



THE UNIVERSITY OF  
NEW MEXICO.

# 2018 Rocky Mountain APPA Annual Conference Track 4 (Technology)



## Renovation of 50 Years Old Farris Engineering Center

Presented by

Don Swick - Facilities Engineer  
UNM Facilities Management  
ENGINEERING AND ENERGY SERVICES

September 25, 2018



Networking. Mentorship.  
Professional Development.



# Renovation of 50 Years Old Farris Engineering Center



## Learning Outcomes:

1. Reuse of existing building structures can eliminate additional land requirements on campus and result in modernized facilities to meet current educational needs.
2. Application of innovative features can be cost effective and result in lower annual operational costs.
3. Continuous commissioning can be accomplished with commercial data analytics software integrated into BAS

# Renovation of 50 Years Old Farris Engineering Center Building Envelope Shape Modification



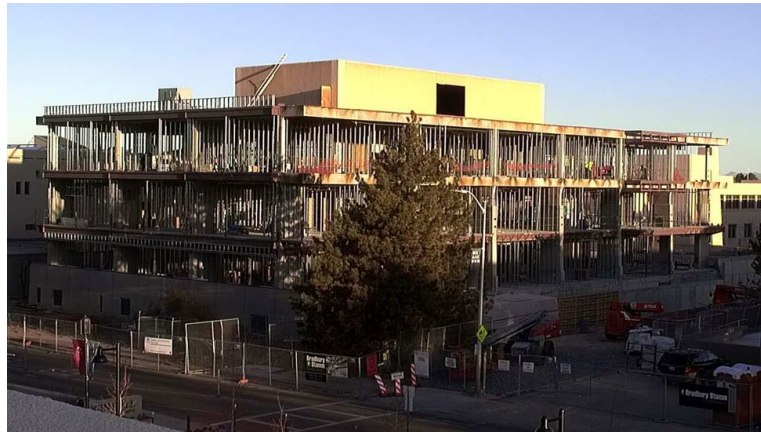
North elevation



East elevation



West elevation

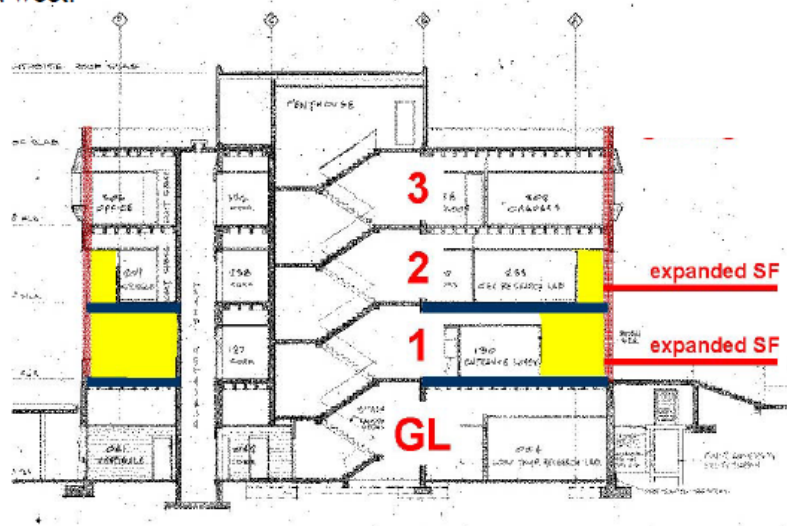


# Renovation of 50 Years Old Farris Engineering Center Building Envelope Shape Modification



Project Component	GSF
FEC: GL, 1, 2, 3 (including shafts, vertical circulation, & penthouse)	67,319
FEC expansion (floors 1+2)	8,695
<b>Total</b>	<b>76,014</b>

**CONCEPT** - At levels 1 & 2, expand the building footprint to the north, south, east and west.



FARRIS ENGINEERING CENTER - RENOVATION

UNM PDC + RMKM



# Renovation of 50 Years Old Farris Engineering Center Building Envelope Shape Modification



# Renovation of 50 Years Old Farris Engineering Center Electrochromic Glass



## HOW DYNAMIC GLASS WORKS

SageGlass' electrochromic coating consists of five layers of ceramic material. Applying a low voltage of electricity darkens the coating as lithium ions and electrons transfer from one electrochromic layer to another electrochromic layer.

Reversing the voltage polarity causes the ions and electrons to return to their original layer, causing the glass to return to its clear state.

This solid-state reaction is controlled through a very low voltage (less than 5V DC) power supply. A darkened state enables SageGlass to absorb and reradiate away the sun's unwanted heat and glare. A clear state allows you to maximize daylight and solar energy.





