



# MUNGER GRADUATE RESIDENCES

## LEED GOLD CERTIFIED

### 44% WATER REDUCTION

The use of high efficiency plumbing fixtures provides water-use reduction with an estimated savings of 1,942,158 gallons of water per year.

### 30% BETTER THAN ASHRAE Std 90.1-2007

The building envelope thermal properties, mechanical cooling/heating systems, and lighting systems have been designed to perform 30% better than the governing State energy code (ASHRAE Std 90.1-2007).

### CONDENSING BOILERS

Condensing boilers and water heaters, which are approximately 10-15% more efficient than non-condensing units, are used to heat building domestic water and to generate hot water for the building heating requirements.

### 730 PREFABRICATED BATHROOMS TOTAL UNITS

**327** SHEETS OF WALL BOARD  
**15,042** LINEAL FEET OF METAL TRACK AND STUD  
**19,088** GALLONS OF WATER SAVED

#### 1 DELIVERY OF PRE-CUT MATERIALS & PRODUCTS

- Proprietary floor system, gypsum wall board, metal studs and track all pre-cut by manufacturer or trades to specified sizes reducing on-site waste and delivery costs.

#### 3 ASSEMBLY OF PANELS & COMPONENTS INTO BATHROOM

- Fabrication of the plumbing piping assemblies in the shop, utilizing precut lengths of copper, has reduced the waste of copper by an estimated 66%.

#### 2 FABRICATION OF INDIVIDUAL PANELS & COMPONENTS

- Pre-cut materials reduces labor and construction time during assembly.
- Wall panels assembled using templates and then moved down the assembly line for wall board.

#### 4 INSTALLATION OF FINISHES

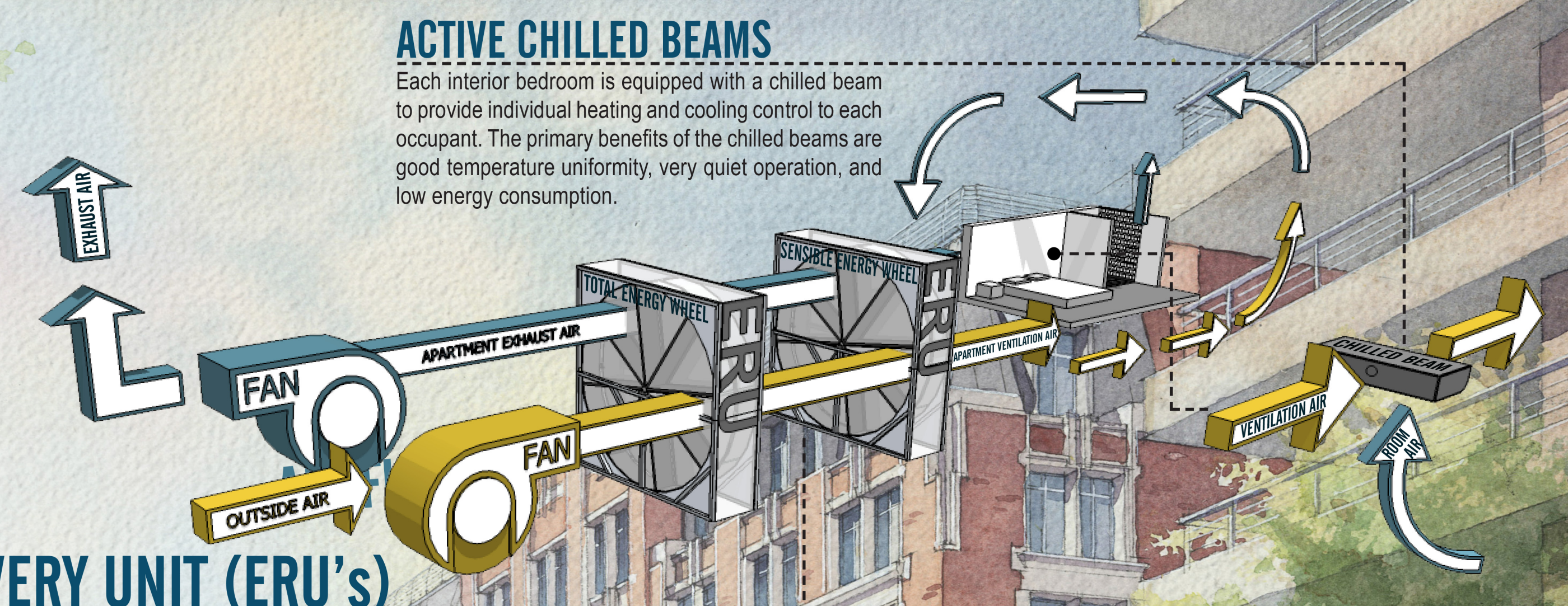
- Final production sequence included installation of shower, floor drains, wall tile, painting, vanity, cabinets, faucets, fixture trim, and hardware in a templated precise and consistent manner.

