Feng Shui

Technical Overview

Palo Alto Code:ART Festival, June 2017
Site #9 Installation

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Installation is comprised of...

LED Lights

- Suspended LED strips, hung in parallel from stairwell
- Ceiling-mounted individual LED lights

Power Supply

- One power converter per subset of the LED system

Control

- Network of micro-controllers to synchronize light colors and fades throughout the installation

LED Lights:
Suspended LED Strips

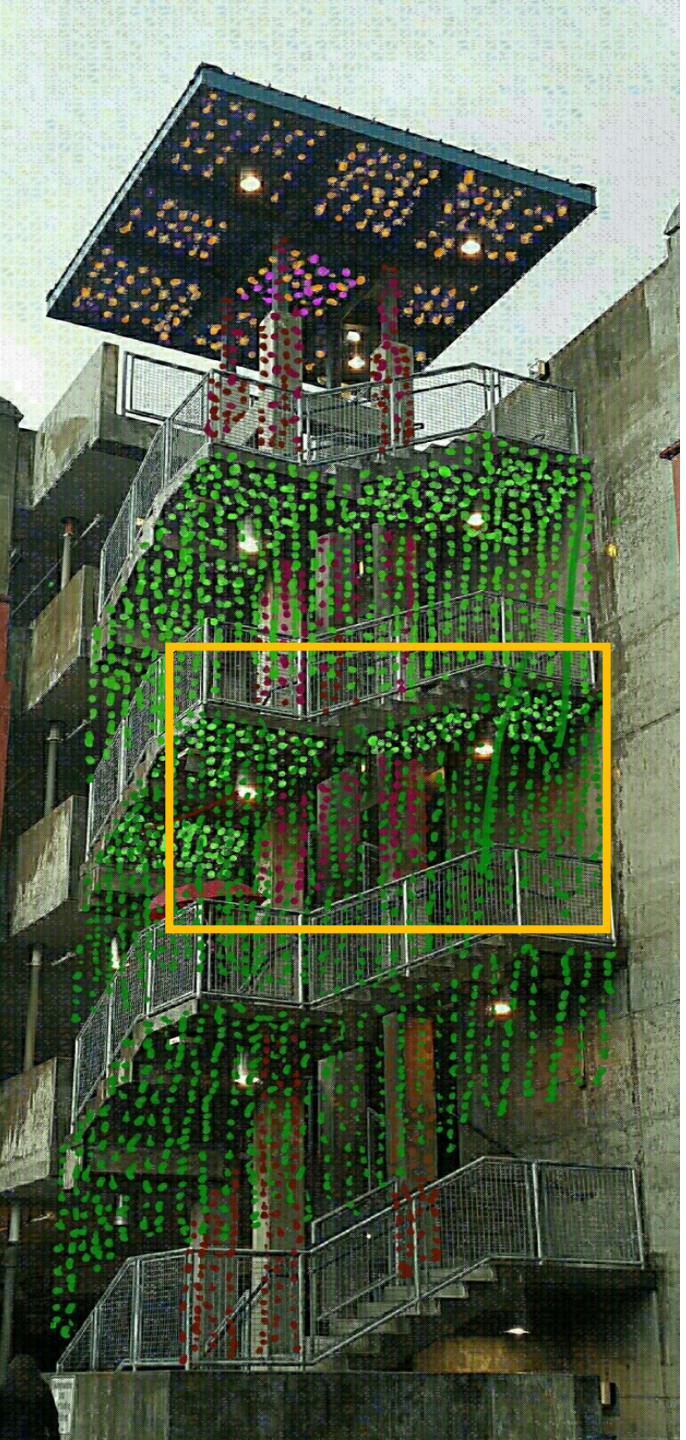
24 LED strips hung in parallel

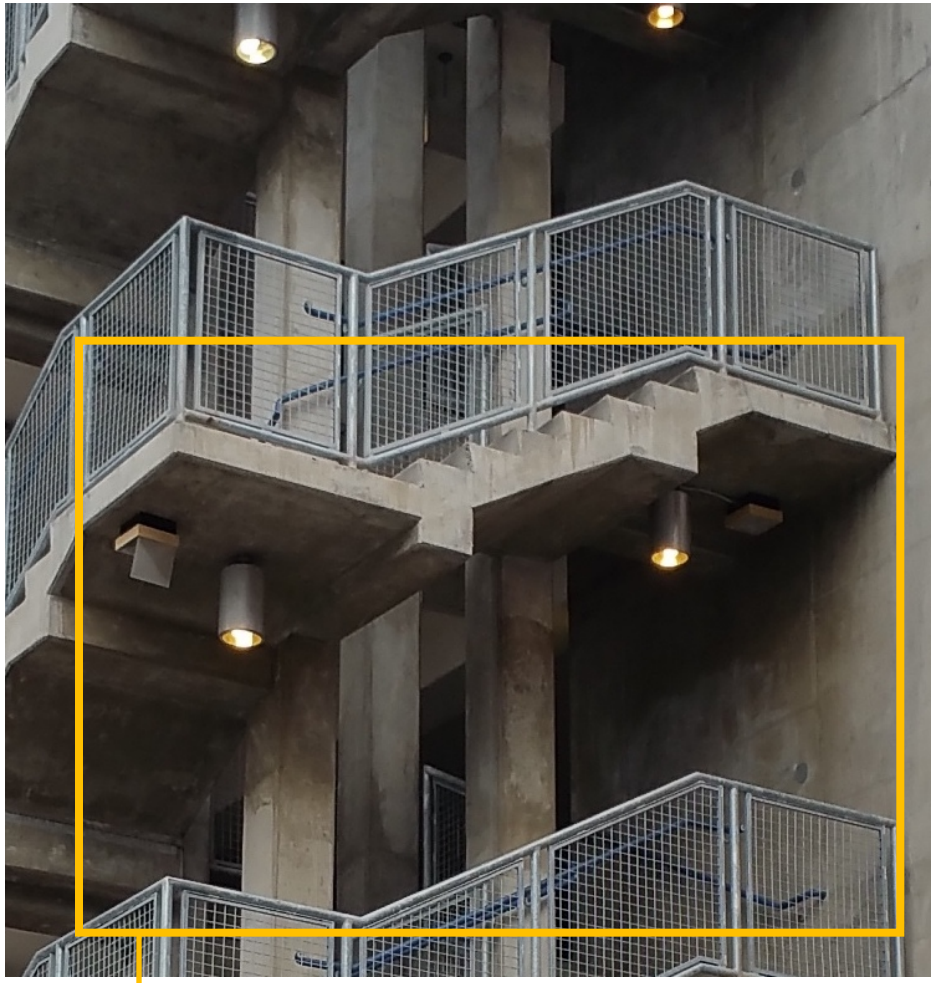
12 strips face outward and are viewed from the street

12 face inward and are viewed from inside the stairwell

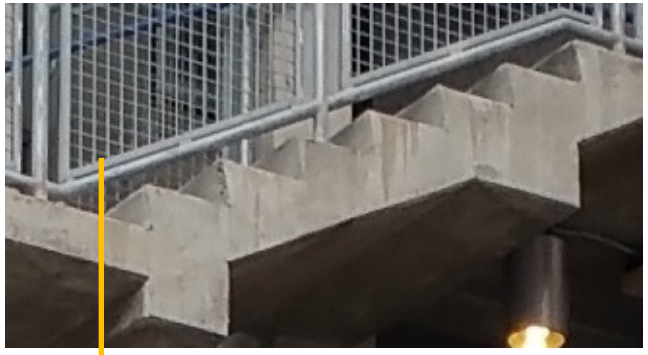
Adjacent strips alternate facing inward or outward

