

## Biannual Sustainability Report

### Projects \$5 Million and Over

March 2015

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## A. Alfred Taubman Health Sciences Library Renovations



### Project Description

A renovation of approximately 137,000 gross square feet of space is planned to create a smaller library collection, increased health sciences instructional space including a clinical skills and simulation suite, and spaces for computing, study, and faculty and student services. A 6,000-gross-square-foot addition will be constructed to improve vertical circulation.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated energy savings of 25% when compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- High Performing Envelope - glazing is specified to include low-e coatings that reduce thermal losses in the winter and radiation gain in the summer.
- Enthalpy Wheel - allows return air to condition outside air which reduces heating/cooling load in the air handling unit.
- Chilled Beams - uses chilled water to cooling medium, which reduces ductwork, shafts, and air handling unit size.
- HVAC Controls - designed to prevent simultaneous heating and cooling; controls temperature using occupancy sensors.
- Interconnection to Medical Science II chiller plant -interconnection of the Taubman chiller plant with the Medical Science chiller plant allows optimization of the two chiller plants.
- Lighting Optimization - efficient fixture selection and the use of occupancy sensors.
- Individually controlled window shades to minimize solar heat gain on sunny days.
- Exterior sun-shading devices on the south facing elevation to minimize solar heat gain on sunny days.
- Daylighting Views - additional windows added to maximize natural light and turn off artificial light.

### Other Sustainability Features

- This project is registered under the LEED® green building certification program with the certification goal of LEED Silver.
- Water Reduction - A 20% water consumption savings beyond Michigan Plumbing Code is anticipated; savings will be obtained via use of dual flush water closets, 1/8 gallon flush urinals, and automatic sensor operated faucets.
- Public Transportation Access - the building's location allows users and occupants to utilize public transportation, which reduces single use vehicles on campus.
- Water Efficient Landscaping - the site will utilize plantings that do not require irrigation.
- Building Reuse - the project will maintain at least 55% of existing walls, floors and roof.
- Recycled Content and Regional Materials will be selected.
- Low-Emitting Materials and a Green Cleaning Process will be utilized for a healthy indoor environment.
- Construction waste management plan will be implemented to salvage or recycle at least 75% of construction materials.

## **A. Alfred Taubman Health Sciences Library Renovations**

### **Project Data**

- Budget: \$55 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 137,000 gross sq. ft. renovation  
6,000 gross sq. ft. addition

### **Status as of March 2015**

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 75%

## A. Alfred Taubman Wing Project



### Project Description

The wing will consist of 36,000 gross square feet and include new studio space, faculty offices, a new classroom, student support spaces and multipurpose space for the presentation of academic projects and for events. Approximately 11,000 gross square feet of space will be renovated in the existing building, expanding studio space on the third floor and locating faculty offices adjacent to the studio space, along with updating finishes in select areas.

### Energy Efficiency Measures

- The building's design and systems will include a number of energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- High performance glazing and exterior wall assemblies for improved performance
- Task lighting, energy efficient light fixtures, and the integration of natural daylight to help reduce the building's electrical load
- Occupancy sensors throughout the addition to turn off lights and HVAC when spaces are un-occupied
- Photo sensing to dim lighting in areas where ambient lighting is provided through skylights
- Displacement Ventilation to provide ventilation air to the occupant breathing zone more efficiently than typical HVAC systems
- Monitoring of Carbon Dioxide levels in high occupancy spaces to provide a quality environment while reducing energy use associated with over-ventilating of spaces

### Other Sustainability Features

- The project is registered under the LEED green building rating system with the certification goal of LEED Silver
- Overall lighting power density (watts per square foot) 30% less than maximum allowable level mandated by ASHRAE standard 90.1
- A 30% water consumption savings beyond Michigan Plumbing Code is anticipated; savings will be obtained through the use of low flow bathroom fixtures
- Efficient methods of landscape irrigation
- The sorting and recycling of construction waste
- The use of low-VOC flooring, adhesives and sealants
- Recycled and regional materials will be selected
- Project site located near public and UM bus routes to encourage use of public transit
- Close proximity to basic services such as banks, theaters and restaurants to encourage building occupants to walk instead of drive

### Project Data

- Budget: \$28.5 M
- Schedule: Completion Scheduled for Fall 2017
- Square Feet: 10,600 gross sq. ft. renovation  
37,158 gross sq. ft. addition

### Status as of March 2015

- Project Status: Study-Planning
- Design Complete: 30%
- Construction Complete: 0%

## Dearborn Science Building and Computer Information Science Building Renovation



### Project Description

The project will create updated laboratory and classroom space for the Department of Natural Sciences within the Science Building. In order to accomplish this, approximately 20,000 gross square feet will be added to the building to create state-of-the-art laboratory spaces, a new elevator, loading dock core, and mechanical penthouse. The exterior walls will be extended and constructed in an energy-efficient manner to allow the entire building project to exceed standard energy performance by more than 30 percent. In addition, the project proposes a complete renovation of the existing building (approximately 80,000 gross square feet) for laboratories and classrooms. The project will also upgrade infrastructure that is shared with the adjacent Computer Science Building. Although there will be a temporary loss of some adjacent parking spaces during construction, there will be no permanent impact on parking from this project.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 40% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- Maximum insulation in foundation walls, exterior walls and roof assemblies
- Energy efficient windows/ glazing for increased thermal performance
- Occupancy sensors for the control of building lighting
- Long life, energy efficient LED light fixtures
- Increased inspections during construction to identify deficiencies in the building envelope
- Increase thermostat 'deadband' to limit equipment cycling
- Magnetic chillers reduces maintenance and improves efficiency
- Energy recovery system captures and re-uses energy and humidity that would be lost to the atmosphere
- Variable drives on equipment allows for equipment to conserve energy when demand is low
- Heat pumps use recovered heat from chillers to supplement space heating requirements

### Other Sustainability Features

- Science Building is utilizing the existing building structure
- Science building expansion is situated on previously developed site instead of a new site
- Science Building is serviced by public and UM bus routes, encouraging use of public transportation
- No new parking provided on site
- Bike racks provided on site
- External shading devices help control heat gain
- All plumbing fixtures in the building will be low-flow fixtures and dual flush toilets
- Regional materials are used wherever possible
- Use of low-VOC materials (carpets, paints, etc.)
- Landscaping is designed to have only native & adaptive plants and minimal irrigation
- Chemical free cooling tower water treatment
- HVAC condensate used for cooling tower make-up

## Dearborn Science Building and Computer Information Science Building Renovation

### Project Data

- Budget: \$51 M
- Schedule: Completion Scheduled for Summer 2016
- Square Feet: 80,000 gross sq. ft. renovation  
20,000 gross sq. ft. addition

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 20%

## Department of Intercollegiate Athletics Operations Center



### Project Description

The Department of Intercollegiate Athletics will construct a new building to centralize and increase operational efficiency for functions currently undersized and housed in various locations across the Stephen M. Ross Athletic Campus. An approximately 18,000 gross square feet building located south of Stadium Boulevard on State Street will accommodate maintenance shops, offices, laundry, shipping and receiving, and equipment storage.

### Energy Efficiency Measures

- High efficiency building envelope.
- Variable air volume HVAC systems, including Laundry and Maintenance Shop.
- High efficiency boiler and water heater.
- All equipment connected to digital controls system.
- Night setback on all HVAC systems including recirculation modes on Laundry and Maintenance Shop.
- High efficiency interior and exterior lighting.
- Occupancy sensors to control lighting.

### Other Sustainability Features

- Use of low flow plumbing fixtures to reduce water consumption.

### Project Data

- Budget: \$6 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 18,000 gross sq. ft.

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 30%



## Earl V. Moore Building Renovation and Brehm Pavilion



### Project Description

The first floor north wing will be renovated to increase the number, size, and quality of practice rooms, and the west side of the second floor north wing will be renovated to accommodate offices displaced from the first floor renovation, a total of approximately 28,000 gross square feet. The Brehm Pavilion will be approximately 34,000 gross square feet and will include three classrooms that will also allow for chamber music rehearsal, a large lecture hall, a jazz and percussion suite, labs for class piano, a large rehearsal hall, lobby and support spaces, and 4,000 square feet of space will be shelled for future use. The project will also update the Moore Building's fire detection and alarm system to provide an integrated system with the Bream Pavilion addition.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 48% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1-2007 - Appendix G.
- Above code-minimum insulation for exterior walls.
- Above code-minimum insulation for roofs.
- Above code-minimum thermal properties for windows.
- Energy Efficient HVAC systems
- Reduction of lighting power density
- Occupancy sensors for lighting control
- Infrared scans of building envelope during construction
- Increased inspection of exterior wall insulation and exterior fenestration
- Ventilation of mechanical room with relief air
- Displacement ventilation in the Rehearsal Hall

### Other Sustainability Features

- This project is registered under the LEED® green building certification program with the certification goal of LEED Silver.
- Development Density and Community Connectivity
- Storm Water Filtration
- Storm Water Retention
- Water Use Reduction
- Water Efficient Landscaping
- Water efficient landscape irrigation system
- Native and adapted landscape plantings
- Minimized project disturbance area and protection of adjacent woodland
- Chipper byproduct from site clearing operations used for erosion control during construction
- High albedo pedestrian pavements minimize urban heat island effect
- Construction Waste Management

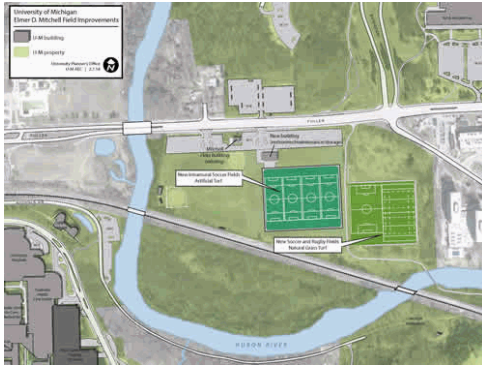
### Project Data

- Budget: \$24.32 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 28,000 gross sq. ft. renovation  
34,000 gross sq. ft. addition

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 55%

## Elmer D. Mitchell Field Improvements



### Project Description

Student Life now proposes improvements to Mitchell field to increase usage flexibility of the fields for various intramural and club sports, increase capacity, and extend the operating hours and operating season for Mitchell. Four softball fields will be repurposed into four artificial-turf soccer/multi-purpose intramural sports fields that will allow for much longer hours of operation and spring use because artificial turf will be well drained and not subject to closure due to rain and muddy conditions that can destroy natural turf. The fields will be enclosed with fencing to control access, protect turf, and to keep balls contained. Lighting will be installed with shields to keep light on the field with minimal spill-over onto adjacent non-university property or into the night sky. Existing multi-purpose fields will be improved for use for intramural sports team practices as well as games for sports that prefer natural turf (e.g., rugby). The existing lighting for these east fields will be upgraded with more energy-efficient fixtures that will also be shielded to prevent light spill-over. The two existing softball fields on the west side of Mitchell Field will remain. Other site work will include drainage improvements, on-site storm water management, and underground utilities. The existing Mitchell Field Building will be renovated for use as storage and a 3,200-square-foot building will be constructed to improve bathroom facilities and to provide for on-site maintenance, storage, and operational support.

### Energy Efficiency Measures

- Storm water infiltration area, or “rain garden” will receive stormwater runoff from the building roof and will be used to support robust, local plant species.
- Design of Exterior canopy utilized to shade south facing window and building façade to minimize heat gain.
- Interior spaces, except for restrooms, are exposed and have no ceilings, thus reducing material waste.
- Low VOC Paints used throughout to improve indoor air quality
- Exterior LED Fixtures use less energy than incandescent/fluorescent fixtures
- Occupancy sensors automatically shut off lights after pre-set time of inactivity, thereby saving energy
- Photocell / time clock turns off exterior building fixtures when no longer needed
- Standalone HVAC units to individually heat/cool spaces and increase energy efficiency
- Energy efficient Air Conditioning units
- Natural Ventilation

### Project Data

- Budget: \$8 M
- Schedule: Completion Scheduled for Fall 2014
- Square Feet: 1,600 gross sq. ft. renovation  
3,200 gross sq. ft. addition

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 99%

## Flint William R Murchie Science Building Renovation



### Project Description

The project will upgrade various building infrastructure components as well as revitalize the classrooms and laboratories within the building to expand its programs in order to better prepare K-12 science teachers, excite younger students about science programs, and better prepare students for careers in science, technology, engineering, and mathematics. The project will renovate approximately 85,000 gross square feet. The renovation will also update the building's infrastructure, including a new fire alarm system, new emergency generator, upgraded telecommunications cabling, and select mechanical, lighting, exterior envelope, and accessibility improvements.

### Energy Efficiency Measures

The energy efficiency goal for the project is to incorporate as many systems as possible; given the building infrastructure system is not a complete replacement and approximately only half the building will be renovated.

- Replacement of operable sash weather seals on existing glazing systems throughout entire building.
- Use of energy efficient lighting fixtures.
- Occupancy sensors in areas of renovation receiving new lighting.
- Replace all existing fume hoods with more energy efficient models.
- Provide low flow toilets, urinals and lavatory faucets at renovated toilet rooms.

### Other Sustainability Features

- New wood doors will be FSC certified.
- Use of low-VOC paint.
- Use of straw based particle board in the architectural millwork.
- Reuse of existing furniture.

### Project Data

- Budget: \$22.17 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 85,000 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 62%

## George Granger Brown Memorial Laboratories Renovation



### Project Description

The approximately 220,000-gross-square-foot George Granger Brown Memorial Laboratories building was constructed in 1958 and houses the chemical, civil, materials sciences, and mechanical engineering departments. The project will upgrade the entire building's fire detection, alarm and emergency power systems. Throughout the majority of the building, there will be a deep infrastructural renewal updating heating, ventilation, air conditioning, electrical, plumbing, roof, windows, and interior finishes. The renovation will also create approximately 25,000 square feet of state-of-the-art academic and instructional spaces.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 38% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- Added roof insulation exceeding code requirements
- Thermally improved glazing systems
- Reduced lighting density
- Lighting occupancy sensors
- Energy efficient light fixtures
- High efficiency HVAC system
- HVAC occupancy sensors
- Increased "dead band" for Offices and Classrooms (5° to 7°)
- Lab exhaust recovery with water-to-water Runaround System
- Pre-heat outside air make-up to labs with North Campus Chilled Water Loop
- Dual flush water closets
- Low flow urinals
- Reduced flow sinks

### Other Sustainability Features

- Light colored roofing to reduce heat island effect
- Maintain 95% of the existing structural walls, floors and roof
- Recycle between 50% and 75% of all construction waste
- All new materials to have a total of 10% and 20% recycled content
- All wood used on project to be FSC certified
- Indoor air quality management plan during construction and before occupancy
- Low or Zero VOC adhesives, sealants, paints, flooring, and composite materials
- Re-use of furniture and equipment in several areas

## George Granger Brown Memorial Laboratories Renovation

### Project Data

- Budget: \$47 M
- Schedule: Completion Scheduled for Summer 2016
- Square Feet: N/A

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 25%

## Intramural Sports Building Renovation



### Project Description

The IMSB that will update infrastructure and address contemporary programmatic needs for fitness and recreational spaces. The project will reconfigure existing space within the building to provide larger areas for cardio and weight training; new group exercise rooms; improved racquetball courts, locker rooms, and staff offices; and spaces for social interaction. Infrastructure upgrades will include accessibility improvements, plumbing and wired and wireless networking upgrades, exterior window replacement, masonry repairs, lighting improvements, and gymnasium floor replacement.

### Energy Efficiency Measures

- The building's design and systems will include a number of energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- Window Replacement - utilizing insulated energy efficient units.
- Enthalpy Wheel - allows return air to condition outside air which reduces heating/cooling load in the air handling unit.
- HVAC Controls - designed to prevent simultaneous heating and cooling; controls temperature using occupancy sensors.
- Increase thermostat "deadband" to limit equipment cycling.
- Variable drives on equipment allows for equipment to conserve energy when demand is low.
- All plumbing fixtures in the building will be low-flow fixtures and dual flush toilets.
- Variable air volume HVAC systems, including Laundry and Maintenance Shop.
- Ventilation of mechanical room with relief air AHU-1.
- High efficiency chiller.
- Direct digital controls.
- Steam pressure powered condensate unit not requiring pumps to return condensate to the central heating plant.
- High efficiency converters using both latent heat of evaporation and the heat of the condensate to reduce the amount of central plant steam required to heat the building.
- Energy Efficient Lighting - new gymnasium lighting, LED lighting.
- Daylight Harvesting - switching perimeter lighting to take advantage of daylight
- Daylighting & Views - while not yet formally calculated there will be an exceptionally high proportion of the building (SF / Total GSF) that has direct access to natural daylight and views to the out-of-doors.
- Lighting Controls - occupancy sensors, photocells, time clocks
- Stormwater Management - Existing cross contaminated drain lines from this building are being scoped for repairs and several are being rerouted to proper stormwater drain lines.

### Other Sustainability Features

- Water Reduction - a 20% water consumption savings beyond Michigan Plumbing Code is anticipated; savings will be obtained via use of dual flush water closets, 1/8 gallon flush urinals, and automatic sensor operated faucets.
- Public Transportation Access - the building's location allows users and occupants to utilize public

## Intramural Sports Building Renovation

transportation, which reduces single use vehicles on campus.

