	Annual leakage rate, in % of total charge. Use default, unless supported by manufacturer documentation.
Mr (%)	End of equipment life refrigerant loss, in % of total refrigerant charge. Use default.

Table was created using equation

LCGWP + LCODP x 105 ≤ 100

Where

Calculation definitions for LCGWP + LCODP x 105 ≤ 100 (IP units)
LCODP = [ODPr x (Lr x Life +Mr) x Rc]/Life
LCGWP = [GWPr x (Lr x Life +Mr) x Rc]/Life
LCODP: Lifecycle Ozone Depletion Potential (lb CFC 11/Ton-Year)
LCGWP: Lifecycle Direct Global Warming Potential (lb CO2/Ton-Year)
GWPr: Global Warming Potential of Refrigerant (0 to 12,000 lb CO2/lbr)
ODPr: Ozone Depletion Potential of Refrigerant (0 to 0.2 lb CFC 11/lbr)
Lr: Refrigerant Leakage Rate (0.5% to 2.0%; default of 2% unless otherwise demonstrated)
Mr: End-of-life Refrigerant Loss (2% to 10%; default of 10% unless otherwise demonstrated)
Rc: Refrigerant Charge (0.5 to 5.0 lbs of refrigerant per ton of gross ARI rated cooling capacity)
Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)

