

SALAMANDER HOSPITALITY RESORT AND SPA:  
MIDDLEBURG, VA



LUKE RENWICK | APRIL 14, 2010 | LIGHTING/ELECTRICAL  
PROFESSORS HOUSER AND DANNERTH



## SALAMANDER RESORT AND SPA



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## THESIS SCOPE OF WORK

- LIGHTING REDESIGN – 4 SPACES:
  - EXTERIOR COURTYARD
  - LIVING ROOM
    - DAYLIGHT STUDY
  - WINE BAR
  - BALLROOM
- ELECTRICAL BRANCH CKT. REDESIGN
- ELECTRICAL DEPTH TOPICS
  - STATIC VS. ROTARY UPS
  - FEEDERS VS. BUS DUCT
- ARCHITECTURAL BREADTH
- MECHANICAL BREADTH





## SALAMANDER RESORT AND SPA



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## PRESENTATION

- LIGHTING REDESIGN
  - EXTERIOR COURTYARD
  - LIVING ROOM
    - DAYLIGHT STUDY
  - WINE BAR
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- INTRODUCTION/OVERVIEW
- LIGHTING DEPTHS
  - EXTERIOR COURTYARD
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- CONCLUSIONS
- ACKNOWLEDGMENTS

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## BUILDING OVERVIEW



- 5 STAR/5 DIAMOND RESORT AND SPA
- MIDDLEBURG, VA





## SALAMANDER RESORT AND SPA

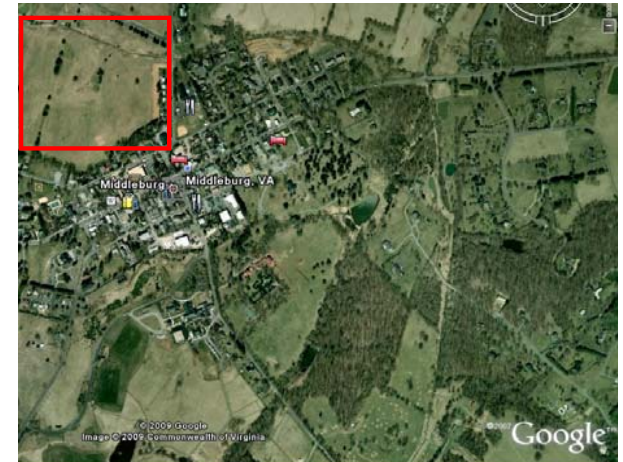
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## BUILDING OVERVIEW



- 5 STAR/5 DIAMOND RESORT AND SPA
- MIDDLEBURG, VA
- 340 ACRE SITE





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## BUILDING OVERVIEW



- 5 STAR/5 DIAMOND RESORT AND SPA
- MIDDLEBURG, VA
- 340 ACRE SITE
- 230,000 SQ. FT.
- LEED CERTIFICATION





## SALAMANDER RESORT AND SPA

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## GENERAL DESIGN GOALS

- LIGHTING RESPECTFUL TO TRADITIONAL VIRGINIA HORSE AND WINE COUNTRY
- PROMOTE RELAXATION WITH LOCATION OF LIGHT AND USE OF WARM COLOR TEMPERATURE SOURCES
- EXHIBIT ELEGANCE, CLASS, HIGH QUALITY





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## EXTERIOR COURTYARD

- DESIGN CRITERIA AND CONSIDERATIONS
  - WELCOME GUESTS
  - GUIDE TRAVEL TO MAIN ENTRANCE
  - SAFETY FOR PEDESTRIANS
  - LIGHT FOR UNLOADING - VALET





