



Energy Conservation

Annual Report – Fiscal Year 2013

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1. EXECUTIVE SUMMARY

In fiscal year 2013, energy conservation teams continued to expand energy conservation efforts in University of Michigan Hospital and Health Centers (UMHHC) facilities and as a result, UMHHC continues to show improvements in energy efficiency.

Energy Performance

In fiscal year 2013, UMHHC facilities consumed nearly \$26 Million in utilities. These facilities improved their energy efficiency by 6% compared to the previous year, resulting in approximately \$1.8 Million of total avoided utility cost. For further details, see section 2, “Energy Performance” of this report.

Energy Conservation

Fiscal year 2013 continued energy conservation efforts by various energy teams which continue to show significant improvements to the overall UMHHC building portfolio. During this year, 10 energy conservation projects were completed in existing facilities which are anticipated to save \$390,000 annually. These projects cost \$264,506 to implement, yielding a 0.7 year overall payback period. For further details, see section 3, “Energy Conservation” of this report.

Environmental Impact

In addition to the demand reduction and cost benefits of energy conservation, improvements also provide a significant environmental benefit by reducing the greenhouse gas emissions associated with the generation of building utilities. Existing facilities improved total utility driven greenhouse gas emission efficiency by 6% compared to fiscal year 2012, yielding nearly 10,000 Tons of avoided greenhouse gas emissions. For further details, see section 4, “Environmental Impact” of this report.

Building Summary & Energy Star

Based on analyses of building utilities and efficiencies, the following buildings are identified as the most efficient UMHHC facilities, categorized by their primary Energy Star building type:

- Hospital Building: Children’s & Women’s Hospital – 183.6 kBTU/ft²
- Medical Office Building: Canton Health Center – 67.4 kBTU/ft²
- General Office Building: Michigan House – 49.0 kBTU/ft²

In total, on a scale of 0 to 100, the UMHHC building portfolio has earned a score of 34 in the U.S. EPA Energy Star rating system. For further details and a complete listing of UMHHC building performance, see section 5, “Building Summary & Energy Star” of this report.

2. ENERGY PERFORMANCE

In fiscal year 2013, the total utility cost for all UMHHC facilities was \$25,711,414. Overall, facilities improved their energy efficiency by 6% compared to the previous year, resulting in approximately \$1.8 Million in total avoided utility cost. This is detailed in Figure 2.1 below.

Figure 2.1: Breakdown of Avoided Utility Cost vs. FY2012

Utility	FY2012 Efficiency	FY2013 Efficiency	FY2013 Average Utility Rate	Avoided Utility Cost
Electric	29.0 KWH/ft ²	27.6 KWH/ft ²	\$0.090/KWH	\$830,490
Steam	0.0700 MLB/ft ²	0.0612 MLB/ft ²	\$14.51/MLB	\$832,995
Natural Gas	0.0188 MCF/ft ²	0.0201 MCF/ft ²	\$7.48/MCF	-\$65,152
Water/Sewer	0.0554 CCF/ft ²	0.0508 CCF/ft ²	\$7.63/CCF	\$228,955
Total:				\$1,800,000

Since utility cost rates and the UMHHC portfolio of building area are continually changing, it is important to normalize utility figures for comparison and evaluation of efficiency and performance from year to year. Figure 2.2 illustrates the recent history of total UMHHC building energy efficiency (measured in BTU/ft²) and utility cost efficiency (measured in \$/ft²). Energy efficiency normalizes electric, steam, and natural gas utility into a common energy unit, BTU. Since water & sewer are not an energy utility, this data is not included in this chart. UMHHC facility efficiency has improved 22% since fiscal year 2005 and has improved by 6% this year. The rise seen in 2012 was due to the initial year of the new Children's & Women's hospital. This building's operation has now been optimized as is reflected in 2013 performance.

