

# Newseum and Freedom Forum Headquarters

Washington, D.C.



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Lighting/Electrical Option

Consultants: Dr. Mistrick ; Prof. Dannerth

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# Presentation Outline

- Lighting
  - Welcoming Lobby
  - News History Gallery
  - Freedom Forum Offices
  - Front entry
  
- Electrical
  - Standard vs Energy efficient transformers
  - Incorporation of a wind turbine system
  
- Mechanical Breadth
  
- Architecture Breadth



*Ralph Appelbaum Associates*

# Building Background



[www.newseum.org](http://www.newseum.org)

## Location:

555 Pennsylvania Avenue, N.W.,  
Washington, D.C.

## Occupancy:

Mixed Use- Gallery / Exhibits,  
office, residential

## Size:

550,000 s.f.

# Lighting Depth

## News History Gallery

# Lighting: News History Gallery

## ■ Description of Space

- 4<sup>th</sup> level
- 130' x 35' gallery
- Center "Timeline" Gallery
- Outer exhibits – artifacts
- Projectors
- End wall quotes



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# Lighting: News History Gallery

## ■ Design Criteria



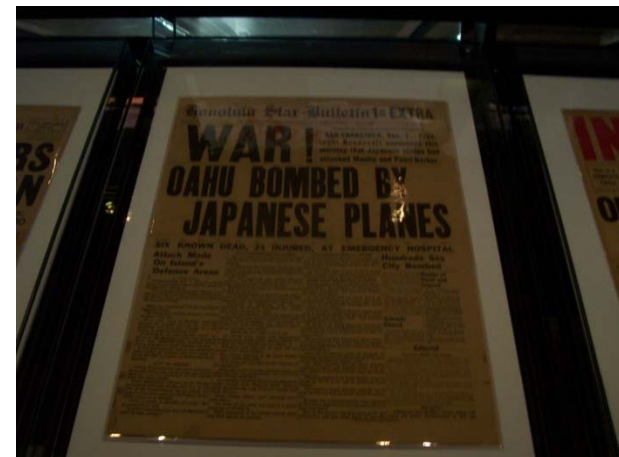
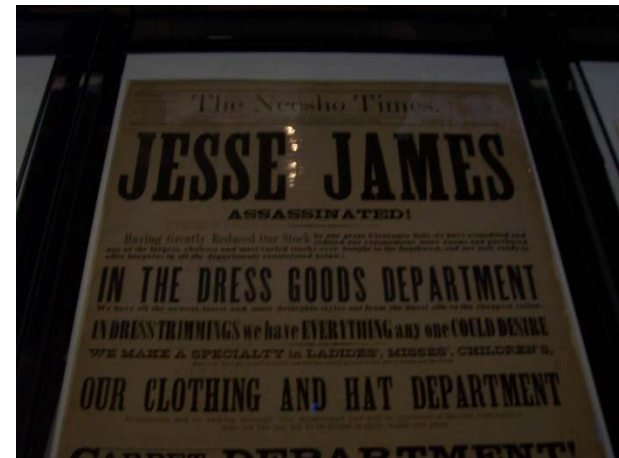
*Ralph Appelbaum Associates*

- Power allowance for a museum general exhibition space is 1.0 watts per square foot
- Emphasis on points of interest
  - Display cases
  - End wall quotations
- Avoid interference with projectors
- Reflected glare issues
- Use low CCT