Bryant St.–Facing





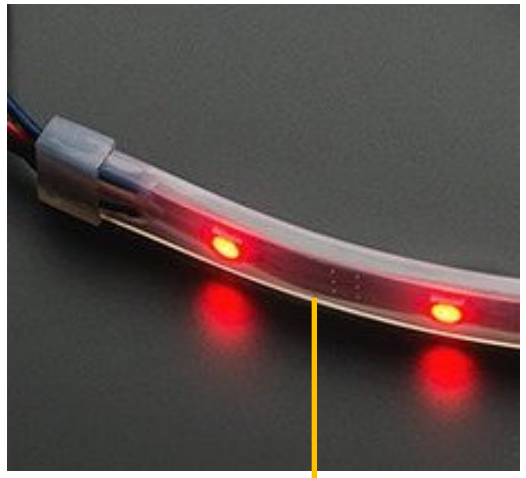
36 LED strips hung in parallel



Each strip is fastened to the bottom of the stair set railing's metal grid

University Ave.–Facing

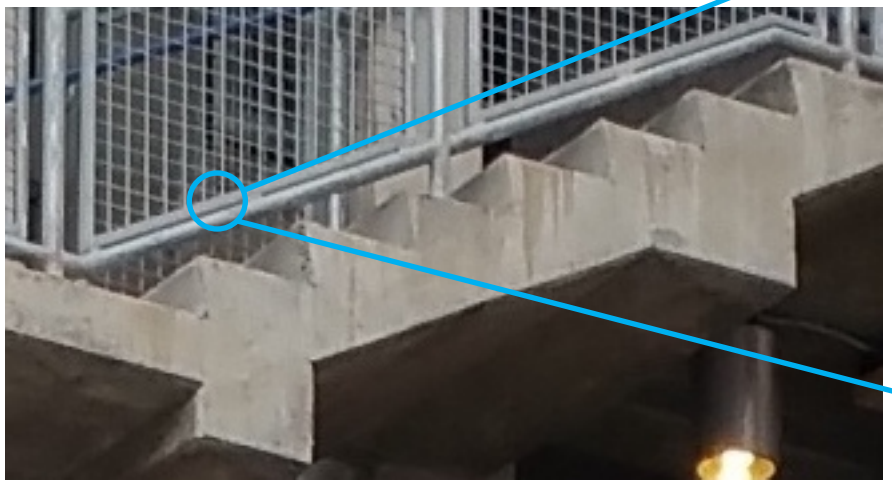
LED Strip Mounting Procedure

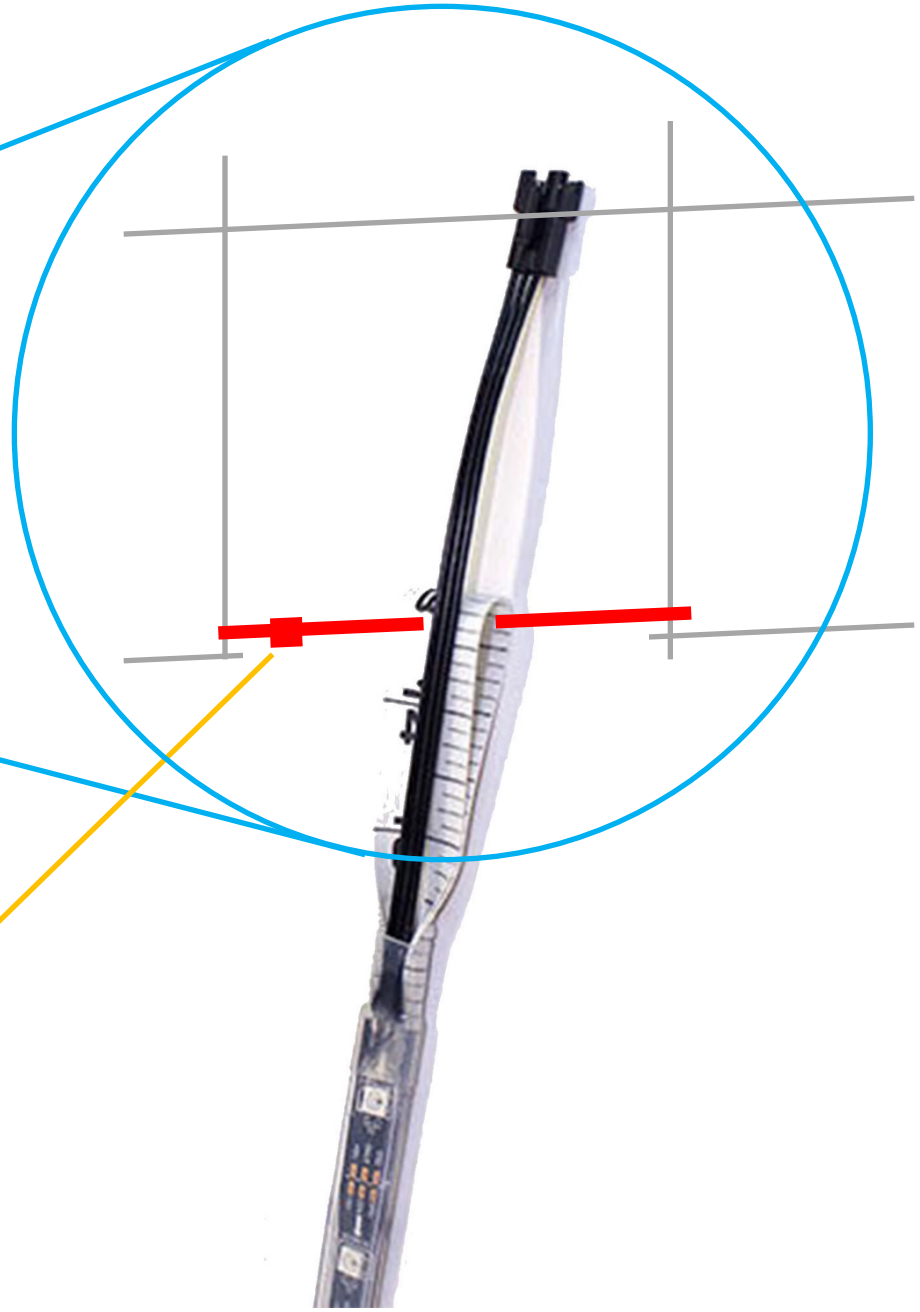


Each LED strip comes with plastic housing, making it suitable for outdoor use

Each strip will then be suspended using *fiberglass measuring tape*, chosen for its durability. The fiberglass tape is folded and slid down the back of the strip's plastic housing. The tape's fold will ensure the strip hangs straight

