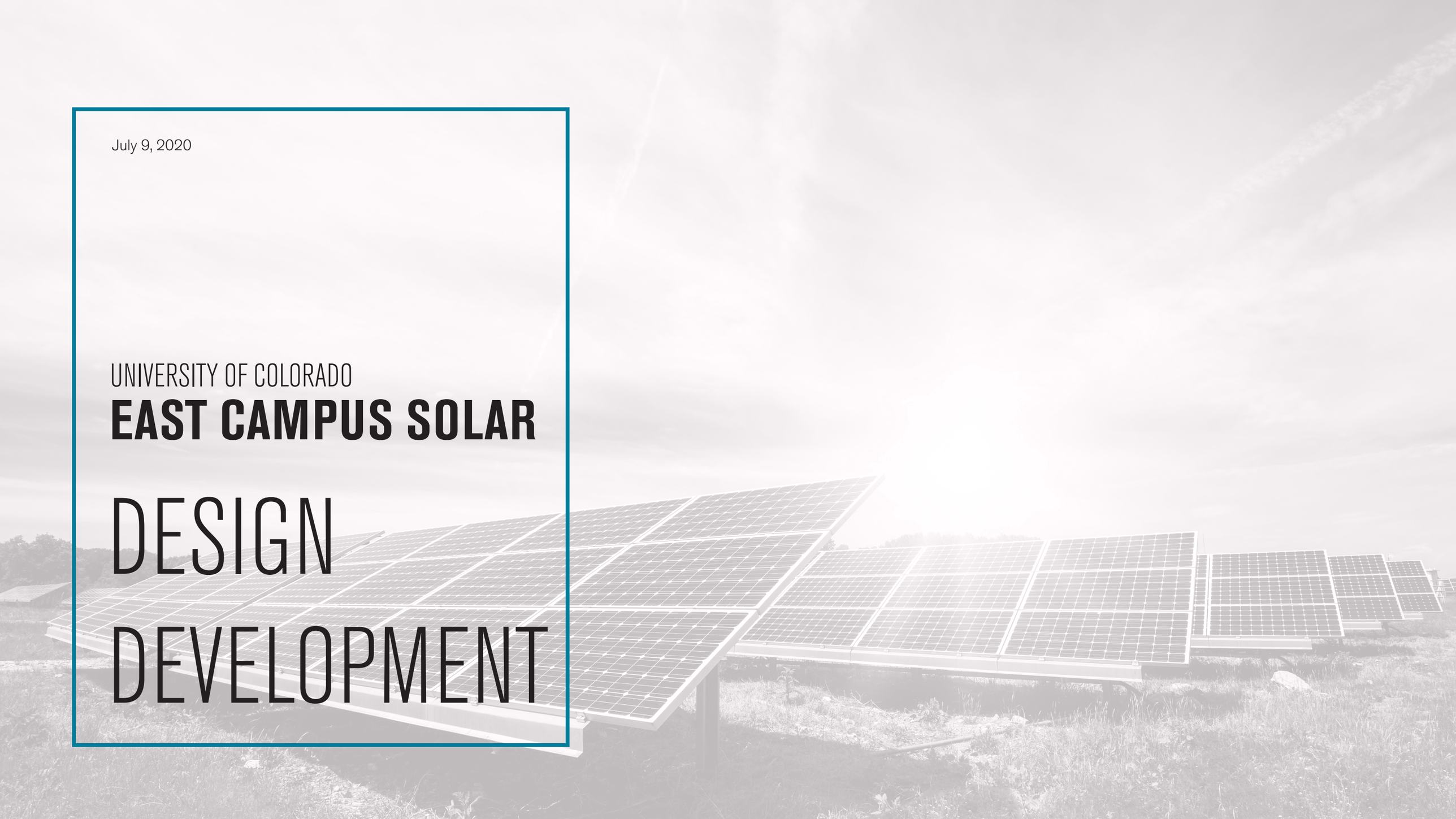
July 9, 2020

UNIVERSITY OF COLORADO

EAST CAMPUS SOLAR

DESIGN DEVELOPMENT



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AGENDA

01 DRB Recap

02 Goals

03 Lighting

04 Architecture & Structure

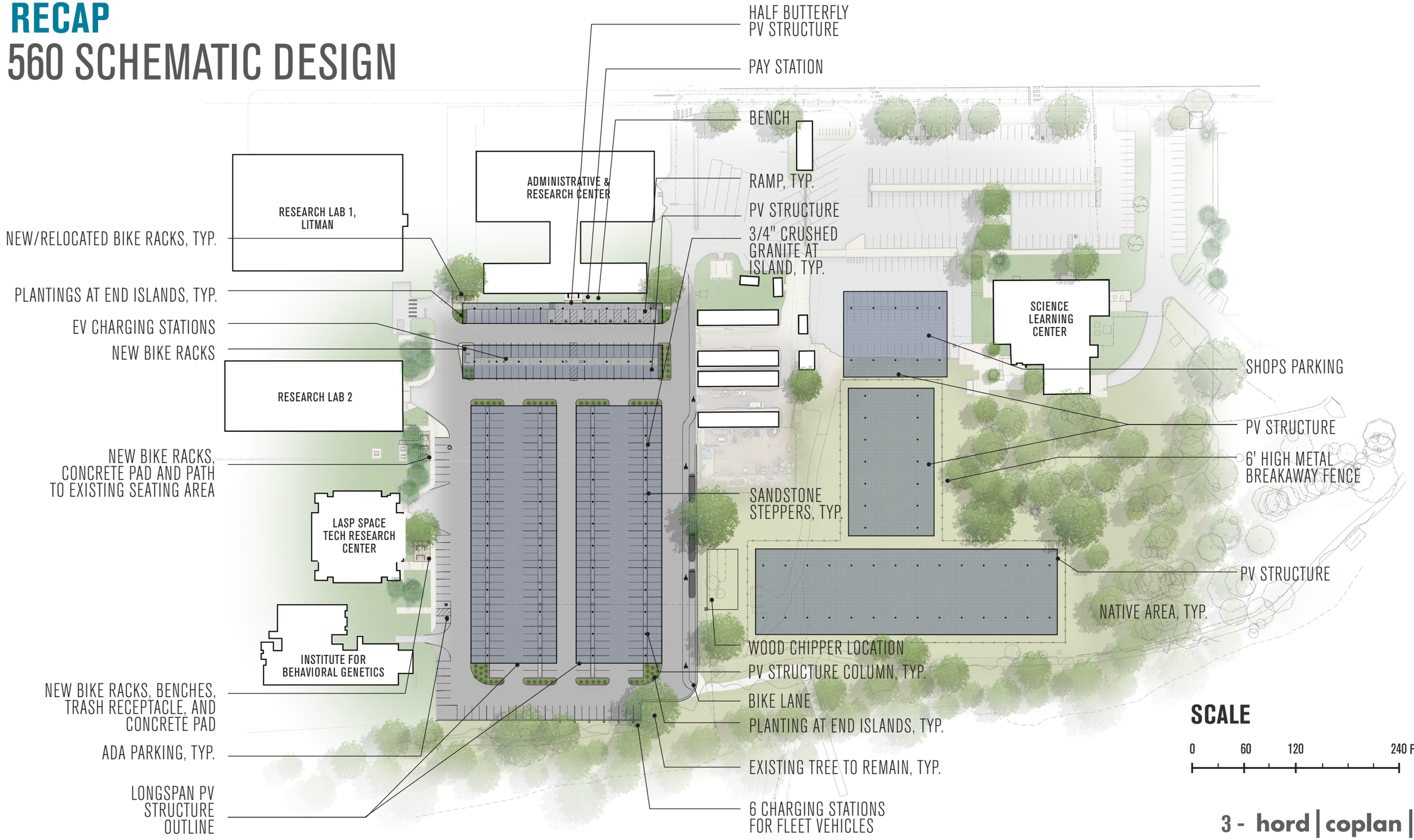
05 Site & Landscape Architecture

06 Next Steps

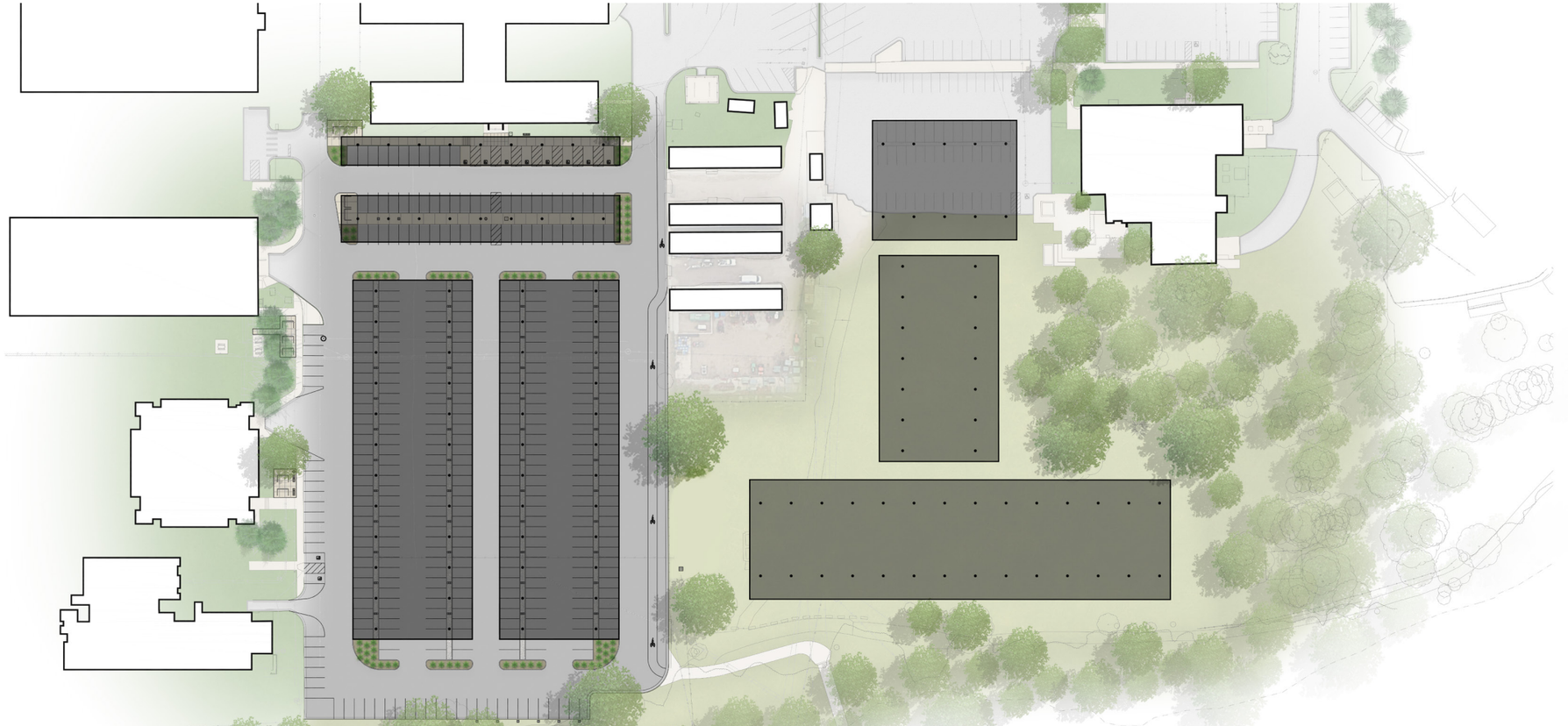
01

DRB RECAP

DRB RECAP
LOT 560 SCHEMATIC DESIGN



DRB RECAP
ENERGY PRODUCTION ESTIMATES



TOTAL SOLAR ENERGY POTENTIAL = 2.58 mW

SCALE

0 60 120 240 FT

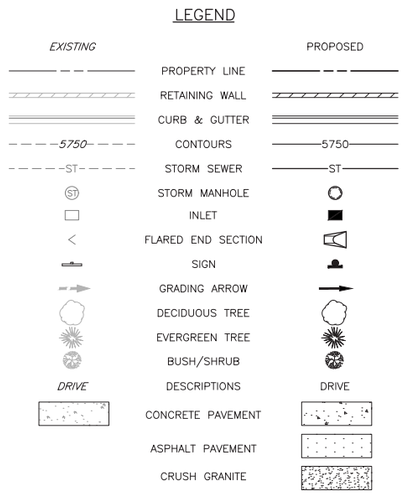
N

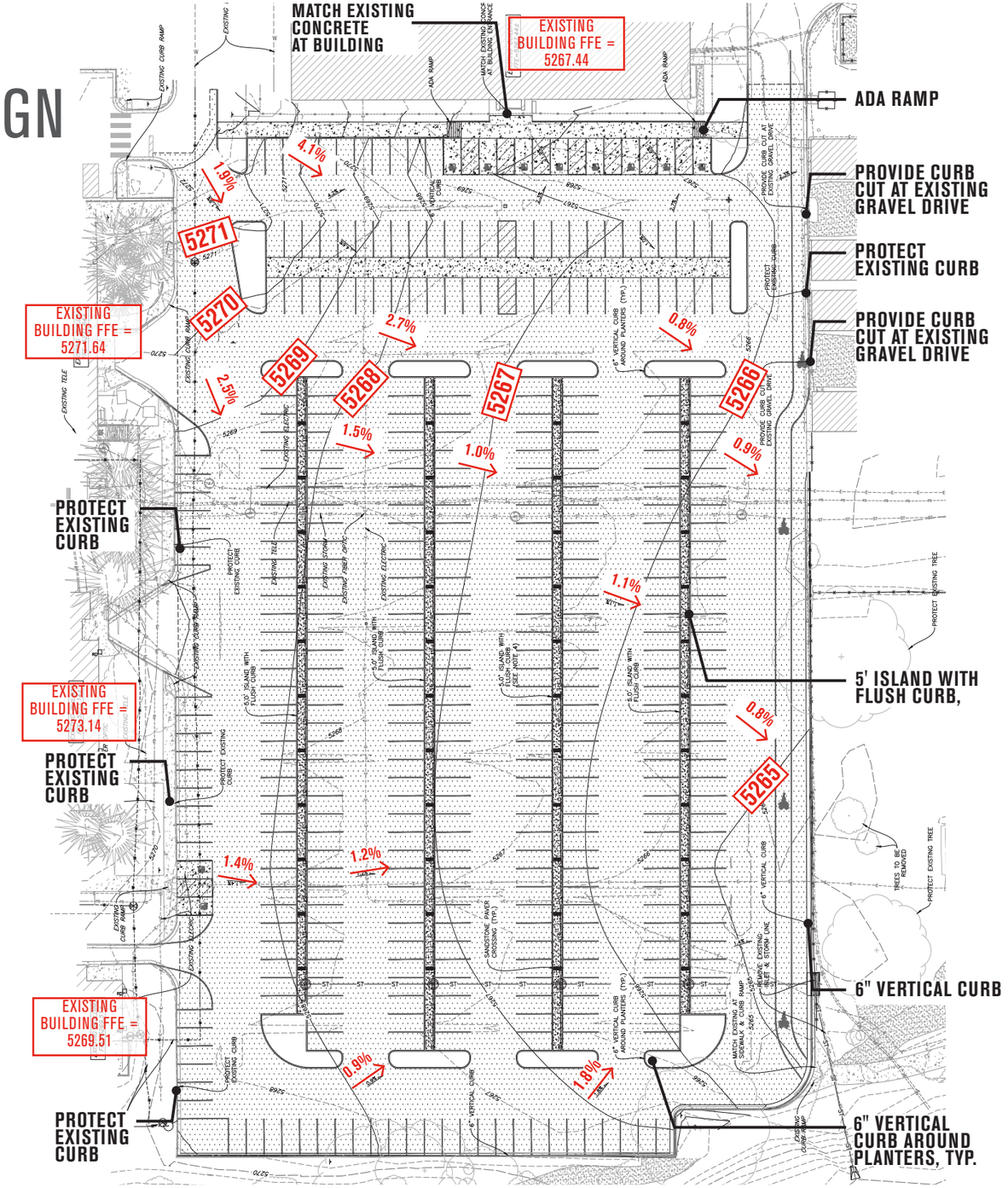
*Estimate based on modified design by Namaste Solar

**Estimate extrapolated from Lot 560.

Note: Solar energy production is a preliminary estimate and subject to change.

DRB RECAP
LOT 560 SCHEMATIC DESIGN GRADING PLAN





NARRATIVE:

Replace the existing surface parking lot to accommodate the proposed solar panel structures. Additional civil improvements include:

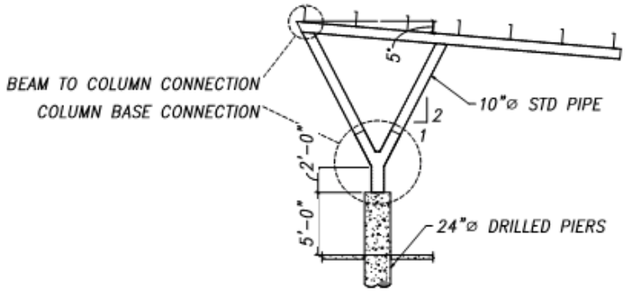
Grading & Drainage: Match existing grades at the curb & gutter along the west perimeter. Mitigate floodplain impacts that occur from the solar structure columns by generally lowering the parking lot grades +/-6". Construct parking islands containing crushed granite surrounded by flush curb to allow stormwater to drain into the islands. Install underdrains within the islands to collect runoff and eventually discharge to Boulder Creek.

Accessibility: Relocate the 8 accessible parking stalls associated with the ARCE building along the north end of the parking lot. Relocate the 2 accessible parking stalls associated with the RL-4 and Behavioral Genetics building to the west, directly adjacent to the existing walk.

