INFINITY®
TECHNOLOGY

FOR EXTREMELY LONG LIGHTING RUNS

GVA LIGHTING

THE ORIGIN OF INFINITY® TECHNOLOGY

The story of INFINITY® technology started in 2010 when GVA Lighting was approached with an unusual request to help delineate the tallest office building in Canada, standing 298 m (978 ft) tall.

The project had strict requirements and limitations placed.

The architect required:

- No penetrations into the building
- No unnecessary lengthy wiring on the façade of the building

And luminaires had to be:

- Industry-leading in surface brightness
- Small with a clean aesthetic
- Color-changing
- Highly reliable
- Reasonably priced

Walterdale Bridge | Edmonton, Canada

THE BRAINWORK BEHIND THE TECHNOLOGY

Our analysis, experiments and extensive engineering brainstorming revealed the following:

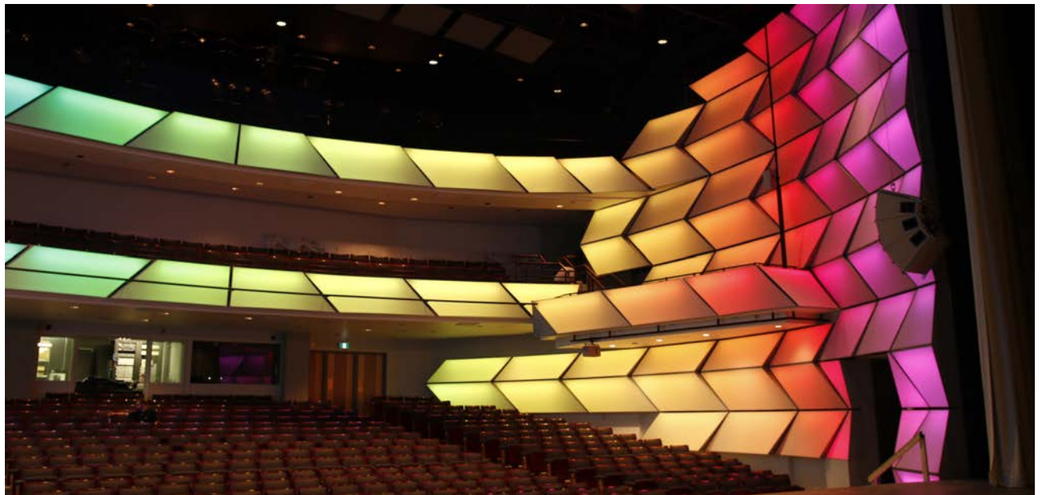
- 18 mid-power LEDs per 300 mm (1 ft) module with maximum power consumption of 5W per module creates desirable luminance and uniformity
- Low voltage design is not applicable; at 5W per 300 mm (1 ft) Class 2 circuits can only power 6 linear meters (20 ft) of lighting and Class 1 with a reasonable cable gauge - up to 30 m (100 ft). Large electrical load with low voltage power requires large gauge wire and cables to handle high current and to minimize voltage drop

Fixtures with built-in AC/DC power supplies are close to the solution, however:

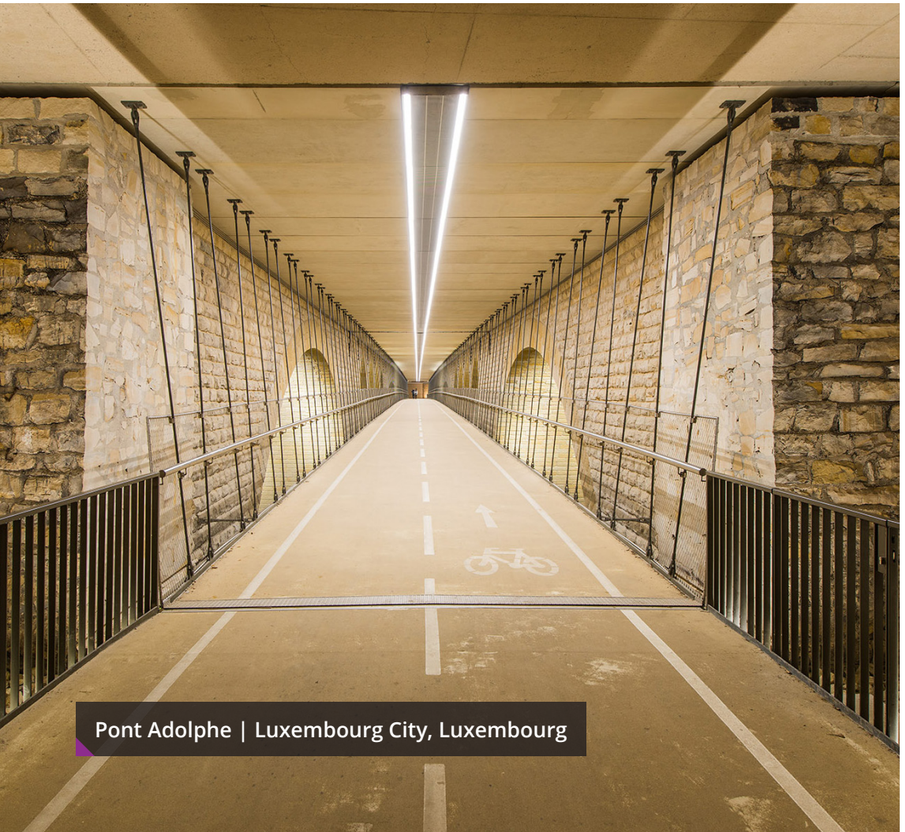
- They all have lifetime limiting due to temperature sensitive electrolytic capacitors
- Physical dimensions are larger than desired
- Length is still limited to approximately 92 m (300 ft)

The luminaire components will determine the luminaire size:

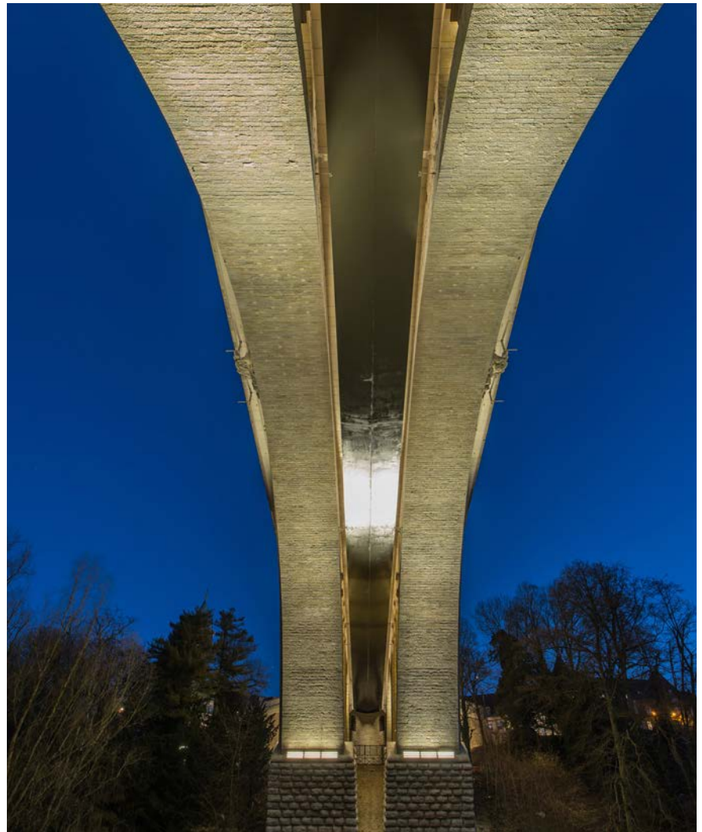
- Cable
- Connectors
- Inductors
- Electrolytic capacitors
- To meet size requirements, cable diameter should be 7~9 mm (0.35 in) or smaller
- To avoid excessive cabling we must transfer the current through the modules (through-wiring)
- The light source must be modular and completely environmentally protected
- A centralized remote power supply is ideal for system reliability and maintenance



Toronto Centre for the Arts | Toronto, Canada



Pont Adolphe | Luxembourg City, Luxembourg



THE RESULT ATTRIBUTED TO INFINITY® TECHNOLOGY

THE INFINITY® FORMULA

P = I x V

CONSTANT POWER | **CURRENT** | **VOLTAGE**

A simple formula for success emerged.