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# Renovation of 50 Years Old Farris Engineering Center Electrochromic Glass



# Renovation of 50 Years Old Farris Engineering Center Electrochromic Glass





# Renovation of 50 Years Old Farris Engineering Center HVAC Selection Process



## VAV with Reheat UNM Standard HVAC

Issue with VAV concept was limited shaft space for ductwork requirements of Supply and Exhaust air volumes (including future LABS)

Other HVAC Options include Fan Coils or Chilled Beams

Limited ceiling height increased cost for condensate drain line system for Fan Coil System

Chilled Beams concept eliminated condensate issue and had minimal height requirement.

Dedicated Outside Air System (DOAS) used for ventilation and incorporated energy recovery.



VAV Boxes with Reheat Coils employed for control of Ventilation and Heating



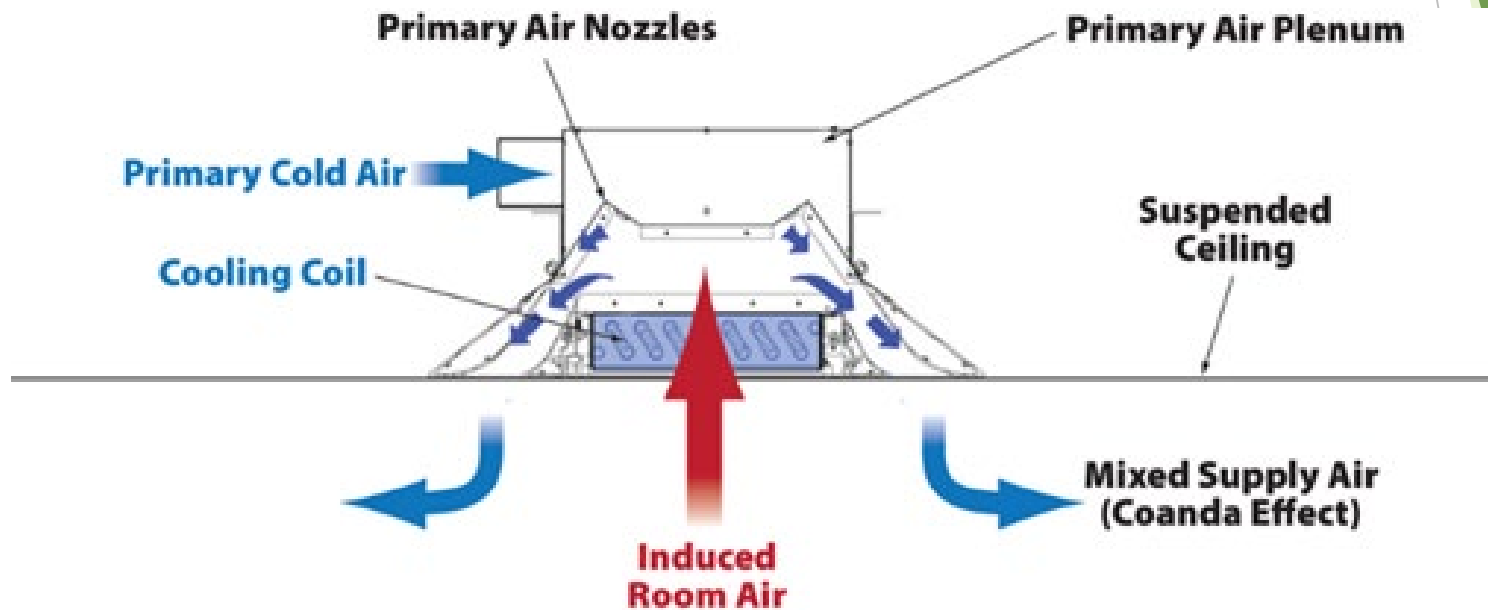
# Renovation of 50 Years Old Farris Engineering Center HVAC Selection Process