Figure 2.2: Total UMHHC Historical Energy & Cost Efficiency

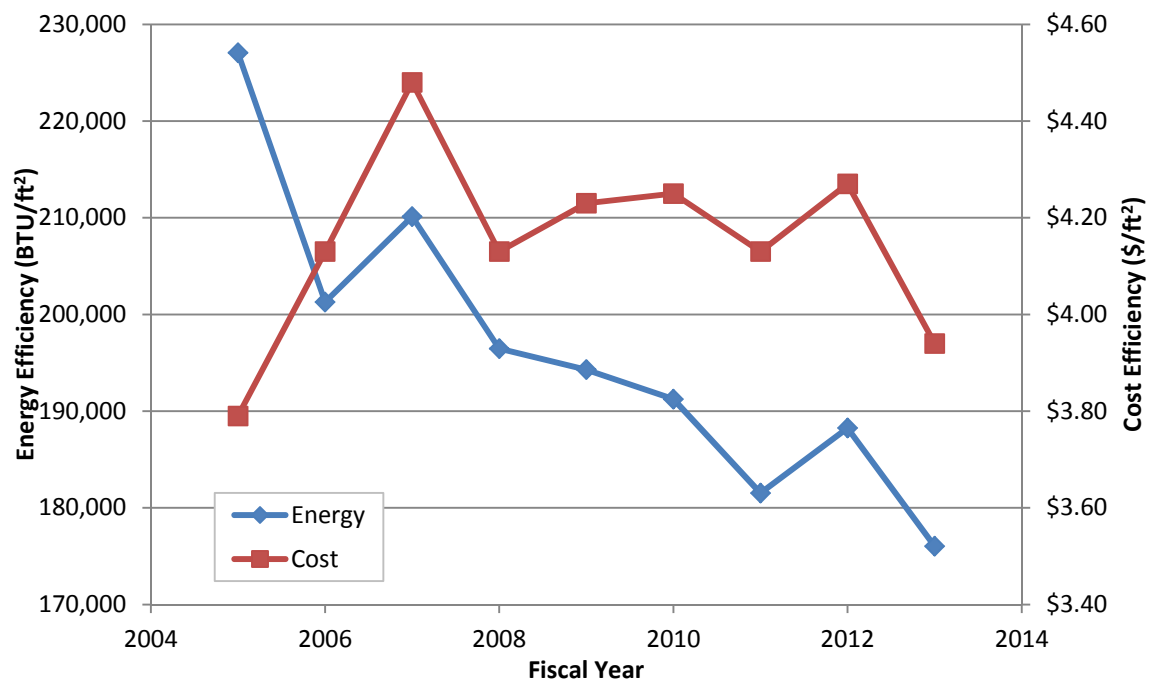


Figure 2.3 below shows the total UMHHC energy and utility cost in recent history without normalizing against the continuous increases in total UMHHC building area.

Figure 2.3: Total UMHHC Historical Energy Use & Utility Cost

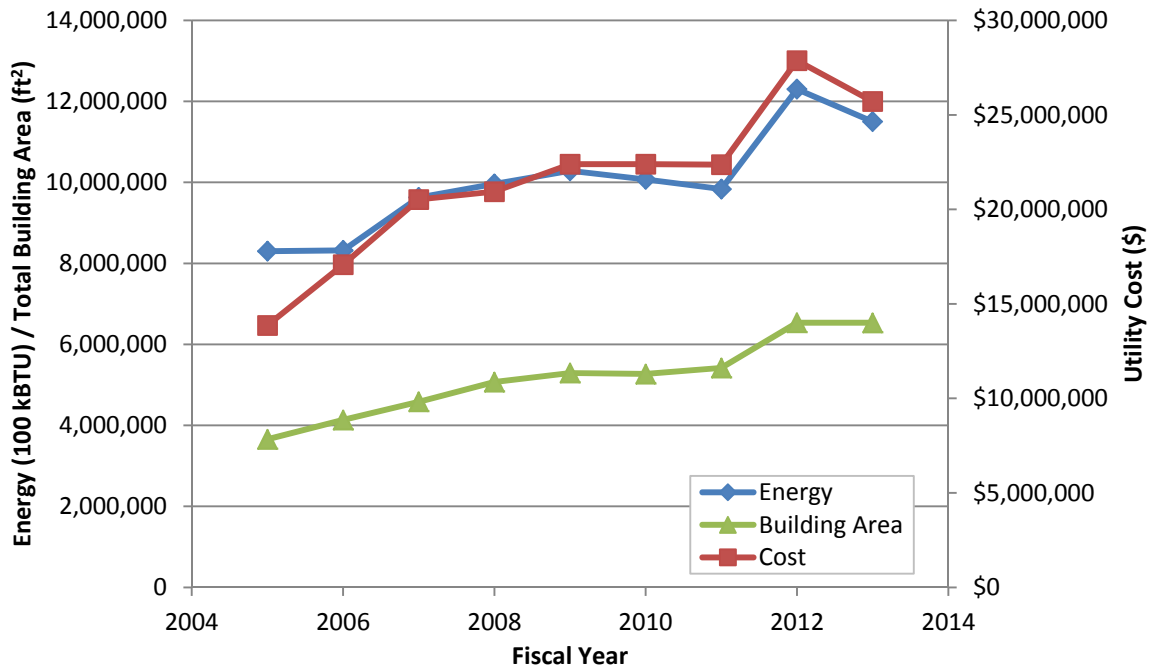
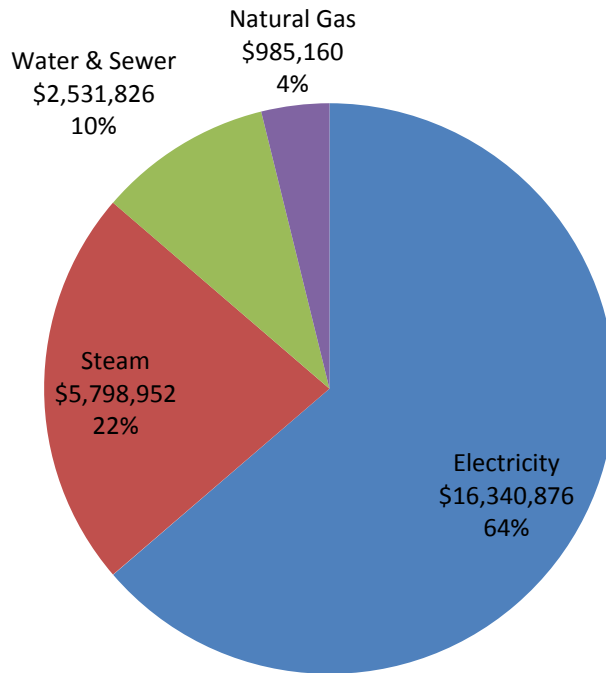