- Water efficient Landscaping - the site will utilize plantings that do not require irrigation.
- Building Reuse - the project will maintain at least 75% of existing walls, floors, and roof.
- Construction Waste Management - should achieve a high degree of success in reducing the amount of construction and waste materials being sent to landfills.
- Reuse / Recycle - Existing wood athletic flooring from the existing racquetball and squash courts will be reclaimed for use in a dynamic new ceiling, and as parts of new signage and wayfinding systems.
- Recycle - Most of the new resilient sports flooring is planned to be procured from manufacturers who use a large quantity of recycled rubber products in the flooring systems.
- New thermally efficient and double insulated aluminum curtain wall window systems will replace existing uninsulated steel windows.
- Portions of the content of the Environmental Graphics intend to tell the story of the sustainable features included within this building, providing a fact-based educational tour of the IMSB.
- New Athletic Wood Flooring for this facility hold a high degree of probability that it will be manufactured from Certified Wood, and that is can be procured within a 500 mile radius of this site.
- Low emitting materials will be specified for use whenever possible
- Local and regional materials are being specified for many parts of this building.

### Project Data

- Budget: \$21.4 M
- Schedule: Completion Scheduled for Fall 2016
- Square Feet: 106,000 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Programming
- Design Complete: 68%
- Construction Complete: 0%

## MSRB II Chiller Replacement and Chilled Water Interconnection to Medical Sciences Research Building III



### Project Description

This project will replace three of the four steam absorption chillers with three electric centrifugal chillers, retaining the most reliable steam absorption chiller to provide backup capacity. The project will also replace the cooling towers, located on the roof of Medical Science Unit II, with new cooling towers. The project will also interconnect the chiller plant at MSRB II with the chiller plant at MSRB III, creating a regional chiller system that will result in energy savings, reduced operational and maintenance costs, and increased redundancy and reliability. In addition, the project will provide a new substation in the Animal Research Facility to serve the new electric load, and the obsolete substation that serves MSRB I will be removed.

### Energy Efficiency Measures

- Provide cooling for the Medical School using electric centrifugal chillers which are more energy efficient than the existing absorption chillers.

### Project Data

- Budget: \$14 M
- Schedule: Completion Scheduled for Summer 2016
- Square Feet: N/A

### Status as of March 2015

- Project Status: Bid-Award
- Design Complete: 100%
- Construction Complete: 0%



## Munger Graduate Residences



### Project Description

The University of Michigan has received a major gift to fund construction and fully furnish a new residential facility for graduate students. The eight-story building will be approximately 380,000 gross square feet and will accommodate approximately 600 students in an apartment-style layout. The new building is proposed to be located on the site of the current Thompson Street surface parking lot, immediately south of the Thompson Street Parking Structure and on adjacent parcels of land.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- This project has been approved for the Designed to Earn ENERGY STAR® certification. This certification recognizes that this design project has met Environmental Protection Agency (EPA) criteria for energy efficiency.
- Above-code below-grade insulation
- Above-code exterior wall insulation
- Above-code roof insulation
- Improved glazing performance
- Improved air-conditioning system efficiency through the use of chilled beams and dedicated outside air systems.
- Reduced lighting density
- Occupancy sensors for lighting
- Daylight sensors in apartment common areas and public spaces
- Energy recovery with total enthalpy wheel
- High efficiency condensing type heating boilers with separate pumped loops for low and high temperature heat emitters to reduce return water temperature and further improve condensing efficiency
- High efficiency condensing type domestic hot water boilers
- "Free cooling" utilized for year round cooling loads where possible

### Other Sustainability Features

- This project is registered under the LEED® green building certification program with the certification goal of LEED Silver
- Building is built on a previously developed site
- Public transportation is available with one bus stop in front of the building and a number of others within a few blocks
- Bike parking available on site, with bike storage located in the lower level of the building
- Porous pavers used on site wherever possible
- Rain garden will be incorporated into the landscape design
- New planting will be native or adaptive vegetation
- Low-flow fixtures will reduce water consumption and use 20% less water than a baseline water use based on the Michigan Plumbing Code

**Munger Graduate Residences**

- Additional metering of heating, cooling, and domestic hot water systems
- Above code ventilation rates in bedrooms
- Low VOC materials will be specified whenever possible to reduce indoor air contaminants
- Regional materials will be specified whenever possible to reduce negative environmental impacts associated with transportation
- Materials with recycled content will be specified whenever possible to reduce use of virgin materials

**Project Data**

- Budget: \$185 M
- Schedule: Completion Scheduled for Summer 2015
- Square Feet: 380,000 gross sq. ft.

**Status as of March 2015**

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 75%

## New Biological Science Building



### Project Description

A new Biological Science Building of approximately 300,000 gross square feet with a connection to the Life Sciences Institute (LSI) Building to increase the utilization of its dock and vivarium functions. A small renovation to LSI will also be necessary for vivarium and related support activities. The new building will house research laboratories, associated support functions, offices, classrooms, vivarium services, and the four museums listed above. The laboratories will be constructed in an open plan to allow for much greater collaboration than what can be achieved in the existing buildings, increased flexibility, space utilization and better management. The proposed site of the BSB is adjacent to LSI where both North Hall and the Museums Annex currently exist

### Energy Efficiency Measures

- The building's design and systems will include a number of energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1- Appendix G.
- Exterior envelope rain screen wall system to minimize air leakage even under the negative pressurization required for laboratories.
- Frit and high performance coatings on the glazing reduce solar heat gain
- Chilled beams for conditioning spaces.
- Preheated outside air with process cooling water to provide precondition makeup air.
- Return air from offices and classrooms utilized as makeup air to laboratories.
- Conditioned open lab air used to help cool lab equipment spaces.
- Energy recovery at fume hoods.
- Chillers and heaters to utilize heat recovery to efficiently provide simultaneous heating and cooling.
- Use and expansion of existing regional chiller plant capacity.
- Occupancy sensors to control lighting.

### Other Sustainability Features

- This project is registered under the LEED® green building certification program with the certification goal of LEED Silver.
- Project sited on public and UM bus routes, encouraging use of public transit.
- Irrigation water usage minimized through use of landscape design and use of native and adaptive plants.
- Construction waste to be diverted from landfills when possible.
- Use of low-VOC paints, flooring, adhesives, and sealants.
- Use of regional materials when possible.
- Use of recycled materials when possible.

## New Biological Science Building

### Project Data

- Budget: \$261 M
- Schedule: Completion Scheduled for Summer 2018
- Square Feet: 300,000 gross sq. ft.

### Status as of March 2015

- Project Status: Bid-Award
- Design Complete: 57%
- Construction Complete: 0%

## Nuclear Engineering Laboratory Renovation



### Project Description

The project will increase space utilization by creating additional usable floor space within the structure and existing penthouse, resulting in an additional 20 percent increase in the total building square footage to 20,500 gross square feet in this four-story building. This will accommodate the expansion needs of the Department of Nuclear Engineering and Radiological Sciences (NERS) in the College of Engineering. The NERS department has consistently maintained top rankings of graduate nuclear engineering programs and is growing in faculty, students, and research. This project includes a comprehensive renovation of the building, and new space for flexible research laboratories, testing areas, offices, support spaces, and mechanical equipment.

### Energy Efficiency Measures

- An energy efficiency goal to reduce the energy usage of the primary air handling system below ASHRAE 90.1-2007 standard levels.
- A primary HVAC system consisting of a 100% OA (outside air) central air handling unit to provide ventilation to each space, with an enthalpy energy recovery wheel design to recover energy from the building exhaust
- Individual space fan coil units to provide space cooling, which decouples the space cooling load on a room level, resulting in increased energy efficiency
- Energy efficient windows/glazing to increase thermal performance
- Unoccupied ventilation setback modes for reduced ventilation load
- LED lighting fixtures used when cost competitive to reduce the lighting power density
- High-efficiency fluorescent lighting fixtures with electronic ballasts used throughout
- Task lighting installed at counters and laboratory casework
- Occupancy sensor lighting controls for automatic shutoff when rooms are unoccupied
- Variable frequency drives (VFDs) for mechanical equipment
- Premium efficiency distribution transformers

### Other Sustainability Features

- Adaptive reuse of an existing building
- Dual-flush water closets and automatic sensor-operated lavatories installed to reduce water usage in the NELR by 20% when compared to the baseline.
- Zoned HVAC control systems provided
- Insulation added in exterior perimeter wall and roof Natural daylighting added by introducing new windows in existing building enclosure.
- Low VOC paint systems

## Nuclear Engineering Laboratory Renovation

- Low VOC linoleum and resilient flooring and carpet adhesives
- Rubber tile containing 30% recycled product
- Solid surface counter top containing 83% recycled glass content
- FSC certified wood veneer
- Acoustical ceiling tile is containing 81% recycled content
- Carpet is 100% recyclable after its life cycle and contains up to 44-67% recycled content
- Surface raceways installed to provide flexible power and data for laboratories
- Ceiling service panels installed to provide flexible power and data for laboratories
- Bi-level switching installed to provide light level flexibility
- Motorized window shades provided to control natural daylight

### Project Data

- Budget: \$11.4 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 20,500 gross sq. ft. renovation  
240 gross sq. ft. addition

### Status as of March 2015

- Project Status: Construction Documents
- Design Complete: 95%
- Construction Complete: 0%

## School of Education Renovation



### Project Description

A renovation of approximately 8,300 gross square feet of space is planned that will improve infrastructure and renovate select areas of the building to improve functionality. Infrastructure improvements on the first and second floors will include new heating, ventilation, and air conditioning systems, new accessible toilet facilities, and a new fire alarm system for all renovated spaces. In addition, the Office of Student Affairs and Teacher Education suite will be renovated to provide a more visible and welcoming environment for students and visitors and increase staff collaboration, three existing classrooms will be renovated to provide a teaching wet laboratory and an interactive classroom with four breakout rooms, and a community lounge will be created.

### Energy Efficiency Measures

- DDC temperature controls
- Chilled beam cooling systems
- Air and water temperature reset
- Outside air flow monitoring
- Variable frequency drives for pumps and air handling unit fans
- Premium efficiency fan and pump motors
- Enthalpy energy recovery wheels in air handling units
- Where new lighting is required, the design outperformed ASHRAE 90.1-2007 energy targets by 16%.
- Where new lighting is required, occupancy sensors are provided in the lounges, offices, classrooms, breakout rooms, and toilet rooms.

### Other Sustainability Features

- Utilizing existing building structure, no site development
- All new plumbing fixtures will be low-flow fixtures and dual flush toilets
- Regional materials are used wherever possible
- Use of low-VOC materials (carpets, paints, etc.)

### Project Data

- Budget: \$13.6 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 8,300 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 75%

## School of Nursing New Building



### Project Description

The School of Nursing is proposing to construct a new building of approximately 78,000 gross square feet to accommodate its instructional space needs, including a clinical learning center with simulation and skill labs, and simulated patient suites in an environment that will foster collaboration and community. The new building will include space for a small number of faculty offices and limited administrative functions. The proposed site is located near the existing location just north of the North Ingalls Building. With the growth in academic and research programs and increases in student enrollment, the School of Nursing anticipates adding approximately 40 faculty and staff members in the next five to ten years. Approximately 125 parking spaces will be lost due to this project.

### Mechanical Systems include the following:

- Two water-cooled chillers, three cooling towers, three variable primary chilled water pumps, two chilled beam chilled water pumps and three condenser water pumps;
- Three boilers and three heating water pumps;
- Two air handling units;
- Chilled beams, VAV and CV terminal units, series fan powered terminal units and finned tube perimeter terminal units

### Electrical Systems include the following:

- The lighting system will provide lighting levels per IESNA recommendations by space type;
- Lighting control systems will allow selection of lighting levels in most spaces;
- All spaces will have automatic off, via occupancy sensors except electrical, mechanical and telecommunication spaces;
- Lighting power density will be at least 30% below ASHRAE 90.1 2007 allowable, calculated by the whole building method.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 27% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- Optimized below grade wall, above grade wall and Roof Insulation;
- Interior Window Blinds/Shades;
- Lighting reduction through the use of occupancy sensors and photocells
- High Efficiency Chillers
- High Efficiency Boilers
- Chilled Beam Cooling System to reduce supply airflow requirements
- Energy Recovery to exchange heat between the outside air and exhaust air streams
- Variable air volume supply air system for some spaces
- Reduced water flow plumbing fixtures
- Water side economizer to reduce hours of operation for water cooled chillers

### Other Sustainability Features

- This project is registered under the LEED® green building certification program with the certification



**School of Nursing New Building**

goal of LEED Silver.

- Native/Adaptive Plants, Shrubs and Trees.
- Highly Efficient Irrigation
- Protection of habitat
- Stormwater Management
- Recycling of Construction Waste
- High recycled content product selection
- Local/Regional material selection
- Low/no VOC product selection
- Maximize natural daylight in interior spaces
- Green Housekeeping Program
- Low Mercury Lighting Program
- Comprehensive Transportation Management Plan
- Green Roof

**Project Data**

- Budget: \$50 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 78,000 gross sq. ft.

**Status as of March 2015**

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 76%

## Stephen M. Ross School of Business Kresge Renovation and New Academic Building



### Project Description

This project includes a comprehensive renovation of the Kresge Business Administration Library, demolition of the Computer and Executive Education Building, construction of a new academic building, and the addition of exterior building finishes (or cladding) to Sam Wyly Hall, the Business Administration Executive Dormitory, and the Hill Street Parking Structure to create a unified look for the entire Ross School complex of buildings. In total, this project represents approximately 75,000 gross square feet of building renovation and 104,000 gross square feet of new building construction. The project will add classrooms, study space, and faculty and research offices, and enhance non-academic operations to improve the student experience, including student life, financial aid, admissions, and onsite recruiting for careers. The new building design will strive to create a welcoming and unified exterior aesthetic along with well-functioning internal connections within the complex.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 33% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- High performance glazing and exterior wall assemblies for improved performance
- Innovative HVAC strategies such as chilled beams in the Kresge building
- Task lighting, efficient light fixtures, and the integration of natural daylight to help reduce the building's electrical load
- Occupancy sensors for lighting control
- High efficiency chiller with optimized part load to improve performance
- Air systems with improved design for part load and low load operation to track occupancy
- Air handling units that will only cool to the minimum temperature needed to satisfy the space heat and dehumidification loads, reducing the zone reheat

### Other Sustainable Features

- This project is registered under the LEED green building rating system with the certification goal of LEED Silver
- A 20% water consumption savings beyond Michigan Plumbing Code is anticipated; savings will be obtained through the use of low flow bathroom fixtures
- Efficient methods of landscape irrigation
- The sorting and recycling of construction waste when possible
- The use of low-VOC flooring, adhesives, and sealants
- Recycled and regional materials will be selected
- Project site located near public and U-M bus routes to encourage use of public transit

### Project Data

- Budget: \$135 M
- Schedule: Completion Scheduled for Fall 2016
- Square Feet: 75,000 gross sq. ft. renovation  
104,000 gross sq. ft. addition

### Status as of March 2015

- Project Status: Construction
- Design Complete: 98%
- Construction Complete: 8%

## UMHHC C.S. Mott Children's and Von Voigtlander Women's Hospitals Renovations for Child and Adolescent Psychiatric Hospital Relocation



### Project Description

A renovation of approximately 22,500 gross square feet of space on Level 8 of CWH is proposed to accommodate the relocation and expansion of the CAPH. The project will create a state-of-the-art facility, increase the CAPH from 14 to 16 beds, and increase the number of private rooms from 4 to 12.

### Energy Efficiency Measures

The Children's and Women's hospital earned a LEED Silver Certification in 2012 and was designed to ASHRAE Standard 90.1 including building envelope and glazing efficiencies.

- Continued reduction of lighting power densities through the use of energy efficient compact fluorescent and LED fixtures.
- Continued reduction of lighting power usage through occupancy sensors though out the renovated space.
- Continued use of low flow plumbing fixtures.

### Other Sustainability Features

- Salvage and reuse of existing mechanical, electrical, and plumbing elements whenever possible; thus eliminating construction waste. (ex: light fixtures, toilets, sinks, HVAC diffusers, etc.)
- Salvage and reuse of existing acoustic lay-in ceiling tiles, doors, and casework whenever possible.
- New building materials will utilize a high amount of recycled content.
- Recycle a minimum of 75% construction waste.

### Project Data

- Budget: \$10.9 M
- Schedule: Completion Scheduled for Spring 2016
- Square Feet: 22,500 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 30%

## UMHHC Medical Short Stay Unit



### Project Description

The project will update spaces to address accessibility concerns and improve infrastructure, including plumbing, electrical, networking, and communications systems. The scope of this project includes the architectural, electrical, and mechanical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- New digital controllers to replace existing Double Duct Variable Volume (DDVAV) HVAC boxes.
- DDVAV boxes to connect to the Building Management System (BMS) to allow scheduling of spaces and energy savings.

### Other Sustainability Features

- Significant reuse of existing features.

### Project Data

- Budget: \$9 M
- Schedule: Completion Scheduled for Summer 2015
- Square Feet: 19,650 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 8%

## UMHHC Operating Room Expansion



### Project Description

This project will renovate approximately 24,500 gross square feet of space to create four new operating rooms within the surgical suite at University Hospital. Support spaces for operating room equipment storage, offices, and a new staff lounge will be created in space vacated by a prior project to relocate the adjacent EEG/EMG clinic to University Hospital South.