#### 5 BARCODE & TESTING FOR DELIVERY

- Water used for pressure testing of the piping was recaptured and reused in factory flood testing from unit to unit.
- Color coded labels and barcodes assisted in tracking assembly, inspections, corrections, delivery and final installation.

#### 6 TRANSPORT & INSTALLATION

- Completed modules were transported 8 miles to the site where they were immediately inserted into the building at their designated floor.
- Close proximity of factory reduced fuel costs and emissions from that of other potential manufacturers hundreds of miles away.



### ACTIVE CHILLED BEAMS

Each interior bedroom is equipped with a chilled beam to provide individual heating and cooling control to each occupant. The primary benefits of the chilled beams are good temperature uniformity, very quiet operation, and low energy consumption.

### ENERGY RECOVERY UNIT (ERU's)

ERU's provide code required outdoor air to each apartment. Instead of simply discharging apartment exhaust air to the atmosphere, the ERU's first capture energy from exhaust air to preheat the outdoor air during the winter and to precool the outdoor air during the summer. These precooling and preheating processes, utilizing a total energy wheel, save a significant amount of energy.

### ALTERNATIVE TRANSPORTATION

Munger is located at the southwest edge of central campus within convenient walking distance to classrooms, recreation buildings and shopping. Dedicated on-site parking was not provided in order to promote use of alternative transportation sources.

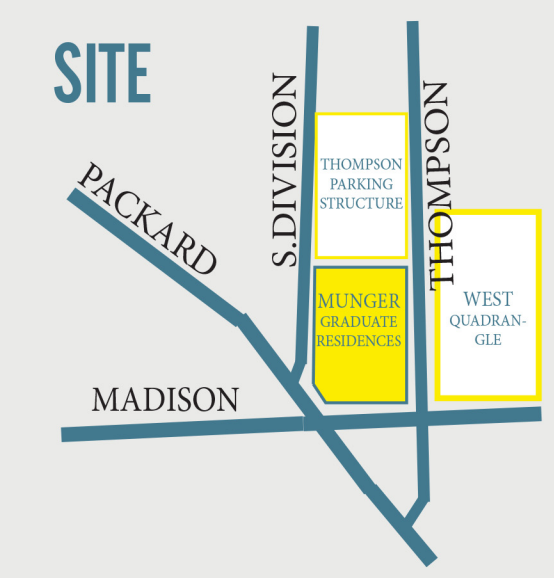
### EASY BUS STOP ACCESS

Seven unique bus line access points are within 1/4 mile walking distance including one stop right outside of the building.

### BICYCLE STORAGE

The project includes 88 outdoor and 96 indoor bicycle storage spaces. There is also a private indoor changing room and bathroom available.

The first of its kind residential facility for Graduate students on campus was created to provide a **life enriching environment** for its trans-disciplinary residents, while employing **state-of-the-art technologies** and methods of **energy efficiency** and **sustainability**. The 8 story facility, providing apartment style living for 634 graduate students, fellows and visiting faculty, was designed to maximize opportunities for **personal connection** and foster a strong sense of belonging. Each fully-furnished apartment offers generous common living spaces: dining areas with large screen displays for leisure viewing and group work, an oversized kitchen, and a washer and dryer. The building also provides abundant **community amenities** such as a **rooftop terrace** with a jogging/walking track, glass enclosed exercise area, multiple gathering spaces, seminar/study rooms, enclosed bike storage and a convenience store. Munger Graduate Residences was conceived and designed by the belief that the setting in which one resides has a powerful, **positive effect on the learning process**.

