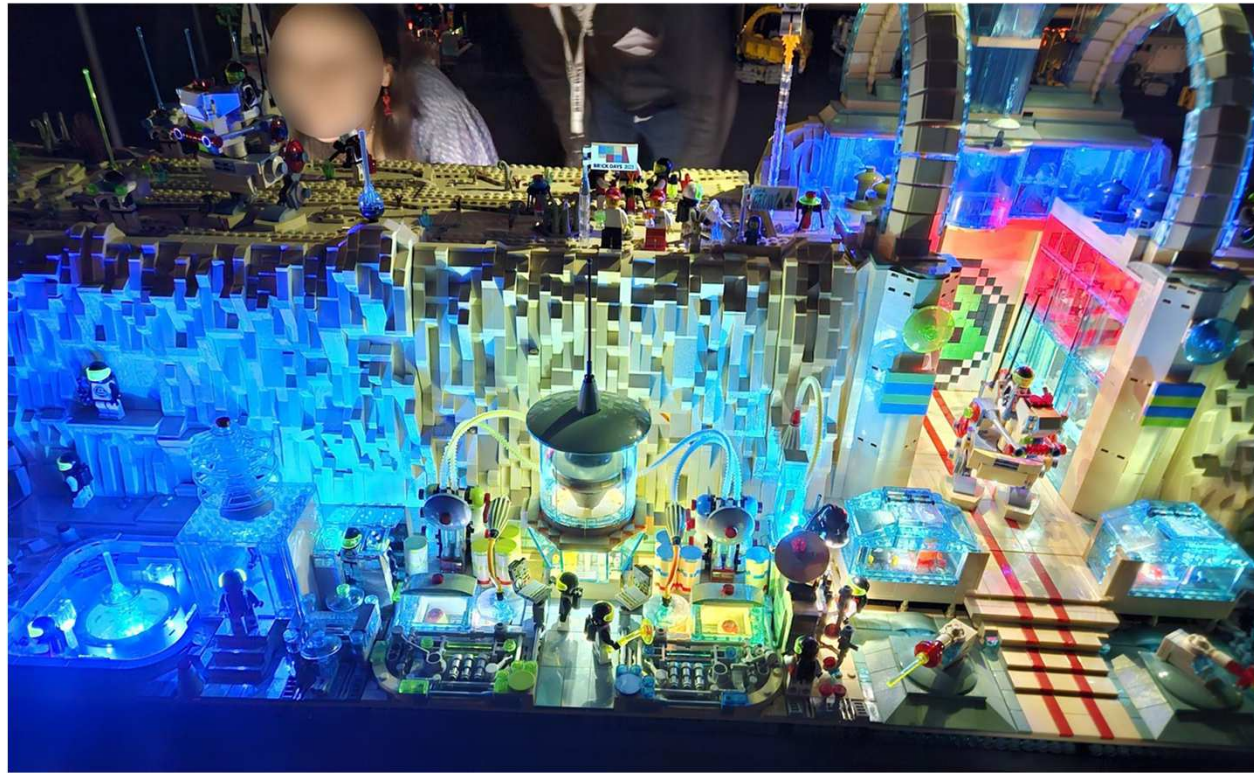


Lighting Up Your Bricks



BRICK DAYS











Topics

1. LEDs

- a. Types
- b. Sources
- c. When to use which type

1. Wire

- a. Types
- b. Sources
- c. How to use it

1. Routing Wire

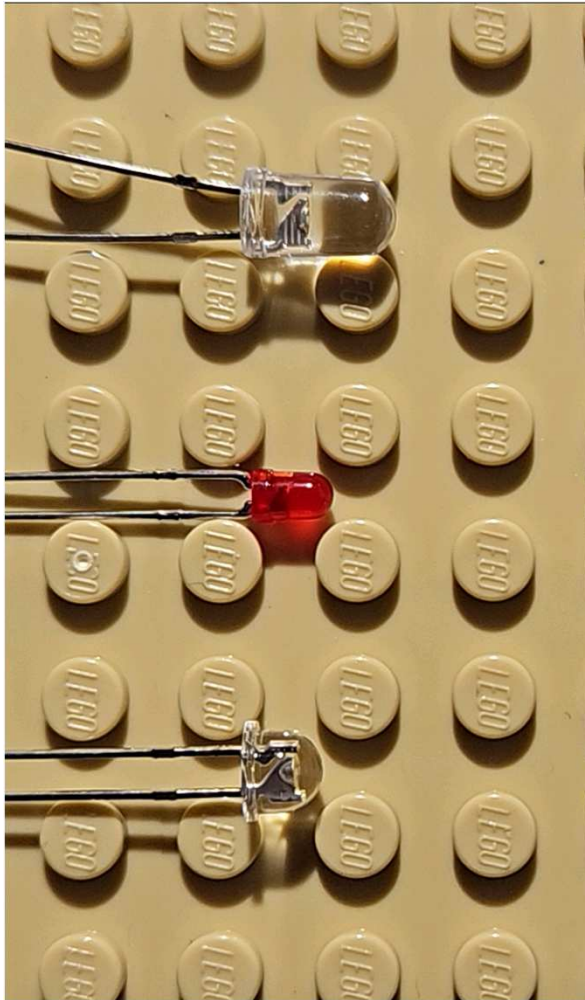
- a. Drill or NOT Drill
- b. Routing Techniques

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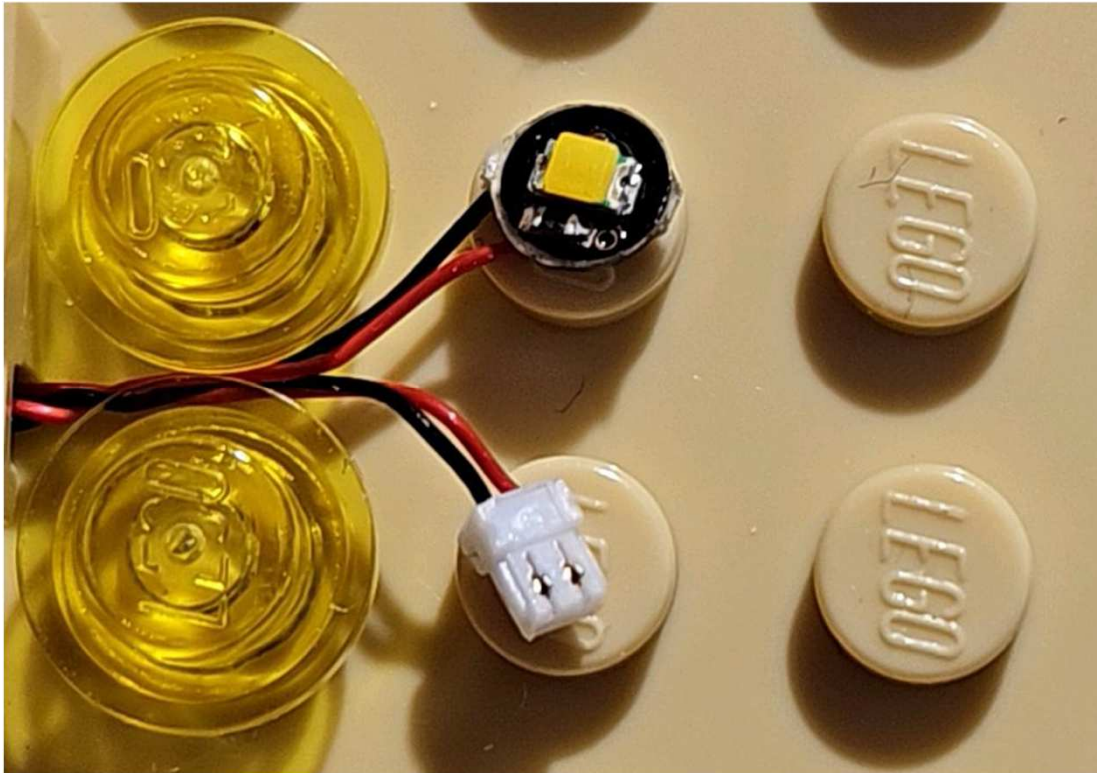


LEDs



- 1. Prebuilt**
 - a. Special Built
 - b. Reel
- 1. Individual**
 - a. Standard LEDs
 - b. Surface Mount