### Energy Efficiency Measures

- Use of variable air volume control where there are nonessential air pressure relationships (offices, locker rooms, break room, etc.)
- Use of occupancy sensors to control lighting where appropriate
- Cooling tower will be winterized, to allow “free cooling” when outdoor air temperature is low
- Use of high efficiency lighting fixtures
- Use of free cooling in coordination with chiller basin and new high efficiency chiller

### Other Sustainability Features

- Use of low consumption urinals, lavatory faucets and shower heads.

### Project Data

- Budget: \$23.5 M
- Schedule: Completion Scheduled for Spring 2016
- Square Feet: 24,500 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 60%
- Construction Complete: 0%

## UMHHC Renovations for Magnetic Resonance Imaging Suite Expansion



### Project Description

A renovation of approximately 11,000 gross square feet of space adjacent to the existing MRI suite is planned that will add a new MRI scanner and associated support space as well as shelved space for an additional MRI at a later date. The project will also enlarge patient reception, waiting areas and provide patient changing rooms, preparation rooms, toilet rooms, a consultation room, equipment room, and storage space.

### Energy Efficiency Measures

The project utilizes existing central HVAC equipment with a goal to utilize energy efficient methods wherever possible.

- Use premium efficiency motors for supply, return and exhaust fans.
- Use digital controls for new VAV boxes.
- Use occupancy sensors to control lighting in offices and other support spaces.
- Use high efficiency lighting fixtures throughout the project.
- Use high efficiency LED exit lights, and down lights.
- Use multi level switching and dimming of light fixtures.

### Other Sustainability Features

- Recycling and reuse of construction waste.
- Use of regional and local materials where possible.
- Use low VOC interior finishes (flooring, adhesives, sealants, coatings wall coverings and paints).

### Project Data

- Budget: \$10 M
- Schedule: Completion Scheduled for Summer 2016
- Square Feet: 11,000 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Bid-Award
- Design Complete: 80%
- Construction Complete: 0%

## UMHHC University Hospital Adult Emergency Department Critical Care Unit



### Project Description

A renovation of approximately 7,800 gross square feet of space in the emergency department on Level BI of University Hospital formerly occupied by the pediatric emergency services area, now located at C.S. Mott Children's and Von Voigtländer Women's Hospitals, is planned. The renovation project will create a new critical care area of nine rooms, enabling stabilization and early initiation of intensive care unit (ICU) protocol-driven care for select populations in the emergency department. This effort is expected to reduce the length of stays in select ICU beds within University Hospital and create increased capacity.

### Energy Efficiency Measures

- Variable Air Volume Air System
- High Efficiency Lighting
- Use of occupancy sensors to reduce airflow in non-occupied periods.

### Other Sustainability Features

- Low water use plumbing fixtures.

### Project Data

- Budget: \$7 M
- Schedule: Completion Scheduled for Summer 2015
- Square Feet: 7,800 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 80%

## Varsity Drive Building Dry Collection Relocation Renovations



### Project Description

This project will relocate dry research museum collections, associated lab spaces, and some offices for the Departments of Anthropology, Paleontology, and Zoology currently housed in the Alexander G. Ruthven Museums Building, the Campus Safety Services Building, and the Clarence Cook Little Science Building to the Varsity Drive Building. A renovation of approximately 71,000 gross square feet at the Varsity Drive Building is planned to accommodate the relocation of the collections. The project will create several environmentally-controlled areas with different temperature and humidity conditions appropriate to protect the various collections. The existing building is a warehouse, and the project will include comprehensive architectural, mechanical, and electrical work necessary to accomplish these improvements. The relocation of the “dry” research collections will create administrative efficiencies by co-locating with the “wet” research collections of the same departments at the Varsity Drive Building.

### Energy Efficiency Measures

- The building’s design and systems includes a number of energy efficient features that will allow for an estimated 21% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1- Appendix G.
- Improved building envelope for renovated area including additional wall insulation on south and east walls, additional insulation on low roof, improved glazing systems on south and east walls, and exterior shading devices/interior light shelves for south glazing.
- Reduced lighting power density and added occupancy sensors throughout the renovated areas, and added daylighting controls for areas with south facing glass.
- Lower velocity ductwork and AHU components to reduce pressure drop and fan horsepower.
- Occupancy sensor tie-in to VAV boxes where appropriate.
- High efficiency condensing boilers.
- High efficiency chillers.
- Desiccant dehumidification vs. standard cool/reheat system.
- High efficiency condensing water heaters.

### Other Sustainability Features

- Low flow plumbing fixtures
- Building Reuse
- Recycled and Regional Materials
- Low Emitting Materials
- Sustainable Sites
  - Alternate Transportation - Bike Storages and Showers
  - Alternate Transportation - No New Parking

### Project Data

- Budget: \$27.45 M
- Schedule: Completion Scheduled for Winter 2015
- Square Feet: 71,000 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 70%



## Weiser Hall Renovation



### Project Description

A renovation of approximately 106,000 gross square feet vacated by the relocation of the Department of Astronomy to West Hall and the repurposing of classrooms will create spaces that will facilitate faculty collaboration and enhance opportunities for graduate and undergraduate students. The renovated space will be organized efficiently with sharing of staff, space, and core facilities between units housed in the building. In addition, approximately 1,500 gross square feet of space will be added by enclosing an overhang area on the ground floor, and extending windows outward on the tenth floor. The project will also address deferred maintenance in the areas renovated.

### Energy Efficiency Measures

- The building's design and systems will include a number of energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- The replacement of all single pane windows with double pane insulated windows.
- High performance glazing where masonry walls are to be replaced with sections of curtain wall.
- Design will consider the opaque to vision ratio to achieve the best performing effective thermal resistance of the glazing system.
- The latest thermal break technologies, coatings, warm edge spacers and gases will be incorporated to optimize the vision unit performance.
- Addition of insulation and vapor barrier at existing un insulated masonry walls.
- Innovative HVAC strategies such as the use of chilled beams.
- Replacement of existing light fixtures with more efficient light fixtures, task lighting, and the opening up of interior floor plates to allow for increased natural daylight penetration.
- Occupancy sensors for lighting controls.
- Rated glass partitions used to open view to existing exit stairs to encourage the use of stairs in lieu of elevator use.
- A green wall is proposed for the double height community commons spaces designed to function as part of the mechanical return air system and improve overall air quality and humidity.
- Coordination of mechanical system and operation to use realistic performance values to avoid unnecessary over-design of the mechanical system.

### Other Sustainability Features

- A 20% water consumption savings beyond Michigan Plumbing Code is anticipated through the use of low flow bathroom fixtures.
- The sorting and recycling of demolition and construction waste were possible.
- The use of low-VOC flooring, adhesives and sealants.
- Use of recycled and regional materials.
- Project site located near public and U-M bus routes to encourage use of public transit.
- The use of supplementary cementitious materials in concrete.

## **Weiser Hall Renovation**

### **Project Data**

- Budget: \$49 M
- Schedule: Completion Scheduled for Summer 2017
- Square Feet: 106,000 gross sq. ft. renovation  
1,500 gross sq. ft. addition

### **Status as of March 2015**

- Project Status: Construction Documents
- Design Complete: 43%
- Construction Complete: 0%

## West Quadrangle and Michigan Union-Cambridge House Renovation



### Project Description

Originally constructed in 1937, West Quadrangle, combined with the Cambridge House portion of the Michigan Union, is an approximately 370,000-gross-square-foot residence hall housing approximately 1,100 students. As part of the ongoing Residential Life Initiative, we propose a deep renovation of West Quadrangle and Cambridge House. Dining services for West Quadrangle residents will be relocated to South Quadrangle allowing renovation of the West Quadrangle dining area for much-needed spaces for student interaction, creation of community, and living and learning activities. Infrastructure upgrades will include: new plumbing, heating, cooling, and ventilation systems; roof replacement; renovated bath facilities; exterior envelope and window repairs; and accessibility improvements.

### Energy Efficiency Measures

- The building's design and systems includes a number of energy efficient features that will allow for an estimated 35% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 - Appendix G.
- This project has been approved for the Designed to Earn ENERGY STAR® certification. This certification recognizes that this design project has met Environmental Protection Agency
- Increased wall insulation
- New roof insulation
- Reduced lighting density throughout the building
- New, energy efficient, regional chiller plant located in South Quad will serve cooling needs of the West Quad and Michigan Union-Cambridge House
- Michigan Union's aging and inefficient chiller plant will be retired and also connected to the new South Quad chiller plant
- Utilizing enthalpy wheels to recover heating and cooling energy from the exhaust systems
- Utilizing occupancy sensors in all common areas
- Utilizing infrared scans of building during construction
- Inspecting exterior wall and fenestration during construction
- Improved glazing performance in Cambridge House where windows are being replaced
- Improved air conditioning system

### Other Sustainability Features

- West Quadrangle is being renovated at its current location with the great majority of both exterior and interior walls being refurbished.
- Public transportation is available with one bus stop in front of the building, on the other side of the street.
- Additional bicycle parking will be provided.
- Low flow fixtures will reduce water consumption by at least 20%
- Building materials, local and regional will be sought wherever possible
- Demolished material will be recycled and/or reused; this includes steel, brick and block.
- Existing site lighting poles, lamps and globes will be reused
- Most of the existing trees will be preserved
- New planting will be native or adaptive vegetation
- Low VOC product selection

## West Quadrangle and Michigan Union-Cambridge House Renovation

- Use of interior window blinds and shades

### Project Data

- Budget: \$114.5 M
- Schedule: Completion Scheduled for Summer 2016
- Square Feet: 370,000 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 90%

## William L. Clements Library Infrastructure Improvements and Addition



### Project Description

The project will involve a comprehensive renovation of approximately 17,300 gross square feet that will update the building infrastructure in a manner that utilizes historic preservation techniques. Infrastructure updates will include accessibility improvements; heating, ventilation and air-conditioning systems, plumbing, electrical, fire detection and suppression, and security systems; and an exterior restoration to protect this legacy building. In addition, the project will construct an underground addition of approximately 7,500 gross square feet that will house portions of the library's collection and mechanical equipment.

### Energy Efficiency Measures

- Improved building envelope for renovated area including additional wall insulation on the basement level walls, additional insulation on the replacement roof, refurbished glazing systems, and new interior storm windows throughout.
- Reduced lighting power density and added occupancy sensors throughout the renovated areas.
- Lower velocity ductwork and AHU components where feasible to reduce pressure drop and fan horsepower.
- Occupancy sensor tie-in to VAV boxes where appropriate.
- Desiccant dehumidification vs. standard cool/reheat system.

### Other Sustainability Features

- Low flow plumbing fixtures
- Material with recycled content
- Low VOC emitting materials and adhesives
- FSC Certified wood materials

### Project Data

- Budget: \$16.8 M
- Schedule: Completion Scheduled for Fall 2015
- Square Feet: 17,300 gross sq. ft. renovation  
7,500 gross sq. ft. addition

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 65%

## Yost Ice Arena Ice System Improvements



### Project Description

The Department of Intercollegiate Athletics proposes a project that will upgrade the arena's ice rink floor, dasher board systems, and refrigeration system, as well as replace the flat roof on the building's north side.

### Energy Efficiency Measures

- Replacement of the facilities existing antiquated ice plant mechanical equipment with new energy efficient and high performance equipment.
- The new refrigeration system will be designed to capture and reuse a significant amount of the waste heat generated by the refrigeration system, which has been traditionally vented to the atmosphere, thereby reducing the use of natural gas and electricity required to operate the system.
- Minimize the amount of water used by the cooling tower through reduced operating time because of using more waste heat inside the building.

### Other Sustainability Features

- Significantly reduce the facilities carbon footprint by removing of approximately 6,000 pounds of hydrochlorofluorocarbons (HCFCs) refrigerant and replacing with less than 800 pounds of an environmentally friendly and naturally occurring refrigerant with zero Ozone Depleting Potential (ODP) and zero Global Warming Potential (GWP).
- Use 15% fly ash in concrete mix design for floor in place of cement.
- The use of recyclable plastics where feasible within new dasher board system.
- The sorting and recycling of construction waste when possible.

### Project Data

- Budget: \$5.8 M
- Schedule: Completion Scheduled for Summer 2015
- Square Feet: 22,000 gross sq. ft. renovation

### Status as of March 2015

- Project Status: Construction
- Design Complete: 100%
- Construction Complete: 0%

## Alice Crocker Lloyd Residence Hall Renovation



### Project Description

Alice Crocker Lloyd Hall is a 176,000 gross-square-footage residence hall housing approximately 560 students. The renovation will update infrastructure, including: new plumbing, heating, cooling, ventilation, fire detection and suppression systems, wired and wireless high-speed network access, renovated bath facilities and accessibility improvements. New spaces will be created in the vacated dining areas that are no longer needed since the Hill Dining Center became operational. New and reorganized spaces within the facility will revitalize the old residence hall and create much needed spaces for living-learning and academically-related activities, dance practice and multipurpose space, art studio, music practice rooms and spaces for student interaction and community development. The scope of this project includes the architectural, mechanical, and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- Energy conservation measures evaluated by ASHRAE 90.1-2007 Appendix G procedures have resulted in reducing energy cost by a minimum of 30% compared to the ASHRAE Baseline Building
- This project has been approved for the Designed to Earn ENERGY STAR® certification. This certification recognizes that this design project has met Environmental Protection Agency (EPA) criteria for energy efficiency.
- Insulating all existing exterior walls that are not currently insulated.
- Utilizing the chilled water from the Mechanical Services Building adjacent to Mosher-Jordan Residence Hall as the cooling sources for the resident rooms in lieu of DX units.
- Reducing the lighting power density for the first and second floor common areas.
- Utilizing space occupancy sensors on the first and second floor common spaces to reduce run hours for the central station air handling units.
- Using increased inspections, including infrared scans, during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies.
- Using an enthalpy wheel in the mechanical system as a means of energy recovery to utilize the lost heat from the toilet room exhaust system.

### Other Sustainability Features

- Alice Crocker Lloyd Hall is being renovated on its current site with over 75% of the existing walls, floors, and roof being re-used as well as 50% of the interior non-structural elements are being re-used.
- Access is being improved, thus encouraging the use of UM and public transportation.
- Bike racks will be installed to encourage the use of bicycles for transportation.
- No new parking will be provided on site (to reduce pollution and land development impacts).
- The use of water conserving plumbing fixtures including low flow toilets, urinals and shower heads will reduce water consumption by over 30%.
- Use of regional and local materials used where possible (not less than 10%).
- Use of low VOC materials including adhesives, sealants, paints, coatings, carpet systems, composite wood and agrifiber products.
- During construction, the demolition contractor is separating and recycling metal and brick.

## **Alice Crocker Lloyd Residence Hall Renovation**

### **Project Data**

- Budget: \$56 M
- Schedule: Completion Scheduled for Summer 2012
- Square Feet: 176,000 gross sq. ft. renovation

### **Substantially Complete: August 2012**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## Central Power Plant Feed Water System Deaerator Upgrade



### Project Description

This project will replace two 1940's deaerators with two modern deaerators meeting current industry standards. Each deaerator weighs approximately 140,000 pounds when filled, measuring 18 feet in diameter and 20 feet in length. An existing decommissioned boiler will be removed, including abatement of lead and asbestos, to provide space for the new system. The new equipment will yield higher-quality water and increase boiler system efficiency, reliability, life expectancy, and redundancy. It will also result in reduced boiler corrosion, component failure, and maintenance.

### Energy Efficiency Measures

- Reduce GHG emissions by improving plant steam-generating efficiency. The new deaerators will produce improved feedwater quality, to keep boiler surfaces clean and free from corrosion and scaling; thereby improving heat transfer; resulting in less fossil fuels used to generate the steam.
- Reduce use of water treatment chemicals. The new deaerators will use mechanical methods to improve oxygen removal from the feedwater, thereby reducing the need to use oxygen scavenger chemicals. The improved feedwater quality will also help reduce the need for use of anti-scaling chemicals.
- Improve Controls. The updated deaerator monitoring system and controls will also help plant operations maintain the highest plant performance, minimize potential inefficiencies or upsets, thereby minimizing use of fuels or production of GHGs.

### Other Sustainability Features

- All hazardous materials that remain on or within Boiler 5 will be properly remediated and disposed of.
- The improved feedwater quality will help extend the useful life of all plant boilers, thereby reducing the amount of future materials and energy that would be used for replacement parts and system components.
- A number of the existing Boiler 5 support steel columns and beams have been incorporated into the new deaerator support system, thereby re-purposing them, and reducing the amount of waste materials that would otherwise have to be sent to a landfill or re-cycle center.

### Project Data

- Budget: \$5.75 M
- Schedule: Completion Scheduled for Fall 2014
- Square Feet: N/A

### Substantially Complete: October 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Chemistry Building and Willard H. Dow Laboratory Chiller Replacement



### Project Description

The chiller plant that serves the Chemistry Building and Willard H. Dow Laboratory is located on the ground floor of the Chemistry Building and was constructed in 1988. One of the plant's three steam absorption chillers failed and was replaced with an electric chiller in 2010. This project will replace the two remaining absorption chillers and associated infrastructure with new electric chillers, pumps, piping, controls, and a new electrical substation. Based on the present costs for steam and electricity, the two new chillers will result in an estimated \$600,000 annual savings compared with the existing chillers.

### Energy Efficiency Measures

- Replace less efficient steam driven absorbers to electric centrifugal chillers.
- Convert constant flow primary chilled water system to variable flow.
- Adding or upgrading variable speed drives.