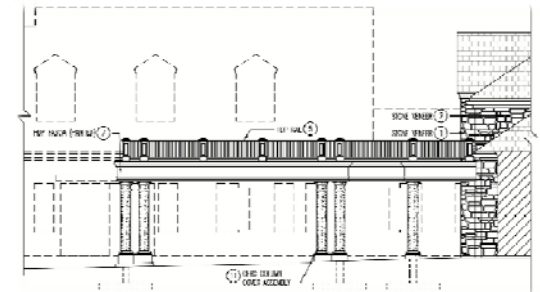
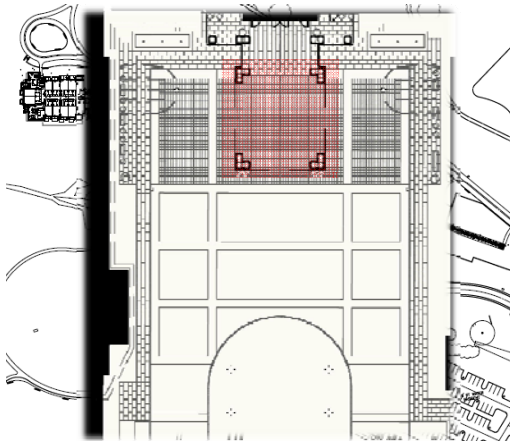


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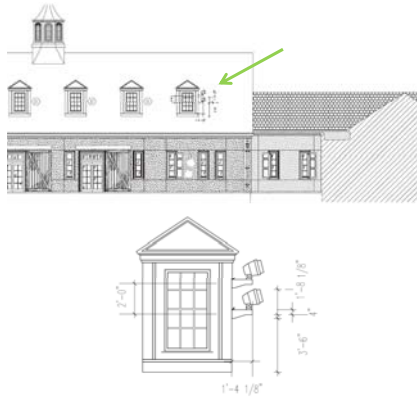
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## EXTERIOR COURTYARD



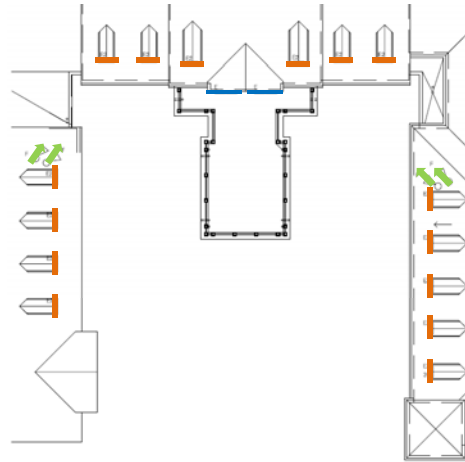


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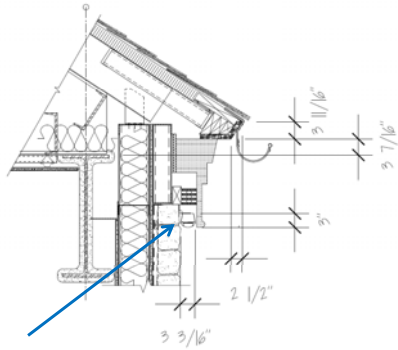
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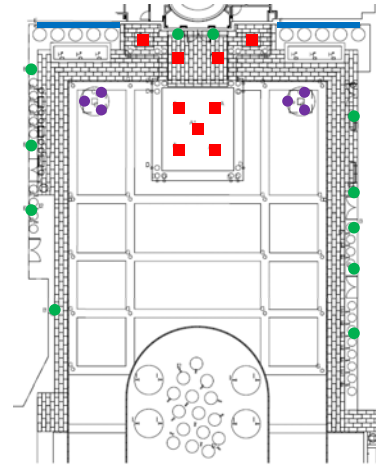
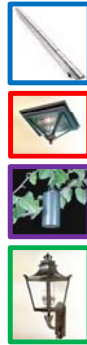


### SALAMANDER RESORT AND SPA



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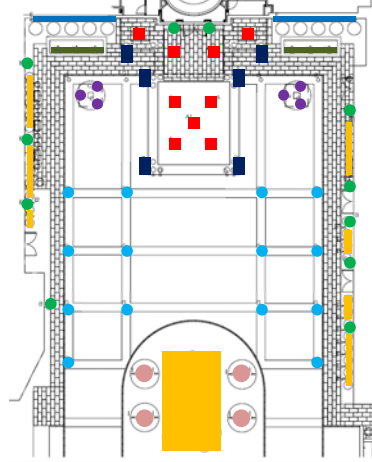


