WESTINGHOUSE ELECTRIC NUCLEAR ENGINEERING HEADQUARTERS

DANIEL AUGHENBAUGH - MECHANICAL OPTION

Daniel Aughenbaugh
Mechanical Option

Westinghouse Nuclear Engineering Headquarters

PRESENTATION OUTLINE

INTRODUCTION

EXISTING MECHANICAL SYSTEM

MY DESIGN ANALYSES

- DEDICATED OUTDOOR AIR SYSTEM
- GROUND SOURCE HEAT PUMP PLANT
- CENTRAL PLANT
- PLANT INITIAL COST
- PLANT LIFECYCLE COST

ARCHITECTURAL STUDY- FAÇADE REDESIGN

CONCLUSIONS

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Mechanical Option

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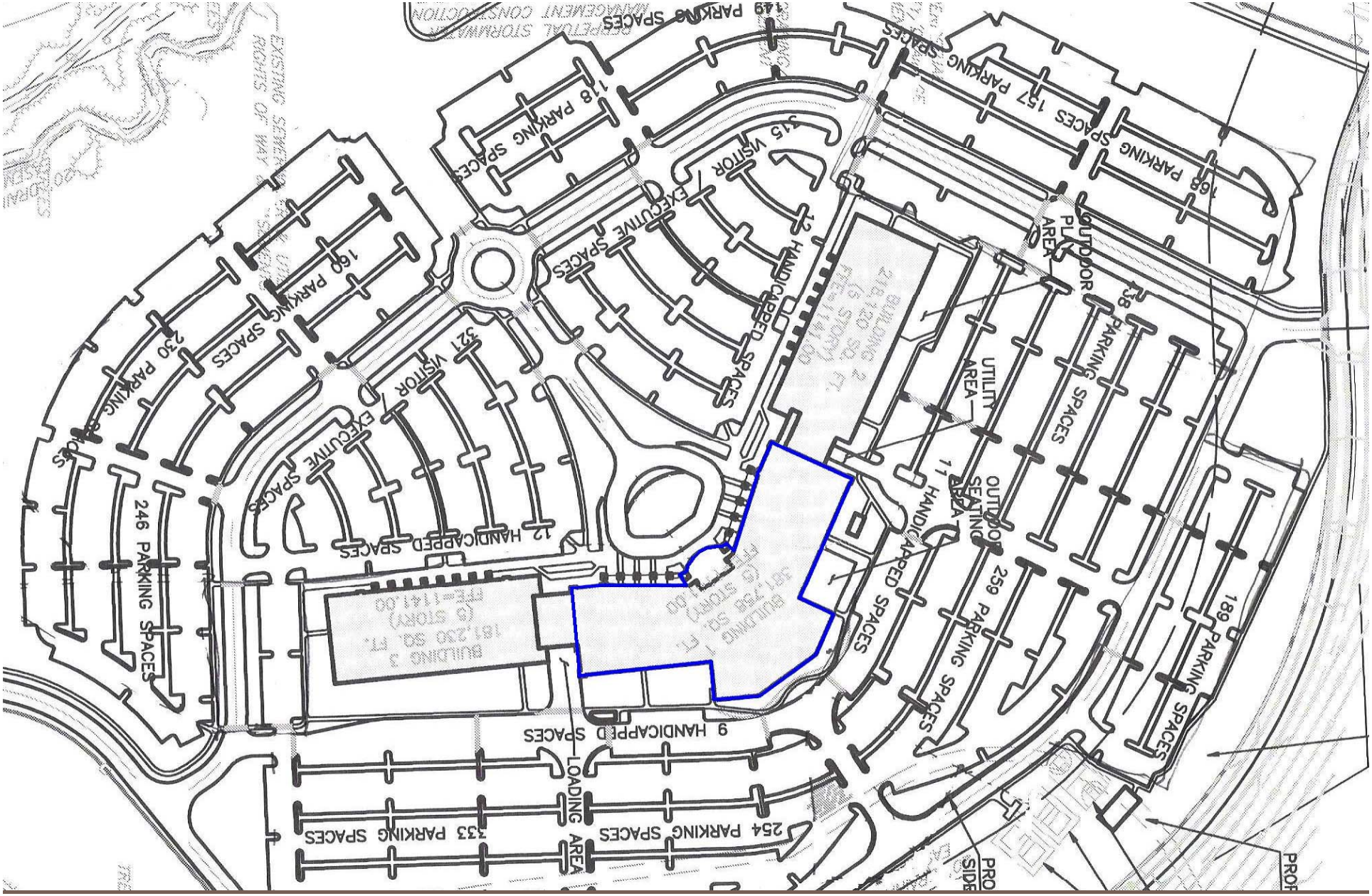
LOCATION:	PITTSBURGH AREA
PROJECT COST:	$240 MILLION
COMPLEX SIZE:	3 BUILDINGS (4-5 FLOORS)
	844,600 SF
OCCUPANCY TYPE: OFFICE	OPEN
DELIVERY METHOD:	DESIGN-BID-BUILD JOINT VENTURE
CONSTRUCTION PERIOD:	2/2008 - 5/2010

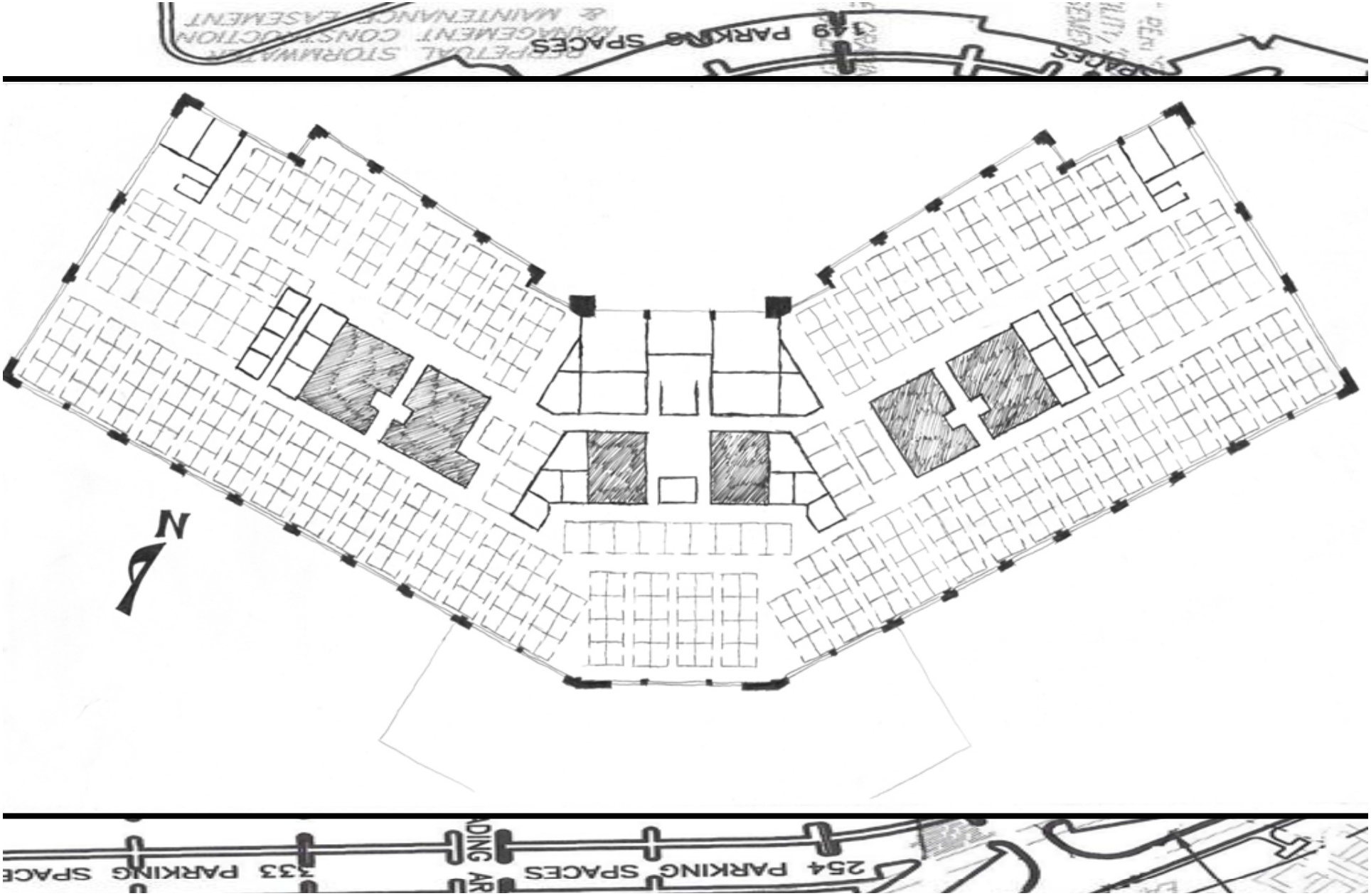
Introduction

Westinghouse Nuclear Engineering Headquarters



Introduction

Westinghouse Nuclear Engineering Headquarters



Introduction

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Facility Mechanical Information

Program is largely open office space with a Cafeteria, Data Center, and Fitness Center