Figure 2.4 below illustrates the distribution and total costs of each of the four primary utilities included in UMHHC facilities for fiscal year 2013.

Figure 2.4: Total FY2013 UMHHC Utility Cost Distribution



3. ENERGY CONSERVATION

Energy Conservation is a combined effort of numerous groups and departments throughout UMHHC. These efforts primarily fall into the following categories:

- **New Construction**
Efficient design and construction practices for new capital construction.
- **Energy Conservation Measures (ECMs)**
Projects in existing facilities designed to improve energy performance.
- **Operations & Maintenance**
Maintain, manage, and optimize building operational efficiency.
- **GreenIT**
Manage power consumption from UMHS computers and IT equipment.

New Construction

UMHHC strives to incorporate energy efficient strategies and practices in all new capital construction projects. This first includes participation and compliance with the University's energy & water conservation standard ([SID-D](#)), requiring several standardized efficiency practices, in addition to requiring compliance with the ASHRAE 90.1-2007 energy standard for all projects, and requiring 30% improvement from baseline compliance for projects over \$10 Million in construction. Every UMHHC capital construction project is now reviewed for compliance with these energy and water requirements, and for opportunities to implement other energy conserving design innovations where feasible.

UMHHC has also committed to follow the University's sustainability in facility design and construction standard ([SID-K](#)). Among other sustainable practices, this standard also includes a requirement that all new buildings and building addition projects with over \$10 Million in associated construction costs, are required to achieve Silver certification under the Leadership in Energy and Environmental Design (LEED) system managed by the United States Green Building Council (USGBC). This LEED program and rating/certification system is designed to encourage sustainable design practices, covering numerous disciplines including site selection & protection during construction, energy & water efficiency, material selection & sourcing, indoor environmental quality, and more. This program offers building certification awards; base certification, silver, gold and platinum.

Energy Conservation Measures (ECMs)

In fiscal year 2013, 10 energy conservation projects were completed in existing facilities which are anticipated to provide approximately \$390,000/year in incremental energy savings. These cost \$264,506 to implement, yielding a 0.7 year overall payback period. This is summarized in Figure 3.2 below.

