

## executive summary

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This report provides a comprehensive overview of all work and analysis completed during the AE 897G Senior Thesis and includes four lighting and four electrical depth topics, as well as three additional breadth topics resulting in a re-design of several systems present in the Drexel Recreation Center. This study does not conclude that there are actual problems with the existing designs, but was simply intended to investigate and approach alternative solutions.

The lighting depth follows the design process through schematic design, design development, and construction documentation of four spaces: the exterior courtyard, lobby, fitness center, and restaurant. All three of the interior spaces selected span the Market Street façade, allowing the lighting design to greatly influence the aesthetics of the facility and to directly influence the experience of the passing pedestrians and drivers. The facility is fueled by the energy of the occupants as they move within the space just as the body is fueled by core energy during a workout. The minimalist design of the architecture with its structurally exposed concrete, straight lines, clean materials, and strong angles allow the energy and active users to become the feature of the space, which they are with the interactive LED element in the fitness center that allows the exerciser to generate kinetic energy which is harvested and converted into a color changing design that allows the energy to be visible from the exterior.

The electric depth modified the branch circuit distribution for each space listed above in response to the lighting redesign, and feeders and panels were analyzed for coordination and voltage drop. A protective device coordination study was performed along with short circuit analysis for a path originating at the utility entrance through the main switchboard to distribution panel DP-1-1, and down to panel AP-1-1. A system to convert kinetic energy from the cardio machines into DC power for an interactive LED lighting load was designed and implemented in the fitness center. A cost comparison will be completed of an alternative solution to the existing PVC conduit distribution system located within the concrete slab of MC cable run through solid bottom cable trays on the ceiling below utilizing poke-throughs to distribute power to branch circuit loads.

An MAE focus of daylighting integration into the gymnasium using skylights in turn initiated the two out-of-option breadths of study: acoustical and structural. To incorporate daylight the dropped panel ceiling in the gymnasium was removed, and resulting load distribution adjustments required an analysis of the existing spacing and loading of steel truss system, as well as reverberation time calculations and consideration of echo and noise within the gymnasium. The structural and acoustic studies within prove that not only are daylights beneficial for the electric power consumption, they are also completely feasible without negatively impacting other scopes of the project.