### Other Sustainability Features

- Reusing pumps and piping where feasible.
- Reduction in city water makeup use due to replacing absorption chillers with electric chillers.

### Project Data

- Budget: \$7 M
- Schedule: Completion Scheduled for Fall 2013
- Square Feet: 18,000 gross sq. ft. renovation

### Substantially Complete: June 2013

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Couzens Hall Renovation



### Project Description

Couzens Hall is an approximately 180,000-gross-square-foot residence hall housing approximately 560 students. The renovation will repair and update infrastructure, including: new plumbing, heating, ventilation, fire detection and suppression systems, wired and wireless high-speed network access, renovated bath facilities and accessibility improvements. New spaces will be created in the vacated dining areas that are no longer needed since the Hill Dining Center became operational. New and reorganized spaces within the facility will revitalize the old residence hall and create spaces for living-learning and academic initiatives, student interaction, and creation of community. The energy performance of the overall building will be brought up to our current design guidelines by: adding insulation to exterior walls where feasible, replacing most of the glazing and/or window systems, adding occupancy sensors for ventilation and lighting system control, and providing energy-efficient heating and air conditioning systems, as well as other energy conservation measures. Although the building will be more energy-efficient and meet our current design guidelines, the addition of air conditioning throughout the building will increase overall energy consumption. The scope of this project includes the architectural, mechanical, and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- This project has been approved for the Designed to Earn ENERGY STAR® certification. This certification recognizes that this design project has met Environmental Protection Agency (EPA) criteria for energy efficiency.
- Insulating all existing exterior walls that are not currently insulated.
- Replacing existing window framing and glazing in the west half (original) of the building and replacing glazing in the east half (newer addition) of the building to increase thermal performance.
- Utilizing the chilled water from the Mechanical Services Building adjacent to Mosher Jordan Residence Hall as the cooling source for the Resident Rooms in lieu of DX units.
- Reducing the lighting power density for the first and second floor common areas.
- Utilizing space occupancy sensors in the resident rooms to reduce lighting power density and reduce run hours for the fan coil units.
- Utilizing space occupancy sensors on the first and second floor common spaces to reduce run hours for the central station air handling units.
- Using increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure and other wall/roof assembly deficiencies.
- Using an enthalpy wheel in the mechanical system as a means of energy recovery to utilize the lost heat from the toilet room exhaust system.

### Other Sustainability Features

- Couzens Hall is being renovated on its current site with over 95% of the existing walls floors and roof and 50% of the interior non-structural elements being reused.
- Access is being improved thus encouraging the use of UM and public transportation.
- Bike racks will be installed to encourage the use of bicycles for transportation.
- No new parking will be provided on site (to reduce pollution and land development impacts).

## Couzens Hall Renovation

- The use of water conserving plumbing fixtures including low flow toilets, urinals and shower heads will reduce water consumption by over 20%.
- Daylighting and views will be provided for over 75% of the spaces in the building.
- Use of regional and local materials used where possible (not less than 10%).
- Use of low VOC materials including adhesives, sealants, paints, coatings, carpet systems, composite wood and agrifiber products.

### Project Data

- Budget: \$49 M
- Schedule: Completion Scheduled for Summer 2011
- Square Feet: 180,000 gross sq. ft. renovation

### Substantially Complete: July 2011

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Crisler Arena Expansion



### Project Description

Built in 1967, Crisler Arena is a multi-purpose venue used for academic, athletic, and entertainment events. In October 2010, the Board of Regents approved a renovation of the arena's core infrastructure and replacement of spectator seating, with a seating capacity of approximately 12,800. The Department of Intercollegiate Athletics will now further renovate and expand Crisler Arena. New construction of approximately 63,000 gross square feet will create new spectator entrances, retail spaces, ticketing areas and a private club space. Renovation of approximately 54,000 gross square feet will accommodate accessible seats, improve circulation and egress, increase the number of restrooms and concession areas, and add other fan amenities. The scope of this project includes the architectural, mechanical, and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- This project is designed to consume 30% less energy than allowed by the 2007 edition of ASHRAE Standard 90.1.
- Maximum insulation in foundation walls, exterior walls, under slab, and roof assemblies.
- Use of increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies.
- Energy efficient windows/glazing for increased thermal performance.
- High efficiency lighting throughout with daylight sensors for spaces with fenestration.
- Occupancy sensors to control lighting.
- Demand control ventilation to reduce mechanical loads to low occupancy and empty spaces.
- High efficiency air cooled chiller.
- Increase thermostat deadbands (the gap between the heating setpoint and cooling setpoint during which no conditioning is provided).
- Increased exhaust air energy recovery.
- Automatic static pressure reset.

### Other Sustainability Features

- This project is LEED® Gold certified.
- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation.
- Reuse of existing Crisler Arena (in lieu of new facility on green-field site).
- Crisler Arena sited on public and UM bus routes, encouraging use of public transit.
- No new parking provided on-site (to reduce pollution and land development impacts).
- Use of water conserving plumbing fixtures, including low-flow shower heads low-flow lavatories, and waterless urinals.
- Energy efficient transformers.
- Use of select sustainable materials (e.g., steel structure, terrazzo flooring).
- Use of low-VOC materials (e.g., carpets, paints).
- Use of regional and local materials where possible (e.g., limestone, brick).

## **Crisler Arena Expansion**

### **Project Data**

- Budget: \$52 M
- Schedule: Completion Scheduled for Winter 2014
- Square Feet: 54,000 gross sq. ft. renovation  
63,000 gross sq. ft. addition

### **Substantially Complete: December 2012**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Crisler Arena Renovation



### Project Description

Built in 1967, Crisler Arena is a multi-purpose venue with a seating capacity of approximately 13,800 used for academic, athletic, and entertainment events. The arena has received minor renovations since construction, and we now propose addressing its highest priority infrastructure needs, including life safety, mechanical and electrical. The project will include: replacement of the roof and asbestos abatement as needed; new fire detection, alarm, and suppression systems; a new smoke evacuation system; emergency egress lighting; replacement of the heating and ventilation units; and building electrical system upgrades. The project includes complete seating replacement, and the addition of seating meeting the requirements of the Americans with Disabilities Act, as well as relocate and widen aisles and add hand rails to the aisles. The scope of this project includes the architectural, mechanical, and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- Increased insulation in the existing roof, in the new exterior walls and under new slabs.
- Energy efficient windows/glazing in new windows for increased thermal performance.
- High efficiency lighting throughout.
- Occupancy sensors to control lighting during unoccupied times.
- Demand control ventilation to reduce amount of outside air being heated/cooled during low occupancy.
- Increase thermostat dead bands for heating during unoccupied times.
- Supply air ductwork sized at lower velocities to reduce the static pressure and therefore less fan energy is required.

### Other Sustainability Features

- Reuse of the existing Arena, reducing waste from demolition of the existing arena and reducing the impact from constructing an entirely new arena.
- Site is located on public and UM bus routes, encouraging use of public transit.
- No new parking provided on-site (to reduce pollution and land development impacts).
- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation
- Energy efficient transformers
- Use of low VOC materials for pipe connections.
- Monitoring outside air delivery to ensure during low load conditions that the correct amount of outside air is being delivered.
- Air handling systems will be designed for thermal comfort by the occupants.
- Refrigerant systems will utilize HCFC which have almost zero ozone depletion ratings.
- Use of low-VOC materials (eg carpets, paints).
- Use of regional and local materials where possible.

## **Crisler Arena Renovation**

### **Project Data**

- Budget: \$23 M
- Schedule: Completion Scheduled for Winter 2012
- Square Feet: 195,110 gross sq. ft. renovation

### **Substantially Complete: September 2011**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## Donald R. Shepherd Softball Center



### Project Description

The approximately 10,200-gross-square-foot Softball Center will include locker rooms for players and coaches, staff offices, a team meeting room, athletic medicine and fitness spaces, hydrotherapy pools, and support space. The project will also include site restoration including the plaza and extension of a water main loop through that area for increased fire protection.

### Energy Efficiency Measures

The building has been designed to be 30% better than Michigan Energy Code ASHRAE 90.1-2007 and has employed the following Energy Conservation Measures:

- Wall insulation values 72% better than ASHRAE 90.1-2007
- Roof Insulation values 23% better than ASHRAE 90.1-2007
- Window glazing performance that is 23% better than ASHRAE 90.1-2007
- Window Shades on all West-facing glazing
- Optimized occupancy schedules, HVAC system zoning, and part load HVAC system efficiency
- Improved ventilation efficiencies
- Heat Recovery
- Demand Control Ventilation
- Very limited use of incandescent lighting
- Utilization of energy-efficient LED site lighting
- Occupancy sensors tied to lighting controls to harvest daylight
- Heat Pump to recover waste heat from chilling cold hydrotherapy pool and use for heating warm hydrotherapy pool.

### Other Sustainability Features

- Only low-VOC materials used on interior spaces
- 20% recycled and regional materials
- 75% diversion rate for construction waste
- Indoor Air Quality plan for all construction activities
- 20% reduction in potable water demand based off code requirements
- Reuse of previously developed site

### Project Data

- Budget: \$5.3 M
- Schedule: Completion Scheduled for Winter 2014
- Square Feet: 10,200 gross sq. ft.

### Substantially Complete: February 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## East Quadrangle Renovation



### Project Description

Originally constructed in 1940 with additions in 1948 and 1969, East Quadrangle is an approximately 300,000-gross-square-foot residence hall housing approximately 860 students and the Residential College. Consistent with the overall Residential Life Initiatives presented to the Board of Regents in September 2004, we propose a deep renovation of East Quadrangle. The renovation will update infrastructure, including: new plumbing, heating, cooling, ventilation, fire detection and suppression systems; wired and wireless high-speed network access; renovated bath facilities; and accessibility improvements. New and reorganized spaces within the facility will revitalize the old residence hall and create much-needed spaces for academically-related facilities, as well as improved dining facilities. Since its inception in 1967, the Residential College has occupied spaces within East Quadrangle not originally designed for academic use, with offices and administrative functions housed in former bedrooms and most classrooms located in the basement. This project will renovate the Residential College to current academic standards.

### Energy Efficiency Measures

- This project has been approved for the Designed to Earn ENERGY STAR® certification. This certification recognizes that this design project has met Environmental Protection Agency (EPA) criteria for energy efficiency.
- The building's design and systems include energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1-Appendix G.
- Increased exterior wall insulation.
- New roof insulation.
- Improved air-conditioning system, which will retire old smaller, inefficient systems.
- Reduced lighting density throughout the building.
- Utilizing occupancy sensors in all common areas.
- Utilizing HVAC occupancy sensors in all common areas.
- Increasing thermostat dead band by 2 degrees for offices and classrooms.
- Utilizing infrared scans of building during construction.
- Inspecting exterior wall and fenestration during construction.
- Using an enthalpy wheel in the mechanical system as a means of energy recovery to utilize lost heat from the toilet room exhaust system.

### Other Sustainability Features

- East Quad is being renovated at its current location with over 80% of the existing exterior walls, 75% of the existing windows, and a majority of the existing interior walls being refurbished.
- Additional bicycle parking will be provided to encourage bicycle usage.
- Building materials both regional and local will be used where possible; project goal is not less than 10%.
- Demolished material will be recycled and/or reused; this includes steel, brick, and block.
- Existing site lighting, poles, lamps, and globes, will be reused.
- Heritage trees throughout the site will be maintained and preserved.
- Porous pavement materials will be utilized throughout existing courtyard spaces; this will take the place of existing non-porous materials.

**East Quadrangle Renovation**

- Select existing kitchen equipment will be rehabilitated for optimal use.
- Composting will be utilized.
- Additional light wells and areaways will be constructed to take advantage of direct and barrowed natural light.

**Project Data**

- Budget: \$116 M
- Schedule: Completion Scheduled for Summer 2013
- Square Feet: 300,000 gross sq. ft. renovation

**Substantially Complete: July 2013**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## George Granger Brown Memorial Laboratories Mechanical Engineering Addition



### Project Description

The approximately 220,000 gross square foot George Granger Brown Memorial Laboratories (G. G. Brown) was constructed in 1958 and houses the Department of Mechanical Engineering, which has evolved to include emerging research areas such as bio-systems, energy systems, and nano-systems. The College of Engineering proposes an approximately 62,500 gross square foot addition to G. G. Brown. The addition will house research laboratories and faculty and graduate student offices to support these emerging research endeavors, as well as spaces that will enhance the ability to realize ultra-high-resolution measurements at molecular and atomic scales.

### Energy Efficiency Measures

- The building's design and systems include energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1 -Appendix G.
- Maximum insulation in foundation walls, exterior walls, under slab, and roof assemblies.
- Use of increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies.
- Energy efficient windows/glazing for increased thermal performance.
- High efficiency lighting throughout.
- Occupancy sensors to control lighting.
- Hybrid Lab HVAC System Configuration.
- Dual Effect Energy Recovery System.
- Lab Lighting Power Density Reductions.
- Lighting Control/Space HVAC Setback.
- Solar Collectors for Domestic Hot Water Heating
- Photovoltaic Solar Array

### Other Sustainability Features

- This project is registered under the LEED® green building certification program with the certification goal of LEED Silver.
- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation.
- GG Brown Laboratory sited on public and UM bus routes, encouraging use of public transit.
- No new parking provided on-site (to reduce pollution and land development impacts).
- Use of water conserving plumbing fixtures.
- Energy efficient transformers.
- Use of select sustainable materials (e.g., steel structure, terrazzo flooring).
- Use of low-VOC materials (e.g., carpets, paints).
- Use of regional and local materials where possible.
- Learning Center for Energy Consumption- provides a touchscreen public interface for display of building energy consumption and status of sustainability goals.

## George Granger Brown Memorial Laboratories Mechanical Engineering Addition

### Project Data

- Budget: \$46 M
- Schedule: Completion Scheduled for Summer 2014
- Square Feet: 62,500 gross sq. ft.

### Substantially Complete: June 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Glenn E. Schembechler Hall Entrance and Museum Renovation



### Project Description

This project will create an appropriate new entrance for the home of Michigan football integrating the museum area. The project will add approximately 7,000 gross square feet to Schembechler Hall and renovate approximately 7,000 gross square feet.

### Energy Efficiency Measures

- Envelope inspections.
- Clerestory glazing.
- 18% more efficient thermal barrier than prescribed by ASHRAE 90.1-2007.
- Optimized occupancy schedules, HVAC system zoning, and part load HVAC system efficiency.
- Improved ventilation efficiencies.
- Low air return.
- Demand Control Ventilation.
- Bi-Polar Ionization which dramatically improves indoor air quality while significantly reducing the requirement for Outside Air thus reducing the energy associated with mechanically conditioning that air.
- Very limited use of incandescent lighting and utilization of LED site lighting.

### Other Sustainability Features

- Adaptive reuse of existing space.
- Passive solar glazing strategies.
- Tall interior spaces coupled with clerestory glazing to optimize daylight harvesting.
- Only low-VOC materials used on interior spaces.
- 20% recycled and regional materials.
- 75% diversion rate for construction waste.
- Indoor Air Quality plan for all construction activities.

### Project Data

- Budget: \$9 M
- Schedule: Completion Scheduled for Winter 2014
- Square Feet: 7,000 gross sq. ft. renovation  
7,000 gross sq. ft. addition

### Substantially Complete: March 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Golf Practice Facility



### Project Description

Provide a new Golf Practice Facility with driving bays, putting and chipping, offices, locker rooms, lounge study and conference room areas.

### Energy Efficiency Measures

This project is designed to surpass code required energy efficiency (ASHRAE 90.1 2007) by 30%. Some of the examples of the energy conservation measures include:

- Maximum insulation in foundation walls, exterior walls, and roof assemblies
- Energy efficient windows/glazing for increased thermal performance
- Daylighting controls for perimeter spaces
- Reduction of lighting levels through use of occupancy sensors
- Efficient mechanical heating/cooling systems. Geothermal wells and heat pumps are used to provide heating and cooling for 4000 square feet of the new golf practice facility. There are seven 300 feet deep wells that serve six heat pumps supplying conditioned air to several zones in the office areas. The geothermal field effectively and efficiently transfers the heat loss and gain from the building to an almost constant ground temperature source through a series of wells. The approximate energy savings is estimated to be 30% with an approximate payback period of 3-4 years.
- Domestic hot water reduction by using low flow fixtures
- Free cooling achieved by providing operable windows in regularly occupied areas.

### Other Sustainability Features

The design team calculates that this project will qualify for LEED Gold-level Certification, if ASHRAE +30 is also achieved. However, the decision to apply for formal certification has not yet been made. Examples of some of the additional sustainability measures incorporated into the project include:

- The Golf Practice Facility is situated on a previously developed site instead of a new site and has no threatened or endangered plants or animal species that inhabit this space
- New building is sited on public bus routes, encouraging use of public transit
- Bike racks and shower facilities are provided, encouraging alternative transportation
- Existing parking provided on the site modified but not increased
- Storm water management incorporates a bioswale that will significantly reduce the quantity of storm water , as well as addressing storm water quality
- High SRI roofing material to reduce heat island effect
- All plumbing fixtures within the building will be low-flow fixtures and dual flush toilets
- At least 50% of construction waste will be diverted from disposal
- Regional /recycled-content materials are used wherever possible, as well as certified wood

### **Golf Practice Facility**

- Use of low-VOC materials (carpets, paints)
- Use of grating mats and exhaust systems with filters to improve indoor chemical and pollutant source control

### **Project Data**

- Budget: \$2.5 M
- Schedule: Completion Scheduled for Summer 2011
- Square Feet: 10,000 gross sq. ft.