Figure 3.2: ECM Projects Completed in FY2013

Building	Project Description	Project Cost	Estimated Savings	Payback (Years)
Cancer Center	Rebalance ULAM area airflows and update air handling unit controls.	\$8,738	\$22,000	0.4
Cardiovascular Center	Improve air handling unit air mixture to enhance free cooling economizer operation.	\$4,500	\$4,300	1.0
Children's & Women's Hospital	Implement ventilation operation schedules for feasible areas within clinical building areas.	\$0	\$150,000	0.0
	Update humidification control algorithms to improve uniform humidity between zones and reduce excess humidification.	\$0	\$60,000	0.0
	Enhance temperature control in PFANS kitchen.	\$0	\$5,000	0.0
	Update PFANS kitchen zone HVAC systems to improve area pressurization control and optimize outside air requirements.	\$0	\$2,400	0.0
University Hospital Building	Convert once through city water cooled condensing units to the process chilled water loop.	\$143,775	\$70,000	2.1
	Install new controls for enhanced ventilation and temperature control in the main auditorium.	\$27,491	\$32,000	0.9
	Enhance temperature control in PFANS kitchen.	\$0	\$25,000	0.0
	Pilot project to install new controls for occupancy sensor based control of lighting and ventilation in clinic and staff areas.	\$80,002	\$18,000	4.4
Totals:		\$264,506	\$388,700	0.7

Operations & Maintenance

UMHHC Operations & Maintenance teams are continuously working to maintain equipment at peak efficiency, to improve and optimize operations wherever possible, and to quickly respond and resolve operational issues at all 6.5 million ft² of UMHHC buildings. This includes several key tasks for an extensive body of equipment and instruments. Examples of key equipment are listed below:

- Building automation systems
- Environmental controls & instruments
- Room temperature controls
- Air handling units
- Pumps
- Chillers
- Boilers
- Steam Traps

GreenIT

The GreenIT initiative began in 2009 with the goal of reducing desktop computer power consumption to over 15,000 workstations across the health system. This initiative seeks to set automatic on and off times and enable power saving standby modes for system computers when feasible. This initiative has resulted in more than a 40% reduction in health system computer power consumption.

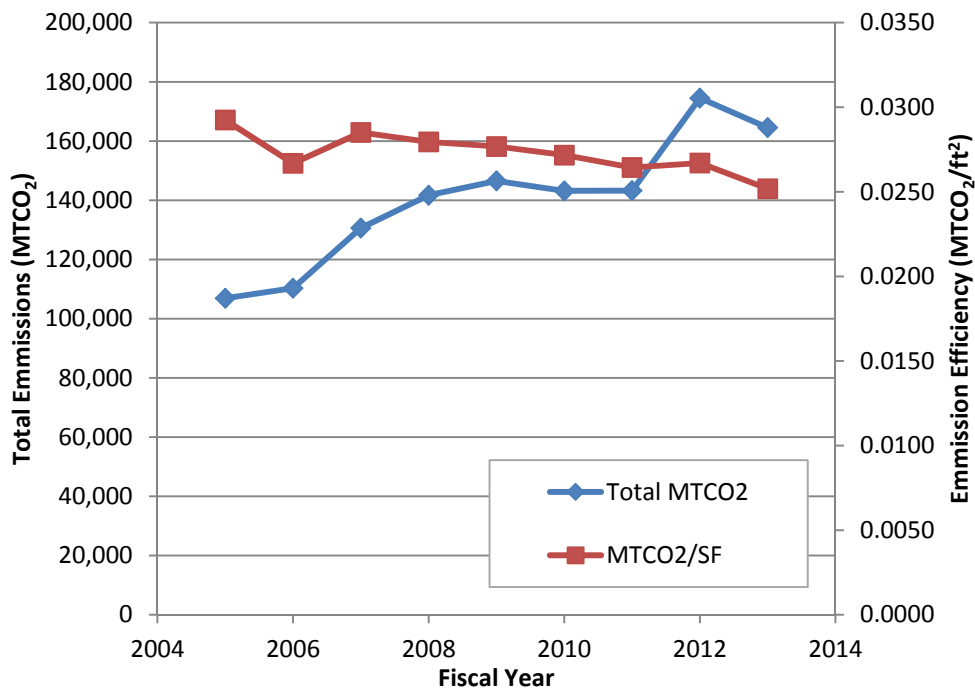
GreenIT teams are continuously working to further improve computer and IT system power management and to maintain energy performance amidst continuous changes to the Health System equipment and software, which now includes approximately 20,000 workstations. GreenIT teams are currently working to identify and update energy management of remaining departments and workstations unnecessarily operating computers and IT equipment continuously.