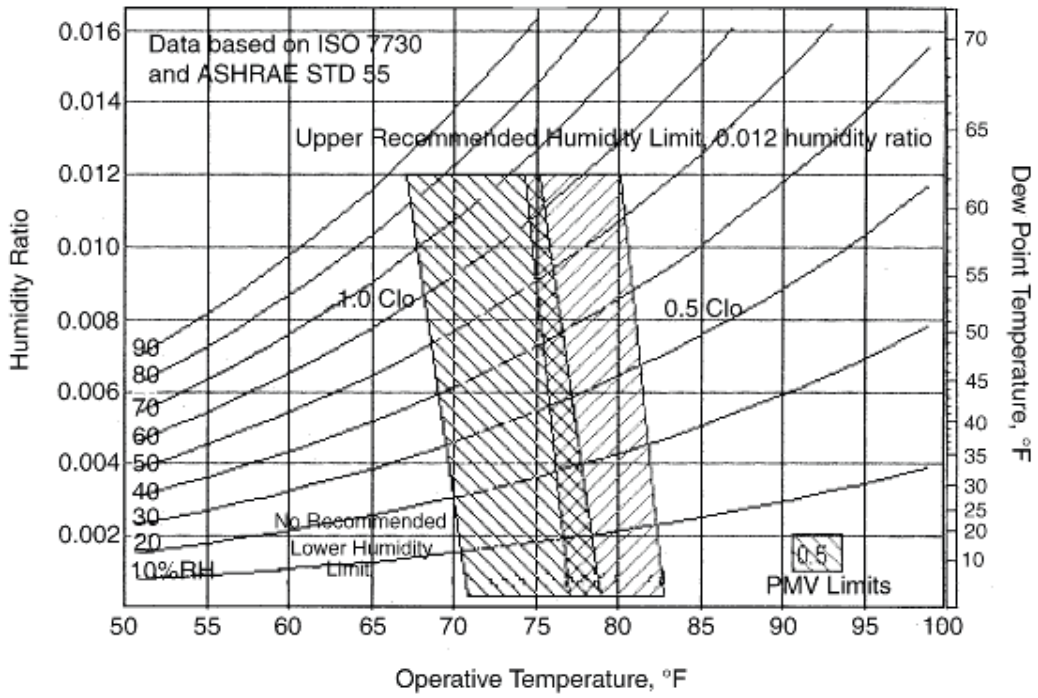
75 AMES **BR+A**

IEQc5 Indoor Chemical & Pollutant Source Control

Room #	Room Name	Door Name	Room Area (sf)	Exahust Rate (cfm)	Door Pressurization (+/- cfm)	NUMBER OF DOORS	Door Width (ft)	Door Height (ft)	Double Door? (Y/N)	Exhaust (cfm/ft2)	Door Crack Area (ft2)	Door Pressurization ("w.g.)	Door Pressurization (Pa)	Room Separation
B0003	BIO WASTE	B0003	191	750	(200)	1	4.0	8.0	Y	3.93	0.167	0.090	22.35	
B0005	MICROBULK NIT4 C02	B0005	203	150	(200)	1	6.0	8.0	Y	0.74	0.188	0.071	17.66	
B0020	RAD WASTE	B0020	160	450	(150)	1	6.0	8.0	Y	2.81	0.188	0.040	9.94	
1006	WASTE CHEM STORAGE (H-2)	1006	183	200	(150)	1	4.0	8.0	Y	1.09	0.167	0.050	12.57	
1008	VIRGIN CHEM STORAGE (H-2)	1008	124	400	(150)	1	4.0	8.0	Y	3.23	0.167	0.050	12.57	
2005	RNAi LAB	2005	1345	3000	(450)	2	6.0	8.0	Y	2.23	0.375	0.090	22.35	
					(150)	1	3.6	8.0	N		0.121	0.096	23.92	
2015	RNAi LAB	2015	1374	3000	(300)	1	6.0	8.0	Y	2.18	0.188	0.160	39.74	NO DOOR PRESSURIZATION, BUT ASSUMING IT SHOULD BE -300
					(150)	2	3.6	8.0	N		0.242	0.024	5.98	
3029	TISSUE CULTURE ROOM	3029	313	1350	150	1	3.6	8.0	N	4.31	0.121	0.096	23.92	DOOR LEADS TO 3035
3035	NOVEL THERAPEUTICS/ CHEM BIO	3035	3163	5035	(600)	2	6.0	8.0	Y	1.59	0.375	0.160	39.74	
					(450)	3	3.6	8.0	N		0.363	0.096	23.92	
4045	POST PCR LAB BL2		1364	3100	(300)	1	6.0	8.0	Y	2.27	0.188	0.160	39.74	
					(150)	1	3.6	8.0	N		0.121	0.096	23.92	
					(150)	1	3.0	8.0	N		0.115	0.107	26.60	
5035	RNAi BL2+ LAB	5035	1509	4400	(300)	1	6.0	8.0	Y	2.92	0.188	0.160	39.74	
5045	RNAi BL2+ LAB	5045	2077	4900	(300)	1	6.0	8.0	Y	2.36	0.188	0.160	39.74	
6115	GSAP LAB	6115	3700	5150	(950)	9	3.6	8.0	N	1.39	1.088	0.048	11.85	INCLUDING CORRIDOR 6000CR
					(600)	2	6.0	8.0	Y		0.375	0.160	39.74	
6118	GEL ROOM	6118	155	100	100	1	3.6	8.0	N	0.65	0.121	0.043	10.63	DOOR LEADS TO GSAP LAB (6115)
6124	BL2+ VIRAL PREP	6124	225	1100	100	1	3.6	8.0	N	4.89	0.121	0.043	10.63	DOOR LEADS TO CORRIDOR 6000CR
7075	SAMPLE PREP		3876	10200	(1,500)	5	6.0	9.0	Y	2.63	1.016	0.136	33.86	
					(600)	6	3.6	8.0	N		0.725	0.043	10.63	
8025	BSP PRE LAB	8025	3160	3100	(600)	2	7.0	8.0	Y	0.98	0.396	0.143	35.67	
					(500)	5	6.0	8.9	N		0.776	0.026	6.44	
					(150)	1	5.0	8.0	Y		0.177	0.045	11.14	
8065	POST PCR GAP LAB		966	7450	(600)	2	6.0	8.0	Y	7.71	0.375	0.160	39.74	
9064	H-2 STORAGE	9064	88	300	(150)	1	3.6	8.0	N	3.41	0.121	0.096	23.92	
9070	BL2 + TISSUE CULTURE ROOM	9070	408	2700	(100)	1	3.6	8.0	N	6.62	0.121	0.043	10.63	
9075	LAB	9075	7349	4050	(900)	8	3.0	8.0	N	0.55	0.917	0.060	14.96	INCLUDING EPHYS ROOM(9062) MICROSCOPY IMAGING(9066), DARK ROOM (9084), CORRIDOR (9000CJ), CORRIDOR (9000CK)
					(900)	6	3.5	8.0	N		0.719	0.098	24.34	
					(600)	2	5.8	8.0	Y		0.371	0.163	40.50	
					(300)	1	6.7	8.0	Y		0.194	0.148	36.94	
					(300)	1	7.0	8.0	Y		0.198	0.143	35.67	
9076	TISSUE CULTURE ROOM	9076	275	1800	(100)	1	3.6	8.0	N	6.55	0.121	0.043	10.63	
9077	TISSUE CULTURE ROOM	9077	508	2700	(200)	1	3.6	8.0	N	5.31	0.121	0.171	42.53	
9078	PROCEDURE ROOM	9078	229	600	(100)	1	3.6	8.0	N	2.62	0.121	0.043	10.63	
9082	HOLDING	9082	86	400	(150)	1	3.6	8.0	N	4.65	0.121	0.096	23.92	
9086	RADIO ISOTOPE	9086	122	1425	(150)	1	3.6	8.0	N	11.68	0.121	0.096	23.92	
9088	LAB MECH ROOM	9088	92	925	(150)	1	3.6	8.0	N	10.05	0.121	0.096	23.92	
10062	H-2 STORAGE	10062	92	175	(150)	1	3.6	8.0	N	1.90	0.121	0.096	23.92	
10075	LAB	10075	8361	6000	(1,500)	14	3.6	8.0	N	0.72	1.692	0.049	12.21	INCLUDING CELLSORTER(10086) MICROSCOPY IMAGING (10090) EQIPMT STORAGE(10080) BACTERIAL ROOM(10076) MICROSCOPY IMAGING(10068) EPHYS ROOM (10064) MACHINE SHOP/ELECTRONICS(10070) CORRIDOR(1000CJ, 1000CK, 1000CL)