# Lighting: News History Gallery

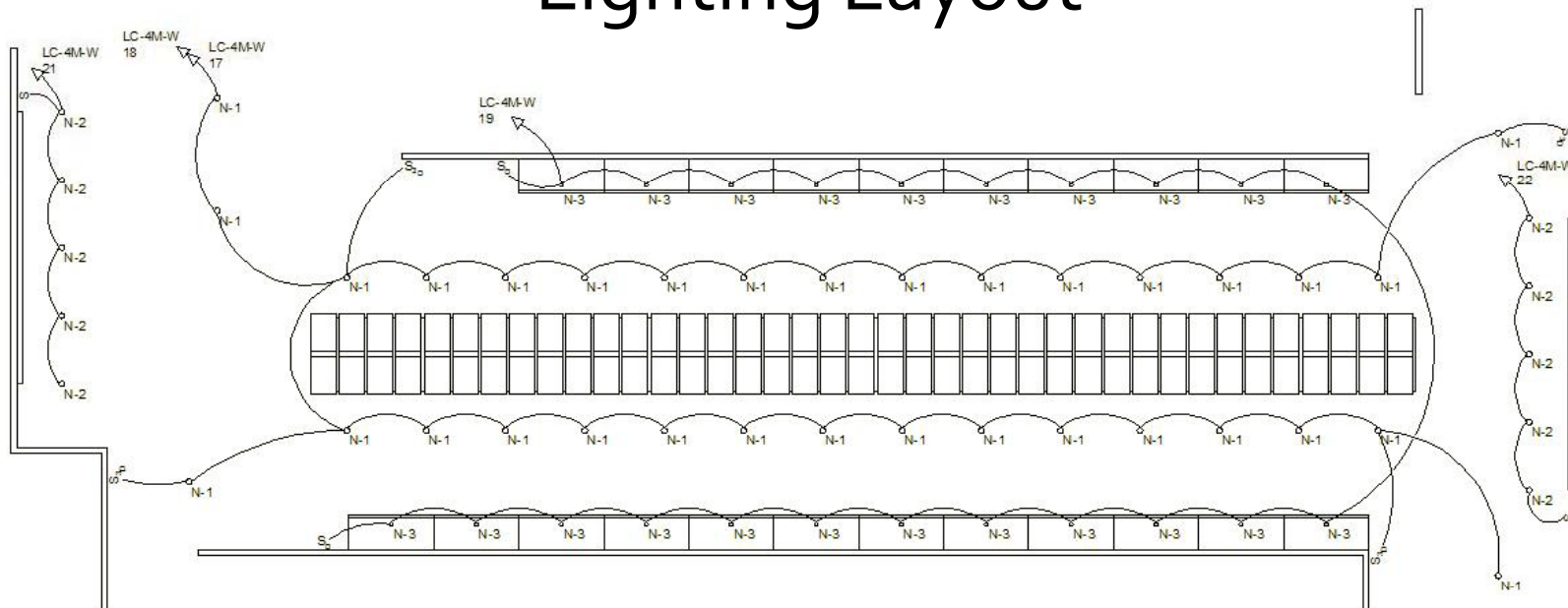
## ■ Museum Lighting Guidelines

- IESNA Lighting Handbook, 10 horiz. Fc
- Highly susceptible artifacts – paper should have a max of 5 fc illuminance
- Moderately susceptible artifacts – outer cases, should have a max of 20 fc illuminance.



# Lighting: News History Gallery

## Lighting Layout



N-1: general ambient light; "timeline"