4. ENVIRONMENTAL IMPACT

In addition to the benefits of reducing overall energy and utility resource demands, efficiency improvements provide further benefits by reducing the greenhouse gas emissions generated during the production of utilities. Figure 4.1 below shows the total historical UMHHC greenhouse gas emission quantities and greenhouse gas emission efficiencies, normalized against total UMHHC building area. Emissions are measured in metric tons of carbon dioxide (MTCO₂). Please note that these figures only include greenhouse gas emissions due to the generation of utilities consumed by facilities, and do not include emissions from other institution operations. In fiscal year 2013, UMHHC decreased utility driven emissions by 6%. This equates to nearly 10,000 MTCO₂ of avoided greenhouse gas emissions, which is equivalent to removing nearly 1,800 automobiles from the road.

In 2011, UM President Coleman announced new sustainability commitments for the University. These commitments include a 25% reduction in total greenhouse gas emissions by FY2025, compared to a FY2006 baseline. It is anticipated that this will be accomplished through improvements to a number of areas of University operations, including major upgrades to onsite utility generation plants, in addition to improvements to existing buildings, University vehicle upgrades, etc. Thus far, UMHHC has increased its total building utility driven emissions by 49% compared to FY2006, however this is across a period of 58% growth in total UMHHC building area in that time. When normalized against total building area, UMHHC has improved its total emission per square foot efficiency by 6% since FY2006. Therefore, UMHHC has significantly expanded but has improved total emission efficiency during that time.

Figure 4.1: UMHHC Utility Driven Greenhouse Gas Emission History



5. BUILDING SUMMARY & ENERGY STAR

During fiscal year 2012, a comprehensive profile was created for all UMHHC facilities within the Energy Star Portfolio Manager benchmarking tool, provided by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE). This tool organizes facility energy data, normalizes data against building size, geographic location, building use types, occupancy, number of licensed beds, etc., and generates a rating score that can be used for benchmarking. Scores range from 0 to 100. A score of 50 is the national average. A score of 75 qualifies a building for the Energy Star Certification award. In fiscal year 2013, UMHHC facility scores ranged from 1 to 88, but in aggregate calculate to a total portfolio score of 34. This is improved from a baseline score of 25 in fiscal year 2012. Figure 5.1 below illustrates UMHHC’s Energy Star rating progress towards national average and Energy Star Award levels.

