MOD09 - Bueller

A guide to building this GBC module

Building Guide for module Version 2.2. August, 2024.

https://www.facebook.com/ryk.field

https://rebrickable.com/users/rykfield/

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https://www.youtube.com/@rykfield

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rykfield

http://eucalypt.com/lego/

MOD09 - Bueller

Based on 10247 - Creator Ferris Wheel (2015)

Due to the size and nature of this GBC module, I don’t anticipate many people will build it, making it difficult to justify the enormous time required to create step-by-step instructions.

As an alternative, the intent of this document is to guide the reader through the process of building each of the sections of the GBC, based on the model design in the ~6000 part Studio file. If you are unfamiliar with Studio, there are several tutorials available on YouTube to supplement the official documentation.

If you need help, or find a problem, please get in touch.

Building For Different Display Modes

As shown on the front cover, MOD09 can be used in a typical GBC loop. Alternatively, for standalone display, additional components can be built to recycle the balls.

In the following pages the typical sequence for building each of the components will be detailed, along with specific important notes. All of the components required for “in-loop” use will be completed first, followed by the optional components for standalone display.

An effort has been made to title each of the subsequent pages with the name of the *subassembly* in the Studio file.

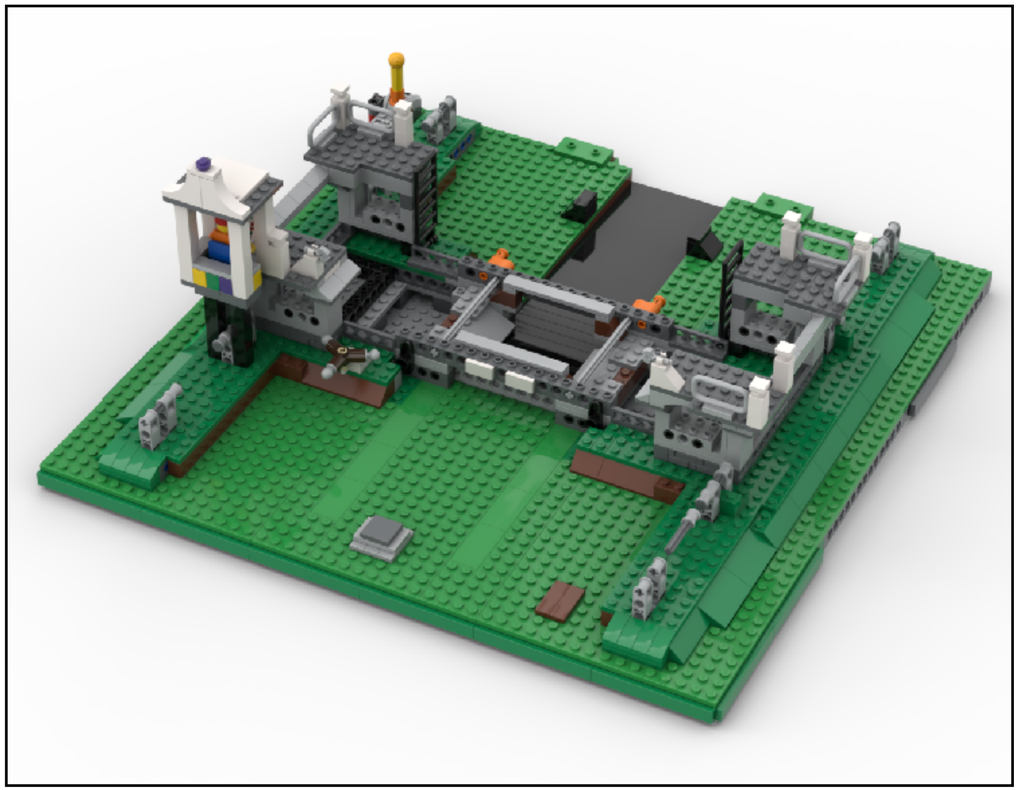
Lets begin…

Base Structure

To add structural integrity and make this large module easier to transport, the entire GBC is built upon MILS-style bases. Each of the different components are then *pinned* together to eliminate movement from vibration when the GBC is running.

Decorative tiling is used along the front and sides of the modules, however some additional tiles have been added to make it easier to determine the right spot to connect different components together.

The black ramp allows balls that fail to load, a path to exit cleanly from the GBC, to be collected by hand at the rear and added back to the loop.

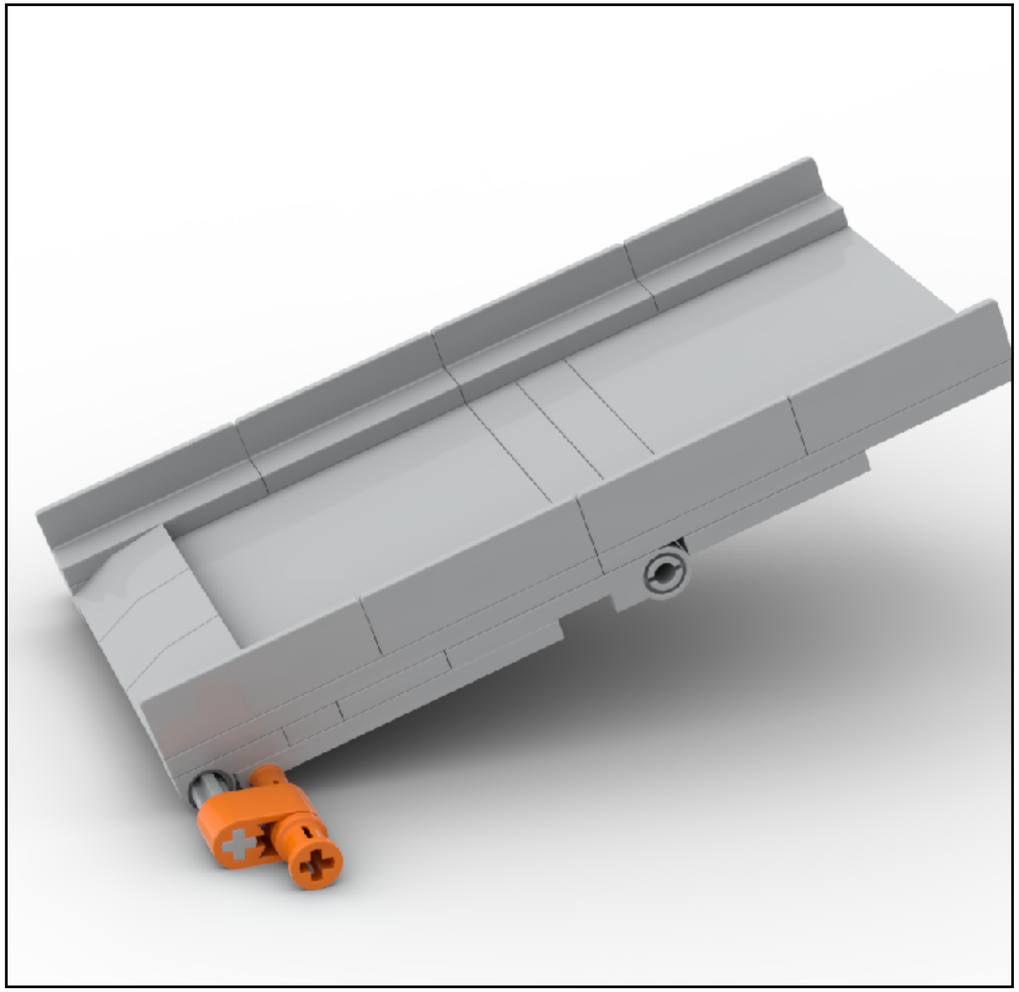


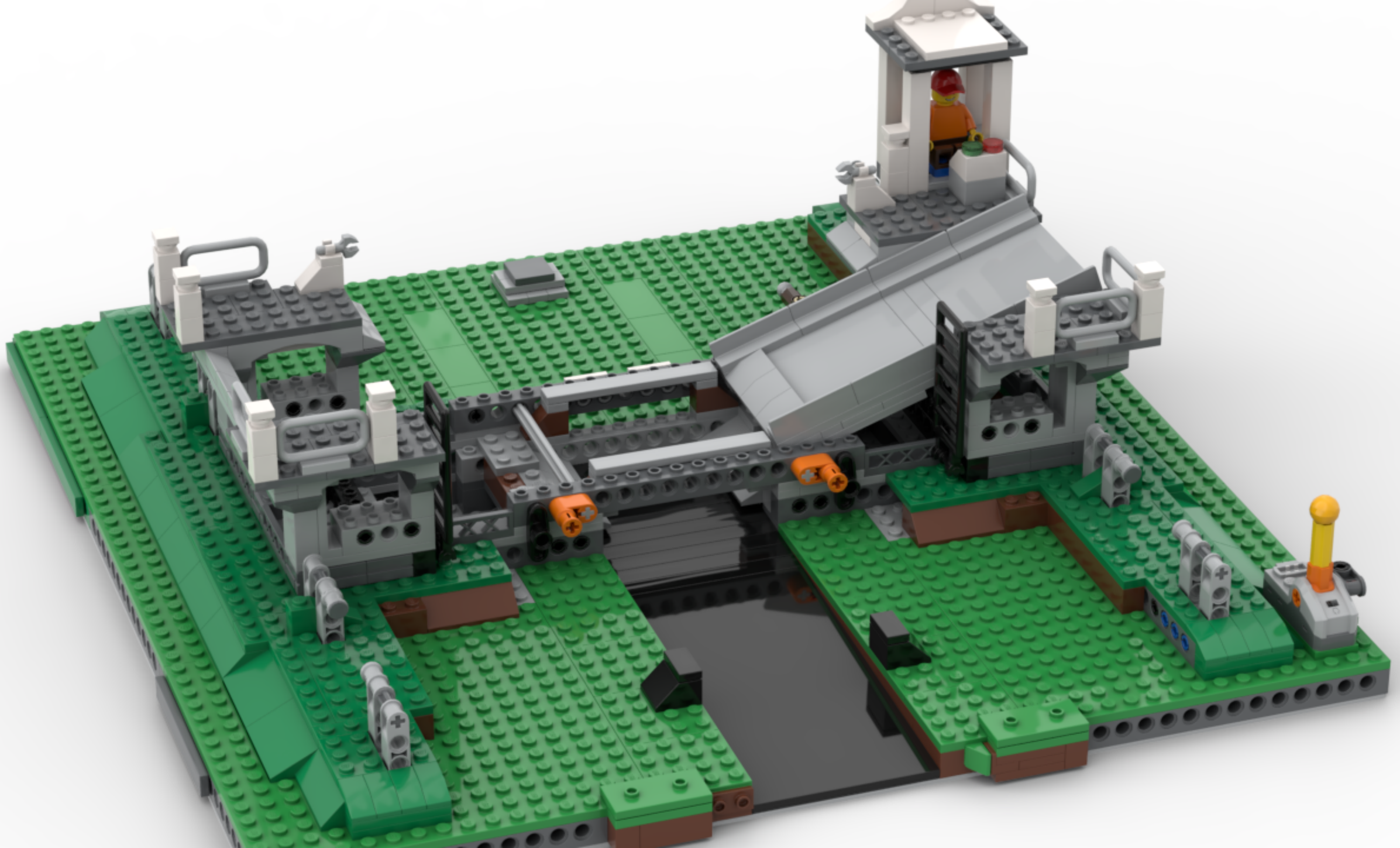
Sloping Platform - Up

The original Ferris Wheel set had grill plates below the Gondolas, which don’t work well with the GBC balls. Tiled platforms have replaced them.