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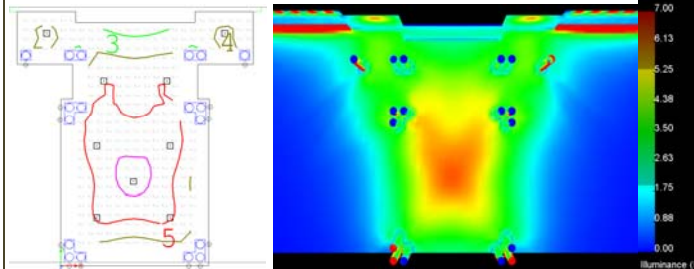


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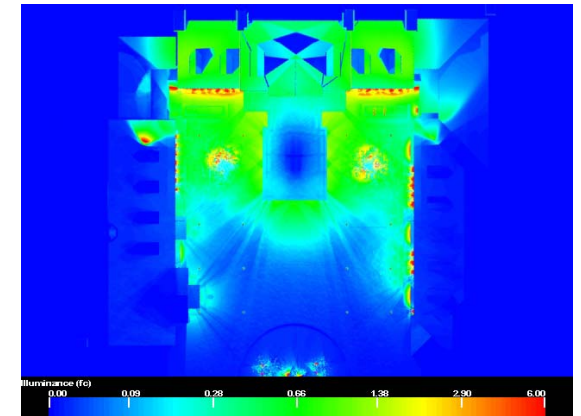
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## EXTERIOR COURTYARD



	IES – ILLUMINANCE	DESIGN ILLUMINANCE
Entrances (Active)	5 fc	5 fc
Prominent Structures	5 fc	10 fc
Sidewalks (Roadside)	0.6 fc	0.5 – 1.0 fc



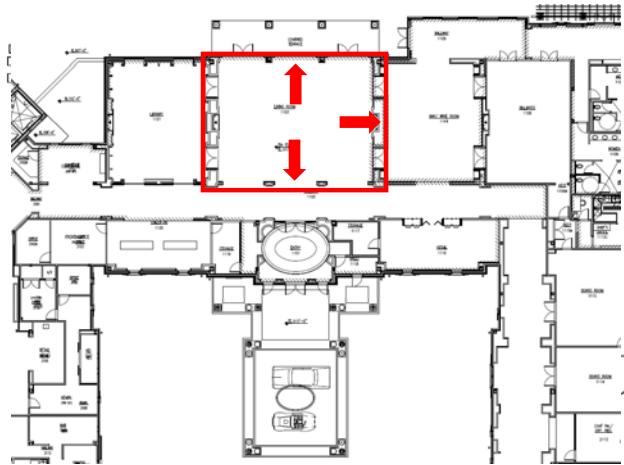


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## LIVING ROOM





## SALAMANDER RESORT AND SPA

	IES – ILLUMINANCE	DESIGN ILLUMINANCE
Simple Visual Tasks	10 fc	10.96 fc

	ASHRAE LIGHTING POWER DENSITY	DESIGN LPD
Lobby/Lounge	1.2 W/sq.ft.	---
With Decorative Allowance	2.2 W/sq.ft.	0.95 W/sq.ft.

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## LIVING ROOM





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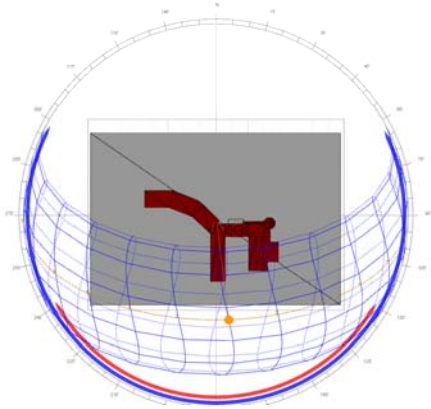
## LIVING ROOM DAYLIGHT STUDY

- ANALYSIS GOALS:
  - DAYLIGHT PENETRATION STUDY
  - (CONTINUOUS )DAYLIGHT AUTONOMY
  - PHOTOSENSOR INTEGRATION
    - ENERGY SAVINGS