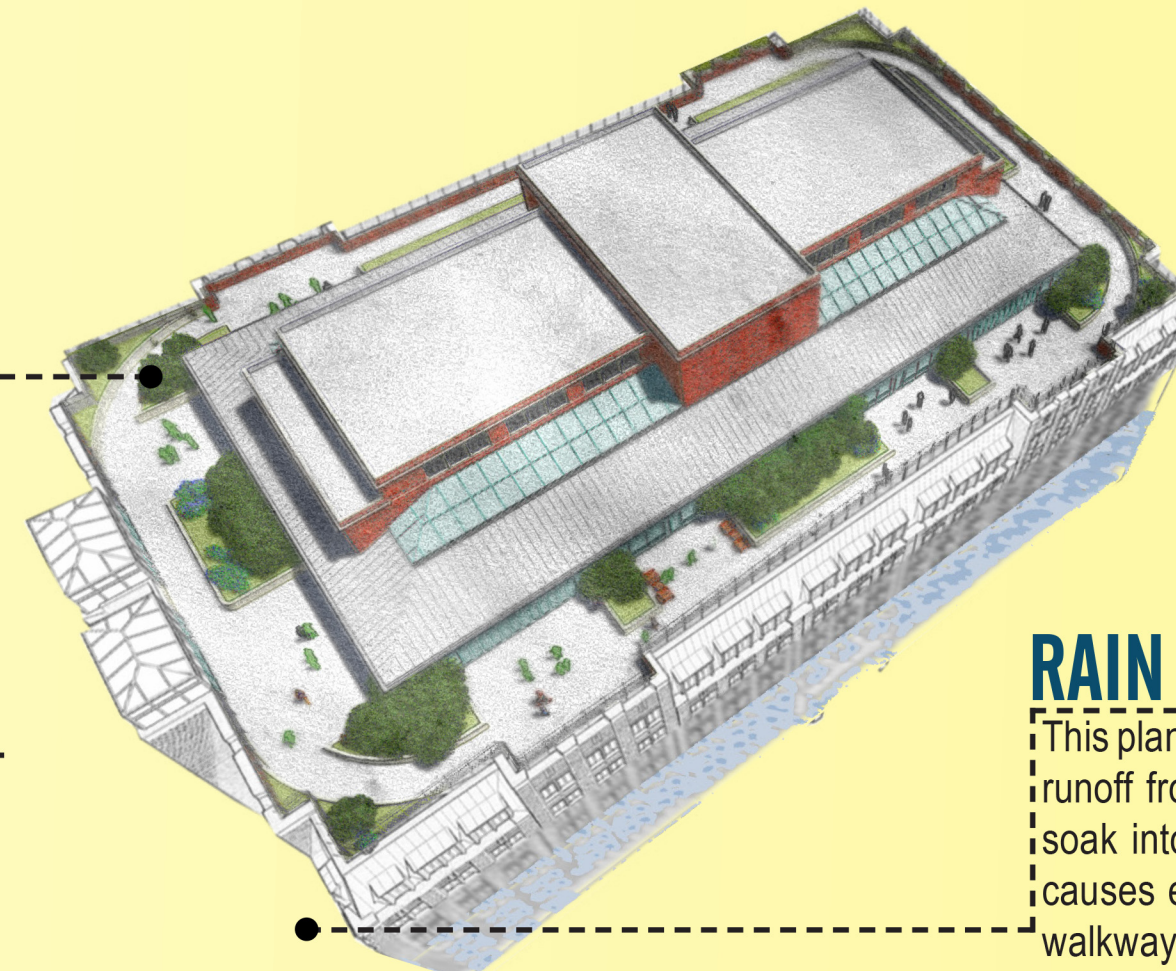


Sustainability Facts		
Munger Graduate Residences		
Building Use	Graduate Student Housing	
Location	Ann Arbor, Michigan	
Size	380,600 Gross Square Feet	
Number of Apartments/Bedrooms	96/634	
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LEED version	v2009	
LEED certification level	Gold	
ASHRAE 90.1 version	2007	
Energy cost savings compared to ASHRAE baseline	30%	
Total energy savings	\$121,051 / year	
Total electrical savings	408,719 KWh / year	
Total gas savings	104,106 Therms / year	
CO2 emissions avoided	764.05 tons	
Water fixture baseline	Energy Policy Act of 1992	
Total water savings	44%	
Construction/Demolition waste diverted from landfill	79%	
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Insulation (R-Value)*	Code	Project
Wall assembly - above grade	15.6	22.0
Wall assembly - below grade	8.4	10.0
Roof assembly	20.8	32.0
Glazing - Curtain wall system		
U-value**	0.45	0.28
Solar Heat Gain Coefficient (SHGC)**	0.40	0.38
Glazing - Fixed assembly		
U-value**	0.55	0.26
Solar Heat Gain Coefficient (SHGC)**	0.40	0.44
Glazing - Visible Light Transmittance (VT)***		0.70
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Project Team		
Owner	University of Michigan - Housing	
Architect	Integrated Design Solutions with HARTMAN COX	
Engineer	Integrated Design Solutions	
Contractor	Walbridge	
Commissioning Authority	HORIZON ENGINEERING	
Project Management	U-M AEC	
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Design Period: 2/13 - 1/14		
Construction Period: 10/13 - 7/15		
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* The higher the R-value the better the insulating quality		
** The lower the U-value and SHGC the more energy efficient the window		
*** The higher the VT value the more daylight in the space. VT is measured between 0 and 1		