1. To keep the luminaire small we had to reduce the current to keep the connectors and cables small

2. Since the brightness (total wattage) could not be reduced we had to increase the voltage

The industry's psychological barrier regarding traditional line voltage (120VAC in North America, 230VAC in Europe) limits the ability to achieve much desired long run lengths

Concluding that the system voltage has to be higher than standard line voltage, it was determined that a range between 250V and 600V is most suitable; this is within the Low Voltage limits of both North America (600VAC or DC) and Europe (1000VAC or 1500VDC by Low Voltage Directive and IEC standard).

3. Voltage should be DC, not AC

Since many line voltage luminaires feature built-in AC/DC power supplies with bulky inductors and capacitors, they cannot maintain the small size required.

More advanced line voltage luminaires feature 'compact AC drivers' which do not require large transformers or electrolytic capacitors, however, these lumianires still have limitations. These systems are prone to high flicker index and THD and they have difficulty with high speed control. Complete DC systems avoid bulky AC components AND achieve better electrical and optical parameters.

4. 380V was selected. It is the sweet spot

- Within IEC standards, CEC & NEC for Low Voltage Classification
- Provides simple and effective design of AC/DC boost converters because selected DC voltage is higher than the peak AC voltage (186V in North America and 354V in Europe)
- Within standard voltage rating of commonly used electronic components, which are readily available & have a reasonable cost
- The voltage of choice for new Data Centers and Microgrids by Emerge Alliance

INFINITY® GVA TECHNOLOGY

THE ACHEIVEMENT OF INFINITY® TECHNOLOGY

We achieved:

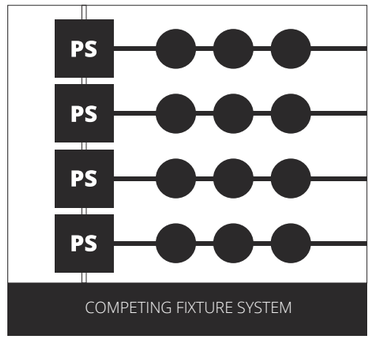
- Long lighting circuits of 300+ meters (1000+ feet) can be fed from a single power and data input point
- Compact luminaire size by eliminating bulky capacitors required for AC/DC converters
- Small cables and connectors resulting in small form factor
- Increased fixture reliability and lifespan by eliminating temperature sensitive electrolytic capacitors (typically rated for 4,000 hours @ 80°C)
- Compatibility with renewable energy sources such as solar and wind
- Energy saving by eliminating AC/DC conversion, which typically represents 10~15% of system losses
- Ideal Power Factor 1.0 or 0.99 for AC/DC source
- Lower system cost with fewer, higher wattage power supplies
- Lower system cost with savings on cabling and connections with through-wiring design

The Problem was solved! We can build very long lighting circuits fed from a single power and data input point.[1]

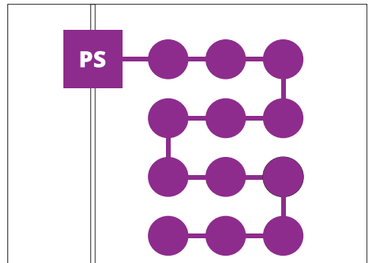
300+ METERS (1000+ FEET)

- Wall washing light @ 1,600 lm/ m (500 lm/ ft) – STR9® MONO @ 5 W/ ft
- Exterior delineation light @ 11,970 cd/ m^2 – HIGHLIGHTER® DL
- Cove lighting @ 1,830 lm/ m (610 lm/ ft) – HIGHLIGHTER® COVE