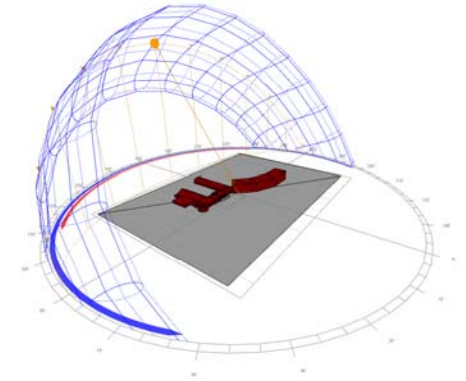
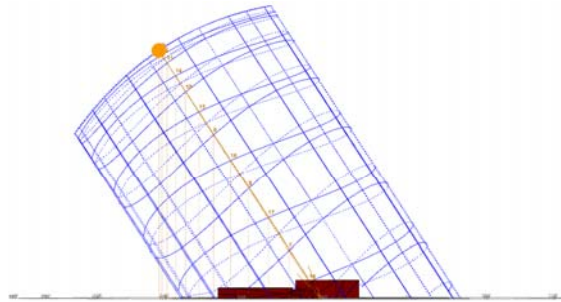
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## LIVING ROOM DAYLIGHT STUDY

- DAYLIGHT PENETRATION STUDY
- MIDDLEBURG, VA: 39° N LAT. , 77.7° W LONG.





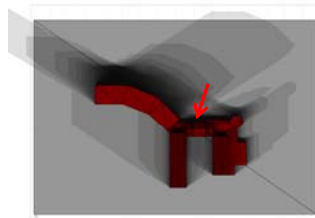
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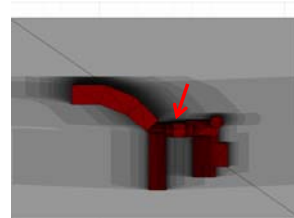
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## LIVING ROOM DAYLIGHT STUDY

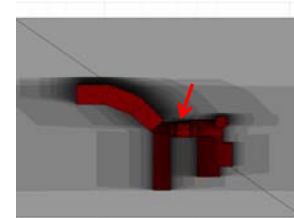
- DAYLIGHT PENETRATION STUDY
  - WINTER SOLSTICE
  - EQUINOX
  - SUMMER SOLSTICE



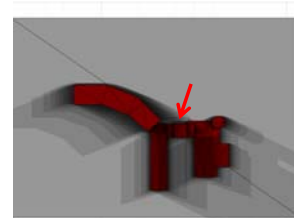
DECEMBER 21<sup>ST</sup>



MARCH 21<sup>ST</sup>



SEPTEMBER 21<sup>ST</sup>



JUNE 21<sup>ST</sup>



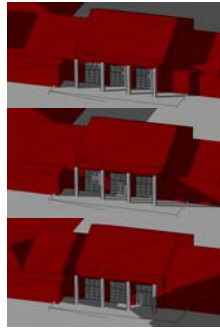
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## LIVING ROOM DAYLIGHT STUDY

- DAYLIGHT PENETRATION STUDY
  - POTENTIAL PROBLEM – JUNE 21<sup>ST</sup>
  - 6:00 AM, 7:00 AM, 6:00 PM





## SALAMANDER RESORT AND SPA

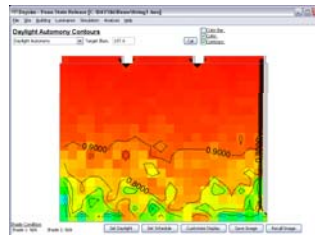
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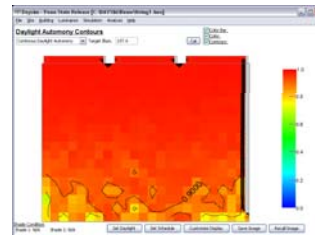
## LIVING ROOM DAYLIGHT STUDY

- DAYLIGHT AUTONOMY/CONTINUOUS D.A.
  - 10 F.C. TARGET

DA



DA<sub>CON</sub>





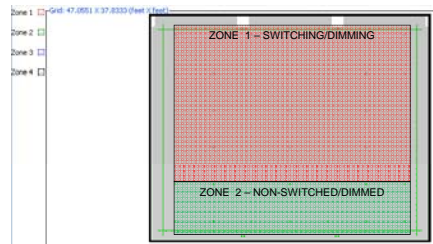
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## LIVING ROOM DAYLIGHT STUDY