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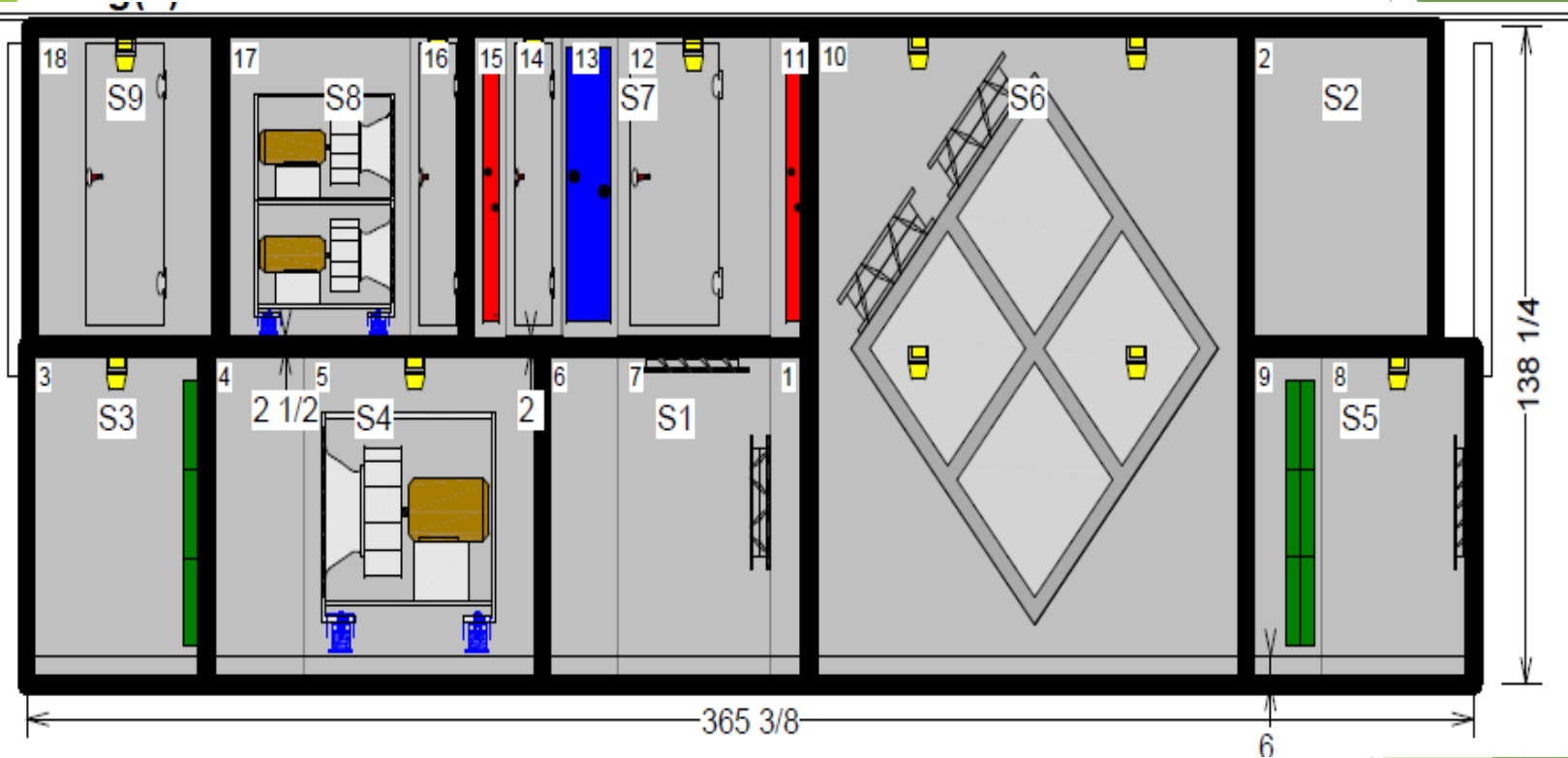


# Renovation of 50 Years Old Farris Engineering Center Chilled Beam Equipment





# Renovation of 50 Years Old Farris Engineering Center DEDICATED OUTSIDE AIR SYSTEM



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# Renovation of 50 Years Old Farris Engineering Center DEDICATED OUTSIDE AIR SYSTEM