Figure 5.1: UMHHC Energy Star Portfolio Rating

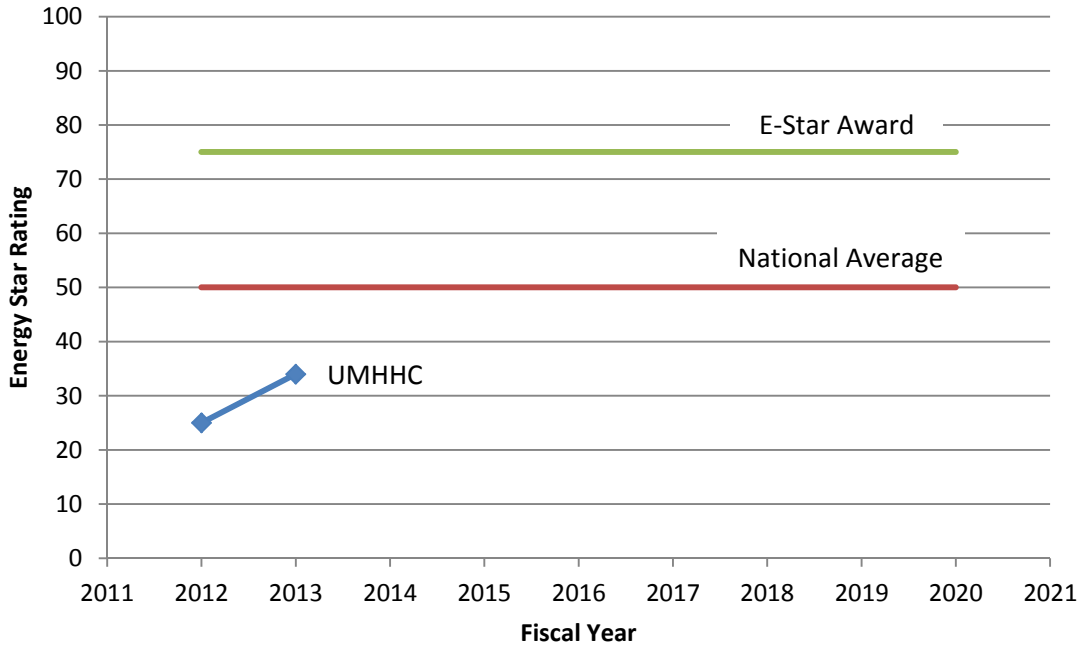


Figure 5.2 indicates the most efficient UMHHC buildings in fiscal year 2013, sorted by the primary Energy Star building type. Due to combined metering and shared utilities between facilities, several buildings are not included in this list because the available utility data does not represent the total utility consumed by the building, and therefore does not provide an accurate measure of efficiency. It should be noted, that energy and efficiency data provided within this report and the table below are based on “site” energy use, which is used for billing. Energy Star ratings are based on “source” energy use which incorporates the efficiency of the utility plant supplying the facility.

Figure 5.2: FY2013 UMHHC Most Energy Efficient Buildings

Rank	ID	Building	Efficiency (kBTU/ft ²)	Energy Star Rating	Total Utility Cost
<i>Hospitals</i>					
1.	5173	Children's & Women's Hospital	183.6	60	\$4,476,313
2.	5109	Cardiovascular Center	186.5	19	\$1,793,900
3.	0316	University Hospital Building	235.9	10	\$9,745,439
<i>Medical Office Buildings</i>					
1.	5019	Canton Health Center	67.4	64	\$138,405
2.	8149	Dexter Family Practice	70.0	57	\$15,510
3.	8155	Livonia Health Center	73.5	55	\$28,434
4.	8065	Briarwood 3	77.4	N/A	\$31,066
5.	8111	Howell Health Center	78.0	N/A	\$7,073
<i>General Office Buildings</i>					
1.	8137	Michigan House	49.0	86	\$162,373
2.	0327	University Hospital Education Center	56.5	69	\$13,971
3.	5153	Traverwood III	62.4	N/A	\$58,198
4.	8100	2101 Commonwealth	71.7	74	\$77,271
5.	8126	KMS Fusion Building	82.7	66	\$290,620

Figure 5.3 below shows fiscal year 2013 utility information, efficiency, and Energy Star information. Please note that data is not directly comparable since data for several buildings does not include total consumed utility due to combined meters and shared utilities.

Figure 5.3: FY2013 UMHHC Building Utility Summary

ID	Building	Total Cost	Efficiency (kBTU/ft ²)	E-Star Building Type	E-Star Rating
8060	101 Simpson	\$2,424	35.1	Office	N/A
327	1018 Fuller Building	\$13,971	56.5	Office	N/A
332	300 N Ingalls Building (UMHHC)	\$543,441	112.3	Office	74
8116	Ann Arbor Ice Cube	\$2,983	40.3	Other	N/A
8076	Briarwood 1	\$99,053	278.0	Medical Office ⁽¹⁾	16 ⁽¹⁾
8130	Briarwood 10	\$76,678	209.7	Medical Office ⁽¹⁾	16 ⁽¹⁾
8065	Briarwood 3	\$31,066	77.4	Medical Office ⁽¹⁾	16 ⁽¹⁾
8042	Briarwood 4	\$29,702	49.2	Medical Office ⁽¹⁾	16 ⁽¹⁾
8016	Briarwood 5	\$52,675	293.1	Medical Office ⁽¹⁾	16 ⁽¹⁾
8142	Briarwood 9	\$34,183	257.7	Medical Office ⁽¹⁾	16 ⁽¹⁾
8030	Briarwood 2	\$73,749	198.5	Medical Office ⁽¹⁾	16 ⁽¹⁾
5029	Brighton Health Center	\$200,802	238.4	Medical Office	3
5011	Burlington Office Center	\$112,349	45.8	Office	84
301	Cancer Center (UMHHC)	\$1,097,831	367.4	Laboratory	N/A
5019	Canton Health Center	\$138,405	67.4	Medical Office	64
5109	Cardiovascular Center	\$1,793,900	186.5	Hospital	19
348	Chelsea Family Practice	\$59,025	94.6	Medical Office	45
5173	Children's and Women's Hospital	\$4,476,313	183.6	Hospital	60
8149	Dexter Family Practice	\$15,510	69.6	Medical Office	57
5038	EAA Surgical Center	\$123,643	231.7	Medical Office ⁽²⁾	12 ⁽²⁾
350	East Ann Arbor Health Center	\$990,961	400.0	Medical Office ⁽²⁾	12 ⁽²⁾
306	East Hospital Mechanical Building	\$239,157	1,273.5	Other ⁽³⁾	N/A ⁽³⁾