- PHOTOSENSOR CONTROL INTEGRATION



	OFF SETTING	ON SETTING	TARGET ILLUM.	KWH SAVED
SWITCHING	50 fc.	25 fc.	25 fc.	465.86

Statistics

24 HRS/DAY  
8760 HRS/YR  
3326.6 KWH OF CONTROLLED ZONE  
0.3068333 KW IN CONTROLLED ZONE

	HOURS SWITCHED											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
SAVED	0	0	32.8	68.8	61.9	84.4	110.5	91.5	84.9	0	0	0
HRS OFF	0	0	54.6	185.6	185.0	229.2	300.0	308.1	141.9	0	0	0
PER DAY	0	0	1.1	6.3	3.4	7.6	9.7	8.0	3.2	0	0	0

465.86 KWH SAVED  
2764.8 HRS SWITCHED OFF/YR

	HOURS SWITCHED		
	JUNE	JULY	AUG
SAVED	84.4	110.5	91.5
HRS OFF	229.2	300.0	248.4
PER DAY	7.6	9.7	8.0



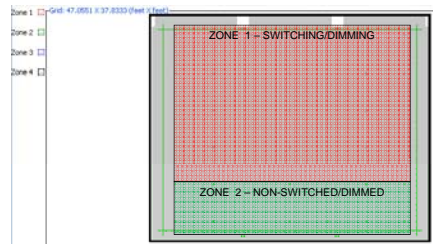
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## LIVING ROOM DAYLIGHT STUDY

- PHOTOSENSOR CONTROL INTEGRATION



	TARGET ILLUMINANCE	KWH SAVED
DIMMING	30 fc.	1174.82

Statistics													
24 HRS/DAY													
8760 HRS/YR													
3226.6 KWH OF CONTROLLED ZONE													
0.368333 KWH IN CONTROLLED ZONE													
1174.82 KWH SAVED													
3169.582 HRS DIMMED /YR													
		JAN	FEB	MARCH	APRIL	MAY	HOURS DIMMED						
		JUNE	JULY	AUG	SEP	OCT	NOV	DEC					
SAVED KWH		52.8	54.4	92.5	126.6	126.4	139.2	152.1	132.3	100.2	95.9	52.1	50.4
HRS DIM		143.3	147.6	251.2	343.5	343.1	377.9	413.0	359.2	271.9	269.3	141.4	136.9
PER DAY		4.6	5.3	8.1	11.5	11.1	12.6	13.3	11.6	9.1	8.4	4.7	4.4