1. Some restrictions apply. Consult factory for maximum run length for your application.

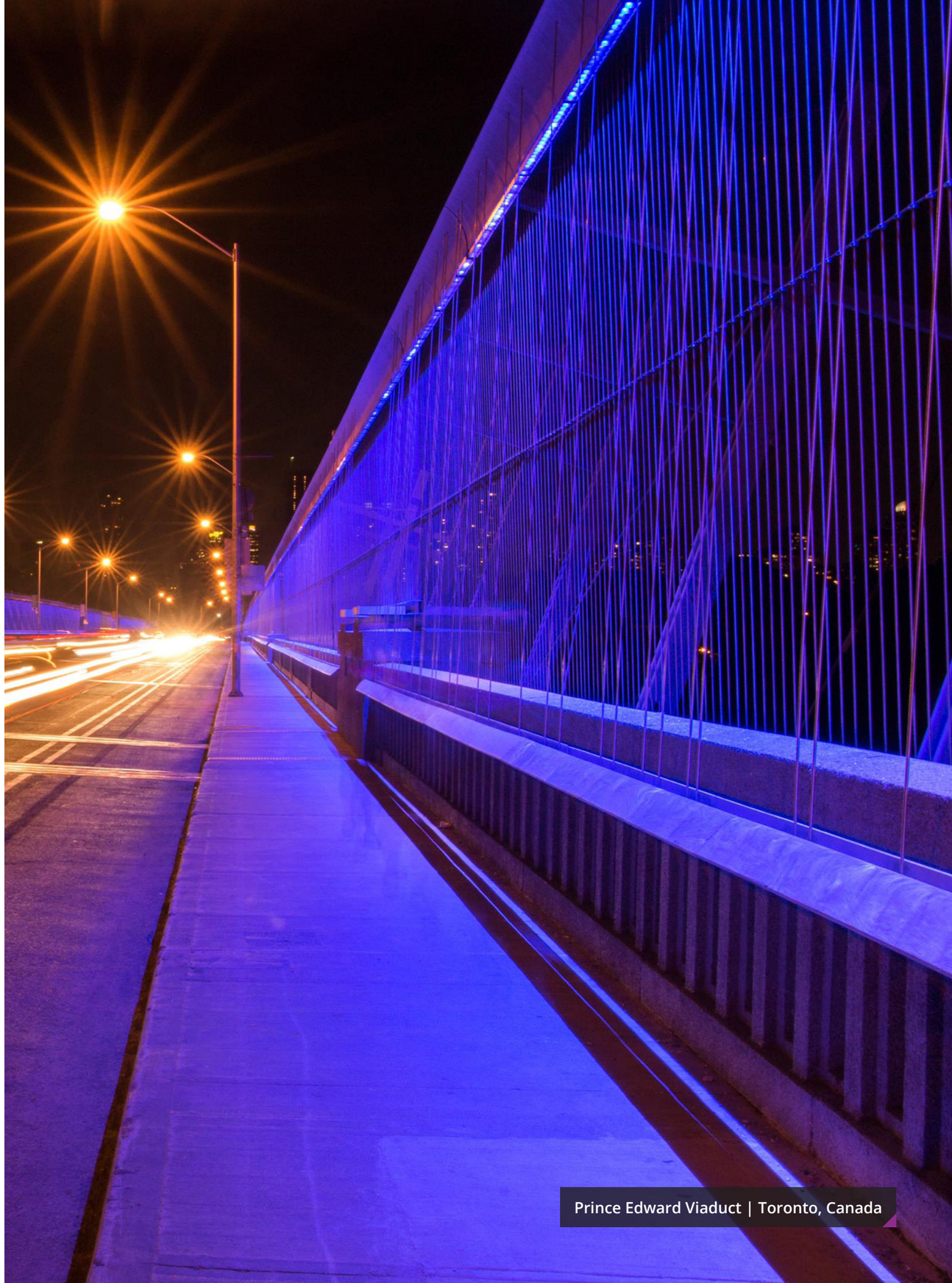


COMPETING FIXTURE SYSTEM



INFINITY® TECHNOLOGY

Apply higher voltage and direct current to achieve long lighting circuits increase system reliability and minimize lighting equipment dimensions.



Prince Edward Viaduct | Toronto, Canada

INFINITY®
GVA TECHNOLOGY

ONE
BRIDGE
ONE
POWER
SUPPLY

Svindersvik Bridge | Nacka, Sweden

300+ meters long lighting circuits

APPLICATIONS PERFORMED BY INFINITY® TECHNOLOGY

- Architectural delineation of skyscrapers
- Illumination of long bridges
- Lighting for long coves in airports, shopping malls, art centers and casinos
- Wall washing and wall grazing of long facades
- Illumination of modern data centers (technology is moving from 48V DC to 380V DC)

As a Member of the EMerge Alliance, GVA Lighting strives towards leading the rapid adoption of safe DC power distribution into commercial buildings through the EMerge Alliance Standards.