In some circumstances, if a ball fails to load into a Gondola correctly, it can fall in front of the Gondola, and be pushed up this ramp, and placed back into the *Feeder Conveyor* module.

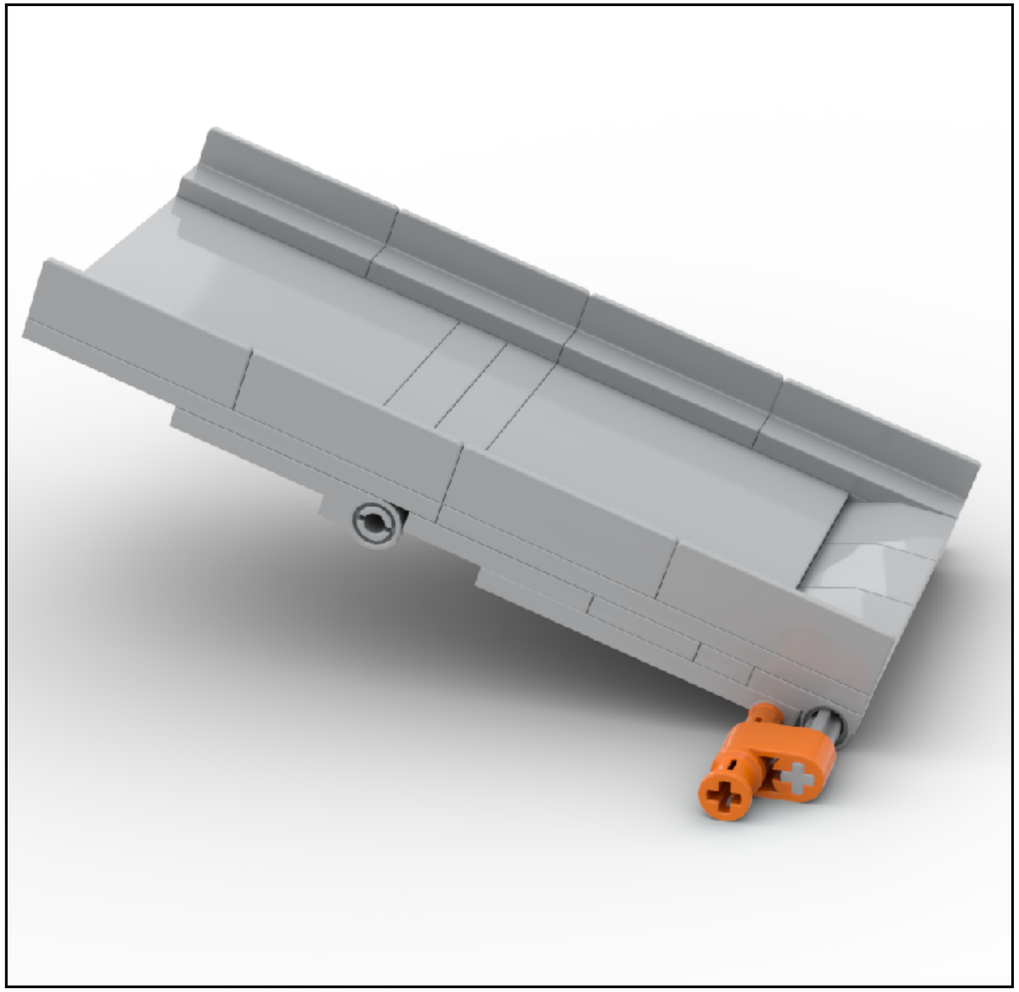
As each section is built, the following page will indicate its placement within the complete GBC.