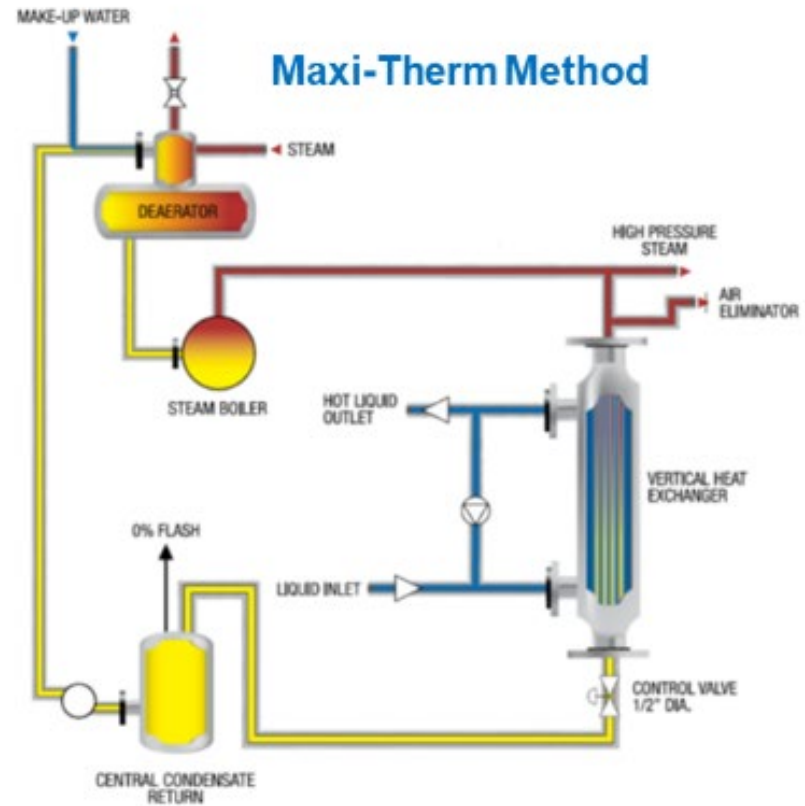
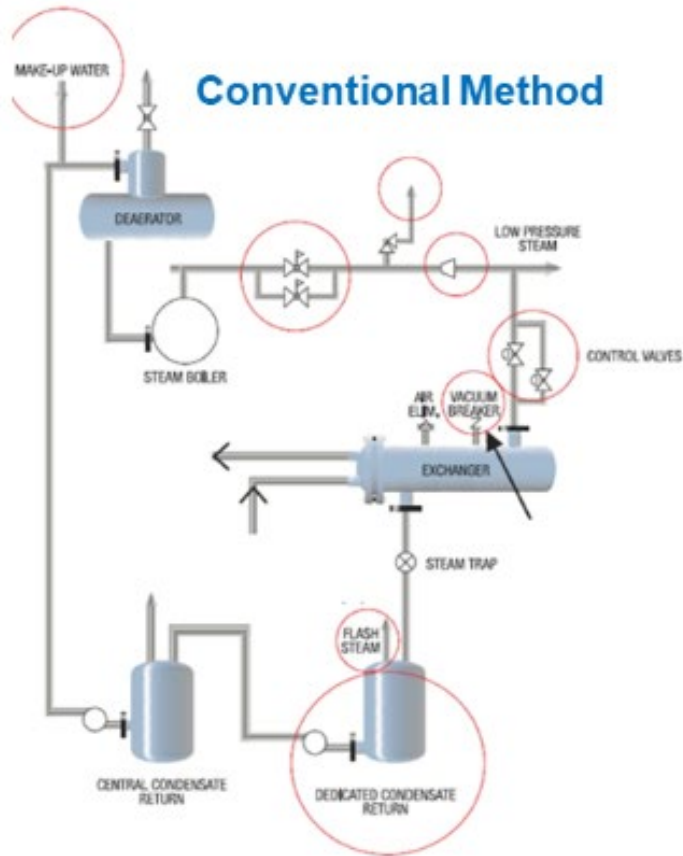
# Renovation of 50 Years Old Farris Engineering Center DEDICATED OUTSIDE AIR SYSTEM





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# Renovation of 50 Years Old Farris Engineering Center MAXITHERM STEAM TO HW EXCHANGER



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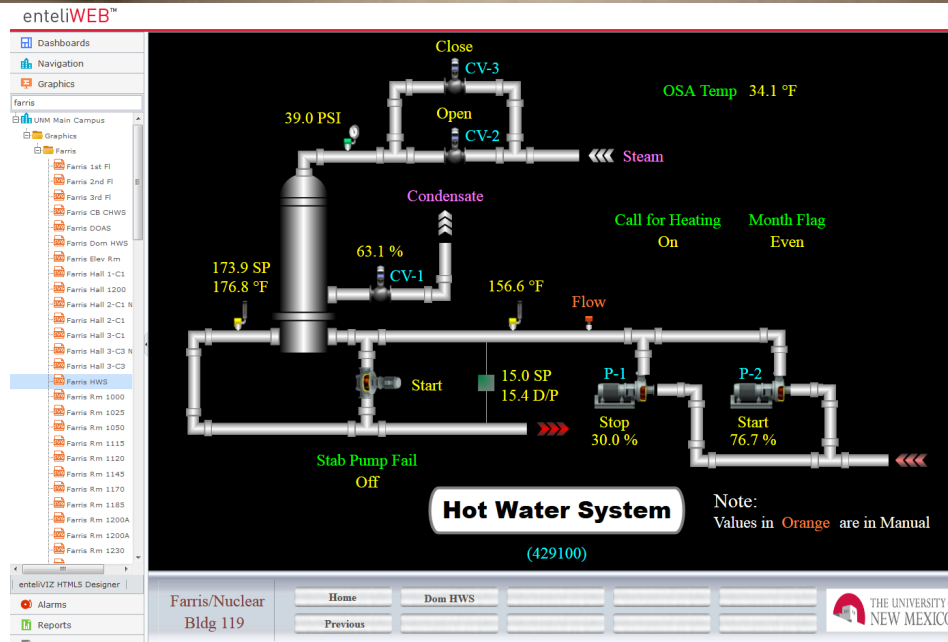