					(300)	1	7.0	8.0	Y		0.198	0.143	35.67	
					(300)	1	6.0	8.0	Y		0.188	0.160	39.74	
2000CA,CB,C	SOILED CORRIDOR		2101	3350	(3,150)	21	3.6	8.0	N	1.59	2.538	0.096	23.92	
12005	ANIMAL HOLDING	12005	381	750	(150)	1	3.6	8.0	N	1.97	0.121	0.096	23.92	
12007	ANIMAL HOLDING	12007	382	750	(150)	1	3.6	8.0	N	1.96	0.121	0.096	23.92	
12009	ANIMAL HOLDING	12009	382	750	(150)	1	3.6	8.0	N	1.96	0.121	0.096	23.92	
12011	ANIMAL HOLDING	12011	383	550	(150)	1	3.6	8.0	N	1.44	0.121	0.096	23.92	
12013	ANIMAL HOLDING	12013	305	550	(150)	1	3.6	8.0	N	1.80	0.121	0.096	23.92	
12015	ANIMAL HOLDING	12015	304	550	(150)	1	3.6	8.0	N	1.81	0.121	0.096	23.92	
12017	ANIMAL HOLDING	12017	304	550	(150)	1	3.6	8.0	N	1.81	0.121	0.096	23.92	
12019	ANIMAL HOLDING	12019	303	550	(150)	1	3.6	8.0	N	1.82	0.121	0.096	23.92	
12021	ANIMAL HOLDING	12021	349	750	(150)	1	3.6	8.0	N	2.15	0.121	0.096	23.92	
12023	ANIMAL HOLDING	12023	345	750	(150)	1	3.6	8.0	N	2.17	0.121	0.096	23.92	
12025	ANIMAL HOLDING	12025	282	750	(150)	1	3.6	8.0	N	2.66	0.121	0.096	23.92	
12027	PROCEDURE ROOM	12027	103	450	(150)	1	3.6	8.0	N	4.37	0.121	0.096	23.92	
12029	PROCEDURE ROOM	12029	109	450	(150)	1	3.6	8.0	N	4.13	0.121	0.096	23.92	
12031	PROCEDURE ROOM	12031	84	450	(150)	1	3.6	8.0	N	5.36	0.121	0.096	23.92	
12033	NECROPSY	12033	94	200	(150)	1	3.6	8.0	N	2.13	0.121	0.096	23.92	
12035	NARCOTICS	12035	62	350	(150)	1	3.6	8.0	N	5.65	0.121	0.096	23.92	
12041	PROCEDURE ROOM	12041	107	500	(200)	1	3.6	8.0	N	4.67	0.121	0.171	42.53	
12043	PROCEDURE ROOM	12043	99	650	(200)	1	3.6	8.0	N	6.57	0.121	0.171	42.53	
12045	PROCEDURE ROOM	12045	104	500	(200)	1	3.6	8.0	N	4.81	0.121	0.171	42.53	
12047	PROCEDURE ROOM	12047	96	500	(200)	1	3.6	8.0	N	5.21	0.121	0.171	42.53	
12048	TESTING	12048	98	300	(150)	1	3.6	8.0	N	3.06	0.121	0.096	23.92	
12050	TESTING	12050	121	300	(150)	1	3.6	8.0	N	2.48	0.121	0.096	23.92	
12052	TESTING	12052	97	300	(150)	1	3.6	8.0	N	3.09	0.121	0.096	23.92	
12054	TESTING	12054	120	300	(150)	1	3.6	8.0	N	2.50	0.121	0.096	23.92	
12056	TESTING	12056	98	300	(150)	1	3.6	8.0	N	3.06	0.121	0.096	23.92	
12062	TESTING	12062	120	300	(150)	1	3.6	8.0	N	2.50	0.121	0.096	23.92	
12066	TESTING	12067	118	300	(150)	1	3.6	8.0	N	2.54	0.121	0.096	23.92	
12068	TESTING	12070	99	300	(150)	1	3.6	8.0	N	3.03	0.121	0.096	23.92	
12070	TESTING	12072	120	300	(150)	1	3.6	8.0	N	2.50	0.121	0.096	23.92	
12072	TESTING	12074	98	300	(150)	1	3.6	8.0	N	3.06	0.121	0.096	23.92	
12074	TESTING	12073	120	300	(150)	1	3.6	8.0	N	2.50	0.121	0.096	23.92	
12076	TESTING	12076	99	300	(150)	1	3.6	8.0	N	3.03	0.121	0.096	23.92	
12079	ANIMAL HOLDING	12079	970	750	(150)	1	3.6	8.0	N	0.77	0.121	0.096	23.92	
12081	ANIMAL HOLDING	12081	370	750	(150)	1	3.6	8.0	N	2.03	0.121	0.096	23.92	
12083	ANIMAL HOLDING	12083	370	750	(150)	1	3.6	8.0	N	2.03	0.121	0.096	23.92	
12085	QUARANTINE		398	1000	(150)	1	3.6	8.0	N	2.51	0.121	0.096	23.92	
12093	JNNEL WASHER/CAGE RACK WASHE	12093	968	2950	(300)	1	6.0	8.0	Y	3.05	0.188	0.160	39.74	
12094	ANIMAL RECEIVING	12094	108	550	(150)	1	3.6	8.0	N	5.09	0.121	0.096	23.92	
12098	PREP	12098	65	400	(200)	1	4.0	8.0	Y	6.15	0.167	0.090	22.35	
12100	MCT	12100	82	300	(150)	1	3.0	8.0	N	3.66	0.115	0.107	26.60	SLIDING DOOR
12102	X-SPECT	12102	81	350	(200)	1	3.6	8.0	N	4.32	0.121	0.171	42.53	
12104	MCT/ PET/ SPECT	12104	112	300	(150)	1	3.6	8.0	N	2.68	0.121	0.096	23.92	
12108	IRR	12108	71	300	(150)	1	3.6	8.0	N	4.23	0.121	0.096	23.92	
12118	ANIMAL RECEIVING	12118	127	550	(150)	1	3.6	8.0	N	4.33	0.121	0.096	23.92	
12132	J.C		20	75	(75)	1	3.0	8.0	N	3.75	0.115	0.027	6.65	

