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PV FEASIBILITY STUDY EXISTING BUILDING STRUCTURAL EVALUATION

LHB, Inc. has completed our structural review of the four buildings that were identified by David Williams as having the potential, based on site constraints, of being utilized for roof top PV installations. The buildings that we investigated were Dupre Residence Hall, Kagin Commons, Leonard Center, and Olin Hall.

We reviewed the original building drawings that were available for the buildings. We determined the original design loading criteria to assess if there was excess capacity available that could be used to support the addition of PV arrays. Additionally we looked at the original structural design to see if, in the absence of excess capacity, they could be easily modified or strengthened to support the added loading. We evaluated all four buildings however focused most of our efforts on Dupre, Leonard Center and Olin Hall since Kagin Commons had been fairly extensively studied by BKBM Engineers when the green roof was added.

As part of our investigation we estimated the loading that would be imposed by adding PV arrays. This included not only the added weight of the PV array which is relatively small, but the increased snow load and the added wind loads that would be imposed on the roofs. The code requires us to consider PV arrays as cold surfaces that collect higher amounts of snow than the adjacent roof and this is then superimposed on top of the normal roof snow load. It is typically this additional snow loading that is the controlling factor when evaluating adding PV arrays to an existing building; the added snow load can be quite significant.

Unfortunately we have determined that the buildings as originally designed do not have excess capacity available. Also, due to the type of original construction, cast in place

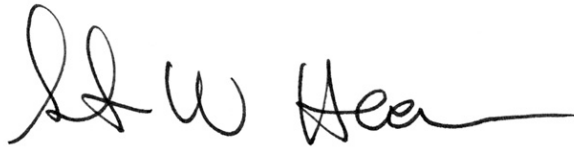
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concrete for Dupre, Kagin and Olin, and long span steel trusses with light steel framing for the mansards on Leonard Center, we do not feel that it would be feasible to reinforce the existing structures.

David Williams also identified the parking lot to the west of the Janet Wallace Fine Arts Center as a possible location for freestanding PV arrays. This appears to be the best option available at this time. However freestanding PV arrays require their own structural support system and foundations which adds significantly to the total cost of the system. If this is something that the college wishes to pursue LHB can assist you with site planning, design of the PV system and design of the support structures.

Thank you for the opportunity to be of assistance to Macalester College. If you have any questions please do not hesitate to contact us.

LHB

A handwritten signature in black ink, appearing to read "S W Hearn", with a long horizontal flourish extending to the right.

STEPHEN W. HEARN, P.E.

c: David Williams, LHB
Rick Carter, LHB
LHB File #120129.00