

CNBC GLOBAL HEADQUARTERS

Englewood Cliffs, NJ



Christine Cajilig | Lighting/Electrical | Thesis 2005

Presentation Outline

Items Covered

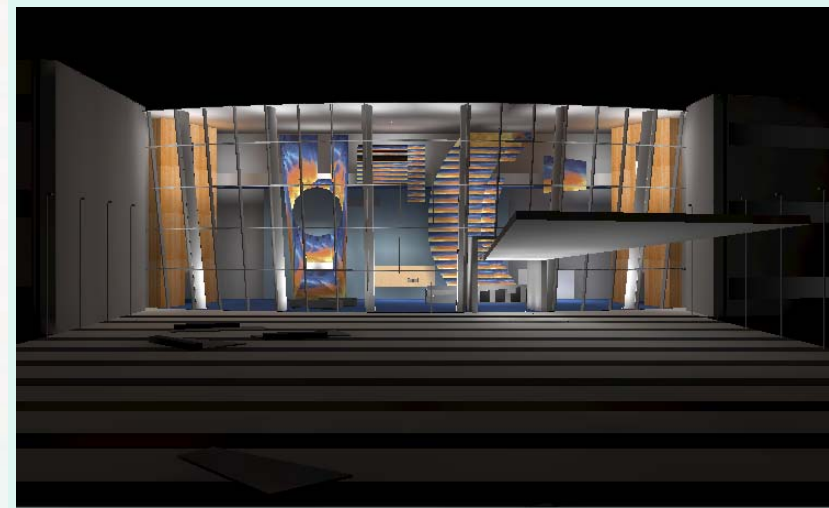
- Building Background
- Lighting Depth: Cafeteria Dining
- Electrical Depth: Static vs. Rotary UPS
- Mechanical Breadth
- Summary
- Acknowledgements
- Questions



Christine Cajilig | Thesis 2005

Items Not Covered

- Lighting Depth:
 - Business News Open Office
 - East Lobby
 - East Plaza
- Electrical Depth:
 - Generator Addition Analysis
- CM Breadth:
 - UPS Life Cycle Cost Analysis



CNBC Global Headquarters

Building Background

- Location: Englewood Cliffs, NJ
- Size: 355,000 square feet
- Owner: General Electric
- Engineers: Arthur Metzler and Assoc.
- Architects:
Core and Shell – HLW International
Interior Fit-out – The Philips Group
- Contractors:
Core and Shell – Kajima
Interior Fit-out – Bovis Lend Lease
- Function: All digital broadcasting facility



Building Background

Lighting Depth: Cafeteria Dining Space

Electrical Depth: Static vs. Rotary UPS

Mechanical Breadth

Summary

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Questions

Lighting Depth : Cafeteria Dining

Function

- Extended seating area for ground floor cafeteria

Architectural Features

- Anigre wood paneling on stair walls
- Blue terrazzo accent walls, terrazzo floor tiles
- Metal fabric ceiling on middle section of cafeteria