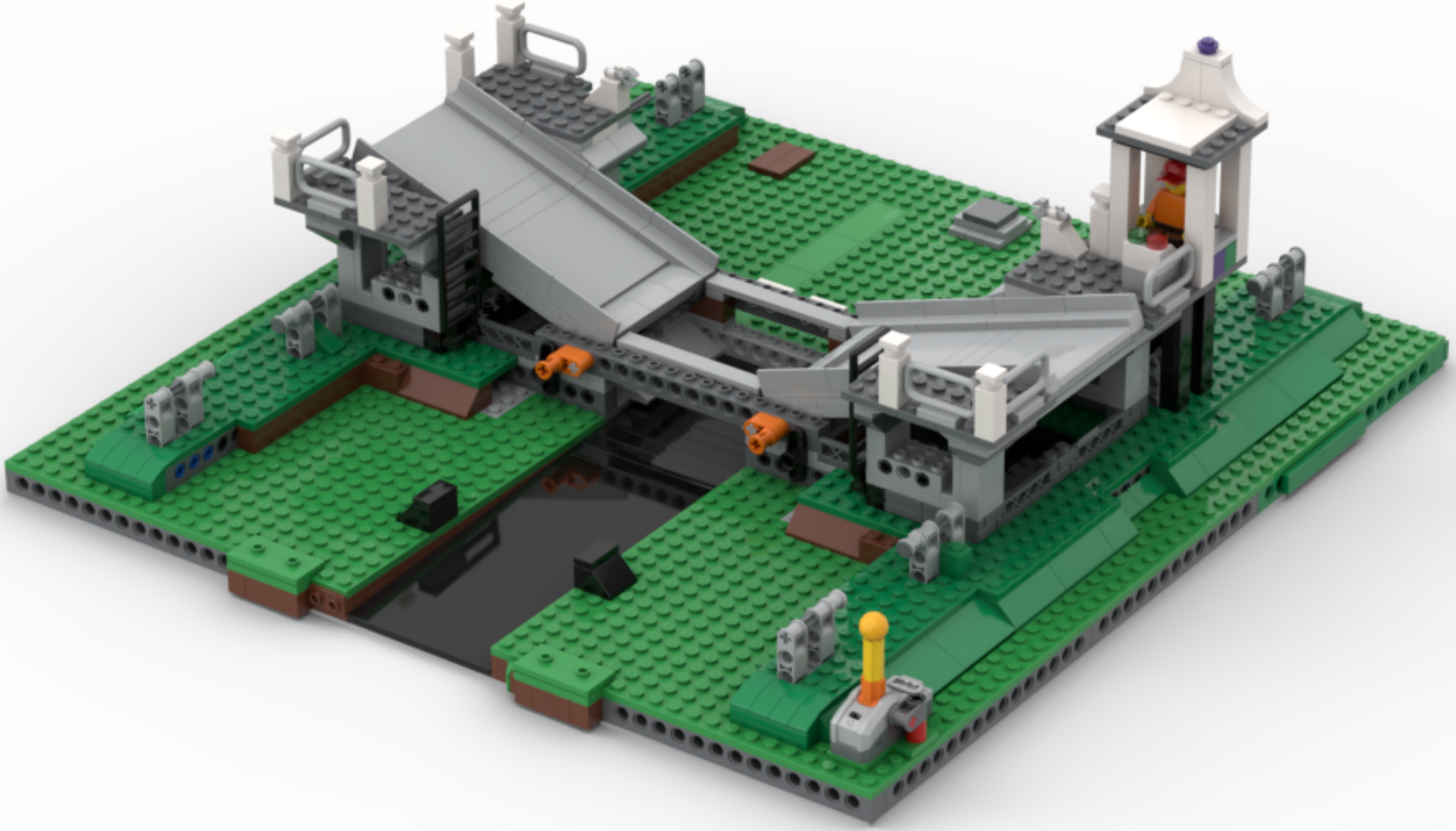




Sloping Platform - Down

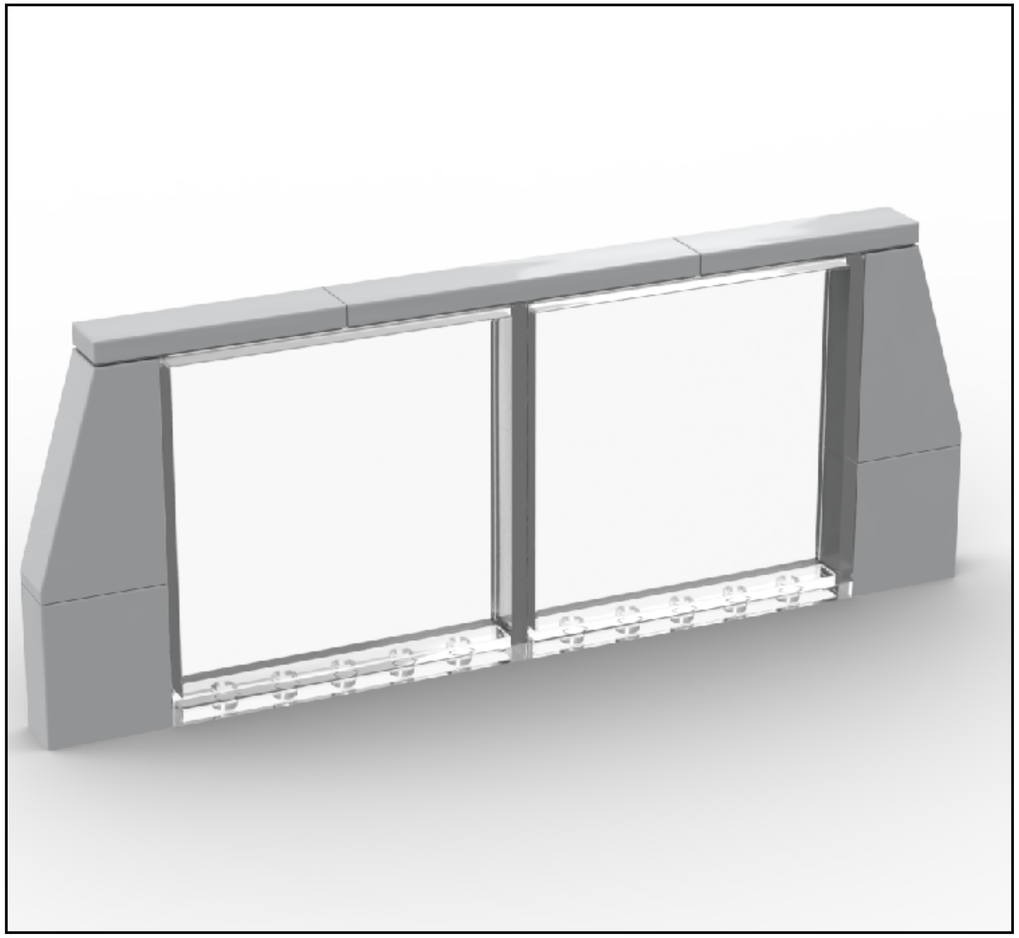
The platform on the opposite side is different only in the arrangement of the curved slope pieces. On rare occasions, balls do not unload correctly, and fall onto this slope, which allows the balls to cleanly exit the module via the black ramp shown previously in the *Base Structure*.

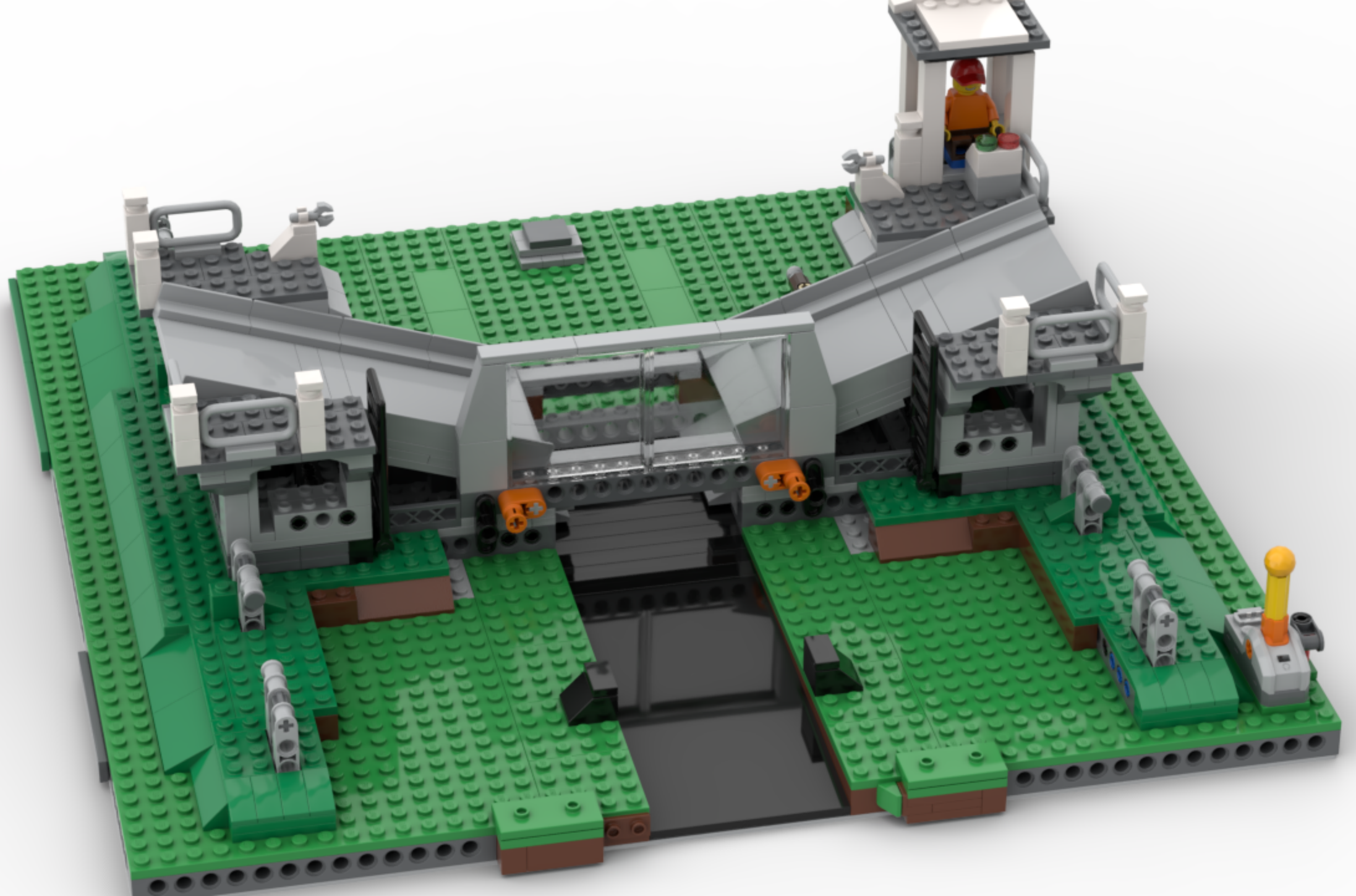




Clear Ball Guard - Rear

This ball guard helps ensure any balls that fail to load properly make their way cleanly out of the module. The flat side of the clear panels should face inward, toward the sloping platforms that have just been added.

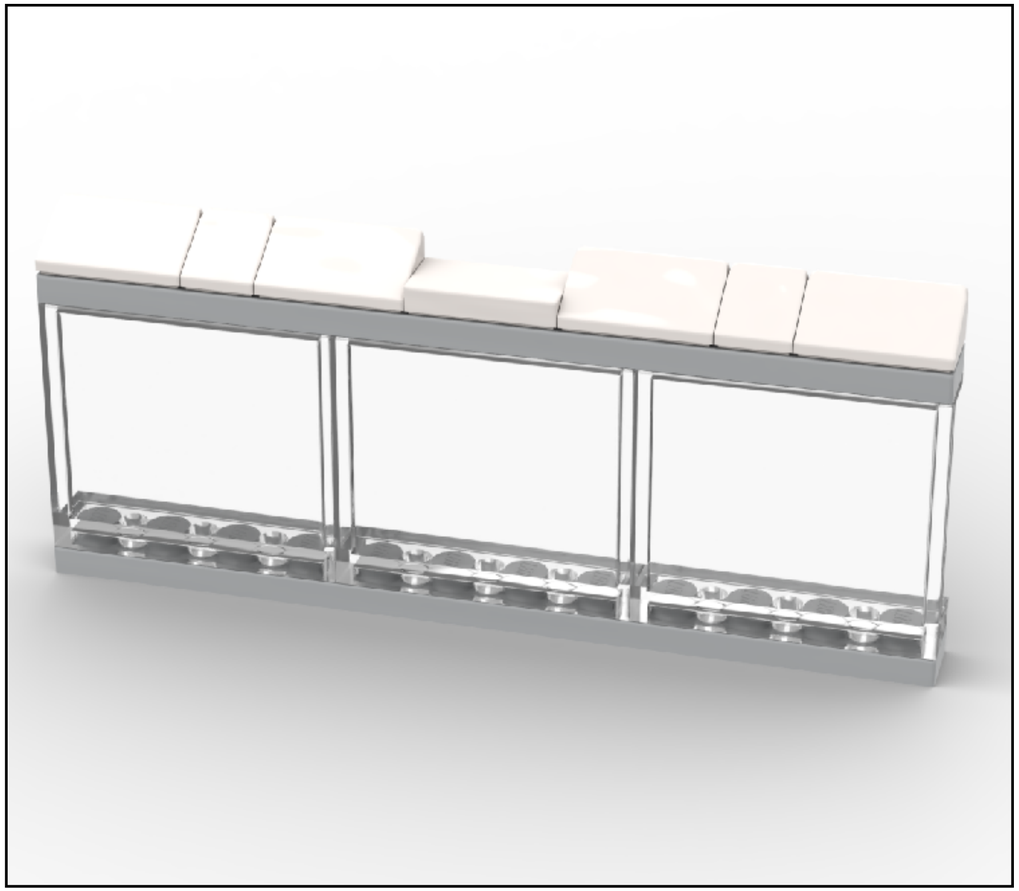




Clear Ball Guard - Front

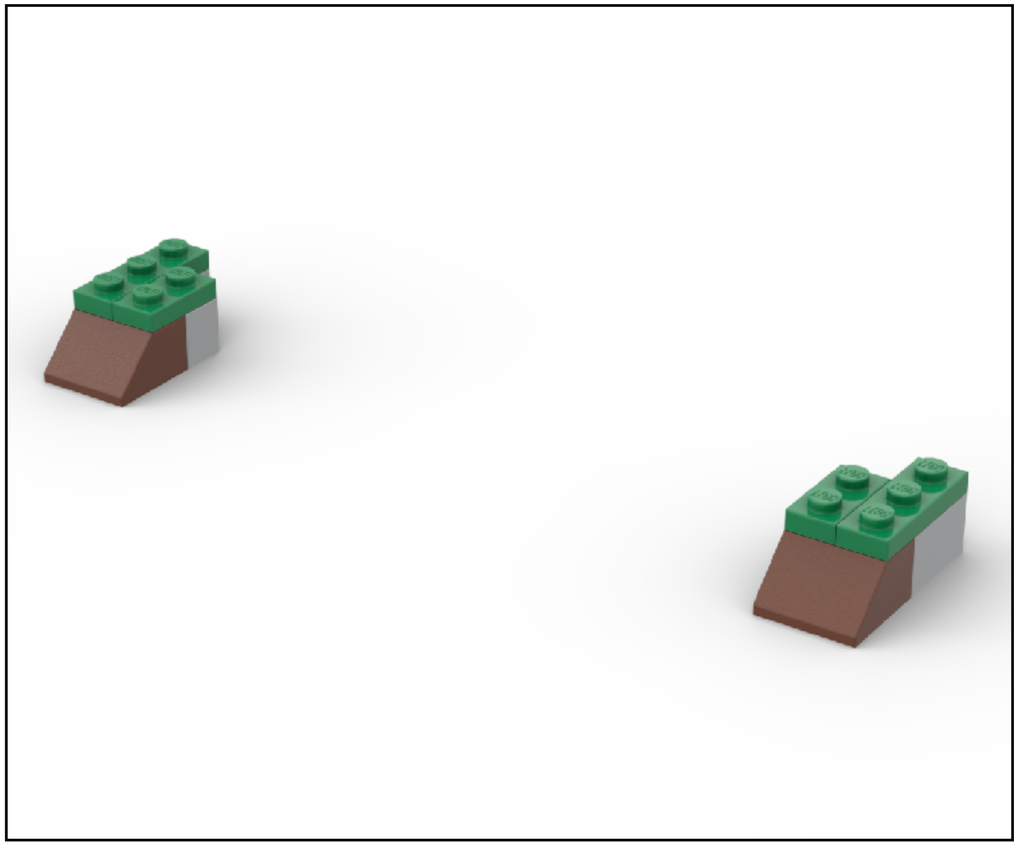
This ball guard is also intended to keep the balls within the sloped path beneath the ferris wheel, and in particular to keep the balls from entering the stepper mechanism beneath the *Loader Module.*