### **Substantially Complete: September 2011**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## Institute for Social Research Addition



### Project Description

This project includes construction of a four-level addition of approximately 44,700 gross square feet and renovation of approximately 7,200 gross square feet of space within the existing Institute for Social Research building. The Institute for Social Research would like to modify the scope of the project to increase the size of the addition to approximately 56,700 gross square feet, primarily through construction of one additional floor, and to increase the area of renovation where new construction attaches to the existing building to 12,800 gross square feet. The newly added research space is needed to address the institute's continued growth in programs and projects, including a significant increase in federally funded initiatives.

### Energy Efficiency Measures

- The Institute for Social Research Addition designed to consume 30 percent less energy than allowed by the 2007 edition of American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1.
- Use of hydronic chilled beam terminal induction cooling devices, which transfer cooling through liquid rather than air and which eliminate fan energy for large ductwork. Distribution of cooling within rooms via induction minimizes distribution energy within rooms.
- Installation of an enthalpy energy wheel to recover waste heat.
- Cooling tower will be winterized, to allow "free cooling" when outdoor air temperature is low.
- Use of increased building envelope inspections, including infrared scans during construction to identify missing insulation and gaps in the building enclosure.
- High efficiency lighting throughout.
- Inclusion of an atrium to bring natural daylight into interior of building, which will reduce the need for artificial lighting.
- Occupancy sensors to control lighting.
- High efficiency chiller.
- Increased thermostat dead band (the gap between heating and cooling set points during which no heating/cooling is required).
- Individually controlled window shades, to minimize solar heat gain on sunny days.

### Other Sustainability Features

- This project is LEED® Gold Certified.
- Installation of a living "green roof" to provide natural conductive roof insulation, to reduce peak storm water run-off, to utilize solar radiation, and to provide thermal inertia for the building (which minimizes peak heating and cooling loads).
- Installation of low flow plumbing fixtures to reduce water consumption 40 percent below the consumption rate of a typical building.
- Utilization of an urban building site that is convenient to UM and public transportation. No installation of parking, to further encourage use of mass transportation.
- Use of selected sustainable materials, such as terrazzo flooring.
- Use of low-VOC materials, such as carpeting and paint.

**Institute for Social Research Addition**

- Use of Certified Wood products in the project.
- Use of low emittance furniture in the project.
- At least 20 percent of new materials will be from local/regional sources.
- At least 20 percent of new materials will be recycled content.
- At least 10 percent of nonhazardous construction and demolition debris will be recycled and/or salvaged by implementing a construction waste management plan.
- Combined chilled water/fire suppression piping to minimize excess piping in the building.
- Consideration of translucent floor panels in the floor of the atrium, to provide natural lighting to occupied basement areas.
- Solar optimization of atrium skylight monitors via energy modeling.
- Installation of new glazing at existing offices that will now front atrium, to provide natural lighting without building envelope heat gain/loss.

**Project Data**

- Budget: \$29 M
- Schedule: Completion Scheduled for Summer 2014
- Square Feet: 12,800 gross sq. ft. renovation  
56,700 gross sq. ft. addition

**Substantially Complete: May 2014**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Intercollegiate Soccer Stadium



### Project Description

Athletics is proposing to add spectator amenities and player support facilities to the competition field for men's and women's intercollegiate soccer. The project involves approximately 20,000 gross square feet of construction, including restrooms and concessions for spectators, a press area, two team locker rooms, and grandstand seating for approximately 1,800 spectators.

### Energy Efficiency Measures

- Design building to meet energy efficiency and performance required by ASHRAE/IESNA 90.1-2004.
- Occupancy sensors control lighting.
- Automatic controls for exterior lighting
- High efficiency hot water heaters.
- Boilers are on a reset schedule with respect to outside air temperature to increase their efficiency.
- Roof top units on an occupancy schedule to allow temperature setting to dial back when building is not occupied.
- Thermostats are provided in each room to allow individual controls.
- Automatic sensors control water flow at lavatories.
- Tempered water is provided to lavatories thereby minimizing the use of hot water.

### Other Sustainability Features

- Design site sediment and erosion control to best management practices.
- Project is located within 1/4 mile of 2 bus lines.
- Bicycle racks and showers are provided for building occupants.
- No new parking is provided.
- Limit site disturbance to 40' beyond the building perimeter and 5' beyond roadway curbs.
- Provide vegetated open space adjacent to the building that is at minimum equal to the building footprint.
- Post-development storm water peak discharge rate and quantity does not exceed the pre-development peak discharge rate and quantity for the one- and two-year 24-hour design storms.
- Storm water management promotes infiltration and captures and treats the storm water runoff from 90% of the average annual rainfall using acceptable.
- Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems by using low flow plumbing fixtures and waterless urinals.
- Use building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials, e.g. structural steel, carpet, athletic flooring.
- Use building materials that have been extracted and/or harvested as well as manufactured, within 500 miles of the project site, e.g. brick, structural steel.
- Use wood-based materials and products, which are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria, for wood building components.
- Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building to reduce IAQ problems resulting from the construction/renovation process.
- Use low VOC emitting adhesives, sealants, paints, coatings, and carpet to reduce indoor air quality

**Intercollegiate Soccer Stadium**

problems resulting from the construction/renovation process by.

- Individual lighting controls provided for minimum 90% of the building occupants to enable adjustments to suit individual task needs and preferences.

**Project Data**

- Budget: \$6 M
- Schedule: Completion Scheduled for Summer 2010
- Square Feet: 20,000 gross sq. ft.

**Substantially Complete: August 2010**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Law School Academic Building and Hutchins Hall Law School Commons Addition



### Project Description

The proposed project includes a new academic building located south of Monroe Street, an addition between Hutchins Hall and the William W. Cook Legal Research Library for a new Law School commons, and renovations within both Hutchins Hall and the Cook Library. The new academic building will be approximately 100,000 gross square feet that will house classrooms, multi-purpose spaces, clinic work spaces, and offices for Law School faculty and administrators. The Law School commons project of approximately 16,000 gross square feet will provide needed student study, interaction, and support spaces. Additionally, the project will include life safety upgrades to Hutchins Hall and the Cook Library and the addition of an electrical substation and chilled water plant. The project will also replace the metal siding on the connection between the Law Quad buildings and the Cook Library stacks wing with a masonry façade as presented.

### Energy Efficiency Measures

- Designed to surpass code required energy efficiency by 30%.
- Maximum insulation in foundation walls, exterior walls, and roof assemblies
- Energy efficient windows/glazing for increased thermal performance
- Occupancy sensors for the shutdown of VAV boxes
- Increase of “deadband” in the thermostat controls for all academic spaces
- Use of increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies
- Daylighting controls for perimeter spaces
- Reduction of lighting levels through use of occupancy sensors
- More efficient mechanical cooling achieved with the use of high efficiency chillers
- Domestic hot water reduction by using low flow fixtures
- Mechanical room airflow reduction achieved by ventilating the mechanical room based on occupancy
- Free cooling achieved by using dry coolers and getting energy savings associated with not running the air conditioning unit compressors

### Other Sustainability Features

- This project is LEED® Gold certified.
- Law School new academic building is situated on a previously developed site instead of a new site and has no threatened or endangered plants or animal species that inhabit this space
- New building is sited on public and UM bus routes, encouraging use of public transit
- Bike racks and shower facilities are provided, encouraging alternative transportation
- No new parking provided on the site
- Landscaping is designed to have only native and adaptive plants and no lawns, therefore reducing the need for mowing and using invasive fertilizers
- Storm water management incorporates a detention tank that will significantly reduce the quantity of storm water
- Storm water quality will be controlled with the use of hydrodynamic separators
- Light colored hardscape surfaces will be installed to help the heat island effect
- All plumbing fixtures within the building will be low-flow fixtures and dual flush toilets

**Law School Academic Building and Hutchins Hall Law School Commons Addition**

- At least 50% of construction waste will be diverted from disposal
- Regional materials are used wherever possible, as well as certified wood
- Use of low-VOC materials (carpets, paints)
- Use of grating mats and exhaust systems with filters to improve indoor chemical and pollutant source control

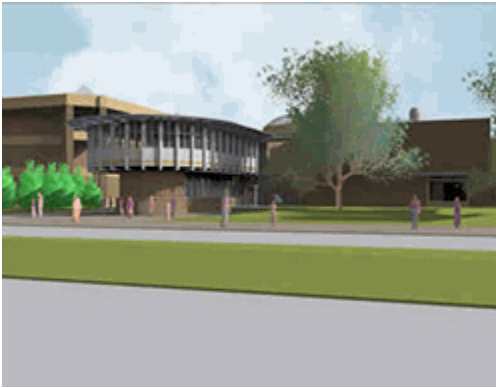
**Project Data**

- Budget: \$102 M
- Schedule: Completion Scheduled for Spring 2012
- Square Feet: 16,000 gross sq. ft. renovation  
100,000 gross sq. ft. addition

**Substantially Complete: September 2011**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Michigan Memorial Phoenix Project Laboratory Addition and Second Floor Renovation



### Project Description

The project creates modern research laboratory space to support the Michigan Memorial Phoenix Energy Institute. A renovation of approximately 10,000 gross square feet will create state-of-the-art laboratory spaces for energy-related research, as well as construction of an addition of approximately 10,000 gross square feet for the institute's administrative functions. As part of this project, the building's electrical substation, which has exceeded its useful life, will be replaced.

### Energy Efficiency Measures

- This project is designed to consume 30% less energy than allowed by the 2007 edition of ASHRAE Standard 90.1.
- Insulating existing exterior walls impacted by the project that are not currently insulated.
- Utilizing space occupancy sensors on the ground and upper floor common spaces to reduce run hours for the central station air handling units.
- Maximum insulation in foundation walls, exterior walls, under slab, and roof assemblies.
- Use of increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies.
- Energy efficient windows/glazing for increased thermal performance.
- External shading of curtain wall glazing.
- High efficiency lighting throughout with daylight sensors for spaces with fenestration.
- Occupancy sensors to control lighting in offices, bathrooms, corridors, and conference rooms.
- Increase thermostat deadbands (the gap between the heating setpoint and cooling setpoint during which no conditioning is provided).

### Other Sustainability Features

- This project is LEED® Gold certified.
- No new parking will be provided on site (to reduce pollution and land development impacts).
- The use of water conserving plumbing fixtures including low flow toilets, urinals and shower heads will reduce water consumption by over 20%.
- Daylighting and views will be provided for over 75% of the spaces in the building.
- Use of low VOC materials including adhesives, sealants, paints, coatings, and carpet systems.
- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation.
- The addition is constructed on a previously developed site in lieu of a green field site.
- The project is sited on public and UM bus routes, encouraging use of public transit.
- Energy efficient transformers.
- Use of select sustainable materials (eg steel structure, terrazzo flooring).
- Use of regional and local materials where possible (eg stone and brick).

## **Michigan Memorial Phoenix Project Laboratory Addition and Second Floor Renovation**

### **Project Data**

- Budget: \$11.1 M
- Schedule: Completion Scheduled for Spring 2013
- Square Feet: 9,600 gross sq. ft. renovation  
10,000 gross sq. ft. addition

### **Substantially Complete: April 2013**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## Michigan Stadium Bowl Painting



### Project Description

Michigan Stadium, an iconic brick and concrete structure, was constructed in 1927. In 1949 and 1998 the capacity was increased with the addition of permanent steel stands, and capacity increased in 2010 with the completion of the Michigan Stadium Renovation and Expansion Project. This project will remove existing paint from the stadium bowl top and underside, repair or replace corroded steel, and repaint these areas and associated steel structure with a corrosion-resistant paint to protect the metal for many years. The project will include appropriate lead mitigation methods since much of the existing painted surface contains lead-based paint.

### Energy Efficiency Measures

- The scope of work for this project is only the removal of the existing paint systems, repair of the steel structure where required, and application of a new paint finish to the existing steel structure. No work related to energy usage is included in this project.

### Other Sustainability Features

- This project includes removal of existing lead based paint on steel decking and structural supports.

### Project Data

- Budget: \$6 M
- Schedule: Completion Scheduled for Summer 2014
- Square Feet: 350,000 gross sq. ft. renovation

### Substantially Complete: August 2013

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Michigan Stadium Renovation and Expansion Project



### Project Description

Approximately 400,000 gross square feet of new facilities are proposed in five structures, and approximately 50,000 gross square feet of existing facilities will be renovated. Two small buildings at the north end of the stadium grounds and one small building at the south end will house restrooms, concessions, and support functions such as first-aid, police and security, and the will-call ticket office. The two main sideline buildings are proposed to accommodate bench seats, media facilities, accessible seats, restrooms, concession areas, an additional concourse, 83 suites, and approximately 3,200 indoor and outdoor club seats. The project will also include widening of the aisles and added handrails in the existing bowl. The renovation will address needed infrastructure upgrades related to site work, utilities, restrooms, concessions, and various mechanical and electrical systems. The capacity of the stadium will be approximately 108,000 following the completion of the project. The scope of this project includes the architectural, mechanical, and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- Design building to meet energy efficiency and performance required by ASHRAE/IESNA 90.1-1999 with the exception of the glazing at suites and club areas.
- Air handling units on occupancy schedule allowing lower winter set point for heating and higher summer set point for cooling when the building is unoccupied.
- Individual controls for air handling units allow heating and cooling to specific areas as needed.
- Automatic sensors at lavatories control water flow.
- Tempered water is provided to lavatories minimizing the use of hot water.
- Thermostat controls in each suite allows for individual control.
- Use low flow toilet fixtures and waterless urinals.

### Other Sustainability Features

- Design site sediment and erosion control to best management practices.
- Stadium is located on bus routes.
- No new parking is provided on site.
- No net increase in storm water runoff.
- ENERGY STAR roof for all new roof surfaces.
- Reduce the use of municipally provided portable water through the use of waterless urinals and low flow fixtures.
- Zero use of CFC-Based refrigerants.
- Use regional and local material where possible, (e.g. brick).
- Ventilation meets ASHRAE 62-1999 Indoor Air Quality requirements.
- Use low-VOC materials, (e.g. adhesives, sealants, paints, coatings, and carpet).
- Use building materials that have been extracted and/or harvested as well as manufactured, within 500 miles of the project site, e.g. brick,
- Operable windows and lighting controls provided for occupied spaces on building perimeter.
- Comply with ASHRAE Standard 55-1992 for thermal control standards.
- Day lighting provided to all interior spaces thereby reducing the use of electrical lights.

## Michigan Stadium Renovation and Expansion Project

### Project Data

- Budget: \$226 M
- Schedule: Completion Scheduled for Summer 2010
- Square Feet: 50,000 gross sq. ft. renovation  
400,000 gross sq. ft. addition

### Substantially Complete: June 2010

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Mobility Transformation Facility



### Project Description

The project will include the site clearing, grading, infrastructure and roadways for a four-lane 1,000-foot straight asphalt road, merge lanes, a network of asphalt and concrete urban streets, roundabout, traffic circle, crushed-gravel road segment, concrete calibration pad, service road connecting to the UMTRI parking lot, storage lot, security fencing around the entire site, covered pavilion, lighting, and electrical and networking infrastructure. This project also includes landscaping and storm water management, with a bridge, culverts, and bank stabilization to minimize wetland impacts adjacent to Millers Creek. The College of Engineering and UMTRI will be responsible for the future installation of site accessories that are not included in this project. Over time, these accessories may include building facades placed onto foundations to simulate urban streets, street signs and trusses for overhead highway signage, roadway and pedestrian lights, railroad crossings, traffic signals, benches, traffic barrels, mock fire hydrants, and other devices necessary to simulate a realistic driving environment.

The Mobility Transformation Facility, although not comprising a building, included several sustainability measures to lessen the impact on the environment. These measures include:

- No heating or cooling load required
- No domestic water or sewage uses
- No landscape irrigation
- Prairie seed mix instead of lawn
- Stormwater quality controls
- Stormwater peak flow controls
- Stabilization of Millers Creek stream banks
- Reduced lighting within security fence
- Construction waste management

### **No heating or cooling load required**

As this project does not comprise a building there will be no heating or cooling required, with its associated energy consumption and maintenance efforts. The entire facility will be located outdoors, allowing for vehicle testing through all weather conditions.

### **No domestic water or sewage uses**

As this project does not comprise a building, there will be not domestic water or sewage use required, with site occupants general using the adjacent UMTRI building as needed. These occupants would otherwise be using facilities in their respective office buildings so there is not additional domestic or sewage load with this project, eliminating the associated energy uses, groundwater drawdowns, and potential leaks of additional piping. A future sporadic use of a rainwater simulator is planned, but will draw from a groundwater well to eliminate the need for treating and long-distance piping of domestic water.

### **No landscape irrigation**

The project is designed with no landscape irrigation planned. Species are selected for their drought tolerance to ensure survival through dry summer periods. This will reduce unnecessary water and energy use.

### **Prairie seed mix instead of lawn**

94% of the disturbed unpaved site area will be seeded with prairie mix instead of lawn, allowing for native or adapted species to thrive with minimal, mowing, fertilization, and pesticides, and provide habitat for wildlife

## **Mobility Transformation Facility**

while treating and absorbing stormwater.