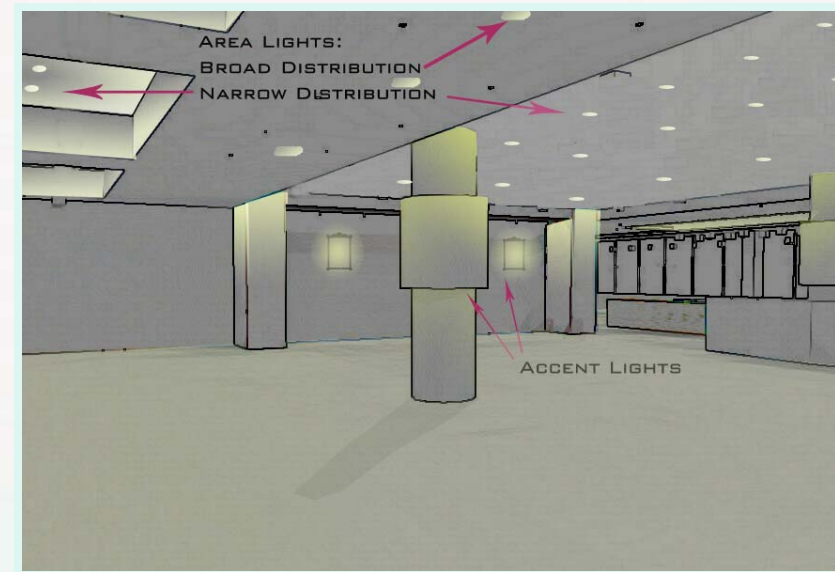
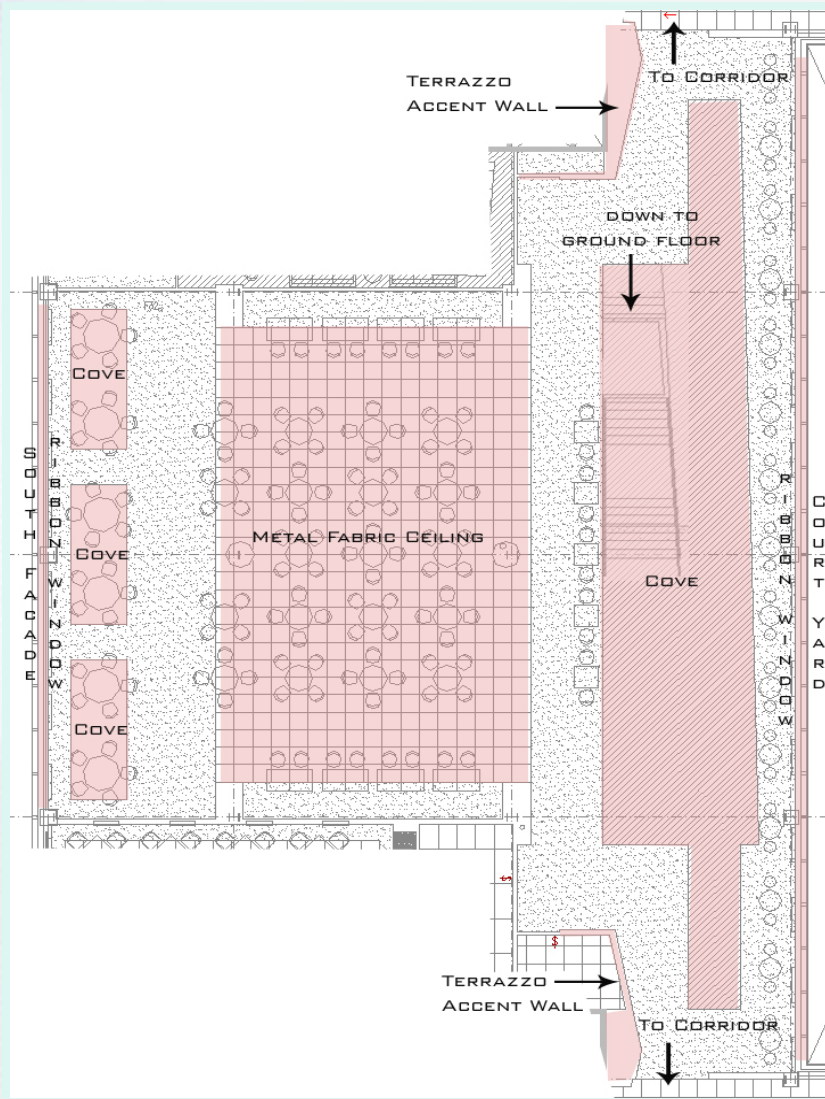


Design Goals

- Promote relaxing dining ambiance
- Create an open, spacious feel
- Evoke a sense of comfort
- Accentuate the contrasting finishes: wood, metal, stone
- Create a sense of continuity with the three sections of the space