HOURS DIMMED			
	JUNE	JULY	AUG
SAVED KWH	139.2	152.1	132.3
HRS DIM	377.9	413.0	359.2
PER DAY	12.6	13.3	11.6

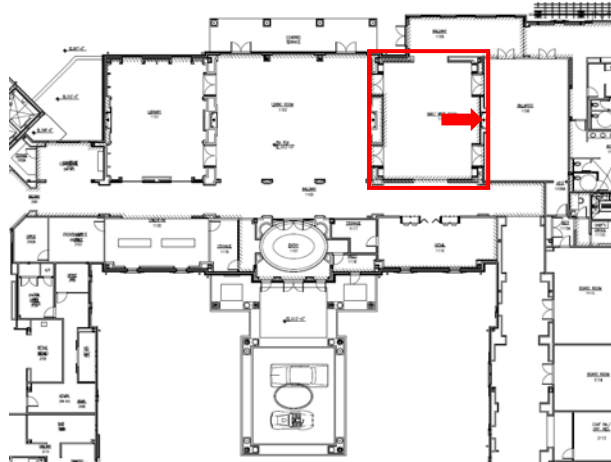


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## WINE BAR



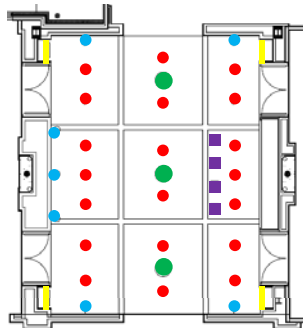


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## WINE BAR



- DESIGN CRITERIA AND CONSIDERATIONS
  - SCENE CONTROL
    - DAY VS. NIGHT
  - ACCENT MURAL
  - BAR FEATURE





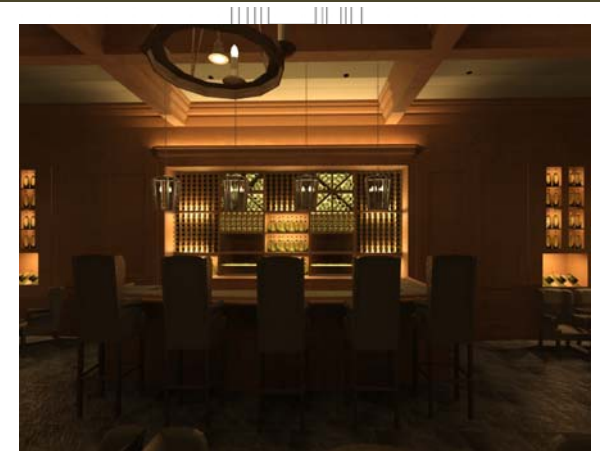


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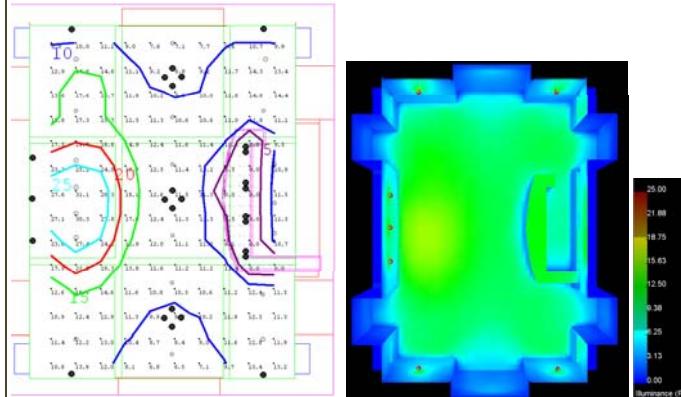




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## WINE BAR



	IES – ILLUMINANCE	DESIGN ILLUMINANCE
Simple Visual Tasks	10 fc	12.38 fc (day scene)

	ASHRAE LIGHTING POWER DENSITY	DESIGN LPD
Leisure Dining/Bar Lounge	1.4 W/sq.ft.	0.75 W/sq.ft.

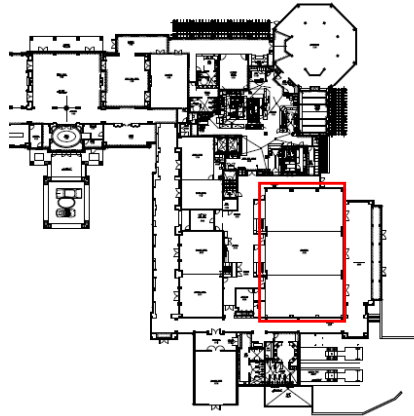


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## GRAND BALLROOM





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## GRAND BALLROOM

	IES – ILLUMINANCE	DESIGN ILLUMINANCE
Simple Visual Tasks	5 - 15 fc	17.7 fc (dimnable)

	ASHRAE LIGHTING POWER DENSITY	DESIGN LPD
Conference/Meeting/ Multipurpose Space	1.3 W/sq.ft.	1.1 W/sq.ft.





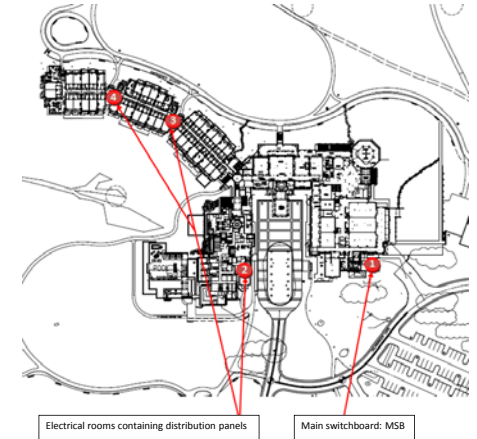
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## FEEDERS VS. BUS DUCT