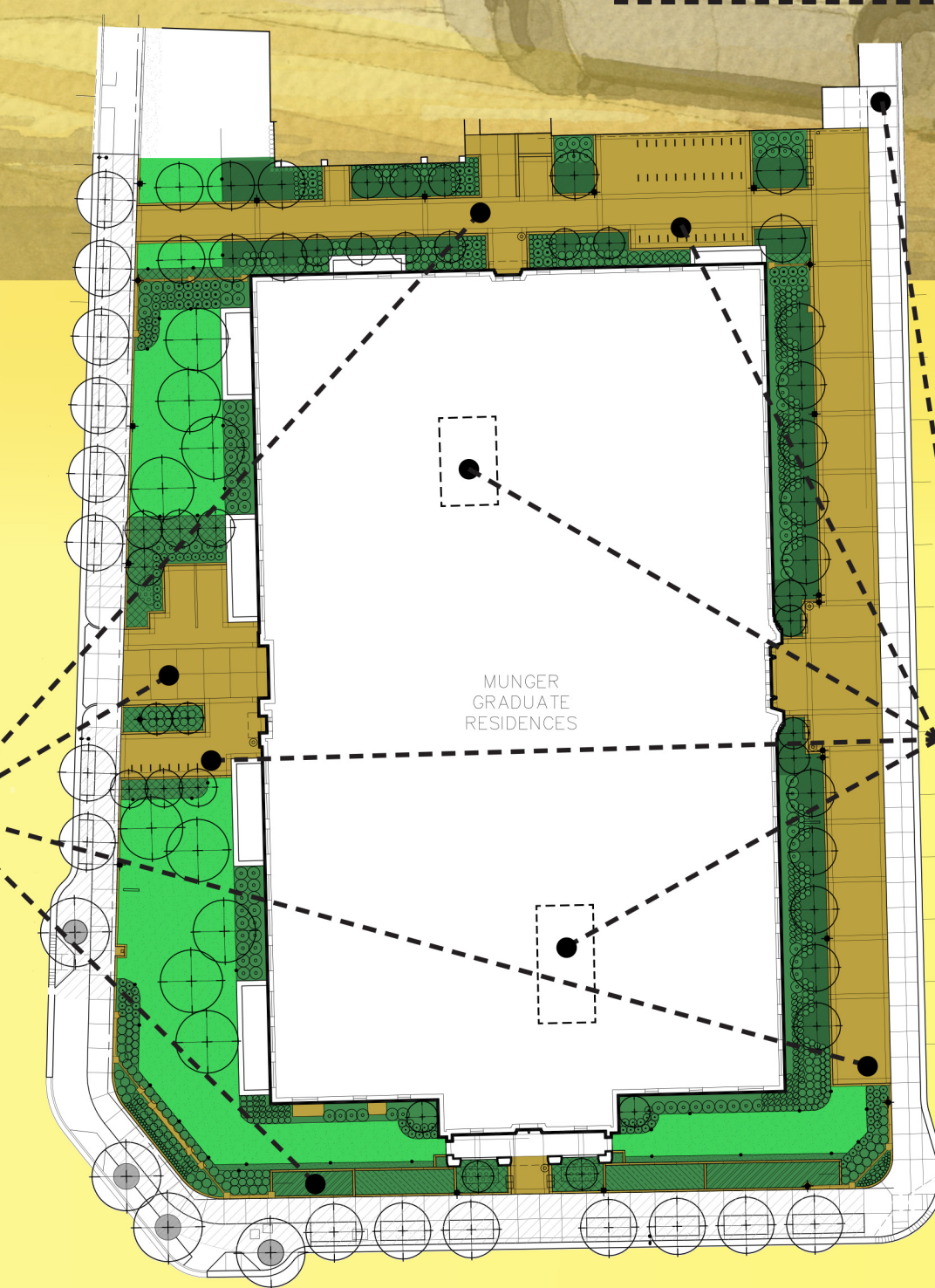
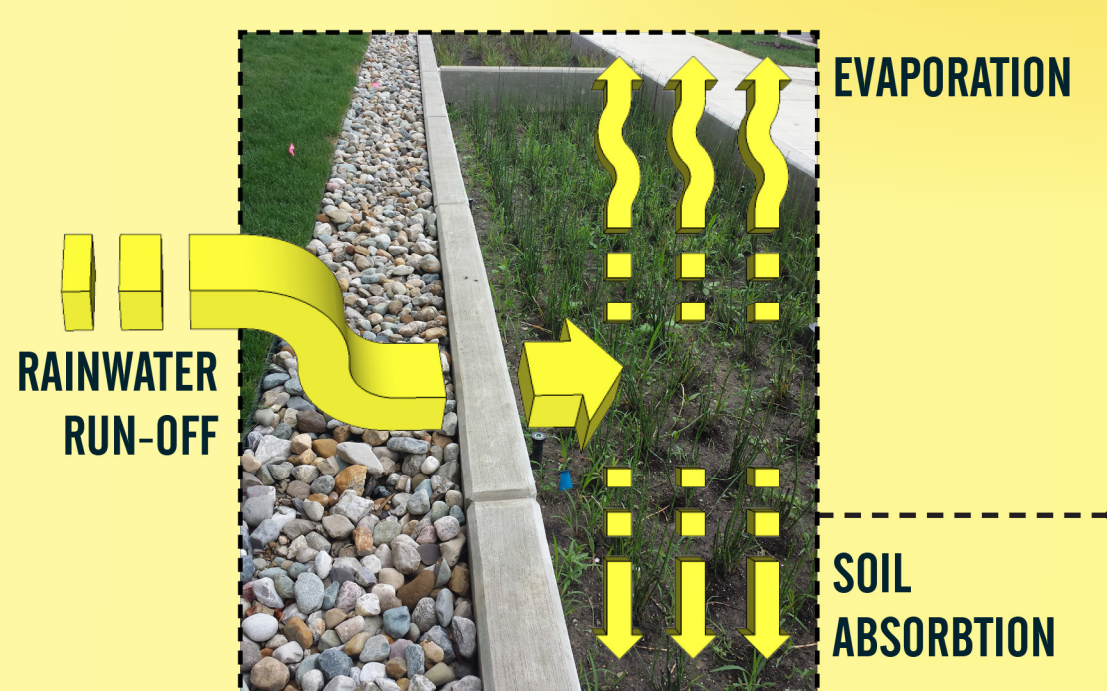
### SUSTAINABLE LANDSCAPE

Featuring a rain garden and permeable paving at the ground level and a rooftop terrace with sustainable vegetation, seating areas and a jogging track, Munger maximizes sustainable features in all of its exterior areas.



### RAIN GARDEN & PERMEABLE PAVEMENT

This planted depression, at the south edge of the site, receives and slowly absorbs rainwater runoff from the roof and grass areas. This reduces rain runoff by allowing stormwater to soak into the ground as opposed to flowing into storm drains and surface waters which causes erosion, water pollution, flooding, and diminished groundwater. Permeable paver walkways surrounding the site also aid in stormwater treatment by mitigating runoff.



planet blue  
UNIVERSITY OF MICHIGAN

INTEGRATED design SOLUTIONS  
architecture engineering interiors & technology

HARTMAN-COX  
ARCHITECTS

DESIGNED  
TO EARN THE  
ENERGY STAR

The estimated energy performance for this design meets US EPA criteria. The building will be eligible for ENERGY STAR after maintaining superior performance for one year.