Lighting Depth : Cafeteria Dining

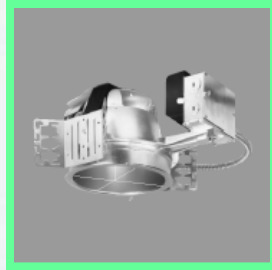
Proposed Design



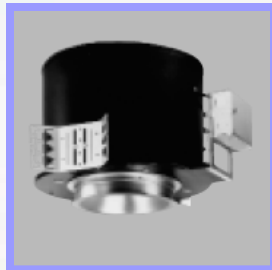
Lighting Depth: Cafeteria Dining

Luminaires Used

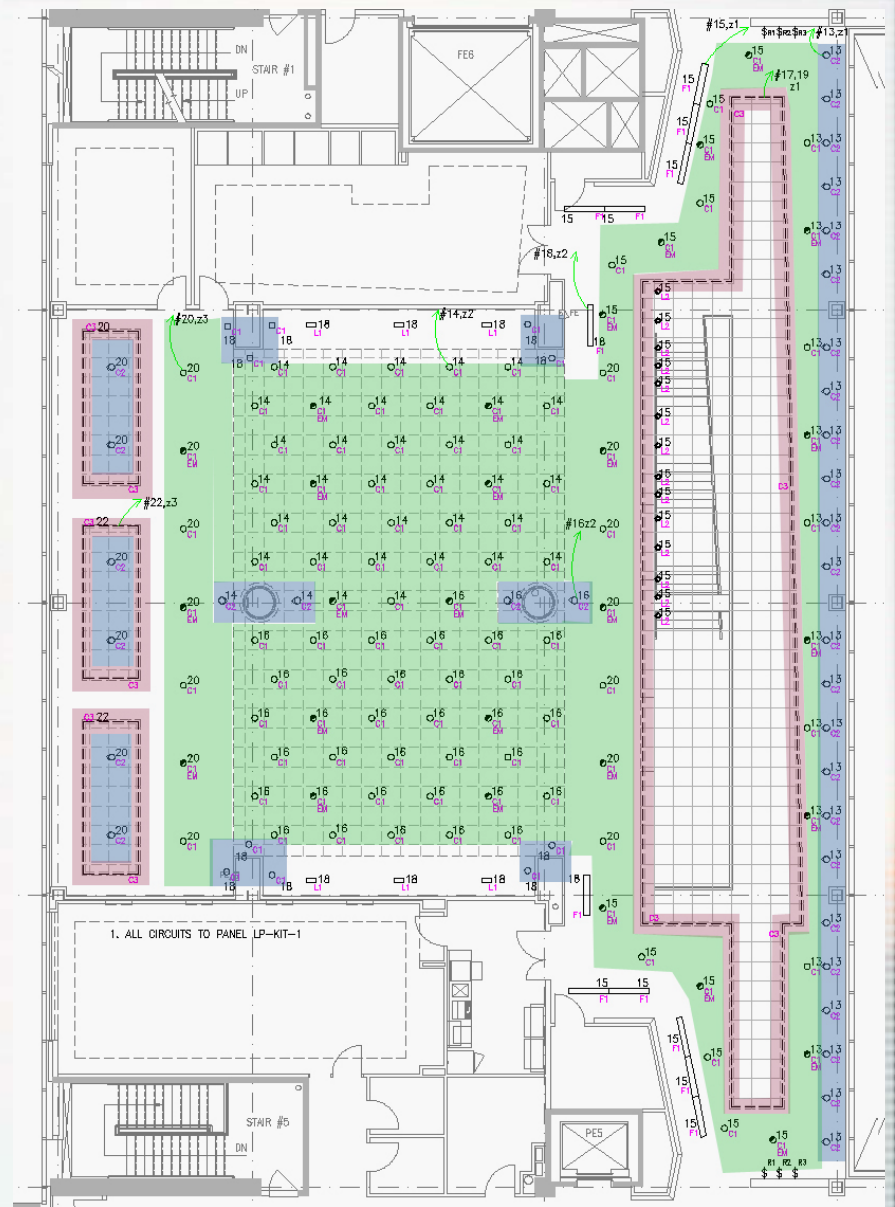
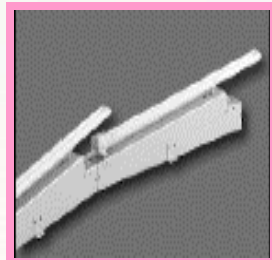
- C1 – Louvered downlight (CF32W/835)



- C2 – Adjustable downlight (CF32W/835)



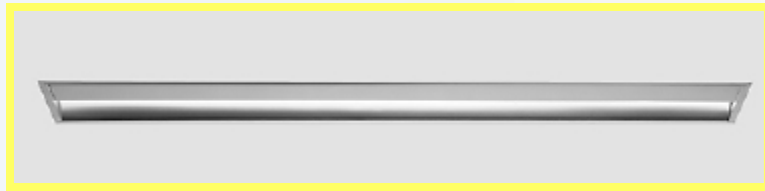
- C3 – Low profile cove lights (CF9W/835)