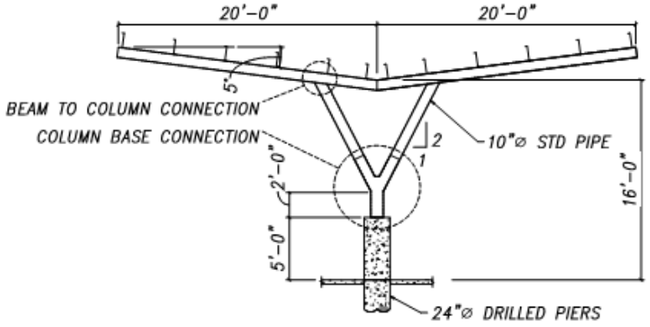
SCALE

0 30 60 120 FT

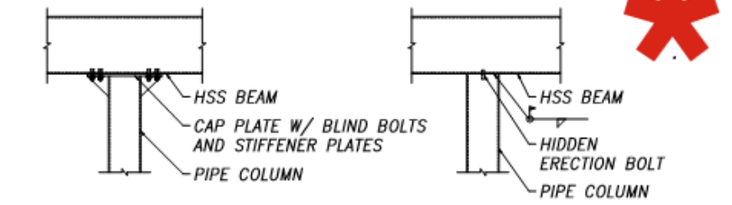
DRB RECAP
SD STRUCTURAL DESIGN

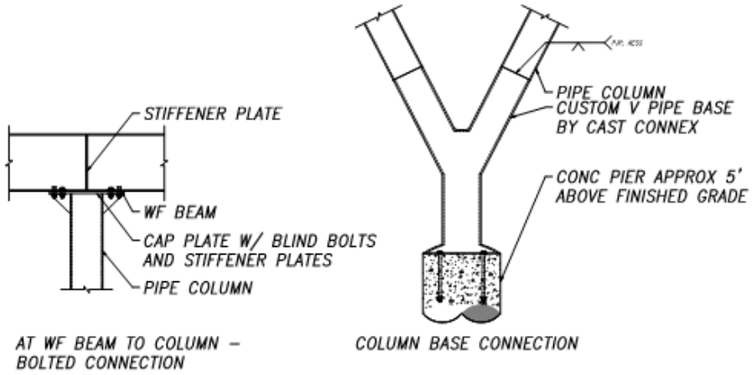


Cantilever Canopy - Lot 560

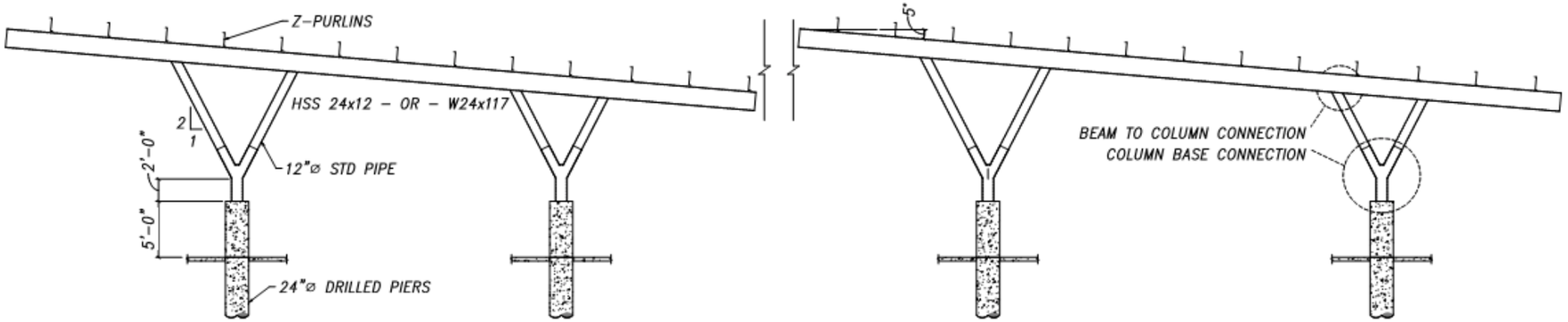


Butterfly Canopy - Lot 560





Top Connection Sections



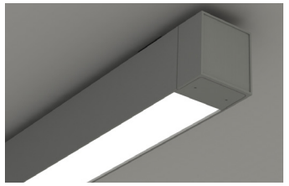
Longspan Canopy - Lot 560

*Resolution to be updated in next draft

DRB RECAP
LOT 560 ELECTRICAL PLAN

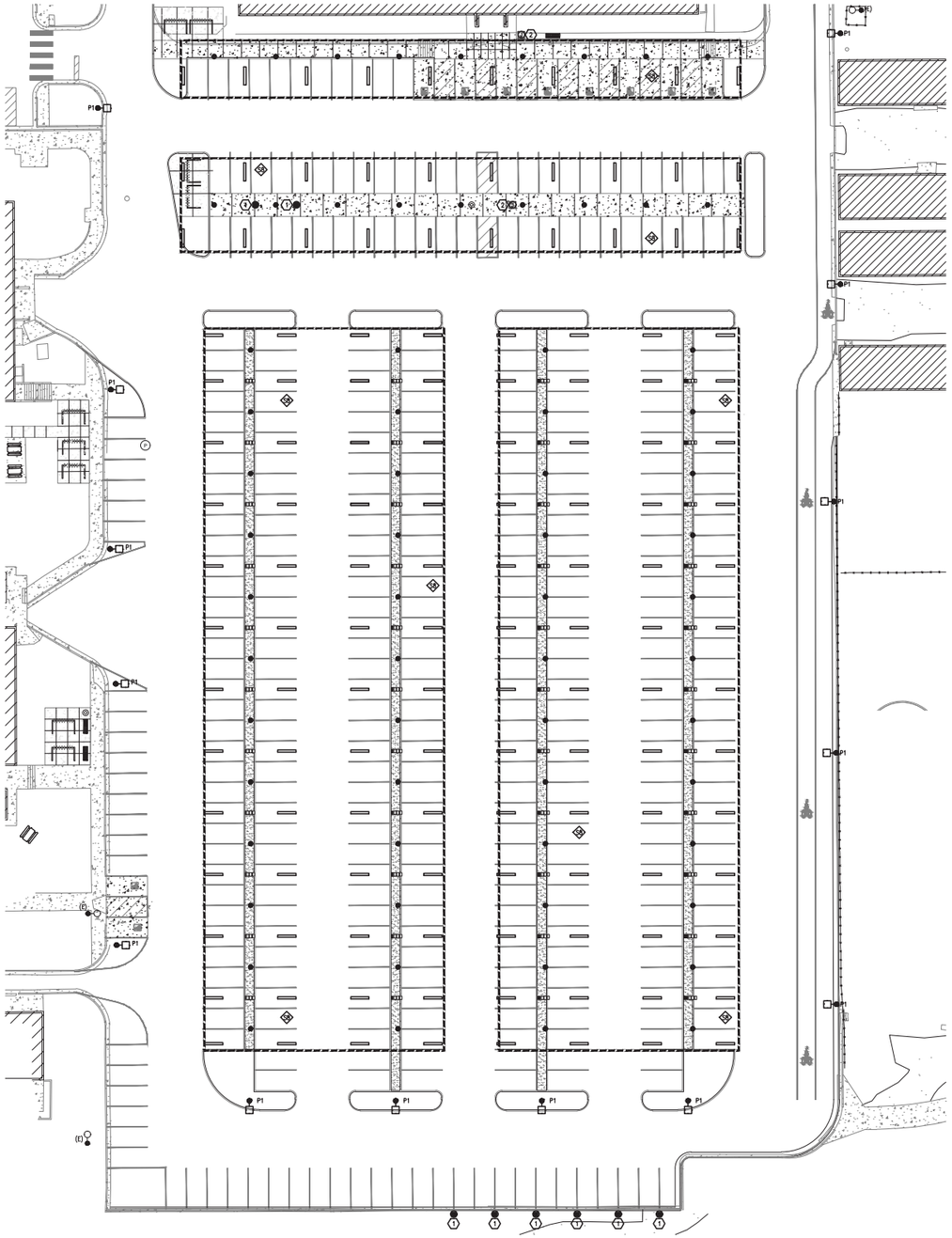
STRIP LIGHT
PAL Microlinea Series 3 Direct

Wet Location - LED



PEDESTRIAN POLE FIXTURE
CREE Edge Series

LED PARKING LOT FIXTURE
CREE Edge Series



NARRATIVE:

Lighting will be provided under the solar canopies using a direct linear fixture mounted to the underside of the canopy.

Electric vehicle charging stations will be provided.

Electrical distribution to the side will be provided and coordinated with UCB Utilities Group.

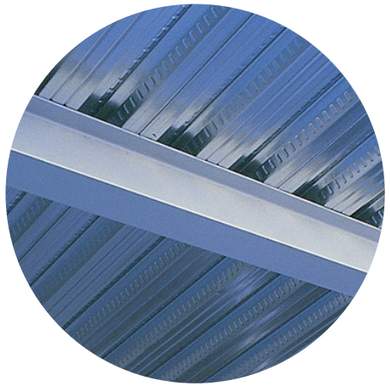
SCALE

0 12 24 48 FT

N

DRB RECAP
ARCHITECTURAL COLOR PALETTE

STRUCTURE



NEUTRAL:
Clear adonized metal deck,
beams & columns

CONCRETE BASE

FORMED CONCRETE BASE:
Natural finish

02

GOALS

DESIGN DEVELOPMENT GOALS:

1. Study lighting options to resolve visibility at night. Consider:
    -Can lights for effectiveness and less prominence
    -Downlights located at column Vs for users/pedestrians
    -LED rope light at beams for less intrusiveness
    -Nighttime lighting exhibits to reflect design

2. Study connectivity of downspouts at Y columns.

3. Investigate roof design of butterfly structure to either face more pronounced angles or consistent shed roof.

4. Study pedestrian crossings for wayfinding/access wider lanes between cars or adding striping.

5. Investigate grading to ensure appropriate drainage and snow storage areas.

6. Further design the pedestrian path beneath butterfly structure.

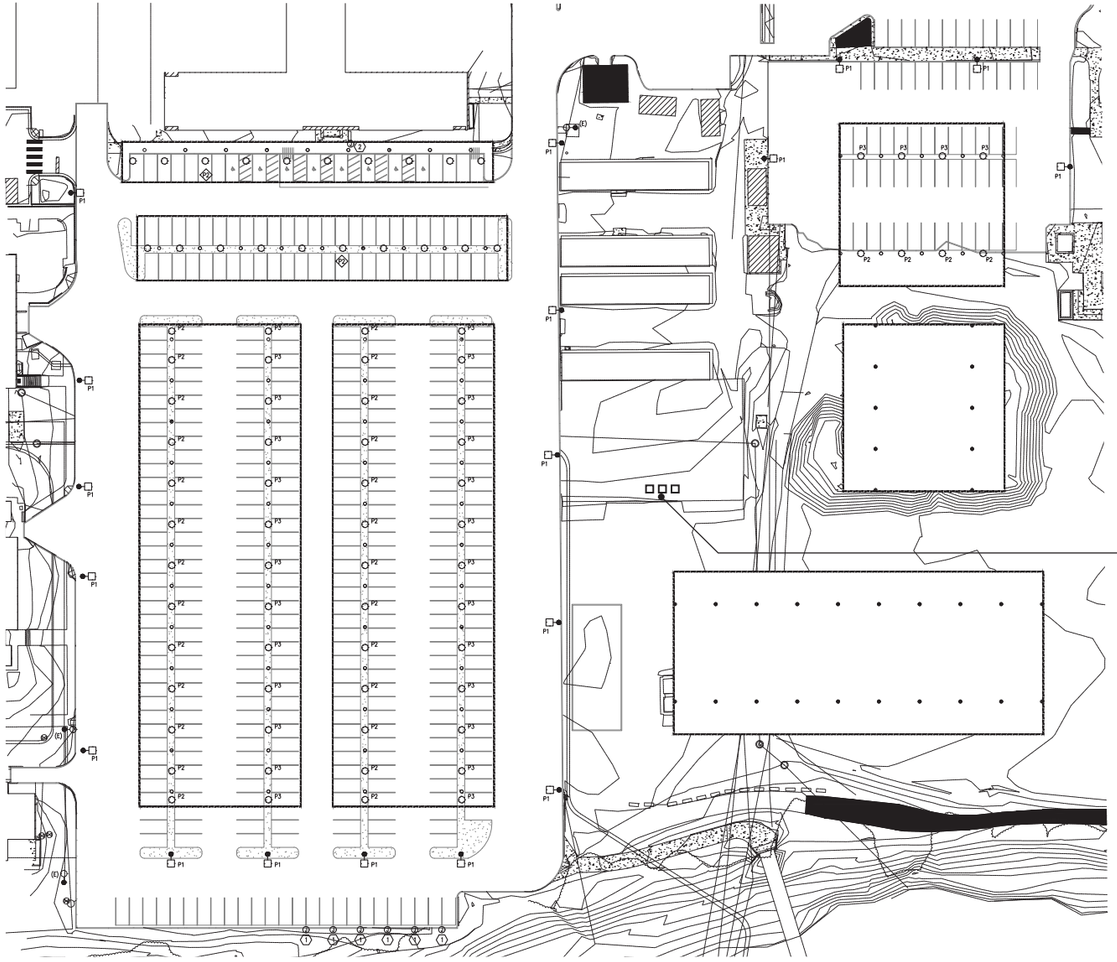
7. Consider using micro-inverters at roof level to eliminate string inverters on columns.