### **Stormwater quality controls**

All stormwater on the site will flow through a filtration basin, a vegetated swale, or a vegetated filter strip to treat contaminants. Additionally, all water falling on paved surfaces will be treated with swirl concentrator chambers to ensure 80% Total Suspended Solids removal in the 90% exceedance events, through engineered measures that function fully throughout winter. Additionally, UM-OSEH and MDEQ soil erosion and sedimentation controls are being implemented.

### **Stormwater peak flow controls**

Site stormwater is routed through a detention basin to ensure that the peak flow rate from the project entering Millers Creek is reduced below existing conditions for the 1-year, 2-year, 10-year, and 100-year storms.

### **Stabilization of Millers Creek stream banks**

As a part of this project the portion of Millers Creek passing adjacent to the test track is being armored to prevent future erosion and stream migration. Additionally, one area with a blown out culvert is being restored with graded back slopes, and another damaged culvert is being repaired, which will reduce soil migration.

### **Reduced lighting within security fence**

Lighting on the main access drive from UMTRI will be installed to UM minimum access standards, and photocell controlled. While an extensive set of varying commonly-used light and traffic signal fixtures are being installed within the secured MTF perimeter for vehicle testing purposes, they will be turned off when not in use, and the MTF is being metered separately and billed to the users to provide an extra incentive to reduce energy consumption when not required. The only lighting fixtures which will be on during nighttime hours when the experimental fixtures are turned off are four solar-powered security lights installed throughout the secured perimeter.

### **Construction Waste Management**

This project will follow the UM waste management requirements outlined in standard specification 017420, requiring tracking of all recycled, salvaged, and landfilled items.

#### **Project Data**

- Budget: \$6.5 M
- Schedule: Completion Scheduled for Fall 2014
- Square Feet: N/A

#### **Substantially Complete: December 2014**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 99%

## New Field Hockey Team Center New Field Hockey Stadium and Ocker Field Improvements



### Project Description

This project will demolish the existing Ferry Field Locker Rooms building that no longer meets the needs for the current level of prominence of the field hockey program, and construct a new field hockey team center. The new 13,000-gross-square-foot building will house locker rooms for players and coaches, offices, training facilities, hydrotherapy pools, meeting space, and broadcast capabilities. The project will also construct a new grandstand with a capacity of 1,500 spectators and an approximately 2,000-gross-square-foot concessions building with public restrooms. Ocker Field will be completely refurbished with new turf, a new scoreboard, and new field lighting. This project will permanently displace ten parking spaces.

### Energy Efficiency Measures

- High-performing thermal envelope to reduce heating and cooling demand.
- A balanced fenestration to provide optimal light transmittance and thermal performance.
- Energy Recovery enthalpy wheel designed to recovered by transferring heat from exhaust air to preheat supply air.
- Heat Pumps to maximize efficiency by balancing the loads between hot and cold therapy pools.
- Occupancy sensors so that lights and mechanical equipment only run when there is someone in the associated space.
- Utilization High-efficiency mechanical equipment, in addition to the energy conservation measures above, to reduce annual operating expenses.

### Other Sustainability Features

- Use of Best Management Practices and Erosion and Sedimentation control measures during construction to minimize and prevent pollution, soil erosion, waterway sedimentation, and airborne dust generation.
- Low-flow plumbing fixtures reducing estimated annual water usage by 31.7%.
- Building materials utilizing a high amount of recycled content and sourced as locally as possible.
- Very low amount of volatile organic compounds (VOC) utilized in building components.

### Project Data

- Budget: \$13.5 M
- Schedule: Completion Scheduled for Summer 2014
- Square Feet: 13,000 gross sq. ft.

### Substantially Complete: July 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## North Campus Chiller Plant Expansion



### Project Description

The North Campus Chiller Plant (NCCP) was completed in 2005 to provide chilled water to North Campus. The NCCP, when compared with individual building chillers, has resulted in energy savings, reduced operation and maintenance costs, increased redundancy and reliability, and reduced proliferation of cooling towers and the associated noise. In fiscal year 2009, the estimated annual operating cost savings due to the NCCP was approximately \$200,000, with the majority of savings achieved with increased energy performance. We now propose to increase the size of the facility by 8,500 square feet and add two 1,300 ton chillers, increasing the total capacity to 6,500 tons. In addition to the expansion of the NCCP, underground connections will be extended to provide chilled water to the Earl V. Moore Building, Space Research Laboratory, and Naval Architecture and Marine Engineering Building (NAME). The increased overall capacity of the plant will allow the elimination of the existing building chillers at the Francois-Xavier Bagnoud, Electrical Engineering and Computer Science, and George Granger Brown Memorial Laboratories (G. G. Brown) buildings, as well as provide cooling for the planned additions to G. G. Brown and the Michigan Memorial Phoenix Laboratory. The estimated incremental annual operating cost savings will be approximately \$100,000 based on today's cost, with the majority of savings achieved with increased energy performance. In addition, we will replace the steam and condensate interconnection between the Aerospace Propulsion Lab and NAME buildings to eliminate the need for one boiler.

### Energy Efficiency Measures

- Selecting chillers based on lowest life cycle cost, which is largely dictated by highest energy efficiency.
- Turning off the new substation during winter operation and just using the existing substation.
- Reducing the energy usage of general lighting by nearly 50% as a result of utilizing energy efficient High Bay Fluorescent light fixtures in place of less efficient Metal Halide lamped light fixtures.
- Daylight harvesting through the glass curtain wall and thus lowering energy usage of general lighting.
- Insulating all exterior walls.

### Other Sustainability Features

- Salvaging the existing acoustical screen-wall panels on the east end of the building and re-installing them in the same relative location on the new east wall of the NCCP.
- Salvaging the existing glass curtain wall on the east end of the building and re-installing it in the same relative location on the new east wall of the NCCP.
- Underground piping extended to satellite buildings was installed by directional boring piping in select areas, to minimize disruption of trees and other surface elements.
- The bentonite slurry from the directional boring will be mixed with the top soil and compose at the North Campus Grounds Facility to improve moisture retention in lieu of going to a landfill.

### Project Data

- Budget: \$8.7 M
- Schedule: Completion Scheduled for Summer 2011
- Square Feet: 8,500 gross sq. ft.

### Substantially Complete: June 2011

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## North Campus Research Complex Building 16 Renovation for Health Services Research



### Project Description

The Medical School proposes to co-locate a dozen or more health service research groups that are currently scattered in various locations into Building 16 in the North Campus Research Complex (NCRC). The five above-grade floors will be renovated to promote collaboration among groups and consolidation of redundant resources to create a more efficient and cost-effective research environment. Three conference rooms and fitness center located in below-grade level will also be renovated for general NCRC use. A renovation of approximately 120,000 gross square feet within Building 16 is planned to accommodate the programmatic needs for these relocations and to address anticipated growth. The renovation will also update the building's infrastructure, including heating, cooling, and ventilation systems; wired and wireless high-speed network access; bathroom facilities; and accessibility improvements. The scope of this project includes the architectural, mechanical and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- The new floor plan design will open up work space to draw natural daylight further into the facility.
- Life cycle analysis is being evaluated for converting from existing electric heating panels to a new perimeter hydronic fin tube design solution.
- New low flow fixtures will be provided in toilet rooms to reduce water consumption.
- The level of renovation was reduced by preserving, reusing and/or repurposing approximately 60% of the current floor plan layout.
- Almost all of the existing furniture within the 120,000 gsf facility will be reused in the renovated space.
- New energy efficient lighting fixtures with electronic ballasts will be used.
- New occupancy sensors are being provided for more energy efficient lighting controls in offices, conference rooms and support spaces.
- New timer light switching will be provided in janitor closets and storage rooms that have infrequent use.
- The existing carpeting will be recycled as part of the renovation.
- Low VOC and recycled content will be used where possible.

### Project Data

- Budget: \$13.7 M
- Schedule: Completion Scheduled for Spring 2012
- Square Feet: 120,000 gross sq. ft. renovation

### Substantially Complete: June 2012

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## North Quad Residential and Academic Complex



### Project Description

The complex will include residential space consisting of suite-style units providing housing that responds to students' contemporary needs, and is not currently available in our housing inventory. The academic space will include the majority of the School of Information, and several highly complementary programs from the College of Literature, Science, and the Arts including Communication Studies, Film and Video Studies, and the Language Resource Center. Classrooms, dining, gallery space, group study areas, and some amenities will also be part of the complex. Flexible and integrated living and learning space will facilitate collaboration and engagement between students and faculty. The mixed-use development will foster student interaction and learning and will provide an appropriate mix of academic, residential, and formal and informal gathering spaces. North Quad will include sufficient space to accommodate 460 student beds and living areas, dining facilities, and, academic and support spaces.

### Energy Efficiency Measures

- Maximum insulation in foundation walls, exterior walls, and roof assemblies
- Energy efficient windows/glazing for increased thermal performance
- Use of increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies
- Reduction of lighting levels through use of occupancy sensors in residential bathrooms, corridors, and classrooms
- Variable water flow controls in lieu of constant volume controls on resident room fan coil units
- Controls to shut down air flow to conference rooms when rooms unoccupied
- Use of occupancy sensors to reset space temperatures to allow wider temperature swings when rooms are unoccupied (included in 26 major spaces such as classrooms)
- Increase thermostat deadbands (the gap between the heating setpoint and cooling setpoint during which no conditioning is provided)
- Use of controls to optimize fan speeds supplying air to VAV (variable air volume) boxes
- Variable flow exhaust hoods in kitchen
- Exhaust heat recovery (from residential bathroom exhaust)

### Other Sustainability Features

- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation
- North Quad constructed on a previously developed site (former Frieze Building site) in lieu of a greenfield site
- North Quad sited on public and UM bus routes, encouraging use of public transit
- Installation of bike racks to encourage use of bicycles for transportation
- No new parking provided on-site (to reduce pollution and land development impacts)
- Use of water conserving plumbing fixtures, including low-flow shower heads, low-flow urinals, and dual-flush toilets
- The plaza/courtyard is a Green roof that covers a significant portion of the lower level
- Natural daylighting provided to underground spaces via sunken courtyards

**North Quad Residential and Academic Complex**

- No increase in the amount of impervious surface- no stormwater run-off increase
- Use of select sustainable materials (eg terrazzo flooring, linoleum and cork flooring)
- Use of low-VOC materials (eg carpets, paints)
- Use of regional and local materials where possible (eg limestone, brick)
- Water-efficient landscaping

**Project Data**

- Budget: \$186.4 M
- Schedule: Completion Scheduled for Spring 2010
- Square Feet: 360,000 gross sq. ft.

**Substantially Complete: May 2010**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Northwood Apartments I, II, and III Fire Alarm and Boiler Upgrades



### Project Description

Constructed between 1955 and 1958, the Northwood Apartments I, II, and III are an approximately 419,000-gross-square-foot, 58-building complex on North Campus with 686 units housing student families. The existing stand-alone smoke detectors will be upgraded with a new central fire alarm system to meet current life safety standards. The project will also replace the hot water boilers to improve operating efficiency, reduce energy use, and provide increased reliability for the heating system.

### Energy Efficiency Measures

- The existing heating hot water boilers will be replaced with noticeably more efficient condensing units.
- The expected efficiency improvement will increase from an existing thermal efficiency likely no greater than 75%, to a minimum efficiency of 85; and to values exceeding 95% in the spring and fall when milder outdoor temperatures allow lower HWH temperatures to be used.
- The new boilers will be furnished with modern controls to perform the lead/lag function automatically. This will insure only the required number of boilers are operating for any given load, ramping up and down seasonally, daily and hourly to reflect the varying outdoor temperatures throughout the year. The new controls will insure that the best combination of boilers are running under any given load, with a continued focus on condensing whenever possible.
- A key control function provided with each boiler group is monitoring of the Outside Air Temperature (OAT) at all times. Milder temperatures result in less heat loss from the buildings. This lower heat demand can be met by circulating lower temperature HWH. Lower HWH temperatures allow the condensing boilers to operate in the highly efficient condensing mode.
- The automatic lead/lag boiler operation, along with the OAT continuous reset of the HWH supply temperature insures that only the required amount of natural gas is used under all of the varying system loads.
- The boiler burner controls will be specified with a 5:1 turndown which allows each boiler to remain in efficient operation down to 20% of full load. Additionally, the design specifies that one of the three boilers will be half the size of the other two. This boiler group configuration creates the ability for each of the five sites to turn down to 10% of full load. The composite 10:1 turndown means that only at seasonal loads less than 10% would require the smallest boiler to go into an on/off cycling mode; saving additional energy.
- The existing heating hot water system distribution pumps will be replaced with units driven by variable speed drives (VSDs), which represents electric power savings, as this feature would allow the system to circulate only the minimum amount of water necessary to meet the load.

### Project Data

- Budget: \$7.5 M
- Schedule: Completion Scheduled for Summer 2013
- Square Feet: 419,000 gross sq. ft. renovation

### Substantially Complete: July 2012

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Palmer Drive Development



### Project Description

The Palmer Drive Development at the University of Michigan consists of a complex of buildings at the southwest corner of Washtenaw Avenue and Huron Street. The new buildings included in this development are:

- Life Sciences Institute Building
- Palmer Drive Parking Structure
- Commons Building
- Undergraduate Science Building

The **Life Sciences Institute Building** (LSI) consists of six floors and a mechanical penthouse to provide "wet" research laboratory and support spaces, core laboratory areas, principal investigators offices, interaction spaces, administrative offices for the Life Sciences Institute, a combination gallery/lobby space, and a small library. The 235,000 gross square feet building houses 325 to 375 people. The **Palmer Drive Parking Structure** accommodates approximately 1,000 parking spaces. The **Commons Building** provides conference space and dining facilities. A Department of Public Safety neighborhood office is located here, as well as academic offices. The building is 99,000 gross square feet. The **Undergraduate Science Building** (USB) is located on top of the Palmer Drive Parking Structure. The four-story building houses instructional space and laboratories for undergraduates particularly in the sciences. All of these buildings are tied together with a new walkway and plaza. This provides a safe, direct circulation path between Central Campus and the Medical Campus.

### Energy Efficiency Measures

- The LSI Building and USB initiated UM efforts to deploy energy-saving strategies specifically tailored to laboratory buildings.
- LSI was both a local and regional ASHRAE Technology Award winner and received national Honorable Mention for its design innovations.
- LSI's vivarium animal cages are directly connected to the building HVAC system, with VAV boxes controlling the supply and exhaust air. This system minimizes the quantities of air required in the animal holding spaces, allows for maintenance access from outside the holding areas, maximizes the space utilization within the rooms, and provides for lighter, more movable animal holding racks. It also provides better isolation between room air and the air in the animal cages, which should result in a cleaner, more odor-free environment. It is believed that this is one of the first operational "house air" systems in the country for vivariums.
- A heat recovery system in LSI, significantly reduces the amount of heat loss while also meeting the laboratory safety criterion of passing through the building only once.
- All air handlers are variable air volume units. Also, motors and pumps are operated through variable speed drives.
- LSI has two separately pumped perimeter heat systems which divide the building into north and south zones and control the temperature as appropriate for each exposure.
- Walls and roof are insulated above code requirements.
- Insulated low-E energy efficient glazing is used throughout the buildings.
- Occupancy sensors are used to turn down lighting during periods when spaces are unoccupied.

## Palmer Drive Development

- Extremely efficient open plan laboratory design minimizes the amount of circulation space required in the building. The open plan will also accommodate changes in laboratory uses with less construction waste and disruption than traditional closed laboratory spaces.
- Carbon dioxide (CO<sub>2</sub>) monitoring in many areas of the LSI building reduces the amount of outside air when spaces are unoccupied, thus saving the energy to heat and cool the outside air.

## Other Sustainability Features

- Day lighting is well distributed throughout the buildings. The exterior walls contain large windows, and the ceiling heights are tall enough to admit a large amount of daylight. In LSI most workstations are located within the first 10 feet from the exterior wall providing natural daylight for the lab researchers that are in the labs all day.
- Sustainable growth wood is used for much of the project's woodwork, including the extensive wainscoting in virtually all of the public areas.
- This project is located within a rehabilitated brown field site, formerly occupied by an underdeveloped impervious surface parking area.
- A one million gallon storm water detention system, located below the parking garage, alleviates the persistent flooding problems in the area and allows for controlled release of storm water.
- The numerous exhaust fans on the roof were designed to function without increasing perceptible noise to the 4000 occupants of the residence halls located within 500 feet.
- The site, containing both an old glacial lake and a 35-foot elevation change, was one of the last underdeveloped areas on Central Campus because of its challenged topography. The siting and planning of this complex takes advantage of the development density already present in the area rather than promoting remote development that would contribute to traffic congestion, vehicular pollution and less efficient distribution of services and utilities.
- Bike racks are provided throughout the complex and shower rooms were included in LSI.
- LSI and USB utilize a pollution prevention approach to reduce the amount of chemicals being used and disposed of as waste.

## Pierpont Commons Cafe Renovation



### Project Description

A renovation of approximately 10,500 gross square feet within the cafe's servery, dining areas, and adjacent corridors is planned that will provide upgraded finishes and seating, four new culinary stations, and select upgrades to infrastructure including mechanical, electrical, plumbing, and networking systems. The renovated spaces will revitalize the cafe and increase dining and study space for students in the North Campus community.