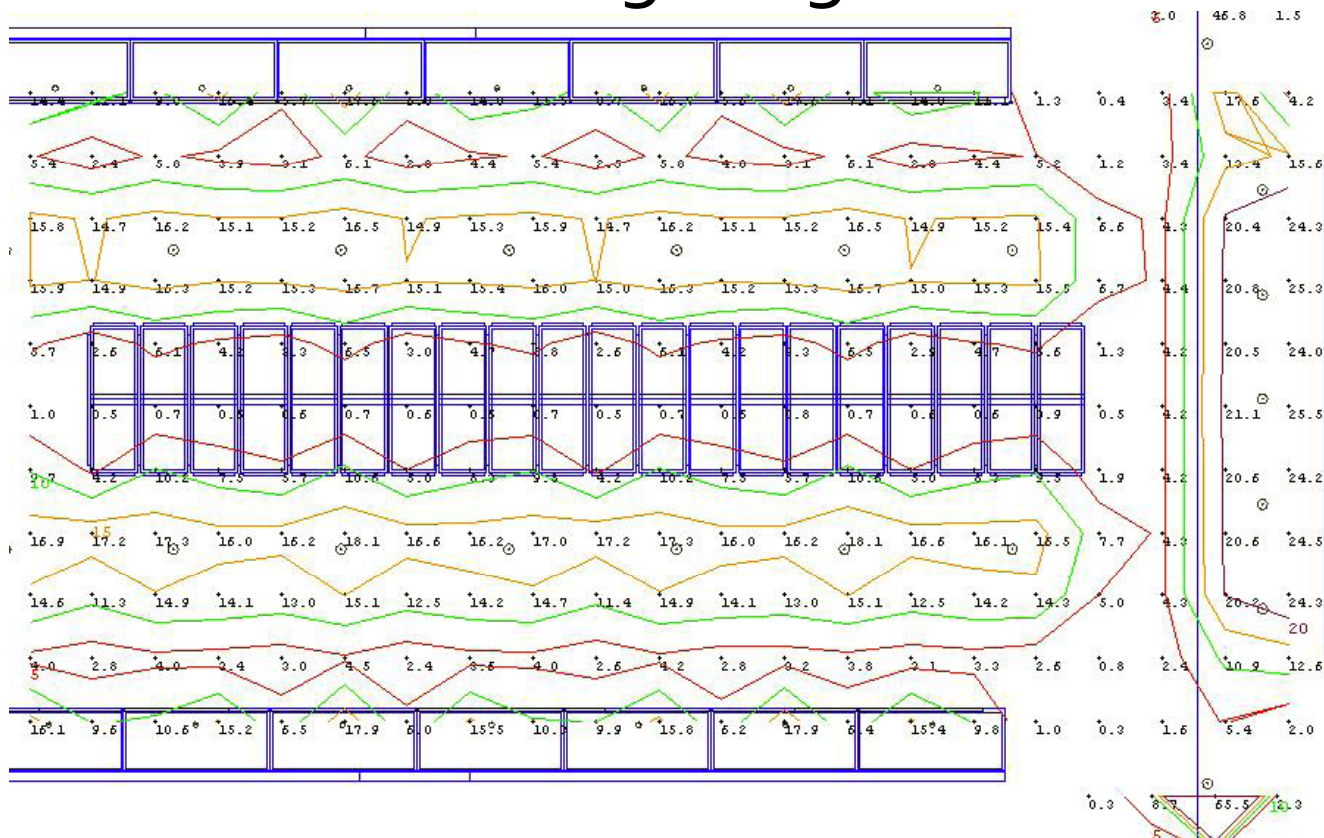
N-2: wall washers

N-3: display case lighting



# Lighting: News History Gallery

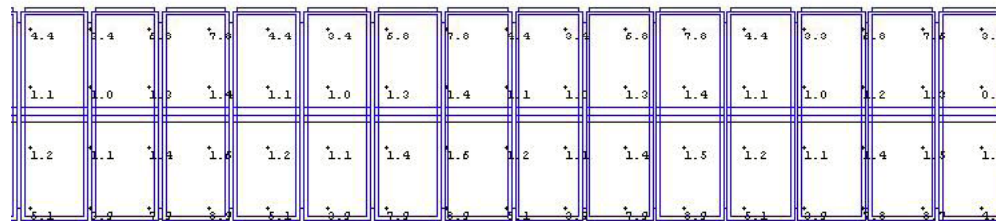
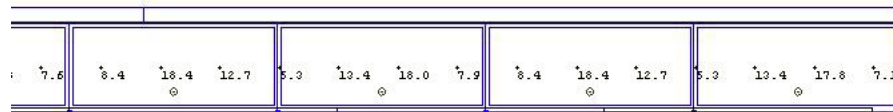
## Lighting Performance



- Average of 9.96 fc
- Higher illuminance at end wall for quotation
- Exhibit guidelines

# Lighting: News History Gallery

## Lighting Performance- Exhibits



- Outer display cases do not exceed 20 fc
- Timeline gallery does not exceed 5 fc with an average of 3.61