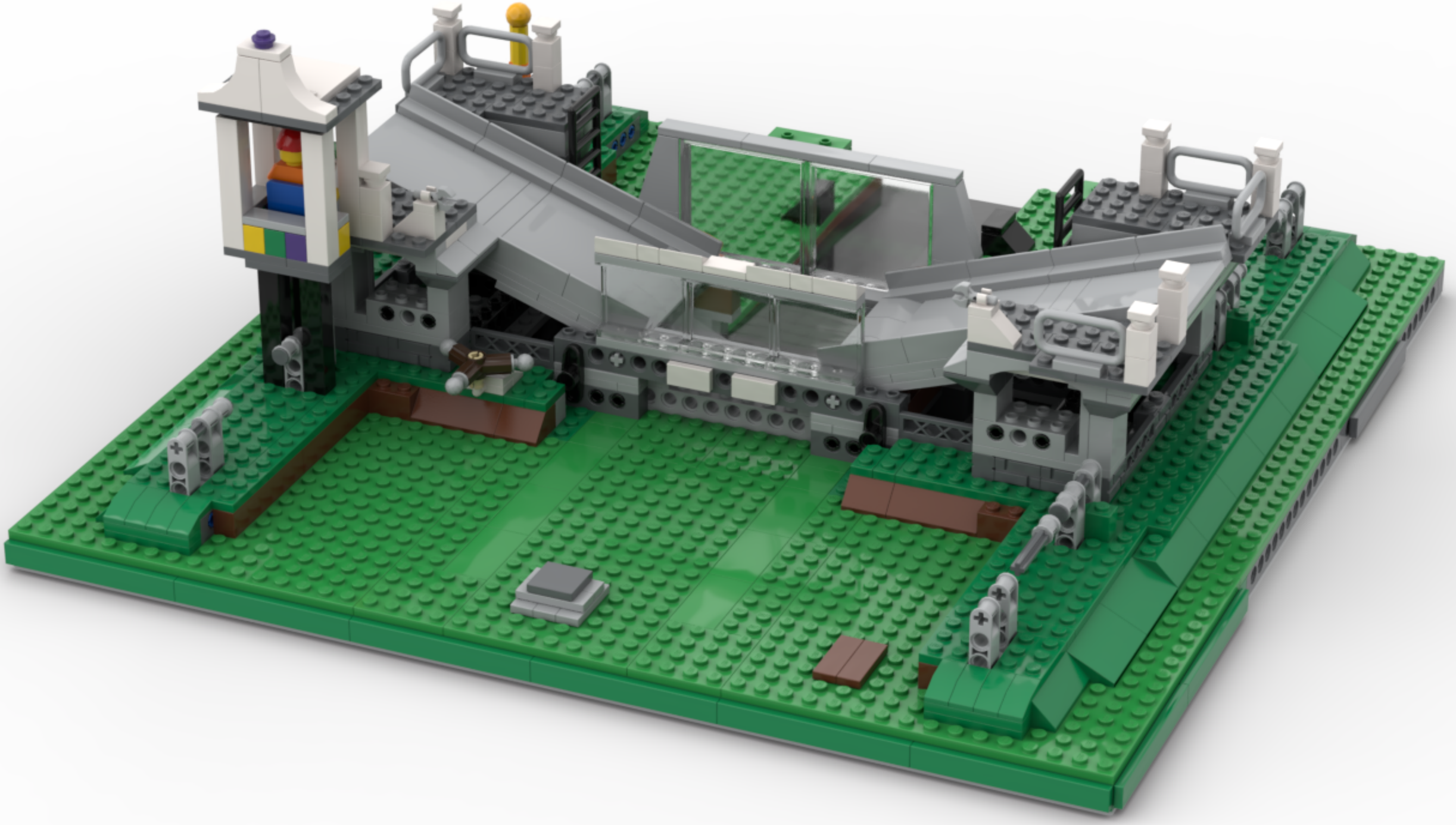
The flat side of the clear panels should face inward, toward the sloping platforms that have just been added.



Grass Slope Plugs

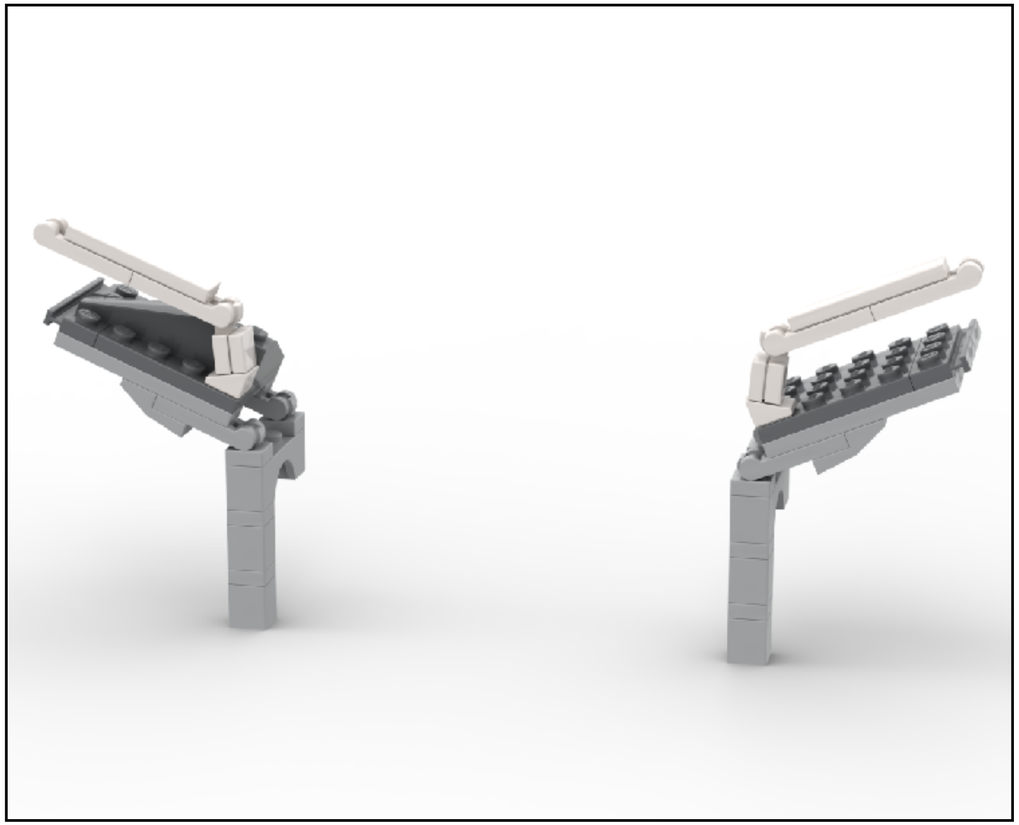
A couple of “plugs” to make the module look a little cleaner.