LEDs



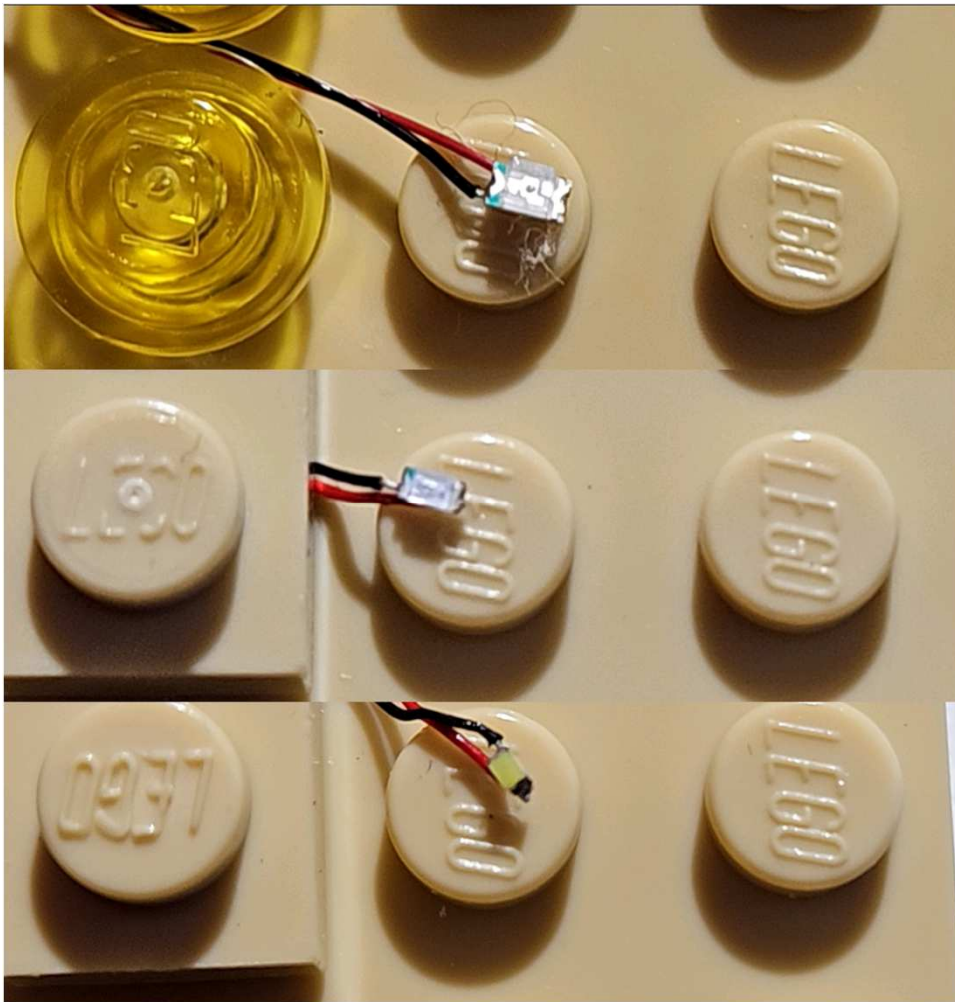
1. Prebuilt

- a. Special Built
- b. Reel

1. Individual

- a. Standard LEDs
- b. Surface Mount

LEDs



1. Prebuilt

- a. Special Built
- b. Reel

1. Individual

- a. Standard LEDs
- b. Surface Mount

Prebuilt/Kits vs Individual

Prebuilt

- requires no soldering/has connectors
- often has determined the routing
- has a power distribution ecosystem
- has limited flexibility

Individual

- requires soldering
- requires routing
- has almost unlimited flexibility

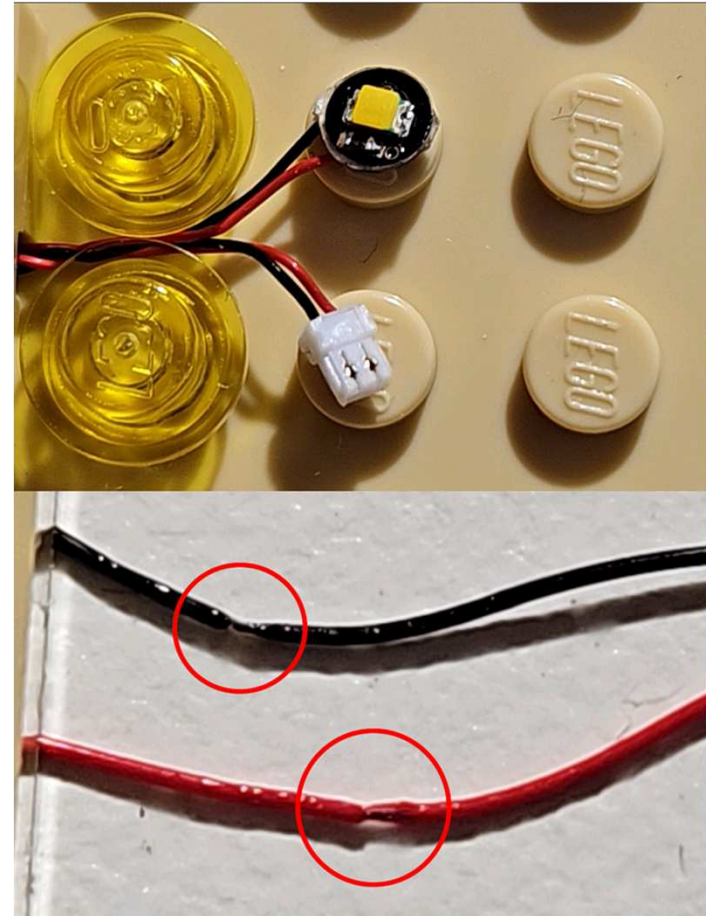
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Prebuilt/Kits

Things to consider

- Connector size
- Wire construction
- Power Distribution Ecosystem
- Color Availability



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LED Sources

Prebuilt/Kits

Brick Stuff
Briks Max
Light My Bricks
Brick Loot
Amazon (various)

Individual

DigiKey.com
Mouser.com
Adafruit.com
Sparkfun.com
Amazon (various)

Partial listings, there are others

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LED Lighting Specifications

- Luminous Intensity (millicandles)
- Viewing Angle (20° to 150°)
- Current (mA)
- Forward Voltage (needed for limiting resistor)

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LED Lighting Types for Large Spaces