# Lighting: News History Gallery

## Renderings



# Lighting: News History Gallery

## Renderings



# Lighting Depth

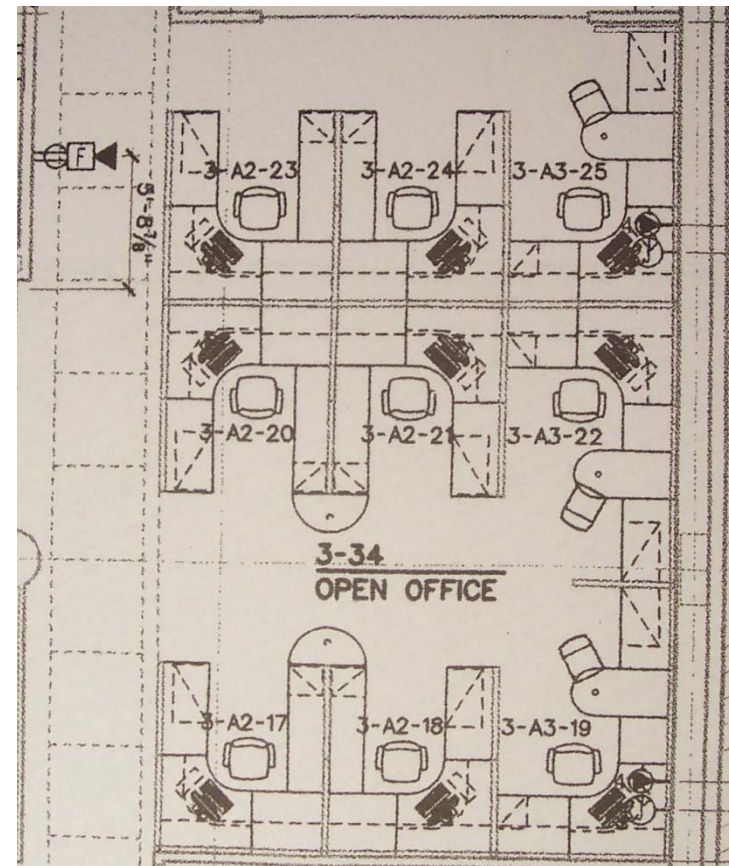
## Freedom Forum Offices



# Lighting: Freedom Forum Offices

## ■ Description of Space

- 3<sup>rd</sup> floor, not a public space
- 28' x 36' with 9' ceilings and 5' partitions
- Computer work
- Materials
  - White acoustic ceiling tile
  - Tan painted gypsum wall board
  - Gray carpeting and cubical partitions

