APTA Annual Presentation

09.26.18

Future-Proofing Facilities for Resiliency and Future Technologies

Stantec

Definitions

in·no·va·tion

- a new method, idea, product, etc.
- the action or process of innovating.

re·sil·ien·cy

- the power or ability to return to the original form, position, etc., after being bent, compressed, or stretched; elasticity.
- ability to recover readily from illness, depression, adversity, or the like; buoyancy.

Facilities

Return on Investment

Better commun
More engag
Improved

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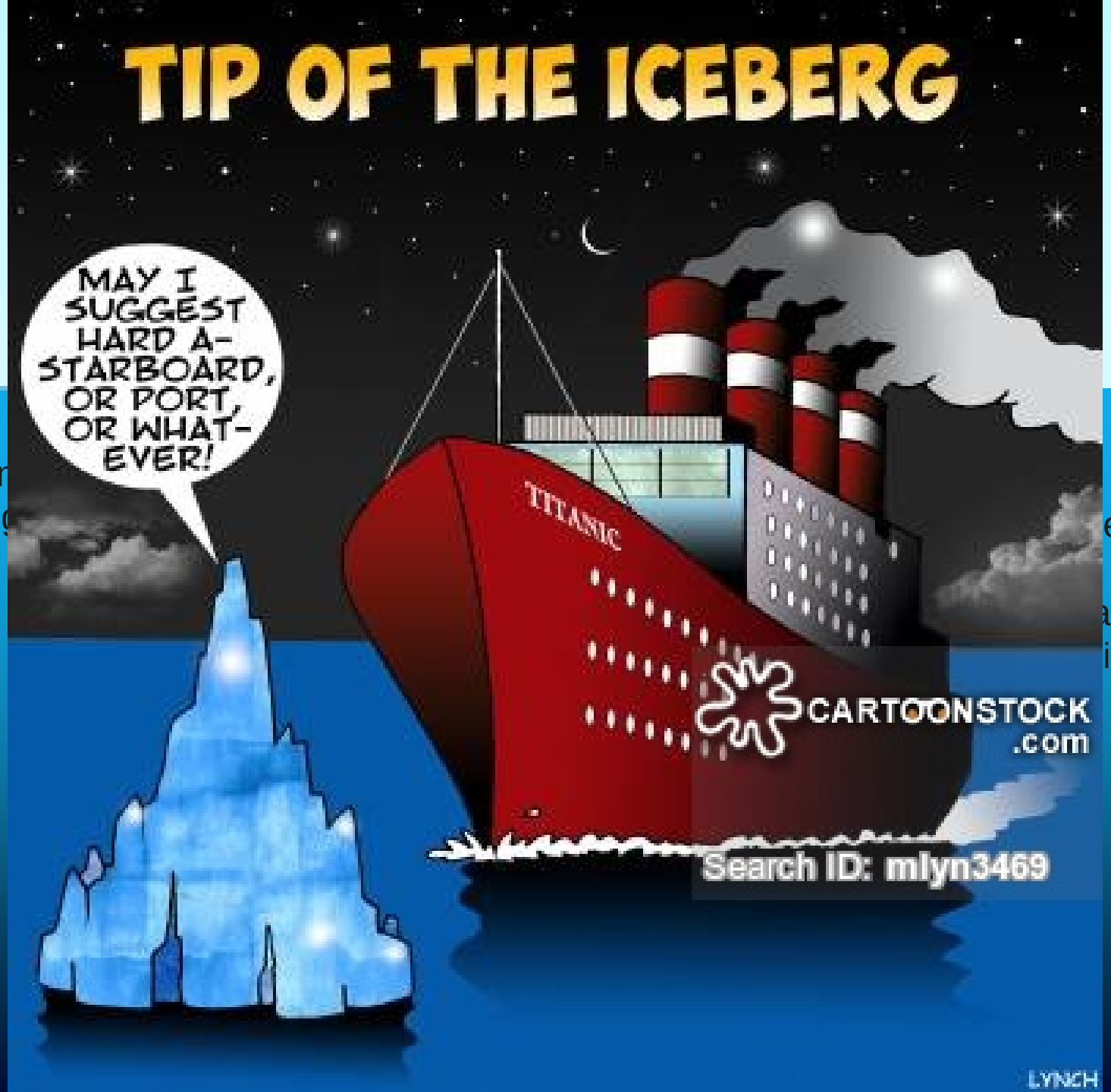


Employees

Value on Investment

- **Master Planning:**

  goal setting, site functionality, integration of new technologies, charrettes

- **Facility Planning:**

  people first, lighting strategies

- **Integration of Digital Design Analysis into the Design Process:**

  checks and balances, daylighting, energy modeling + LCCA

Presentation Outline

Evaluate the risks, maximize the opportunities

Why Transit Facilities?

- 24/7/365 facilities
- Reduced operating costs = improved transit service
- People + Facilities + Operations + Fleet Replacement = Overall Operating Costs

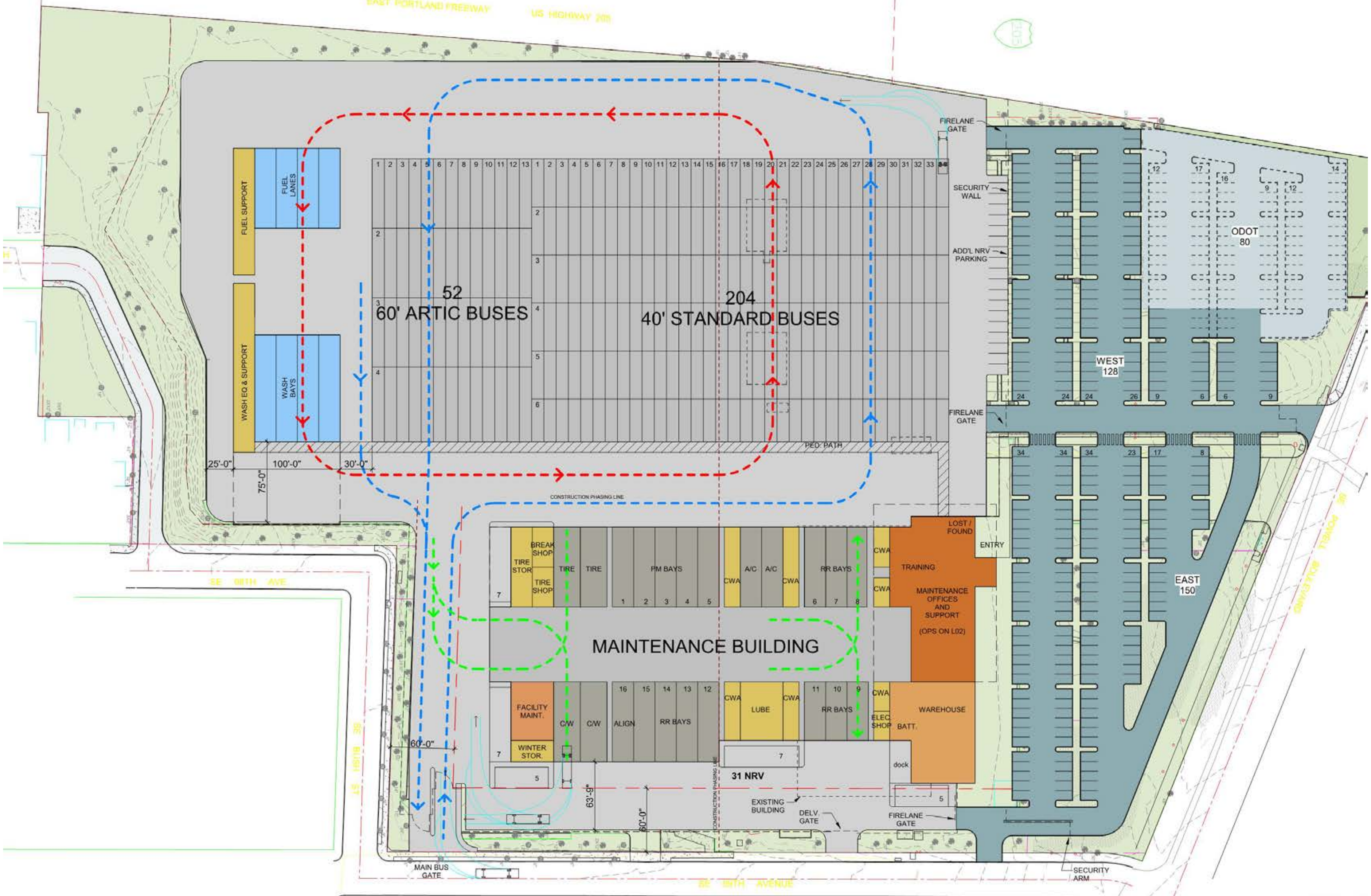
- **Happier, healthier, and safer employees = improved service delivery**