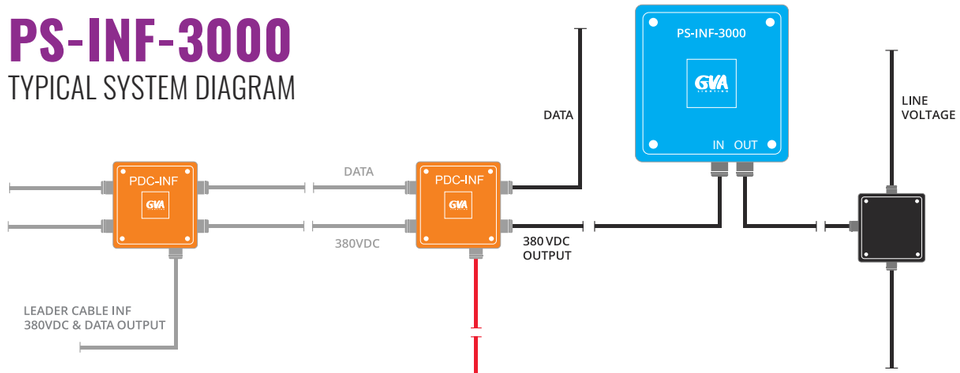
INFINITY® GVA TECHNOLOGY

INFINITY® MAXIMUM RUN LENGTH IN 300MM (1FT) MODULES

POWER SOURCE	INPUT VOLTAGE	HL-DL& HL-COVE [3,4,5]	HL-COVE LITE	STR9® - MONO-INF [1,2,4]		
		5W / FT	5W / FT	5W / FT	7.5W / FT	15W / FT
PS-INF-3000[6]	200~240V AC	576	462	580	390	195
	120V AC	296	282	295	195	95
PS-INF-6000[6]	200~240V AC	1028	462	1070	740	385
	120V AC	576	462	580	390	195
PS-INF-15K	380V AC 3-Phase	2880 total, 1040 per single run	3120 total, 462 per single run (77 fixtures)	2900 total, 1085 per single run	1950 total, 750 per single run	975 total, 390 per single run
	400V AC 3-Phase					
	480V AC 3-Phase					
PS-INF-30K	380V AC 3-Phase	5760 total, 1040 per single run	6240 total, 462 per single run (77 fixtures)	5800 total, 1085 per single run	3900 total, 750 per single run	1950 total, 390 per single run
	400V AC 3-Phase					
	480V AC 3-Phase					

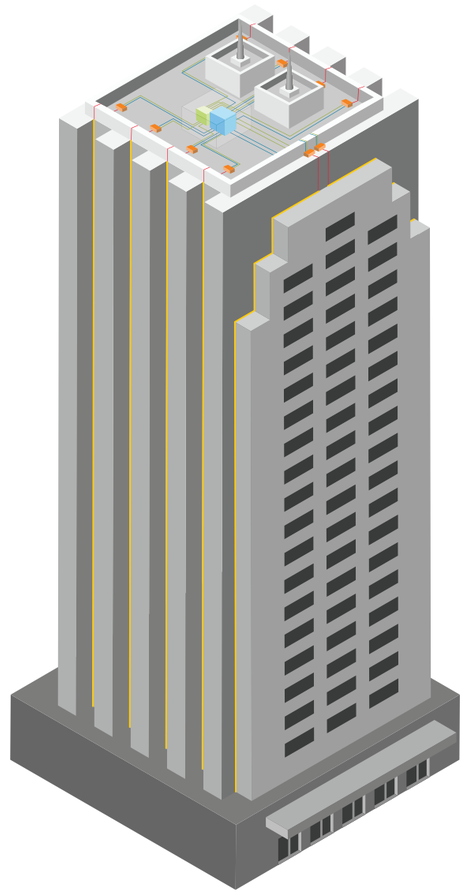
Notes & Conditions for Table:
1. STR9-MONO-INF, 1500mm (5ft) long; 14AWG cables; 3 meter (10ft) leader cable; no jumpers; 30°C Ta. For other conditions/configurations consult factory.
2. Maximum run length for STR9-LITE-INF are equal to Currently offered for STR9-INF.
3. HL-MONO-INF, 1200mm (4x1ft module) strings; 3 meter (10ft) leader cable; no jumpers; 30°C Ta.
4. Maximum length for HL-RGB-INF is limited by pixel resolution: 341 modules with 300mm (1ft) addressability, 672 modules with 600mm (2ft) address-ability, 880 modules with 900mm (3ft) addressability.
5. Run lengths can be longer with lower wattage per module. Consult factory.
6. PS-INF-3000 and 6000 available.

