# Naval Network & Space Operations Command (NNSOC)

## Naval Surface Warfare Center Dahlgren Division
## Dahlgren, VA

**Proposal**
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**Executive Summary**

The Depth and Breadth Design Proposal describes the redesign of the Naval Network & Space Operations Command. The electrical and lighting portion of the proposal is the depth topics while two breadth topics are discussed that I tried to relate to my depth topics. The end of the proposal shows a tentative progress schedule laid out for the remainder of the time until the due date.

The electrical depth will be a redesign of the emergency UPS system of the building to see if space can be saved by changing the existing battery bank system with a rotary UPS system. The other topic is to see whether Photovoltaic panels would be a beneficial source of power to the building.

The lighting depth is an integration of a new daylight system into the building while using controls to limit the amount of electric light needed. I am also redesigning the outdoor entrance, lobby, and training theater to try and make it a more interesting space. The design of these spaces will include the recommendations following the concept comments I received at the lighting design proposal along with the IESNA Handbook, ASHRAE 90.1, and the NEC codes.

For my two breadth topics I will be analyzing the affects of adding in the glazing for daylight integration with the HVAC equipment and ASHRAE 90.1. I will also be doing a LEED study on the points that could be achieved or lost with the implementation of the new daylight design.

## Background

The NNSOC is part of the Naval Surface Warfare Center Dahlgren Division in Dahlgren, VA. It is a 2-story, 75,000 square feet new construction connected to an existing building via a new lobby. The building is almost square and used mainly as an open office plan with an assembly training theater located near the center of the 1st floor. The lobby is the main entrance to both the new building and the existing building using two entrances, one for the back parking lot and one for the main front parking area.

## Depth Work – Electrical Design

The current design of the electrical system is cost efficient but appears to require a lot of space inside the building due to the need for a battery room and the UPS system. The battery room takes up an area of roughly 1300 square feet.

Currently the UPS system services critical loads in both facilities and has two 625kVA modules to provide N+1 reliability. Each system has a 30-minute battery plant to provide the necessary power to service the present critical loads and 25% spare capacity for future expansion. The UPS system is set up so if one system goes down, critical loads can be transferred to the other UPS module by closing the static transfer switch located between the UPS switchboards and UPS distribution panels.

A better understanding of the UPS system is as follows. Two UPS battery modules are connected by two feeders to each side of the Main double-ended switchgear, which means if one side of the utility goes down both systems can still operate from the other side of the utility's service. From the UPS modules, feeders go to two UPS switchboards, one for each module. Each UPS switchboard provides a feeder to two 600A static transfer switches. These transfer switches allow power to be delivered to either UPS distribution panel which in turn delivers power to the end panels and loads.

The other topic is to analysis whether photovoltaic panels would be beneficial as an additional power supply to the building. Care has to be taken to make sure all financial costs are included in the design, along with the expected payback period.

## Solution

The solution will be to take a look at a rotary UPS system instead of the battery bank UPS system. Research will include the cost analysis comparing the two systems, equipment needed or existing equipment resized, and any spatial savings.

A study of the benefits of PV panels on a structure involve the amount of power that will be available to collect, along with the cost of the systems needed to turn the collected energy into usable energy.

**Solution Method**

The solution involves meeting the NEC code for all changes, along with researching rotary systems to find out how they work, what equipment is needed, costs, efficiencies, and comparing these values to the existing UPS system.

Method of solving the PV array is finding the weather data for the available area, finding the amount of power a collector will produce, prices for all the equipment needed for the system, and the payback time involved if the system is implemented. I will use software available from www.retscreen.net to help with my analysis. Retscreen is a website that provides weather data and programs that help analysis solar arrays and integration within a building HVAC system.

**Depth Work – Lighting Design**

The lighting design is a pretty standard system for this type of building. It incorporates an indirect fluorescent system in the open office areas and a recessed direct fluorescent system in the training theater. This lighting system is fairly dull and may not be getting the best efficiency due to lack of integration of daylight into the spaces.

**Solution**

To integrate daylight into the office spaces better. I will be looking into types of skylights, glazing, and daylight controls in order to provide a more uniform daylight distribution and use less power for lighting in the office areas. A full report of my lighting proposal, along with the comments from my presentation to the designers at Lutron, is located on the "Technical Assignments" portion of my thesis website at: http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/CSA130/index.htm

**Solution Method**

The proposed lighting solution follows the recommended design guidelines put forth in the IESNA Lighting handbook. After combining those recommended values with the NEC and ASHRAE 90.1 to meet code, aesthetics can finally be considered for each space. The lighting and daylight studies will be done using AGI software. Daylight analysis will also be done using SPOT. AGI is lighting design software that can provide realistic images for lighting designs, as well as calculate the light levels that fixtures will provide. SPOT is an excel program that helps with placement of photosensors in a space and does daylight analyzes to help optimize the energy balance of HVAC and lighting equipment.

**Breadth Topic 1**

After my proposed daylight redesign is complete, I will be analyzing the affects of the glazing area added in the space with the HVAC design. The added glazing may affect ASHRAE Standard 90.1 as well as the designed heating and cooling loads of the space.

**Breadth Topic 2**

To do a LEED analysis of the office space with the implemented daylight design to see what points, if any, would be gained from the new design compared with the existing design. Also, what points could potentially be taken away from such a design.