8. Provide the Environmental Product Declaration sheet for project steel.

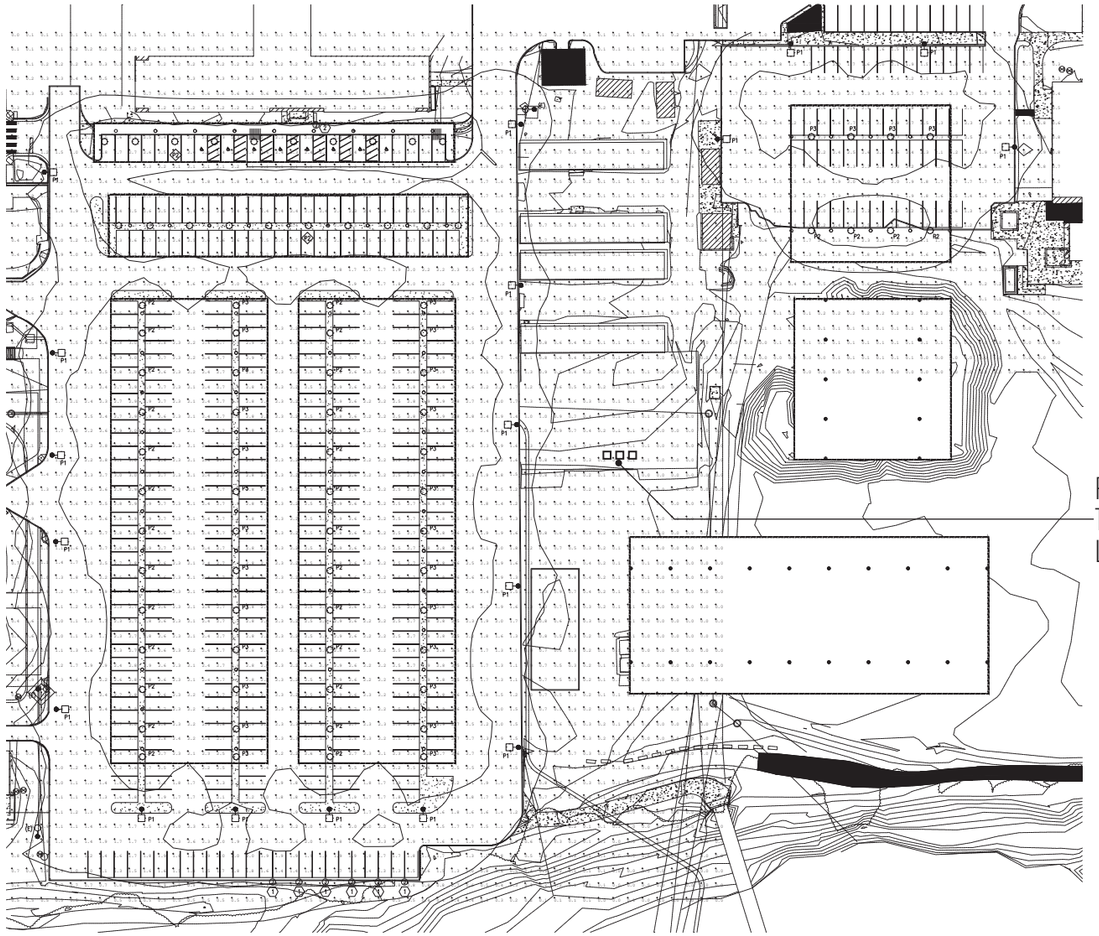
03

LIGHTING

DESIGN DEVELOPMENT
OVERALL ELECTRICAL PLANS



LIGHTING PLAN



PHOTOMETRIC PLAN

SCALE

0 40 80 160 FT

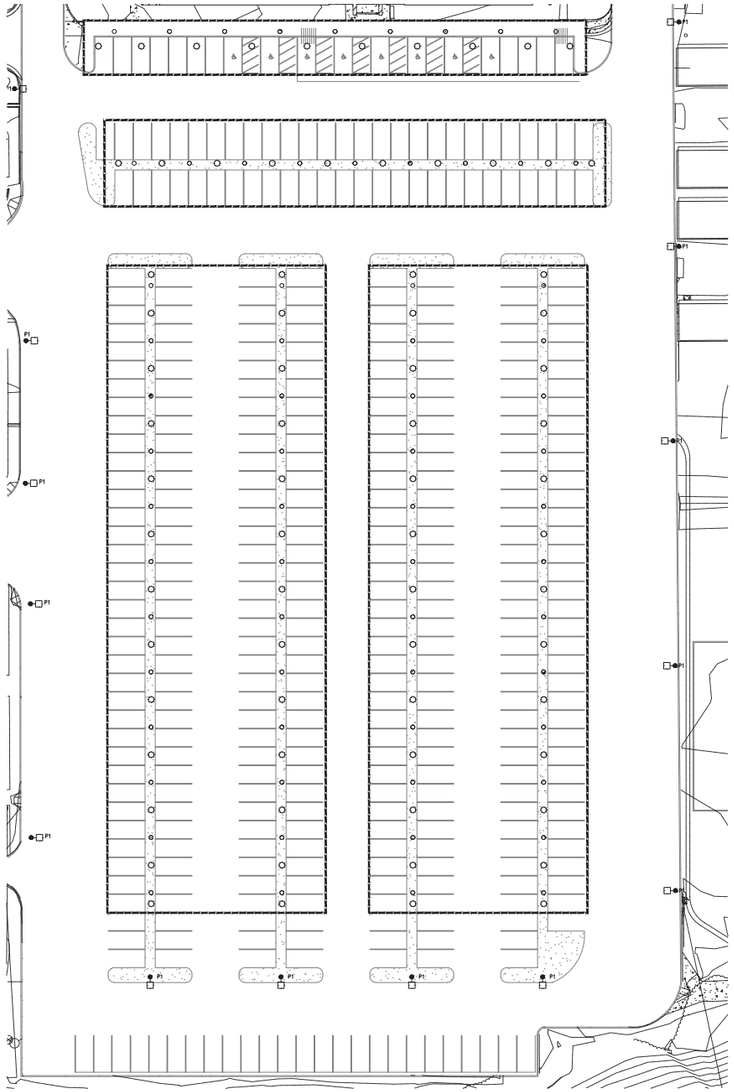
N

DESIGN DEVELOPMENT
LOT 560 LIGHTING PLAN - OPTION 1

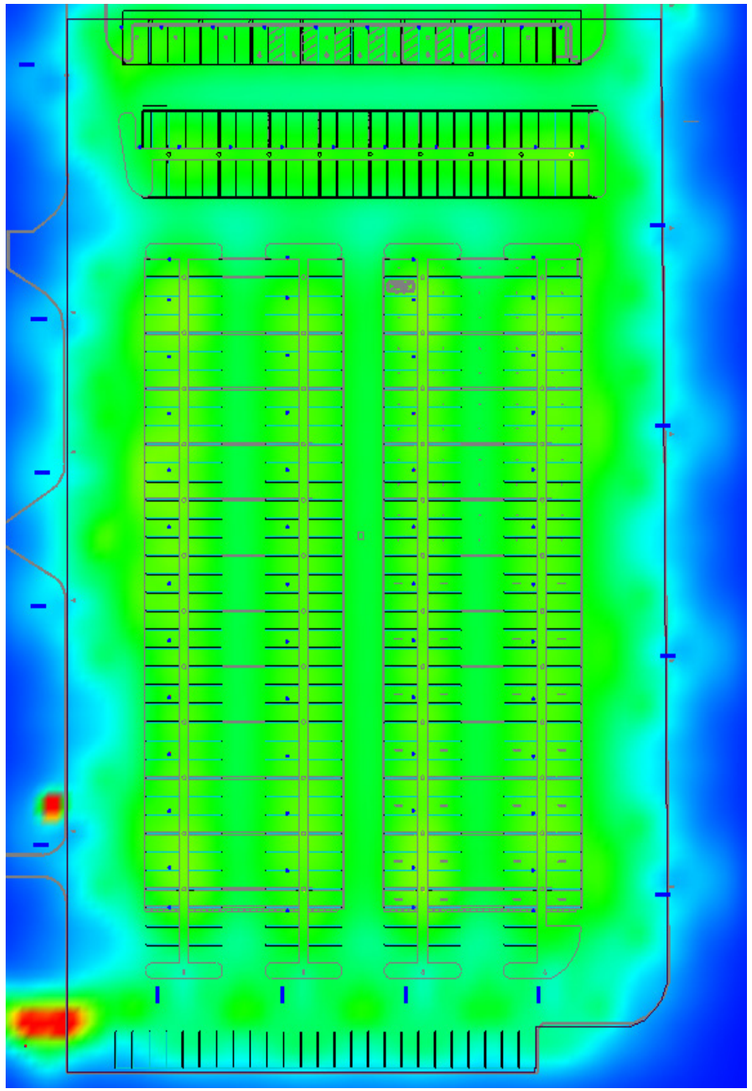
ROUND CANOPY FIXTURE
Lithonia VCPG Ultimate LED

PEDESTRIAN POLE FIXTURE
CREE Edge Series

LED PARKING LOT FIXTURE
CREE Edge Series



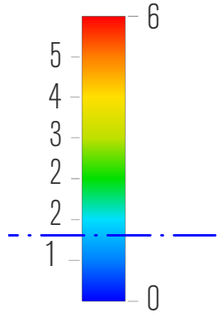
LIGHTING PLAN - OPTION 1



LIGHTING TO BE MOTION-SENSORED
PHOTOMETRIC PLAN - OPTION 1

LEGEND

Illuminance
(fc)



ElumTools
Default
Analysis

SCALE

0 12 24 48 FT

N

DESIGN DEVELOPMENT
LIGHTING DATA - OPTION 1

VCPG Ultimate LED
Parking Garage

Catalog Number

Notes

Type

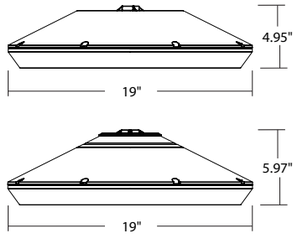
Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

Diameter: 19"

Height: 4.95" (6" with Up-Light)

Weight (max, with no options): 25 lbs



Introduction

The all new VCPGX LED (Visually Comfortable Parking Garage) luminaire is the ultimate solution for parking garage applications. The deep recessed lens design of VCPGX LED minimizes high angle glare, while its patent pending transition zone reduces the contrast ratio between the luminaire and the dark ceiling. The dedicated up-light module option further reduces this contrast, creating a more visually comfortable environment.

The VCPGX LED delivers up to 87% in energy savings when replacing 175W metal halide luminaires. With over 100,000 hour life expectancy (12+ years of 24/7 continuous operation), the VCPGX LED luminaire provides significant maintenance savings over traditional luminaires.

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: VCPGX LED V8 P3 40K 70CRI T5M MVOLT PM UPL2 DWHXD

VCPGX LED

Series	LED Light Engines	Package	Color temperature	Color Rendering Index	Distribution	Voltage		Mounting
VCPGX LED	V4 4 Light Engines V8 8 Light Engines	P1 P2 P3 P4 P5 P6 P7 (with V8 only)	30K 3000 K 35K 3500 K 40K 4000 K 50K 5000 K	70CRI 80CRI	T5M Type V, medium T5R[1] Type V, rectangular T5E Type V entry LANE[1] Drive lane	MVOLT 347 480	For ordering with fuse 120 208 240 277 347 480	**Shipped included** PM Pendant mount standard (24-inch length supply leads) SRM Surface mount (24-inch length supply leads) ARM Arm mount (use RSXWBA accessory to mount to a wall) **Shipped separately** YK Yoke/trunnion mount[2]

Options

Shipped installed

UPL1	Up-Light: 500 lumens
UPL2	Up-Light: 700 lumens
E8WC	Emergency battery backup, CEC compliant (8W, –20°C min)[4,4,5]
E10WH	Emergency battery backup, CEC compliant (10W, 5°C min)[4,4,5]
HA	High ambient (50°C, only P1–P4)
SF	Single fuse (120V, 277V, 347V)
DF	Double fuse (208V, 240V, 480V)
SPD10KV	10KV Surge Pack
LDS36	36in (3ft) lead length
LDS72	72in (6ft) lead length
LDS108	108in (9ft) lead length
DMG	External 0-10V leads (no controls)[6]

Shipped Separately

BDS	Bird Shroud
HS	House Side Shield

Standalone Sensors/Controls

PIR	Motion/ambient sensor for 8-15' mounting heights
PIRH	Motion/ambient sensor for 15-30' mounting heights
PIR3FC3V	Motion/ambient sensor for 8-15' mounting heights, pre programmed to 3fc and 35% light output
PIRH3FC3V	Motion/ambient sensor for 15-30' mounting heights, pre programmed to 3fc and 35% light output
PIR3FC3V924	UL924 Listed motion/ambient sensor for emergency circuit for 8-15' mounting heights, pre programmed to 3fc and 35% light output[7]
PIRH3FC3V924	UL924 Listed motion/ambient sensor for emergency circuit for 15-30' mounting heights, pre programmed to 3fc and 35% light output[7]

Networked Sensors/Controls

NLTAIR2 PIR	nLIGHT AIR Wireless enabled motion/ambient sensor for 8-15' mounting heights
NLTAIR2 PIRH	nLIGHT AIR Wireless enabled motion/ambient sensor for 15'-30' mounting heights
NLTAIR2 PIR924	nLIGHT AIR Wireless enabled, UL 924 Listed motion/ambient sensor for emergency circuits for 8-15' mounting heights[8]
NLTAIR2 PIRH924	nLIGHT AIR Wireless enabled, UL 924 Listed motion/ambient sensor for emergency circuits for 15-30' mounting heights[8]
XAD	XPoint™ Wireless enabled[9]
XAD924	XPoint™ Wireless enabled, UL 924 Listed for emergency circuit[7,9]
XAD PIR	XPoint™ Wireless enabled motion/ambient sensor for 8-15' mounting heights
XAD PIRH	XPoint™ Wireless enabled motion/ambient sensor for 15-30' mounting heights
XAD924 PIR	XPoint™ Wireless enabled, UL 924 Listed motion/ambient sensor for emergency circuits for 8-15' mounting heights[7]
XAD924 PIRH	XPoint™ Wireless enabled, UL 924 Listed motion/ambient sensor for emergency circuits for 15-30' mounting heights[7]

Finish *(required)*

DWHXD	White
DNAXD	Natural aluminum
DDBXD	Dark bronze
DBLXD	Black

ROUND CANOPY FIXTURE LIGHTING STRATEGY:

HOT SPOT REDUCTION: Motion-sensored, to minimize unnecessary hot-spots

LIGHTING COVERAGE: Focus on lighting accuracy and even coverage throughout parking spaces, aisles, curbs, and walkways

HIGHLIGHTING: Primary downlighting can be set for stronger output at high ends of structure, and lesser output at low ends of structure to allow for even coverage for pedestrians and cars, while highlighting carport structure shape

- -Column-washing angling recommended
- -Dedicated uplighting option recommended for contrast-reduction
- -High-angle glare reduction

ENERGY: LED energy savings

MAINTENANCE:

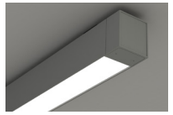
- -LED maintenance savings
- -Bird shroud option recommended

AESTHETICS: Dynamic fixture

- -Mounting options work irrespective of decking presence: yoke option recommended; pendants available.

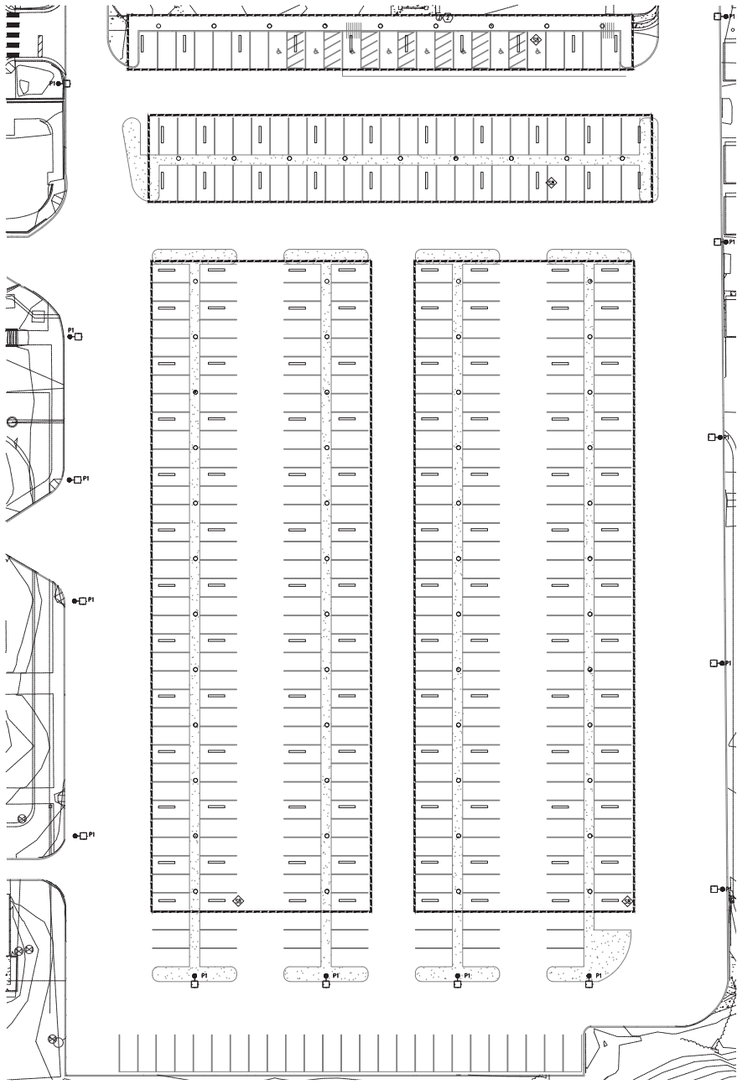
DESIGN DEVELOPMENT
LOT 560 LIGHTING PLAN - OPTION 2

LINEAR FIXTURE
PAL Microlinea Series 3 Direct Wet Location - LED

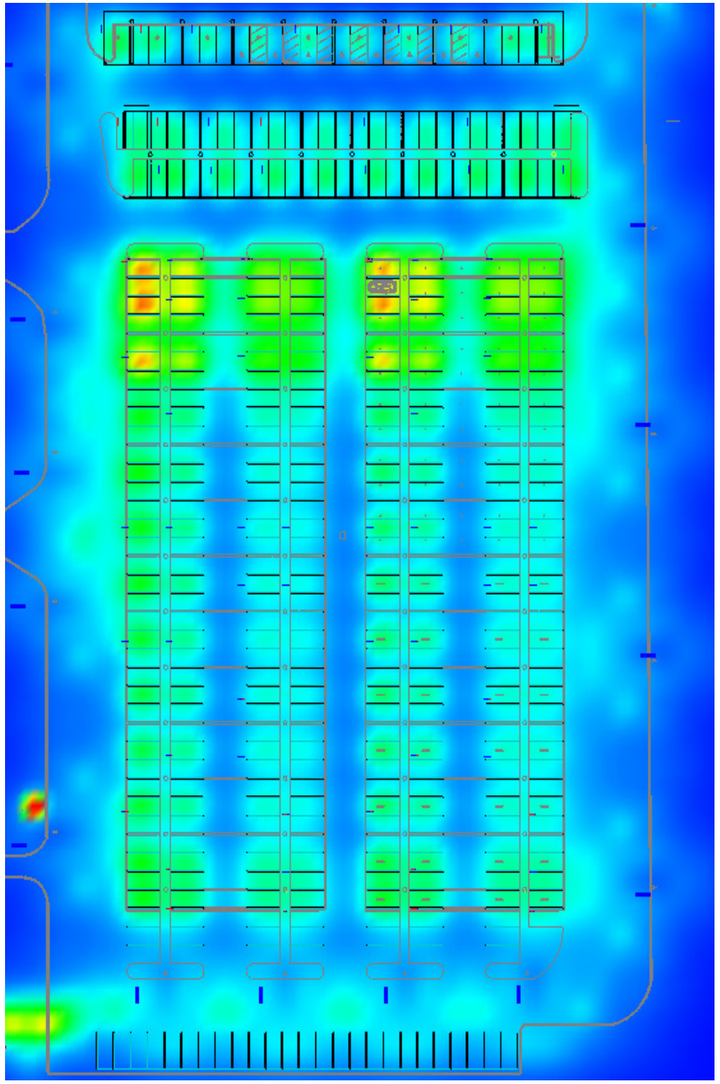


PEDESTRIAN POLE FIXTURE
CREE Edge Series

LED PARKING LOT FIXTURE
CREE Edge Series



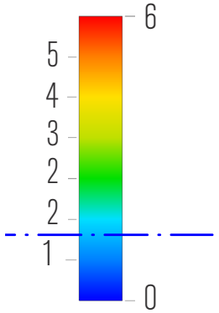
LIGHTING PLAN - OPTION 2



LIGHTING TO BE MOTION-SENSORED
PHOTOMETRIC PLAN - OPTION 2

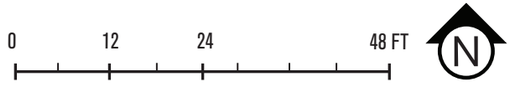
LEGEND

Illuminance (fc)



ElumTools Default Analysis

SCALE

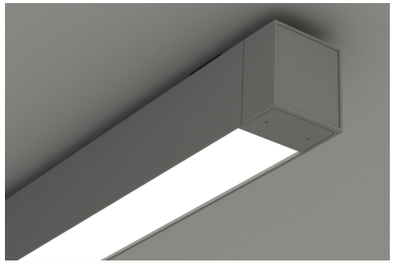


DESIGN DEVELOPMENT
LIGHTING DATA - OPTION 2

Catalog Number	Type
Project Name	

Microlinea™ Series 3 Direct Wet Location - LED

(Overall Width 3-17/32", Luminous Aperture 3-7/32")

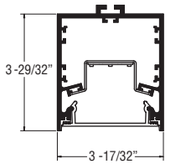


ML3WL-D

Suspended, Ceiling, Recessed or Wall Mount - Wet Location/IP-65 Rated

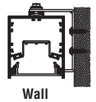
3-17/32" x 3-29/32" Direct (LED)

5 Year Limited Warranty LED Boards & Drivers



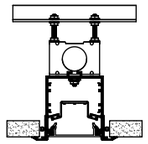
ML3WL-D-HO
ML3WL-D-MO

Rigid Stem



Wall

Ceiling



Recessed

S P E C I F I C A T I O N S

Housing

One piece .125" thick extruded aluminum. Die-cast aluminum end caps are fully gasketed and secured with no visible fasteners. Standard lengths are nominal 2', 3', 4', 6' and 8'. Provisions may be made for continuous rows of virtually any length.