PS-INF-3000
TYPICAL SYSTEM DIAGRAM



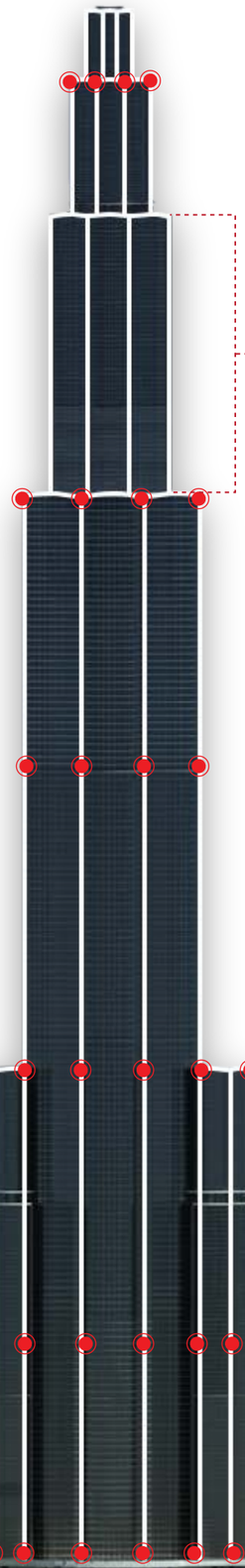
PS-INF-30K 30KW SYSTEM (INDOORS) MAXIMUM 5760 HL-DL 300MM (1FT) MODULES PER PS-INF-30K	
OPTIONAL CONTROL SYSTEM (INDOORS)	
LEADER CABLE 30' / 9.1M MAXIMUM	
PDC-INF	
MAXIMUM NUMBER OF HL-DL MODULES, 300MM(1FT) PER RUN: MONOCHROMATIC - 1040 RGB 1FT RESOLUTION - 341 RGB 2FT RESOLUTION - 672 RGB 3FT RESOLUTION - 880	

PS-INF-30K
TYPICAL SYSTEM DIAGRAM



LEADING COMPETING SYSTEM

20,000 FEET OF LIGHTING
(Based on AC power)



60
BUILDING
PENETRATIONS

60
SEPARATE
LIGHTING RUNS

5-7 YEARS
AVERAGE LIFETIME

SLOWER
INSTALLATION

MORE
MATERIALS USED

MORE
ENERGY USED
FOR OPERATION

NOT SOLAR ENERGY
COMPATIBLE

1
POWER
SUPPLY

NO
BUILDING
PENETRATIONS

12-15 YEARS
AVERAGE LIFETIME

FASTER
INSTALLATION

LESS
MATERIALS USED

LESS
ENERGY USED
FOR OPERATION

SOLAR ENERGY
COMPATIBLE

GVA INFINITY® SYSTEM

20,000 FEET OF LIGHTING
(DC Components only)