Goal Setting:
Design 2 Thrive

- Zero Energy
- Carbon Neutral
- Water Balance
- Materials Balance
- Zero Waste
- Land Balance
- Visionary
- Resilience
- Prosperity
- Happiness
- Beauty
- Health

Master Planning

Your master plan affect$ your operation, every day!



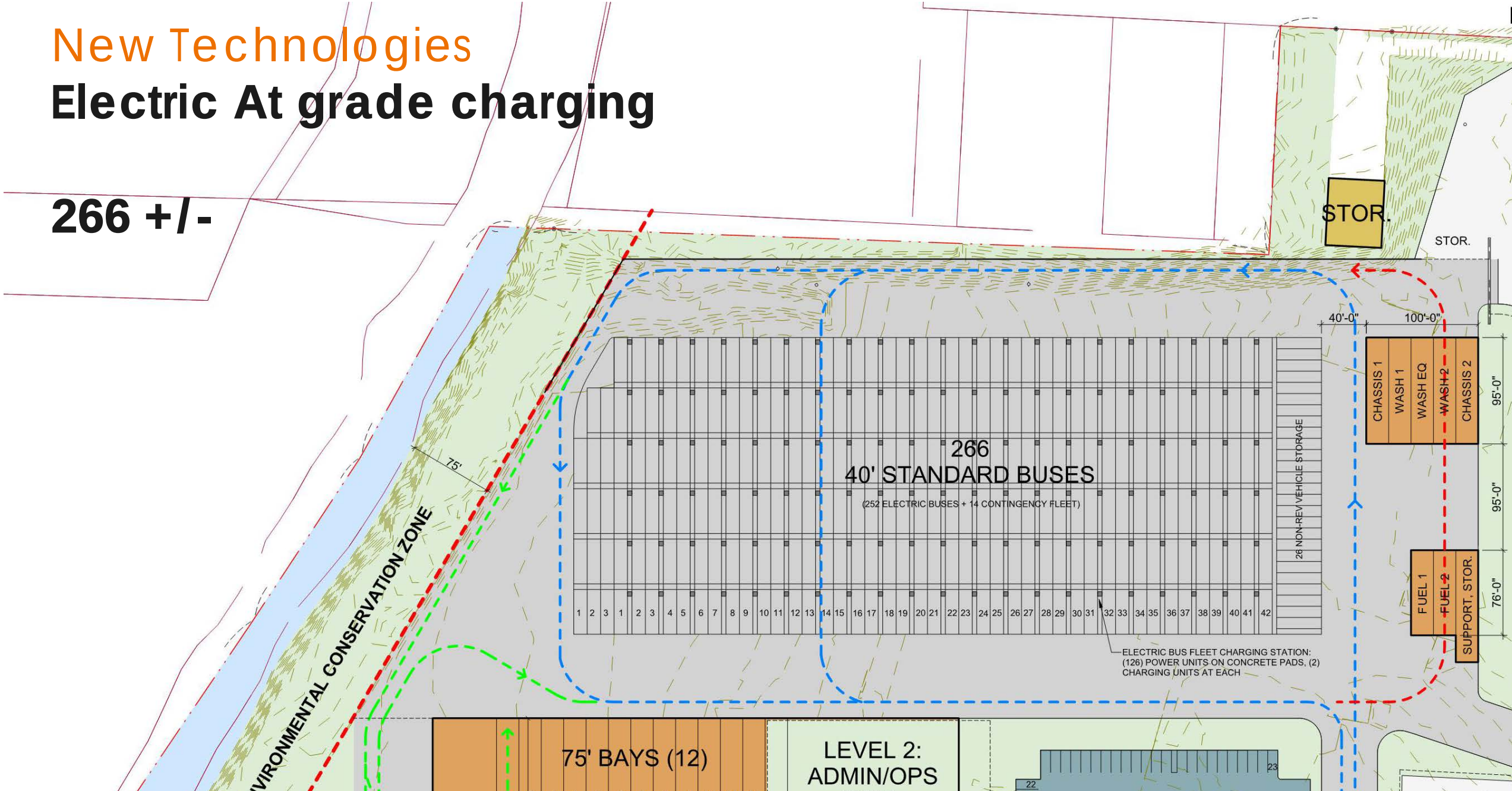
EAST PORTLAND FREEWAY
US HIGHWAY 205
FUEL SUPPORT
FUEL LANES
WASH EQ & SUPPORT
WASH BAYS
52
60' ARTIC BUSES
204
40' STANDARD BUSES
PED. PATH
25'-0"
100'-0"
30'-0"
75'-0"
CONSTRUCTION PHASING LINE
FIRELANE GATE
SECURITY WALL
ADD'L NRV PARKING
ODOT 80
WEST 128
EAST 150
LOST / FOUND
ENTRY
TRAINING
MAINTENANCE OFFICES AND SUPPORT
(OPS ON L02)
WAREHOUSE
BATT.
ELEC. SHOP
dock
BREAK SHOP
TIRE STOR
TIRE SHOP
TIRE
PM BAYS
A/C
CWA
RR BAYS
MAINTENANCE BUILDING
FACILITY MAINT.
WINTER STOR.
C/W
ALIGN
LUBE
31 NRV
60'-0"
63'-9"
EXISTING BUILDING
DELV. GATE
MAIN BUS GATE
SECURITY ARM
SE 98TH AVE
SE BUSH ST
SE POWELL BOULEVARD