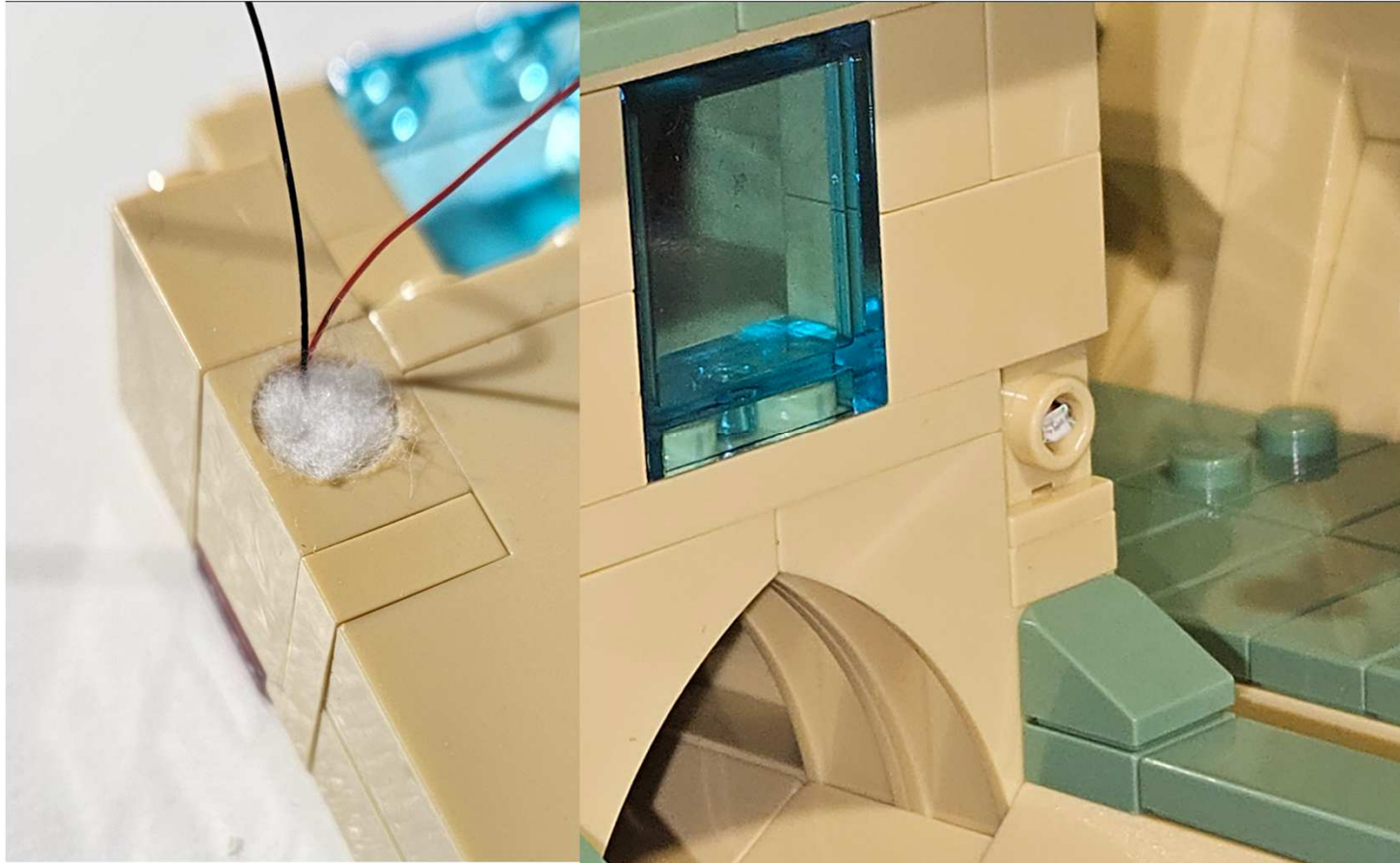
Flood vs Spot



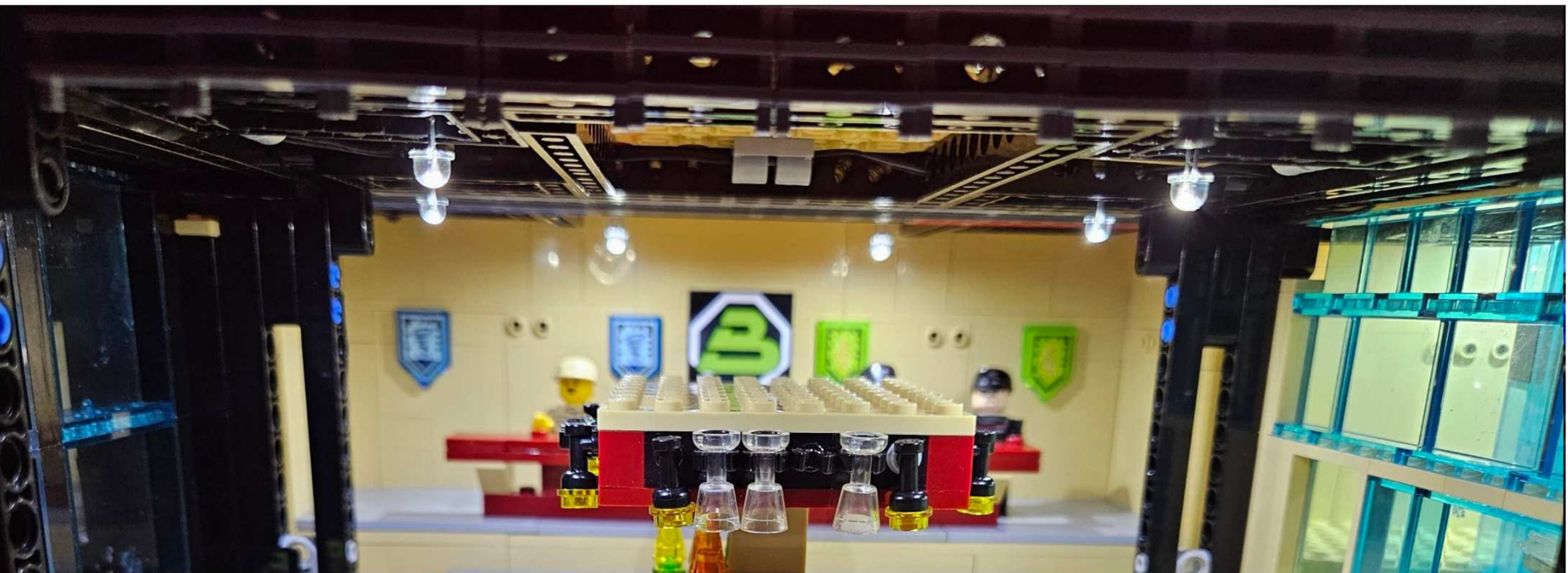
LED Lighting Types for Small Spaces



LED Lighting Types for Very Small Spaces



LED Lighting Types for Simulation



LED Lighting Colors

- **Many colors available**
 - Red, Pink, Purple
 - Green, Aqua
 - Blue, Ice Blue
 - Yellow, Amber, Orange
 - Cool White, Warm White, Neutral White
- **Most transparent pieces let all light through**
 - Exception is transparent Red
- **UV LEDs and Fluorescent brick colors**
- **Diffusion with transparent pieces**



Wire

Maximum wire size is 30 AWG

Minimum (practical) wire size is 36 AWG

Use multi strand wire

Use wire with a silicone or teflon jacket

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Wire Sources

Amazon for the silicone flexible wire

Adafruit.com

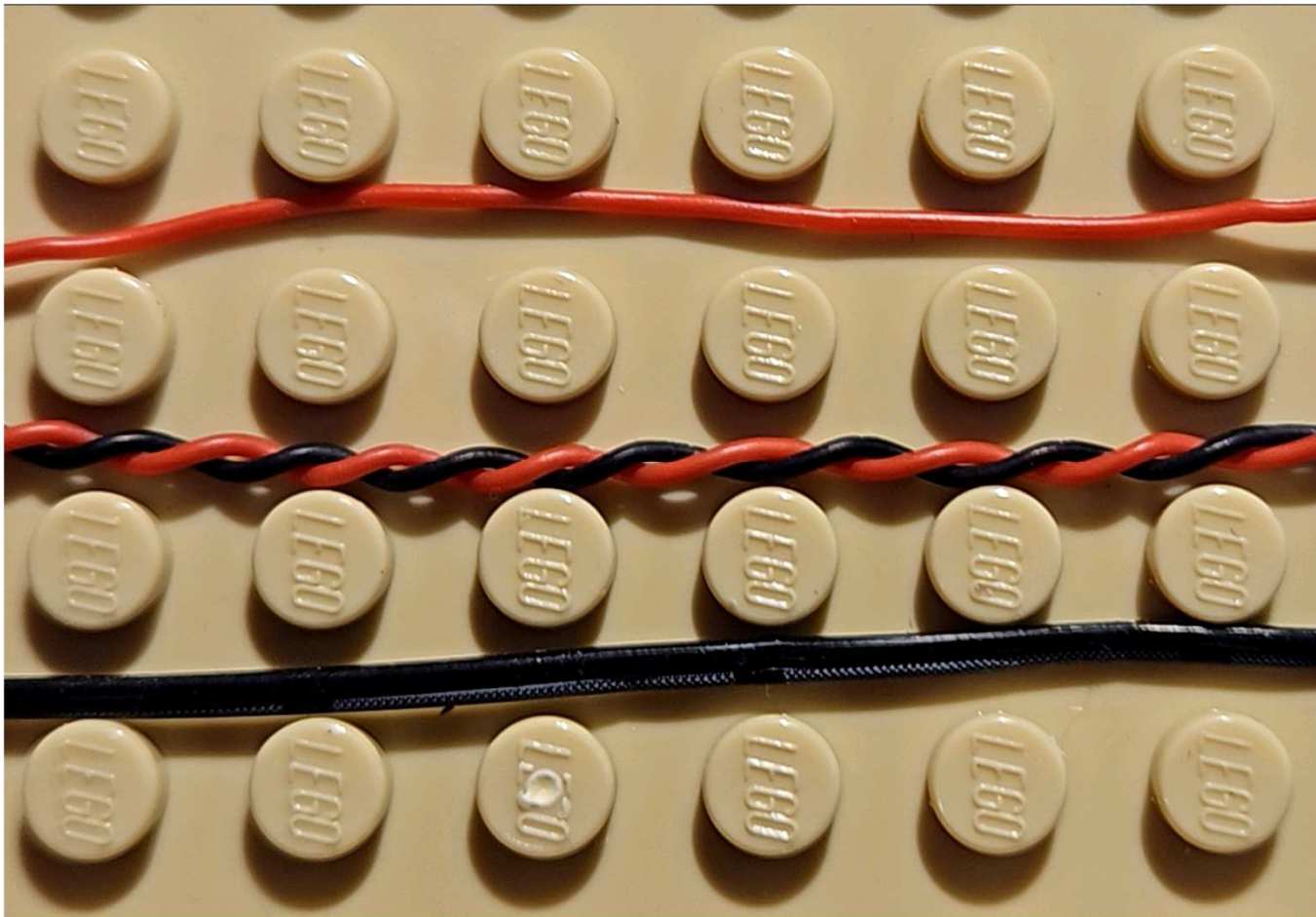
Digikey.com



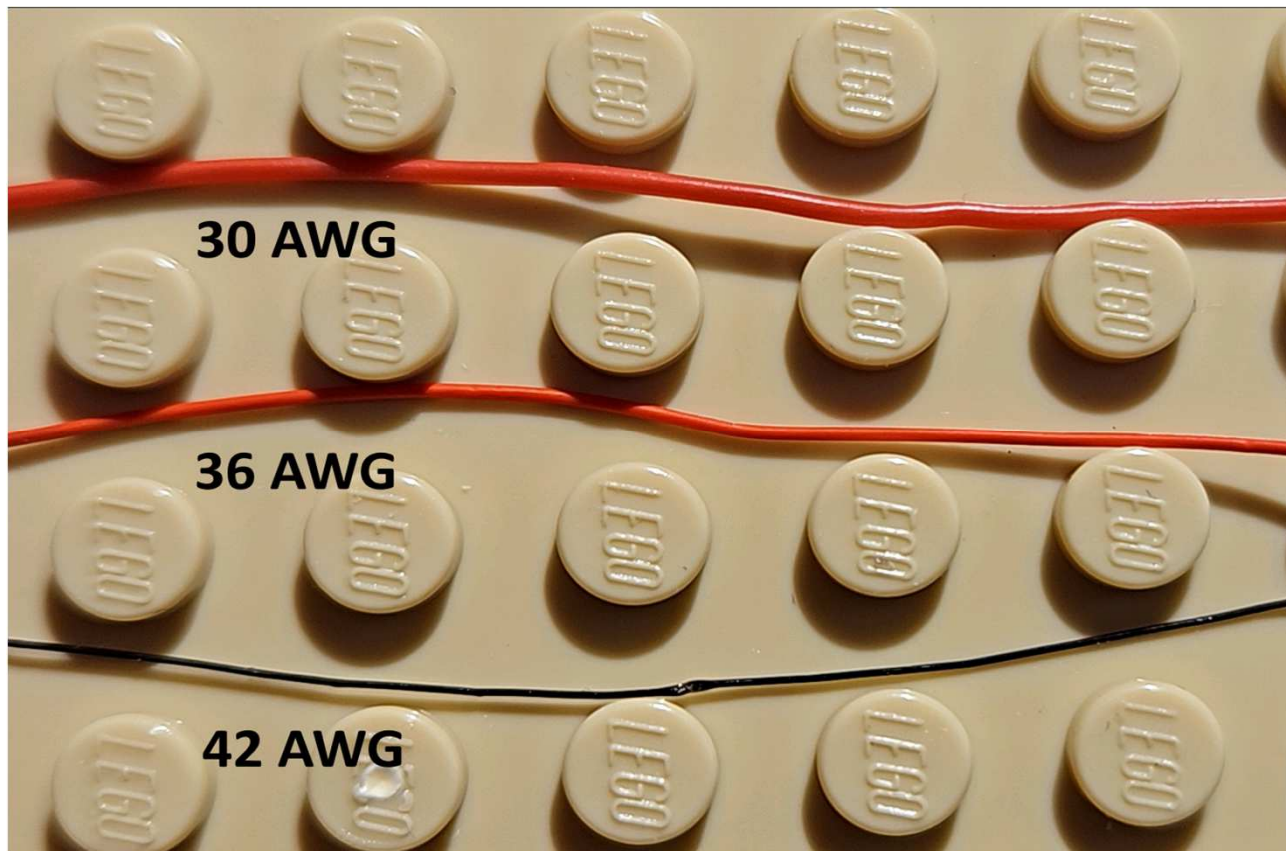
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Wire



Wire



Soldering

**When you have to do it
Use Proper Tools**

- 30-50 watt soldering iron w/fine points
- Wire strippers down to 32 AWG (this is the most important tool)
- good tweezers and maybe a hemostat
- Solder should be no larger than 0.020" (0.5mm) diameter