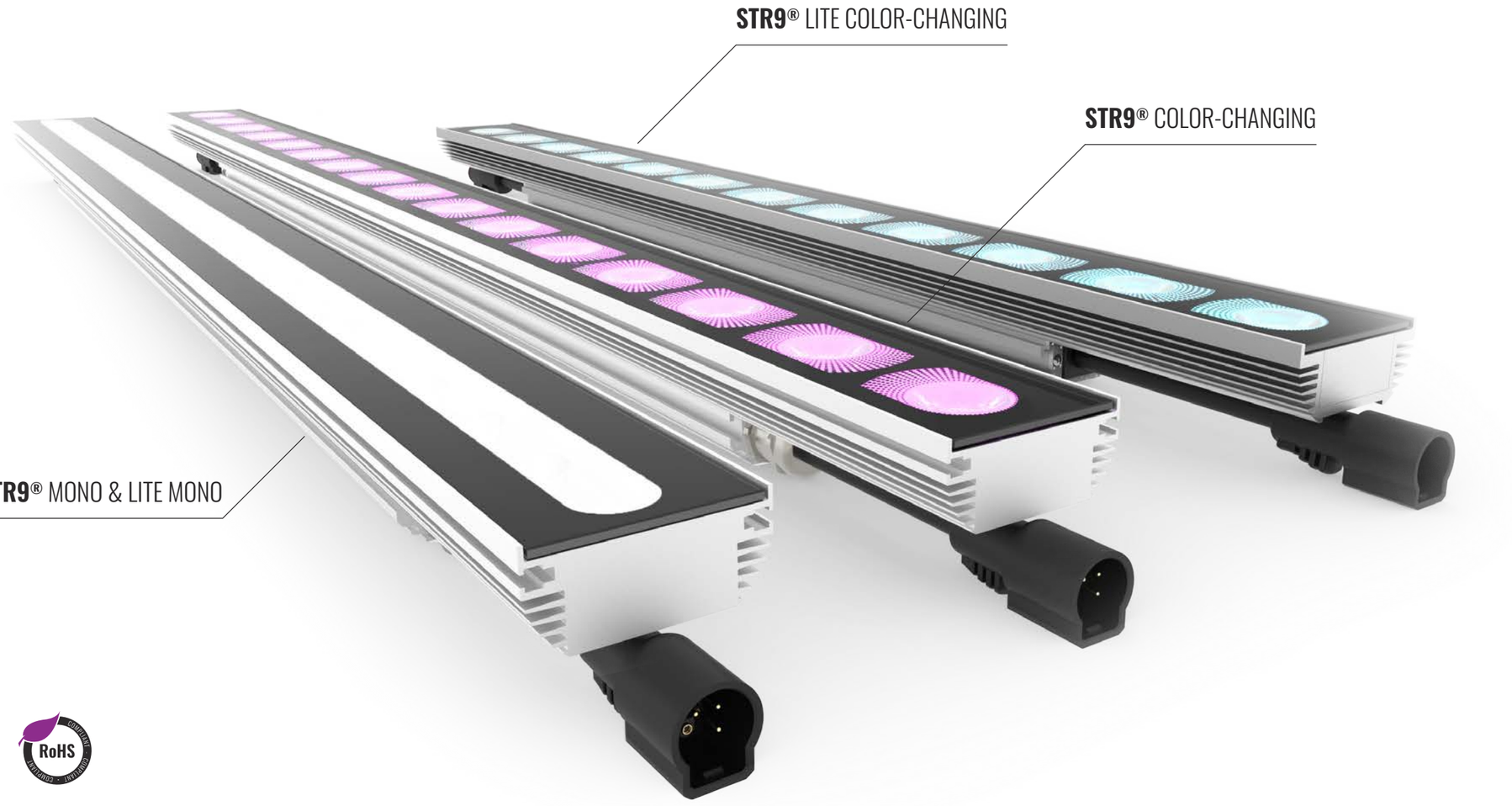
COLOR-AMP® GVA TECHNOLOGY

INFINITY® GVA TECHNOLOGY

STR9® SERIES

COMPACT SERIES OF HIGH-POWER WALL WASHING & GRAZING LINEAR LED LIGHTING

Available in monochromatic or color-changing RGBW30K, RGBA, or RGB LED options. STR9® Series utilizes GVA's proprietary UNIBODY™ Technology for extremely reliable IP66, IP67, and IP68 protection against water ingress [1].



5 YEAR · REACH · RoHS

c UL us LISTED · ANSI C136.31-2010 · CE · IP66 · IP67 [1] · IP68 [1] · KG IK10 [2]