# Renovation of 50 Years Old Farris Engineering Center MAXITHERM STEAM TO HW EXCHANGER

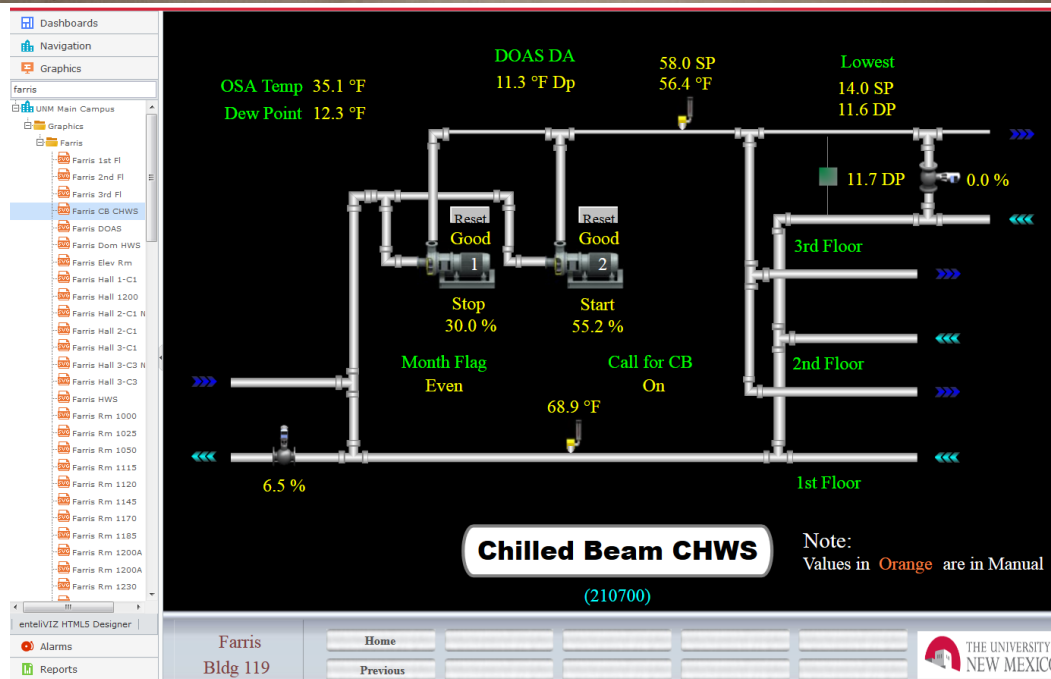




# Renovation of 50 Years Old Farris Engineering Center VFD Pumping HW Loop



# Renovation of 50 Years Old Farris Engineering Center VFD Pumping CBW Loops



# Renovation of 50 Years Old Farris Engineering Center HVAC CONTROLS FEATURES



## Building Automation System Features

- Delta Controls System with web based interface
- Chilled beam system control strategies more complex than traditional VAV
- New Thermostat design with color background
- Belimo Energy Valves on DOAS PHW, CW and HW coils for temperature, water flow and energy reporting
- Belimo PIQCV pressure independent 2-way control valves for HW and CB coils assure proper flow
- Integration with Lighting Occupancy sensors for HVAC set back control during occupied hours





