Executive Summary

The Maryland Transportation Authority Police Training Facility Thesis Project examines several of the engineering systems throughout the building, including the lighting and electrical systems, and mechanical and acoustical systems of the range.

The Lighting Depth concentrates on redesign the lighting four spaces within the building, Classroom 'A', the physical training gymnasium, the front façade and entrance canopy, and the firing range. Design criteria for each space was developed using recommendations from the IESNA and the lighting power density requirements of ASHRAE Standard 90.1. The lighting design in these spaces was focused on creating a productive and healthy learning environment and control and flexibility was a goal or each design.

Several issues were examined in the Electrical Depth portion of the thesis. The electrical panelboards were examined and updated to coordinate with the new requirements of the four lighting design from the Lighting Depth. Similarly, the electrical system was redesigned based on the new air-handling loads proposed in the Mechanical Breadth. This resulted in the upsizing of the Main Distribution Panel to meet the mechanical loads. A cost-benefit analysis of energy efficient transformers was also performed, showing that, although initial first cost of the energy efficient transformers is higher, annual energy costs are estimated to be 4% lower, resulting in a payback period of 6 years. Finally a coordination study of protective devices was performed by examining a single path through the distribution system. The study shows that the protection devices are properly coordinated.

The firing is notably an interesting space provides unique challenges. The breadths explored the mechanical and acoustical systems of the range to determine their effectiveness and suggest alternative systems to better meet the needs of the space. The existing mechanical system was cause swirling of air, which would promote lead inhalation and poisoning. The proposed solution utilizes a diffusing wall behind the shooters that introduces air to the space at low velocities. This reduces swirling and carries harmful particles down the range away from the occupants. The acoustical study examines the sound transmission between the firing range and the adjacent classroom. As the system was previously design, the classroom noise reduction from the range to classroom would not be sufficient to meet the noise criterion of 35 for a classroom. A double wall system consisting of a CMU wall, a 3" air gap, and a heavily insulated stud wall is proposed in the Acoustical Breadth to bring the noise down to an acceptable level.