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Soldering

Not the Best Choices



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Routing Wire

Except for lighting kits for specific Lego Sets

Routing wire will be a necessity

Why should I route wires 🙄

Will I have to drill holes 😬

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Drilling Holes

Upside

- Makes routing much easier
- Very few cases where wire cannot be hidden

Downside

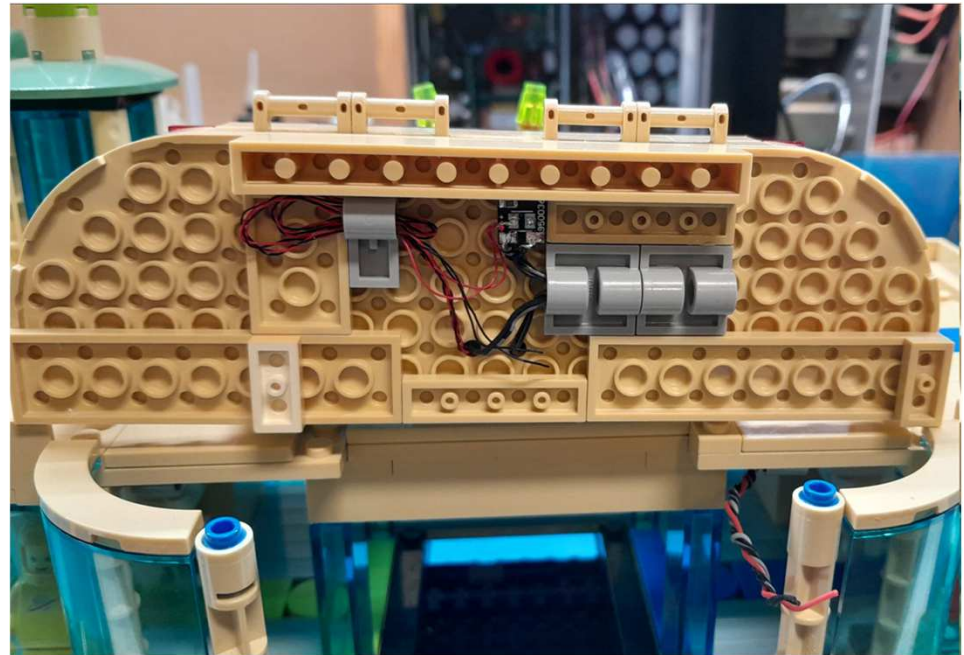
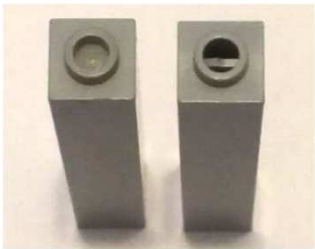
- Permanently modified bricks
- Somehow just feels wrong

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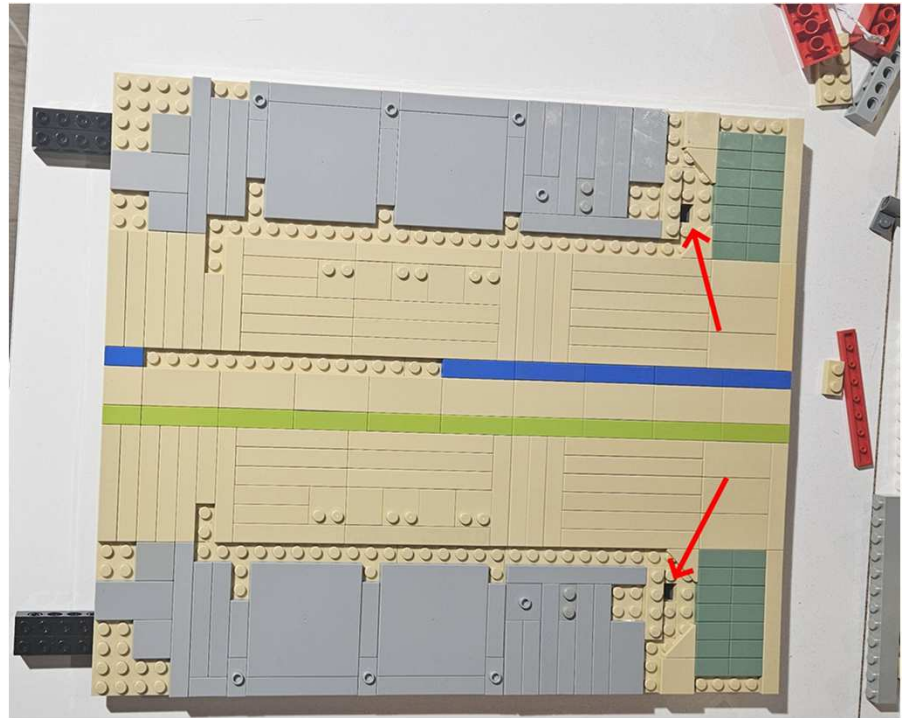
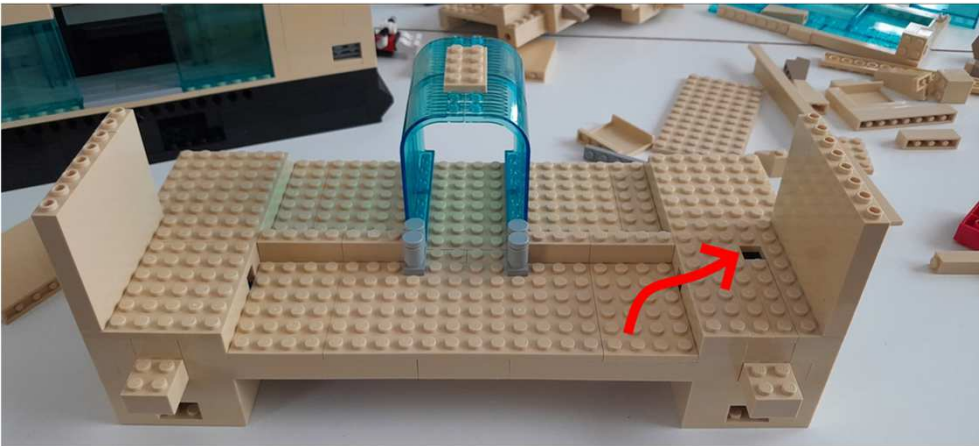
Drilling Holes

Holes I have Drilled



Drilling Holes

Holes I have *NOT* Drilled

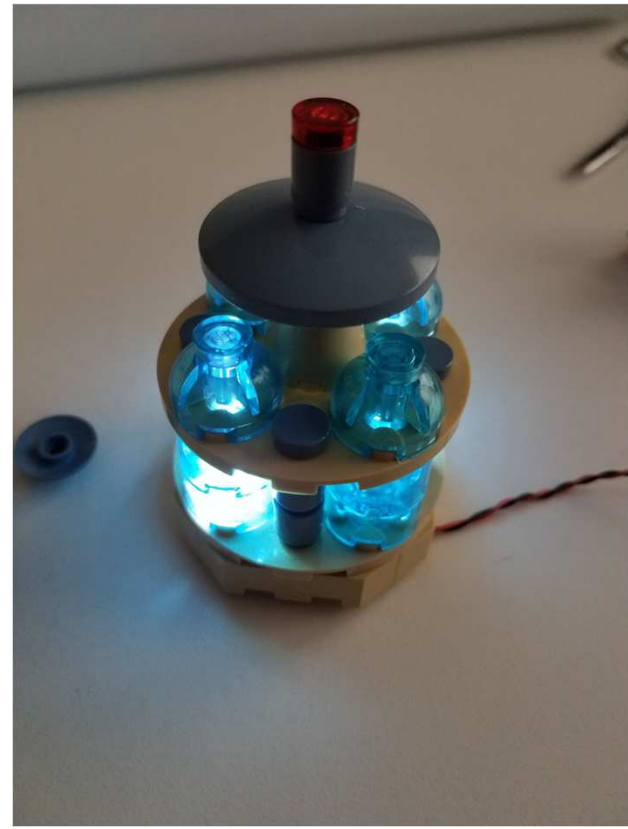
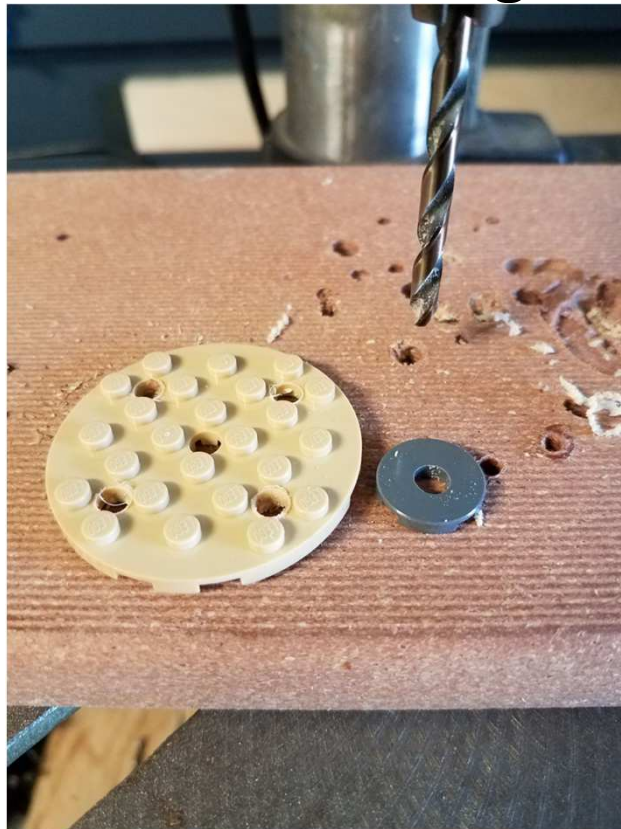
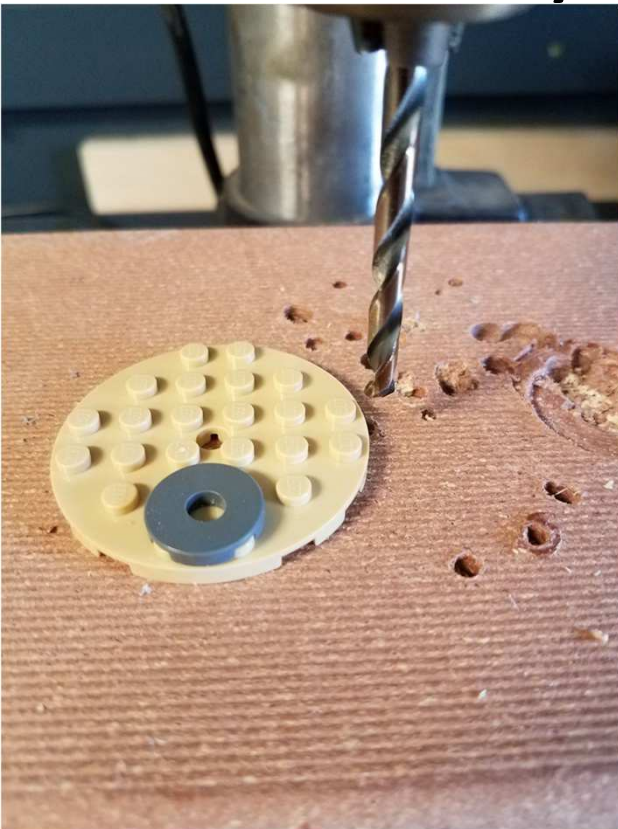


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Drilling Holes

Sometimes you need to move light instead of wire



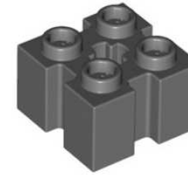
Bricks for Wire Routing

Some of the bricks that can be used for wire routing. Each has its own use as shown in the following slides.