Façade is approximately 40% glazing for all orientations

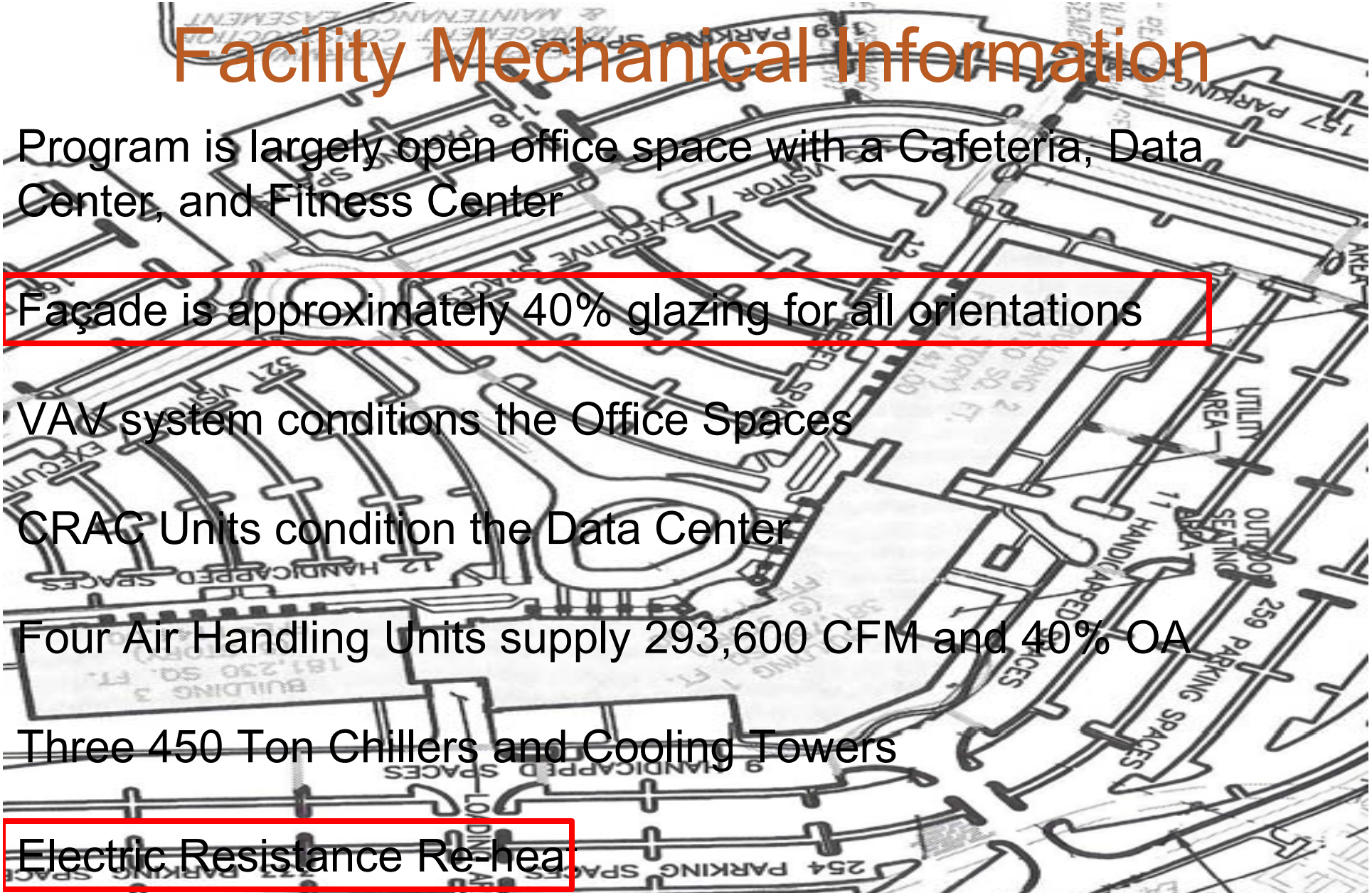
VAV system conditions the Office Spaces

CRAC Units condition the Data Center

Four Air Handling Units supply 293,600 CFM and 40% OA

Three 450 Ton Chillers and Cooling Towers

Electric Resistance Re-heat



Redesign Analyses

Redesign Analyses

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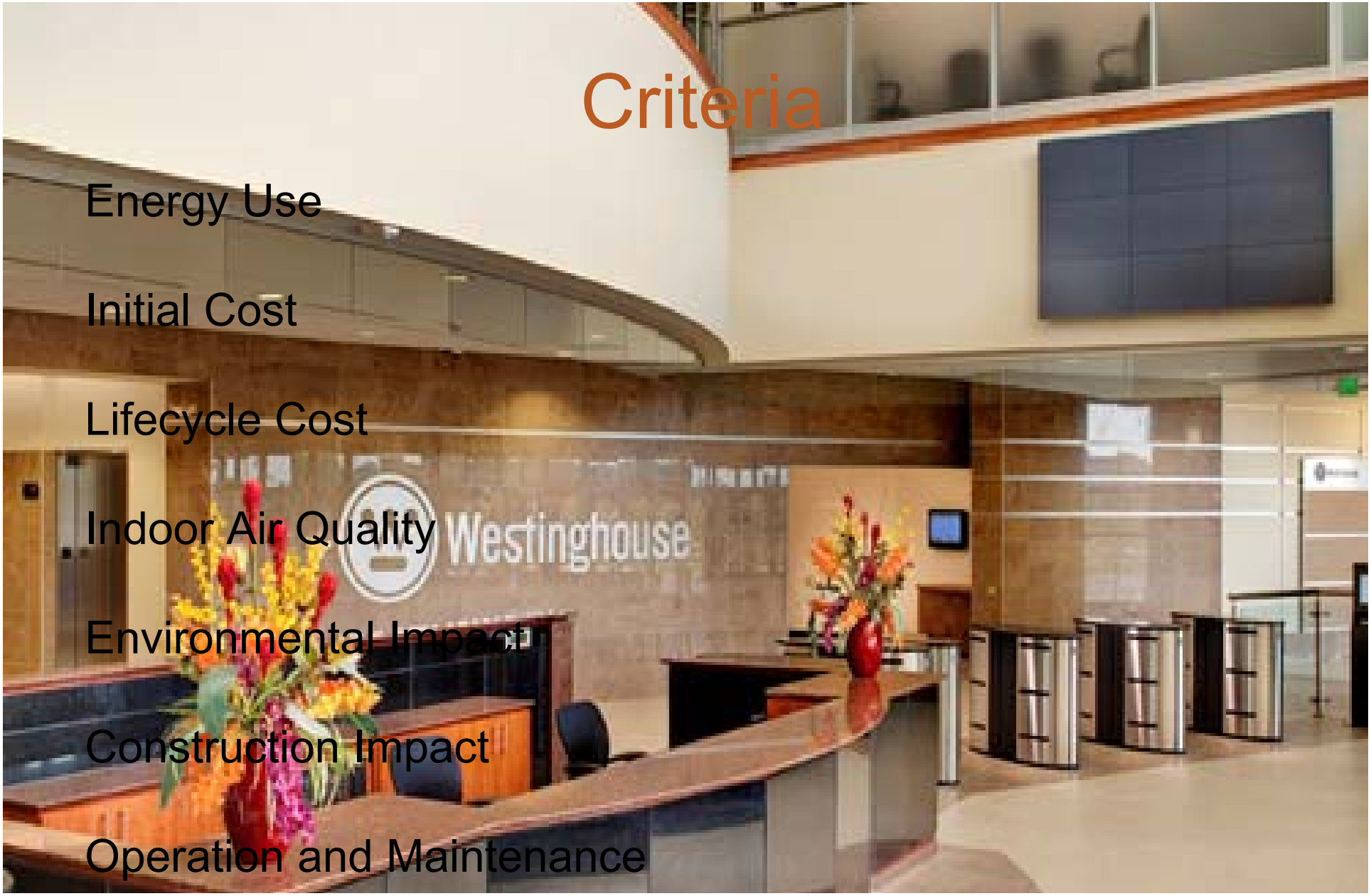
Redesign Analyses

1. Reduce Plant Loads with a Dedicated Outdoor Air System
2. Investigate a Hybrid Ground Source Heat Pump Plant
3. Investigate a Central Plant
4. Façade Redesign

Criteria



Energy Use

Initial Cost

Lifecycle Cost

Indoor Air Quality

Environmental Impact

Construction Impact

Operation and Maintenance

Dedicated Outdoor Air System

DOAS

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Dedicated Outdoor Air System

1. Less Ventilation Air
2. Indoor Air Quality
3. Sensible and Latent Loads are decoupled

DOAS

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Plant Load Reduction

Proposed:

1. Active Chilled Beams (ACB)

2. DOAS Fan Powered Terminal Units (FPT)

3. ACBs to condition Core Office Areas, DOAS FPTs to condition Perimeter Office Areas

DOAS

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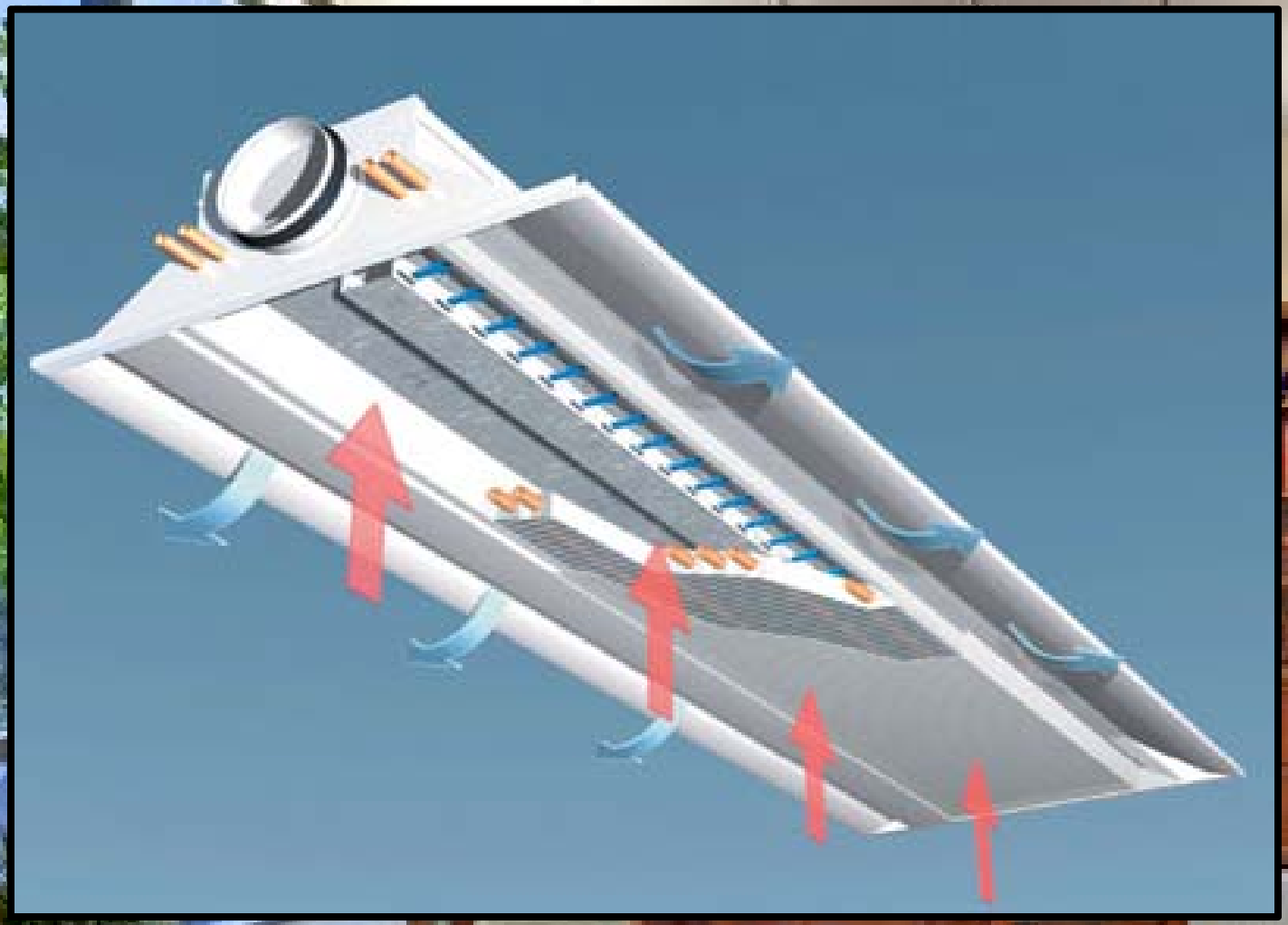
Active Chilled Beams



DOAS

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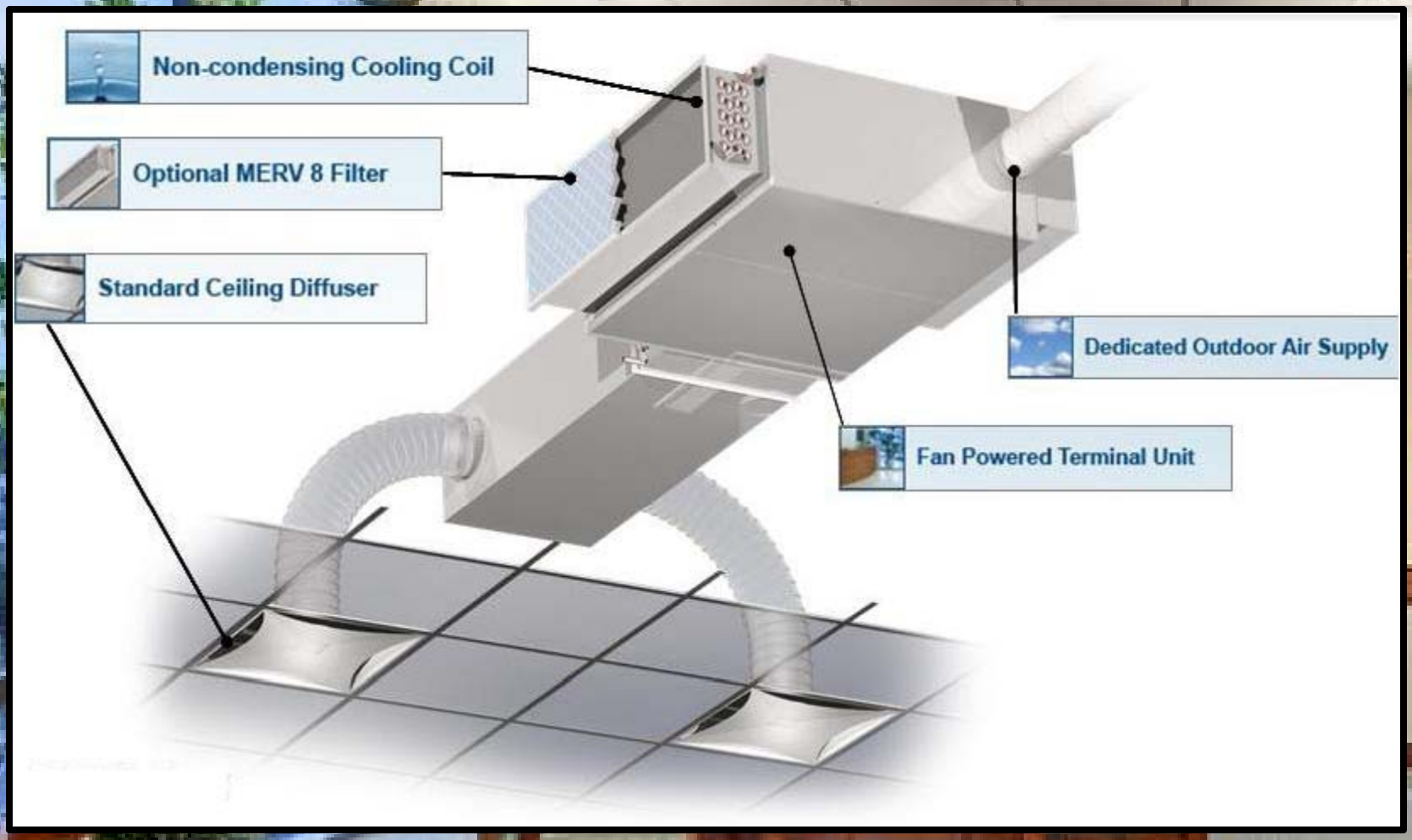
DOAS Fan Powered Terminal Units



