Technical Report Two

Yale Sculpture Building

New Haven, CT

Kha N. Dang
Architectural Engineering – Lighting | Electrical Option
www.arche.psu.edu/thesis/eportfolio/2007/portfolios/knd107

Advisors: Ted Dannerth
Richard Mistrick
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Electrical Systems Existing Conditions and Building Load Summary Report

Executive Summary:

This is a report analyzing the existing power distribution systems and communication systems for the Yale Sculpture Building. The report contains a narrative describing the general and special characteristics of the systems, along with a summary of the total building electrical loads and a check of the size of the existing main distribution equipment.

This report is organized in the following overview:

1) Power Distribution Systems
    A. Single-line diagram
    B. Narrative or organized list describing the following:
        a. Summary description of the system type
        b. Service entrance
        c. Various voltage systems
        d. List of transformers
        e. Emergency power system
        f. General description of the overcurrent protective devices
        g. General location of switchgear, panelboards and motor control centers
        h. Typical lighting systems and operating voltage
        i. ASHRAE/IESNA 90.1 shutoff requirements
        j. Power factor correction (capacitors)
        k. Important design requirements
        l. Tables
            1) primary lamps and ballasts
            2) major mechanical equipment
        m. Calculation of the NEC building design loads
        n. Utility rate structure

2) Communication Systems
    A. Summary description of communication systems

Parts A, D, I, M and N are located in “Attachments” folder | link. These sections were separated to keep this document easily legible and decrease excess scrolling.

I. Power Distribution Systems

IA. Single-line Diagram

Refer to Attachment "Single-Line Diagram.pdf"

IBa. Summary description of the system type

The electrical system for the Yale Sculpture Building is separated into three secondary electrical services. The electrical service that supplies the main Sculpture building feeds into a 1200A, 408Y/277V 3 phase switchboard that has a short circuit rating of 100,000A. Off of the main switchboard, the lighting receives power through a 112.5 KVA step-down transformer. The remaining service feeds off of the main switchboard. One of the secondary electrical services is connected to the fire pump controller. This 1200A service entrance cabinet is connected to a 125 HP 3 phase 460 V fire pump. The last secondary electrical service is connected to the parking garage. Since the Parking Garage includes retail spaces, there is a commercial metering switchboard with six meter sockets. The emergency power system consists of a 200 KW power generator which is connected to the three secondary services via four automatic transfer switches.

IBb. Service Entrance

The Yale Sculpture Building's power distribution system does not connect to the Yale University power grid. The system is connected directly to the utility via an underground electrical service. The utility is connected to the main Sculpture Building from the North side of the building at Edgewood Avenue.

IBc. Various Voltage Systems

Voltage Systems in the Yale Sculpture Building

A. 208Y/120 – Lighting/ Receptacles
B. 480Y/120 – Connection to main switchboard to transformer; Lighting/ Receptacles/ Dimmer Cabinets
C. 480Y/277 – HVAC Equipment, Emergency Power

IBd. List of Transformers

Refer to Attachment "Yale Sculpture Transformer Schedule.pdf"

IBe. Emergency Power System

Emergency Power System

A. The Emergency Power system is located in the basement of the Main Sculpture Building.
B. A two hundred (200) kilowatt generator powers the emergency system. The generator is connected to a 480Y/277V 400A panelboard.
C. The System utilizes five (5) transfer switches. Two (2) sets of switches are used for the main Sculpture Building/Gallery and Parking Garage. The last transfer switch powers the Fire and Jockey pumps.

IBf. General description of the overcurrent protective devices

Primary circuit breakers ranging from 20A – 400A

IBg. General location of switchgear, panelboards and motor control centers

General location of:

A. Switchgear – Basement of main Sculpture Building
B. Panelboards
    a. Main Sculpture Building
        1) Basement
        2) Storage Closet (Floors 1-4)
    b. Gallery
        1) Utility Closet – Mezzanine Level
    c. Parking Garage
        1) First Floor – Electrical and Mechanical rooms
C. Motor control centers – Basement of Sculpture Building

IBh. Typical lighting systems and operating voltage

The typical lighting system in Yale Sculpture Building is fluorescent fixtures. The lighting system operates on a 208Y/120V voltage system.

The lighting system can be separated by buildings.

1. Main Sculpture Building:

The lighting in the classrooms is arranged in a grid of three lamp, linear fluorescent fixtures. The lobby consists of two lamp, compact fluorescent down lights and recessed track fixtures that can house most LSI track fixtures. The utility areas such as storage and fire pump rooms have industrial fluorescent fixtures. The overall design is composed of fluorescent linear fixtures to maximum energy savings and maintenance.

2. Gallery

The lighting in the Gallery is regulated by two occupancy sensors. The lighting system consists of suspended linear fluorescent track fixtures and supplemented by compact fluorescent down lights.

3. Parking Garage

The Parking Garage's lighting plan is made up of 150W surface mounted area fixtures that are spaced approximately 2.5 parking spaces.

IBi. ASHRAE/IESNA 90.1 shutoff requirements

ASHRAE/IESNA 90.1 shutoff requirements are fulfilled

A. The Yale Sculpture Building utilizes occupancy sensors in every classroom. The occupancy sensors are set to shut off lighting after a 30 minute delay if the space is vacant. The studio spaces have both occupancy sensors and day light sensors.
B. Gallery is equipped with occupancy sensors.
C. Exterior Lighting is controlled by a photocell. The photocell shuts off fixtures if there is adequate day lighting.

IBj. Power factor correction (capacitors)

The Yale Sculpture Building's electrical distribution system does not utilize capacitors.

IBk. Important design requirements

The electrical power distribution system must conform to the National electrical Code. The Yale Sculpture building requires several large scale shop equipment therefore the system must be able to handle the increased electrical load. Voltage drop is an important issue to consider because the span of the building.

IBl. Tables

1) **primary lamps and ballasts**
2) **major mechanical equipment**

Tables

1) Primary lamps and ballasts – Refer to Attachment "Lamp and Ballasts.pdf"
2) major mechanical equipment – Refer to Attachment "Mechanical Equipment.pdf"

IBm. Calculation of the NEC building design loads

Refer to Attachment "NEC DESIGN LOADS.pdf"

IBn. Utility Rate Structure

Refer to Attachment "UITariffis3.4.06.pdf".

The Utility rate structure is unknown as of October 31, 2006. Please visit http://www.uinet.com/ for more information.

II. Communication Systems

IIA. A telecommunications cabling horizontal system consists of one telecommunication work area location with outlets and cables for each workstation and connected to the appropriate terminating hardware in the Telecommunications closet.

IIB. Telecommunication systems include video, voice and data infrastructure.

IIC. Fire Protection

The fire protection system in the Yale Sculpture building utilizes a sprinkler system in conjunction with smoke detectors, fire alarm horns, addressable interface devices and fire alarm speakers/ strobes. The fire protection system is controlled by a fire pump controller in the basement of the Yale Sculpture Building. The controller has an automatic transfer switch that is connected to the emergency generator.

IIC. Security

The Yale Sculpture Building's security system is build around several types of entry doors, cameras and a burglar alarm system. Entry doors have a card reader with an electric strike. Several doors have an electro-magnetic lock with a keyswitch. Cameras are located on both interior and exterior surfaces.