Because each 2m strip is cut from a 5m reel, it must be sealed at either end with heat-shrink tube. The heat-shrink seal is sufficient to anchor the fiberglass tape at the top of the strip. A small glass bead will be placed inside the strip's bottom seal to prevent the strip from curling





Each sealed strip is then attached to the bottom of the railing's metal grid using a zip tie threaded through the folded fiberglass tape

LED Strip Cost

3 x 24 + 3 x 36 = 180 strips

180 x 2m/strip = 360m needed

Sold in 5m reels, 360/5 = 72 needed

At $15/lot for 80 lots

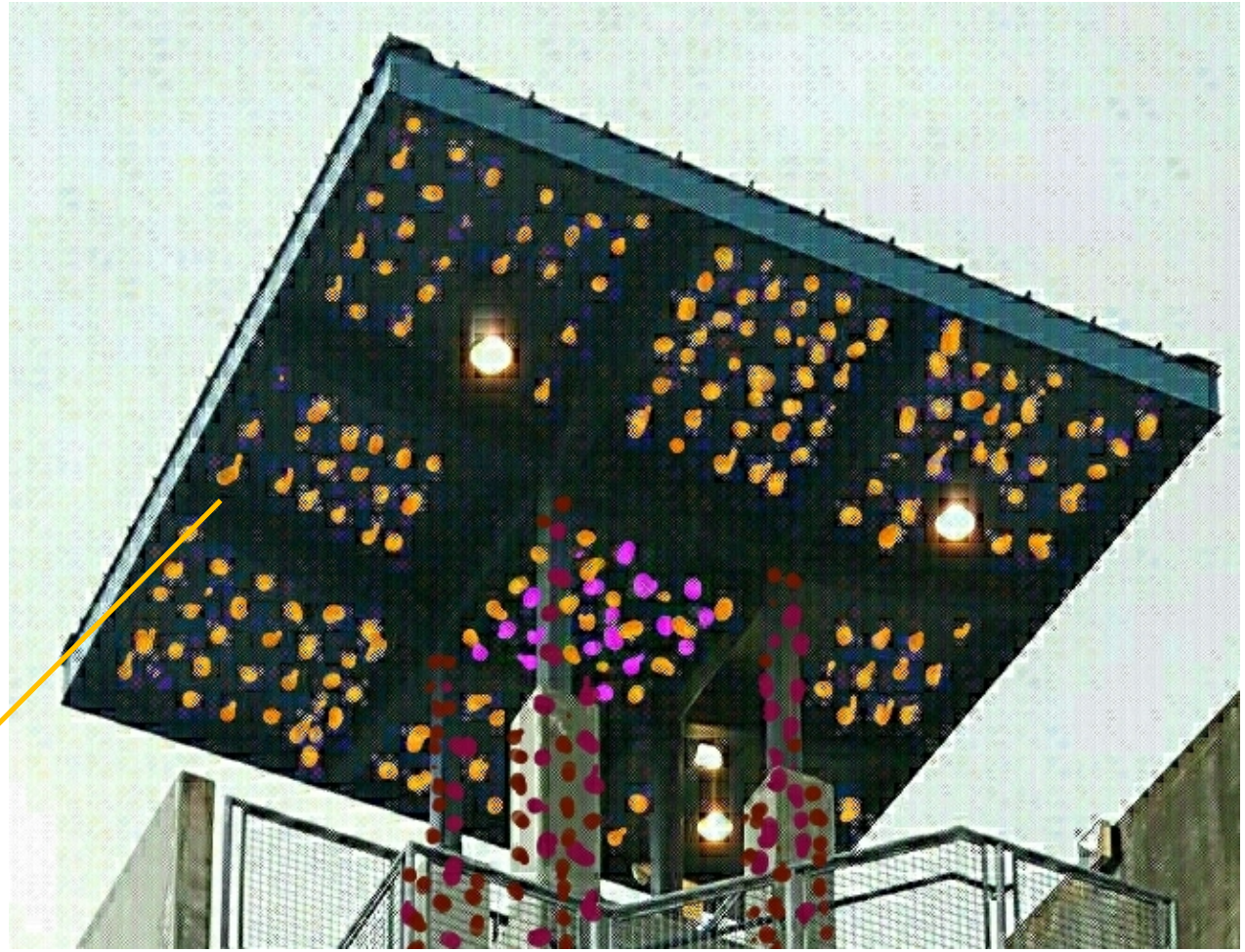
(Includes extras in case some strips malfunction)

