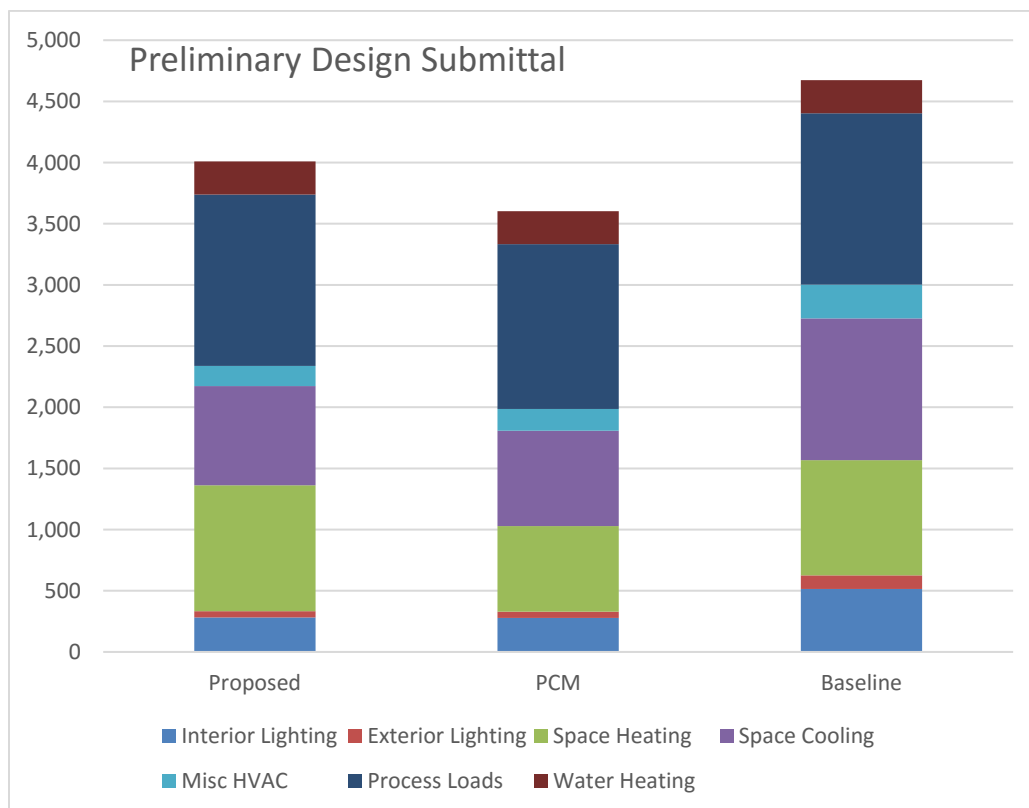


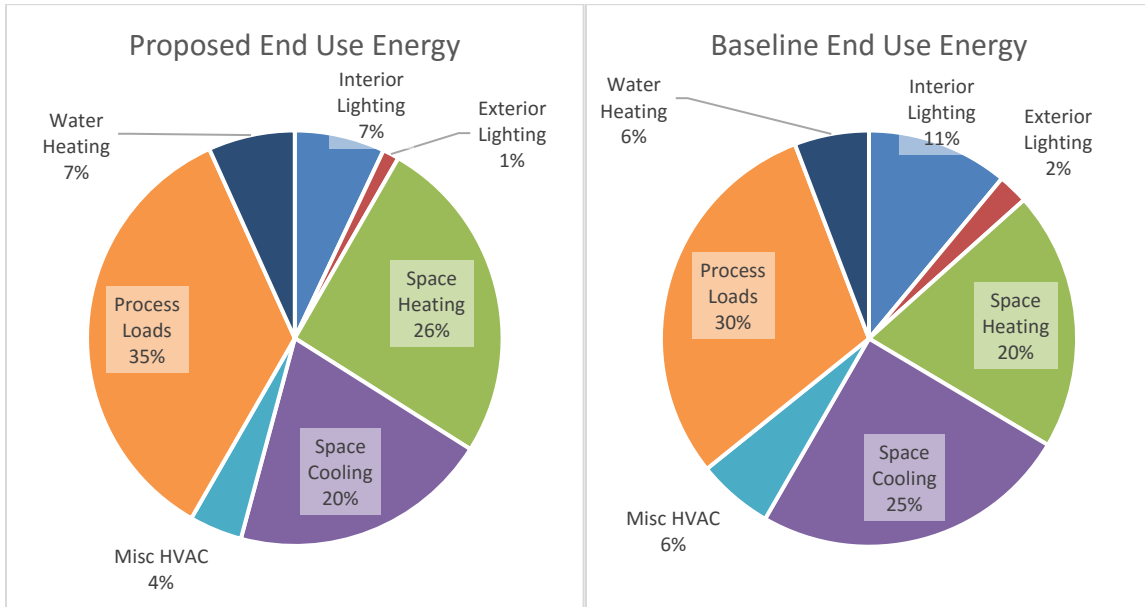
memorandum

attn:	LEED Review Team	from:	Sarah Gudeman
company:	GBCI / USGBC	date:	11/11/2016
project name:	Kiewit Training & Innovation Center		
mei project:	15265		
re:	EAp2 / c1 – Submittal Narrative Supplemental Information		