Lighting Depth: Cafeteria Dining

Luminaires Used Continued

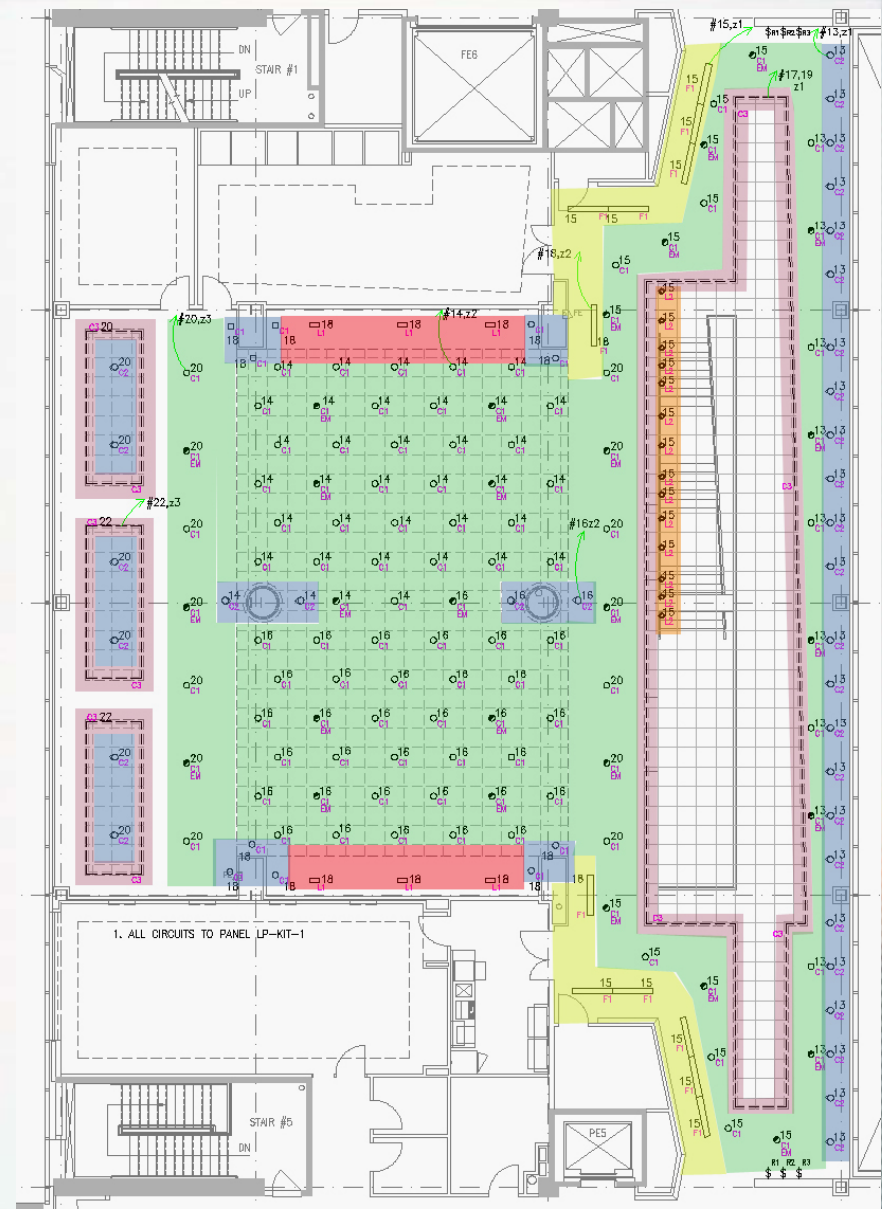
- F1 – Fluorescent wall wash (F28T5/835)



- L1 – Low voltage spot light (50MRC16)



- L2 – Low voltage directional uplight (20MRC11)



Lighting Depth : Cafeteria Dining

Power Density Comparison

	Watts	Actual Power Density	ASHRAE Std. 90.1	Meets Std. 90.1?
Area Lighting	8734	1.40	1.4	YES
Accent Lighting	1118	0.18	1.0	YES
Total	9852	1.58	2.4	YES
Total Square Feet	6230			



- Existing power density was 3.4 W/sf

***New design is a 53% reduction of power density and meets ASHRAE Standard 90.1 2001

Lighting Depth : Cafeteria Dining

Design Results



North end: 14.4 fc horizontal, 4 fc vertical illuminance

Lighting Depth : Cafeteria Dining

Design Results



Middle: 21.3 fc horizontal, 9 fc vertical illuminance

Lighting Depth : Cafeteria Dining

Design Results



South end: 10 fc horizontal, 3 fc vertical illuminance

Lighting Depth : Cafeteria Dining

Design Summary

- More dynamic, lively space: different materials accented
- Continuity is accomplished with recurring theme (metal fabric)
- Relaxing atmosphere with non-uniform illuminance on walls
- Use of indirect cove lighting and simple downlights give a cleaner and a more sophisticated modern space
- ASHRAE Standard 90.1 2001 met
- 53% reduction from existing power density