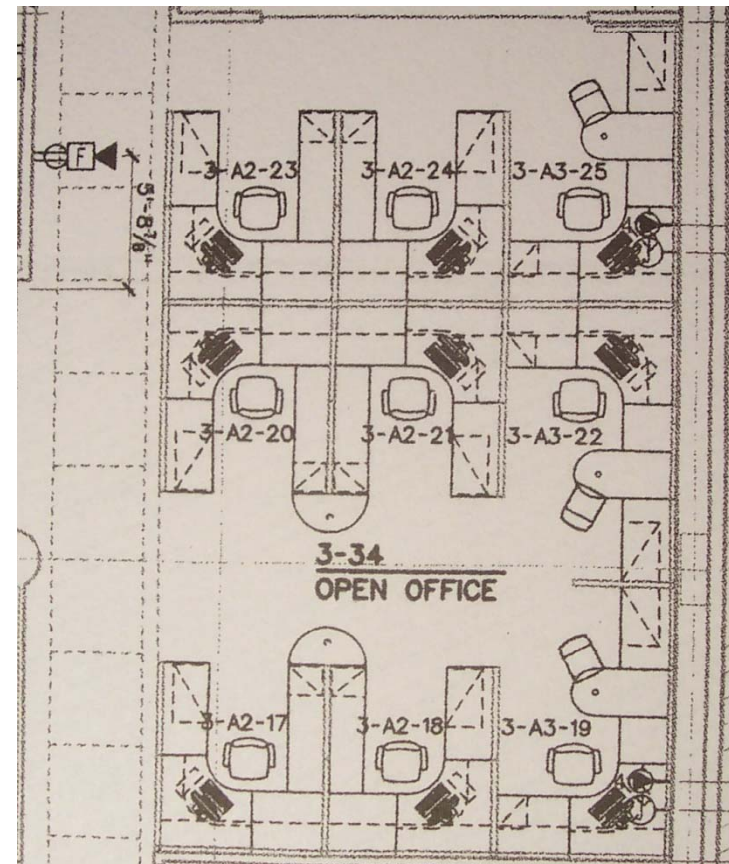




# Lighting: Freedom Forum Offices

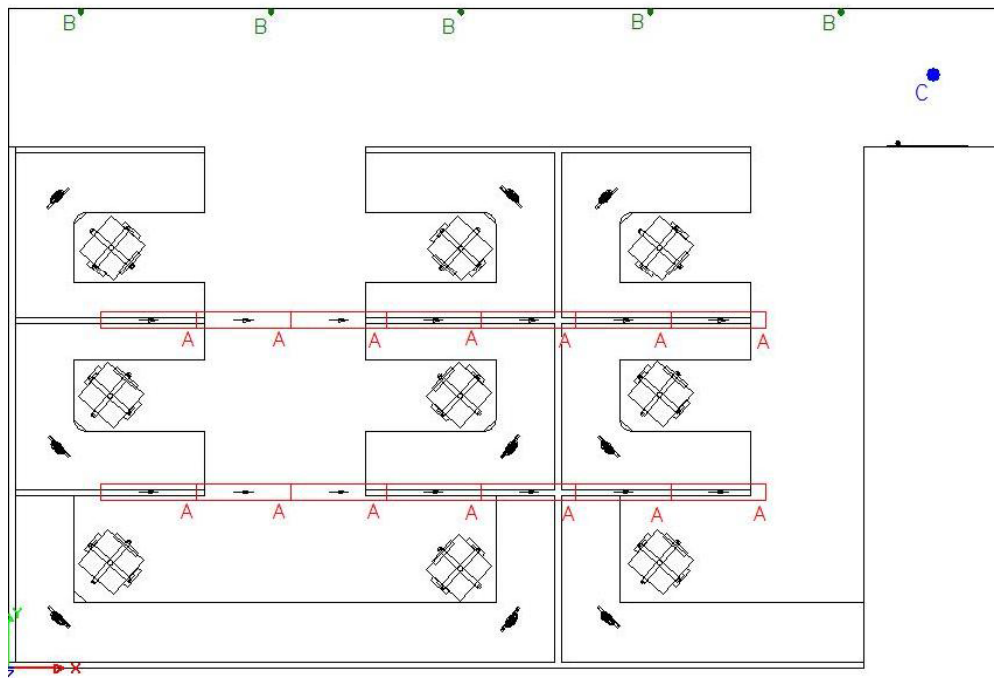
## ■ Design Criteria

- Avoid reflected glare
- Accent director's office
- Create an environment with visual clarity
- Uniformity on the task plane
- Allowable power density of 1.0 Watts/ ft<sup>2</sup>
- Provide 30 fc of horizontal illuminance at the work plane and 10 fc in corridor



# Lighting: Freedom Forum Offices

## Lighting Layout



### Fixture A: Indirect

- provide uniform ambient task lighting

### Fixture B: wall sconce

- provide a decorative relaxed feel and illuminate the corridor

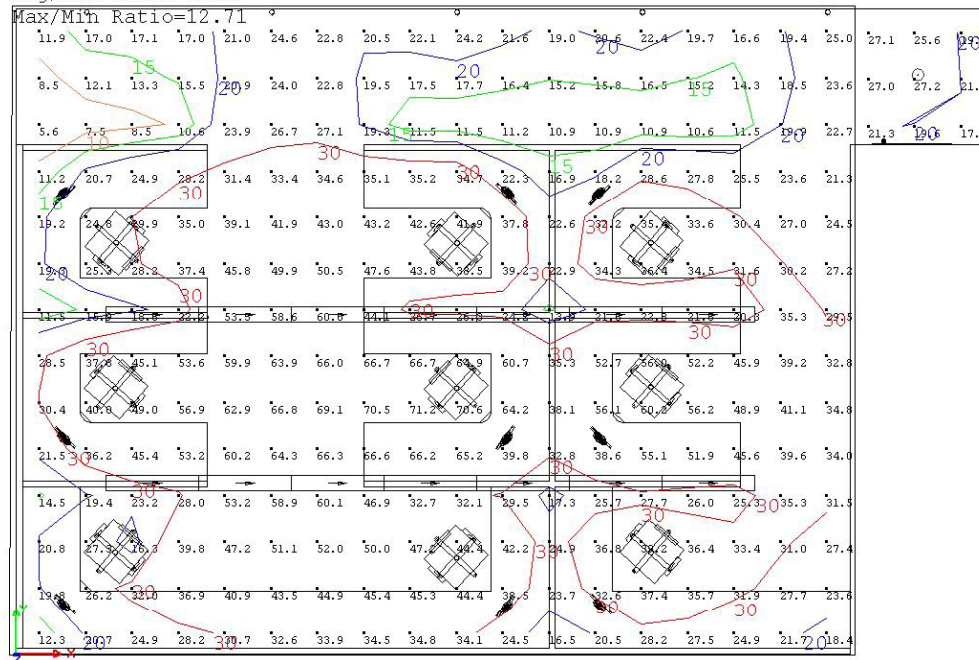
### Fixture C: wall washer

- accent the end of the corridor where the directors office is located

# Lighting: Freedom Forum Offices

## Lighting Performance

Illuminance Values (Fc)  
 Average =33.05  
 Maximum =71.2  
 Minimum =5.6  
 Avg/Min Ratio=5.90