8072	Eisenhower Corporate Park West	\$341,813	145.4	Medical Office	18
5070	Eisenhower CP	\$88,971	81.7	N.R. Warehouse	4
314	Holden Perinatal Research Lab	\$66,813	215.3	Other ⁽³⁾	N/A ⁽³⁾
9601	Hospital Chilled Water Loop	\$169,679	N/A	N/A	N/A
8111	Howell Pediatrics	\$7,073	78.0	Medical Office	N/A
5296	Howell Teen Clinic	\$1,729	101.9	Medical Office	N/A
8161	Kellogg Eye Center – Brighton	\$12,237	82.9	Medical Office	56
5098	Kellogg Eye Center – Milford	\$6,842	113.3	Medical Office	N/A
8160	Kellogg Eye Center – W. Bloom	\$2,055	49.3	Medical Office	N/A
8126	KMS Fusion Building	\$290,620	82.7	Office	66
419	Laundry	\$521,109	826.8	Other	N/A
8155	Livonia Health Center	\$28,434	73.5	Medical Office	55
8096	Livonia Specialty Care	\$187,152	155.0	Outpatient P.T.	N/A
318	Maternal & Child Health Center	\$269,596	104.5	Other ⁽³⁾	N/A ⁽³⁾
308	Med Inn	\$360,073	155.9	Other ⁽³⁾	N/A ⁽³⁾
8137	Michigan House	\$162,373	49.0	Office	86
5058	Michigan Visiting Nurses	\$1,448	37.2	Office	N/A
312	Mott C.S. Children’s Hospitals	\$189,025	42.3	Other ⁽³⁾	N/A ⁽³⁾
5223	North Campus Aux. Support Bldg	\$649,599	495.4	Data Center	N/A
5056	New Hope Baptist Church	\$2,220	111.1	Medical Office	N/A
399	North Campus Admin Complex	\$297,625	169.8	Office	31
8112	Occupational Medicine Building	\$33,663	147.0	Medical Office	3
320	Parking – M22 Structure	\$35,809	N/A	N/A	N/A
8100	Commonwealth Building	\$77,217	71.7	Office	74
5340	River Place Offices	\$22,545	136.0	Medical Office	6
8039	RP Housing 1011 Cornwell Place	\$7,668	122.3	Other	N/A
8063	RP Housing 1035 Wall	\$168	N/A	N/A	N/A
829	RP Housing 1322 Wilmott	\$4,230	102.7	Other	N/A
8121	Saline Health Center	\$22,763	122.0	Medical Office	1
8036	Survival Flight Ann Arbor Airport	\$14,869	121.5	Other	N/A
317	Taubman Health Care Center	\$1,208,822	100.4	Other ⁽³⁾	N/A ⁽³⁾
8162	Traverwood I	\$15,429	38.4	Office ⁽⁴⁾	1 ⁽⁴⁾
5143	Traverwood II	\$164,275	281.9	Office ⁽⁴⁾	1 ⁽⁴⁾
5153	Traverwood III	\$58,197	62.4	Office ⁽⁴⁾	1 ⁽⁴⁾
5241	Traverwood IV	\$103,632	625.7	Office ⁽⁴⁾	1 ⁽⁴⁾
319	Medical Professional Building	\$65,817	74.9	Other ⁽³⁾	N/A ⁽³⁾
390	Child Care Center	\$48,277	107.2	Other	N/A
316	University Hospitals Complex	\$9,745,439	235.9	Hospital	10
5117	Rachel Upjohn Building	\$62,712	56.7	Medical Office ⁽²⁾	12 ⁽²⁾
8110	West Ann Arbor Health Center	\$17,610	78.5	Medical Office	33
309	Women’s Office Building	\$125,159	96.3	Other ⁽³⁾	N/A ⁽³⁾

Notes:

1. The Briarwood facilities are grouped together in the Energy Star Portfolio.
2. Due to shared metering, all East Ann Arbor campus facilities are grouped together in the Energy Star Portfolio.
3. Since chilled water sub metering is not in place, all buildings served by the East Mechanical chiller plant are grouped together in the Energy Star Portfolio. An Energy Star rating for this group of buildings is not available since there is not >50% of area dedicated to one Energy Star building type.
4. The Traverwood facilities are grouped together in the Energy Star Portfolio.