Modeling Results Summary

The graphs below summarize results from supplied documentation and the LEED credit template. The project is seeking compliance through an exceptional calculation methodology for the implementation of Phase Change Materials (PCM) in the building envelope. Refer to the end of this memo and documentation supplied under EAp2-10 for additional information.





Occupancy & Diversity

A full memo describing occupancy, diversity, and the function of the Kiewit Training & Innovation Center has been provided under documentation uploads for Plf3. These files are titled “Kiewit FTE and Transients Zoning 20160606.pdf” and “15265 memo LEED Occupancy 20160606 (kiewit).pdf”.

In summary, the Kiewit Training and Innovation Center will be used as a short-term training facility for employees, giving it two distinct occupant groups, made up of full time facility employees, learner employees, and instructor employees.

- Occupant Group 1: 61 Full Time Equivalent (FTE) occupants
- Occupant Group 2: 125 Transients (learners and instructors)

Given the flexibility of the building’s occupancy, not all areas will be utilized simultaneously. Peak occupancy at a given time is anticipated at 186 total.

Process Energy

As calculated, annual process energy of approximately 1,400 MBTU/yr accounts for 30% of the total Baseline energy cost. This includes both space by space receptacle equipment and other process loads (elevators, as well as refrigeration, kitchen and data center equipment).

Receptacle equipment was modeled in a space by space method, based on information provided by the Owner and Architect. This W / SF value for each room was calculated based on wattage of equipment planned for each space (W) and the square footage of that space (SF). Space by space equipment power density therefore reflect the actual process loads anticipated for the building. This information is shown in the model ECB report under “Receptacles – Conditioned” at 348 MBTU/yr (101,934 kWh/yr).

Other process equipment is grouped in the model ECB report under “Stand-Alone Base Utilities” with non-process loads for domestic hot water and exterior lighting. The loads counted as process energy include elevators, refrigeration equipment, kitchen equipment and data center equipment at values as entered into Table 1.4’s ‘Equipment’ worksheet. Model results include energy consumption as follows:

- Elevator Equipment: 74,166 kWh / yr
- Refrigeration Equipment: 59,568 kWh / yr
- Cooking Equipment: 52,234 kWh / yr
- Data Center Equipment: 122,640 kWh / yr

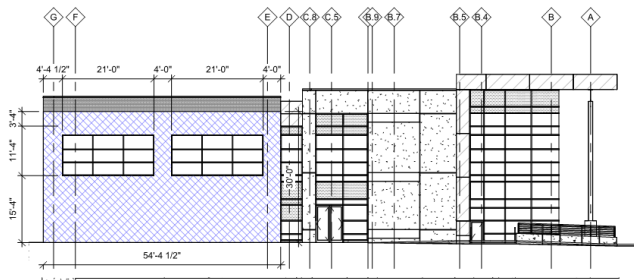
Kitchen MAU and Hood

The building includes a commercial kitchen with the following exhaust and ventilation equipment: range hood exhaust, dishwasher exhaust hood and makeup air unit. This equipment is in addition to the zone terminal unit from the building HVAC system which provides comfort cooling and heating to the space. Kitchen exhaust and make up air equipment is not sized for occupant comfort and dedicated solely to cooking loads.

For this reason, kitchen makeup air unit MAU-1, range hood fans KEF-1 & 2, and dishwasher exhaust fan DWEF-1 airflows, schedules and equipment are modeled identically in the proposed and the baseline models. All parameters associated with this equipment (capacity, airflow, schedule, temperatures, setpoints, etc) are held constant between the two models.

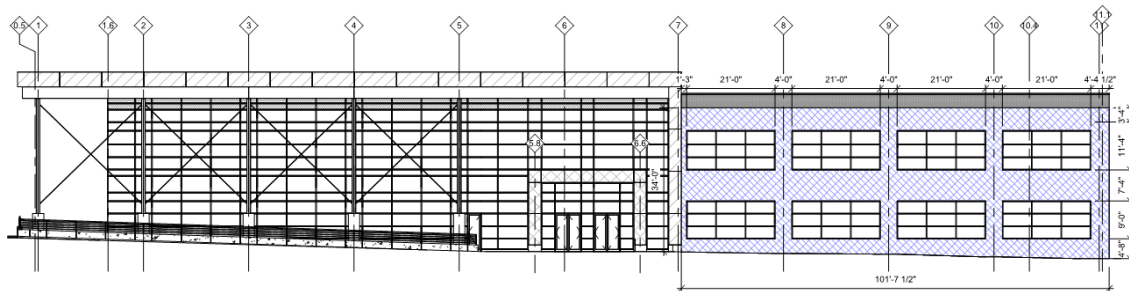
Phase Change Material

This project is utilizing phase change materials (PCM) for additional thermal mass in the select exterior wall areas and above ceilings in interior zones. Areas of inclusion are documented below. Refer to Exceptional Calculation methodology documentation for additional information.