- GOALS
  - CALCULATE COST FOR LONG-RUN COPPER FEEDERS
  - COMPARE TO COST OF BUS DUCT
  - FIND LOWEST COST SOLUTION



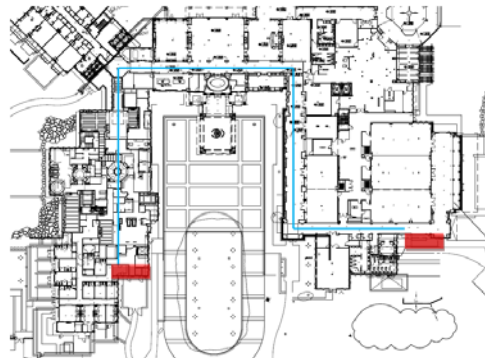


## SALAMANDER RESORT AND SPA

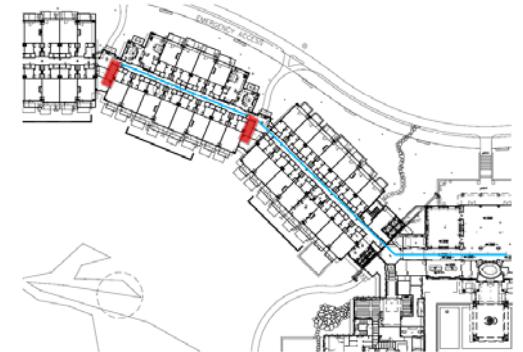
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## FEEDERS VS. BUS DUCT



MSB TO DN4B3/DN4B3A = 610 FT.



MSB TO DN4G4A = 600 FT. ; DN4G4A TO DN4G4B = 141 FT.



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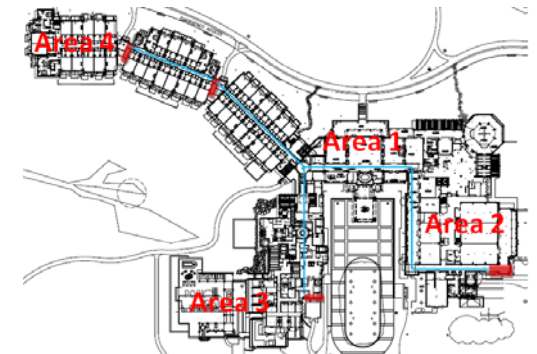
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## FEEDERS VS. BUS DUCT

- ANALYSIS SCENARIOS:
  - EXISTING COPPER FEEDERS
  - INDIVIDUAL BUS DUCT FROM MSB TO DISTRIBUTION PANELS
  - ONE LARGE BUS DUCT – TAP OFF TO DISTRIBUTION PANELS
  - INDIVIDUAL BUS DUCT TO PANELS – ALUMINUM BUS DUCT
  - LARGE BUS DUCT TO PANELS – ALUMINUM BUS DUCT

Scenario	Total Cost
#1: MSB to Distribution Panels via Feeders	\$513,614.15
#2: Individual Busduct to Distribution Panels	\$439,790.00
#3: Large Busduct with Tap-offs to Panels	\$416,732.00
#4: Scenario #2 with Aluminum Busduct	\$351,711.00
#5: Scenario #3 with Aluminum Busduct	\$362,460.00

•SAVINGS: SCENARIO #1 – SCENARIO #4 = **\$161,903.15**





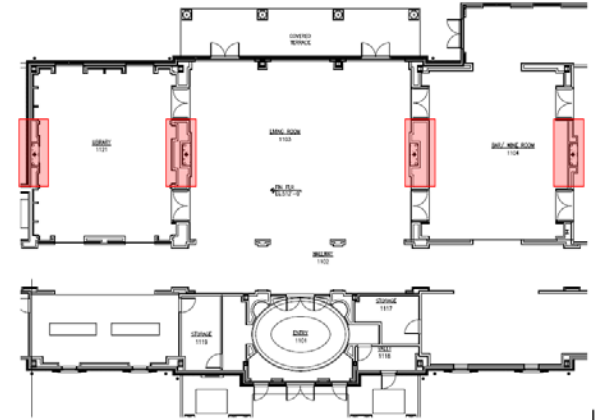
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## HEAT RECOVERY