### Energy Efficiency Measures

- Mechanical systems designed to meet ASHRAE 90.1-2007.
- Lighting power density designed to be 29.3% below ASHRAE 90.1-2007. Total density includes both general and accent lighting.
- Master dimming cabinet provides automated lighting control for general and accent lighting zones in the dining and servery areas. Dimmable light fixtures allow users to fine-tune desired light levels and save energy.
- Occupancy sensors provide automated lighting control for closets and corridors.
- The majority of light fixtures are LED type, while some fixtures utilize T-5 or T-8 fluorescent lamps, which should result in long-term maintenance savings. There are no incandescent sources.

### Other Sustainability Features

- Carpet used has one or more of the following sustainability features:
  - Post-Consumer Recycled Content.
  - Pre-Consumer Recycled Content.
  - Participation in carbon neutral program in which verified carbon offsets are purchased to cancel out the CO<sub>2</sub> equivalent of carpet lifecycle cost.
  - Participation in Green Label Plus program to ensure the highest standard of indoor air quality by limiting Volatile Organic Compounds (VOCs).
- All paint is low VOC.
- Reclaimed wood used in a few locations provided by a local source.
- Tile used has one or more of the following sustainability features:
  - Natural content which limits the release harmful substance into the environment.
  - Recycled content to reduce waste and limit use of resources.
  - Green guard certified to ensure the most stringent standards for low VOC levels.

### Project Data

- Budget: \$5.3 M
- Schedule: Completion Scheduled for Fall 2014
- Square Feet: 10,500 gross sq. ft. renovation

### Substantially Complete: August 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Player Development Center for Intercollegiate Basketball



### Project Description

An addition of approximately 57,000 gross square feet to Crisler Arena is proposed. The new facility will house two new basketball practice courts that will provide better scheduling flexibility related to the academic schedules for student athletes as well as offer a complement of services not currently available to the men's and women's intercollegiate basketball teams. The project will include team locker areas, strength and conditioning space, athletic medicine space, and coaching and staff offices.

### Energy Efficiency Measures

- Maximum insulation in foundation walls, exterior walls, under slab, and roof assemblies.
- Use of increased inspections, including infrared scans during construction to identify missing insulation, gaps in the enclosure, and other wall/roof assembly deficiencies.
- Energy efficient windows/glazing for increased thermal performance.
- External shading glazing for Hall of Fame curtain wall.
- Use of translucent glazing to add daylighting to practice gym.
- High efficiency lighting throughout with daylight sensors for spaces with fenestration.
- Occupancy sensors to control lighting in offices, bathrooms, corridors, and conference rooms.
- Demand control ventilation to reduce mechanical loads to low occupancy and empty spaces.
- High efficiency air cooled chiller.
- Increase thermostat deadbands (the gap between the heating setpoint and cooling setpoint during which no conditioning is provided).
- Increased exhaust air energy recovery.
- Automatic static pressure reset.

### Other Sustainability Features

- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation.
- Player Development Center constructed on a previously developed site between Crisler Arena and the parking lot (in lieu of a greenfield site).
- Player Development Center sited on public and UM bus routes, encouraging use of public transit.
- No new parking provided on-site (to reduce pollution and land development impacts).
- Use of water conserving plumbing fixtures, including low-flow shower heads low-flow lavatories, and waterless urinals.
- Energy efficient transformers.
- Use of select sustainable materials (e.g. steel structure, terrazzo flooring).
- Use of low-VOC materials (e.g. carpets, paints).
- Use of regional and local materials where possible (e.g. limestone, brick).

## **Player Development Center for Intercollegiate Basketball**

### **Project Data**

- Budget: \$23.2 M
- Schedule: Completion Scheduled for Fall 2011
- Square Feet: 57,000 gross sq. ft.

### **Substantially Complete: October 2011**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## Ross School of Business - Facilities Enhancement Project



### Project Description

The Ross School of Business Project involves the demolition of Davidson Hall, Assembly Hall and Paton Center, (approximately 180,000 gross square feet) and construction of a new building of approximately 270,000 gross square feet. The new facility will be seven floors housing twelve tiered classrooms, an auditorium and colloquium, faculty offices, student service activities space, and a central gathering space that will provide seating areas and a food court. Adjoining work at the Kresge Library includes the enclosure of the Kresge portico and air conditioning chiller installations in the Kresge Library mechanical room.

### Energy Efficiency Measures

- Green roofs and roofing with a high Solar Reflectance Index to reduce heat island impact
- Energy savings through the implementation of individual room thermostats, and providing low temperature set-points during winter months, and high temperature set-points during summer months, for non-occupied spaces.
- Use of occupancy sensors in all rooms and offices, and automated variable light levels in the skylight Winter Garden through zoned photo sensor metering and lighting controls
- Use of enhanced commissioning to verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents

### Other Sustainability Features

- This project is LEED® Silver certified.
- Storm water management practices involving storm water detention (underground tanks and green roofs), storm drainage percolation areas, porous concrete pavement, and vortex manhole sedimentation separator
- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation
- Constructed on a previously developed site in lieu of a greenfield site
- Provided on-site bike storage and a shower facility
- No new parking provided on-site (to reduce pollution and land development impacts)
- Sited on public and UM bus routes, encouraging use of public transit
- Limited use of potable water by planting native vegetation and using highly efficient drip irrigation
- Maximized water efficiency within buildings through the use of waterless urinals, dual-flush toilets, and faucets with aerators and motion sensors
- Selected refrigerants and HVAC equipment that minimize the emission of compounds that contribute to ozone depletion and global warming
- Construction activities diverted more than 75% of the construction waste from this project away from landfills and incinerators and instead redirected the waste back into the manufacturing process as recovered resources
- Helped to increase the market demand for recycled content materials by utilizing products and materials made from recycled content that make up more than 10% of the total value of the materials or the project
- Helped to increase demand for building materials and products extracted and manufactured within 500 miles of the building site by utilizing materials from the region that make up more than 20% of the total value of materials .

**Ross School of Business - Facilities Enhancement Project**

- Developed and implemented an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building to help sustain the comfort and well-being of construction workers and building occupants
- Reduced the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants

**Project Data**

- Budget: \$145 M
- Schedule: Completion Scheduled for Fall 2008
- Square Feet: 270,000 gross sq. ft.

**Substantially Complete: December 2008**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## South Quad Renovation



### Project Description

The project will renovate approximately 106,700 gross square feet of space, including the ground and first floors of South Quadrangle. The renovation will provide expanded student dining facilities for the Central Campus neighborhood and updated bathrooms throughout the building. New and reorganized spaces will revitalize the residence hall and create much-needed spaces for student interaction and community development, such as group study spaces, music practice rooms, and refurbished lounges. Infrastructure improvements within the renovated areas include: new plumbing, heating, cooling, ventilation, fire detection and suppression systems; wired and wireless high-speed network access; and accessibility improvements.

### Energy Efficiency Measures

South Quadrangle Renovation design focuses on maximizing energy efficiency by creating energy conservation measures such as:

- The building's design and systems will include a number of energy efficient features that will allow for an estimated 30% energy savings compared with a code energy compliant building as defined in ASHRAE 90.1-Appendix G.
- Improved glazing system performance
- Using occupancy sensors as lighting controls
- Utilizing VAV kitchen hood exhausts as well as partial hood makeup via transfer from community spaces
- Utilizing additional kitchen hood enclosures such as baffles and side curtains
- South façade external shading devices
- Specifying low pressure loss air handling units
- Utilizing infrared scans of building during construction

### Other Sustainability Features

- Water conservation measures for this project include following measures to target minimum 20% water usage reduction:
  - Dual flush water closets
  - Low flow urinals
  - Low flow shower heads
  - Storm water management system will be created to infiltrate runoff from the increased impervious surface
- Additional bicycle parking will be provided to encourage bicycle usage
- Porous pavers will be utilized in several areas
- Select kitchen equipment will be rehabilitated and reused
- Construction waste management will be such that at least 50% of the material will be diverted from landfills
- Building materials both regional and local have been sought wherever possible, to make up minimum of 10%
- Kitchen waste will be going through a pulper, significantly reducing the amount of solid waste from the dining facility.

## South Quad Renovation

### Project Data

- Budget: \$60 M
- Schedule: Completion Scheduled for Summer 2014
- Square Feet: 106,700 gross sq. ft. renovation

### Substantially Complete: July 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## The Lawyers' Club Building and John P. Cook Building Renovation



### Project Description

A comprehensive renovation of The Charles T. Munger Residences in the Lawyers' Club and the John P. Cook Building, and updating key infrastructure in the club wing of The Lawyers' Club Building. The renovation of the dormitory areas, approximately 92,000 gross square feet of space, will address infrastructure needs including new plumbing, heating, ventilation, fire detection and suppression systems, wired and wireless high-speed network access, and accessibility improvements. Although air conditioning will be added, we will target overall energy performance to exceed national energy efficiency standards by more than 30 percent. The renovation will preserve the historic exterior of the buildings, and the existing "townhouse-style" entries to resident rooms will be replaced with an interior connecting corridor within each building that will increase safety, accessibility, and sense of community for the residents. In the club wing of The Lawyers' Club Building, approximately 67,000 gross square feet, will update key infrastructure items integral with the dormitory wing, including new fire detection and suppression systems, and tuck-pointing of exterior masonry surfaces.

### Energy Efficiency Measures

- Water conserving toilets, showers and lavatory faucets.
- Heat recovery devices on air handling units.
- Insulation added to the attic.
- Electronic room thermostats which allow students to put their room in standby heating/cooling mode when they leave.

### Other Sustainability Features

- Slate roof replacement will utilize the existing solid slates, reducing the need for new slate.
- Existing structure to remain, eliminating much construction demolition materials from landfill. Also eliminates the need to construct a new building.
- Offsite modular prefabrication of toilet rooms allows for higher quality control, expedites schedule and reduces costs.

### Project Data

- Budget: \$39 M
- Schedule: Completion Scheduled for Summer 2013
- Square Feet: 159,000 gross sq. ft. renovation

### Substantially Complete: June 2013

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Thompson St Parking Structure Addition



### Project Description

The addition to the Thompson Street Parking Structure is an integral part of the University's Parking and Transportation strategic plan to provide parking for anticipated incremental growth in demand, and to replace parking lost on central campus due to various construction projects, including Joan and Sanford Weill Hall and the Perry Building addition. The project involves a 385-space parking structure addition to the west side of the Thompson Street Parking Structure, and 9,000 gross square feet of office and support space for the departments of Parking and Transportation Services and the Office of Budget and Planning. The existing Thompson Street Parking Structure and parking lots within the development zone currently provide 776 parking spaces. When the addition is complete, the entire parking structure will accommodate approximately 1,060 vehicles, for a net increase of 284 parking spaces.

### Energy Efficiency Measures

- Electrical systems, including lighting, are designed to conform to requirements of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1-1999.
- Parking Structure Addition mechanical systems conform to requirements of ASHRAE 90.1-1999.
- The office building envelope has been designed to exceed the requirements of ASHRAE 90.1-1999.
- Exhaust fans at underground parking are controlled by a CO2 monitoring system, in order to minimize unnecessary operation.
- Parking structure lighting controls are being installed to turn off lights near the exterior when daylight is adequate.
- Lighting in public and infrequently used areas of the office building are controlled by occupancy sensors.
- Energy efficient windows/glazing will be installed for increased thermal efficiency.

### Other Sustainability Features

- By utilizing features of the adjacent existing parking structure, the Addition adds required new function with a minimum of new construction.
- Covered parking for motorcycles and secured and open parking for bicycles, which will increase the use of these low energy modes of transportation.
- Installation of a 7,800 cubic feet storm water detention tank, to minimize peak storm water run-off.
- Designed for a 75 year life, to minimize reconstruction costs.
- Oil/sand separators are being installed on existing sanitary and storm water effluents in order to improve the quality of water leaving the site.
- Low flow toilet flush mechanisms and position-actuated faucets are being installed to minimize water consumption.
- Natural daylighting is provided to all office spaces.

## Thompson St Parking Structure Addition

### Project Data

- Budget: \$15.7 M
- Schedule: Completion Scheduled for Fall 2010
- 273 Net Parking Space

### Substantially Complete: November 2010

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Towsley Center for Children Replacement Facility



### Project Description

The Towsley Center for Children is currently located within two conjoined houses at 710 and 716 South Forest that were constructed in 1912 and 1914 and have been altered many times over the years. We evaluated an option to renovate and expand the existing facility; however, the cost to address barrier-free access and correct existing deficiencies would result in costs that are comparable for a new facility. Therefore, we are proposing to replace the existing facility with a 21,000 gross square foot, two-story building on the same site. Approximately 13,000 net square feet will provide capacity for 142 spaces for children within the new Towsley Center, double its current capacity.

### Energy Efficiency Measures

- Increased insulation in foundation walls, exterior walls, and roof assemblies
- Energy efficient windows/glazing for increased thermal performance
- Reduction of lighting levels through use of occupancy sensors
- Controls to shut down air flow to specific spaces when they are unoccupied
- Use of occupancy sensors to reset space temperatures to allow wider temperature swings when rooms are unoccupied
- Increase thermostat deadbands (the gap between the heating setpoint and cooling setpoint during which no conditioning is provided)
- Use of controls to optimize fan speeds supplying air to VAV (variable air volume) boxes

### Other Sustainability Features

- Use of an Erosion and Sedimentation Control Plan during construction to reduce pollution from construction by controlling soil erosion, waterway sedimentation, and airborne dust generation
- Towsley Center for Children is constructed on the site of the original center in lieu of a greenfield site
- Center is sited on public and UM bus routes, encouraging use of public transit
- Original area of the site designated and developed for parking was significantly reduced (to lessen pollution and land development impacts)
- Reclaimed selected elements from the original center for re-use as interior windows and millwork accents.
- Use of water conserving plumbing fixtures.
- Use of select sustainable materials (eg synthetic slate roofing ,PVC-free flooring tile and carpets)
- Use of low-VOC materials (eg carpets, paints)
- Use of regional and local materials where possible (eg, brick)
- Water-efficient landscaping

### Project Data

- Budget: \$8 M
- Schedule: Completion Scheduled for Fall 2009
- Square Feet: 25,428 gross sq. ft.

### Substantially Complete: December 2009

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## UMHHC A. Alfred Taubman Health Care Center Internal Medicine



### Project Description

The A. Alfred Taubman Health Care Center opened in 1986 and houses multi-specialty clinics, diagnostic and treatment services, and offices. The outpatient clinics and administrative areas for Internal Medicine that occupy the third floor of the facility have remained essentially unchanged since 1986. With anticipated continued growth in clinical activity, the University of Michigan Hospitals and Health Centers propose to renovate 27,500 gross square feet of space on the third floor to improve appearance, function, and use for ongoing patient care needs. This project will permit the creation of new and improved patient clinic settings in Gastroenterology, Pulmonary, Renal, Infectious Diseases, Rheumatology, Medical Genetics and General Medicine.

### Energy Efficiency Measures

- Within the Renovated Areas, new HVAC and Electrical Systems are designed to optimize efficiency.
- Utilized Variable Air Volume system.
- Use of digital controls for new VAV Boxes.
- Energy Efficient Lighting fixtures
- Provided multi-level switching and dimming of lights.
- Occupancy sensors used to control lighting in offices and other support spaces.

### Other Sustainability Features

- Use of low VOC Interior Finishes such as sheet flooring, paints and wall coverings.

### Project Data

- Budget: \$7.5 M
- Schedule: Completion Scheduled for Summer 2013
- Square Feet: 27,500 gross sq. ft. renovation

### Substantially Complete: November 2013

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## UMHHC A. Alfred Taubman Health Care Center Levels 1 and 2 Backfill



### Project Description

The opening of the clinics in the C. S. Mott Children's and VonVoigtlander Women's Hospitals resulted in approximately 35,000 square feet of vacated space on the first and second floors of the A. Alfred Taubman Health Care Center. The newly available space has allowed Ambulatory Care to re-evaluate the services currently offered onsite and provide the ability to offer multi-specialty services conveniently located for patients. This project will create a multidisciplinary transplant clinic, an outpatient non-cancer infusion center, and a same-day pre-op clinic. Neurology, Neurosurgery, Otolaryngology, and Radiology clinical services will be expanded, and the outpatient pharmacy will be relocated and expanded into a shared retail space with MedEQUIP.

### Energy Efficiency Measures

- Within the renovated areas, new HVAC and electrical systems are designed to optimize efficiency.
- Utilized Variable Air Volume system.
- Use of digital controls for new VAV Boxes.
- Energy efficient lighting fixtures.
- Provided multi-level switching and dimming of lights.
- Occupancy sensors used to control lighting in offices and other support spaces.

### Other Sustainability Features

- Use of low VOC Interior Finishes such as sheet flooring, paints and wall coverings.

### Project Data

- Budget: \$13 M
- Schedule: Completion Scheduled for Spring 2013
- Square Feet: 35,000 gross sq. ft. renovation

### Substantially Complete: August 2013

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## UMHHC Children's and Women's Hospital Replacement Project



### Project Description

The C. S. Mott Children's and Von Voigtlander Women's Hospitals Replacement Project will provide a new, state-of-the-art inpatient and outpatient facility for children and women. An approximately 1,100,000 gross square foot facility is planned that consists of a clinic building of 9 floors and an inpatient building of 12 floors plus a helipad on the easternmost roof. The building will include inpatient space, clinic and office space to support children's and women's programs. Since demand for patient care services has increased beyond expectations, the project will also include the completion of the majority of the shelled space within the original program (approximately 151,000 square feet) including 84 additional patient rooms, two magnetic resonance imaging (MRI) units, one operating room (OR), and an inter-operative MRI/OR suite along with additional clinic and office space.