Site Design – Vehicle and Pedestrian Flow

New Technologies

Electric At grade charging

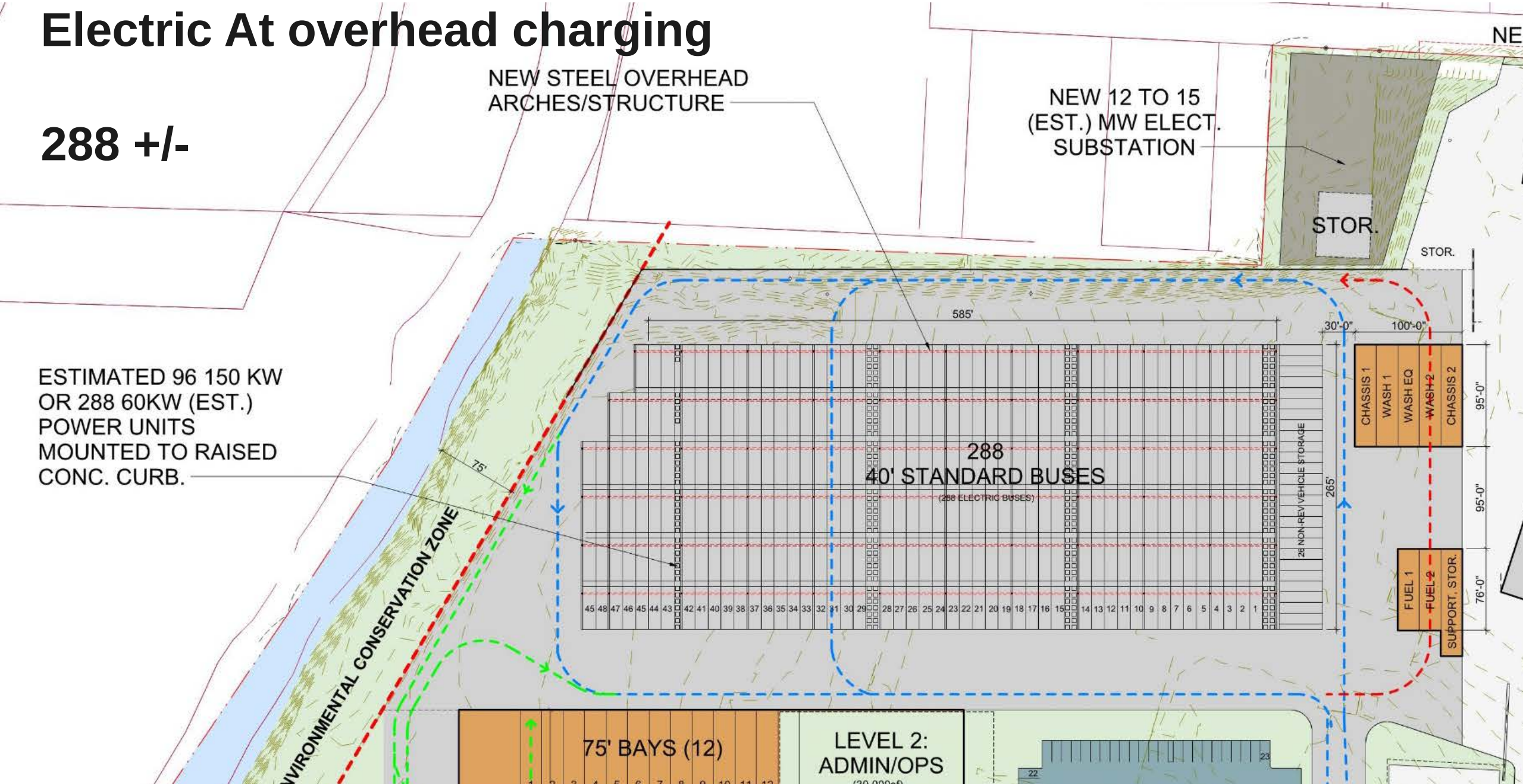
266 +/-



New Technologies

Electric At overhead charging

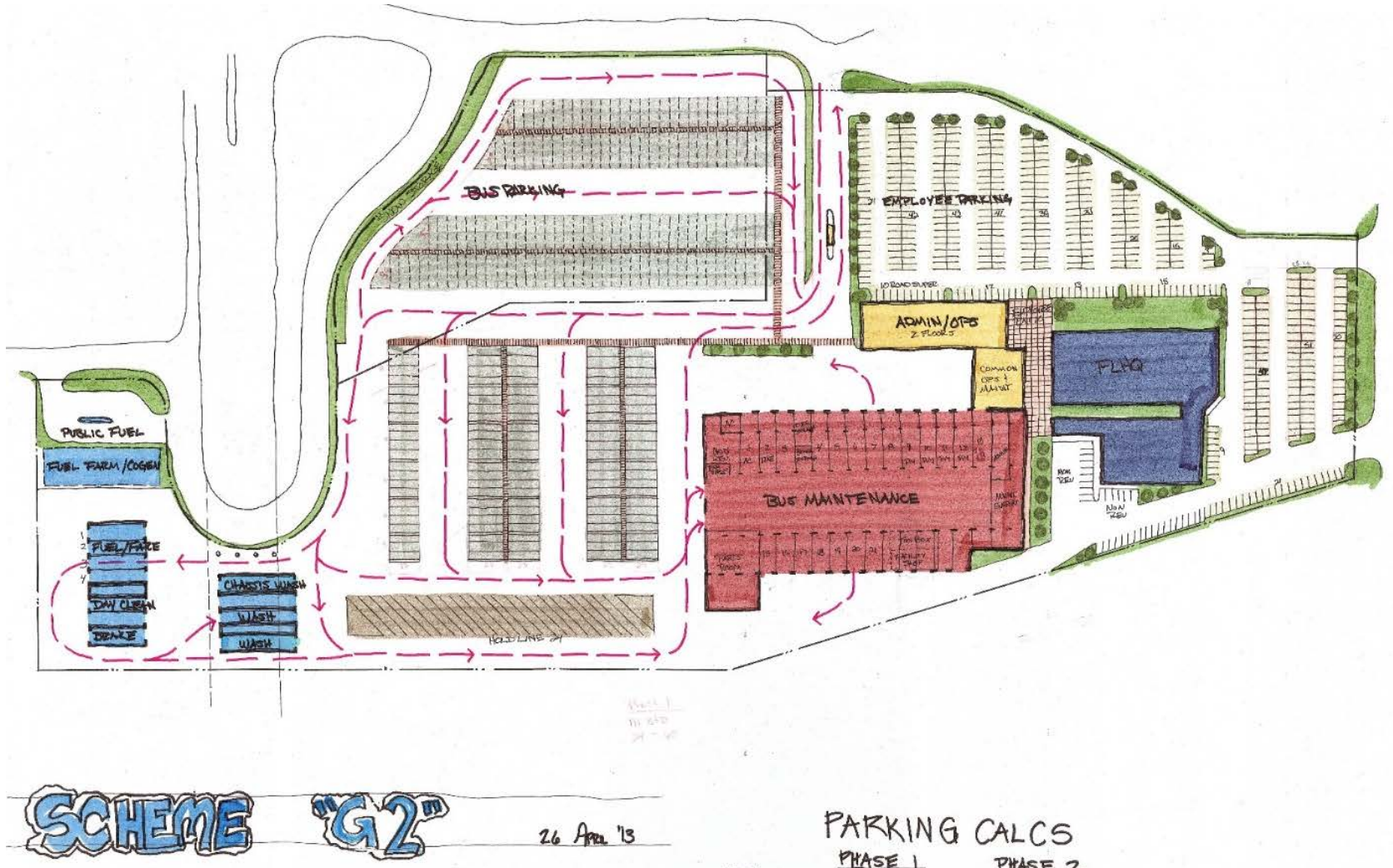
288 +/-



Strategies

Design Charrettes

- Engage Stakeholders
- Collaboration
- Security
- Vehicular Access
- Double deep vs. stacked parking configurations
- Building orientation
- Fleet and employee circulation
- Service cycle configuration
- Adjacencies
- Growth planning



No steps backward!