Internal Construction

All internal mechanical components, including fasteners, are aluminum or stainless steel.

Finish

Standard and custom finishes are baked powder coat electrostatically applied (2.0 mil minimum thickness) to assure aesthetics and durability.

Optical Controls

- (LOH) .100" thick, high transmittance extruded acrylic snap-in lens, formulated for maximum diffusion of the LED light source. Lens is continuously gasketed against dust and water intrusion.
- (VR) Vandal Resistant: .100" thick, high transmittance extruded 100% D.R. acrylic lens with tamper-resistant hardware.

Reflector/Heat Sink

.060" thick formed aluminum finished with a high reflectance white baked powder coat.

Driver

Osram-Sylvania "Optotronic" power supply is UL/CUL recognized, 0-10V dimming available, 120-277 universal voltage. 347V also available.

Light Engine

Osram-Sylvania LED modules available for 3000K, 3500K and 4000K CCT:

HO - High Output
*2683 Total Delivered Lms. at 28 System Watts (Values per 4' using 4000K LED modules)

MO - Medium Output
*1713 Total Delivered Lms. at 17 System Watts (Values per 4' using 4000K LED modules)

*Due to continued advancement in LED technology, lumen performance is subject to change. Please visit our website for the most up-to-date information.

Circuitry

All fixtures are factory pre-wired for a single circuit. Provision for multiple switching/circuiting is optional.

Wiring

All fixtures intended for continuous rows are provided with factory installed quick-connect wiring.

Mounting

All mounting components are aluminum or stainless steel. Standard finish for wall and ceiling assemblies is matte black. Stem/Canopy assemblies are painted to match fixture housing.

Certifications

All fixtures are UL/CUL listed for use in 'Wet Locations'. Ambient temperature rated up to 40° C, or 35° C with battery back-up. IC rated. IP-65 rated**

**The IP (or Ingress Protection) rating defines the degree of protection for a luminaire from outside elements.

Series
ML3WL-D

Nominal Lengths:
2', 3', 4', 6', & 8'

Mounting
P = Rigid Stem (Up to 24" Standard)
W = Wall
R = Recessed
J = Ceiling

Power Feed Location
EF = End Feed
TF = Top Feed
(N/A for Recess or Ceiling Mt.)

ML3WL-D-HO-K40-4-P-LOH-F01M-EF-120-[ ]

Lumen Output
HO - High Output
*2683 Total Lumens - 95 Lm/W
MO - Medium Output
*1713 Total Lumens - 100 Lm/W
*Lumen ratings per 4' section (4000K)

CCT
K30 3000 Kelvin
K35 3500 Kelvin
K40 4000 Kelvin

Optical Control
LOH LED Optimized High Transmittance Lens
VR 100% D.R. Acrylic Lens with Tamper-Resistant Hardware

Standard Finishes
F01M Matte White
F10 Bronzed
F11T Textured Black
F12 Ultrasonic Clear
FCC Custom Color

Voltage
120
277
347

Options
EMCKT Emergency Circuit (Separate Hot & Neutral)
EBPHST Self-Testing Emergency Battery Pack (10 Watt) (N/A for 2' Fixtures) (N/A for 347V)
FS Fused Drivers
Dim10 100 - 10% Dimming
Dim1 100 - 1% Dimming
CWD Cold Weather Driver -40°C Ambient Temp Rating (Available for High Output Only - 3' or Longer Fixtures) (N/A for 100 - 1% Dimming Option)

PAL Precision Architectural Lighting 4830 Timber Creek Drive Houston, Texas 77017
Tel 713.946.4343 Fax 713.946.4441 www.pal-lighting.com

Made in America

6/19

LINEAR FIXTURE LIGHTING STRATEGY:

HOT SPOT REDUCTION: motion-sensored, to minimize unnecessary hot-spots

LIGHTING COVERAGE: focus on lighting accuracy at parking spaces, with transitional smooth feathering light reduction beyond

HIGHLIGHTING: primary downlighting horizontal to ground surface (differing pendant lengths) for pedestrian and car clarity. Angled structural shape not specifically hightlighted.

-Stepped pendant application could highlight structural height change

-Column-washing possible with added LED strip lights at column

-Dedicated uplighting potential for contrast-reduction

-High-angle glare reduction

ENERGY: LED energy savings

MAINTENANCE:

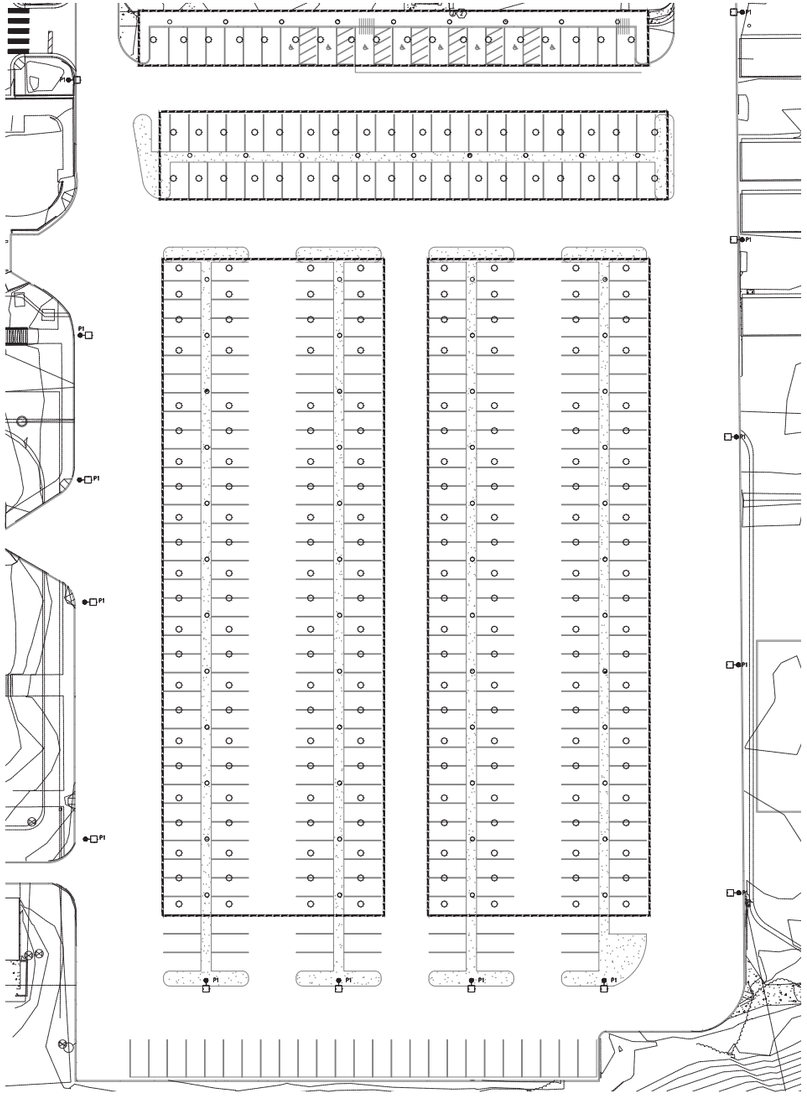
-LED maintenance savings

-Bird spikes can be added

AESTHETICS: sleek fixture

-Ceiling mountings work irrespective of decking presence: rigid stem mount option

DESIGN DEVELOPMENT
LOT 560 LIGHTING PLAN - OPTION 3

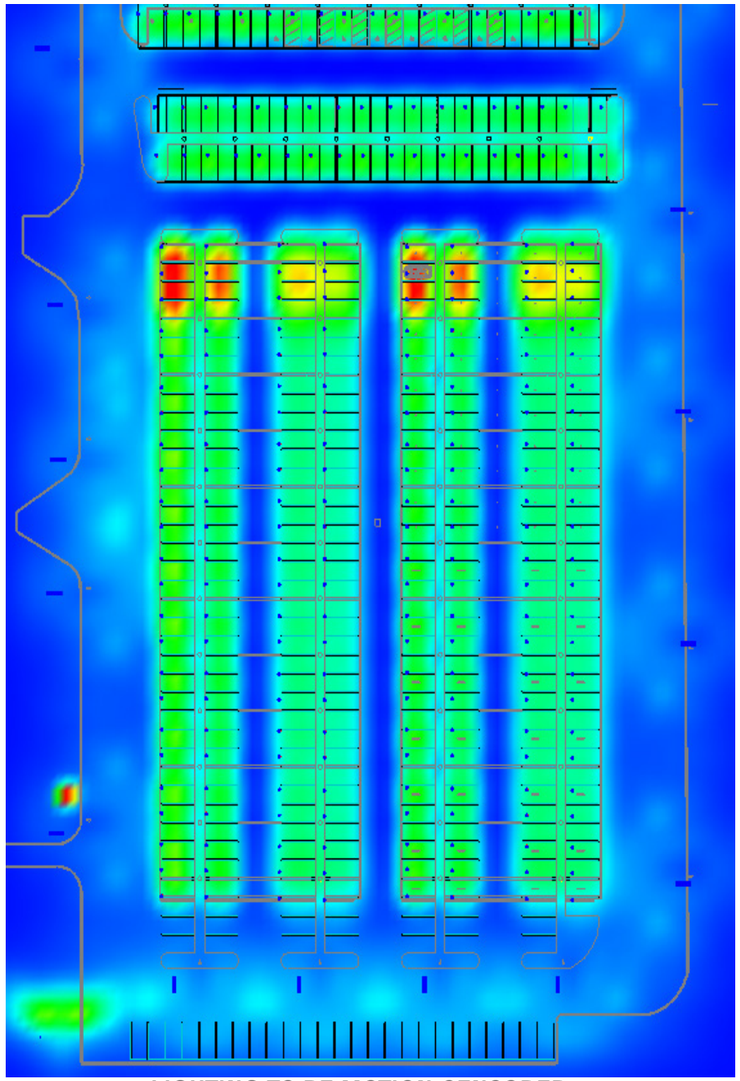


LIGHTING PLAN - OPTION 3

CYLINDER FIXTURE
ACUITY/GOTHAM
EVO 4CC

PEDESTRIAN POLE FIXTURE
CREE Edge Series

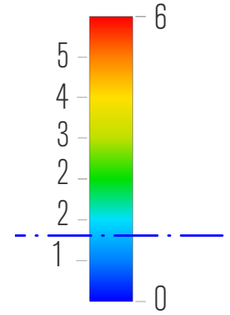
LED PARKING LOT FIXTURE
CREE Edge Series



LIGHTING TO BE MOTION-SENSORED
PHOTOMETRIC PLAN - OPTION 3

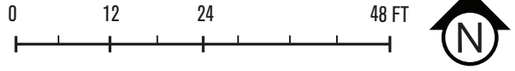
LEGEND

Illuminance
(fc)



ElumTools
Default
Analysis

SCALE



DESIGN DEVELOPMENT
LIGHTING DATA - OPTION 3

gotham® | E V O®
Multiple Layers of Light

Luminaire Type:
Catalog Number:

General Illumination Pendant Cord Cylinder — 4"

OVERVIEW

Feature Set

- Batwing distribution with feathered edges provides even illumination on horizontal and vertical surfaces
- Bounding Ray™ optical design
- 45° cutoff to source and source image
- Fully serviceable lensed LED light engine
- Fixtures are damp location standard; wet location option (WL)
- ENERGY STAR® Certified product
- Have the cleanest of installations with a 0.29" diameter color coordinated cord. Multi-conductor ultra-pliable cord with embedded aircraft cable ensures no chance of kinks, crooked mounting, or need to tether power cord to suspension cable (patent pending).
- Multiple recessed or surface j-box mounting configurations available with cords
- 20 standard colors in textured and gloss finish; custom or RAL colors also available

Distribution

Superior Perfomance

Nominal Lumens	250	500	750	1000	1500	2000	2500	3000	3500	4000	4500	5000
Delivered Lumens	271	573	808	1001	1527	1994	2580	3110	3612	4120	4584	5045
Wattage	3.1	7.2	7.9	8.8	13.7	19.5	25.7	31.2	38.4	35.4	40.1	44.7
Lumens per Watt	87.4	79.6	102.3	113.8	111.5	102.3	100.4	99.7	94.1	116	114	113

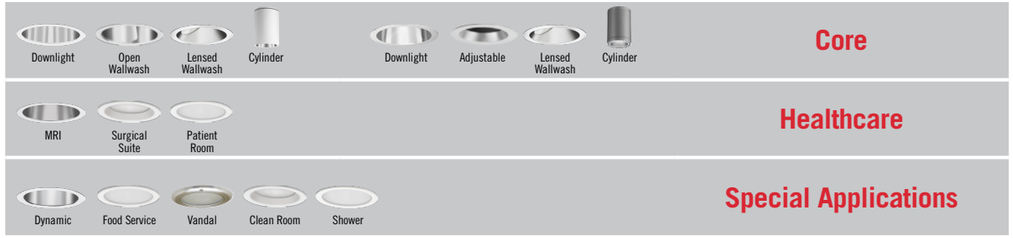
COMPLIMENTARY PRODUCTS

Coordinated Apertures | Multiple Layers of Light

General Illumination Layer | EVO

High Center Beam Layer | Incito

EVO + Incito — Multiple Layers of Light



CYLINDER LIGHTING STRATEGY:

HOT SPOT REDUCTION: Motion-sensored, to minimize unnecessary hot-spots

LIGHTING COVERAGE: Focus on lighting accuracy at parking spaces

HIGHLIGHTING: Primary downlighting can be set for stronger output at high ends of structure, and lesser output at low ends of structure to allow for even coverage for pedestrians and cars, while highlighting carport structure shape

-Stepped pendant application could highlight structural height change

-Column-washing possible with added LED strip lights at columns

ENERGY: LED energy savings

MAINTENANCE:

-LED maintenance savings

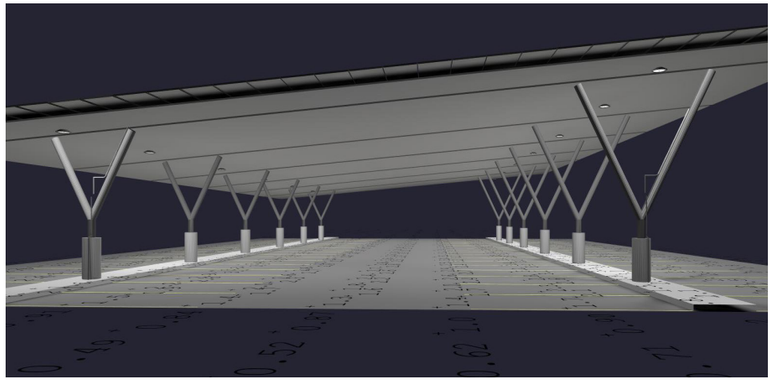
-Bird spikes can be added

AESTHETICS: more standard fixture

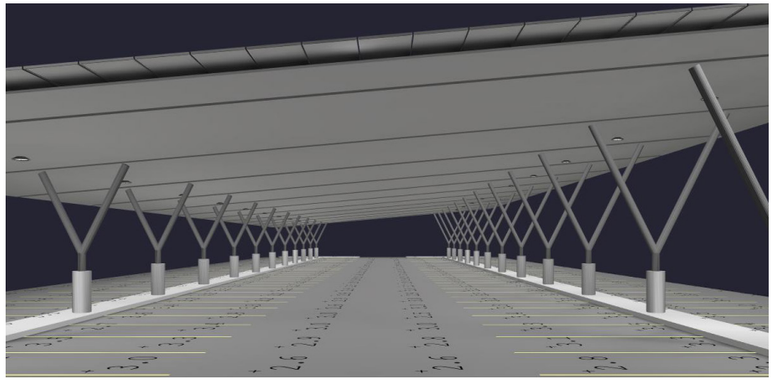
-Pendant mountings work irrespective of decking presence

-If decking pursued, lights could be recessed

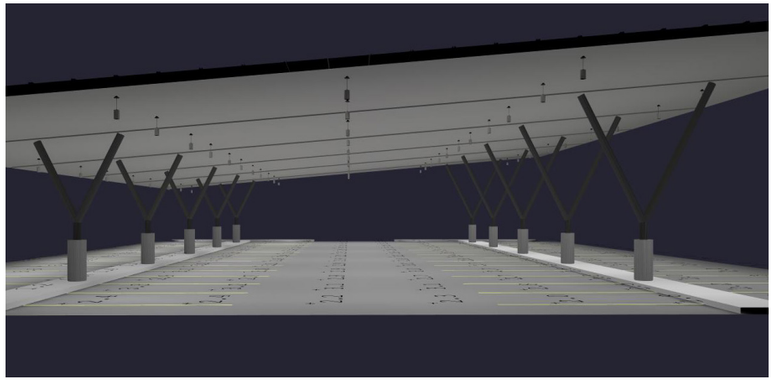
DESIGN DEVELOPMENT
LOT 560 PHOTOMETRIC STUDY



OPTION 1: ROUND CANOPY FIXTURE



OPTION 2: LINEAR FIXTURE



OPTION 3: CYLINDER FIXTURE

Motion-Sensored Light Fixtures

DESIGN DEVELOPMENT
LOT 560 LIGHTING COMPARISON

OPTION 1: ROUND CANOPY FIXTURE (PREFERRED)