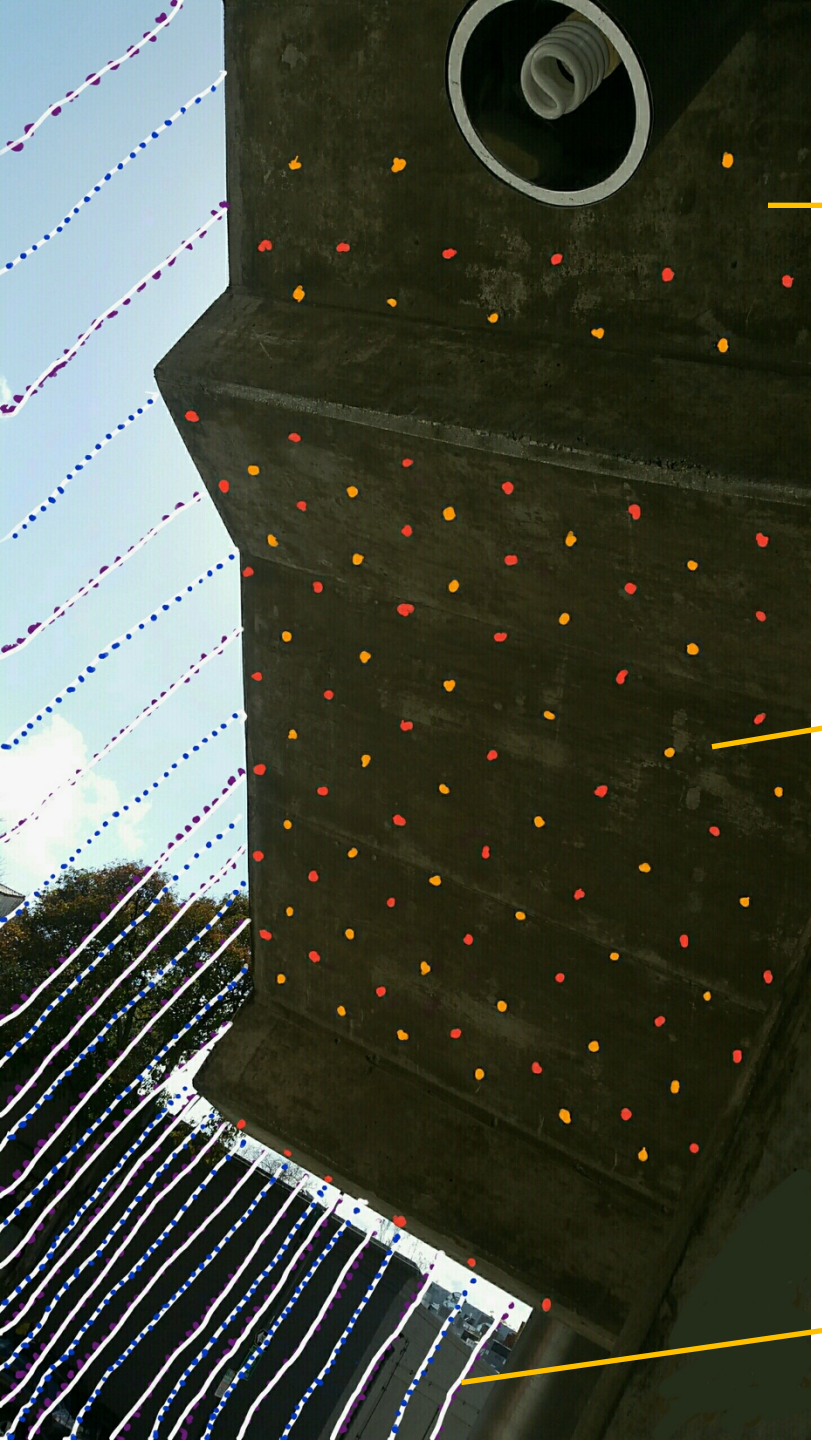
Cost estimate: $1200

LED Lights:
Ceiling-mounted LEDs

The installation will utilize surface-mounted LEDs in two locations:

The underside of the stairwell's top roof





And the underside of each stair set.