Strategies:

Functional Flow

- Covered vs heated
- Mixed fleet potential
- Electrification

Facility Planning

People First

Light and Health

“If light were a drug, I’m not sure the FDA would approve it.”

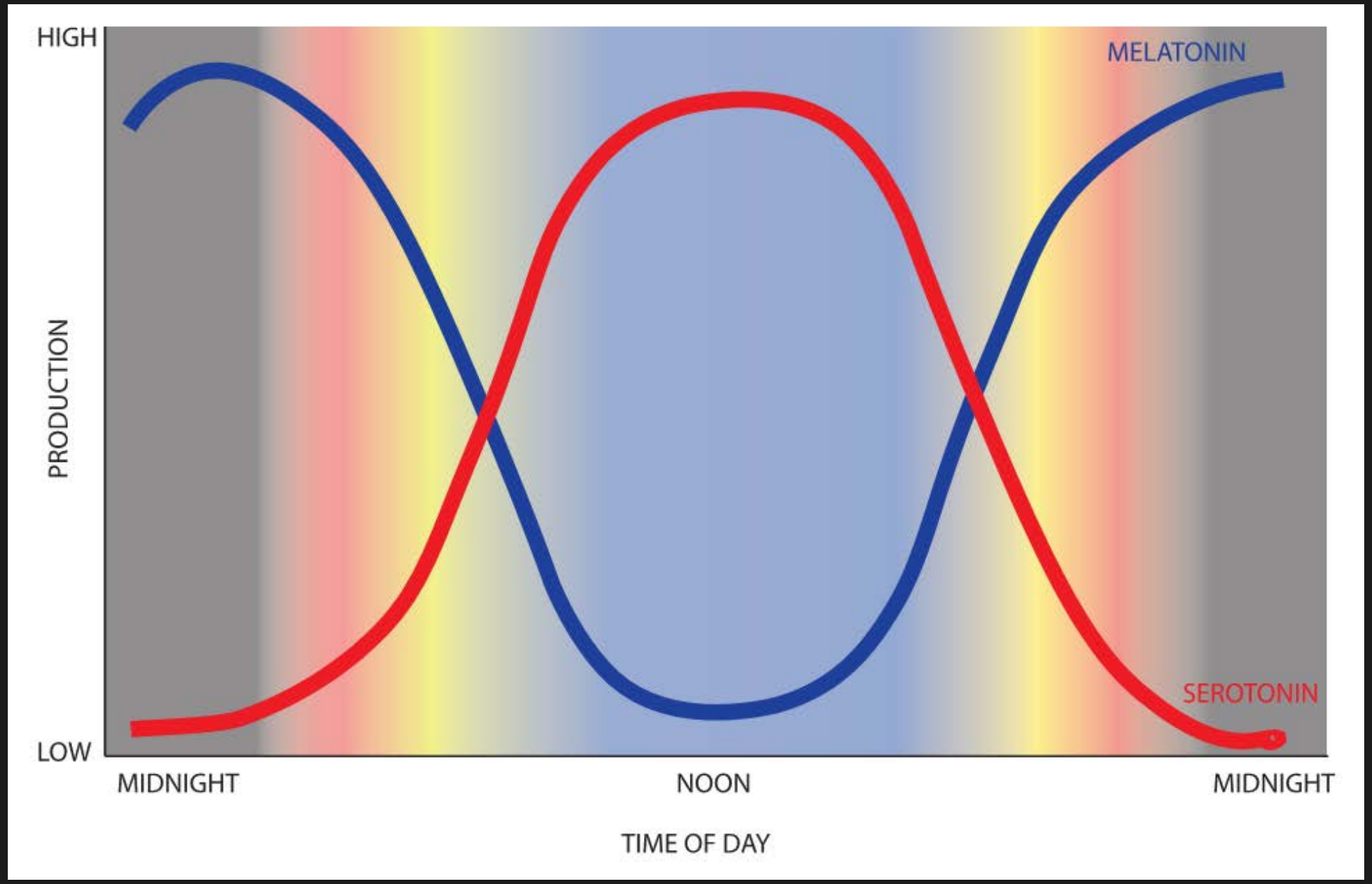
Charles A. Czeisler, PhD, MD, FRCP
Professor of Sleep Medicine
Harvard Medical School