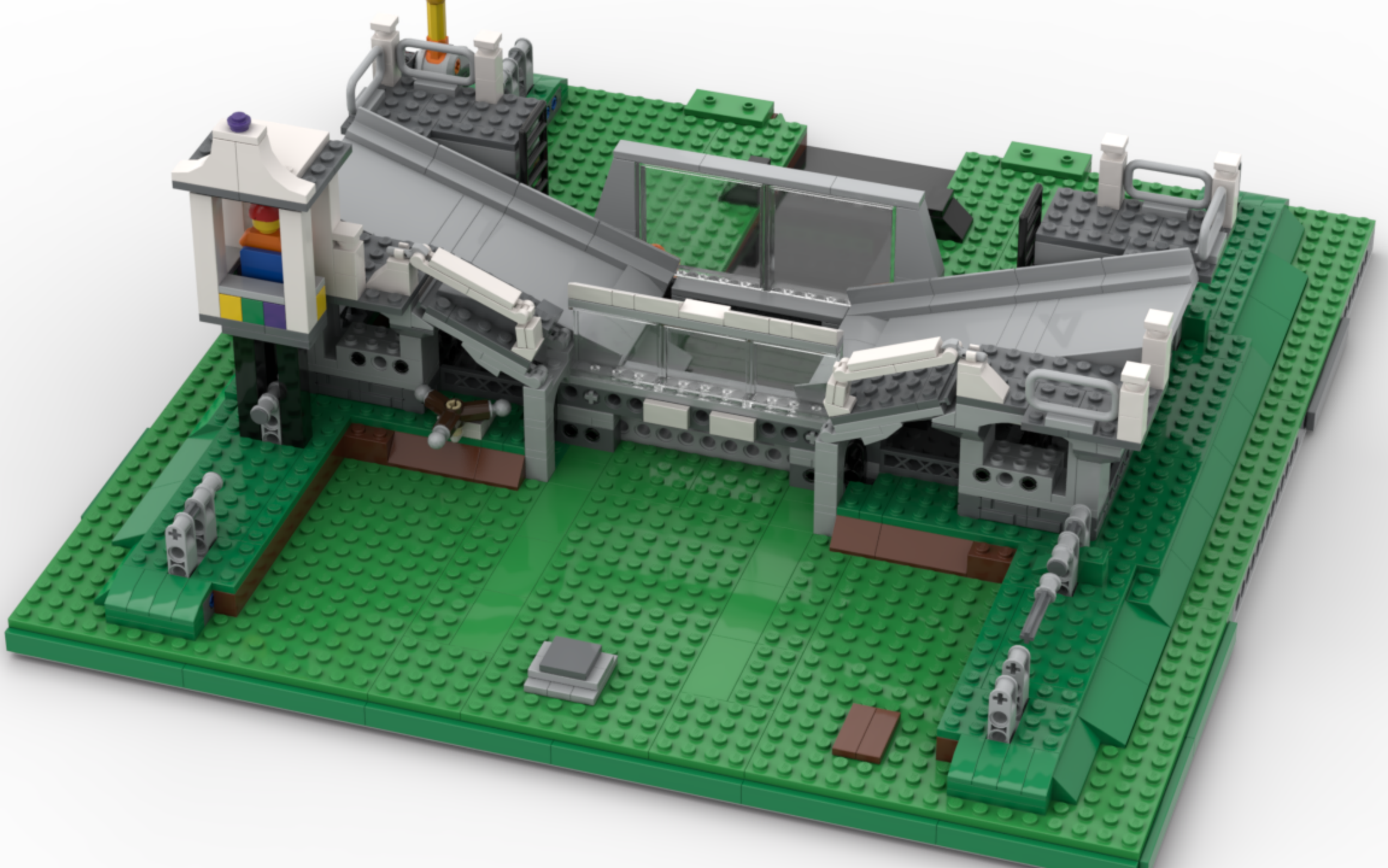




Side Ramp - Left & Right

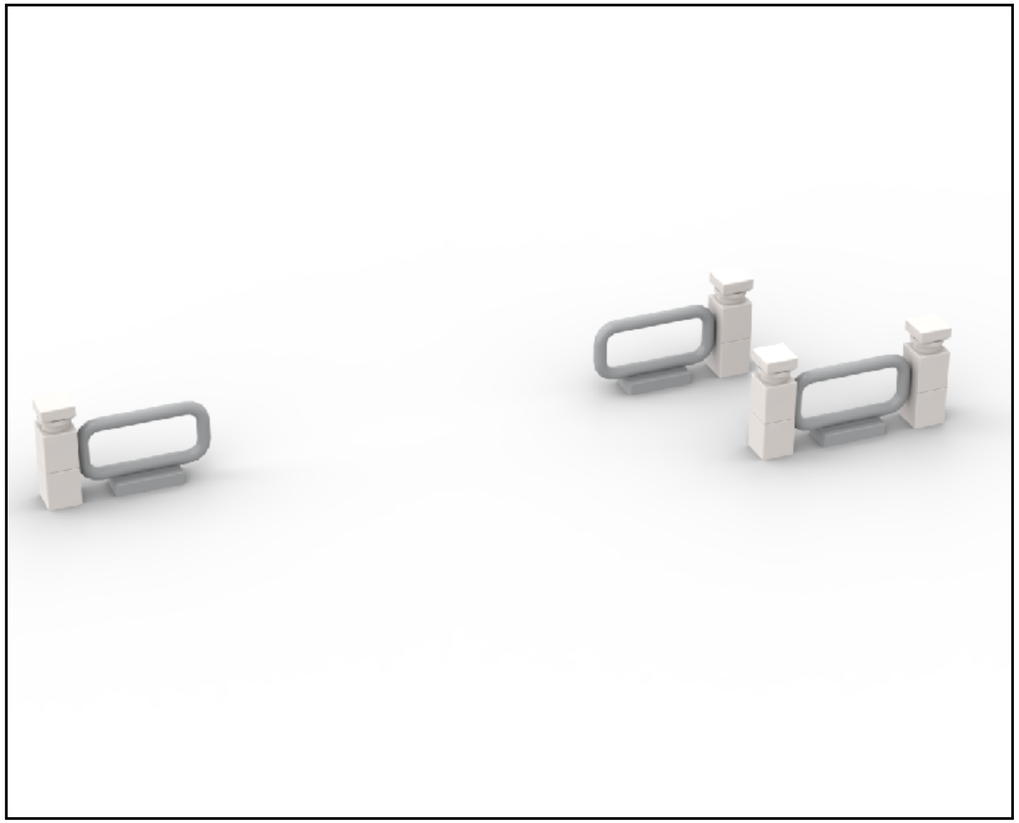
These ramps are decorative (to help retain the original look of the official Ferris Wheel set) as well as functional, in keeping wayward balls within the ferris wheel ball path.

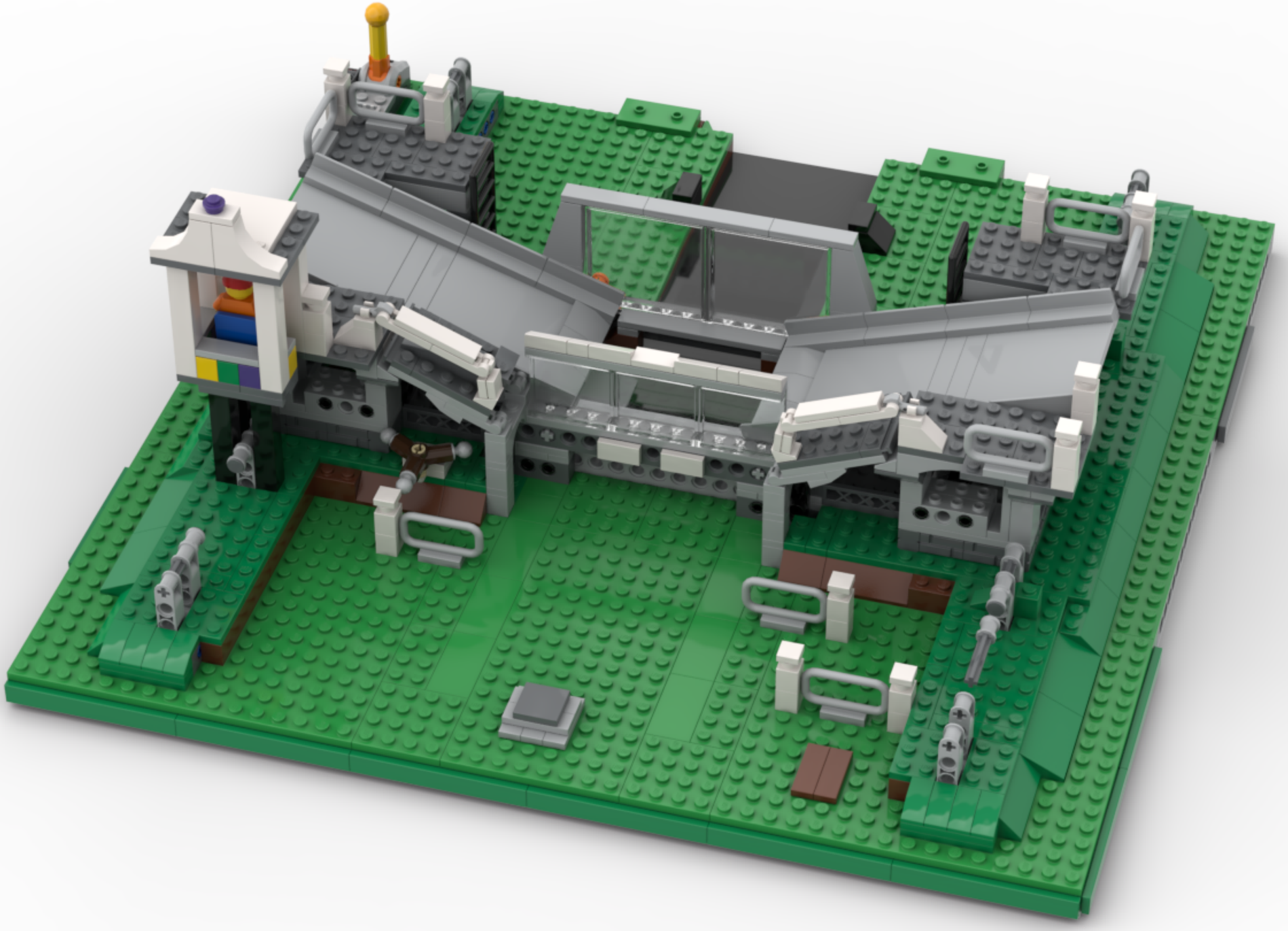




Fences - Front

Decorative elements, to be added now while there is easy access to this area of the build.