Building Background

Lighting Depth: Cafeteria Dining

Electrical Depth: Static vs. Rotary UPS

Mechanical Breadth

Summary

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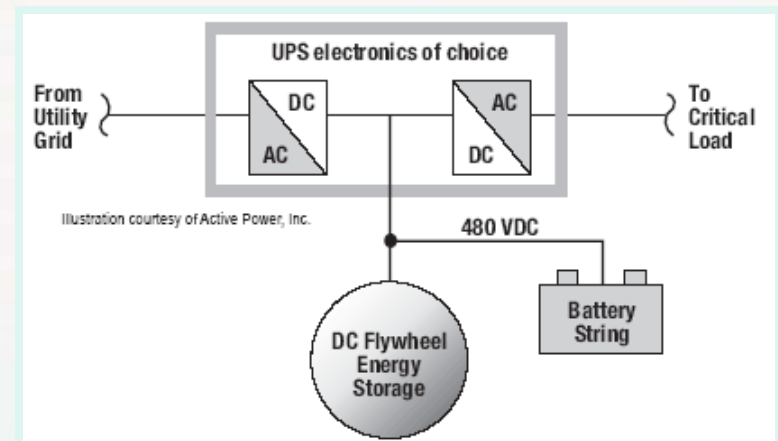
Electrical Depth : Static vs. Rotary UPS

Existing System

- (2) 1,000 kVA static UPS operating in parallel and power tied
- (4) racks of flooded cell batteries
- 13 minutes of back up power
- Integrated with (2) 2,000 kW generator set

Proposed System

- (2) 1,200 kVA rotary UPS operating in parallel and power tied
- Flywheel back up technology
- 15 seconds of back up power
- Integrated with (2) 2,000 kW generator set



Electrical Depth : Static vs. Rotary UPS

Design Life for Module

- Rotary UPS
 - MTBF = 200,000 hrs (22.8 years)
- Static UPS
 - MTBF = 170,000 hrs (19.3 years)
 - Flooded cell battery MTBF = 80,000 hrs (9.1 years)

***Because the batteries are the source of back up power, reliability of static UPS is dependent on battery life.

Back-Up Time

- 13 minutes vs. 15 seconds

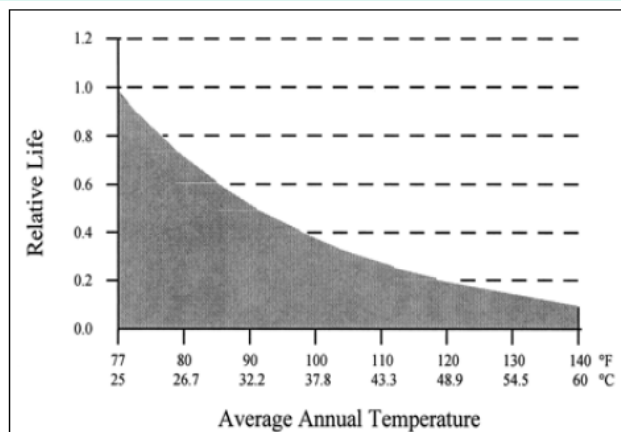
***Rotary UPS: Short ride through system with needed generator integration.

Electrical Depth : Static vs. Rotary UPS

Environmental Conditions Requirement

Rotary UPS		Existing Static UPS	
Min. Operating Temperature	0°F	Min. Operating Temperature	0°F
Max. Operating Temperature	104°F	Max. Operating Temperature	104°F
		Operating Temperature	77°F
Humidity (w/o condensation)	5% - 95%	Humidity (w/o condensation)	0% - 95%
Storage Temperature	-13°F - 158°F	Storage Temperature	-4°F - 158°F
		Battery Temperature Requirements	77°F average annual temp.

- Narrow operating temperature range for the static UPS because of temperature sensitivity



- Battery life over average annual ambient temperature shows decline in life as temperature increases

***Stringent cooling requirements for static UPS

Electrical Depth : Static vs. Rotary UPS

Other Rotary UPS Benefits

- More compact – occupied 30% less space

Reclaimed space →



← New location of UPS

- Less frequent, less complicated maintenance
- Life cycle cost for 20 years is \$126,000 less than static UPS system