DOAS

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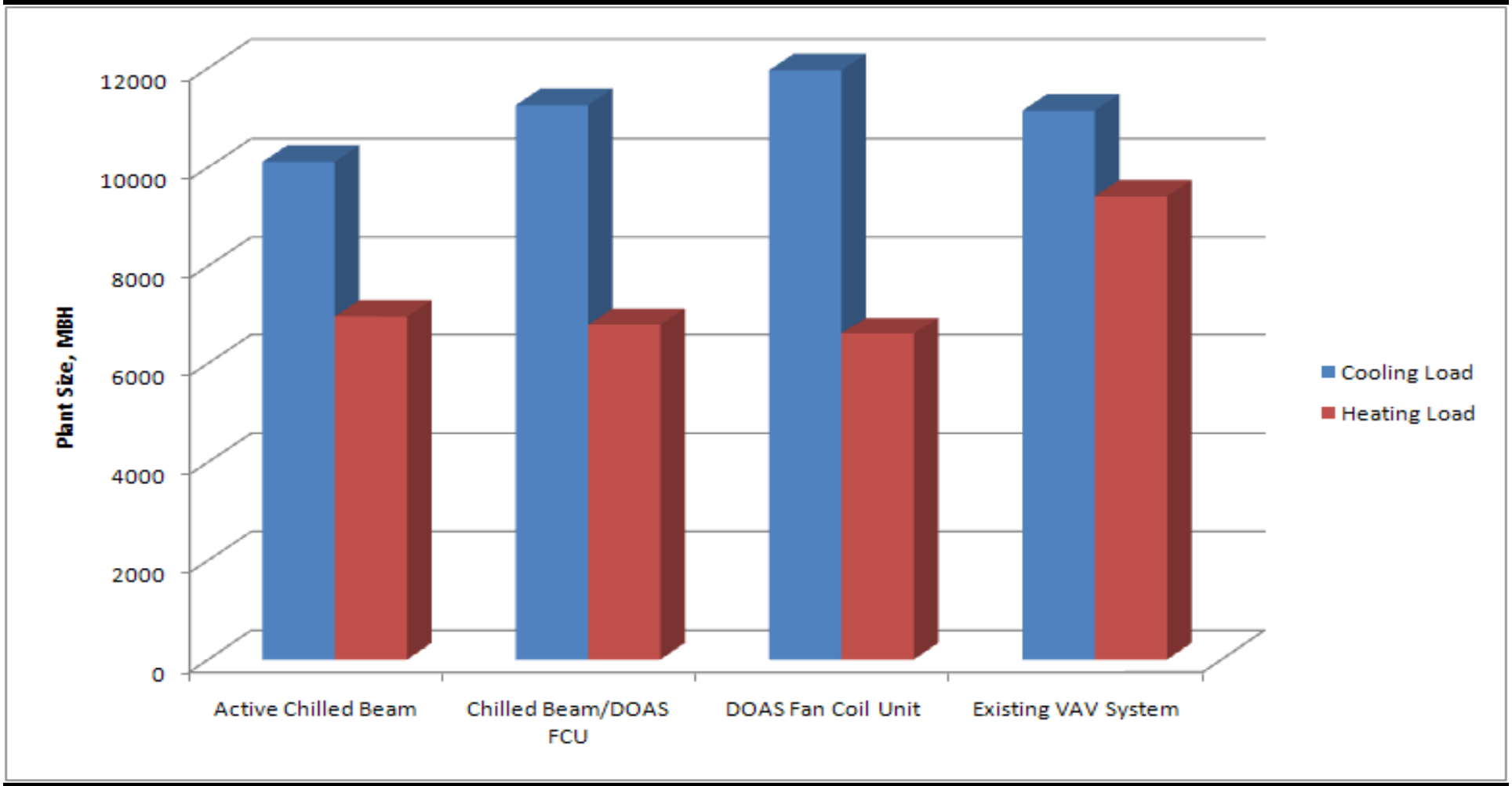
Plant Loading



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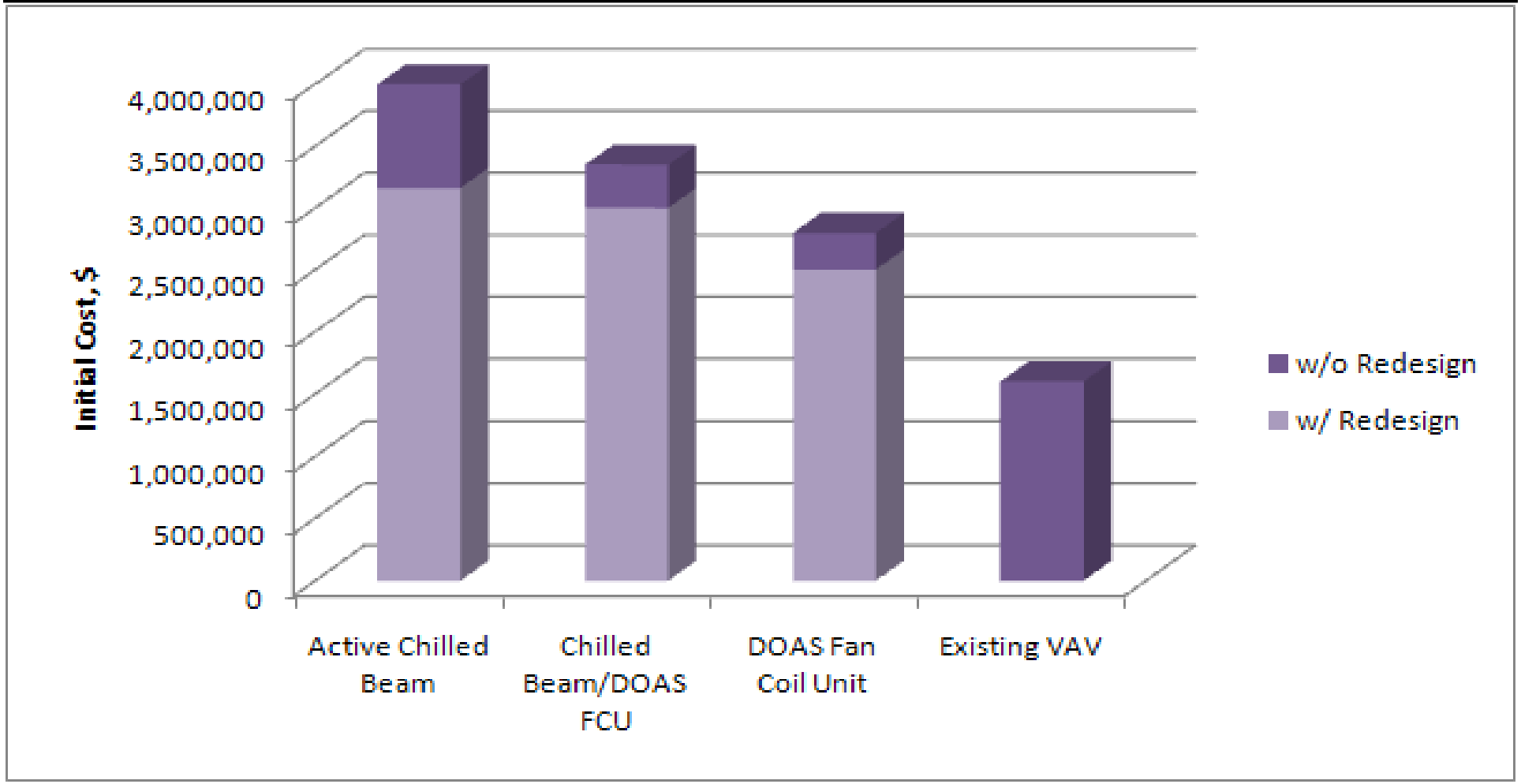
System Initial Cost



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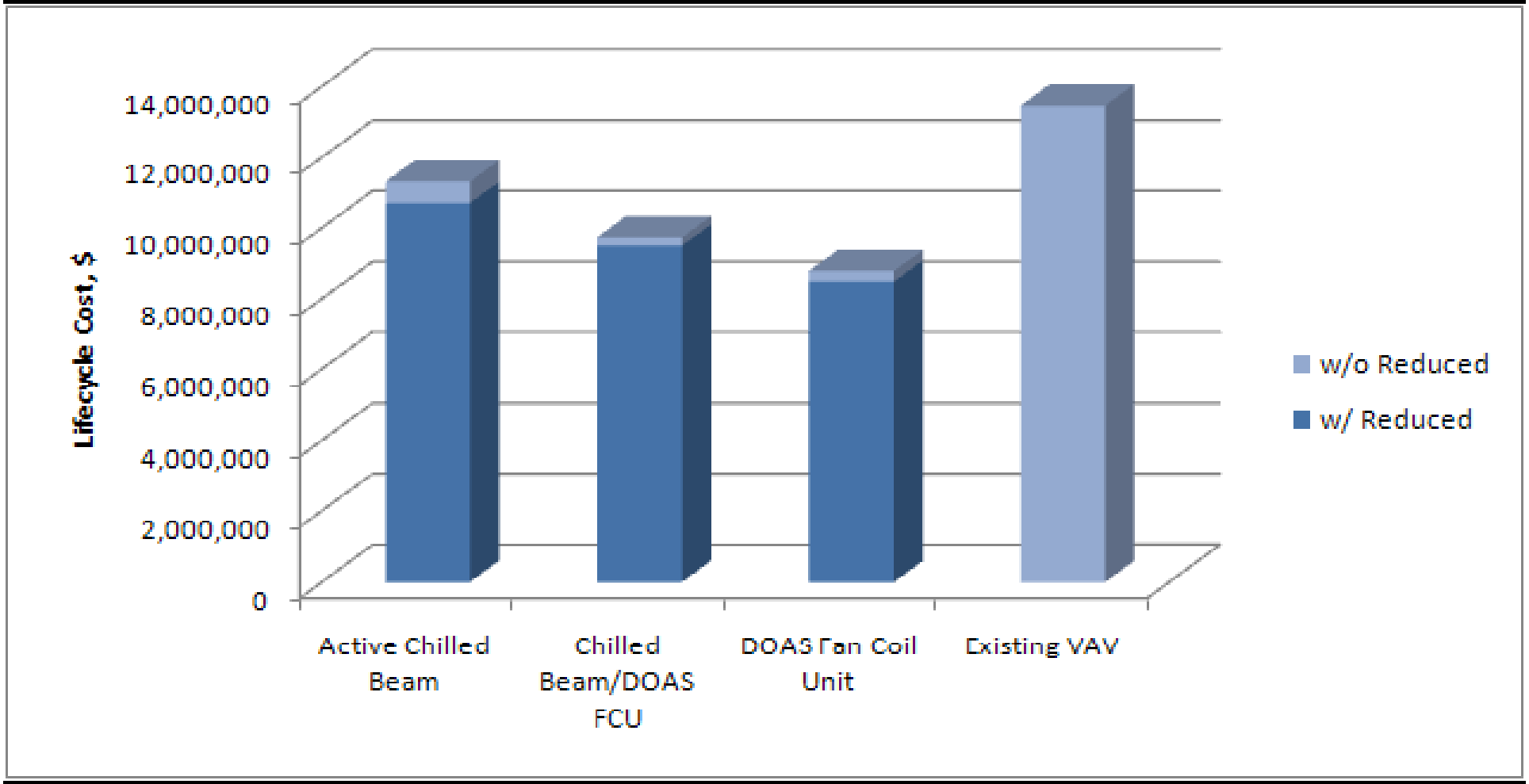
System Life Cycle Cost



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Hybrid Ground Source Heat Pump Plant

Hybrid GSHP

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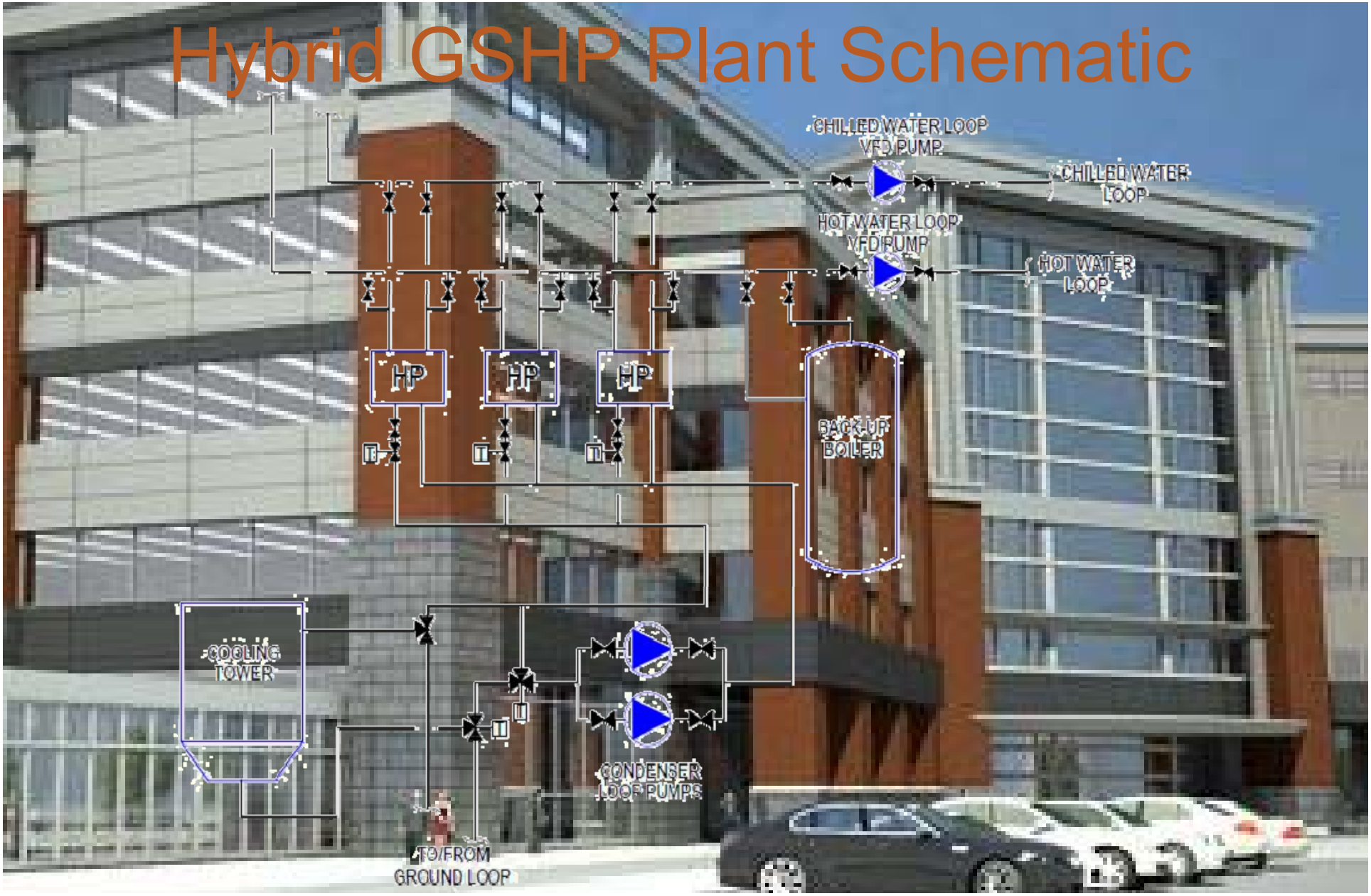
Hybrid GSHP Plant Schematic