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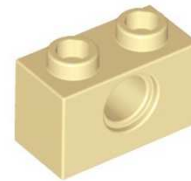
Part 4216 Brick Modified
1 x 2 with Channel



Part 90258
Brick with Channels and
Axle Hole



Part 32028 Plate Modified
with Door Rail



Part 3700 Technic 1 x 2 Brick



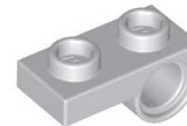
Part 3062
Brick Round



Part 4073
Round Plate



Part 11458 Plate Modified
with Top Pin Hole



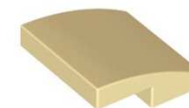
Part 18677 Plate Modified
with Bottom Pin Hole



Part 2817 2x2 Plate Modified
with Pin Holes



Part 10247 2x2 Plate Modified
with single Pin Hole



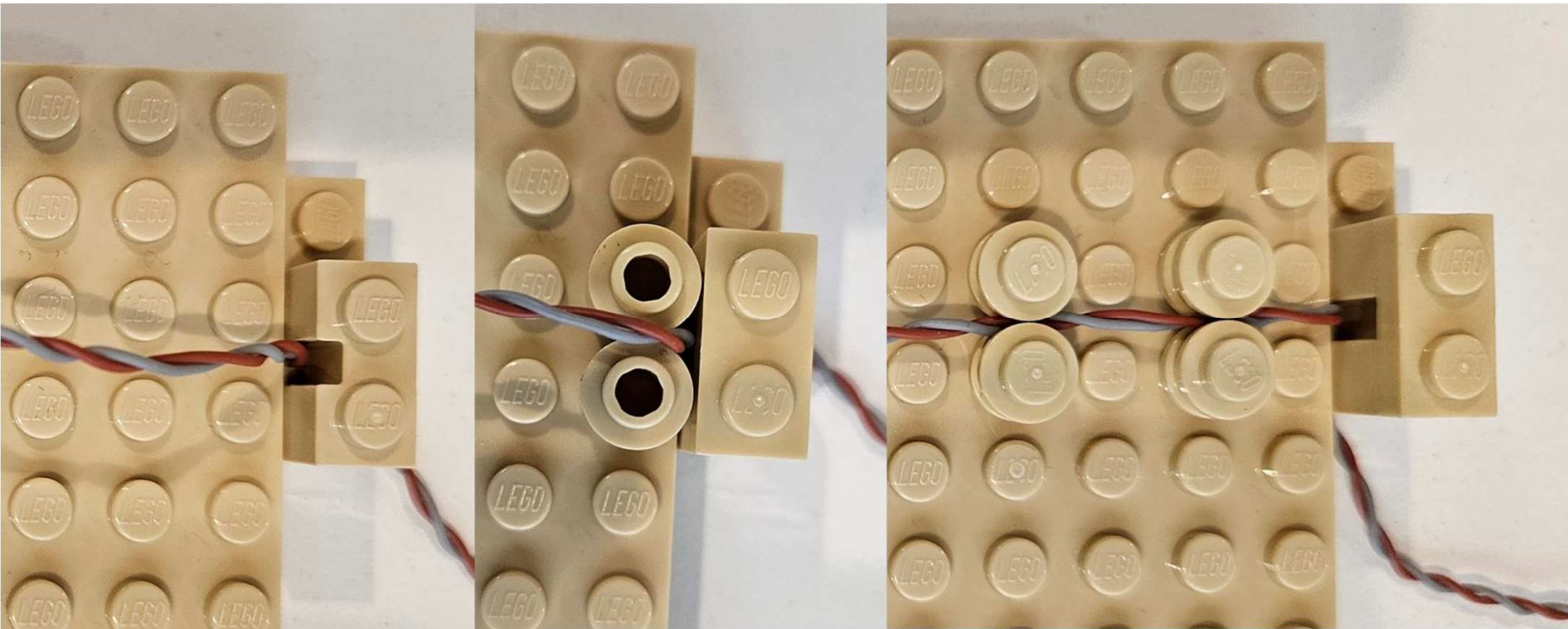
Part 15068
Slope Curved



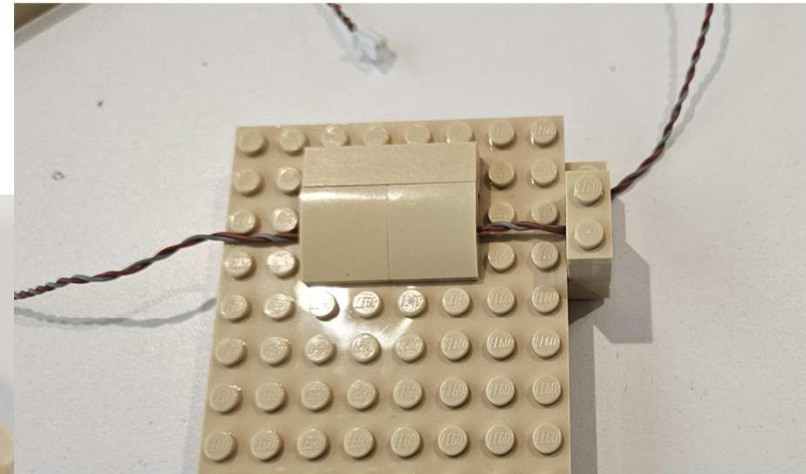
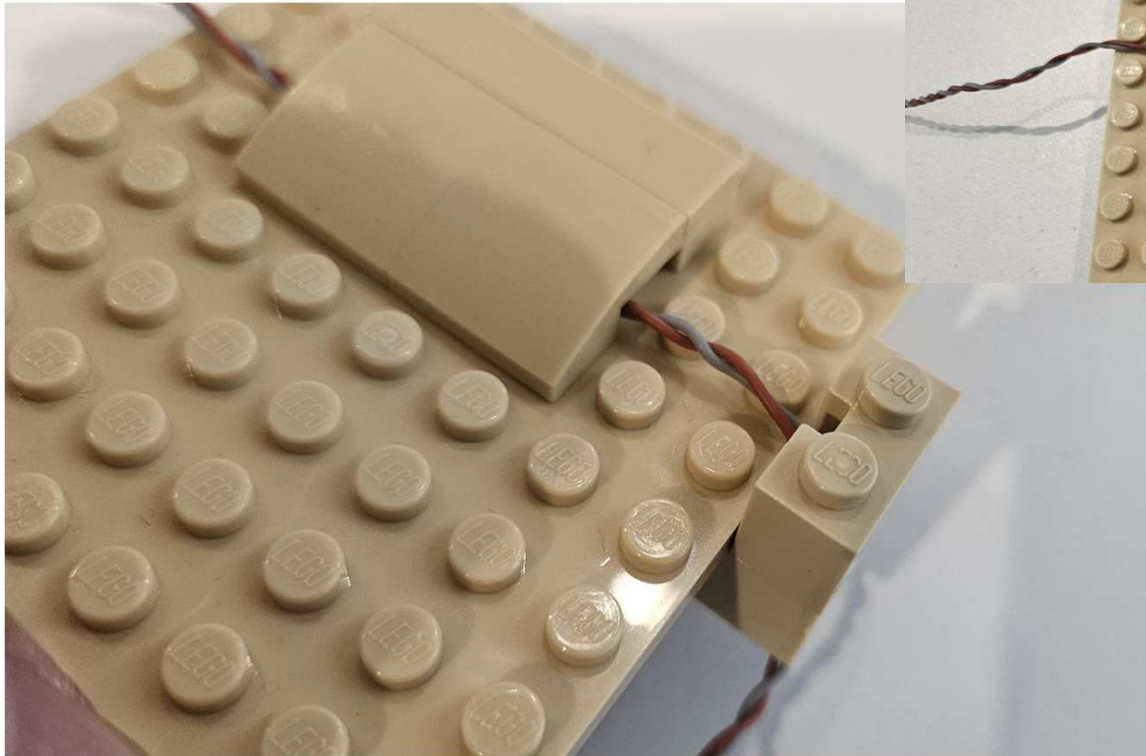
Part 62462 Pin Joiner Round
with Slot