Building Background

Lighting Depth: Cafeteria Dining

Electrical Depth: Static vs. Rotary UPS

Mechanical Breadth

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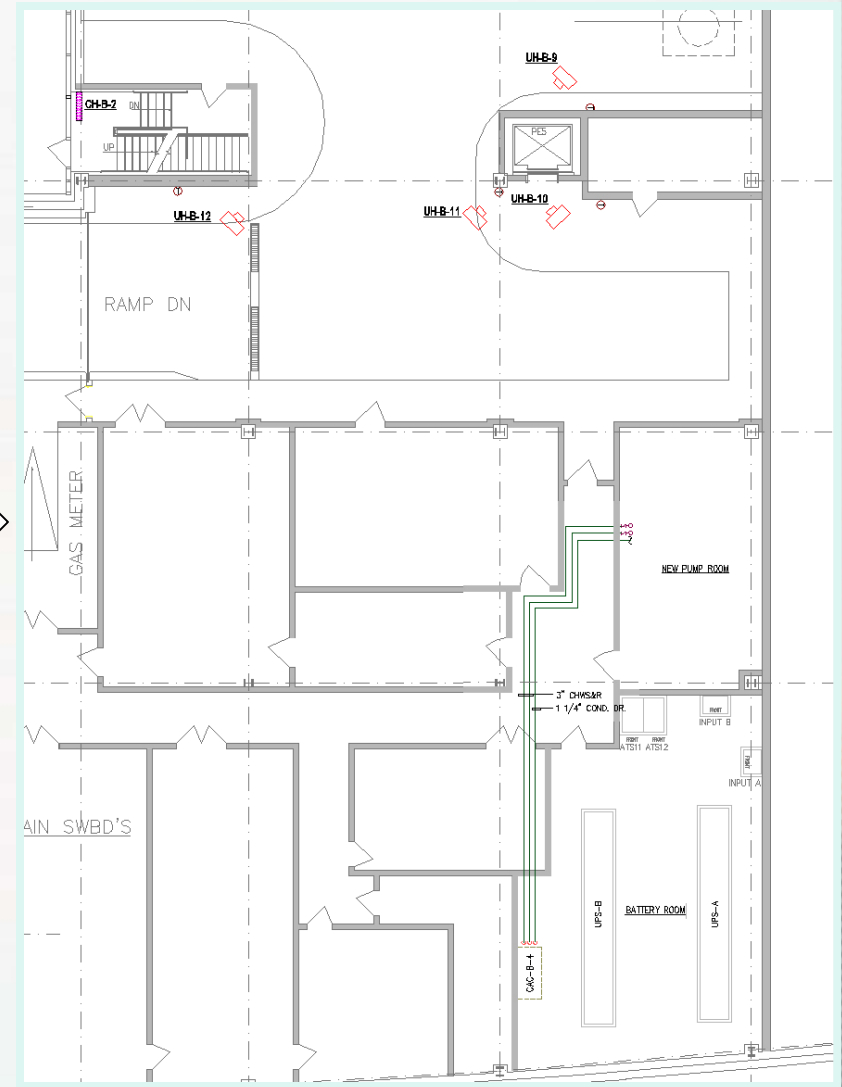
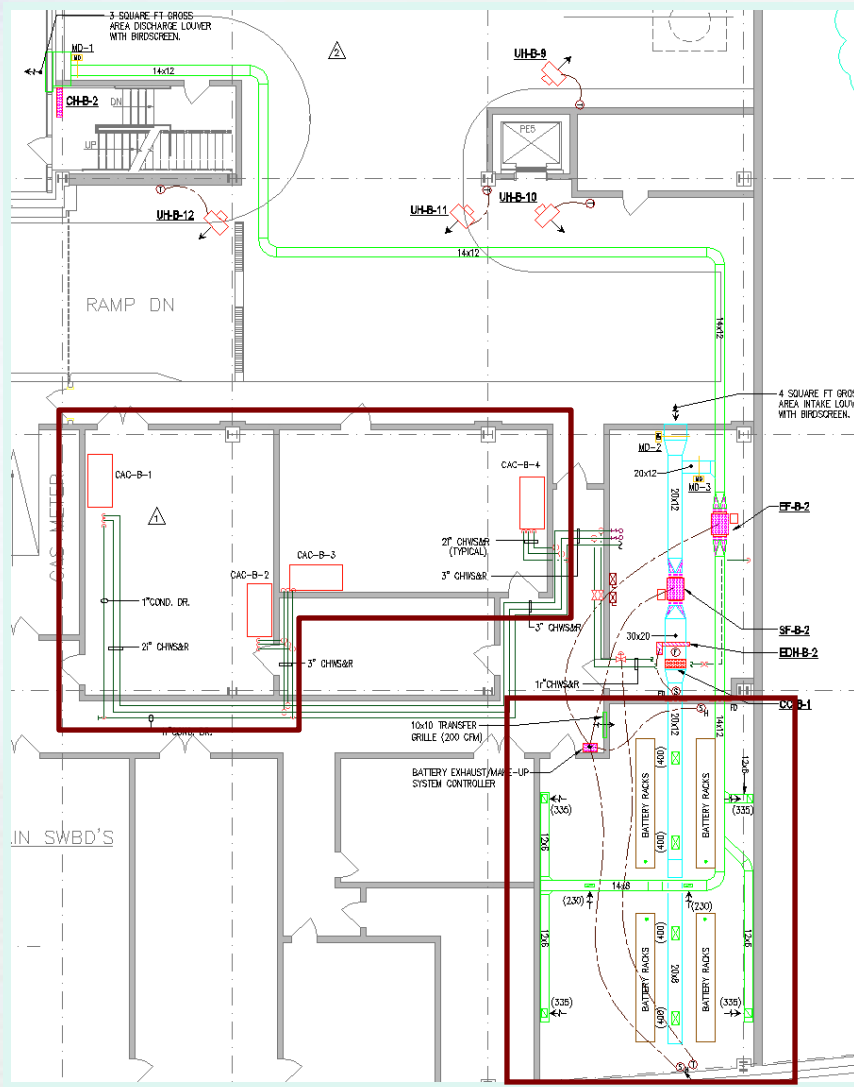
Mechanical Breadth

