Executive Summary

The intent of this report is to evaluate and redesign many of the building systems within the building with aiming to increase the quality of the project. This will be done while taking into account aesthetics, functionality, energy savings, cost savings, constructability and the interrelationship between systems. The main systems the analysis will focus on are the lighting design and electrical distribution with breadth studies in the areas of structural design and acoustics.

The lighting depth portion of the report focuses on four major spaces; the main entrance façade, main entry lobby, exhibit gallery and typical painting studio. For each of these spaces, the report will cover the design criteria, initial concept, fixture selection, light loss factors, lighting controls, allowed power density per ASHRAE 90.1 and AGI32 analysis. Additionally, each space will have a design synopsis and evaluation that will convey my design process and provide commentary on the final product.

The lighting redesign led to the need for the electrical distribution to be redesigned to account for the changes. Branch circuits, feeders and panelboards for each space were redesigned to handle the new lighting loads. In addition, a photovoltaic array study and the use of energy efficient transformers versus standard transformers were both explored to determine the financial feasibility of each system. While It was found that a photovoltaic array may be effective in the Northern Virginia Climate, it was not economically feasible due to GMU being a non-profit organization and not being eligible for financial tax breaks given by the federal government. Meanwhile, it was found that the use of energy efficient transformers would also not be recommended due to the extremely low electrical utility rate.

Upon analysis of the existing daylighting strategy in the typical painting studio, it was found that clerestories were ineffective and therefore changed to diffuse skylights. While this provided more uniform distribution of daylight, it also meant the redesign of the roof framing system to structurally accommodate the skylights.

Finally, an acoustical study was performed to evaluate and improve the existing acoustical conditions for the wood shop in the lower level of the building. The conditions in an adjacent crit room were evaluated as well to check for sound transmission problems from the wood shop into the crit room. While noise levels in the wood shop were unable to drastically change, it was found that by changing the construction of the crit room wall the sound transmission from the wood shop into the crit room could be prevented.