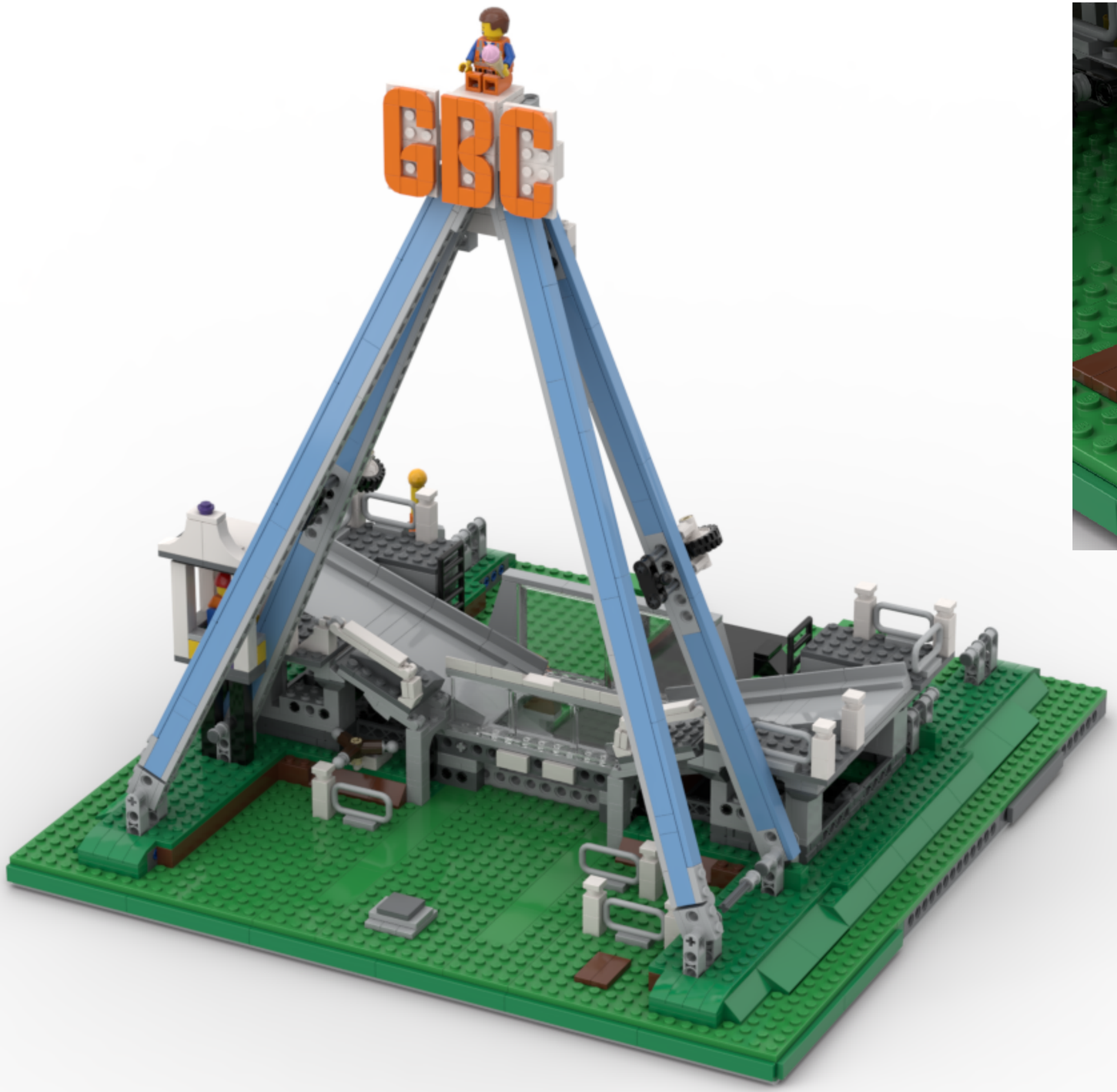
A Frame - Front

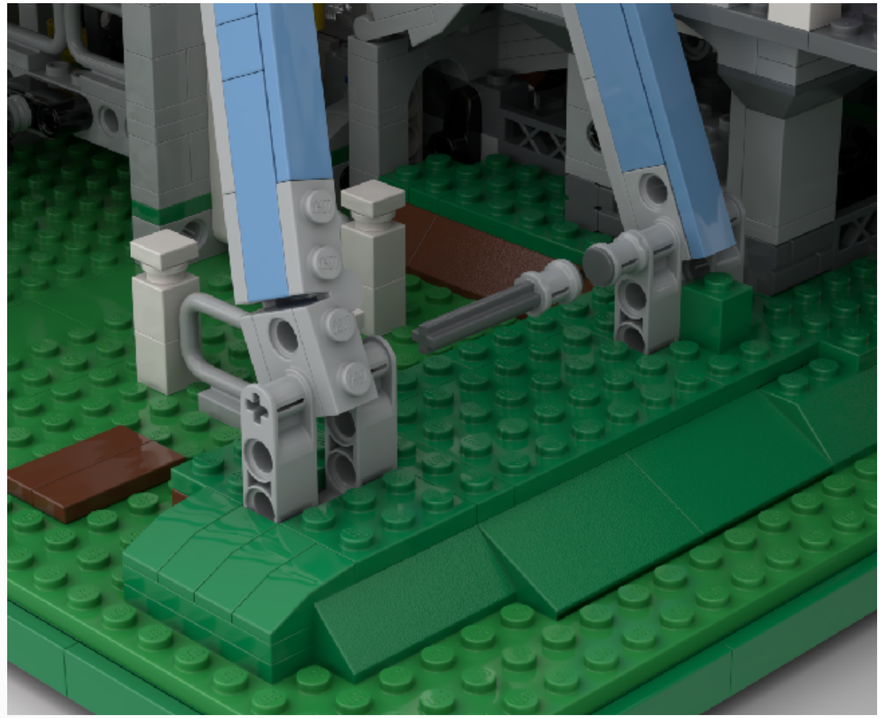
These legs will support the front side of the Ferris Wheel. Once built they can be attached directly to the base using the technic axles as shown on the next page.

Note: The rear left leg goes *inside* the control booth.

At this point, Emmett deserves a break for ice cream.

In the original design, only two drive/guide wheels are used, one on the front *A Frame*, and one on the rear. I have changed this to four guide wheels, to improve the overall stability and alignment of the Ferris Wheel for loading balls into the *Gondolas*.



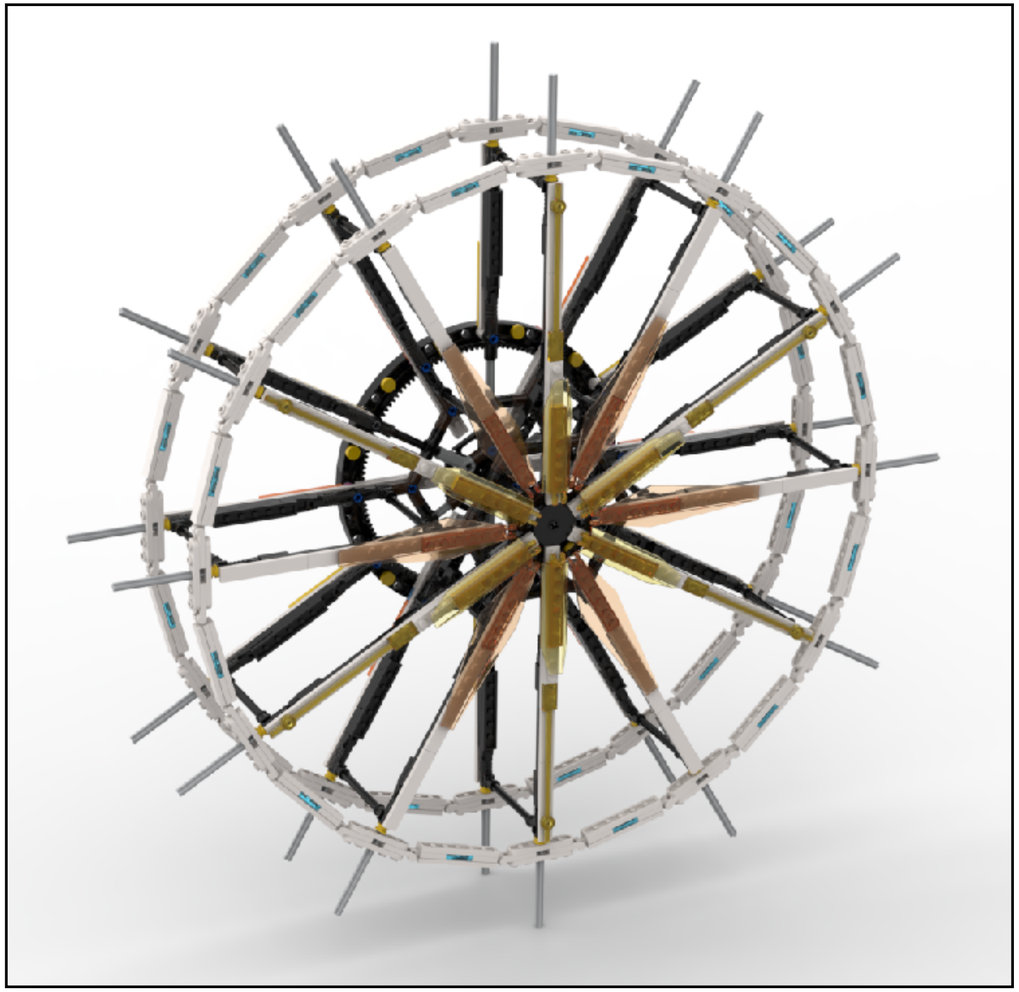


Pull pins and attach legs

Ferris Wheel - Complete

The main wheel is built in two sections, the front wheel, with all of the cross members as well, and the rear wheel, which is modified to include the Technic banana gears, which are used to rotate the wheel.

Once assembled, the wheel can be attached to the front *A Frame*, and should be secure enough to hang there while you build the rear *A Frame*.