Mechanical Changes due to New Rotary UPS

- Room temperature no longer needs to be maintained at 77 °F
- 60 tons of cooling and associated piping saved
- New UPS room only needs 10,000 cfm of cooling
- Ventilation drops from 1,600 cfm to 52 cfm (due to removal of (4) racks of flooded cell batteries)

Mechanical Breadth

Existing vs. New Mechanical System Serving UPS Room



Mechanical Breadth

First Cost Savings from Unneeded Mechanical Equipment

Equipment	Quantity	Price*	Total Cost
Electric Duct Heater 30" Wide x 12" high, 30kW	1	1292.5 each	\$1,292.50
Chilled Water AHU 20 ton self contained unit	3	20,825 each	\$62,475.00
Exhaust Fan for fumes Belt Drive	2	1075 each	\$2,150.00
Galvanized steel pipes 3"	26 feet	31.75 lf	\$825.50
Galvanized steel pipes 2 1/2"	46 feet	26.4 lf	\$1,214.40
Galvanized steel pipes 1 1/4"	70 feet	13.47 lf	\$942.90
Metal Ductwork 14" x 12"	153 feet	12.45 lf	\$1,904.85
Metal Ductwork 14" x 8"	19.5 feet	8.62 lf	\$168.09
Metal Ductwork 12" x 6"	42 feet	6.69 lf	\$280.98
Metal Ductwork 20" x 12"	57 feet	20.8 lf	\$1,185.60

*Material and labor included in price

Total Savings:	\$72,439.82
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Building Background

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Mechanical Breadth

Summary

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Summary

Lighting Depth

- Recurring theme (metal fabric) gives continuity to the space
- New lighting design creates a cleaner, more sophisticated space
- 53% reduction from existing power density and ASHRAE Std. 90.1 2001 met

Electrical Depth

- Problems inherent with batteries eliminated; result is a more reliable system
- Rotary UPS is a short ride through system that needs generator integration
- Space reclaimed

Mechanical Breadth

- 60 tons of cooling and 1,600 cfm of ventilation deemed unnecessary
- Removal of extensive mechanical equipment gave a substantial first cost savings of about \$72,500

Acknowledgements

Arthur Metzler and Associates

Tishman Speyer Properties

Cleveland Brothers Co. and Caterpillar, Inc.

AE Faculty, especially my advisor, Dr. Mistrick

Family, Roommates, Friends

Questions??

Electrical Depth : Clarification

Back up Duration

- Rotary UPS
 - 15 sec is enough time to allow the UPS to handle a majority of power disruptions that last only up to 5 sec
 - It is also enough time to cover longer outages until a backup generator can come online to full power (< 10 seconds).
- Static UPS
 - Good for smaller applications without generator set integration
 - 15 minutes not enough time for back-up should gen-set fail (MTTR >4 hrs)