- Minimum of 30 fc in work area
- Average of about 33 fc
- Higher illuminance at directors office

# Lighting: Freedom Forum Offices

## Renderings



# Electrical Depth

## Transformer Comparison

## Electrical: Standard vs Energy Efficient Transformers

- Comparison
  - The existing standard transformers
  - Powersmiths energy efficient transformers



[powersmiths.com](http://powersmiths.com)

**POWERSMITHS**  
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## Electrical: Standard vs Energy Efficient Transformers

### ■ Goals

- Require less demand from electric service PEPCO
- Reduce energy consumption by the Newseum
- Reduce electric costs for the Newseum



[powersmiths.com](http://powersmiths.com)

## Electrical: Standard vs Energy Efficient Transformers

### Existing Transformers

Tag	T4	T5	T6	T7	T8	T9	T10	T11	T13
Size (kVA)	15	30	45	75	112.5	150	225	300	750
Quantity	3	9	7	8	7	3	10	1	1

Total: 49

### Analysis performed using Powersmiths Energy Savings Payback Calculator

input data:           362 operating days/year  
                          10 hours of operation/day

# Electrical: Standard vs Energy Efficient Transformers

## Electrical demand savings

Peak kW reduction (normal op hours)	59.7	kW
Annual kWh reduction	455,898	kWh
Reduction in Air Conditioning Load (on peak)	12.52	tons

## Electrical cost savings

	Annual Operating Cost	Life Cycle Operating Cost & Savings	
		20 years	32 years
Status Quo Transformers	\$70,793	\$2,557,206	\$5,833,544
Powersmiths Transformers	\$18,036	\$651,506	\$1,486,226
<b>Savings with Powersmiths</b>	<b>\$52,757</b>	<b>\$1,905,701</b>	<b>\$4,347,317</b>

# Electrical: Standard vs Energy Efficient Transformers

## Cost - Benefit

**Cost**

Powersmiths Transformers  
 Status Quo Transformers

**Cost**

\$270,953

**\$135,476**

**Payback on total cost**

2.57years

## Environmental Benefits

**Summary of Environmental Benefits**

Annual Reduction in Greenhouse Gases (per EPA)			Equivalence	
336	tons of CO2		63	Acres trees planted
1,090	tons of Coal		45	Car Emissions
2,638	kgs of SO2		46	homes heated
1,136	kgs of NOx			

## Architecture Breadth

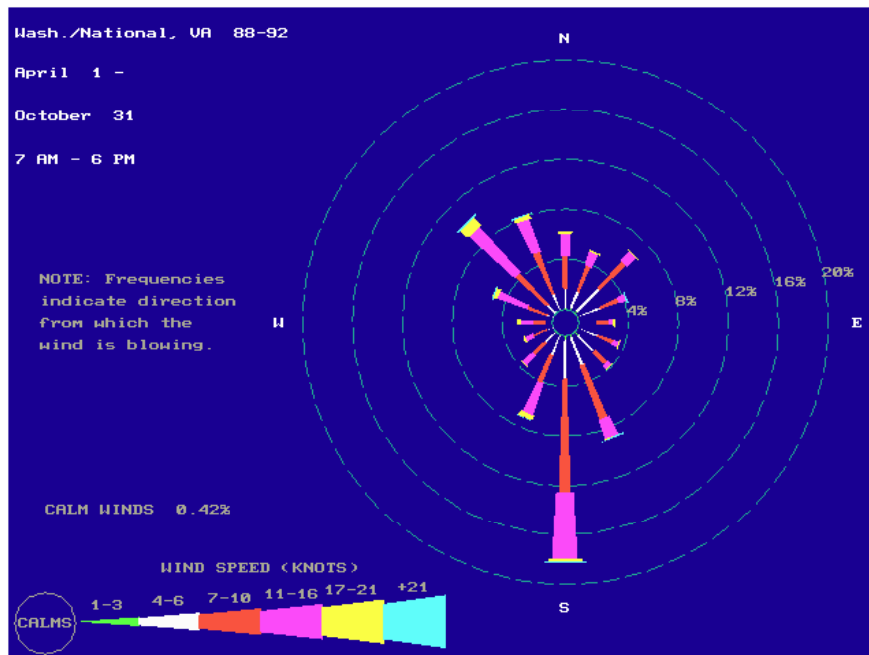
Construction of a wind turbine system from electrical depth study