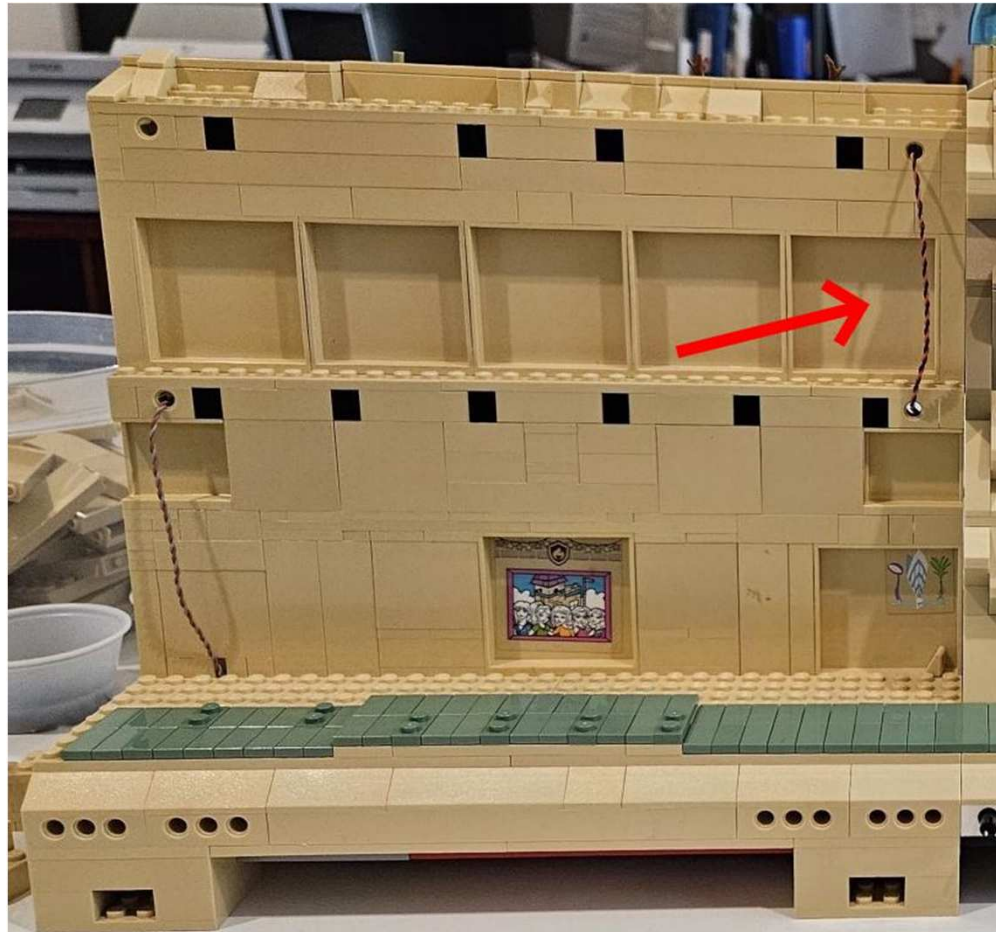
Routing Techniques



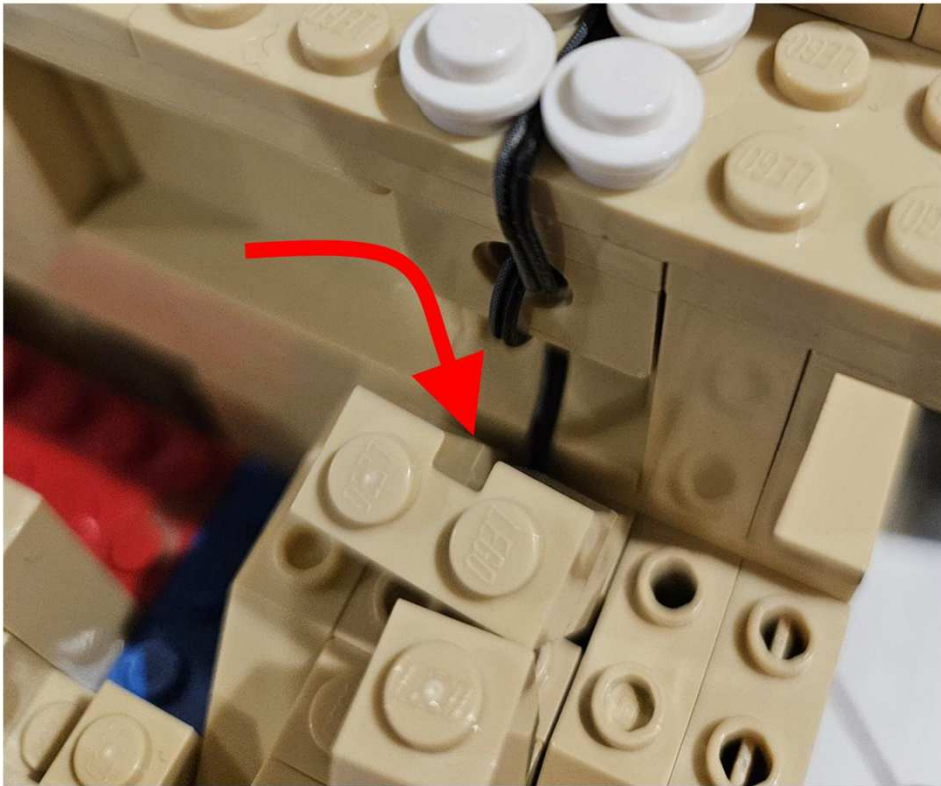
Routing Techniques



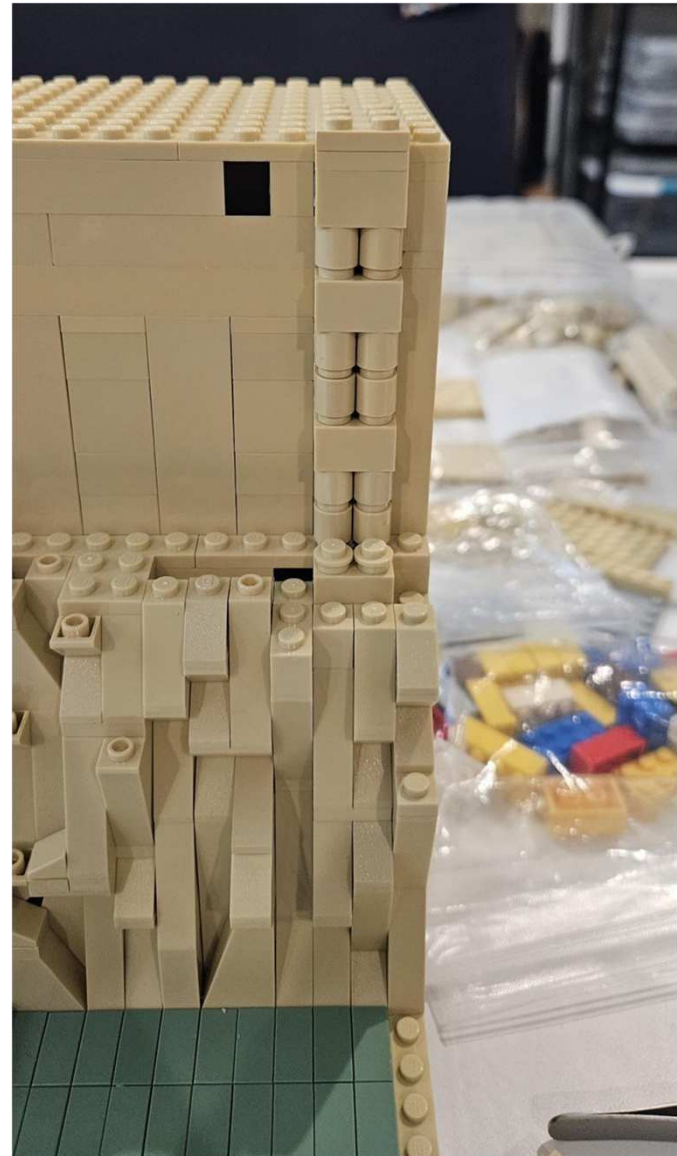
Routing Techniques



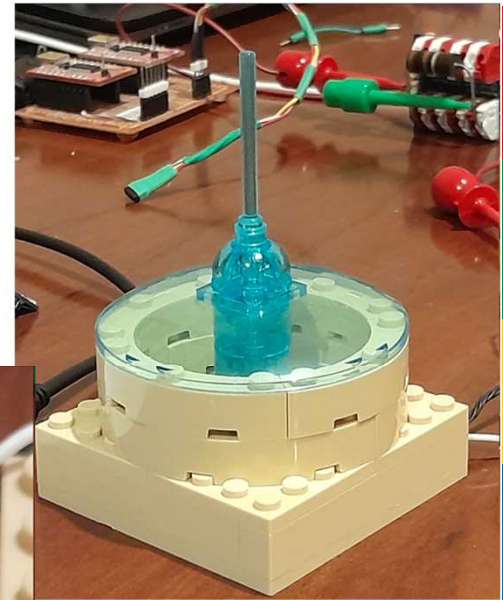
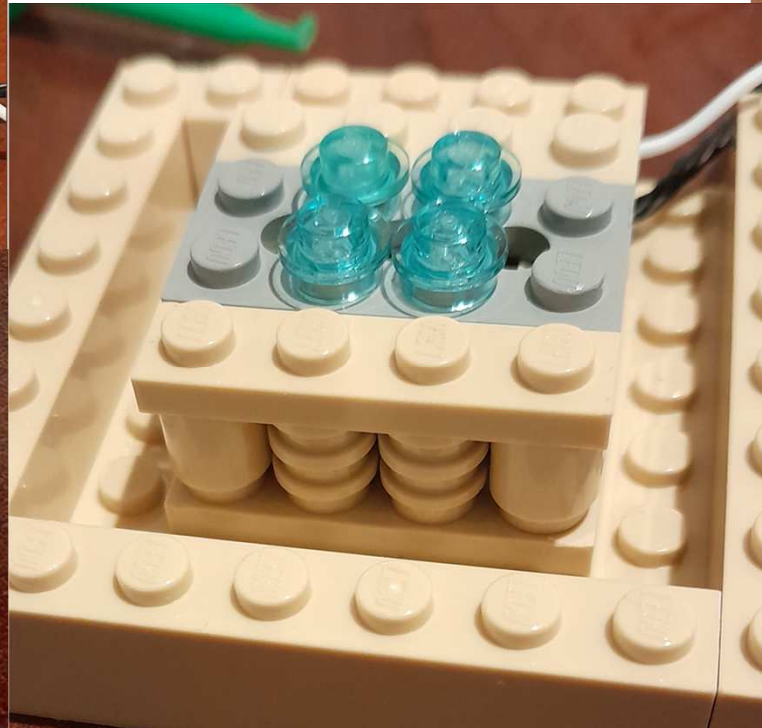
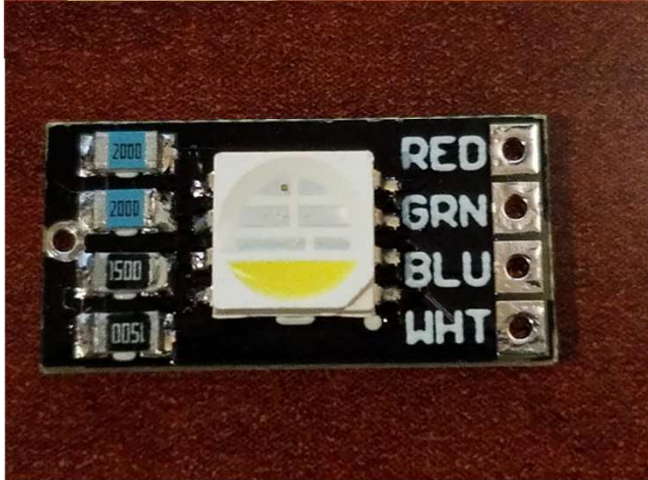
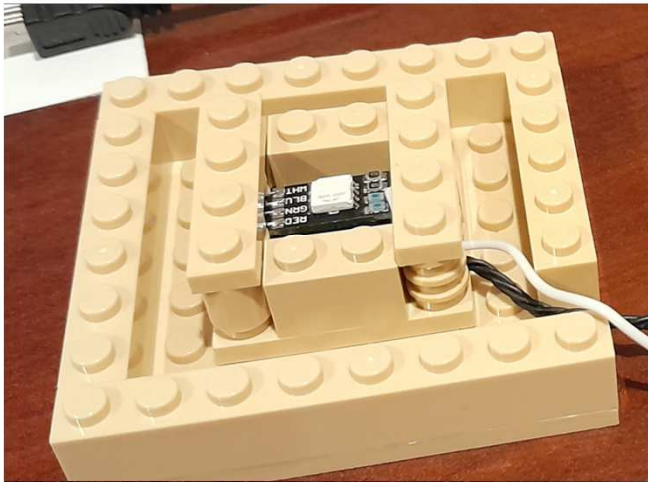
Routing Techniques