4 WEST ELEVATION **1,240 SF**
AS.21
0' 4' 8' 16' 32'

Figure 1 - West Elevation for PCM



3 SOUTH ELEVATION **2,000 SF**
AS.21
0' 4' 8' 16' 32'

Figure 2 - South Elevation for PCM

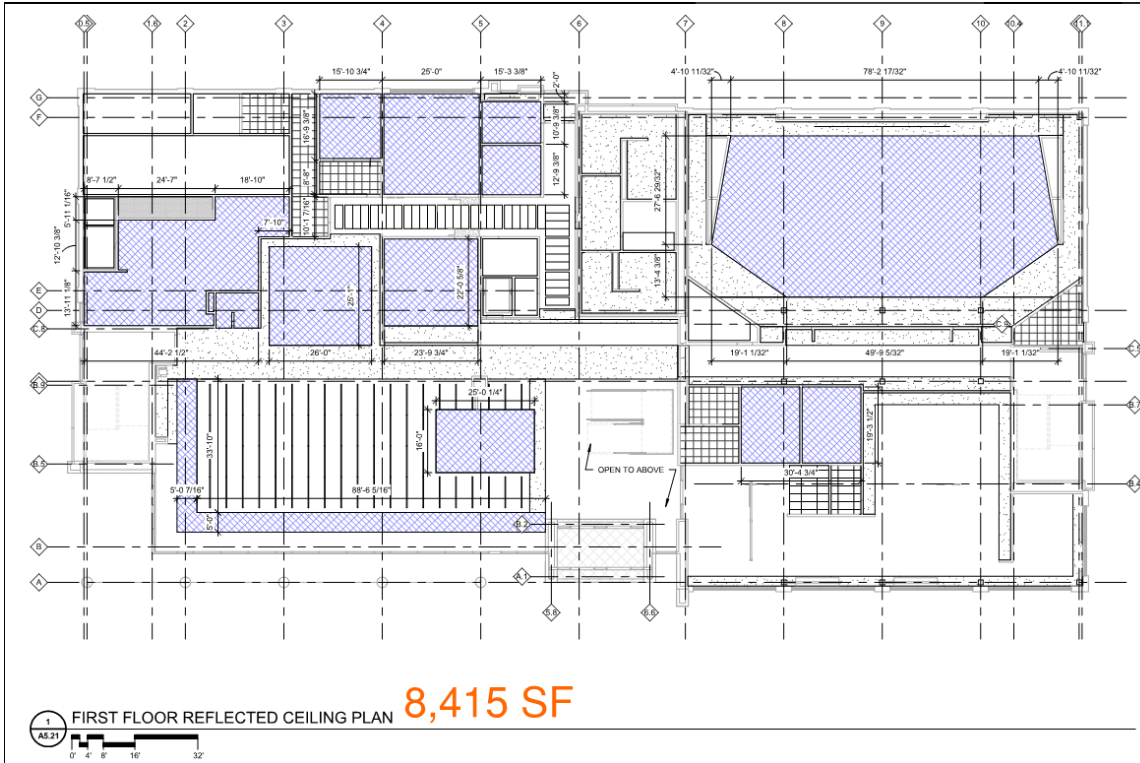


Figure 3 - First Floor RCP for PCM

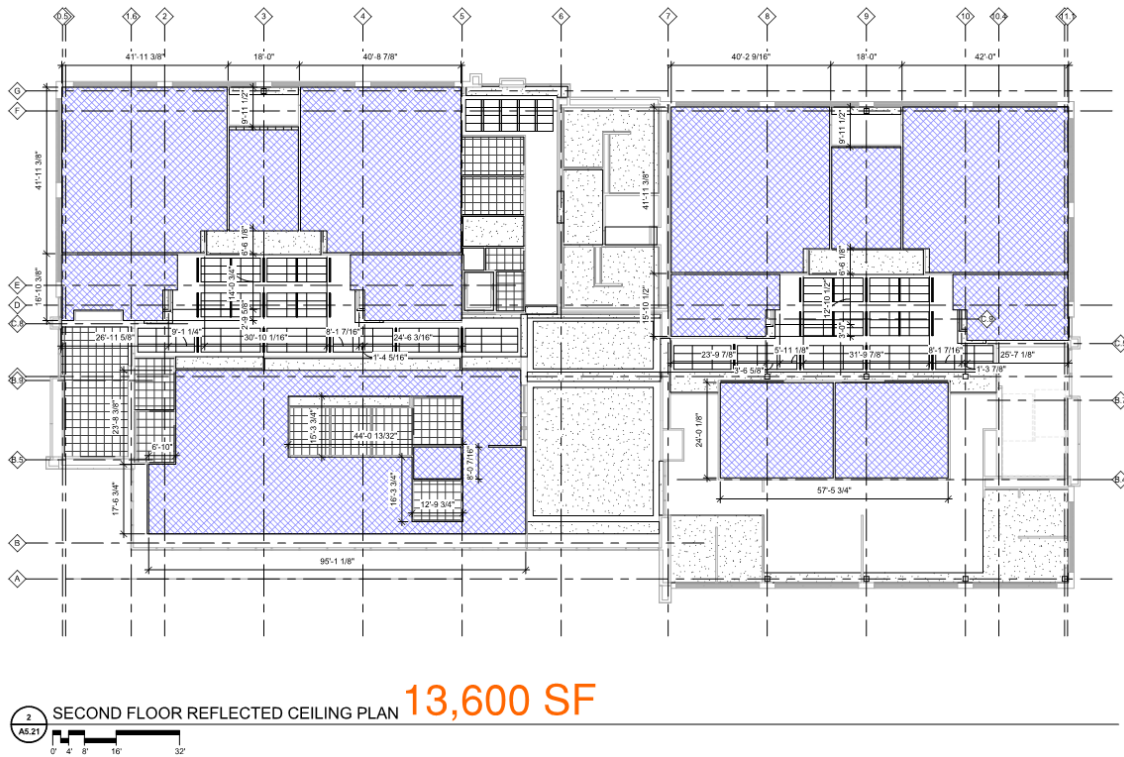


Figure 4 - Second Floor RCP for PCM

An Energy Plus (E+) model was completed by third-party consultant NRGsim Inc.

NRGsim used previous extensive experience in modeling Phase Change Materials (PCM / Infinite R) for a product major manufacture to accurately perform post-processing on the Trane Trace 700 energy model completed as part of EAp2/c1 documentation.

First, the E+ model was tuned to match within 1% total and 5% HVAC of the TRANE proposed model results.

Then, the proposed model was revised to demonstrate anticipated energy-efficiency benefits from the inclusion of PCM. Resulting savings are 10.1% total from Proposed energy and 22.9% from Baseline energy. These results are in line with previous modeling expectations for the PCM product in this type of building and climate. They are summarized in more detail in the tables below. All modeling results from E+ are also attached.

Table 1 below demonstrates Proposed modeling results of the Energy+ model in comparison to the TRANE model. Table 2 shows energy end use