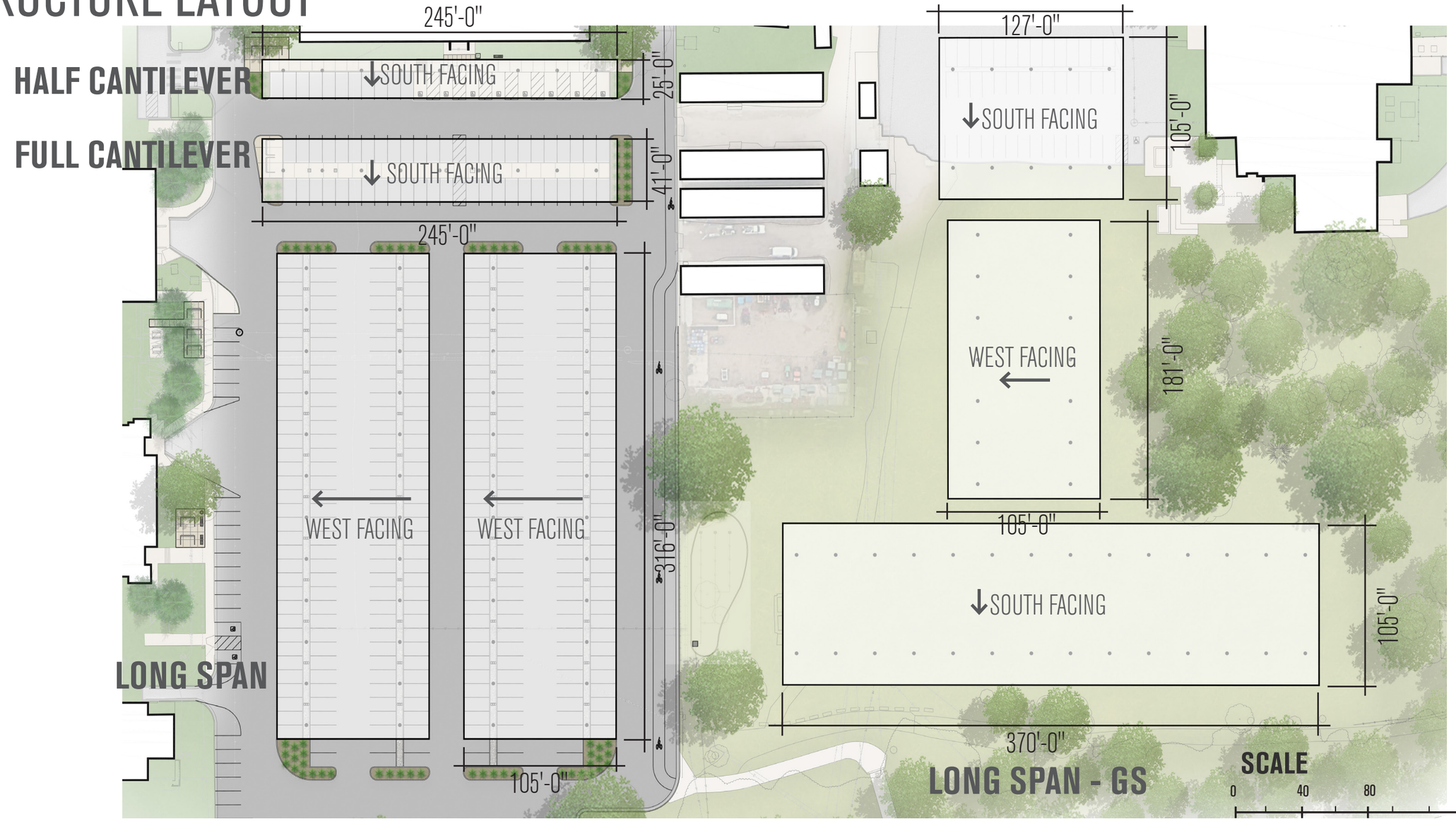
OPTION 2: LINEAR FIXTURE

OPTION 3: CYLINDER FIXTURE

04

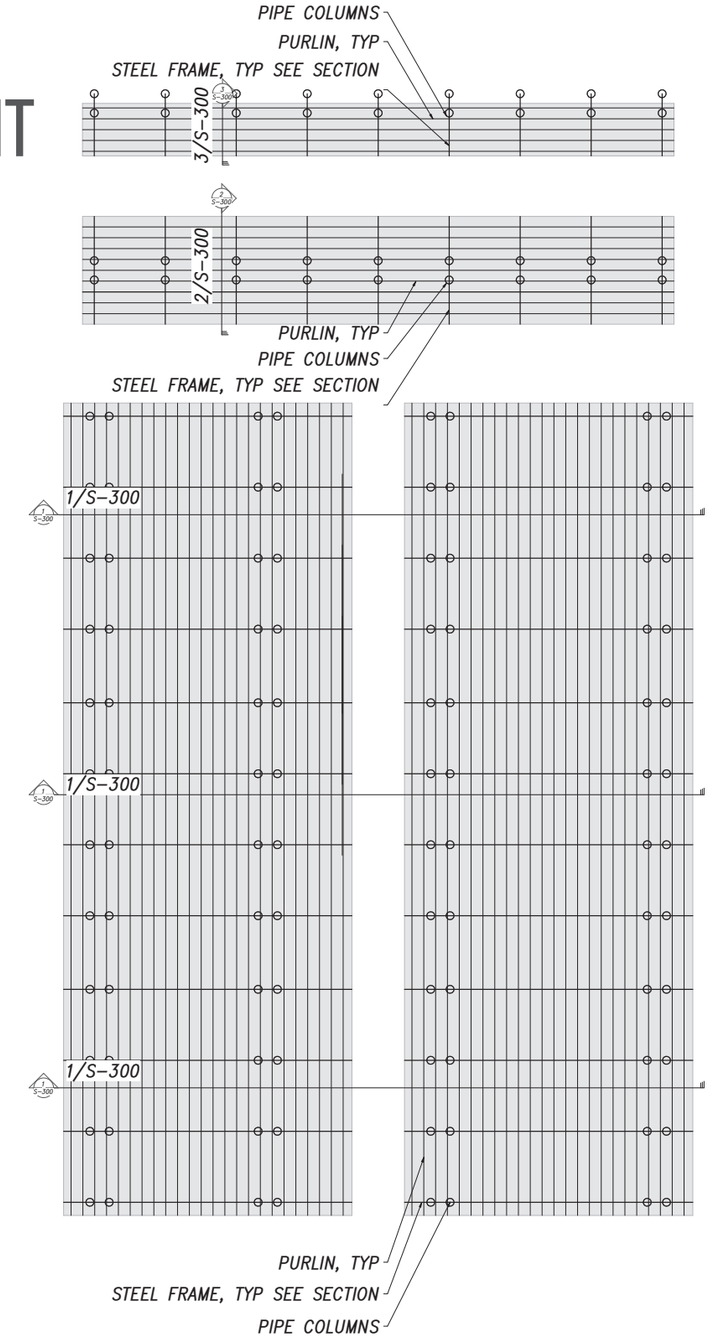
ARCHITECTURE & STRUCTURE

DESIGN DEVELOPMENT
PV STRUCTURE LAYOUT



DESIGN DEVELOPMENT

LOT 560 DESIGN DEVELOPMENT STRUCTURAL PLAN



COLORADO AISC FABRICATORS WHO CAN PROVIDE THE ENVIRONMENTAL PRODUCT DECLARATION PRIOR TO CONSTRUCTION:

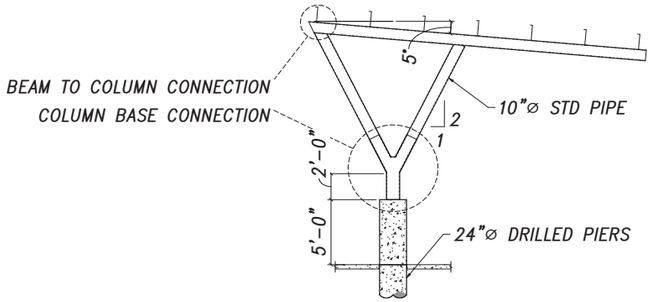
- -Dufficy
- -Front Range Steel
- -Iron Mountain
- -Metal Solutions
- -Metro Steel Fabrications
- -Pikes Peak Steel
- -Redd Iron
- -RK Specialties
- -Rocky Mountain Steel
- -W&W/AFCO
- -Zimkor

SCALE

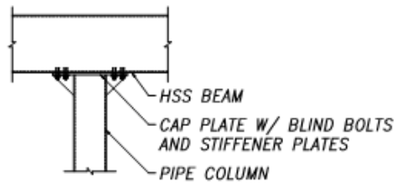
0 20 40 80 FT

N

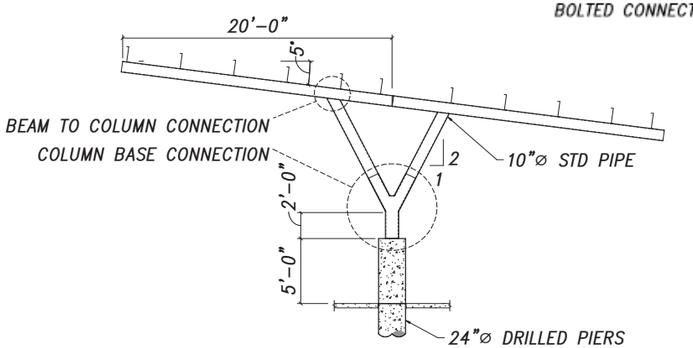
DESIGN DEVELOPMENT
STRUCTURAL DETAILS



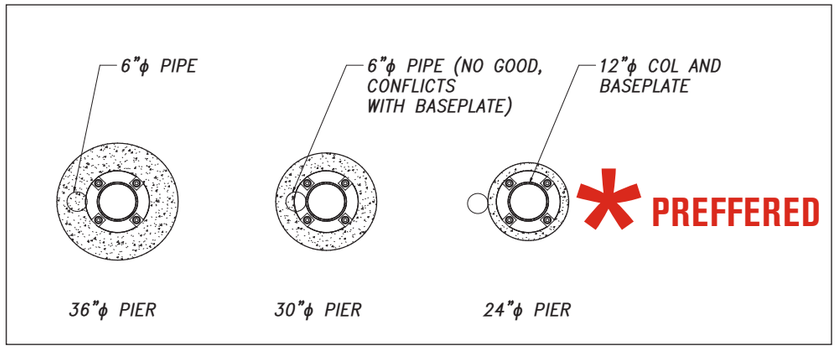
Half Cantilever Canopy - Lot 560



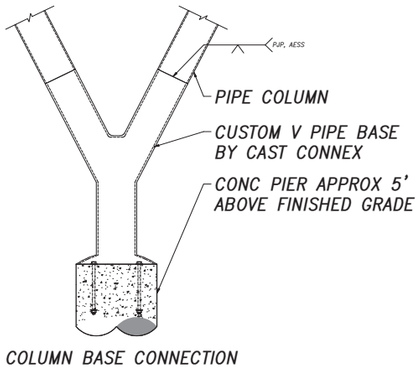
AT HSS BEAM TO COLUMN – BOLTED CONNECTION



Full Cantilever Canopy - Lot 560

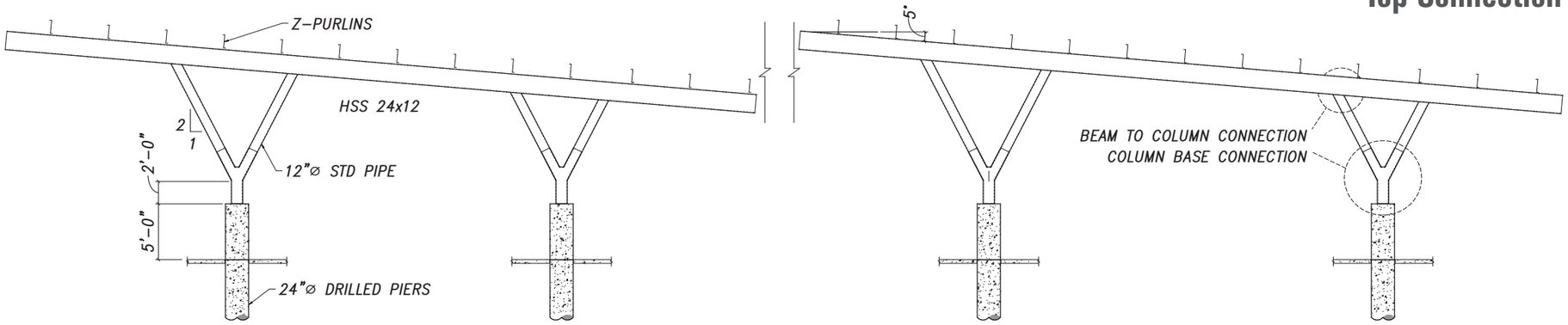


Downspout Options



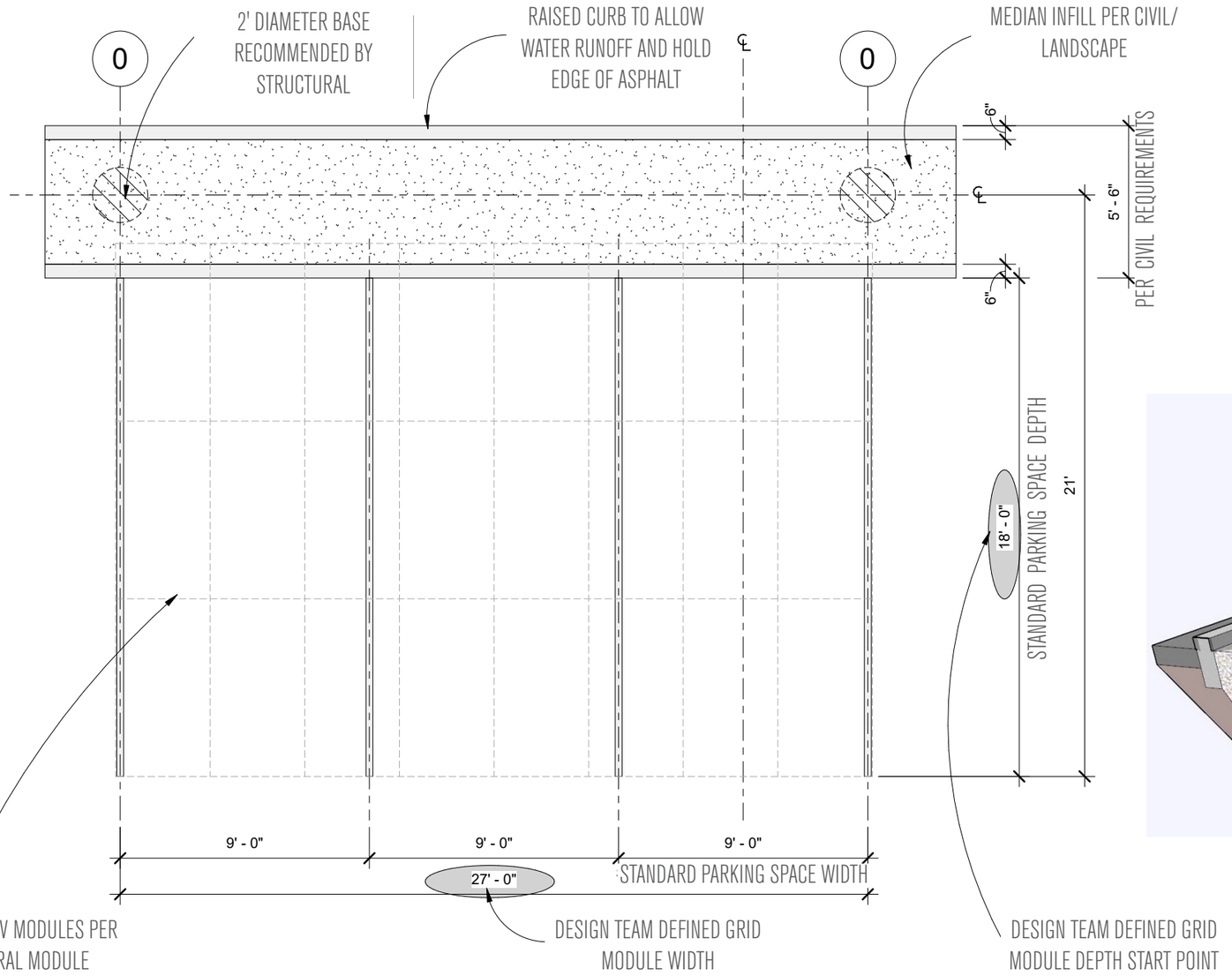
COLUMN BASE CONNECTION

Top Connection Sections

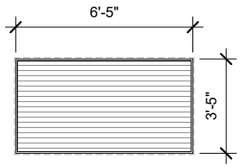


Longspan Canopy - Lot 560

DESIGN DEVELOPMENT
STRUCTURAL LAYOUT DIAGRAM



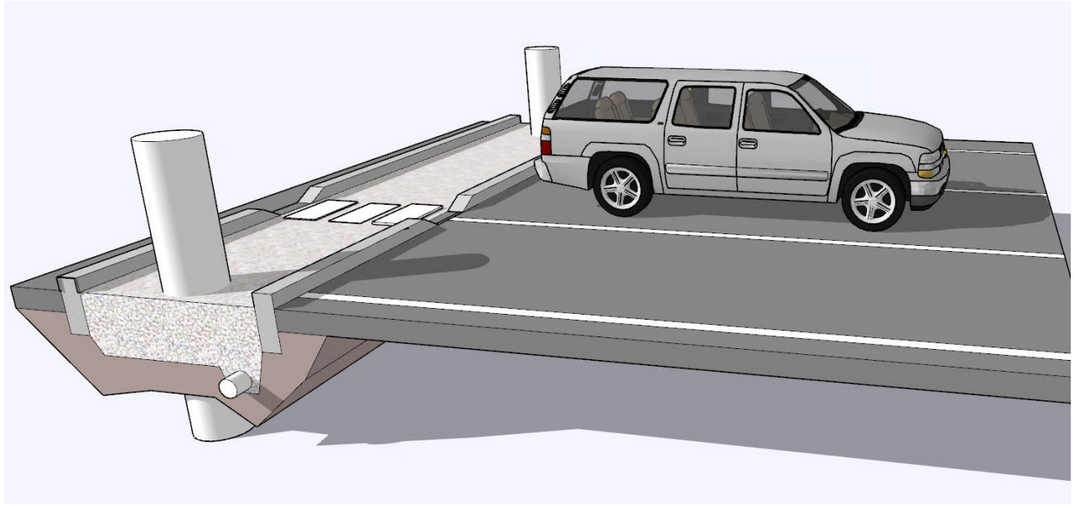
Industry Standard PV Panel Size



1: ACTUAL SIZE WILL VARY PER SOLAR PROVIDER.