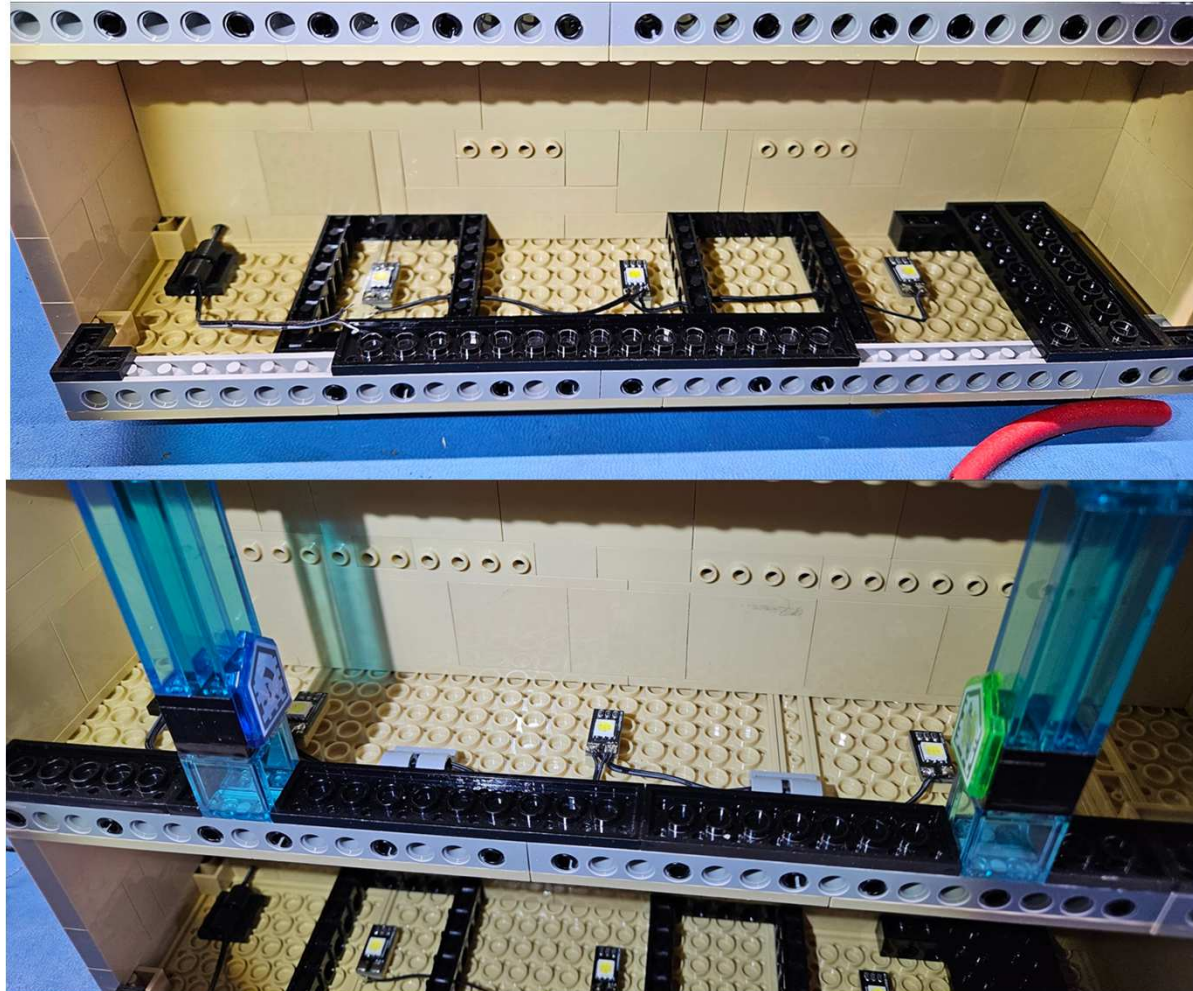
Routing Techniques



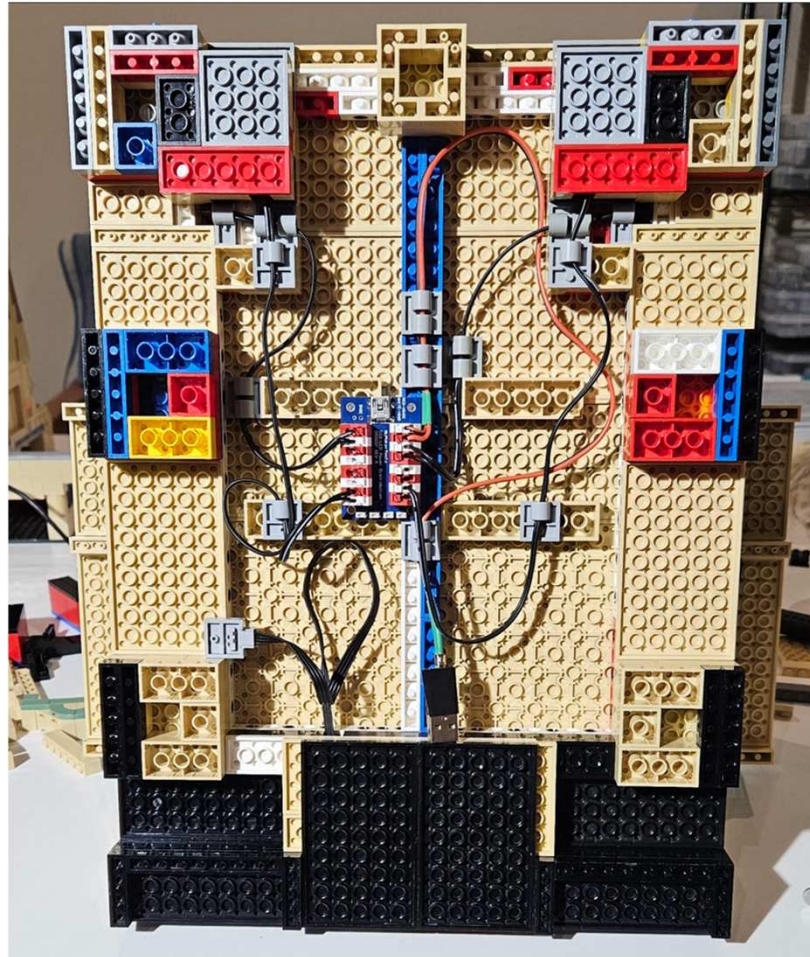
Routing Techniques



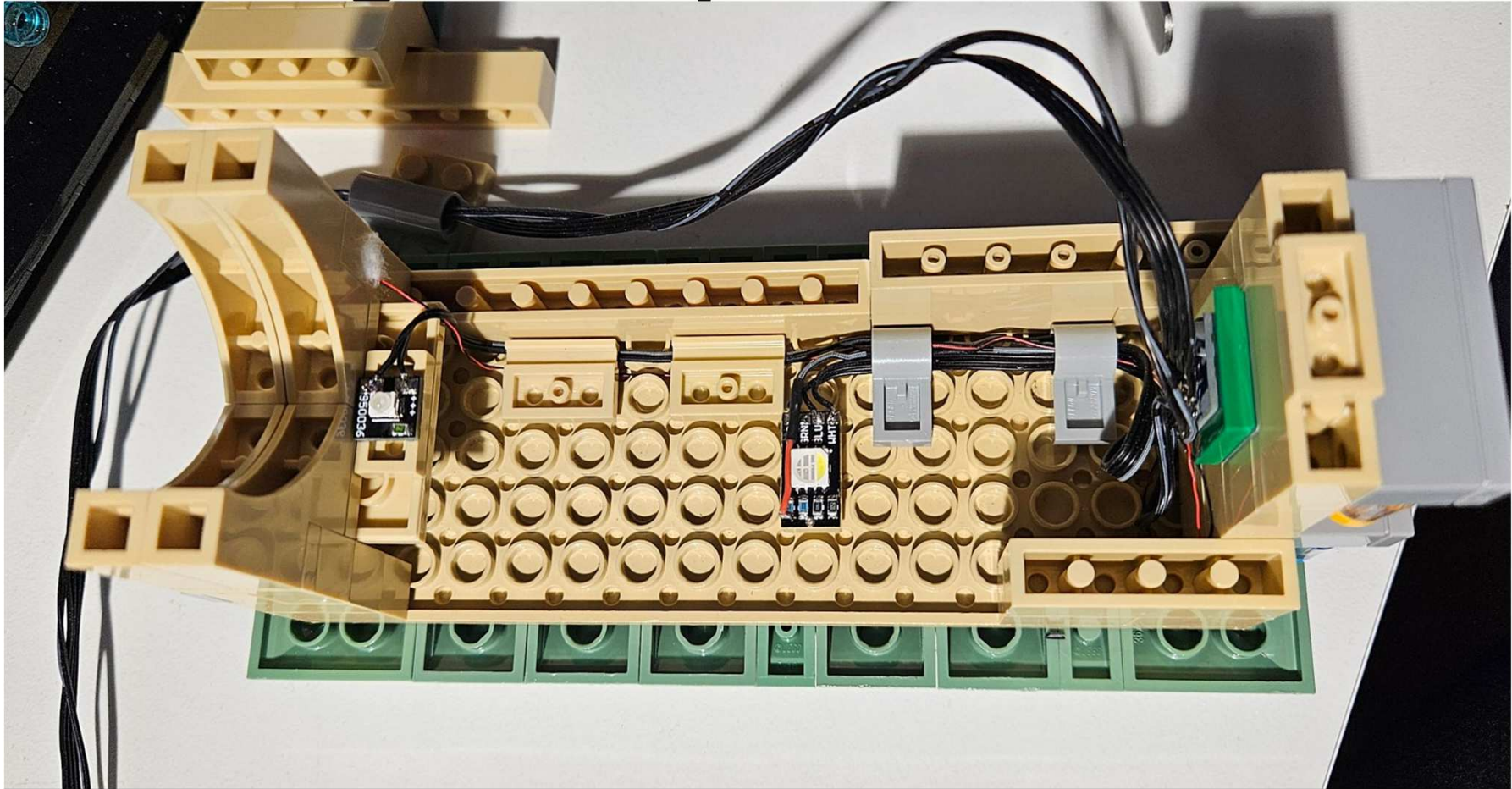
Routing Techniques



Routing Techniques

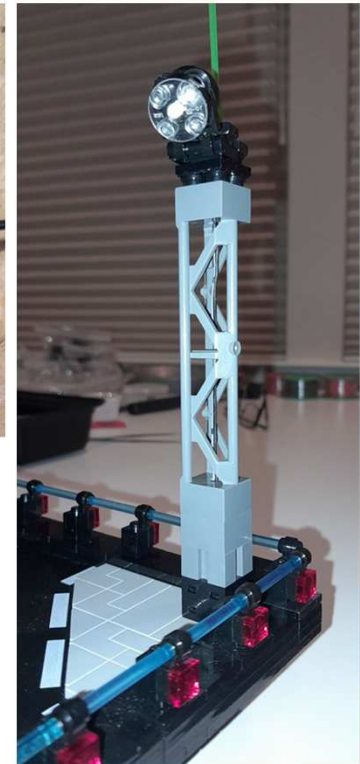
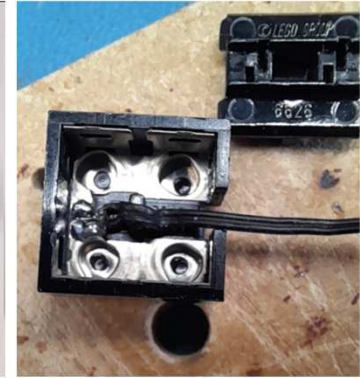


Routing Techniques



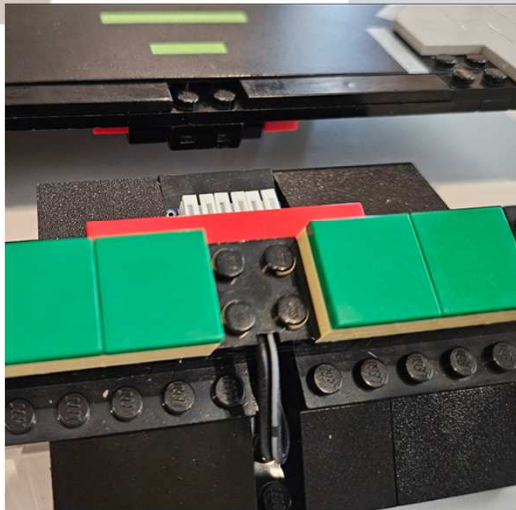
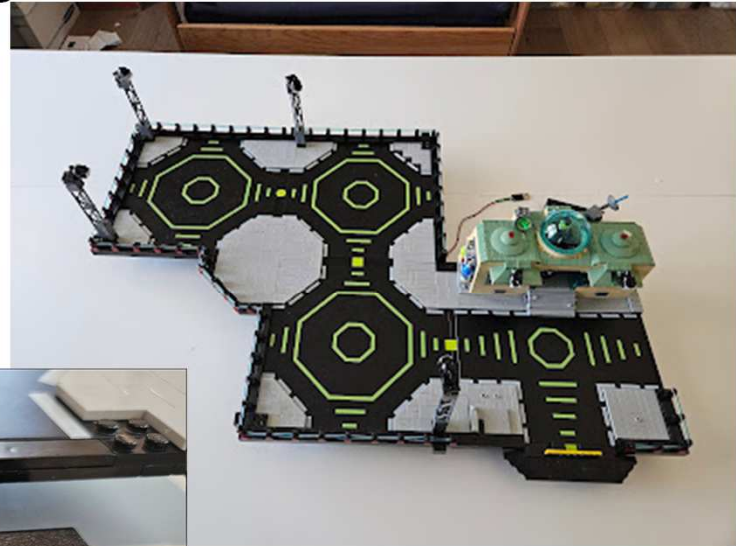
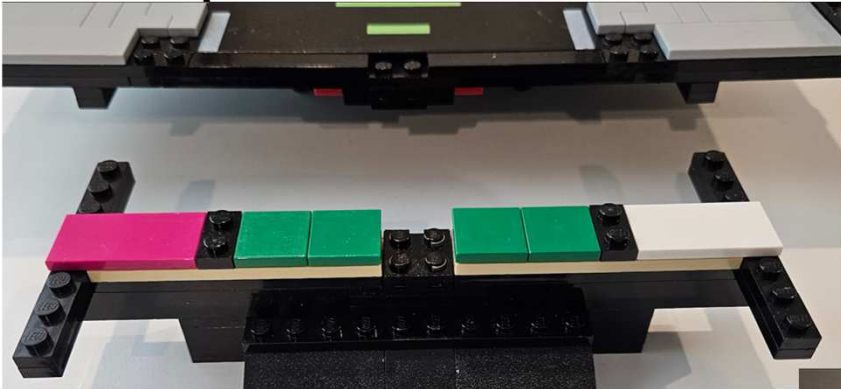
Brick Power