Circadian Lighting

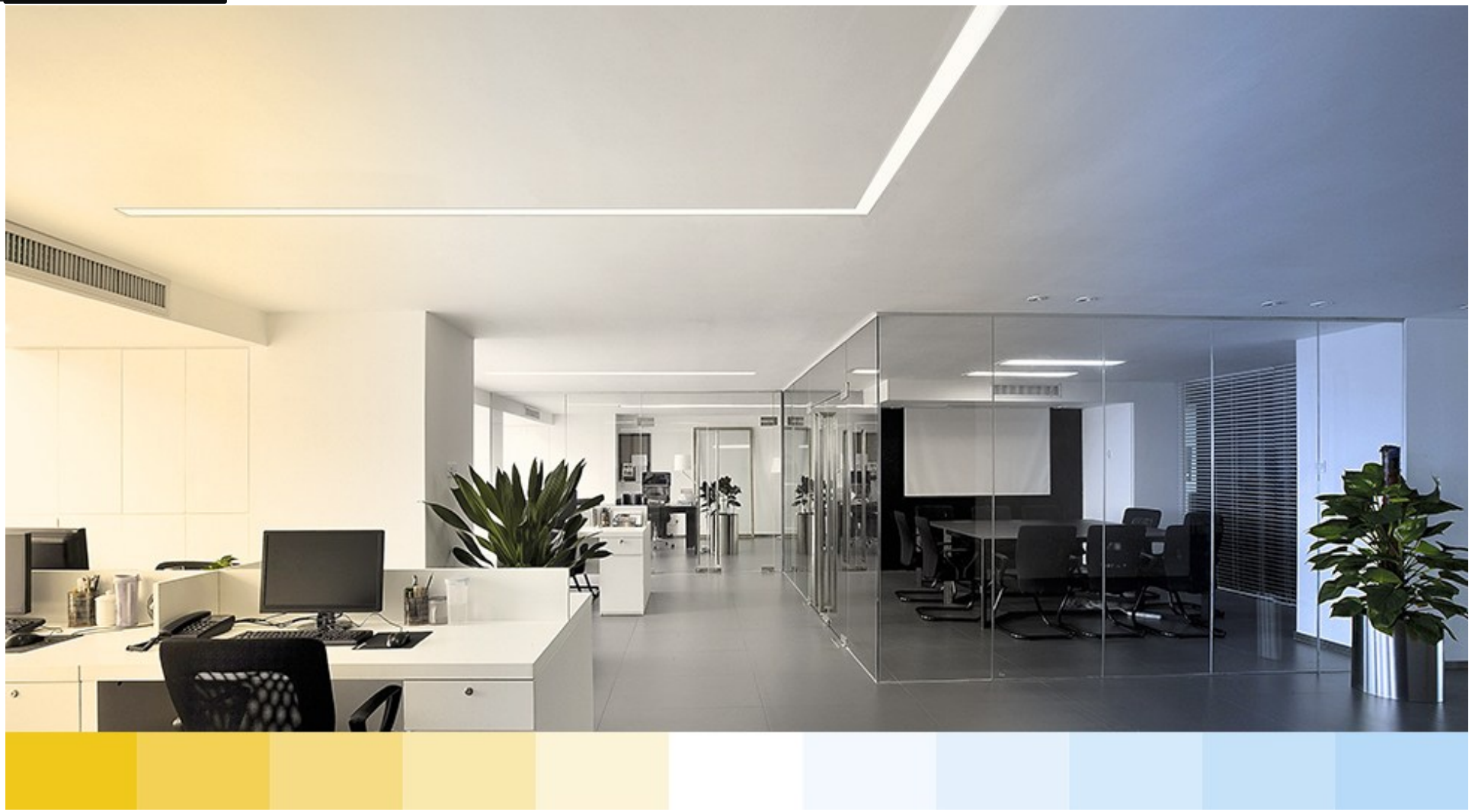
sleep habits and employee health

6
8
10
12
14
16
18
20
22
24
2
4

Melatonin, Serotonin & Light

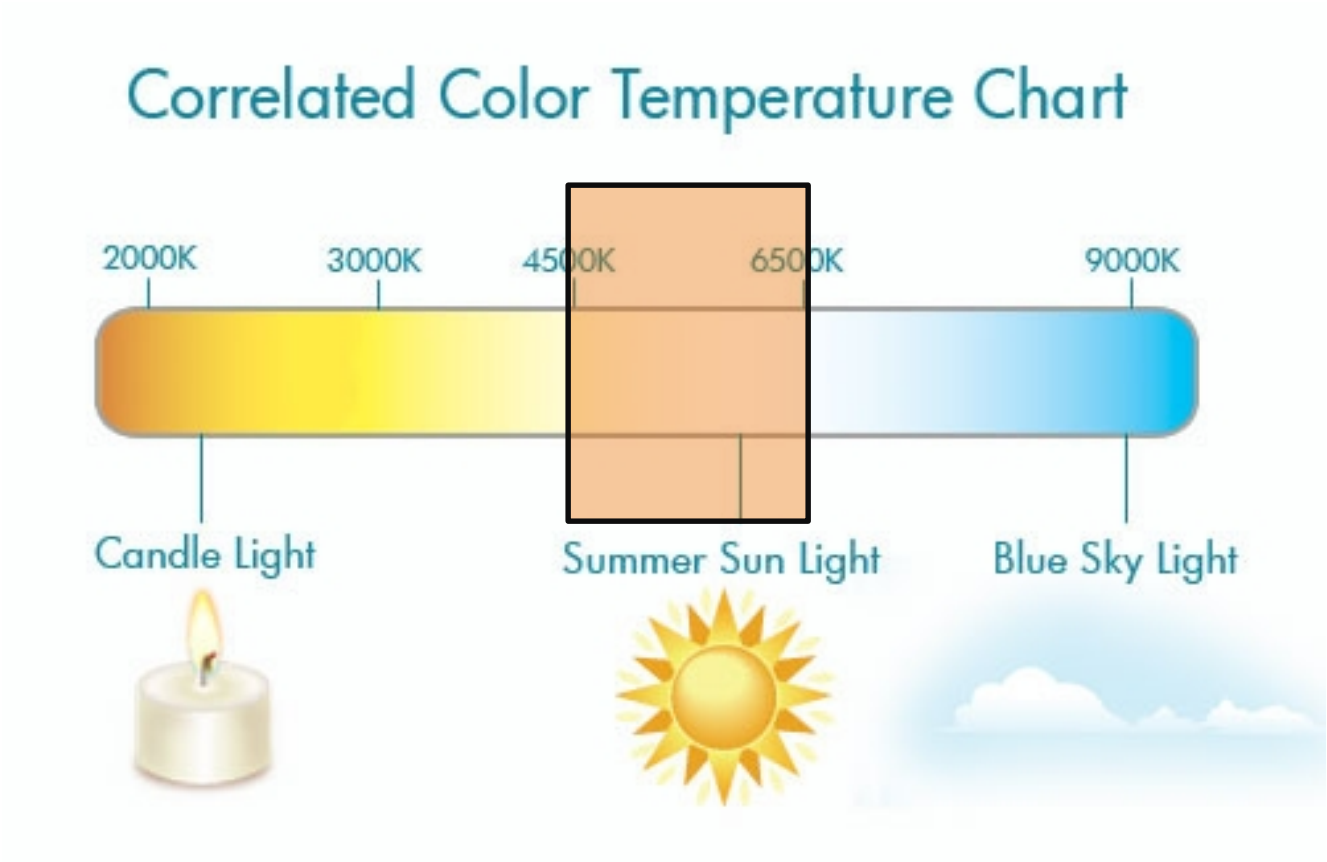


Circadian



http://luxnlum.in/tunable-white-led-lighting/

CCT



HTTP://WWW.QS-TECH.COM/NEWS-DETAILS-259.HTML

Emotional Response to Light

Color Rendering Index

- A quantitative measurement of the ability of the light source to reveal colors of objects in comparison to natural light.
- The higher the value, the more accurately the color appearance is rendered.

HTTP://EMMLIGHT.COM/KENNISBANK/KLEURTEMPERATUUR-KELVIN-CRI/

Human Response to Light

Spectral Power Distribution

A representation of the radiant power emitted by a light source at each wavelength within the visible region of the electromagnetic spectrum.