# Renovation of 50 Years Old Farris Engineering Center Dedicated Outside Air System



enteliWEB™

Dashboards

Navigation

Graphics

farris

UNM Main Campus

Graphics

Farris

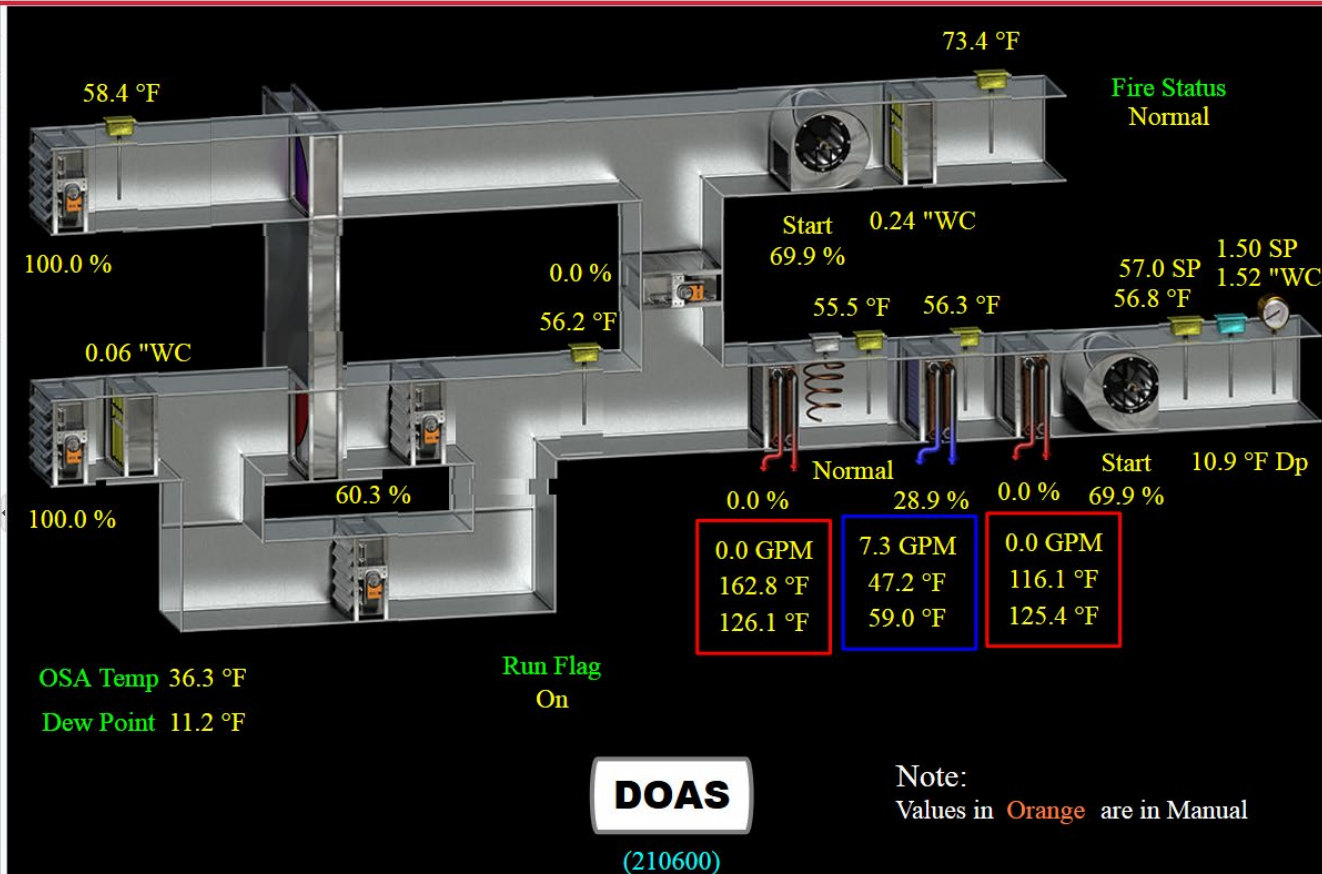
- Farris 1st Fl
- Farris 2nd Fl
- Farris 3rd Fl
- Farris CB CHWS
- Farris DOAS**
- Farris Dom HWS
- Farris Elev Rm
- Farris Hall 1-C1
- Farris Hall 1200
- Farris Hall 2-C1 N
- Farris Hall 2-C1
- Farris Hall 3-C1
- Farris Hall 3-C3 N
- Farris Hall 3-C3
- Farris HWS
- Farris Rm 1000
- Farris Rm 1025
- Farris Rm 1050
- Farris Rm 1115
- Farris Rm 1120
- Farris Rm 1145
- Farris Rm 1170
- Farris Rm 1185
- Farris Rm 1200A
- Farris Rm 1200A
- Farris Rm 1230

enteliVIZ HTML5 Designer

Alarms

Reports

Logs



Farris  
Bldg 119

Home

1st Floor

2nd Floor

3rd Floor

HWS

Previous



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# Renovation of 50 Years Old Farris Engineering Center HVAC CONTROLS FEATURES



## BAS Data Analytics - Pilot

CopperTree Analytics is the developer of Kaizen, a powerful ongoing commissioning and analytics tool that works in conjunction with the Building Automation System (BAS) and energy metering systems. Kaizen continuously monitors a building's performance and energy consumption, measuring it against optimal performance guidelines, and its own learned baseline, alerting if a fault is detected, or if performance is sub-optimal.