- ANALYSIS GOALS:
  - PROVIDE HEAT RECOVERY TO AIR HANDLING UNIT "AHU-2"  
FROM FIREPLACE EXHAUST
  - DESIGN LOOP, SIZE RECIRCULATION PUMP







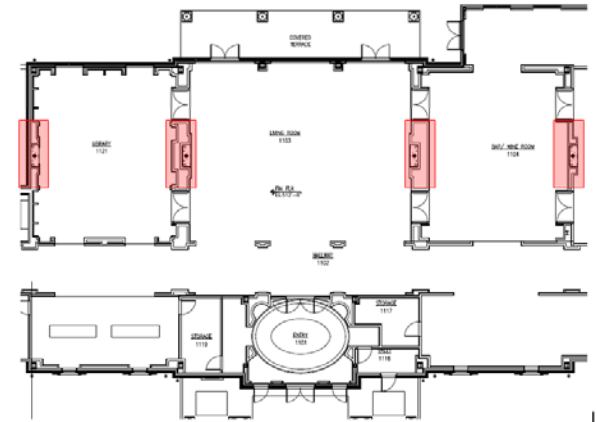
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## HEAT RECOVERY

- PRESSURE DROP:
  - PIPE LENGTH → 10.8FT.
  - FITTINGS → 32FT.
  - COILS → 11.5FT.
- TOTAL HEAD = 54.3FT.
- SENSIBLE LOAD NEEDED FOR PREHEAT COIL = 480 MBH
  - MBH = 500 \* GPM \* ΔT
- PUMP SIZED AT 24 GPM TO PROVIDE 480 MBH





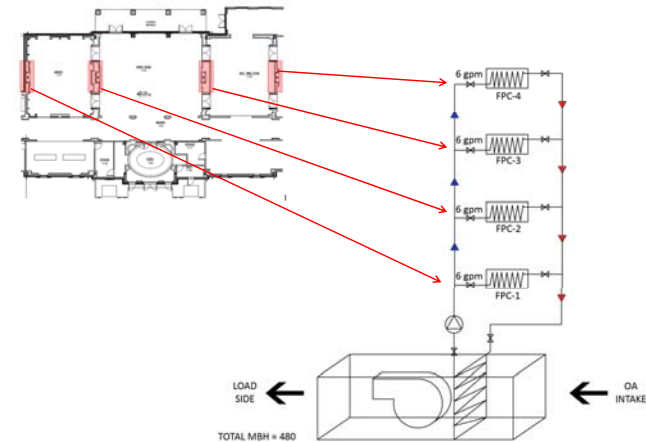
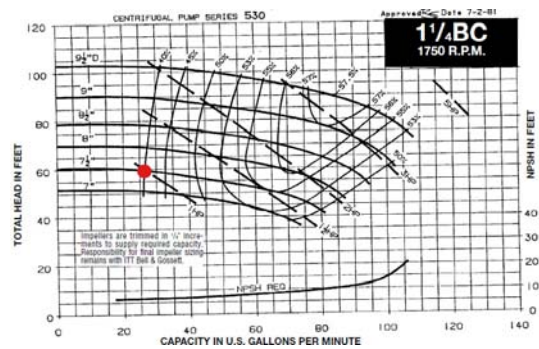
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## HEAT RECOVERY

- 1 HP END SUCTION HEAT RECOVERY PUMP





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## CONCLUSION

- LIGHTING
  - CONSERVATIVE, DECORATIVE LIGHTING RESPECTFUL TO MIDDLEBURG CONTEXT
  - ENHANCES ARCHITECTURE/INTERIOR DESIGN
  - ENERGY EFFICIENT – REDUCED POWER CONSUMPTION BY 60%
- ELECTRICAL
  - COST EFFECTIVE SOLUTION TO ALUMINUM BUS DUCT REPLACEMENT OF LONG-RUN COPPER FEEDERS
- MECHANICAL
  - ENERGY SAVINGS FOR HEAT RECOVERY





## SALAMANDER RESORT AND SPA

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## ACKNOWLEDGEMENTS

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  - MARK MILLER
- AE CLASSMATES
  - 5<sup>TH</sup> YEAR LIGHTING/ELEC. STUDENTS
- FAMILY AND FRIENDS





## SALAMANDER RESORT AND SPA

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QUESTIONS?