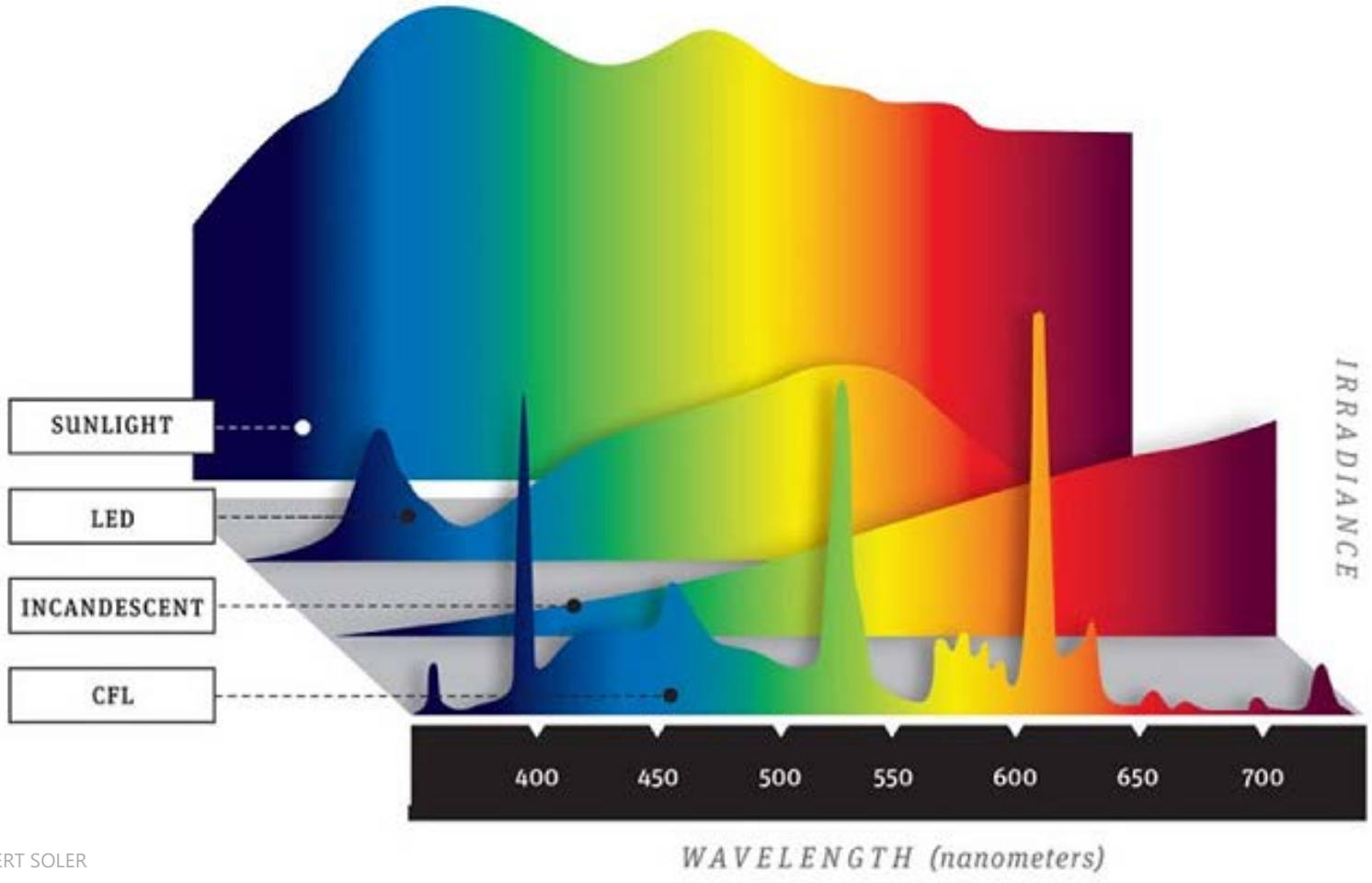


IMAGE CREDIT: ROBERT SOLER

LA Metro Division 13
Downtown Los Angels
LEED Gold

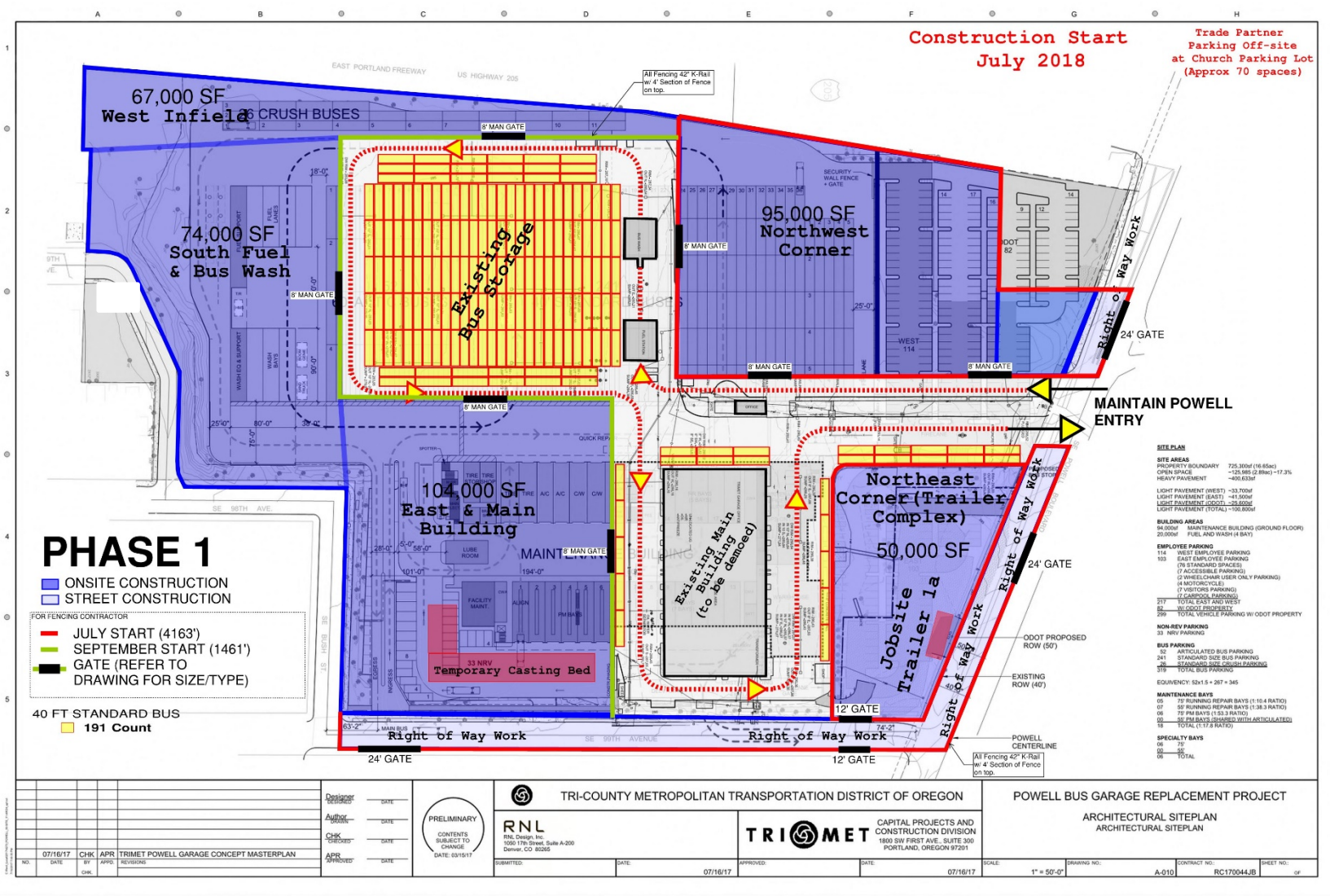
Transpo Admin, Maint, Ops Facility
South Bend, IN
LEED Platinum