Shown here is the underside of one of the three University Ave.–facing stair sets

Each LED is mounted with a temporary adhesive, and wired in series with adjacent LEDs of the same color

(The white lines mark the hanging LED strips, alternating inward- and outward-facing)

Mounted LED Cost

800

+ 3 x 180

+ 3 x 130

= 1730 LEDs

Sold in 500-unit lots, 4 needed

At $40/lot

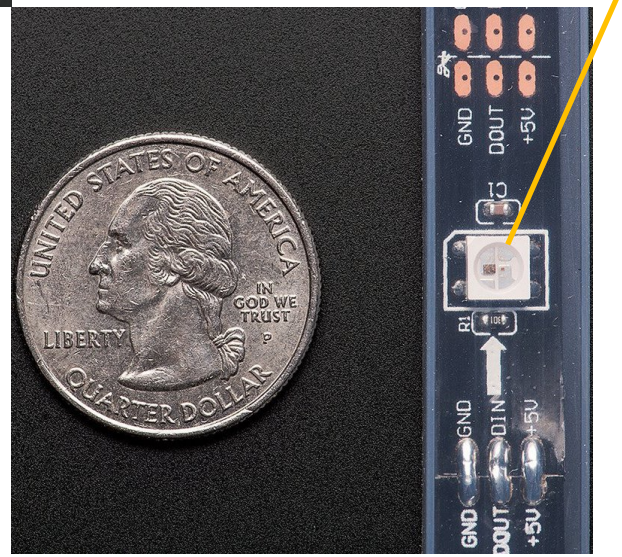
Cost estimate: $160

Power Supply

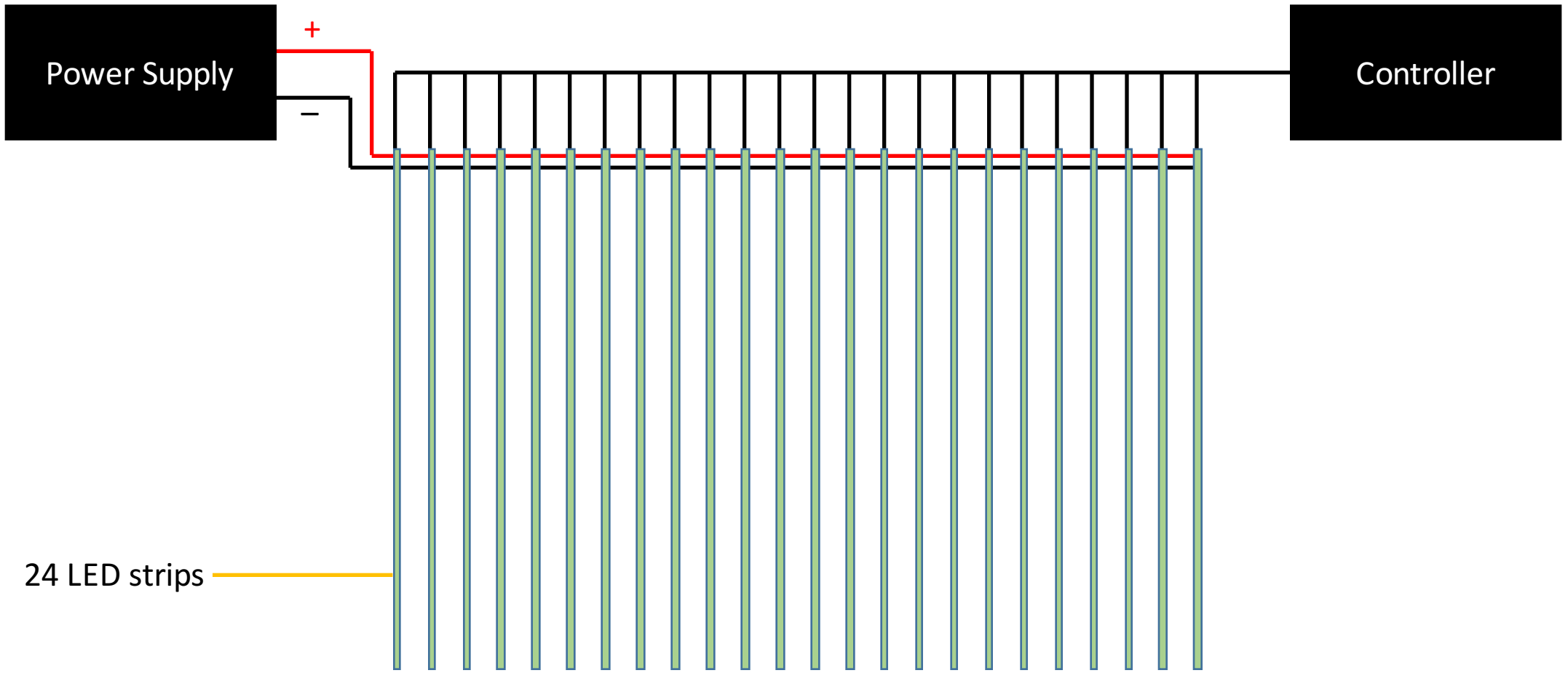
Powering LED Strips

Each LED strip will be 2m long with 30 LEDs/m --> 60 LEDs/strip

Each WS2812 LED in a strip takes a voltage of 6V and pulls a max of 60mA current when set to white color (full R, G, B)



In total, each strip will draw a max of 3.6A current.



Connected in parallel, the strips would draw 24 x 3.6A = **86.4A** current when showing white (full R, G, B), running at full power