- Goals
  - Determine the best layout for the turbines
  - Take into account environmental considerations
  - Take into account aesthetic considerations



*swiftwindturbine.com*

# Architecture Breadth



<http://home.pes.com/windroses/wrgifs/13743.GIF>

## ■ Environmental considerations

- Wind availability
- Wind direction



## Architecture Breadth

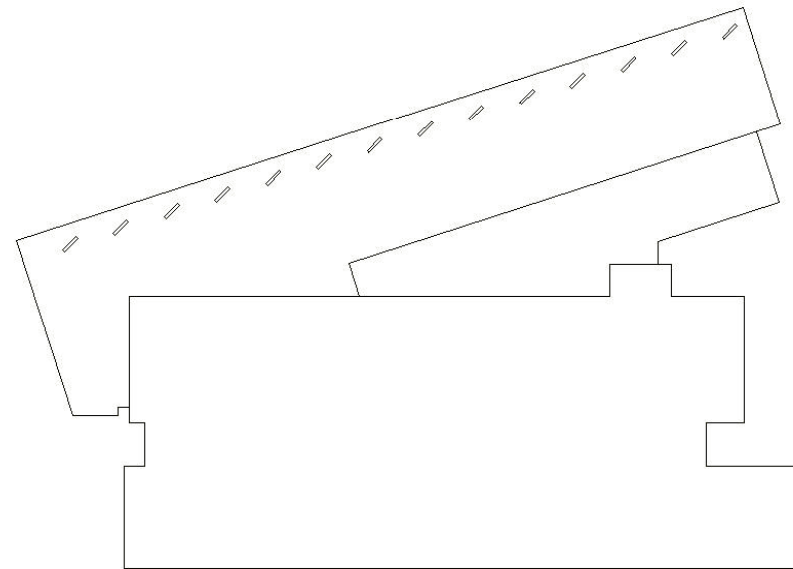
- Aesthetic considerations
  - South façade is a long Pennsylvania Avenue
  - North-west: above apartments, not as noticeable



[www.newseum.org](http://www.newseum.org)

## Architecture Breadth

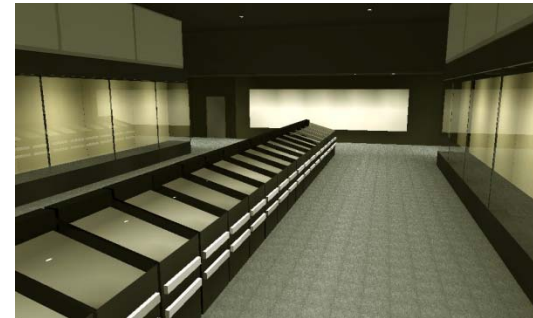
- Layout
  - With the considerations, the north-west corner was selected
  - An array of 14 turbines spaced 20 ft apart.
  - Ample space with the 7 foot diameters
  - Minimum roof clearance of 2 feet per specifications



# Conclusions

## News History Gallery

- meets design criteria
- satisfies max illuminance for museum artifact lighting
- attention on displays



## Freedom Forum Offices

- meets design criteria
- elimination of glare
- uniform working environment



# Conclusions

## Transformer Comparison

- saves electricity demand
- saves electricity costs
- pays for itself quickly
- benefits Newseum and public



## Turbine Layout

- incorporates many considerations
- provides a good layout
- utilizes the wind direction while being easy on the eye



# Acknowledgements

I would like to thank everyone who has helped me and gave me support along the way during senior thesis : \_\_\_\_\_

Thank you to Turner Construction and the Freedom Forum for allowing me to use the Newseum as my thesis building and supplying me with drawings.

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Professor Parfitt  
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# Questions???

Any Questions?