Appendix E: EQc7.1 01 Detailed Narrative from BR+A

1. It is expected that the occupants will, for the most part, dress seasonally. Since the building occupancy includes areas that require special clothing to fulfill the space function, such as lab coats for the lab areas, these areas were designed to have a consistent clothing level year round. Clothing insulation is considered in design only as it relates to the seasonal requirements for the space temperature and humidity setpoints, when the clothing levels are expected to be remarkably different throughout the year (short sleeves in summer, wool sweaters in winter) requiring different seasonal setpoints. Each unique category of space design setpoints is outlined on the LEED-Online Form.



The space setpoint for typical spaces on the project was designed based on 74°F and 50% RH in cooling mode and 68 °F in heating mode. These setpoints are also outlined in the uploaded HVAC BOD.

In all spaces that comprise this project, the space activity level was taken into account when calculating the cooling load and sizing the HVAC equipment serving the spaces. ASHRAE Fundamentals has several categories of occupant activity that designers use when calculating cooling loads, ranging from seated at theater (sitting for long periods of time), office work (standing and sitting), walking standing (moving about a lot between workstations) to higher level activities like factory work, bowling, and athletics, where the people would be contributing a much higher heat gain to the spaces. Since the spaces have primarily office, meeting space and lab occupancy, they were designed to the standing and sitting activity level.

Radiant temperatures are a concern in this building mainly at the perimeter glazed areas. Design measures to mitigate excess solar gain include active chilled beams, interior adjustable blinds, and daylighting control of the Eastern exposure light fixtures. Design measures to mitigate asymmetric radiant winter conditions near windows include excellent thermal-performing windows, radiant floor heating at the perimeter, and local perimeter thermal control zones.