Hybrid GSHP

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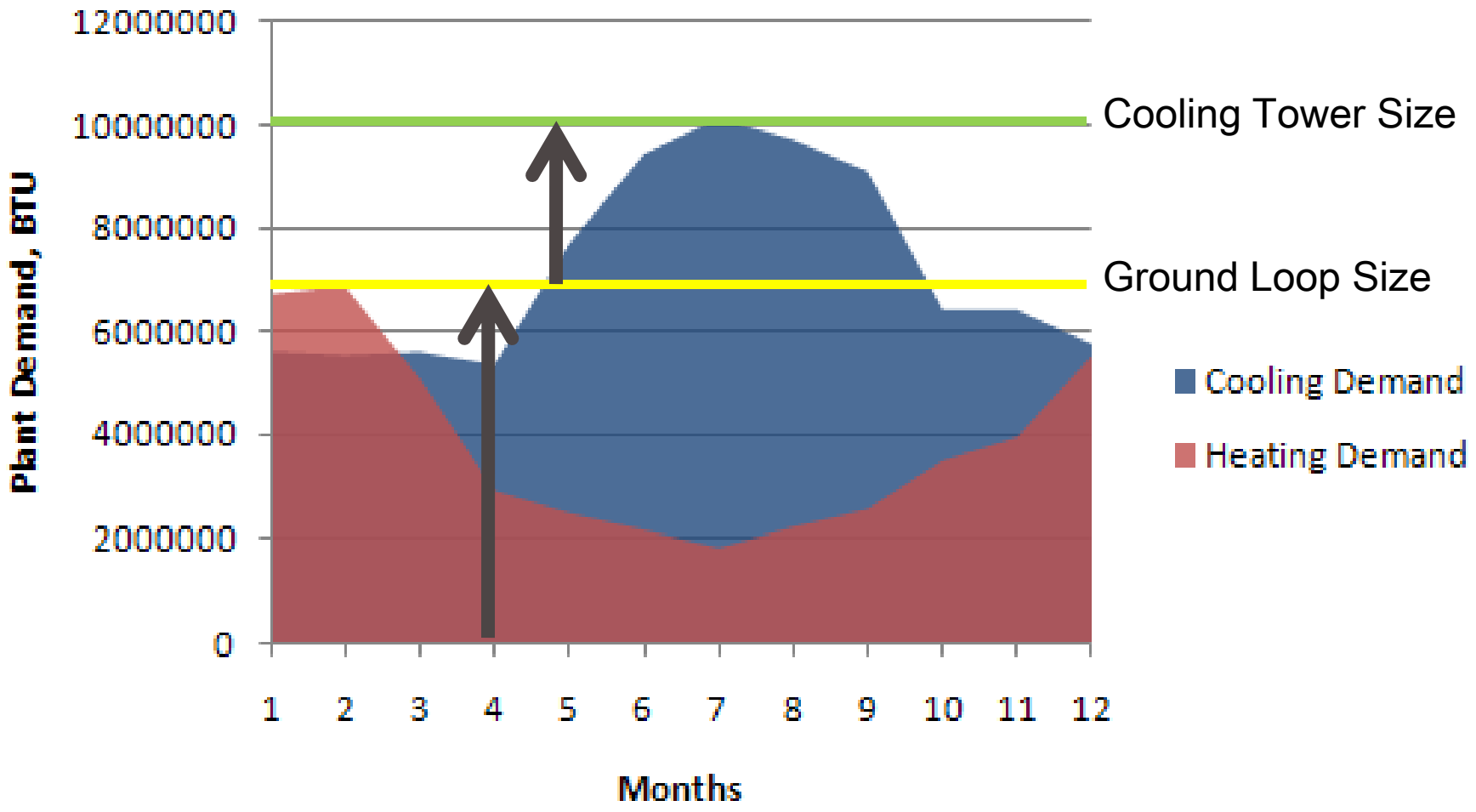
Hybrid GSHP Sizing



Hybrid GSHP

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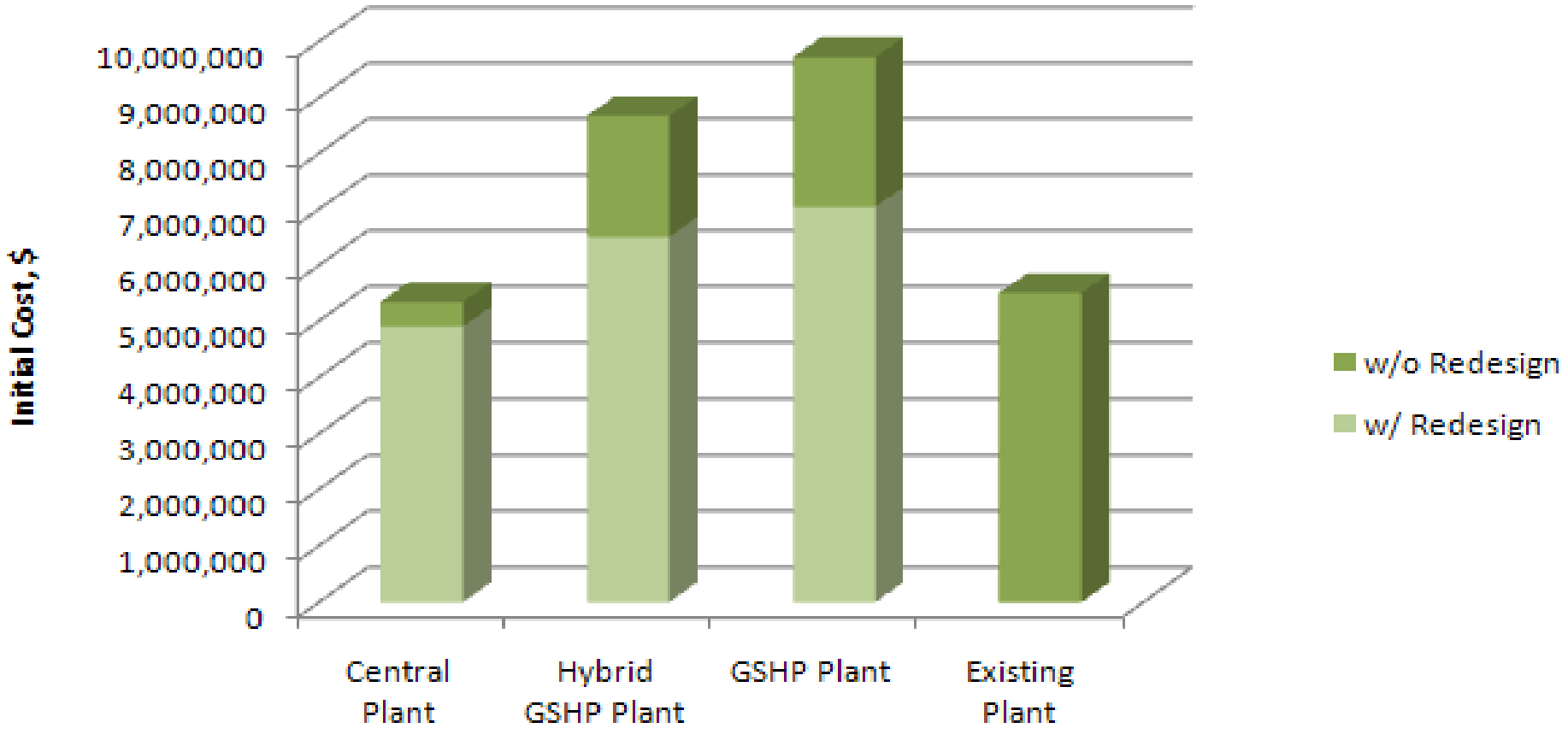
Plant Initial Cost



Plant Analysis

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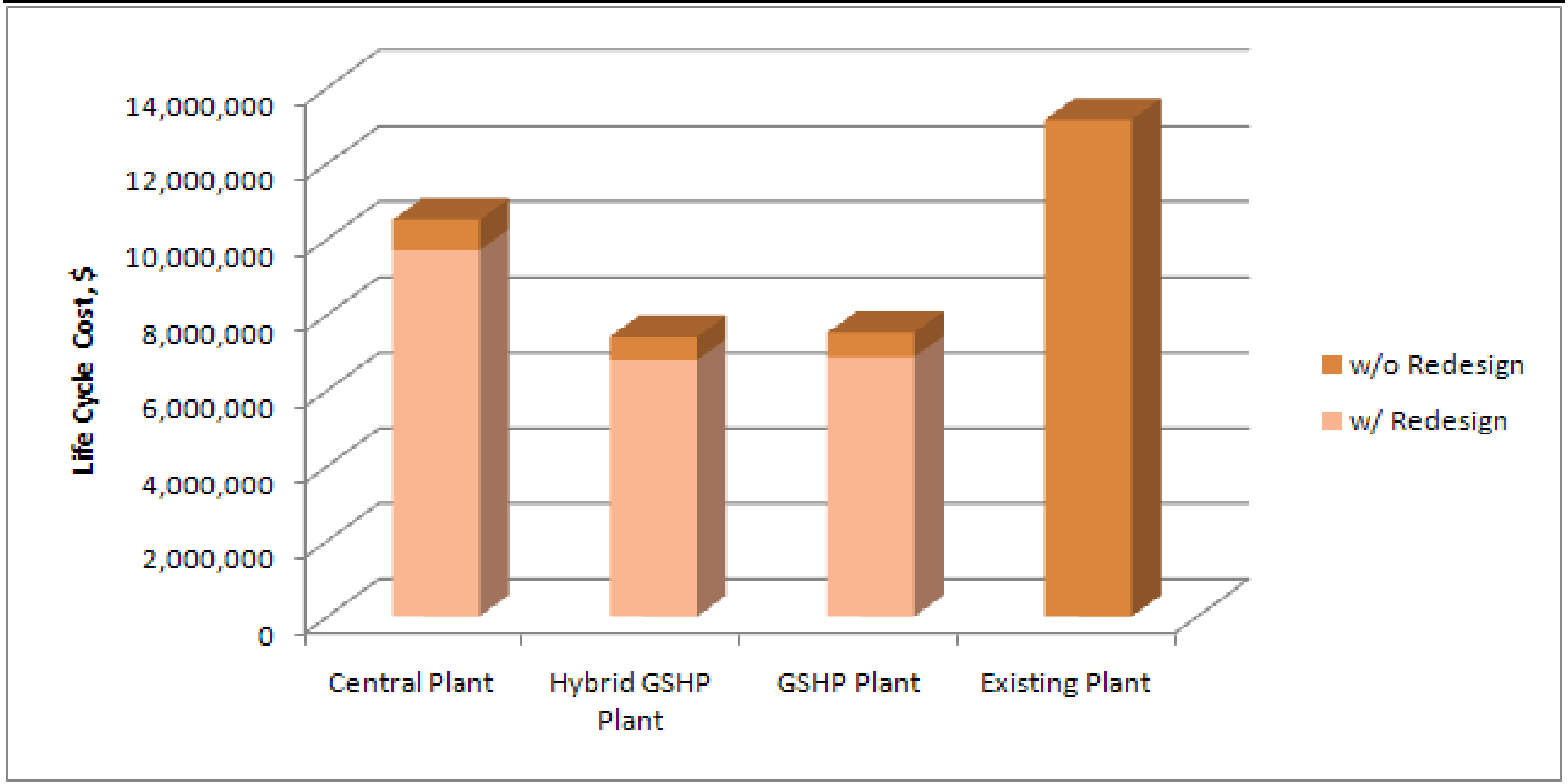
Plant Lifecycle Cost