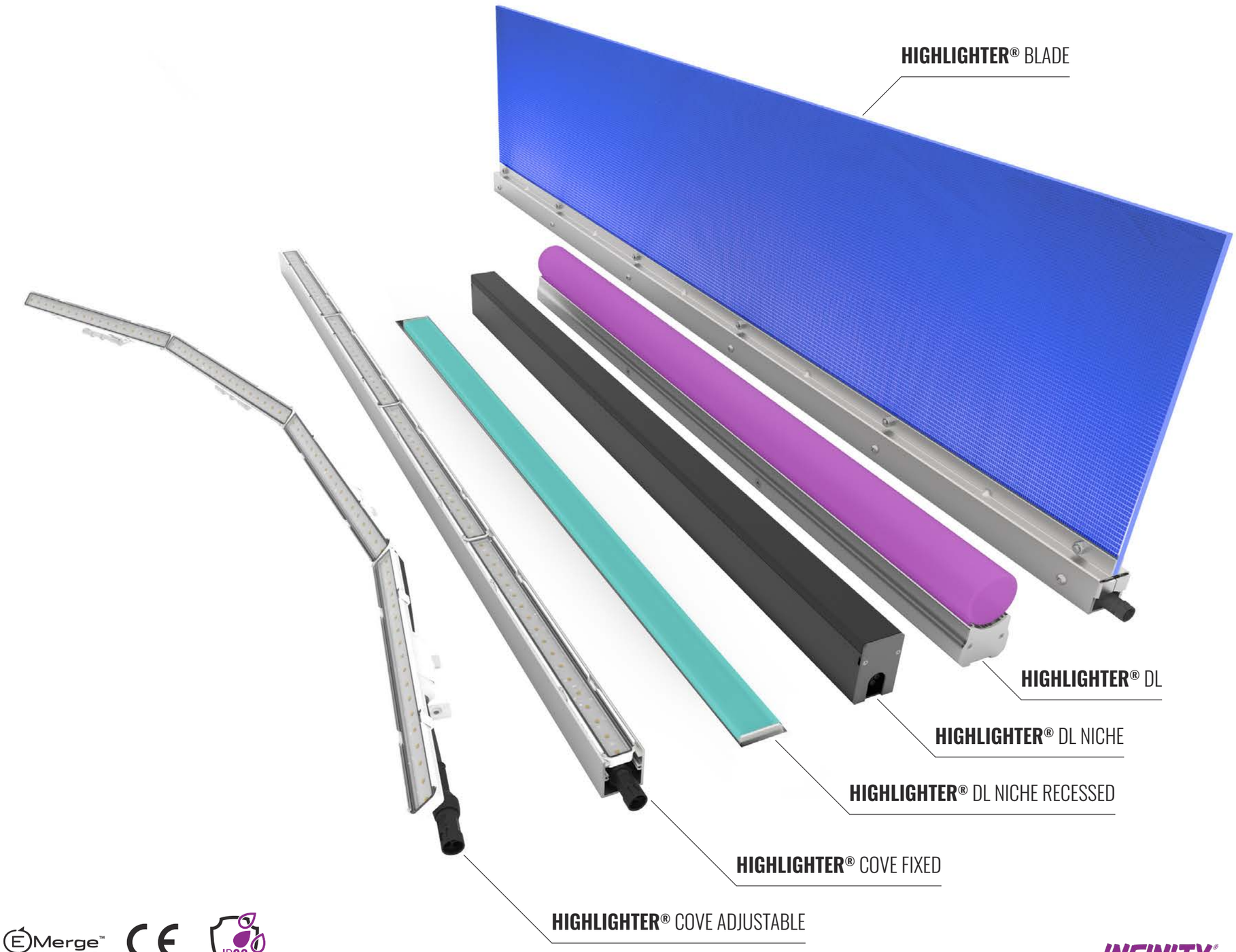
1. Passes IP66, IP67, and IP68 tests, warranty only applicable to IP66
2. IK06 is standard; IK10 is available upon request

INFINITY® GVA TECHNOLOGY

HIGHLIGHTER® SERIES

MODULAR DELINEATION AND COVE LED LIGHTING

Offers the freedom to accentuate exterior and interior architecture with monochromatic or color-changing light in a wide range of form factors addressable by 300 mm (1 ft) segments.



5YEAR · REACH · RoHS · c UL us LISTED · eMerge ALLIANCE · CE · IP66

INFINITY® GVA TECHNOLOGY

FL™ SERIES

ADVANCED ARCHITECTURAL SPOT & FLOOD LED LIGHT

High performance, specification-grade LED spot & flood lights, available in four power options and sizes significantly lighter and smaller than competing fixtures.

RGBW -IM Red, green, blue, and white 4-in-1 LEDs color mix inside the optic to achieve uniform color directly adjacent to the luminaire, and color-match with STR9® RGBW.

RGBW -OM Different colored LEDs mix outside the fixture to achieve color-changing light available in an ultra narrow 3.2° optical distribution configuration with greater opportunity to customize LED selection.

5YEAR · REACH · RoHS · ANSI C136.31-2010 · CE · IP66

INFINITY® GVA TECHNOLOGY

PIXEL TW

DIRECT VIEW ARCHITECTURAL PIXELATION LED LIGHTING

Direct view pixelation and media facade luminaires with excellent color-mixing diffusion and high brightness with through-wiring for quick installation.

5YEAR · RoHS · CE · IP66 · III

INFINITY® GVA TECHNOLOGY

CREATING NEW BEAUTY FOR OUR HOME PLANET™

GVA LIGHTING

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