Downtown Center

- 68,000 square feet
- 3 Story
- Pursuing LEED Platinum & Zero Net Energy
- Completed February 2018

Project Team:
- Heller Manus Architects
- Integral Group – MEP
- Turner Construction Company - CM
Electrification of New Buildings

- 29% energy savings better than 2013 Title 24 Code
- Designed to an EUI of 24.4 kbtu/sf
- Achieve all 19 LEED points under Optimize Energy Performance
Energy Efficiency Design

- Heat Recovery
- Right-sizing the Dedicated Outdoor Air System (DOAS)
- Radiant Cooling
- Air-source Heat Pump for Heating
An electric air-source heat pump provides heating and cooling through a hydronic radiant slab

An additional heat pump serves an air handling unit and supplemental 4-pipe fan coils are being used for large enclosed spaces (rooms with over 6 people design capacity) in the South West perimeter to trim peak loads.
All Interior and Exterior Lighting is LED

- Lighting loads were design to 0.5 W/sf
The Downtown Center is Meeting all Three Energy Performance Requirements from Exhibit L of the EDPA

1. Title 24 Model (Code Model)
2. LEED Model
3. Energy Performance Benchmarks
Title 24 Model

The new software released for the T24 2013 code cycle (CBECC-Com) is not able to capture many of the energy efficiency components of this design. The following items are included in the design, but cannot be modeled in CBECC-Com:

- Heat Recovery
- Right-sizing the Dedicated Outdoor Air System (DOAS)
- Radiant Cooling
- Air-source Heat Pump for Heating

**Energy Usage Results**

- Due to limitations in the new Title 24 software, Integral Group has used the Whole Building Energy Model results (EUI of 27.5 kbtu/sf) as proof that the project meets the intent of Exhibit L.
- The LEED model shows that we are achieving all 19 EA1 points
- The Benchmark model shows that we are better than the requirement with an EUI of 24.4 kbtu/sf
TDV Performance, UC Merced Downtown Campus

<table>
<thead>
<tr>
<th>TDV Energy Use (TDV-kBtu/sf)</th>
<th>Baseline</th>
<th>Proposed CBECC COM</th>
<th>With HR and Right Sized DOAS</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>169</td>
<td>6% savings 159</td>
<td>29% savings 121</td>
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</tbody>
</table>
The current energy model is showing 19 EAcl points without PV.

Current Energy Savings is 50% better than LEED 2009 baseline

![Bar chart showing energy costs and savings](chart.png)
The first cost of the radiant mechanical system is 18% lower than the conventional VAV system. This is due to the smaller duct sizes and plenum spaces, allowing the building floor to floor height to decrease. Along with the enhanced daylight strategies, the lower cost for mechanical and electrical systems allow a higher budget for the shading structure. This structure will decrease glare, improve occupant thermal comfort, and decrease cooling loads.
1 Million $$ in First Cost Savings

**FIRST COST TRANSFER :: MECHANICAL SYSTEMS**

- **VAV with Reheat, Air Cooled with Boiler**: $3,610,000
- **Radiant with DOAS and Air Cooled Chiller**: $2,620,000

UNIVERSITY OF CALIFORNIA

MERCED
Life Cycle Costing at UC Merced

Life Cycle Cost Assessment
A life cycle cost assessment is a method for assessing the total cost of facility ownership. It takes into account all costs across the set lifetime of a building, including first cost, annual energy cost, replacement, and operations and maintenance. The timeline for this project was set to 30 years, with a discount rate of 6%, and an energy escalation rate of 4%/yr.

<table>
<thead>
<tr>
<th>LCCA Assumptions</th>
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<tbody>
<tr>
<td>Discount Rate</td>
<td>6%</td>
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<tr>
<td>Analysis Period</td>
<td>15 years</td>
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<tr>
<td>Electric Cost</td>
<td>$0.15/kWh</td>
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<tr>
<td>Energy Escalation</td>
<td>4%/yr</td>
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<table>
<thead>
<tr>
<th>LCCA Results</th>
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<tbody>
<tr>
<td>$679,000 NPV generated by Radiant HVAC System</td>
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<tr>
<td>Equal to $9/sf First Cost Savings</td>
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### Whole Building Energy Performance Targets

<table>
<thead>
<tr>
<th></th>
<th>Annual Electricity</th>
<th>Annual Thermal</th>
<th>Total Annual Energy</th>
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<tbody>
<tr>
<td></td>
<td>40% of benchmark</td>
<td>40% of Benchmark</td>
<td>40% of Benchmark</td>
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<tr>
<td></td>
<td>kBTU/gsf/yr</td>
<td>kBTU/gsf/yr</td>
<td>kBTU/gsf/yr</td>
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<tr>
<td>Target</td>
<td>19.5</td>
<td>8</td>
<td>27.5</td>
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<tr>
<td>Design</td>
<td>24.4</td>
<td>0</td>
<td>24.4</td>
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On-Site Solar

Plans to incorporate 535k photovoltaic system on the roof top of the Downtown Center
Questions?