Design Analysis Tools

Integration of Digital Design Analysis

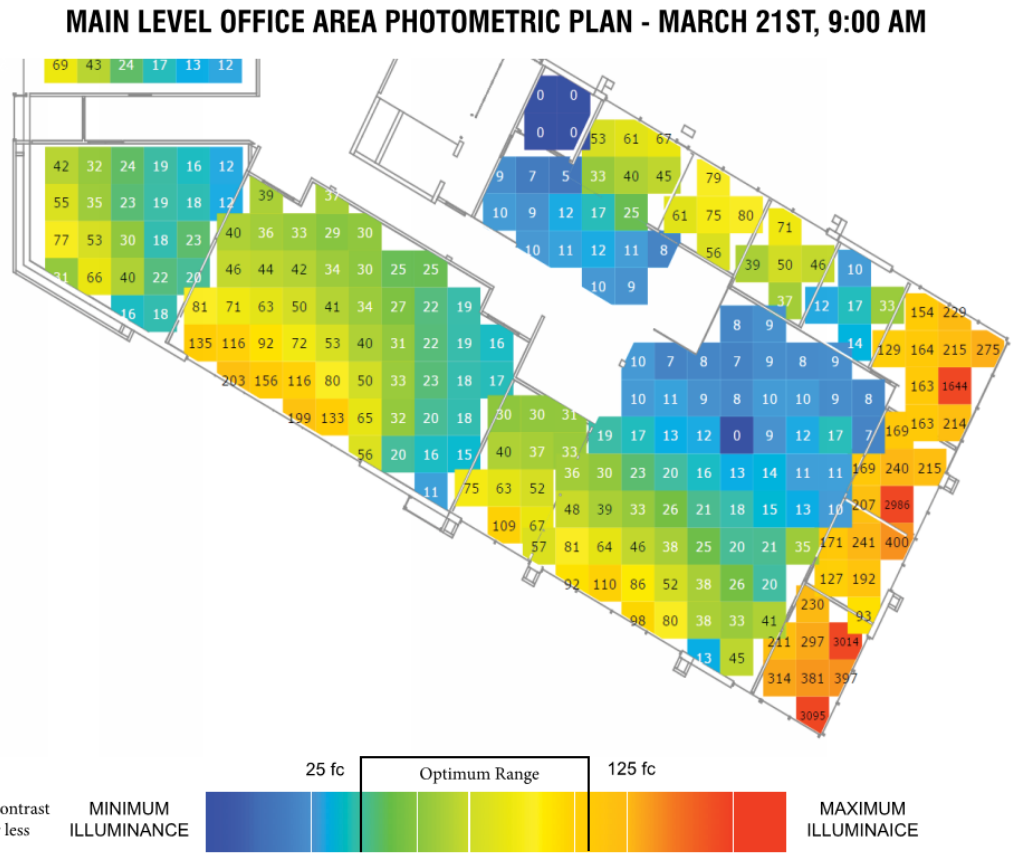
Checks and Balances

- Accuracy
- Program vs actual SF
- Phasing Analysis
- Quantity takeoffs
- Vehicle counts
- Cost estimate evaluation



Daylighting Design

- Influences building plan
- Space allocation
- Massing



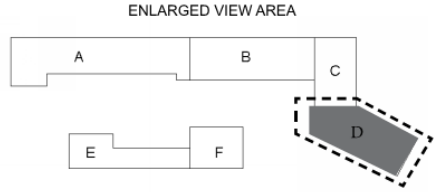
SUMMARY

- Calculations shown above were performed using a 5 ft X 5 ft calculation grid measured at workplane height (30" above finished floor) and are in units of Foot-Candles (Fc).
- The target illuminance level for office settings is 30-50 fc at the workplane. This can be achieved primarily through daylighting and supplemented with LED lighting.
- The designed exterior light louver system blocks direct sunlight and the resulting glare from entering the office areas for most of the year. These louvers also help increase the daylight penetration into the space, pushing more light further into the building.

RNL

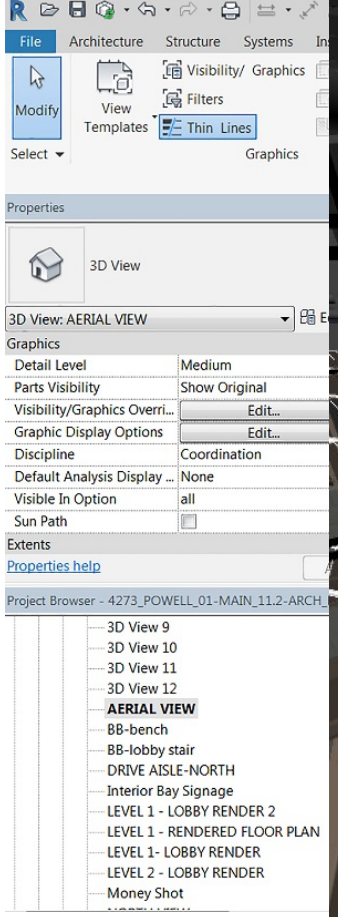
PARK CITY UTILITIES AND STREETS CAMPUS - SCHEMATIC DESIGN DAYLIGHT ANALYSIS

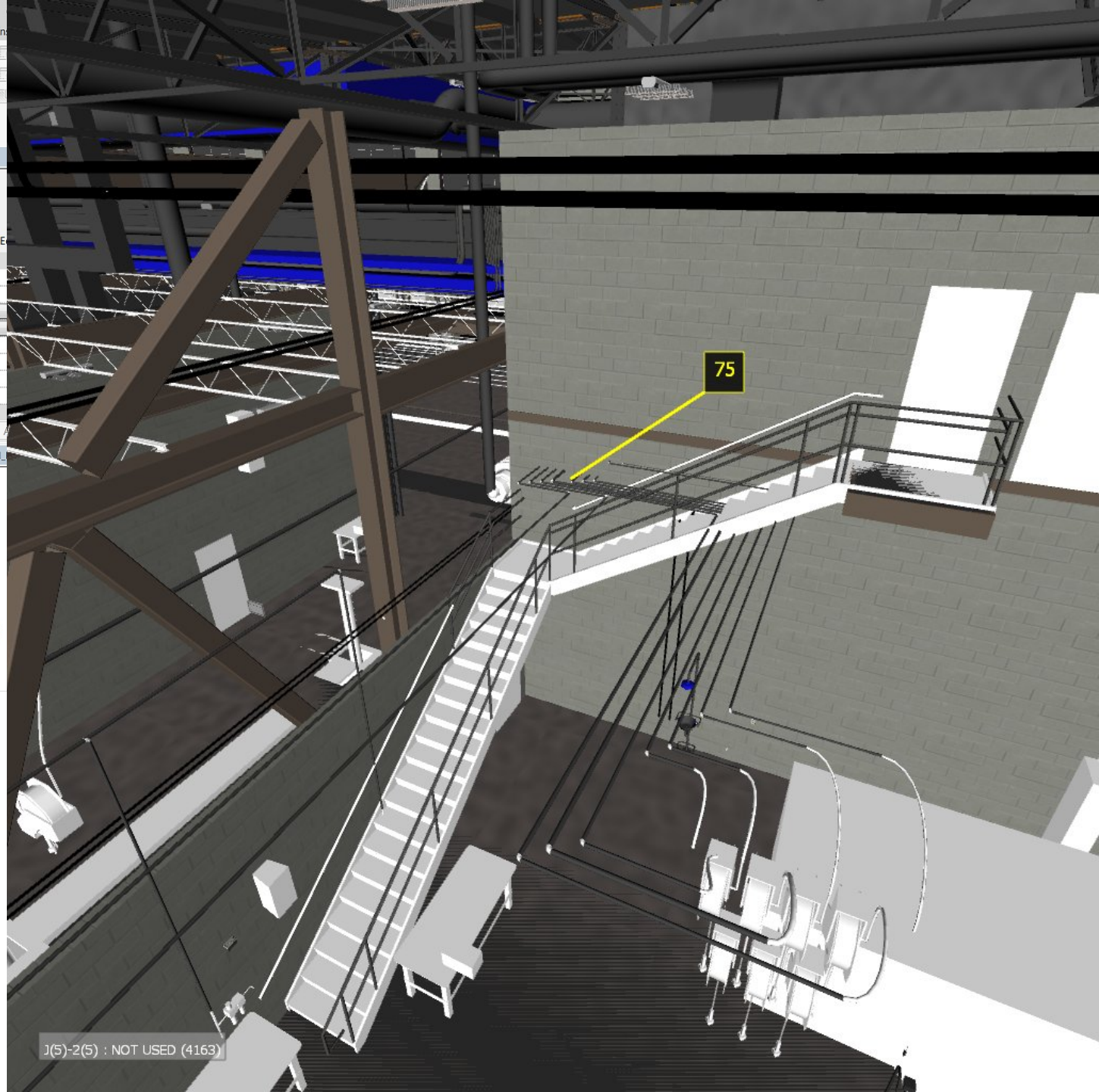
1050 17TH STREET SUITE A-200, DENVER, CO 80265 T: 303 295 1717 F: 303 292 0845