However, the most *cost effective* power supplies for the installation's requirements are rated for 5V at 60A

Like this 320W-5V AC DC converter, priced at $80/unit.

At 60A, it supplies enough current to power 24 parallel strips at **70% brightness**

Which should be plenty for the installation's intended effect.

(This converter takes alternating current [AC] drawn from the wall and converts it to direct current [DC], which the LEDs require)

Power Supply Cost

3 x 3-square sections

+ 3 x 24-strip sections

+ 6 x 18-strip sections

+ 6 x ceiling sections

= 9 converters needed

Sold at $80/unit

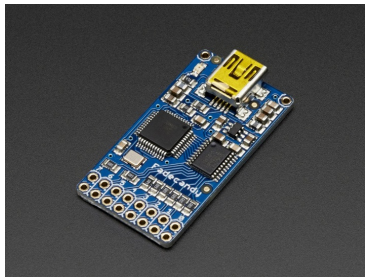
Cost estimate: $720

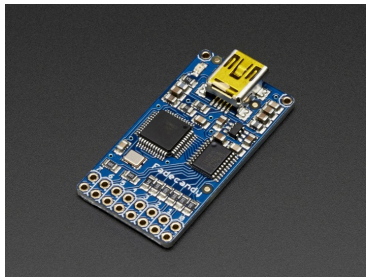
Control

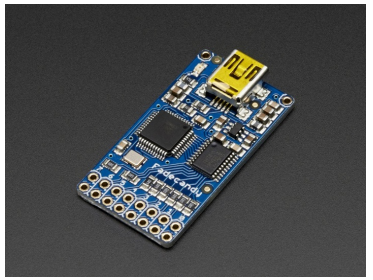
Control

Each section of LEDs will be controlled by a Raspberry Pi micro-controller

Which communicates with several FadeCandy micro-controllers that send RGB values to the LEDs