The building will be connected to the existing Taubman Health Center via a link as well as the Simpson Parking Structure. Site Improvements include utility reconfigurations, roadway reconfigurations, landscaping, steam tunnel and ductbank extensions, and stormwater detention.

### Energy Efficiency Measures

- Designed to ASHRAE Standard 90.1 including building envelope and glazing efficiencies.
- Energy modeling was performed to determine optimum system selections with maximum efficiencies.
- Energy efficient equipment is provided such as chillers, pumps and fans.
- Reduction of lighting power densities through the use of energy efficient compact fluorescent and LED fixtures.
- Reduction of lighting power usage through occupancy sensors throughout the building and daylight harvesting controls for the main lobbies and clinic corridors.
- Sophisticated Building Management System controls to optimize fan speeds and system performance.

### Other Sustainability Features

- This project is LEED® Silver certified.
- Vegetative roof to reduce storm water run-off, reduce heat island effect, and create a natural habitat.
- Storm water infrastructure (collection) and management to minimize run-off and avoid impact to neighboring Nichols Arboretum.
- Landscape Plan uses native plants and plant varieties acclimated to the Ann Arbor climate zone.
- Landscaping will be irrigated by 100% non-potable water collected in the underground storage basins.
- Use of Best Management Practices and Erosion and Sedimentation control measures during construction to minimize and prevent pollution, soil erosion, waterway sedimentation, and airborne dust generation.
- Recycling approximately 75% of construction waste.
- Building materials utilizing a high amount of recycled content.
- Very low amount of volatile organic compounds (VOC) utilized in building components.

## **UMHHC Children's and Women's Hospital Replacement Project**

### **Project Data**

- Budget: \$539 M
- Schedule: Completion Scheduled for Fall 2011
- Square Feet: 1,100,000 gross sq. ft.

### **Substantially Complete: June 2011**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 98%

## UMHHC Parkview Medical Center and Scott and Amy Prudden Turner Memorial Clinic Building Demolition



### Project Description

The University of Michigan Hospitals and Health Centers (UMHHC) proposes to demolish the Parkview Medical Center and Scott and Amy Prudden Turner Memorial Clinic buildings. The demolition of these buildings has been in our master plan for several years and is possible because the clinical functions are now housed in the W. K. Kellogg Eye Center and Brehm Tower. The buildings no longer meet the needs of the UMHHC and are not conducive to reuse for clinical or office functions. This project will demolish both buildings, renovate the existing easterly portion of the W. K. Kellogg Eye Center that connects to these buildings, including a new point of entry, and expand the parking lot. The scope of this project includes the architectural, mechanical and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- Use of Energy Star products or products listed as Federal Energy Management Program (FEMP).
- Provision for task lighting to reduce amount of general lighting required.
- Use of occupancy sensors to reduce lighting energy usage when rooms are unoccupied.
- Use of energy saving lamps and electronic ballasts in lighting fixtures with a minimum power factor of 0.90.
- Photoelectric controls and/or timers for site lighting to control daily illumination hours.
- Use of split system heat pump units for new conference room area.
- All motors larger than 0.75 HP to be 'premium efficient' rating.
- Use of battery powered sensor faucets in toilet rooms.
- A swirl concentration device will be used to improve the quality of the storm water leaving the site. This device will remove more than 80% of the total suspended solids in the storm water runoff.

### Demolition Phase Sustainable Features

- Abate asbestos containing materials and proper handling and disposal of lead containing materials.
- Proper disposal of regulated building waste such as; mercury containing articles, batteries, smoke detectors, and electronic waste, among other building articles.
- All non-hazardous contaminates soils are brought to a Class II landfill.
- Provide Toxicity Characteristic Leaching Procedure (TCLP) testing on select materials to determine whether hazardous chemicals will leach from waste material.
- Material is then disposed as either hazardous or non-hazardous material.
- No vehicular idling allowed on site and all diesel equipment is fueled by biodiesel fuel B-20.
- All diesel equipment utilizes exhaust after treatment devices to reduce emission from diesel engines.
- UM maintenance shops shall have the opportunity to salvage and reuse building components.
- Maintain best practices for soil erosion and sediment control procedures.

## **UMHHC Parkview Medical Center and Scott and Amy Prudden Turner Memorial Clinic Building Demolition**

### **Project Data**

- Budget: \$5 M
- Schedule: Completion Scheduled for Fall 2012
- Square Feet: 69,000 gross sq. ft. renovation

### **Substantially Complete: December 2012**

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## UMHHC University Hospitals Central Sterile Supply Expansion



### Project Description

Surgical procedure activity in the University Hospital operating rooms has increased by 30 percent since 1995. The volume of instrumentation requiring sterilization has exceeded the capacity of the current processing facilities. To achieve improvements in space, equipment, and work process, an expansion of the central sterile supply area on level B2 of University Hospital is proposed. A renovation of approximately 16,000 gross square feet of space will consolidate surgical instrument processing, assembly, sterilization and storage operations. The scope of the project includes the architectural, mechanical, and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures:

- Variable air volume control used where there are nonessential air pressure relationships including offices, locker rooms, break room, etc.
- Limited use of incandescent lighting.
- Occupancy sensors used where appropriate.
- Low consumption urinals, lavatory faucets, and shower heads used.
- Premium efficiency motors were used on all new motor driven equipment.

### Other Sustainability Features

- NA

### Project Data

- Budget: \$6.9 M
- Schedule: Completion Scheduled for Spring 2011
- Square Feet: 16,000 gross sq. ft. renovation

### Substantially Complete: June 2011

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## UMHHC University Hospitals Emergency Department Expansion



### Project Description

A multi-phase renovation of approximately 22,500 gross square feet on level B1 of University Hospital will create 27 treatment bays, 6 triage rooms, 2 family consultation rooms, as well as expanded and improved patient reception areas for the Emergency Department. This renovation also includes the relocation and expansion of the Psychiatry Emergency Service to space adjacent to the Emergency Department. The scope of this project includes the architectural, mechanical and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures:

- The entry vestibule design is such that direct heating and cooling losses are minimized including insulated panels and glazing.
- Variable air volume control used where there are nonessential air pressure relationships including offices, locker rooms, break room, etc.
- Limited use of incandescent lighting.
- Occupancy sensors used where appropriate.
- Low consumption urinals, lavatory faucets, and shower heads used.
- Premium efficiency motors were used on all new motor driven equipment.

### Other Sustainability Features

- NA

### Project Data

- Budget: \$13.9 M
- Schedule: Completion Scheduled for Winter 2012
- Square Feet: 28,900 gross sq. ft. renovation

### Substantially Complete: February 2012

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%



## UMHHC University Hospitals Kitchen Renovations for Room Service Protocol



### Project Description

The patient food kitchen on level B2 in University Hospital opened in 1986 and utilizes the “cook-chill-reheat” food production method. This process has been replaced in many hospitals with an on-demand “room service” approach to nutrition that enables patients to have more control of their environment. This process is already in place for pediatric patients in C. S. Mott Children’s Hospital and will be utilized in the new C. S. Mott Children’s and von Voigtlander Women’s Hospitals currently under construction. This project will renovate approximately 13,000 gross square feet on level B2 of University Hospital to allow the shift of Food and Nutrition Services for adult patients at University Hospital and the Cardiovascular Center from cook-chill-reheat production to the room service method. Food service operations will be relocated to the North Campus Research Complex during construction. The scope of this project includes the architectural, mechanical and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

- Use occupancy sensors to control lighting in office and other support spaces.
- Use of energy efficient lighting fixtures.
- High efficiency refrigeration coolers and freezers.
- Energy efficient kitchen equipment.
- Premium efficiency motors throughout.

### Other Sustainability Features

- Recycling/reuse of construction waste and kitchen equipment.
- Use of selected sustainable materials such as quarry tile flooring.
- Use of Low-VOC materials such as sheet flooring, adhesives, sealants, coatings and paints.
- Use of regional and local materials where possible.
- Enhanced commissioning, construction to improve Indoor Air Quality management and thermal comfort improvements.

### Project Data

- Budget: \$8.5 M
- Schedule: Completion Scheduled for Winter 2013
- Square Feet: 13,000 gross sq. ft. renovation

### Substantially Complete: September 2012

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## UMHHC University Hospitals MPU Renovations



### Project Description

The medical procedure unit (MPU) at University Hospital has a ratio of 2.3 prep/recovery bays per procedure room, well below the industry standard of 4 to 1, hindering patient throughput. This project will expand the MPU space by approximately 4,000 gross square feet into the exterior courtyard on level 2 adjacent to the MPU, and renovate 2,200 gross square feet of existing space. The expansion will create additional prep/recovery bays, procedure rooms, and storage space, and expand the patient and family reception and waiting room. The project will also include networking upgrades that will accommodate newer technology for endoscopic procedures. The scope of this project includes the architectural, mechanical and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures

The project utilizes existing central HVAC equipment but the goal was to utilize energy efficient methods and strategies for the new construction wherever possible.

- Utilized variable air volume system.
- Installed energy efficient VFD and premium efficiency motors on existing central equipment supply and return fans serving space.
- Revised controls sequence for supply and return fans.
- Provided digital controls for new VAV boxes.
- Incorporated occupancy sensors to automatically shutoff lights where appropriate.
- Used high efficiency fluorescent lighting in all general spaces.
- Use ultra-high efficiency LED exit lights, night lights and down lights in procedure rooms.
- Provided multi-level switching and dimming of lights.
- Maximized insulation in new roof assembly, exceeding min energy code requirements.
- Low VOC interior finishes (Paints, Flooring, Wall coverings, etc).

### Other Sustainability Features

- High level of air quality in spaces.
- Infill of exterior courtyard, reuse of existing wall construction.

### Project Data

- Budget: \$6 M
- Schedule: Completion Scheduled for Spring 2012
- Square Feet: 2,200 gross sq. ft. renovation  
4,000 gross sq. ft. addition

### Substantially Complete: June 2012

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Vera B. Baits Houses II Renewal



### Project Description

Constructed in 1967, the approximately 175,000-gross-square-foot, five-building Vera B. Baits Houses II complex (Baits II) provides housing for approximately 575 students. Consistent with the overall residential life initiative, we propose a comprehensive renovation of Baits II. The renovation will update infrastructure, including: new fire detection, alarm, and suppression systems; wireless high-speed network access; new energy-efficient windows and roof systems; and new interior finishes and furnishings. Community spaces will be reorganized or repurposed to create spaces for academic activities, student interaction, and creation of community.

### Energy Efficiency Measures

- New roofing complying with ASHRAE 90.1-2007 standards, with insulating values between R21 and R40.
- New aluminum windows with 1-inch, double-pane insulated glazing, thermal breaks, and special coatings.
- New energy-efficient light fixtures complying with ASHRAE 90.1-2007 standards, with occupancy sensors.
- New toilet fixtures with water-saving 1.6 gallons-per-flush and dual-action flush valves (0.6 gpf for liquids).
- New plumbing faucets and shower heads with water-saving features.
- New energy-efficient and paper-saving electric hand dryers.
- New energy-efficient kitchen appliances and computers.

### Other Sustainability Features

- Use of salvaged existing student furniture from other U-M dormitories instead of new furniture.
- Use of new flooring with recycled content, low-VOC emissions, and regionally-produced material.

### Project Data

- Budget: \$11.95 M
- Schedule: Completion Scheduled for Summer 2013
- Square Feet: 175,000 gross sq. ft. renovation

### Substantially Complete: August 2013

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Wall Street East Parking Structure



### Project Description

Construction of the new parking structure will add 530 net vehicle spaces to the university's parking system near the medical campus. The project will provide for an attractive gateway to the Wall Street area and medical center campus with environmentally- sustainable features. We envision an architecturally- detailed facade with open space at each end of the structure that will contain park-like landscaping with trees and gardens for storm water management which may also be used for irrigation and reducing storm runoff to the river. We also intend to include infrastructure for electric vehicle charging stations.

### Energy Efficiency Measures

- The Wall Street East Parking Structure is being designed to incorporate best sustainability practices for a building of this use type. US Green Building Council project criteria do not allow the Wall Street East Parking Structure to be considered for Leadership in Energy and Environmental Design (LEED) certification.
- Efficient fluorescent and LED light fixtures will be installed throughout.
- Interior light fixtures will be controlled by occupancy sensors and photocells to minimize energy use and to increase security.
- The completed parking structure will consume energy at a rate that is 30% less than established by ASHRAE Standard 90.1-2007.

### Other Sustainability Features

- The Wall Street Parking Structure will be designed as an open parking structure, thereby avoiding the need for powered ventilation.
- Infrastructure will be installed for electric vehicle charging stations.
- Native and adapted plant materials that minimize the need for irrigation will be planted.
- Landscaped areas will be maximized and porous pavements will be installed to reduce storm water runoff.
- Storm water will be mechanically and environmentally cleaned on-site prior to discharge.
- A large rain garden will be constructed in the east front yard of the parking structure to collect surface storm water runoff and to maximize on-site infiltration. Replenishing ground water on-site minimizes the potential for downstream flooding.
- An integral covered bus stop will encourage park and ride use, minimizing motor vehicles on campus.

### Project Data

- Budget: \$34 M
- Schedule: Completion Scheduled for Spring 2014
- 530 Net Parking Space

### Substantially Complete: July 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## West Hall Renovation for the College of Literature, Science, and the Arts



### Project Description

This project will relocate the Department of Astronomy from its current location in the David M. Dennison Building to the third and fourth floors of West Hall to permit greater collaboration with the Center for the Study of Complex Systems and the Department of Physics located in West Hall. A renovation of approximately 21,800 gross square feet of space within West Hall is planned to accommodate the relocation. The project will also relocate the administrative offices of the Department of Statistics from the fourth floor of West Hall to space that will be shared with the Department of Astronomy to gain administrative efficiencies.

### Energy Efficiency Measures

The project team evaluated a number of energy conservation measures (ECMs) per the requirements of U-M Design Guidelines "Special Instructions to Designers D: Energy and Water Conservation". Since this is a partial renovation involving primarily the building interior, the main focus was on water and energy conservation. In addition, a new mechanical unit that will serve all four floors of the south wing of the building offers an opportunity for greater energy efficiency beyond the strict boundaries of the project area. Specific energy efficiency features of the project include the following:

- New high efficiency zoned heating, ventilation and air conditioning unit (which exceeds building code requirements)
- Enthalpy economizer control
- Direct digital controls
- Increased thermostat dead band
- Use of energy efficient fluorescent light fixtures (in compliance with ASHRAE 90.1-2007)
- Lighting controls which include occupancy sensors and daylight sensors
- New low flow plumbing fixtures (20.7% savings)

### Other Sustainability Features

- Reuse of a significant portion of an historic building, which reduces construction waste compared with demolition and new construction
- Reuse of the building exterior and structure saves the embodied energy of the building
- Reuse of existing window shades for reductions in waste and solar gain

### Project Data

- Budget: \$5.5 M
- Schedule: Completion Scheduled for Summer 2014
- Square Feet: 21,800 gross sq. ft. renovation

### Substantially Complete: September 2014

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Wolverine Tower Renovations for Business & Finance



### Project Description

A renovation of approximately 61,000 gross square feet on seven levels will consolidate units currently spread across several floors, move all staff workstations out of the basement, and accommodate the relocation of MHealthy into Wolverine Tower, resulting in more efficient use of office space and increased cross-departmental sharing of both administrative staff and of common areas, such as conference and training rooms, kitchens and lunch rooms. The project will also address life safety and accessibility concerns and add a common lunch room, wellness area and showers, and a personal room. The scope of this project includes the architectural, mechanical and electrical work necessary to accomplish these improvements.

### Energy Efficiency Measures and Other Sustainability Features

- New lighting fixtures exceed ASHRAE+30% and will save an estimated 36,000 watts, which equates to approximately \$36,000 worth of electricity savings per year.
- There will be additional savings from the installation of occupancy sensor and time controls in offices and conference rooms.
- New variable air volume (vav) boxes will be installed to replace original building vavs, which will be more efficient in controlling temperature.

### Project Data

- Budget: \$6.3 M
- Schedule: Completion Scheduled for Fall 2011
- Square Feet: 61,000 gross sq. ft. renovation

### Substantially Complete: September 2011

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%

## Yost Ice Arena Seating Replacement and Improve Fan Amenities



### Project Description

The Department of Intercollegiate Athletics is proposing a project that will replace the spectator seating on the east, south, and west sides of the rink, improving accessibility as well as emergency egress. The project also includes improvements to the east and west concourses, conversion of the level four west side media balcony into a series of loge boxes, a new level five on the west side for media, as well as new corner and stair platforms for additional seating. Infrastructure improvements will be made, including upgrading the existing fire alarm system, extending the existing fire suppression system to areas not currently protected, and replacing the exterior windows.

### Energy Efficiency Measures

- The project will comply with ASHRAE Standards 90.1-2007.
- Replacing existing single pane window with high performance glazing system.
- Where mechanical units are replaced they will be replaced with high efficiency units.

### Other Sustainability Features

- We are renovating an existing building instead of tearing it down and/or building a new building.
- During construction best management practices to control sedimentation and erosion will be used.

### Project Data

- Budget: \$16 M
- Schedule: Completion Scheduled for Fall 2012
- Square Feet: N/A

### Substantially Complete: October 2012

- Project Status: Substantial Completion
- Design Complete: 100%
- Construction Complete: 100%