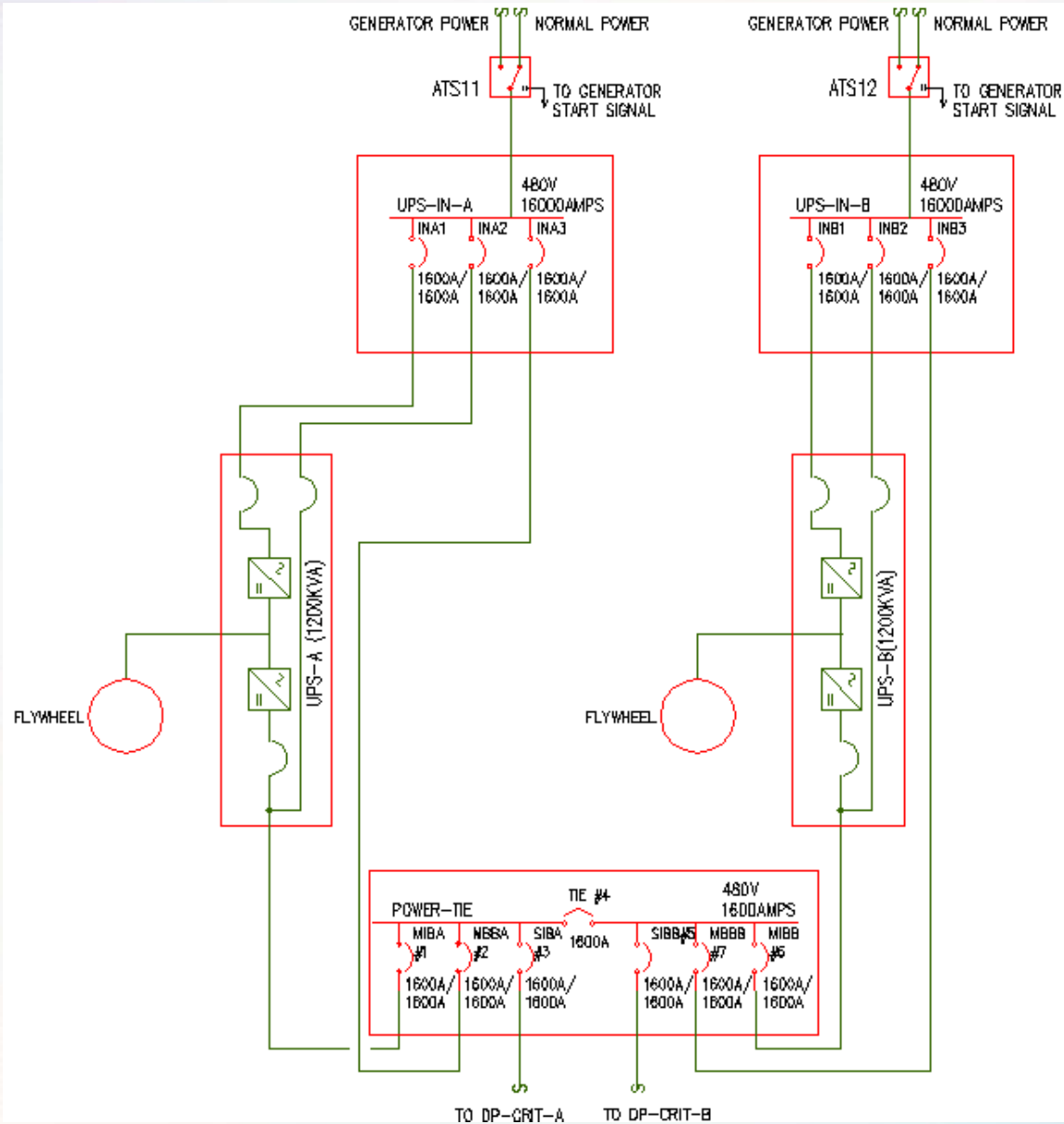
Electrical Depth : Clarification

Life Cycle Cost Analysis

Comparison of Life Cycle Present Value Cost			
Life Cycle taken as 20 years	Static UPS	Rotary UPS	Savings from Rotary UPS
Initial Investment Cost:	\$667,000	\$1,036,800	-\$369,800
Maintenance Cost:	\$557,774	\$101,702	\$456,072
Replacement Cost:	\$241,862	\$39,690	\$202,172
Energy Consumption Cost:	\$16,705	\$178,183	-\$161,478
<i>Total Present Value Life Cycle Cost:</i>	<i>\$1,482,341</i>	<i>\$1,356,375</i>	\$125,966

Electrical Depth : Clarification

UPS Single Line



Lighting Depth : Clarification

Uniformity on work plane



NOTES: 1. ALL FIXTURES DESIGNATED AS W# TO BE FED FROM PANEL LP-SW-1.
2. ALL EMERGENCY FIXTURES 'EM' TO BE FED FROM PANEL ELP-SW.