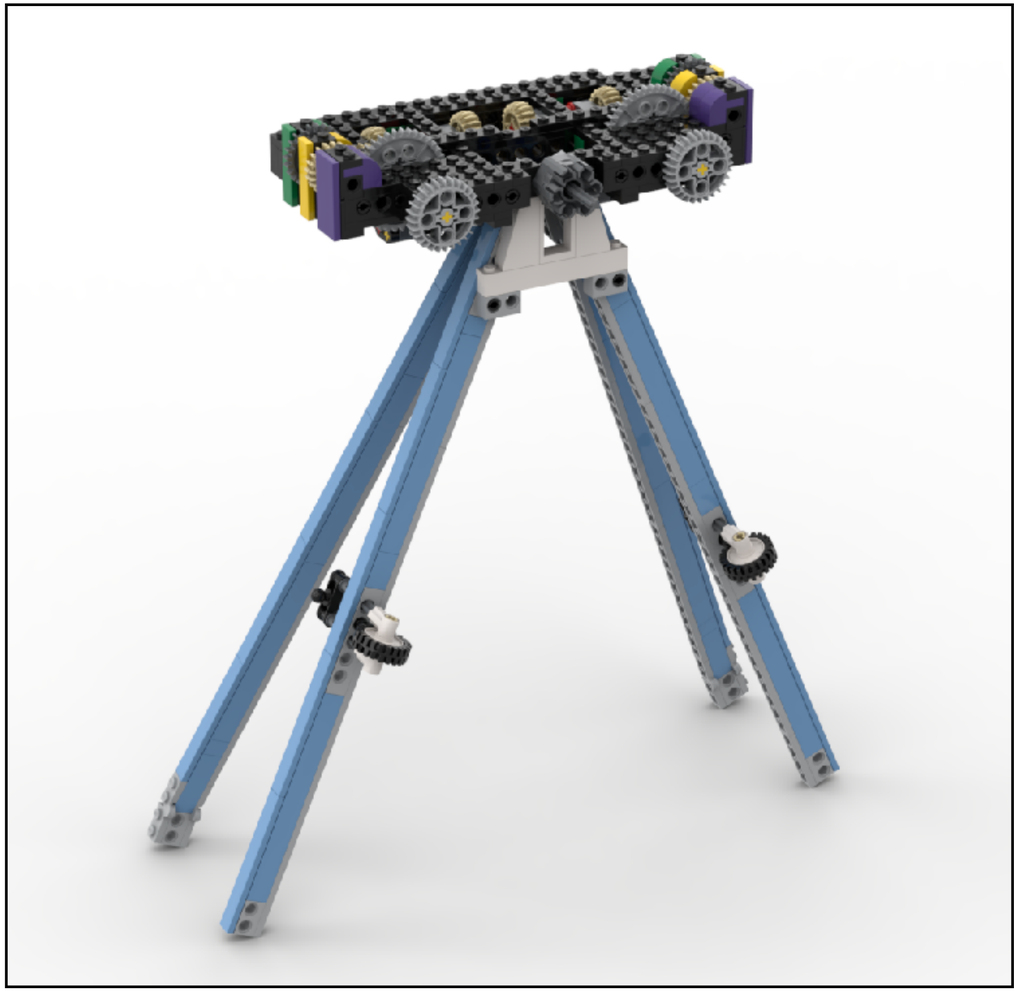


GBC

A Frame - Rear and Gear Rack

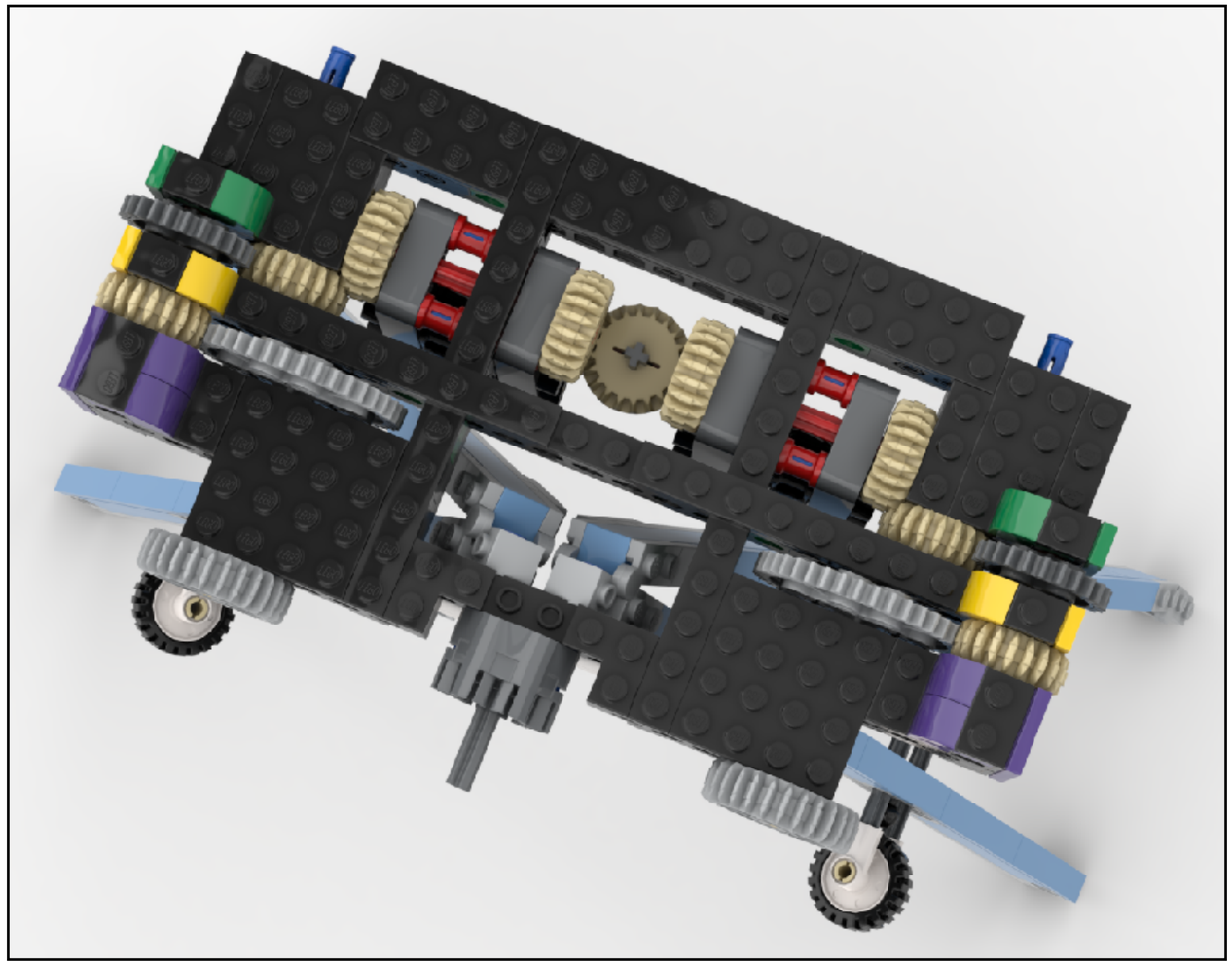
The rear *A Frame* legs are only slightly modified from the original design. The *Gear Rack* will drive the banana gears to rotate the Ferris Wheel.

See next page before attaching the *Gear Rack* to the *A Frame*.



This alternate angle shows how the *A Frame* is attached inside the *Gear Rack*. There is just enough room in the 3x6 stud rectangle to place the *A Frame* inside it, and then slide it onto the blue technic pins in the *Gear Rack,* while also connecting the black technic pins at the bottom of the white framing to the *A Frame.*

It can be difficult and fiddly, but it does all fit together properly.

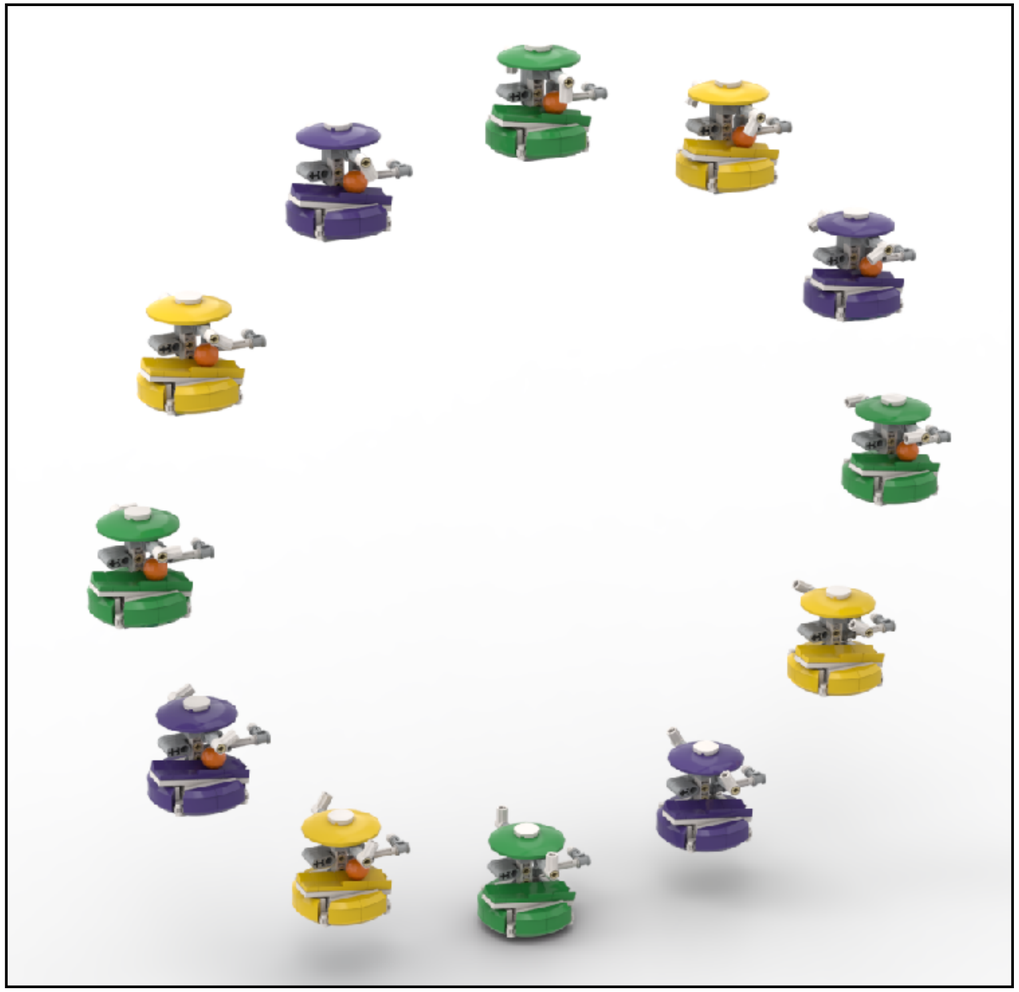


Gondolas

if you thought building the Ferris Wheel was repetitive, grab a drink or a snack, because its about to get very mind numbing…

12 Gondolas, each identical, in three different colours, arranged as shown.

Note: If you find balls failing to unload from a particular gondola, it usually indicates that the slope the ball is sitting on is not pushed completely down on the low end.