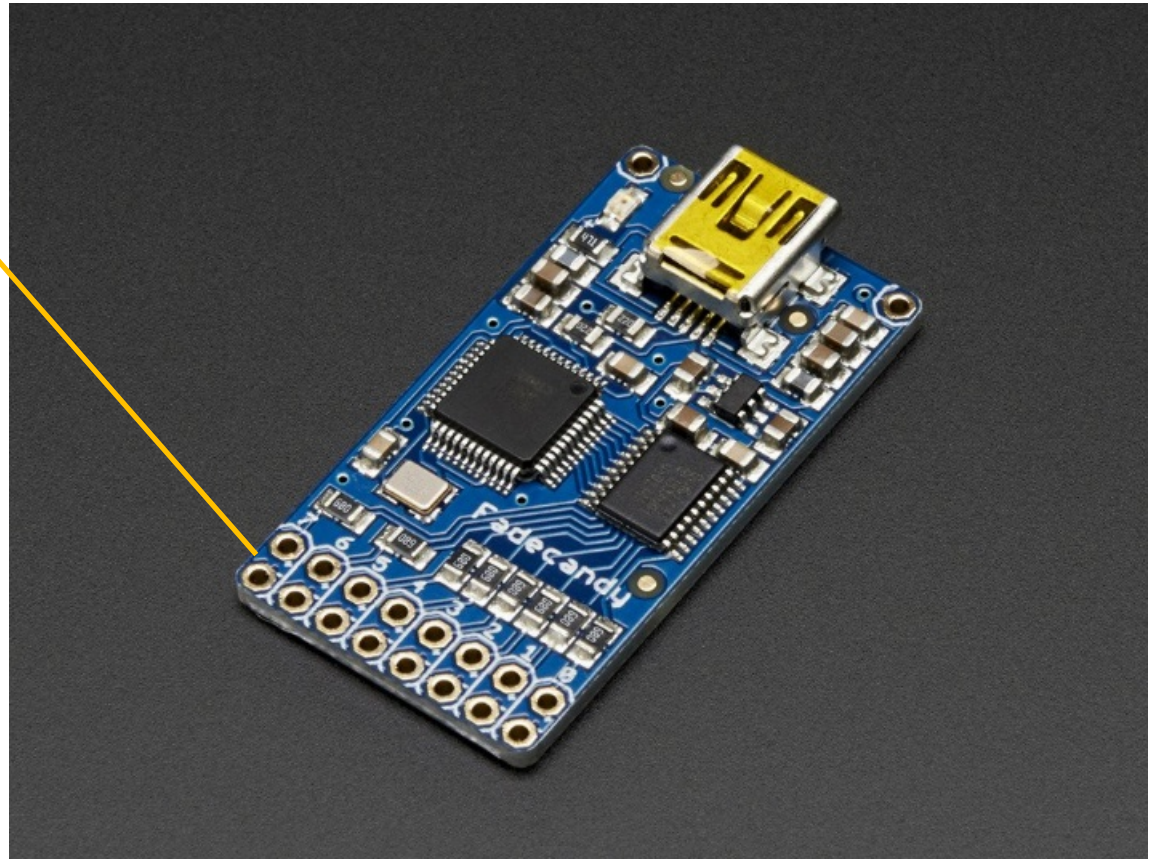






The FadeCandy micro-controller offers finer RGB color control to produce more accurate, eye-pleasing LED colors

It can communicate with a maximum of **8 LED strips**, limited to 64 LEDs per strip. (Our 2m strips contain only 60 LEDs)



Control System Cost

3 3-square sections x 3 Fadecandy

+ 3 24-strip sections x 3 FadeCandy

+ 6 18-strip sections x 3 FadeCandy

+ 6 ceiling sections x 3 FadeCandy

= 54 total FadeCandy needed

Sold at $25/unit

Cost estimate: $1350

(To cut this cost, considering ordering custom-made micro-controllers with the same design as the FadeCandy but with more outputs)

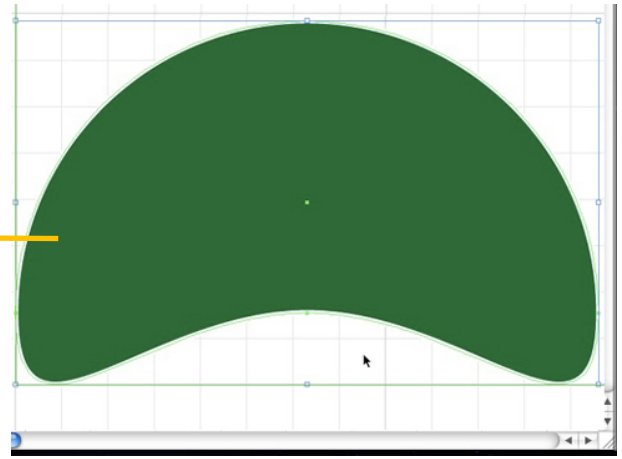
Total Cost

LED strips:	1300.00
Single LEDs:	160.00
Power supply:	720.00
Control System:	1350.00
Total:	**$2530.00**

Further Considerations

LED Lights

- For LEDs mounted to the stair set undersides, considering designing custom-shaped PCB boards to reduce the amount of exposed wiring that would come with the current grid-shaped single-LED layout
- Cost, type of adhesive for ceiling-mounted LEDs



Power Supply

- Cost of wiring

Control

- Custom-made micro-controllers with the same design as the FadeCandy, but with more outputs to support more LEDs. This could reduce micro-controller cost