BIM / VR

- Integrated Coordination and Collision Detection
- 3D Visualization
- Reduced Construction Conflicts and Change Orders - Navisworks



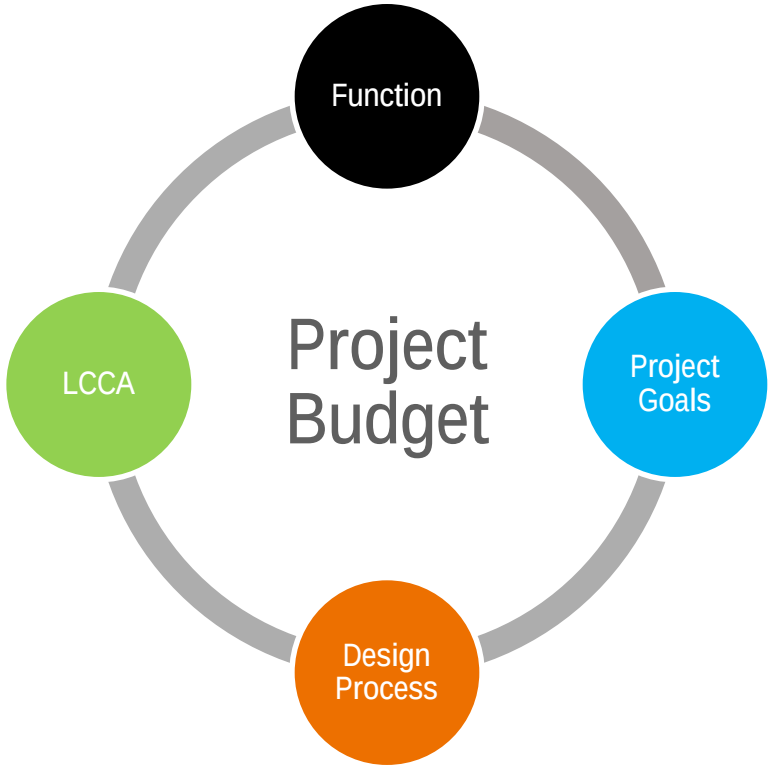


Life Cycle Cost Analysis

ENERGY RESULTS SUMMARY	Total Energy Use Index		Annual Utility Costs			EAc1	EAc2
	kBTU/sf/yr	% Reduction	$/yr	% Reduction	$ Reduction	Points	Points
ASHRAE 90.1-2007 Baseline	93.3		$168,731				
Design Case (without Solar Thermal)	68.3	26.8%	$126,297	25.1%	$42,435	7	0
Design Case (with Solar Thermal)	63.1	32.3%	$117,493	30.4%	$51,239	10	4
Recommended Case EEM #8,9	52.9	43.3%	$98,889	41.4%	$69,842	15	4

MILESTONES:

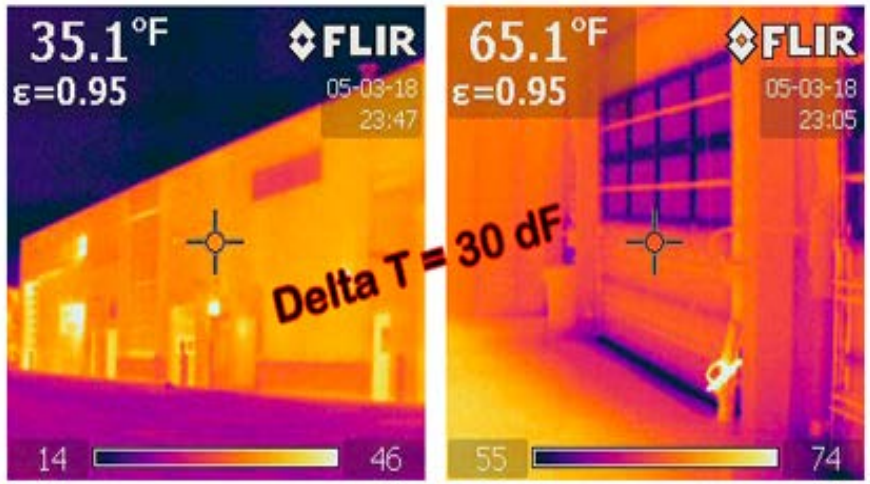
- Program Cost Estimate
- Schematic Design Detailed Cost Estimate
- Life Cycle Cost Analysis
- Design Development Detailed Cost Estimate
- Update Life Cycle Cost Analysis
- Construction Documents
- Bidding & Permitting
- Construction



Energy Conservation

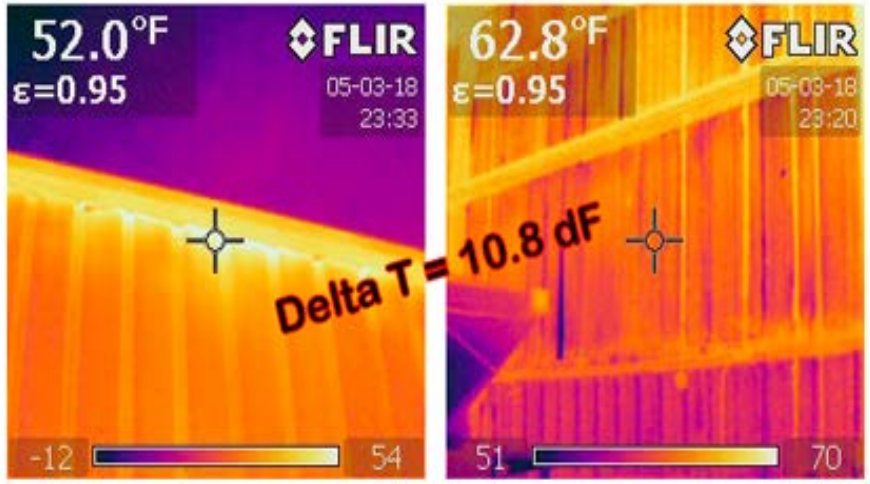
High Performance Facility

- Doors
  - Insulated
  - Seals
  - Reduce infiltration –
    - single largest uncontrolled load
  - Quick open/close –
    - minimize open time
- Walls & Roofs
  - Continuous insulation -
    - evaluate code vs LCCA
  - Appropriate detailing
    - minimize thermal bridging
    - long term durability
    - integration of daylighting



35.1 dF exterior north facing surface temperature of the new fleet building

65.1 dF interior north facing surface temperature of the new fleet building



Conclusion:

Future-Proofing Facilities for Resiliency and Future Technologies

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Innovation and Resiliency Forecasting

85% of the cost is established in the first 15% of the decisions

- Predict unknown risk
- Environmental impacts analysis
- Snow plowing, removal, and storage analysis
- Stormwater detention, retention strategies
- Evaluate immediate costs vs. long term value
- Balance immediate capital costs vs. long term operational costs

Plan for growth, expansion, and new technologies

Be prepared for inclement weather and the unexpected

Promote Stewardship

Civic Pride

- Campus of City Buildings
- Community Visibility
- Contextual
- Retention & Recruitment

RMWB PW Operations Center

Contact Info

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