# Renovation of 50 Years Old Farris Engineering Center BAS Data Analytics - Pilot



## Optimal building performance, every day

CopperTree Analytics Golden Standard feature ensures that the building is running the way intended every day by taking a daily 'snapshot' of the BAS settings, and comparing it against the previous baseline settings for the building. This allows operators to maintain the commissioned state of the building, reducing performance degradation over time.





# Renovation of 50 Years Old Farris Engineering Center SERVER ROOM EFFICIENCY

Server Rack  
stacks direct  
warm air into  
return air  
plenum,  
optimizing  
cooling  
equipment  
performance.



# Renovation of 50 Years Old Farris Engineering Center SERVER ROOM EFFICIENCY



Roof Top Cooling Unit has variable capacity scroll compressor AHRI IEER rating of 13.8 and economizer capability for free winter cooling.





# Renovation of 50 Years Old Farris Engineering Center SERVER ROOM EFFICIENCY



IT and Electrical closets have Ductless  
Mini- Splits equipment with AHRI SEER  
rating of 16.0





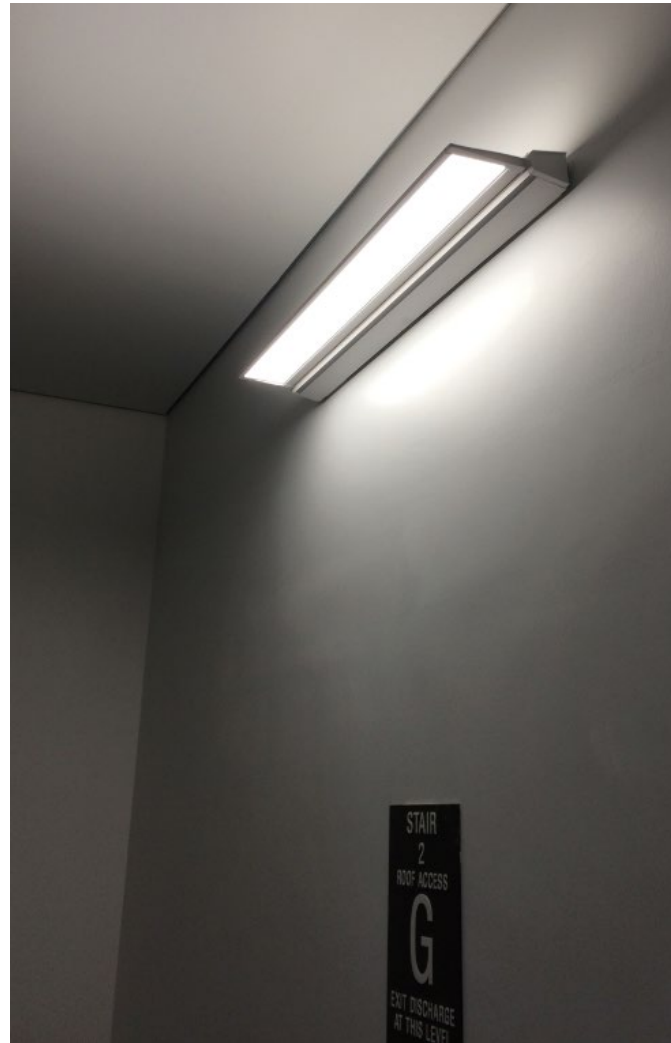
# Renovation of 50 Years Old Farris Engineering Center LED Lighting Features