2: ASSUME 1/2" SPACING BETWEEN PANELS.

Axonometric Analysis

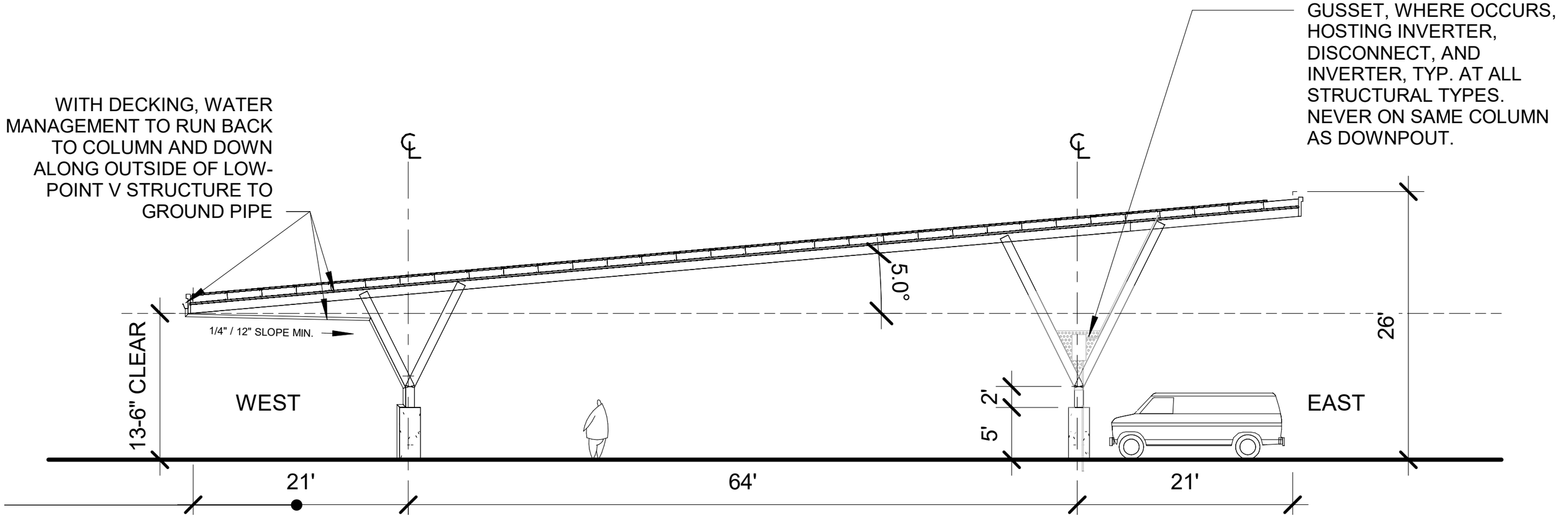


DESIGN DEVELOPMENT
STRUCTURE A

A **Monolithic:**
LONG SPAN

APPLICATION: back-of-house power generation

- Design-Team-Defined monolithic structure with cantilever over parking spaces.

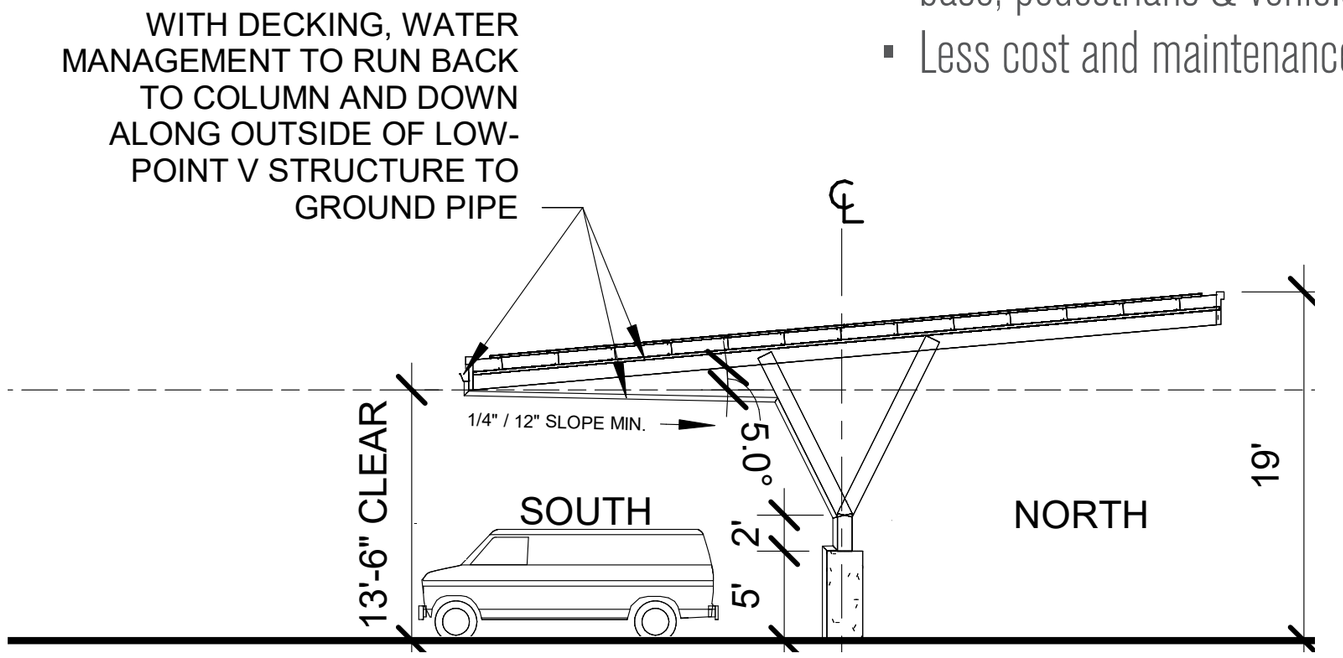


DESIGN DEVELOPMENT
STRUCTURE B

B Full Cantilever:

APPLICATION: double-row locations with walk between parking

- 10' wide flush concrete island to accommodate structure base, pedestrians & vehicle bumpers
- Less cost and maintenance

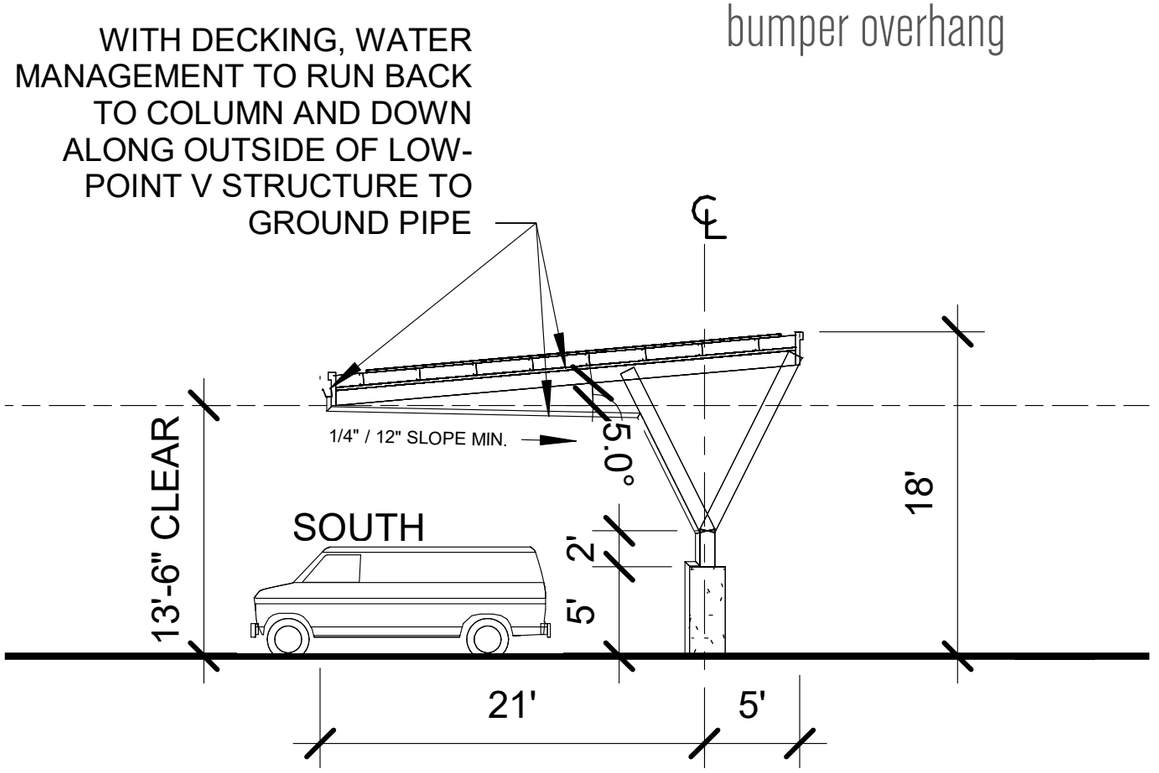


DESIGN DEVELOPMENT
STRUCTURE C

C Half Cantilever:

APPLICATION: single row locations adjacent to buildings

- 8’ walk in front of vehicle for ADA access & allows for bumper overhang

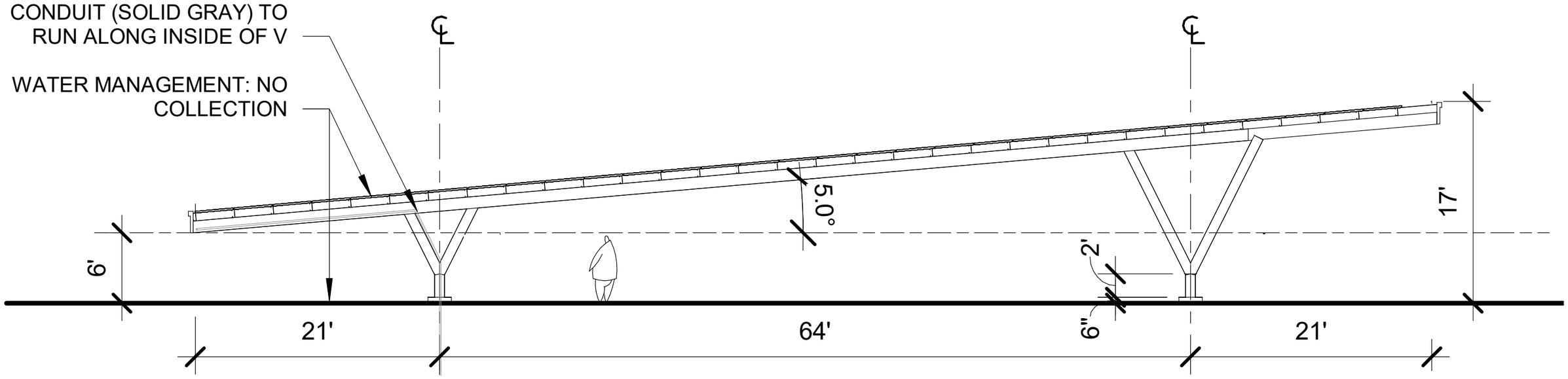


DESIGN DEVELOPMENT
STRUCTURE D

APPLICATION: maximum power generation at Green Space

D **Monolithic:**

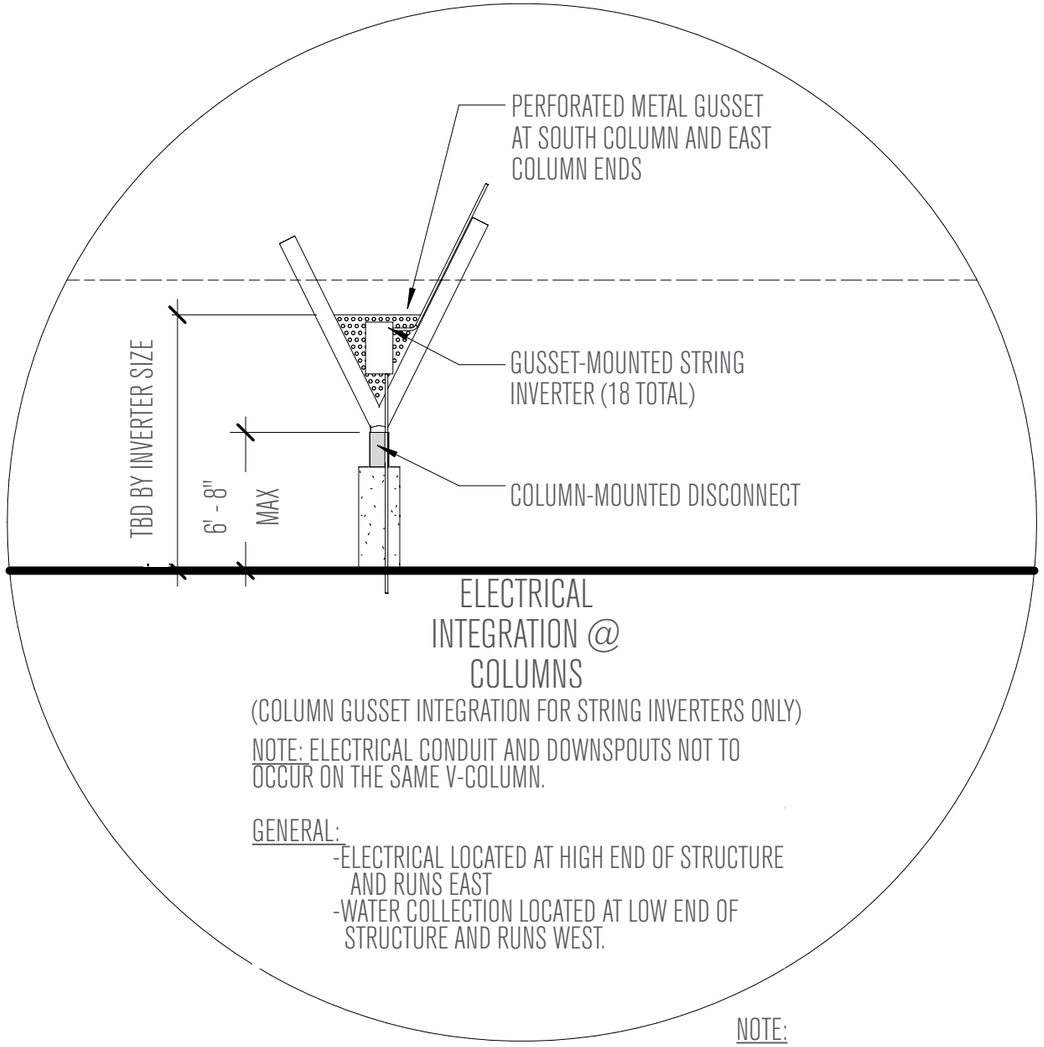
LONG SPAN - GS



PARAMETERS:

- Same as structure A, except lower to the ground
- No concrete base above grade to minimize debris blockage

DESIGN DEVELOPMENT
ELECTRICAL INTEGRATION



ELECTRICAL INTEGRATION @ COLUMNS

(COLUMN GUSSET INTEGRATION FOR STRING INVERTERS ONLY)

NOTE: ELECTRICAL CONDUIT AND DOWNSPOUTS NOT TO OCCUR ON THE SAME V-COLUMN.