Plant Analysis

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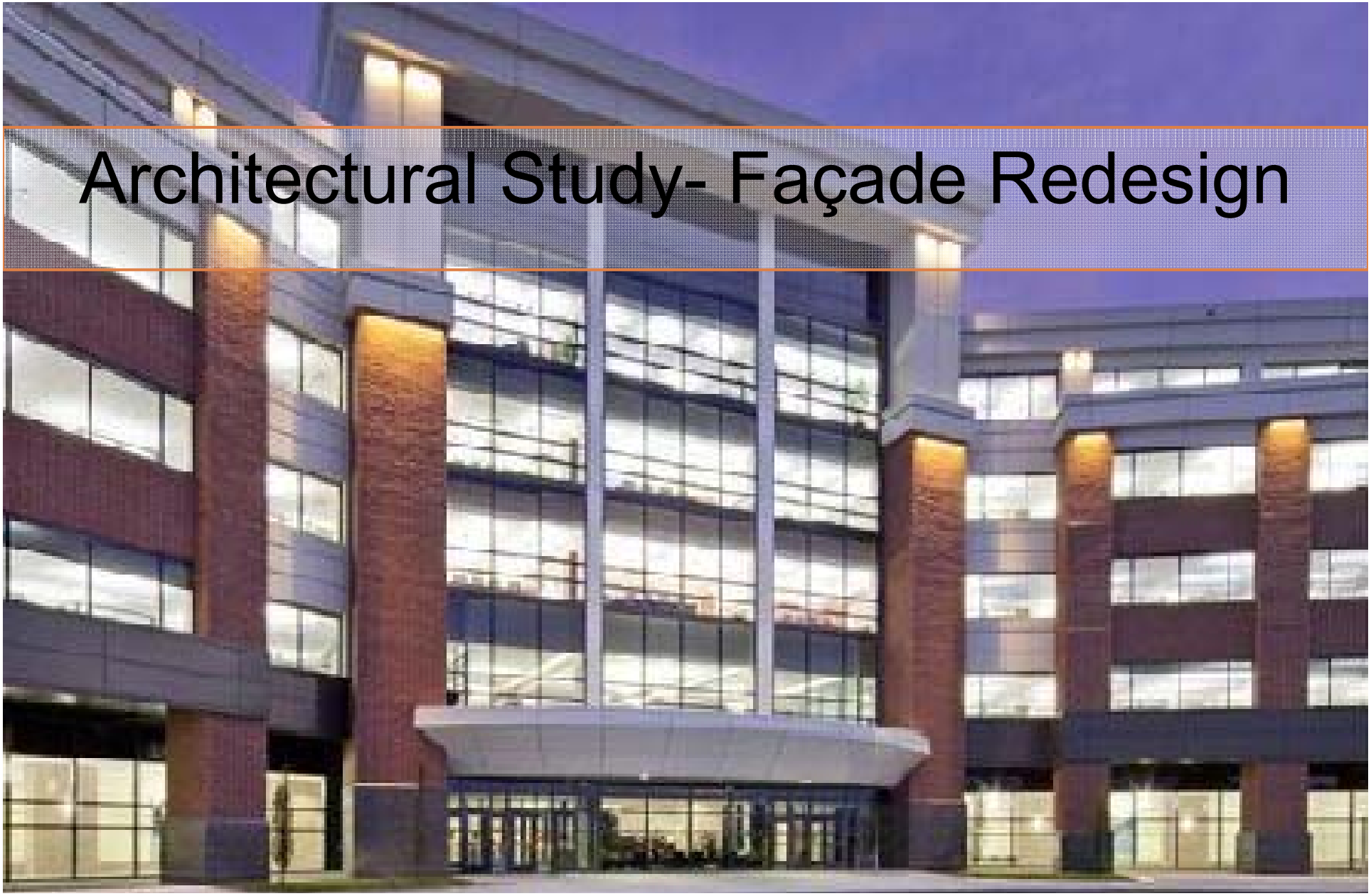
Architectural Study- Façade Redesign



Architecture

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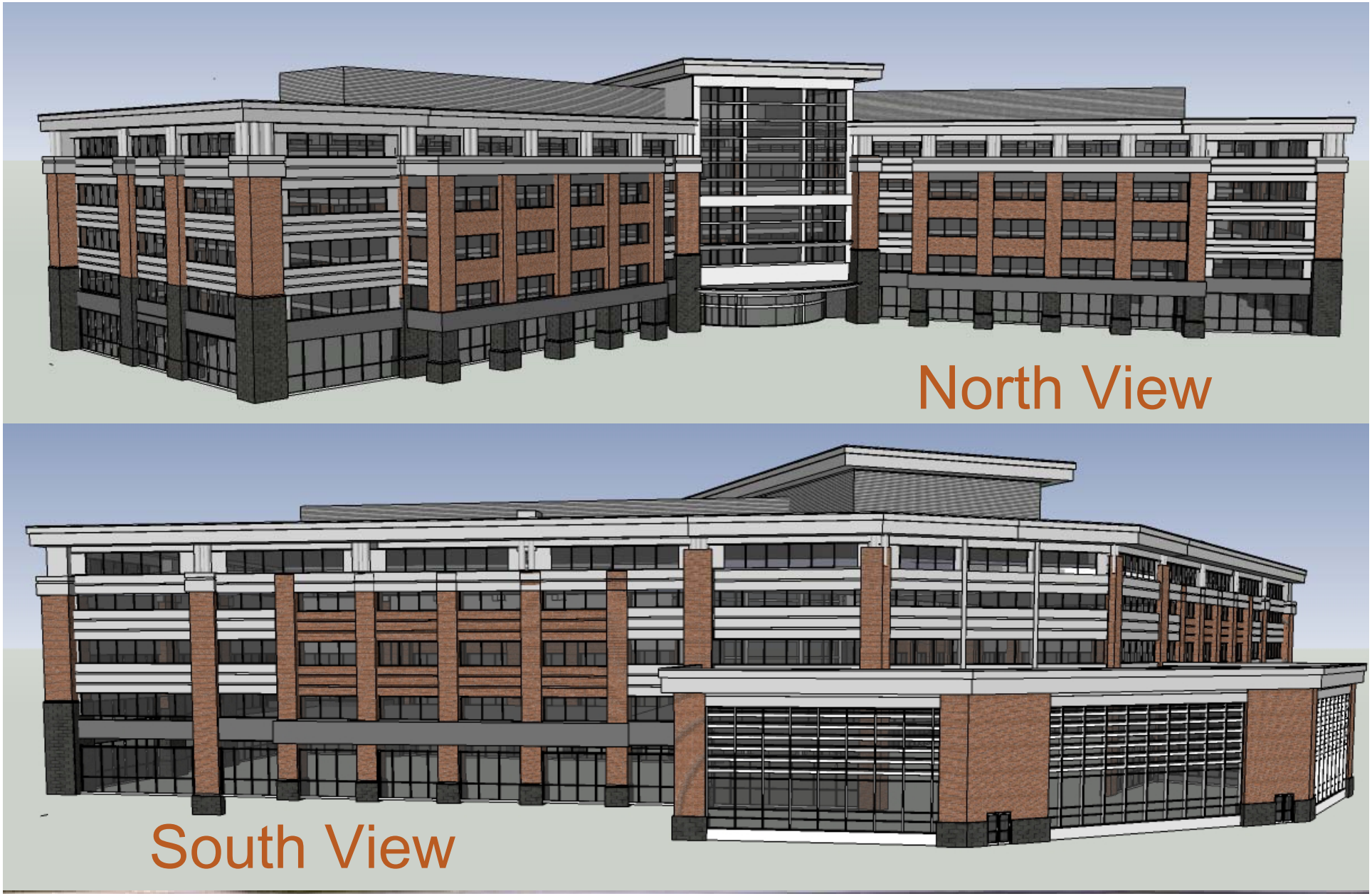

Architecture

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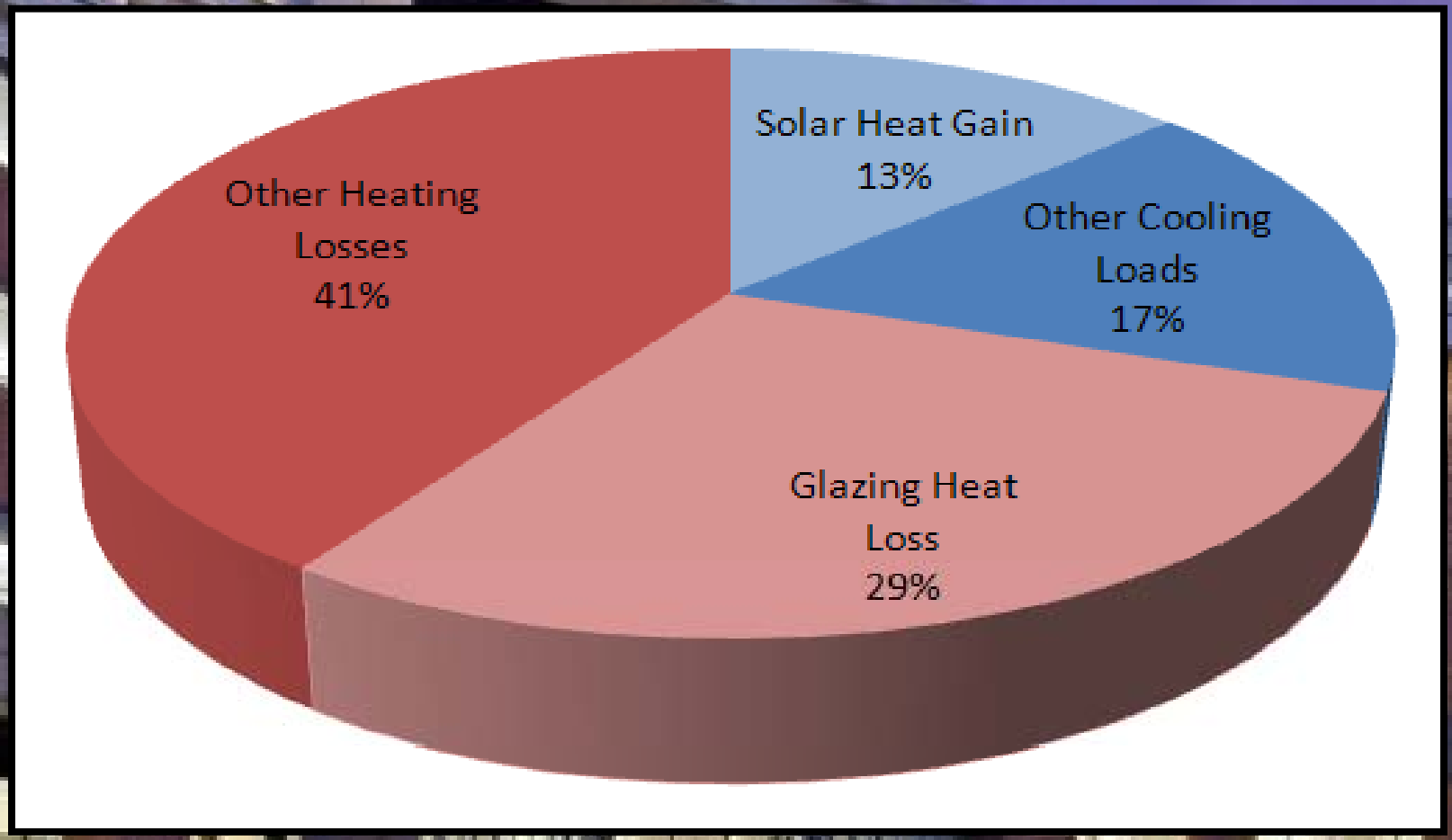
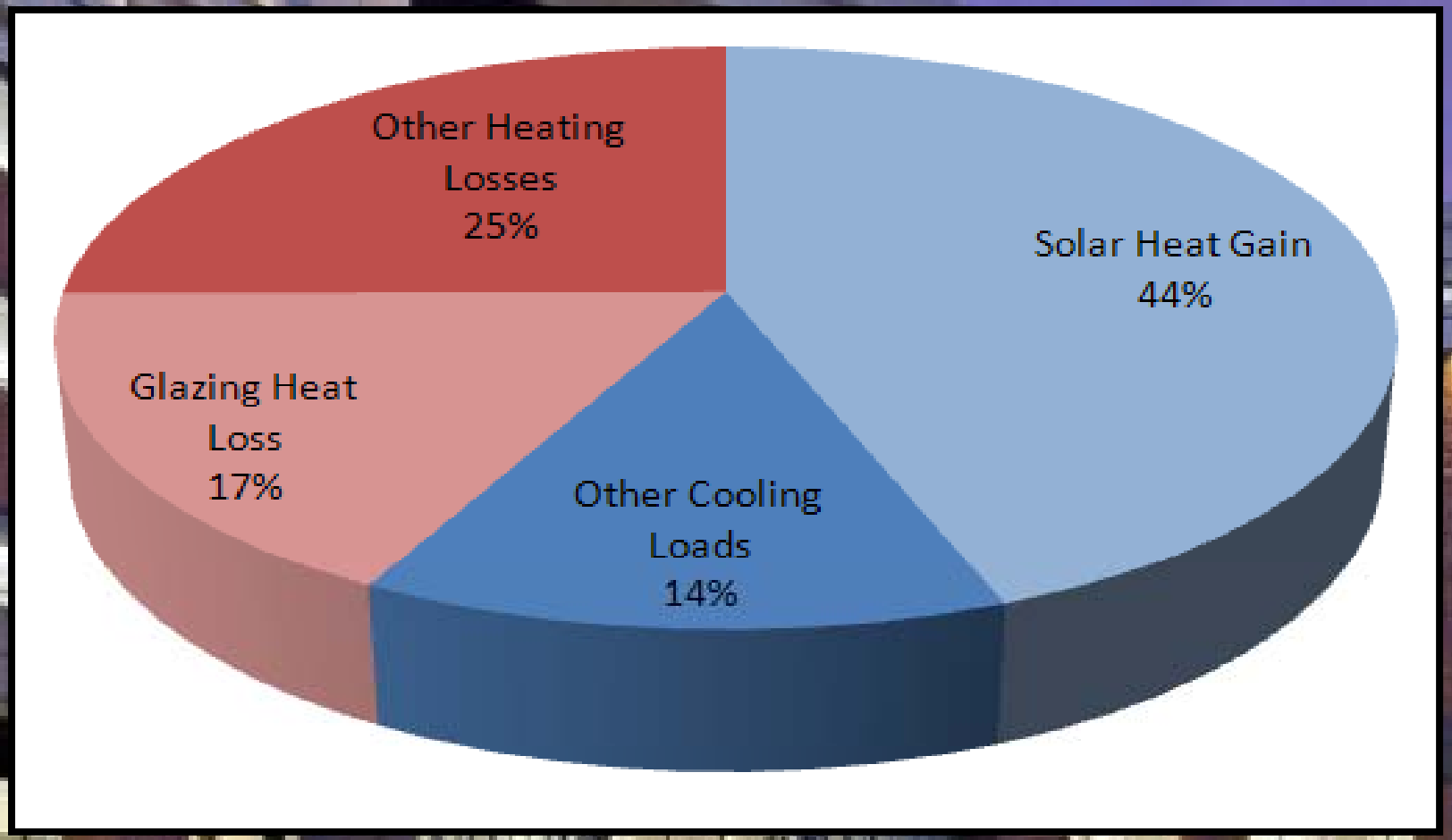
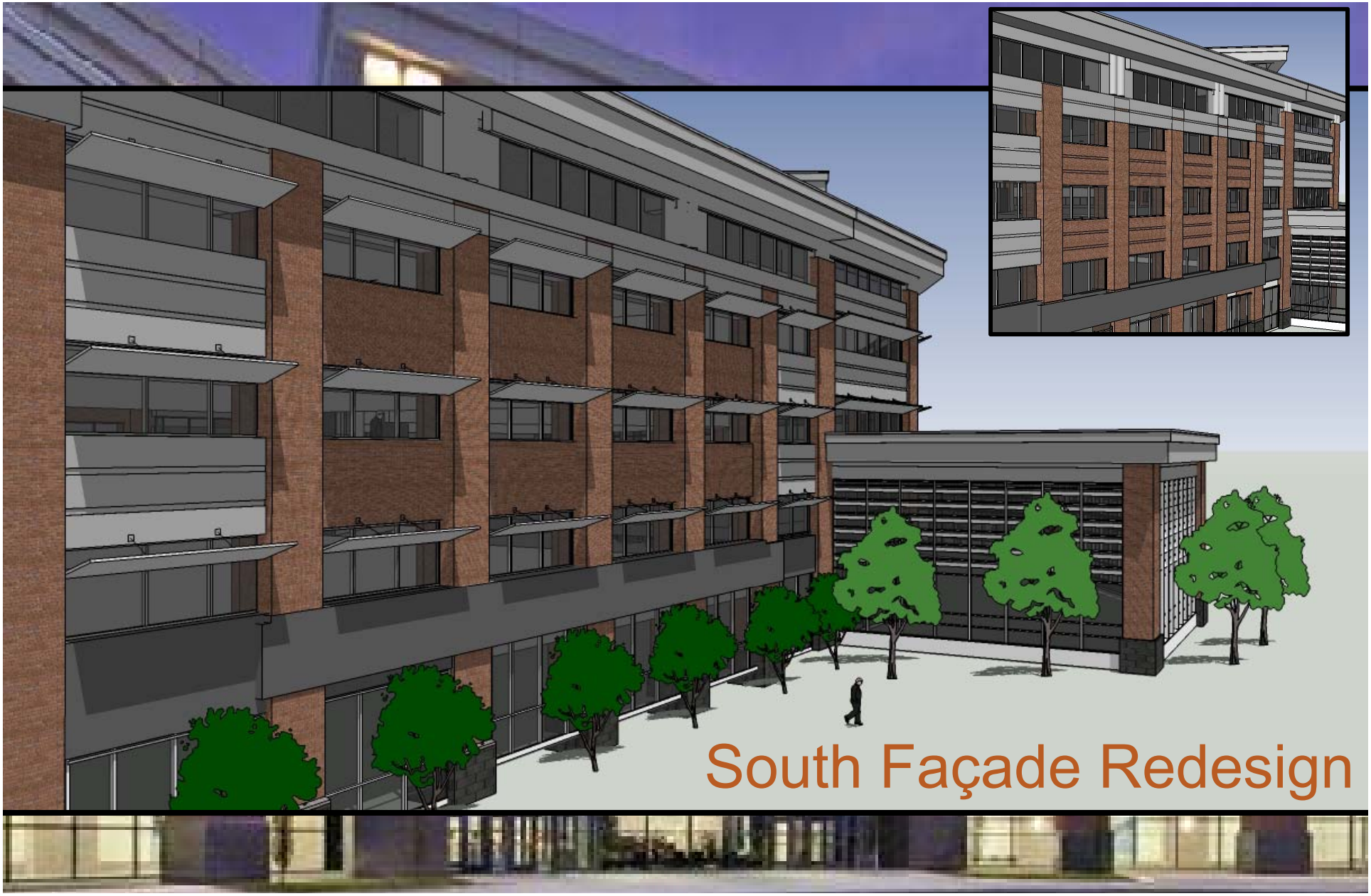
North Office Area Thermal Loading