The air speed is a consideration in the design of the air outlets in regards to placement and outlet

velocity of the air distribution systems. The supply air diffusers were selected and placed to prevent any air "dumping" on the occupants, where the cold air hits an obstruction and crashes down on the occupants at low discharge air temperatures, or high discharge air velocities preventing the cold discharge air from mixing at the ceiling level before reaching the occupied zone. As such, the diffusers were placed away from any obstructions such as columns and were selected so that their 50 fpm throw (distance from the diffuser at which the air is at 50 fpm) was low enough to prevent the air streams from adjacent diffusers from crashing, which would have the same effect. The diffusers are all a high-induction type to allow for proper air mixing with the ambient air prior to reaching the occupants at a lower velocity (less than 40 fpm), eliminating both drafts and cold spots over a variable volume operating range.

2. The unit capacities to serve the space conditions are as indicated in the uploaded AHU schedule and psychrometric charts. It is expected that the space comfort levels will be maintained year round with the VAV systems as designed and controlled. Refer to the attached Sequences of Operation for the designed response of the systems to varying loads and conditions.

3. The systems have been designed to maintain comfort levels within the building year round and under all occupancy levels. The systems were designed at outside air conditions (summer and winter) that exceed ASHRAE's 1% weather conditions, making weather related comfort issues such as extended heat waves or cold snaps less likely, though not impossible. The only other factors that would negatively impact space comfort, besides problems with the installation or operation of the systems, would be if space occupancies changed dramatically post-installation, making the as-designed HVAC systems over- or under-sized for the new usage. The diversity built into the systems should allow for the zone level HVAC to be modified or replaced in these cases without impacting the central system capacities.

4. Please refer to uploaded ductwork and piping plans for the space layouts served by the HVAC systems. Individual zones are identified by the terminal devices (VAV/CV boxes, chilled beams, radiant heating). All terminal devices, as well as registers and outlets, are labeled and scheduled in the uploaded documentation.

5. It is not expected that any structural or decorative items will negatively impact comfort levels within the spaces. All outlets have been selected and located to prevent any drafts or cold spots. The control sensors have been located within the room to be away from heat sources, including windows and equipment layouts as designed; the occupants will be oriented to the need to not obstruct the sensors by the building operators once the building is occupied and as new employees are brought on board as part of their thermal comfort response to EQc7.2.

6. It is not anticipated that any zone will have areas outside the comfort control areas that will preclude any occupants from being permanently located.

7. Please refer to uploaded piping plans for locations of thermal controls and the Instrumentation Terminal Devices and Direct Digital/Automatic Temperature Controls documents for control descriptions. The temperature sensors to be installed on this project provide some manual adjustment of the local setpoint for each zone (±4 °F) but the overall control of the facility will be automatically controlled by the BMS.

8. The control functionality that must be met on this project is outlined in the Direct Digital/Automatic Temperature Controls and Sequences of Operation documents, which have been uploaded. The final control sequences and diagrams will be produced by the installing contractor and provided to the building Owner as part of the project closeout documents.

9. The operation and maintenance documentation, including the building controls, will be provided to the building Owner as part of the project closeout documents.

10. The operation and maintenance requirements of the building controls will be provided to the building Owner as part of the project closeout documents. All zone and central controls will be automatic and monitored and supervised by the BMS.

11. The capacity of the unit serving the project was based on the calculated peak loads. These were based on the outside air conditions and interior cooling loads for the project, as listed in the uploaded HVAC BOD and the envelope criteria as listed below. The outside air loads were based on the conditions outlined in the uploaded HVAC BOD and psychometric charts and the air volumes listed in the uploaded AHU schedules.

    The building envelope information was based on the actual architectural design as follows:

    Wall: Assembly U-value: 0.043 Btu/h-ft2-F; corrugated metal panel, 2 1/2" R.I, air barrier, 5/8" sheathing, 31/2" cavity insulation, 1/2" GWB.

    Roof: Assembly U-value: 0.036 Btu/h-ft2-F; 2" conc pavers, 4" R.I, 1/8"asphalt board, waterproof membrane, 4 1/2" normal weight concrete slab, 3" vented roof deck

    Floor: 6" conc slab, w/continuous vapor barrier & 2" continuous insulation under the slab.

    Glazing: 1" clear heat strengthened radiant low-e insulating glass. Whole curtain wall U-value: 0.3, SHGC: 0.41

    Since all the installed systems are variable volume, they are fully capable of meeting the expected diversity in the cooling and heating loads throughout the year.