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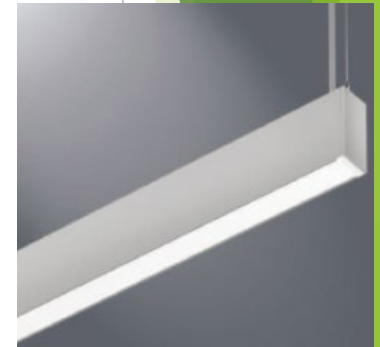
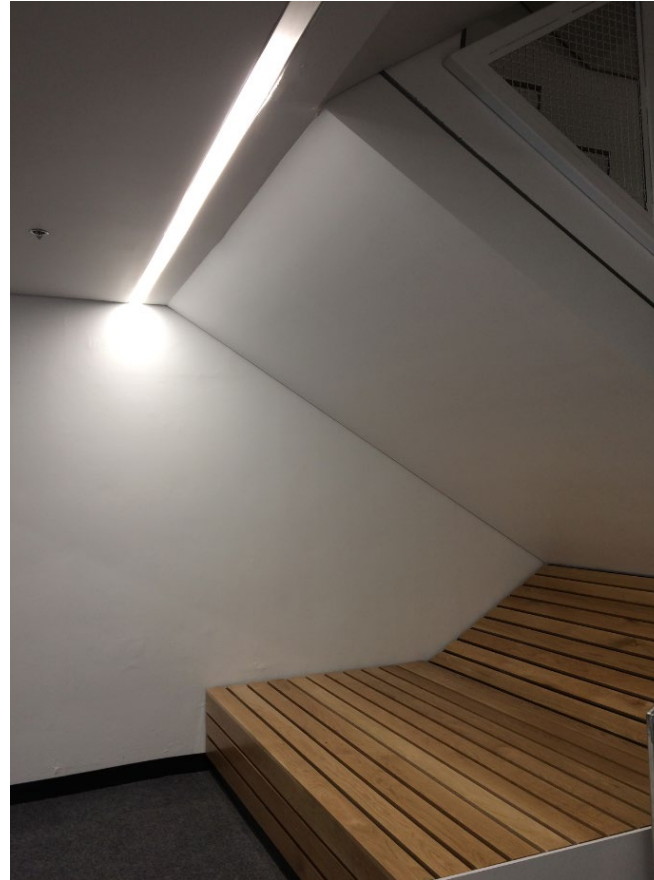


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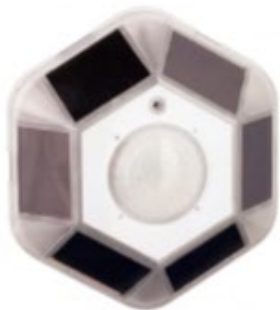
# Renovation of 50 Years Old Farris Engineering Center Lighting Control System

## Lighting Control Components



Room Controller - Control circuits,  
plus dimming, occupancy strategies  
done wirelessly

Wall Switches - Wireless, no battery



Occupancy Sensors - Wireless,  
charged by light, optional battery  
back-up



# Renovation of 50 Years Old Farris Engineering Center Lighting Control System



## Lighting Control Components

Third Party Signal - Wireless  
communication of Room Occupancy  
status to HVAC equipment



WiFi interface - Wireless Time  
of Day control Signal for  
Hallway Fixtures



GW2 - Gateway



## Renovation of 50 Years Old Farris Engineering Center LEED Design Goal



A major component of LEED is Energy and Atmosphere (35 Points), Optimizing Energy Performance can be up to 19 points alone, so energy efficient design of the buildings HVAC and Lighting Components is a priority.

Existing Energy Cost and Usage (2016 prior to construction) was \$3.30 per SF, and 169 KBTU/SF

Design Model of new facilities Energy Cost and Usage Annual projections are \$1.03 per SF, and 54 KBTU/SF



# Renovation of 50 Years Old Farris Engineering Center LEED Design Goal



## Path to Gold Strategy

**Approved Design Credits: 51 points**

Needed for Gold: 60 points

Construction Phase Credits that appear achievable with current documentation:

EAc3	2 points (provided by CxA)
EAc5	1 point
MRc2	2 points
MRc4	1 point
EQc3.1	1 point
EQc4.1	1 point
EQc4.2	1 point
EQc4.3	1 point
EQc4.4	1 point
IDc1.1	1 point (low-mercury lighting)
IDc2	1 point
Total:	13 points
<b>Sub-total:</b>	<b>64 points</b>

Construction Phase Credits that need additional information to confirm status:

MRc7	1 point (depends on LEED compliant FSC invoices)
EQc3.2	1 point (depends on feasibility and cost of flush out)
IDc1.4	1 point (green cleaning or green education)

Potential Credit Total: 67 points





## Renovation of 50 Years Old Farris Engineering Center PNM Rebate



UNM PPD Project Engineer processed “New Construction Whole Building Performance - Greater than 20% Savings” application for PNM Rebate

Annual KWH Total Saving included Building of 156,929 KWH, plus Exterior Lighting of 18,339 KWH resulting in total incentive of \$18,443.75.

Bridgers & Paxton processed the PNM New Construction Quality Application Bonus for UNM

Steven Hernandez of DNV GL - Energy (firm that implements PNM Business Energy Efficiency Programs) works with UNM to complete applications.

Emma van Moorsel, PNM Strategic Account Manager, does the honor of delivering PNM Rebate Check to UNM PPD.



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## Thanks - Questions