It is possible to repair the old 9 Volt power connectors that were simple 2 x 2 x $\frac{2}{3}$ plates. Depending on wire AWG you need to use, they can be taken apart and then re-pressed together. When using 28 AWG or smaller, then you will have to solder the wires in.



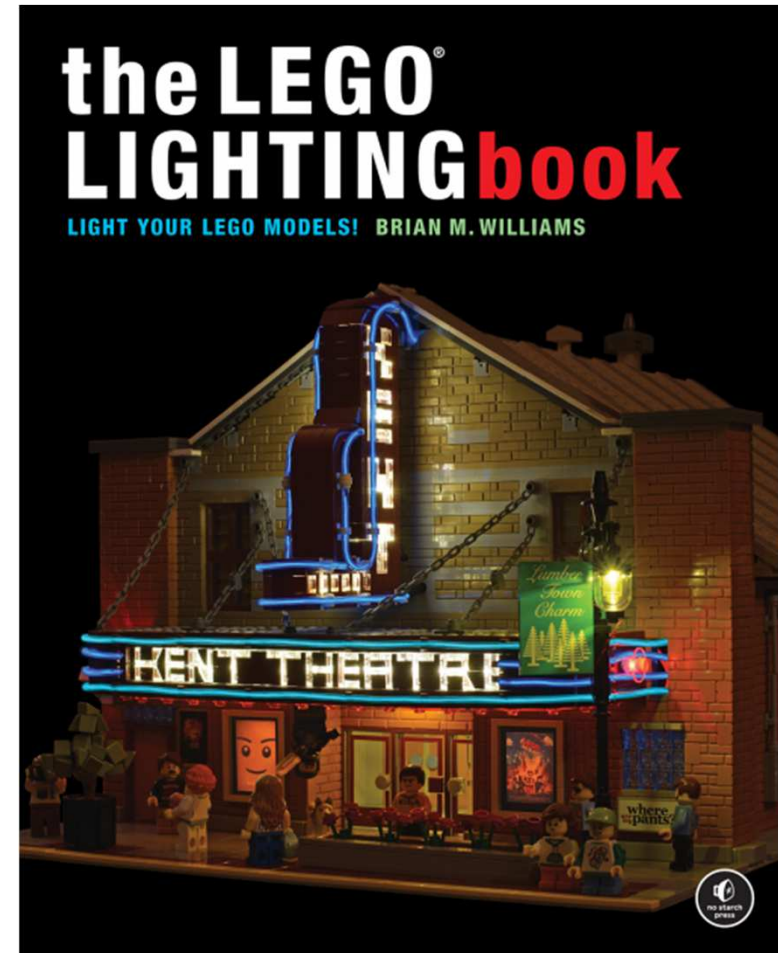
Brick Power

The Space Port uses these bricks and goes together in 5 minutes now.



Continued Learning

Great book for both novices and
advanced users



BRICK DAYS



THANK YOU

Neal Whitsett



maker54@mymakertools.com



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