GENERAL:

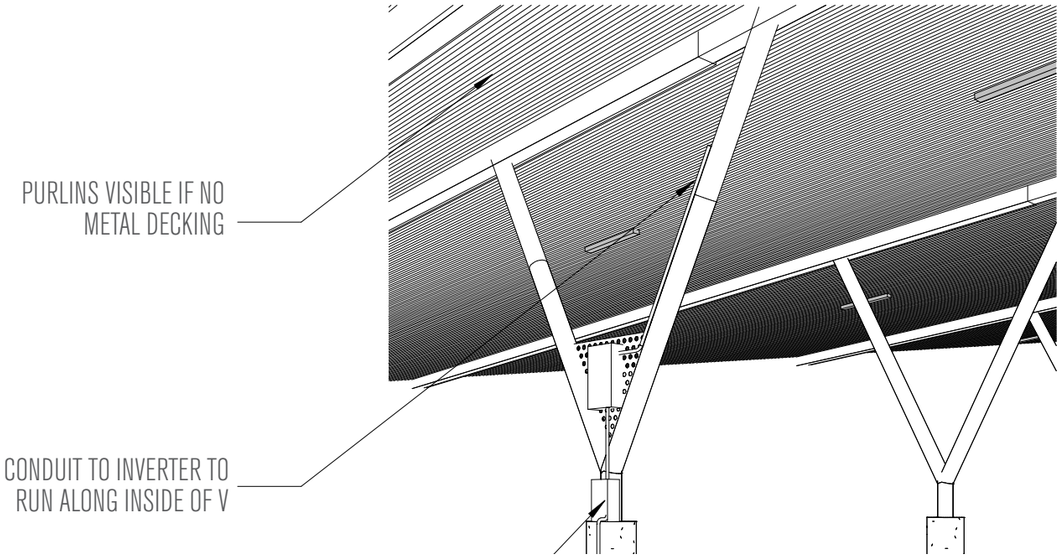
-ELECTRICAL LOCATED AT HIGH END OF STRUCTURE AND RUNS EAST

-WATER COLLECTION LOCATED AT LOW END OF STRUCTURE AND RUNS WEST.

Longspan Canopy Electrical Integration

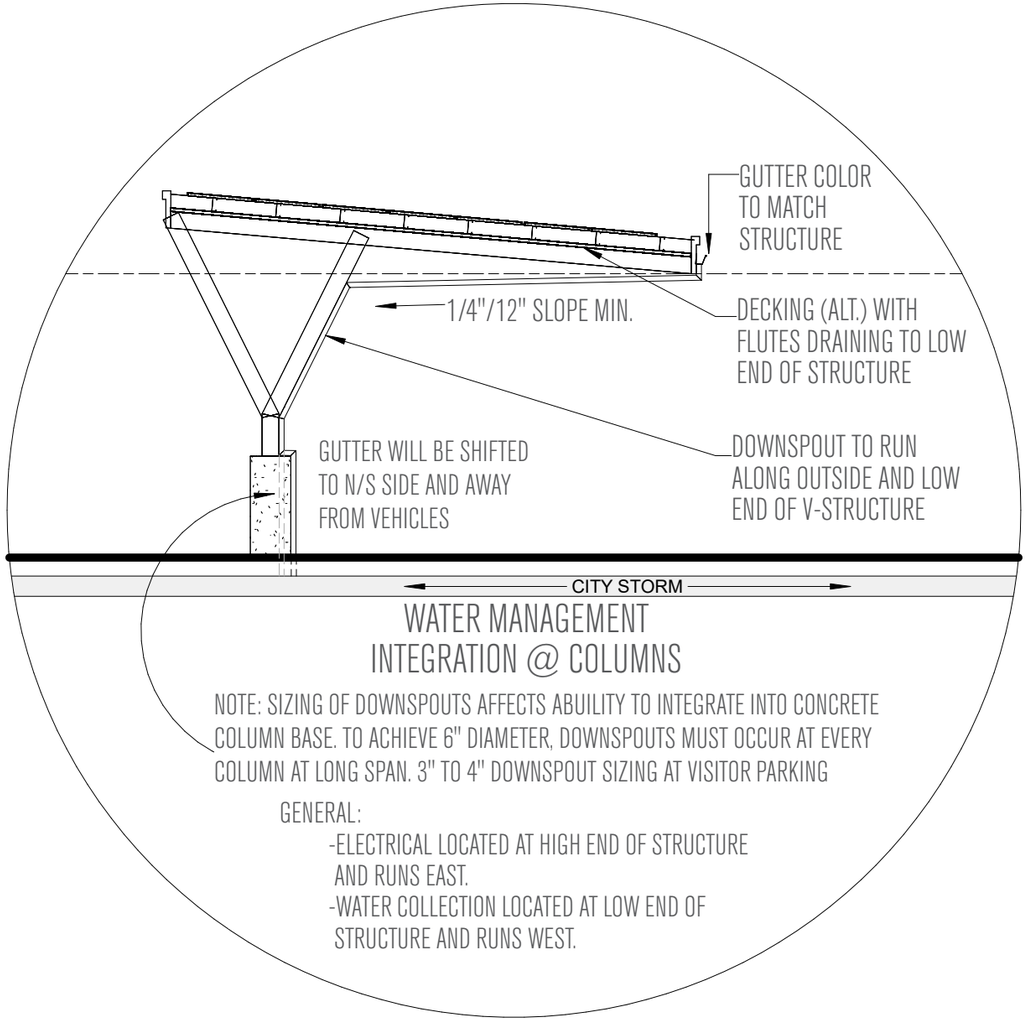
MICRO-INVERTER

STRING INVERTER



NOTE:
SELECTED PV PROVIDER TO ADVISE ON CHOICE OF INVERTER TYPE (MICRO-INVERTER OR STRING INVERTER). GUSSET SHOWN HERE REQUIRED ONLY FOR MOUNTING STRING INVERTER, IF SELECTED.

DESIGN DEVELOPMENT
WATER MANAGEMENT INTEGRATION



WATER MANAGEMENT INTEGRATION @ COLUMNS

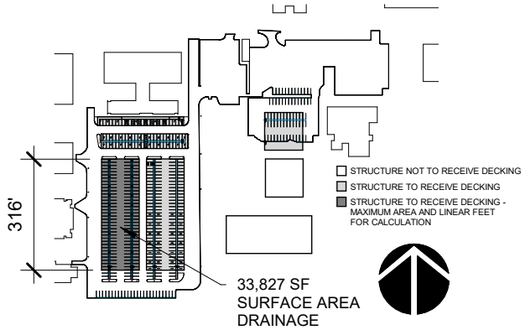
NOTE: SIZING OF DOWNSPOUTS AFFECTS ABUILITY TO INTEGRATE INTO CONCRETE COLUMN BASE. TO ACHIEVE 6" DIAMETER, DOWNSPOUTS MUST OCCUR AT EVERY COLUMN AT LONG SPAN. 3" TO 4" DOWNSPOUT SIZING AT VISITOR PARKING

GENERAL:

-ELECTRICAL LOCATED AT HIGH END OF STRUCTURE AND RUNS EAST.

-WATER COLLECTION LOCATED AT LOW END OF STRUCTURE AND RUNS WEST.

Longspan Canopy Water Management Integration



CALCULATOR SOURCE: http://apps.smacna.org/dsgcal/

Downspout & Gutter Sizing Reports

Project Name: CU E Campus Solar

Rainfall Intensity (in/hr): 9.4
Based on rainfall averages in Boulder, COLORADO (100 years)

Roof Rainfall Design Area (ft²): 33,827.00
* Area of Largest Roof Serving a Single Gutter System
Design Area manually entered by user

Gutter in Lineal Ft: 316
* Length at Largest Roof Serving a Single Gutter System

Gutter Length Serving Single DS (ft.): 27
*Assumption: downspouts are equally spaced
**Maximum gutter length to be served by a downspout is 50ft per SMACNA ASMM

M (depth to width ratio): 0.75

Min. Gutter Width (in.): 9 [Rectangular]

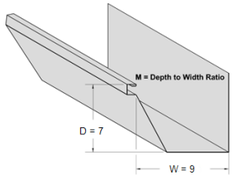
Min. Gutter Depth (in.): 7

# of Downspouts: 12

Additional Downspouts: 5
*to reduce size of gutter and downspouts additional downspouts can be added

Min. Area per DS (in²): 21.68

Min. DS Size (in): 6 [Plain Round]
*Per Table 1-3 on page 1.4 of SMACNA ASMM



Downspout & Gutter Sizing Reports
Calculations are derived using the 7th Edition of SMACNA's Architectural Sheet Metal Manual

Water Management Sizing Study

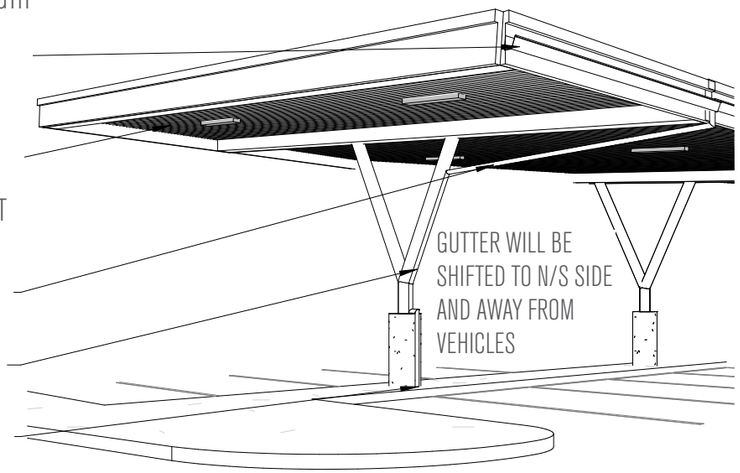
COLLECTION GUTTERS RUN LENGTH OF LOW END SOFFIT. COLOR TO MATCH STRUCTURE (BLACK)

PURLINS VISIBLE IF NO METAL DECKING

TO ACHIEVE GRAVITY FLOW, DOWNSPOUT MUST ANGLE OPPOSITE TO STRUCTURE. HANGARS TO BE EXPLORED IN FUTURE DESIGN PHASE

DOWNSPOUTS RUN ALONG OUTSIDE OF V AND ON LOWEST COLUMN

COLLECTION OF WATER PIPED UNDER PAVING



DESIGN DEVELOPMENT
WATER MANAGEMENT INTEGRATION

DESIGN DEVELOPMENT

VIEW FACING EAST AT LOT 560 VISITOR LOT STRUCTURES

DESIGN DEVELOPMENT

VIEW FACING EAST AT LOT 560 VISITOR LOT STRUCTURES - NIGHT VIEW

PREFERRED VCPG FIXTURE SHOWN

DESIGN DEVELOPMENT
VIEW FACING NORTHWEST AT LOT 560

DESIGN DEVELOPMENT
VIEW FACING NORTHWEST AT LOT 560 - NIGHT VIEW

PREFERRED VCPG FIXTURE SHOWN

DESIGN DEVELOPMENT

ENLARGED VIEW FACING NORTHWEST AT LOT 560

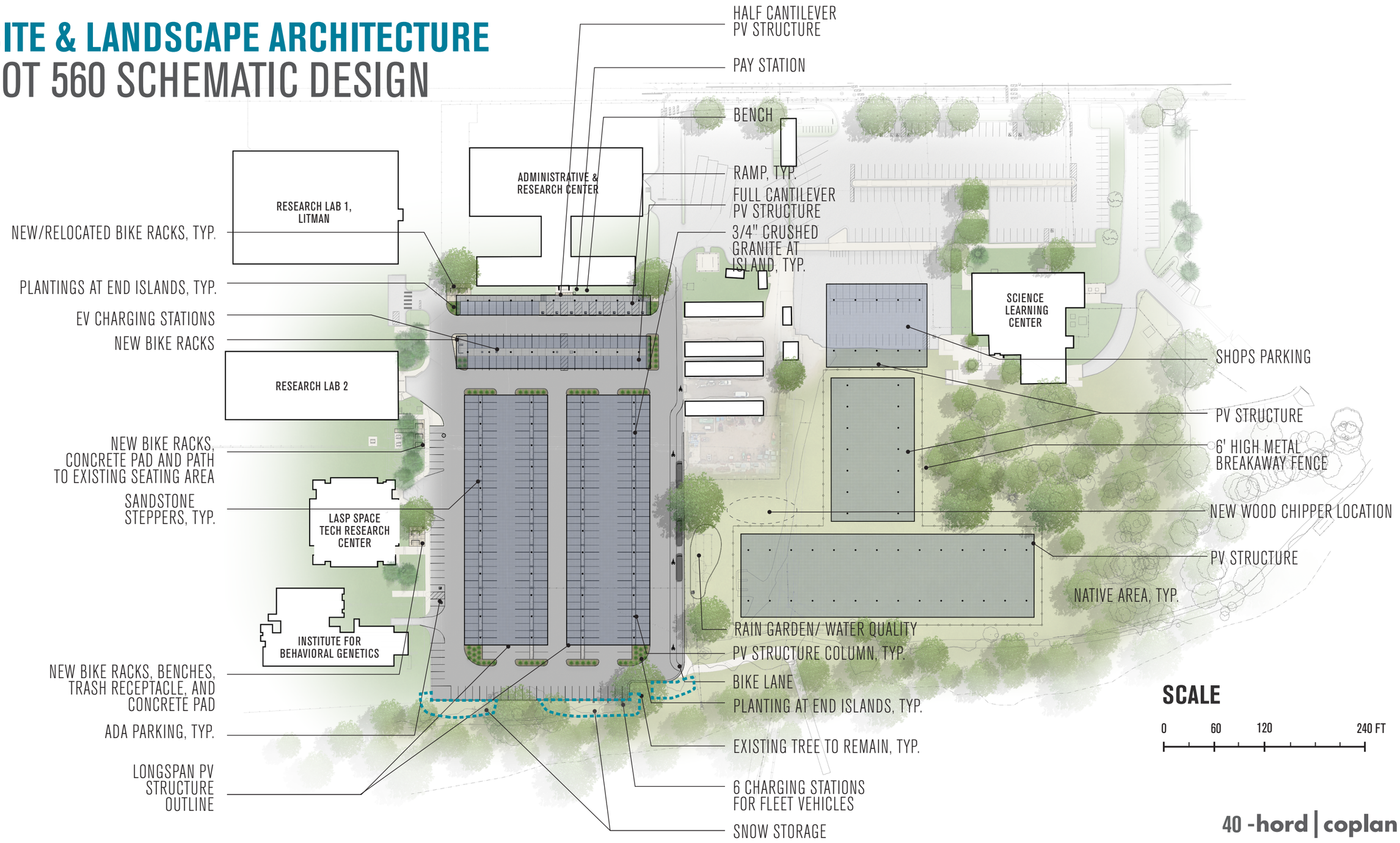
DESIGN DEVELOPMENT
ENLARGED VIEW FACING NORTHWEST AT LOT 560

PREFERRED VCPG FIXTURE SHOWN

05

SITE & LANDSCAPE ARCHITECTURE

SITE & LANDSCAPE ARCHITECTURE
LOT 560 SCHEMATIC DESIGN



SITE & LANDSCAPE ARCHITECTURE
TREE & PLANTING PROTECTION PLAN

LEGEND

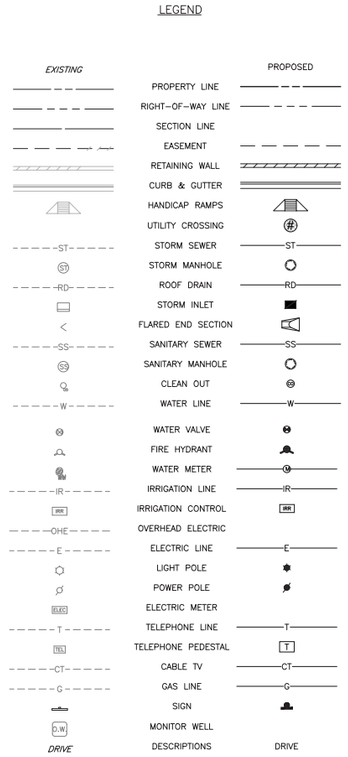
- Target Area
- Tree - To Remain
- Tree - To Be Replaced
- Tree - To Be Removed (no replacement needed)
- Native Area
- Irrigated Landscaped Area
- Tree and Planting Protection Fence