South Office Area Thermal Loading





Architecture

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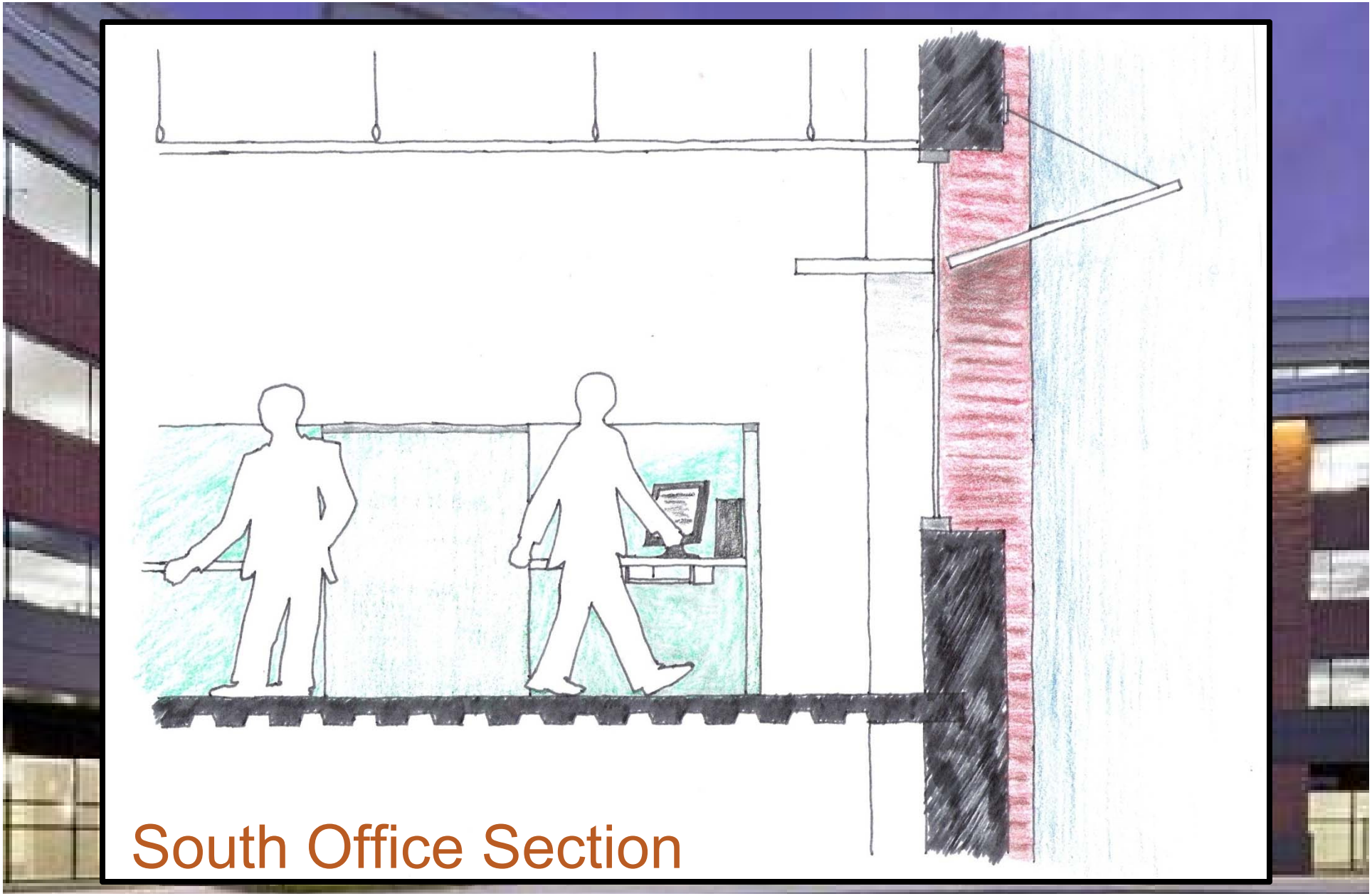

South Office Section

Architecture

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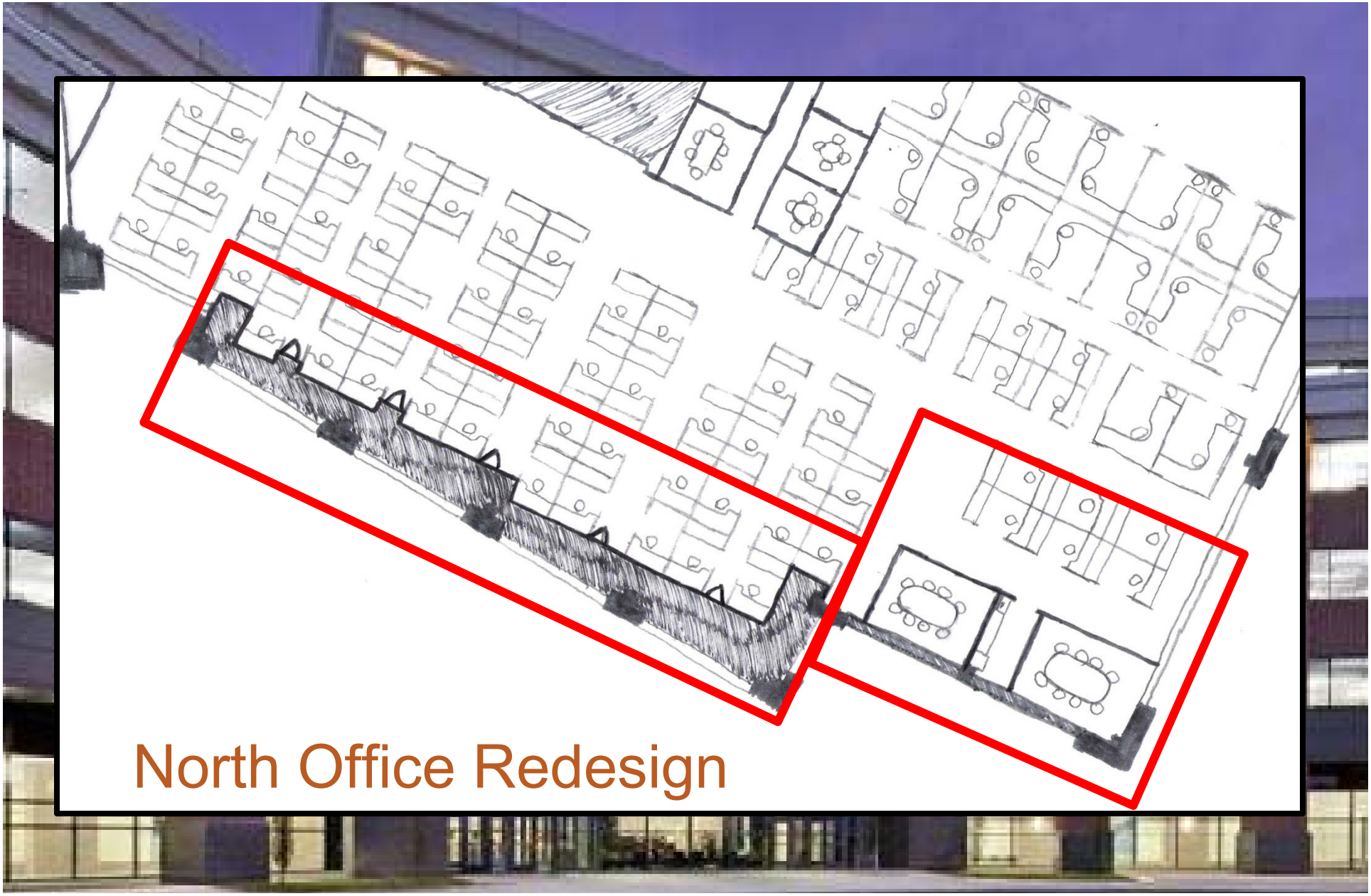

