

Thesis Proposal

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Lighting/Electrical Option

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December 12, 2008

National Intrepid Center of Excellence | Bethesda, MD



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Executive Summary

This proposal details the work to be completed in the Spring of 2009. It presents a description of the redesign of several systems present in the National Intrepid Center of Excellence (NICoE). Included are explanations of two depth and two breadth topics. This document does not conclude that there are actual problems with the existing systems, it is just meant to provide an approach to alternate solutions.

The lighting depth presents new design concepts in four proposed spaces: exterior site and façade, lobby, auditorium, and physical and occupational therapy/waiting areas. The new design aims to create a comfortable, pleasant, and workable atmosphere that is tailored to the needs of the occupants. The space should also be functional, with light levels that meet those specified in the IESNA Handbook. All power density requirements present in ASHRAE 90.1 should also be met.

The electrical depth includes a redesign of the branch circuit distribution for the four spaces to be re-lighted. A protective device coordination study and short circuit analysis will also be conducted. The redesign of the HVAC system will lead to modified/additional design loads. The selection of distribution equipment and protective devices for that section will be necessary. SKM software will then be used to perform short circuit analysis, protective device coordination, and arc fault study for the distribution system.

The mechanical and structural breadths will be developed as a direct result of the affects of daylighting in two of the spaces. The mechanical breadth will cover the effect of varying glass types in the curtainwall system as well as the addition of a clerestory or skylights. The change in loads will be analyzed and changes to the HVAC system will be made accordingly. The structural breadth will include a redesign of the roof framing system and alterations in the column and beam layout.

Breadth 1: Structural

As a result of the daylight analysis and inclusion of skylights, clerestories, etc. in the second floor Occupational Therapy space, the structural layout will be affected. The new daylight delivery system will need to be supported all on sides through a redesign of the roof framing. Additional beams may be required and a repositioning of the column layout may be necessary. The extent of structural alterations will be based on the size, location, and type of daylighting features. Hand calculations will be used calculate the added load and determine the size of the new supports.

Breadth 2: Mechanical

The north-facing curtainwall façade with ceramic frit will allow a large amount of light into the Lobby and PT/OT spaces during the day. Changes to the glass materials or the inclusion of a new type of daylight delivery system (skylights, clerestory, etc.) will greatly affect the gain or loss of heat from within the building. Hand calculations will be used to determine the energy lost or gained through these new features. Further analysis of the new heating and cooling loads throughout the year will be conducted through additional calculations. A redesign of a section of the existing HVAC system will then be performed.