Table 1 - Energy Model Tuning Summary

Energy End Use Summation	TRANE Energy [MBTU]	Energy+ Energy [MBTU]	Diff%
HVAC (Heating, Cooling, Fans, Pumps)	2,004	2,096	-5%
Internal Loads (Lighting, Equipment, Hot Water)	901	882	2%
Process Loads (Outdoor Lights, Elevators, Cooking, Refrigeration)	1,104	1,063	4%
Total	4,009	4,041	-1%

Table 2 – Proposed Energy Model Summary with PCM Energy Savings

End Use	process?	Energy Type	Proposed			Baseline	
			PCM [MBTU]	Original [MBTU]	Energy Savings [MBTU]	Energy Use [MBTU]	Energy Savings [%]
Interior Lighting		Electricity	278	282	0	515	-46%
Exterior Lighting		Electricity	51	51	0	110	-54%
Space Heating		Electricity	3	2	-1	0	-
Space Heating		Gas	172	284	112	318	-46%
Space Heating		HHW	525	744	219	624	-16%
Space Cooling		Electricity	18	18	0	11	71%
Space Cooling		CHW	761	792	31	1,148	-34%
Pumps		Electricity	5	19	14	30	-83%
Heat Rejection		Electricity	1	1	0	1	0%
Fans - Interior		Electricity	172	145	-27	245	-30%
Service Water Heating		Gas	270	271	0	271	0%
Receptacle Equipment	X	Electricity	335	348	1	348	-4%
Refrigeration Equipment	X	Electricity	195	203	13	203	-4%
Cooking Equipment	X	Electricity	171	178	0	178	-4%
Data Center Equipment	X	Electricity	402	419	8	419	-4%
Elevators	X	Electricity	243	253	7	253	-4%
			3,603	4,010	10.1%	4,674	22.9%