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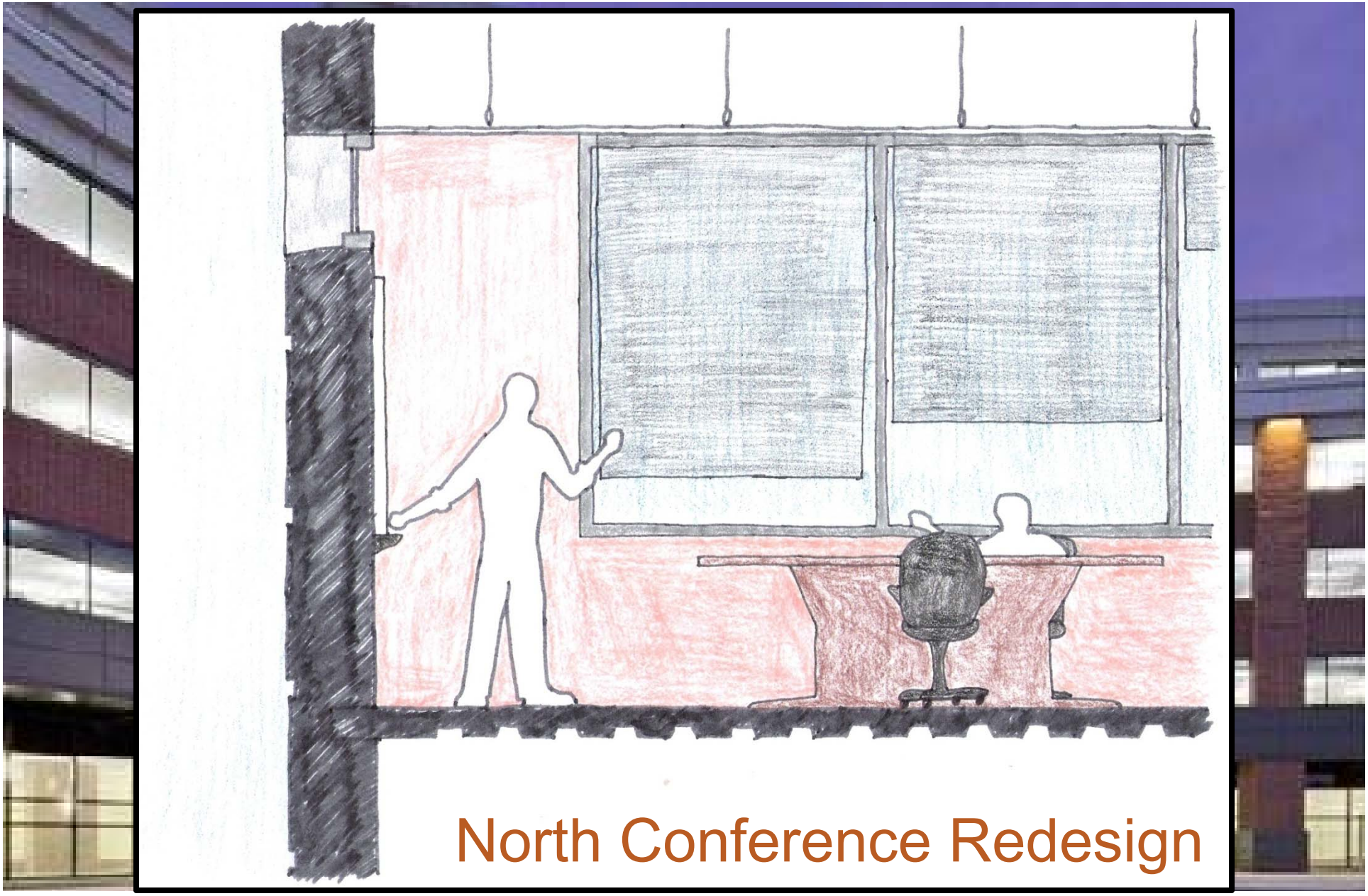

North Conference Redesign

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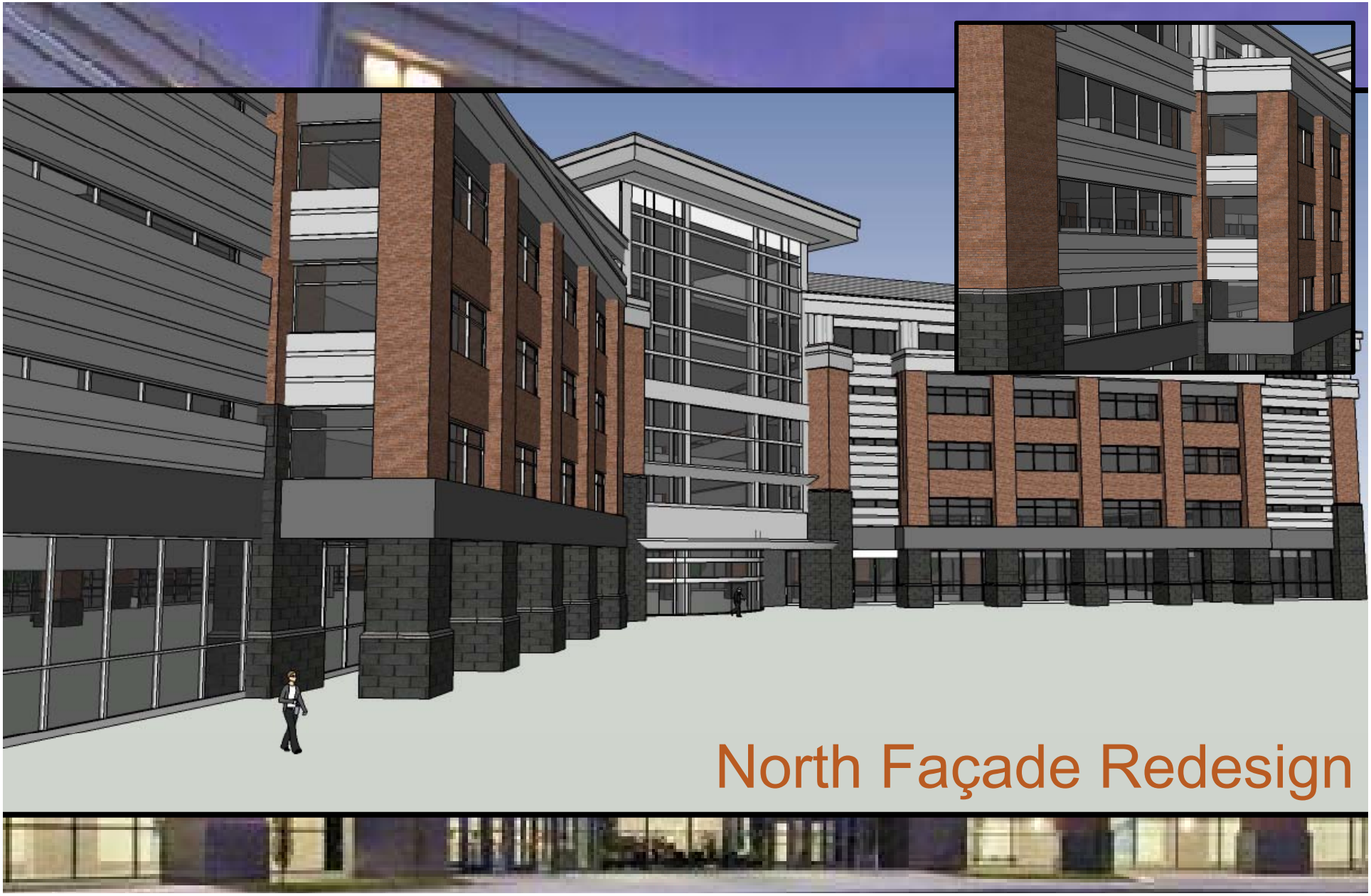

Architecture

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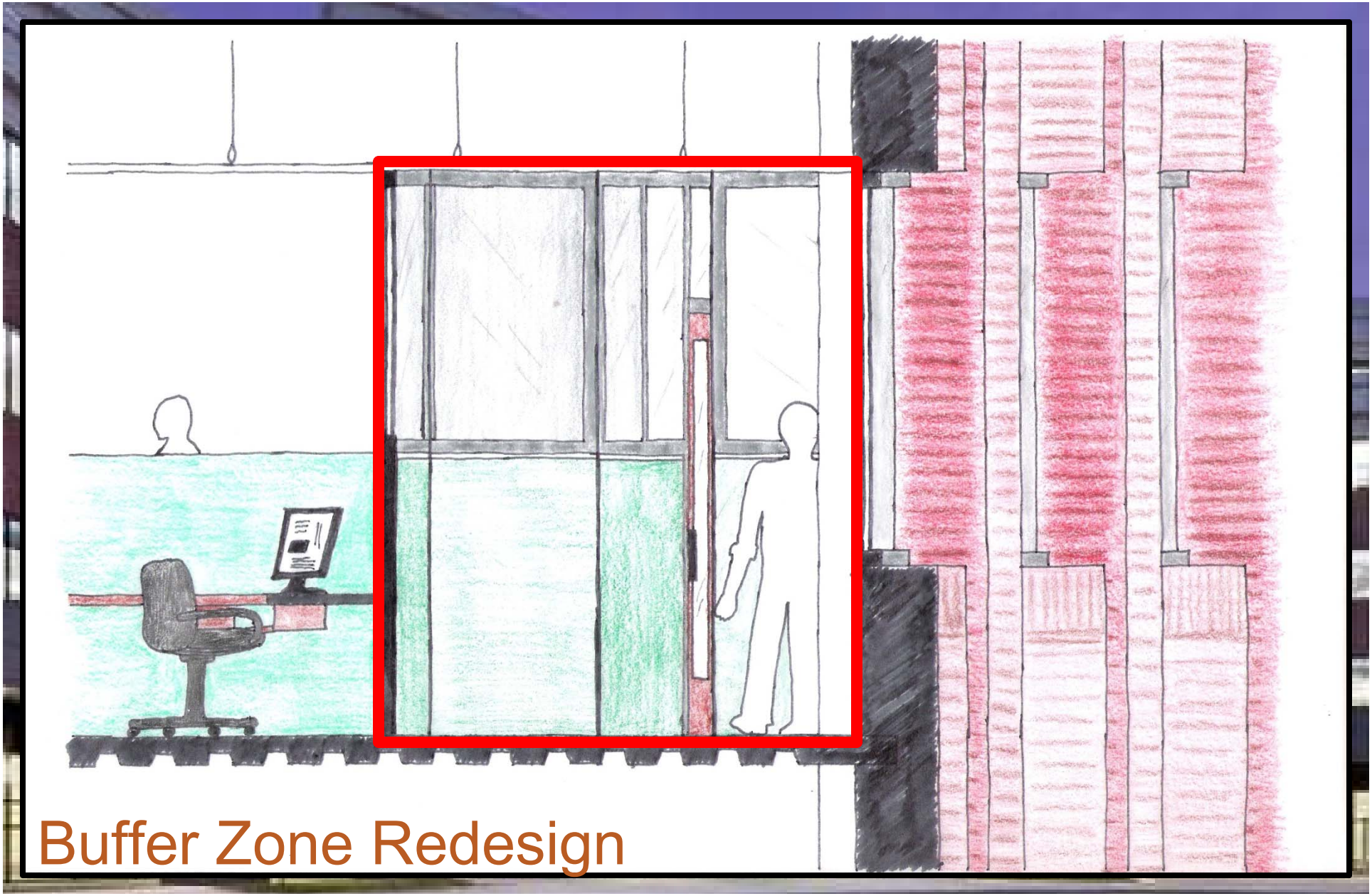

Buffer Zone Redesign

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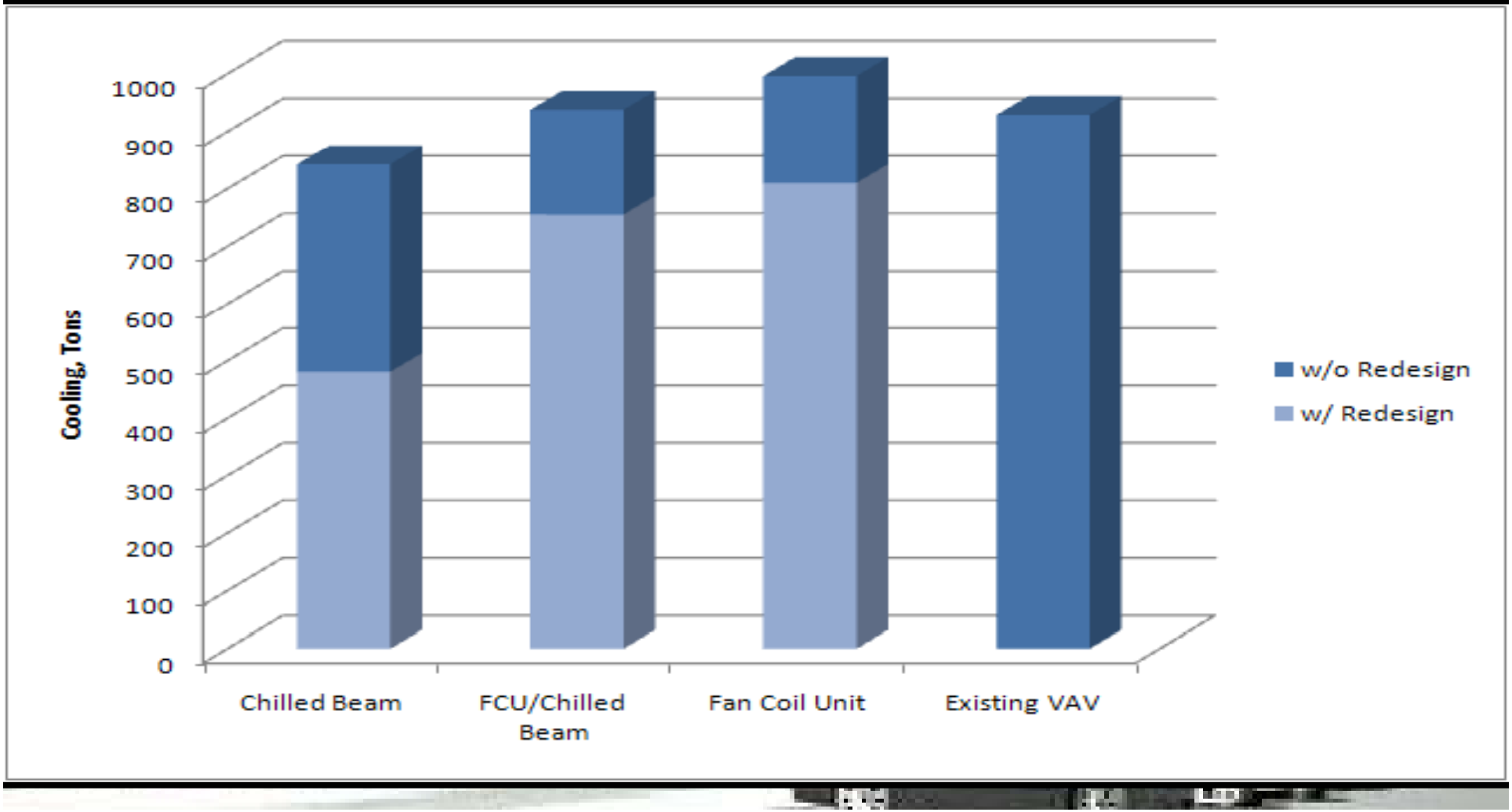
Plant Impact