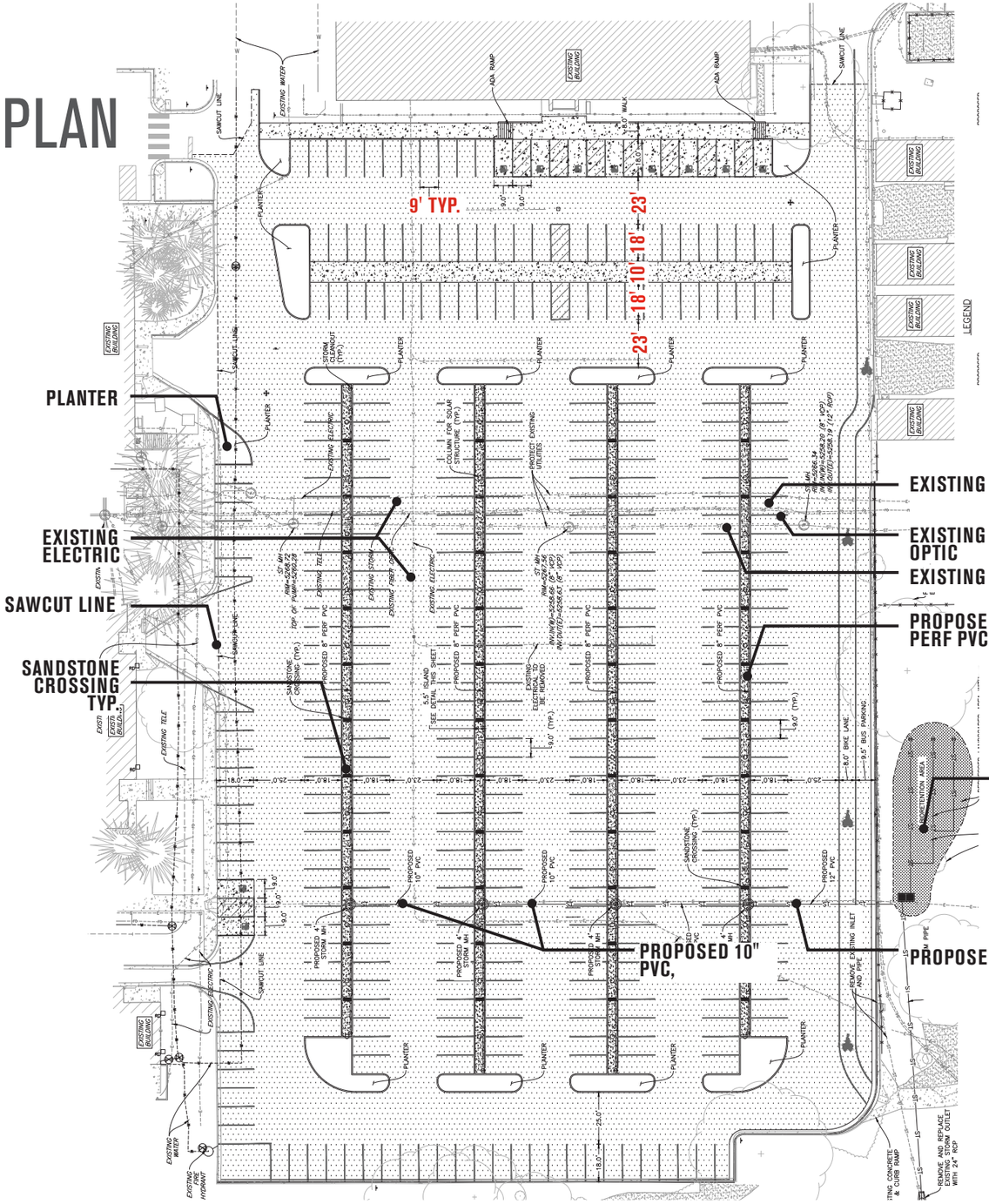
SCALE

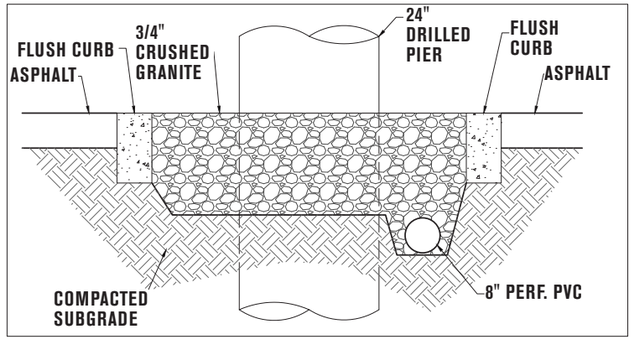
0 60 120 240 FT

N

DESIGN DEVELOPMENT
LOT 560 SITE & UTILITY PLAN







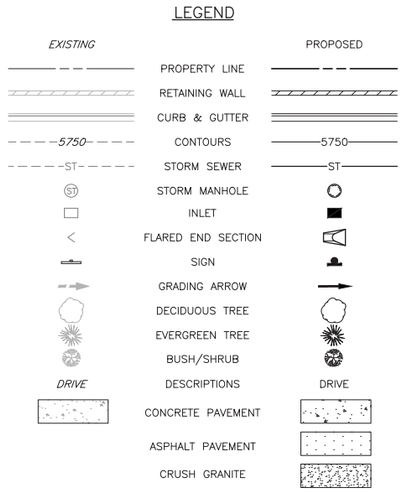
ISLAND DETAIL
N.T.S.

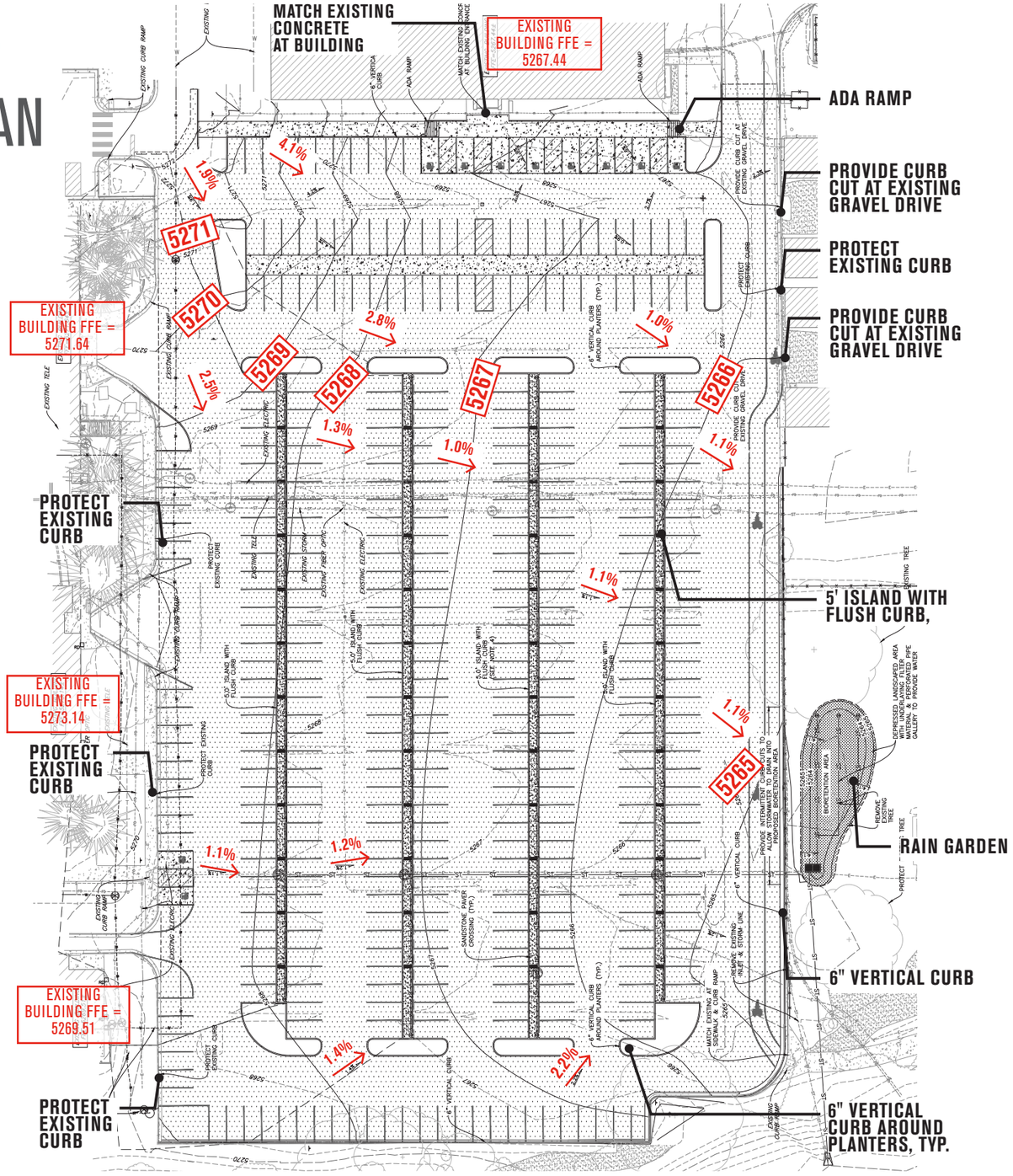
SCALE

0 30 60 120 FT

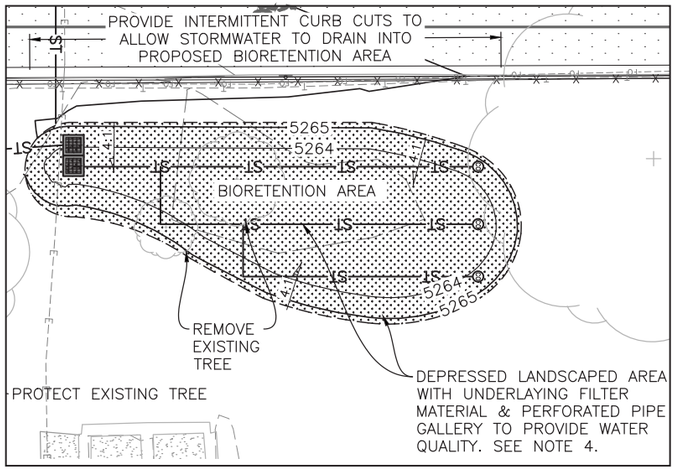
42 -hord | coplan | macht

DESIGN DEVELOPMENT
LOT 560 GRADING PLAN





RAIN GARDEN ENLARGEMENT

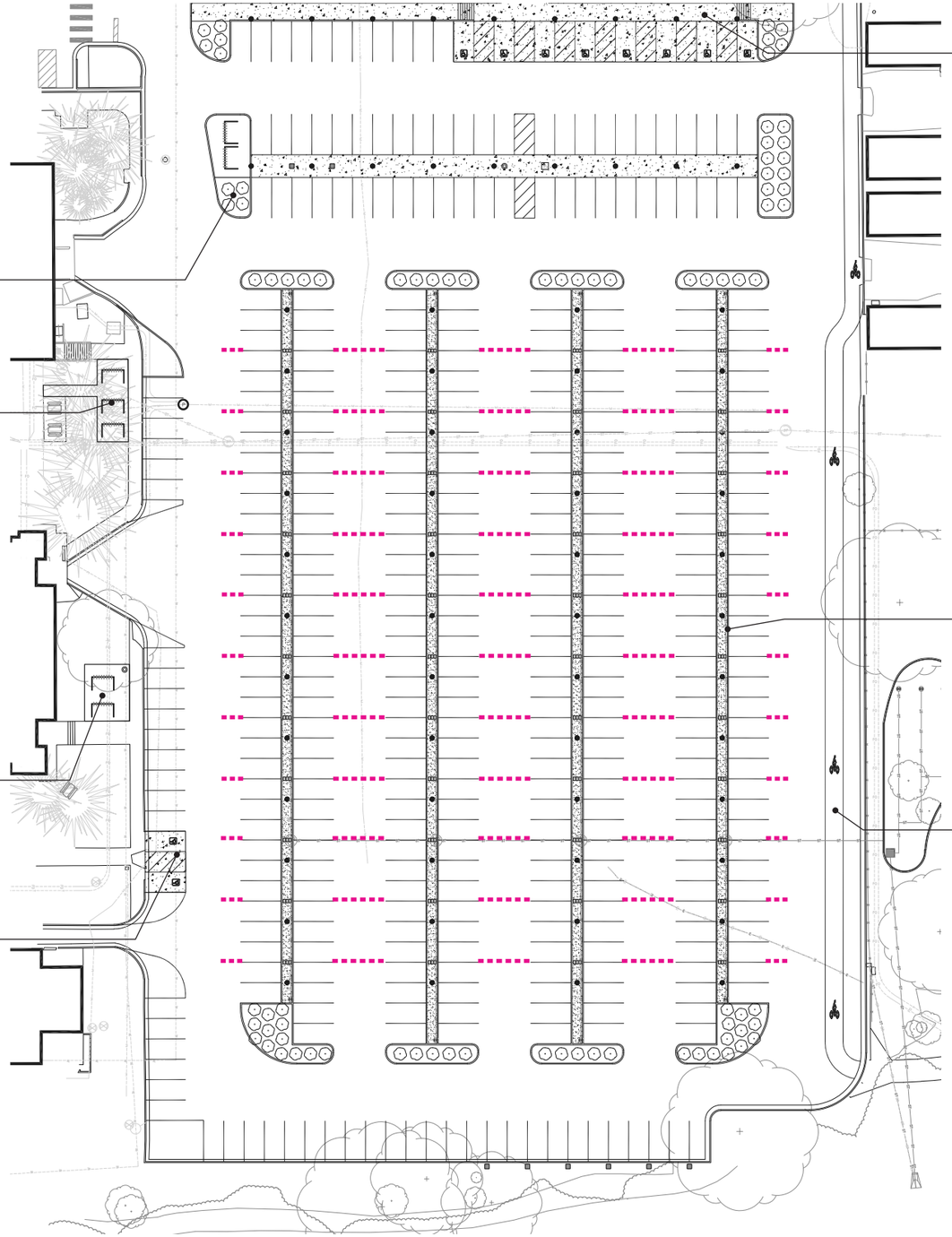


4. PROPOSED WATER QUALITY SYSTEM (BIORETENTION AREA) SHOWN HAS APPROXIMATELY 4,000 CF OF VOLUME, TO PROVIDE THE WATER QUALITY CAPTURE VOLUME AS DETERMINED BY THE CURRENT MILE HIGH FLOOD DISTRICT CRITERIA.

SCALE

0 30 60 120 FT

DESIGN DEVELOPMENT
LOT 560 PEDESTRIAN WAYFINDING



LEGEND

DASHED STRIPING AT PEDESTRIAN PASSAGE

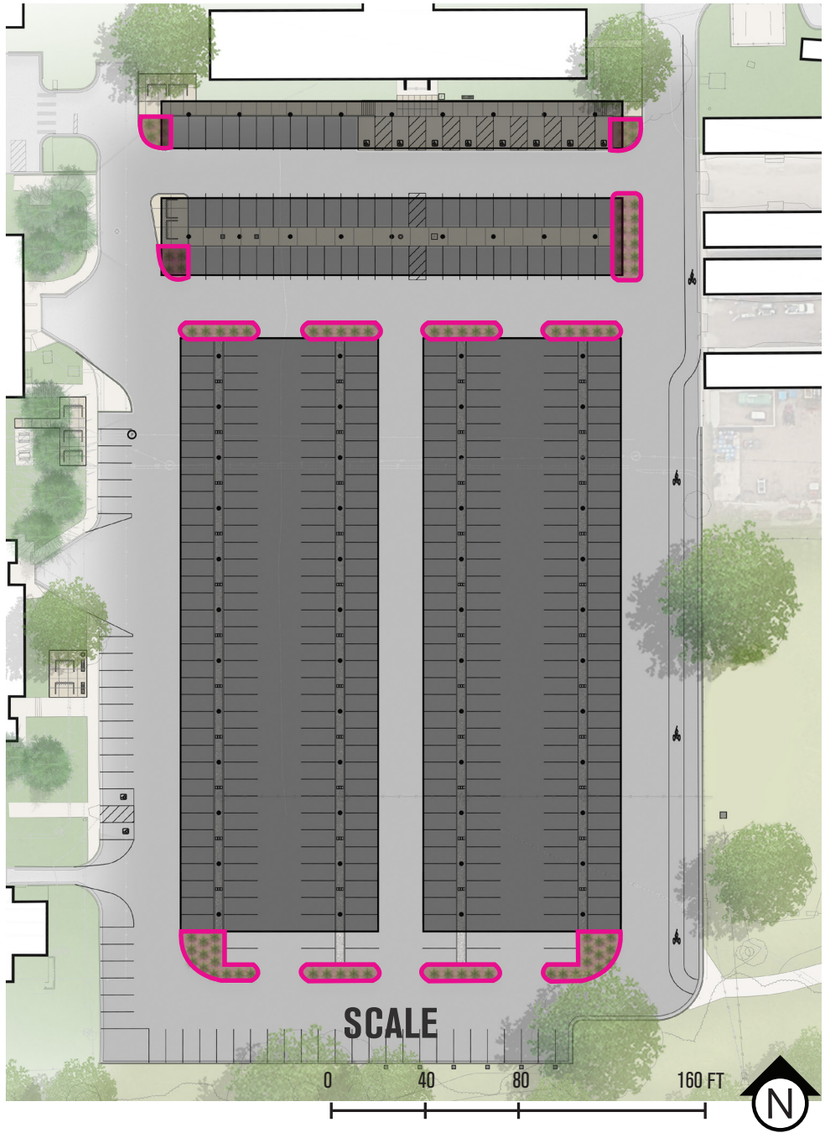
NOTE: STRIPING DESIGN & LOCATIONS TO BE ADDRESSED AT PROJECT COMPLETION

SCALE

0 60 120 240 FT

N

DESIGN DEVELOPMENT
LOT 560: PLANTING DESIGN



Planted Parking Islands

Achillea 'Moonshine'
Moonshine Yarrow

Bouteloua gracilis 'Blonde Ambition'
B. A. Grama Grass

Deschampsia cespitosa 'Northern Lights'
N. L. Tufted Hair Grass

Euonymus fortunei 'Coloratus'
Purpleleaf Wintercreeper

Helictotrichon sempervirens
Blue Oat Grass

Hermerocallis 'Stella D'Oro'
Dwarf Daylilly

Perovskia atriplicifolia 'Little Spire'
Dwarf Russian Sage

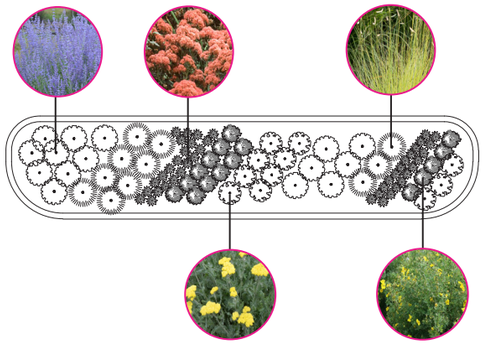
Potentilla neumanniana 'Nana'
Dwarf Spring Potentilla

Schizachyrium scoparium 'Blue Heaven Grass'
Blue Heaven Little Bluestem

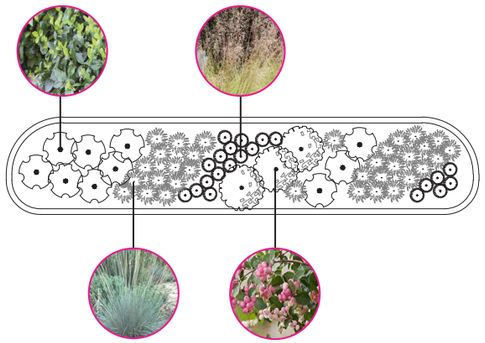
Sedum 'Autumn Joy'
Autumn Joy Sedum

Symphoricarpos x doorenbosii 'Magic Berry'
Magic Berry Snowberry

PROTOTYPE: ISLAND IN SUN



PROTOTYPE: ISLAND IN SHADE



NEXT STEPS