Architecture

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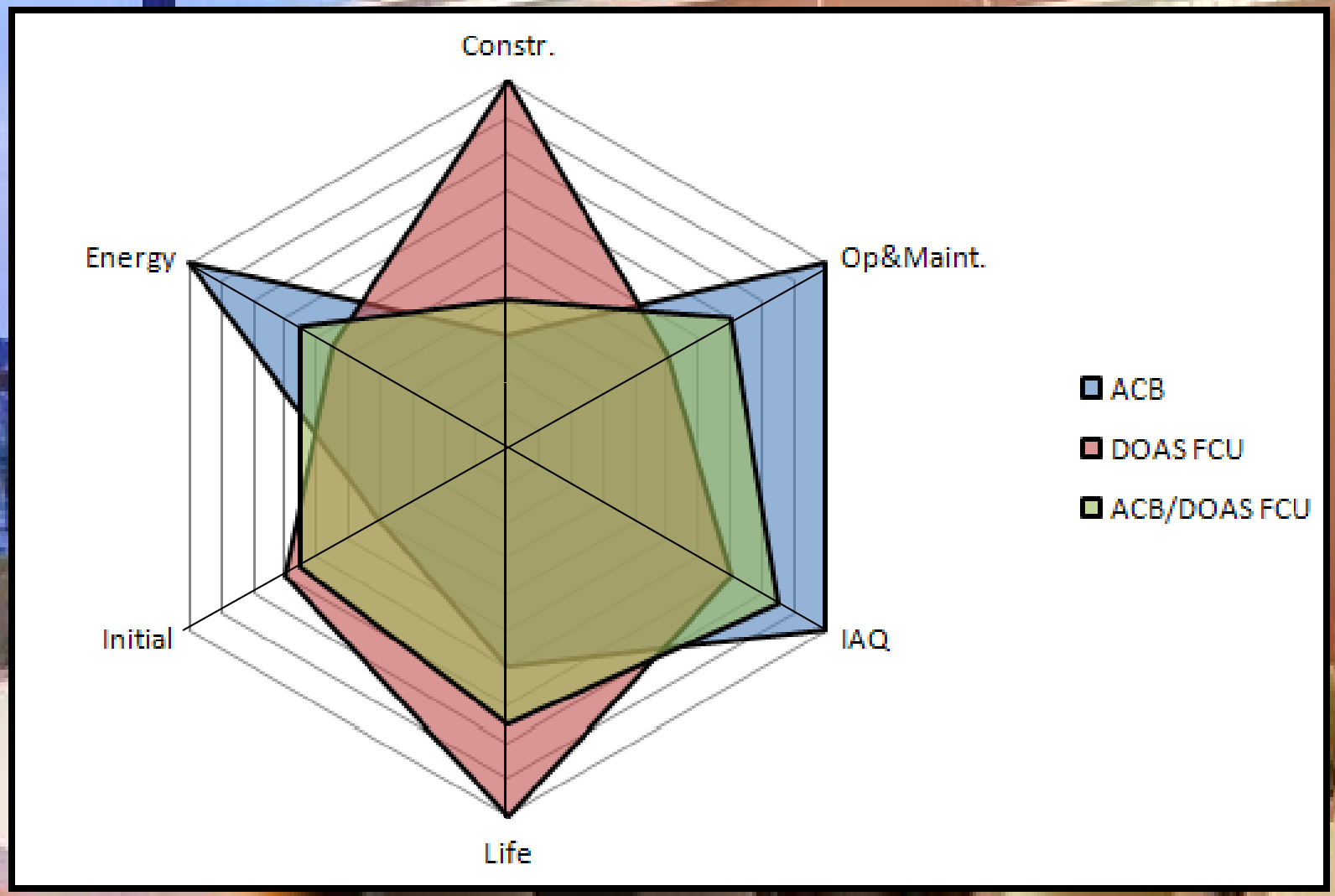
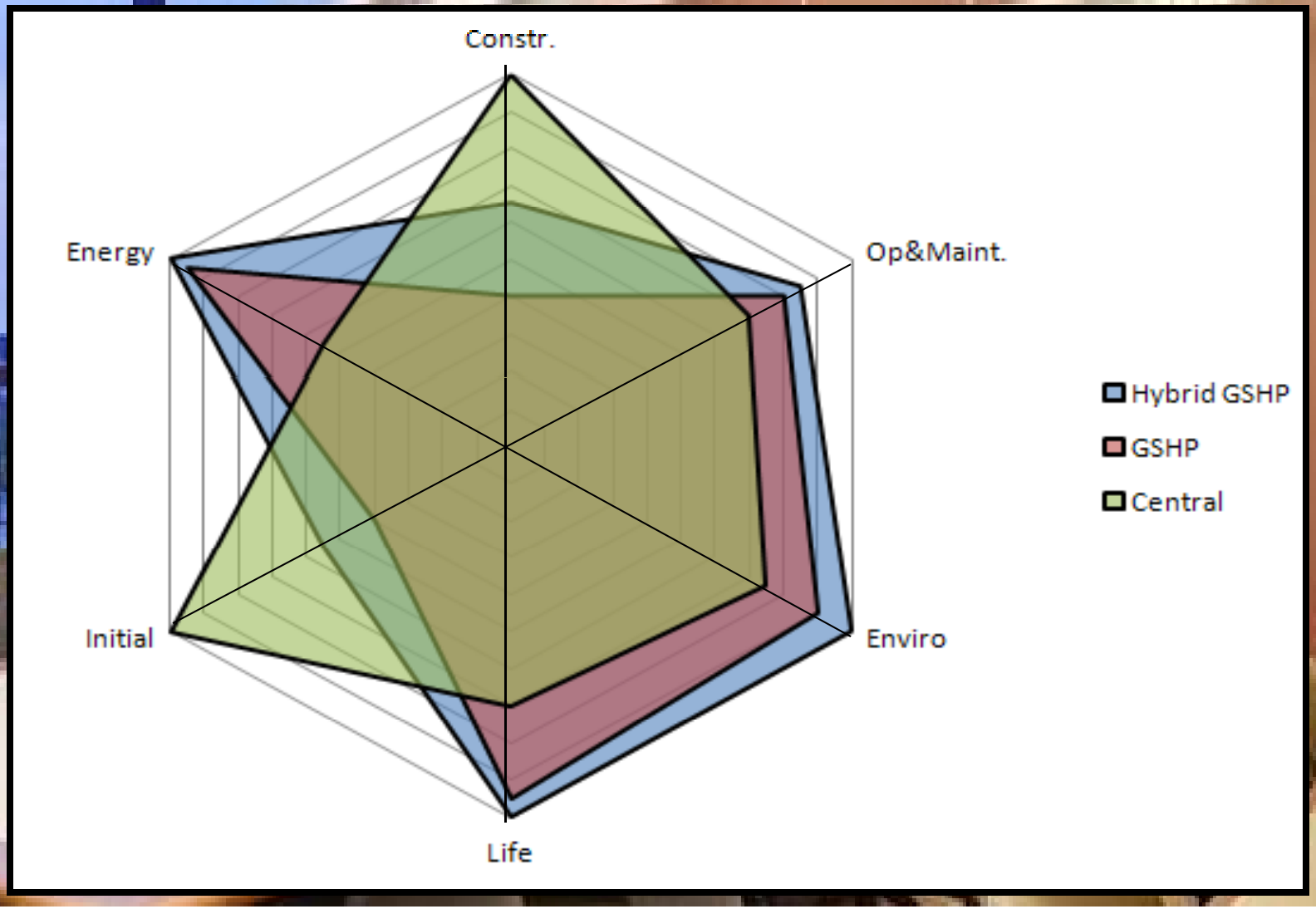
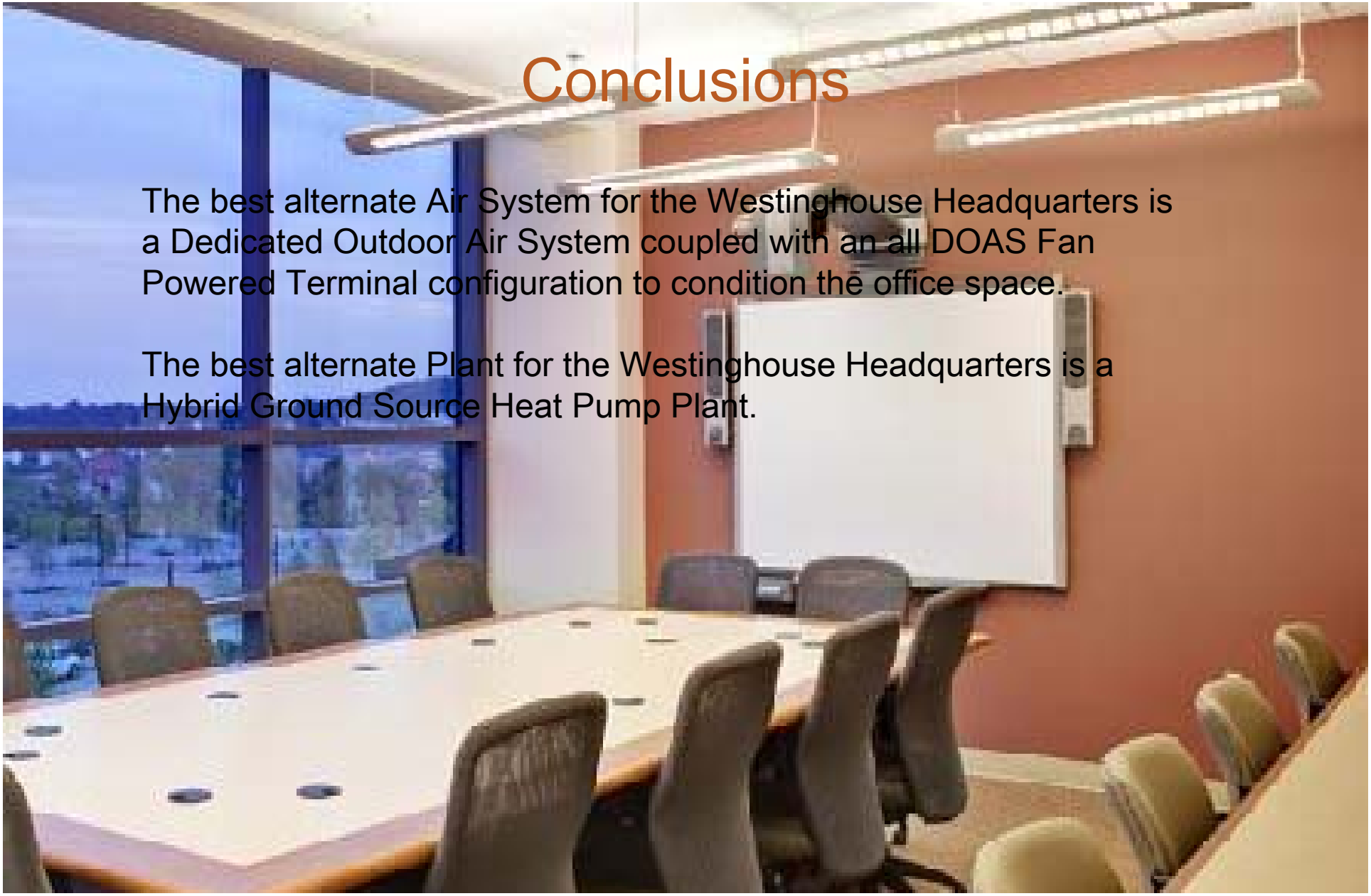
Conclusions

Conclusions: Air Systems



Conclusions: Mechanical Plant





Conclusions

The best alternate Air System for the Westinghouse Headquarters is a Dedicated Outdoor Air System coupled with an all DOAS Fan Powered Terminal configuration to condition the office space.

The best alternate Plant for the Westinghouse Headquarters is a Hybrid Ground Source Heat Pump Plant.

Thank You...

Professor Bahnfleth

Professor Freihaut

Professor Holland

Bob Hennessey, Turner Construction

Ernie Tillman, LLI Engineering

Joel R. Bernard, IKM Inc.

Special Thanks to all my friends and family for their support!

Questions ?

Daniel Aughenbaugh
Mechanical Option

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