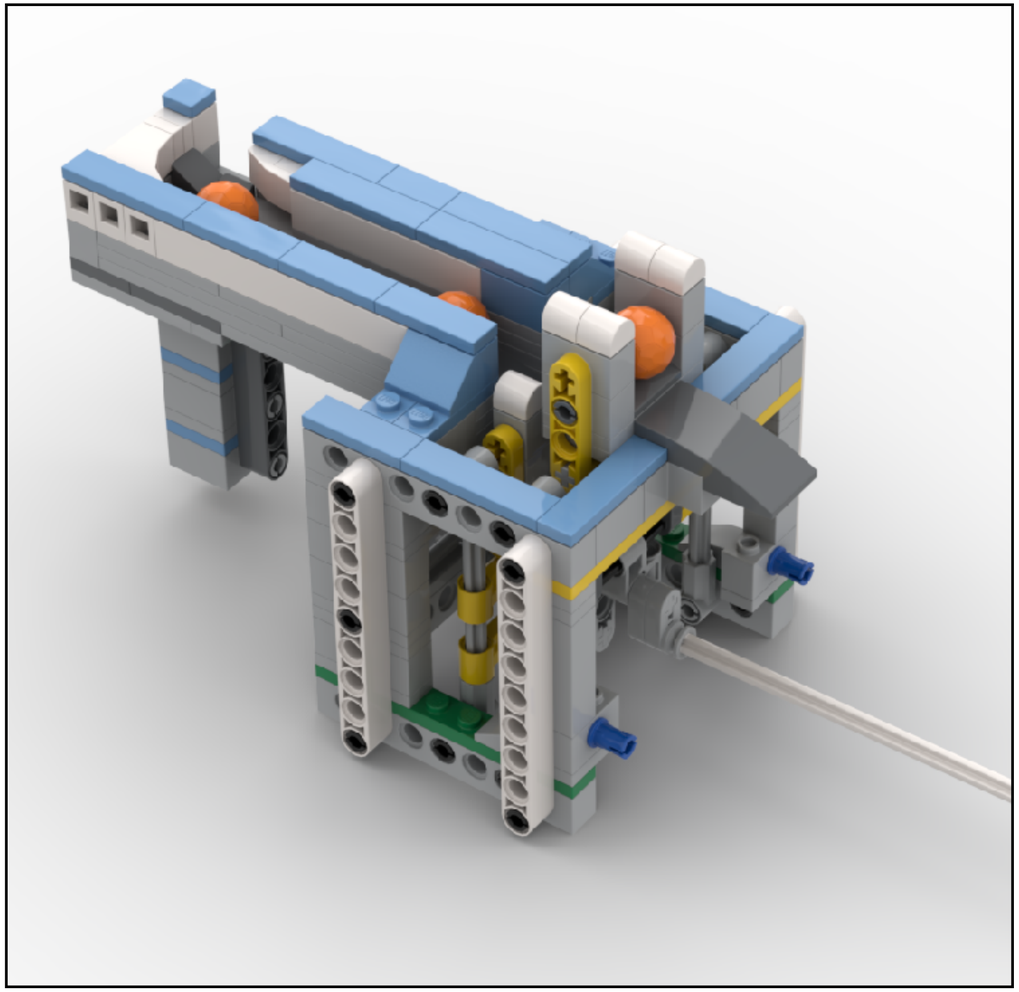


GBC

Ball Loader

This basic Akiyuki-style step loader is driven by the long white axle that travels directly under the *Gondolas* and connects to the *Timing Assembly and Support Frame* (yet to be built) at the rear of the GBC.

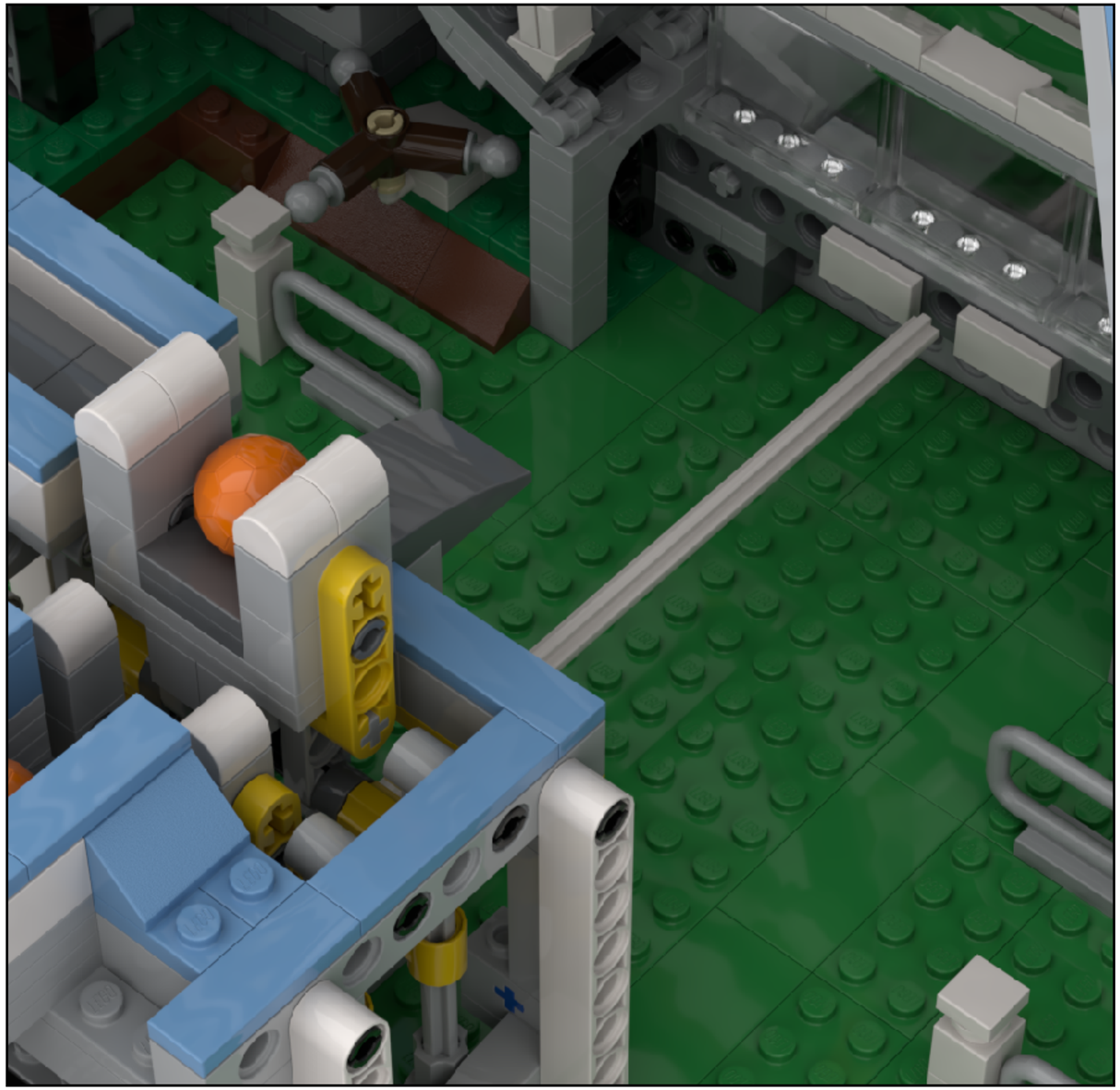
Once built, refer to the next page, and then slide it into place, until the blue Technic pins click into the *Base Structure*.



The white tiles are to help guide the axle into the correct hole. They are not required for any other purpose.

The black gear underneath the *Ball Loader* will rotate the stepper mechanism. Use this to rotate the long axle so it can slide into the *Timing Assembly* (not yet built) without being forced.

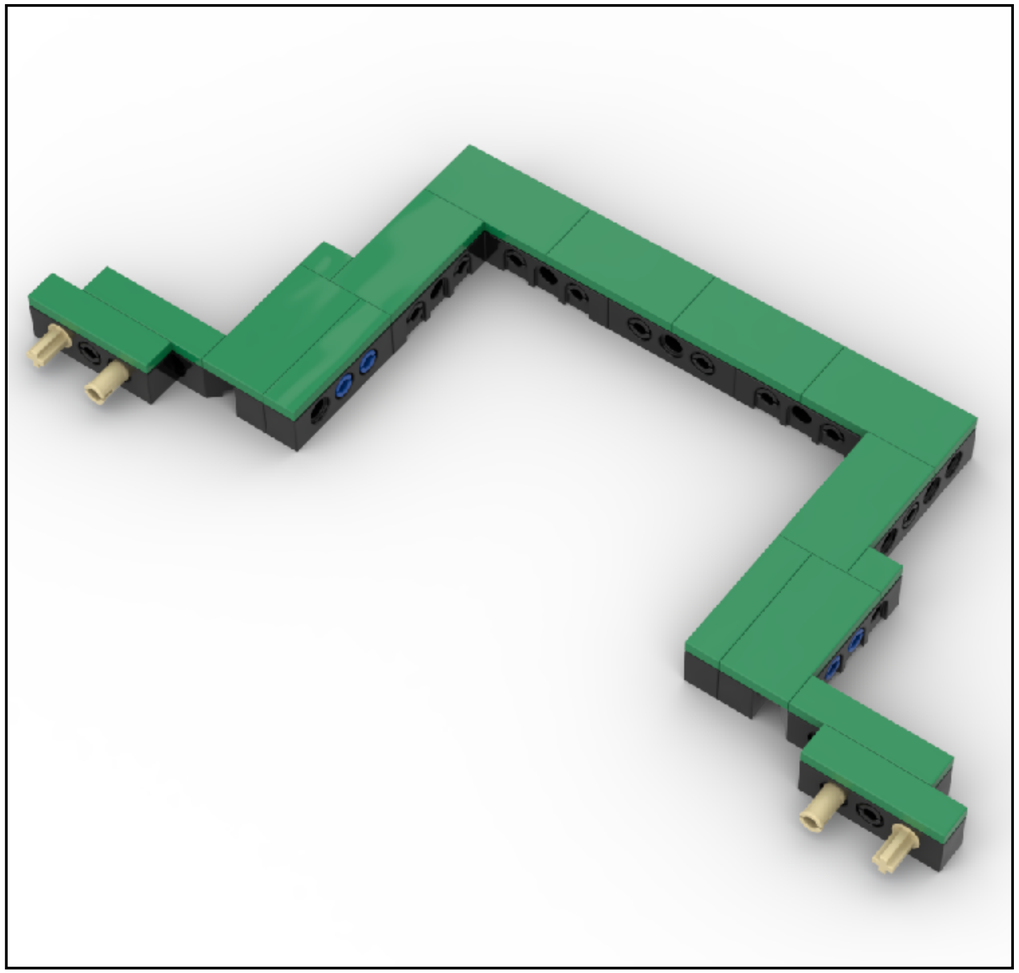
When either the *Ball Loader* or *Timing Assembly* have been removed and need to be reconnected, rotating this long axle with the gear for proper alignment will prevent this axle from being forced back into the stepper mechanism, resulting in a jam in the stepper.

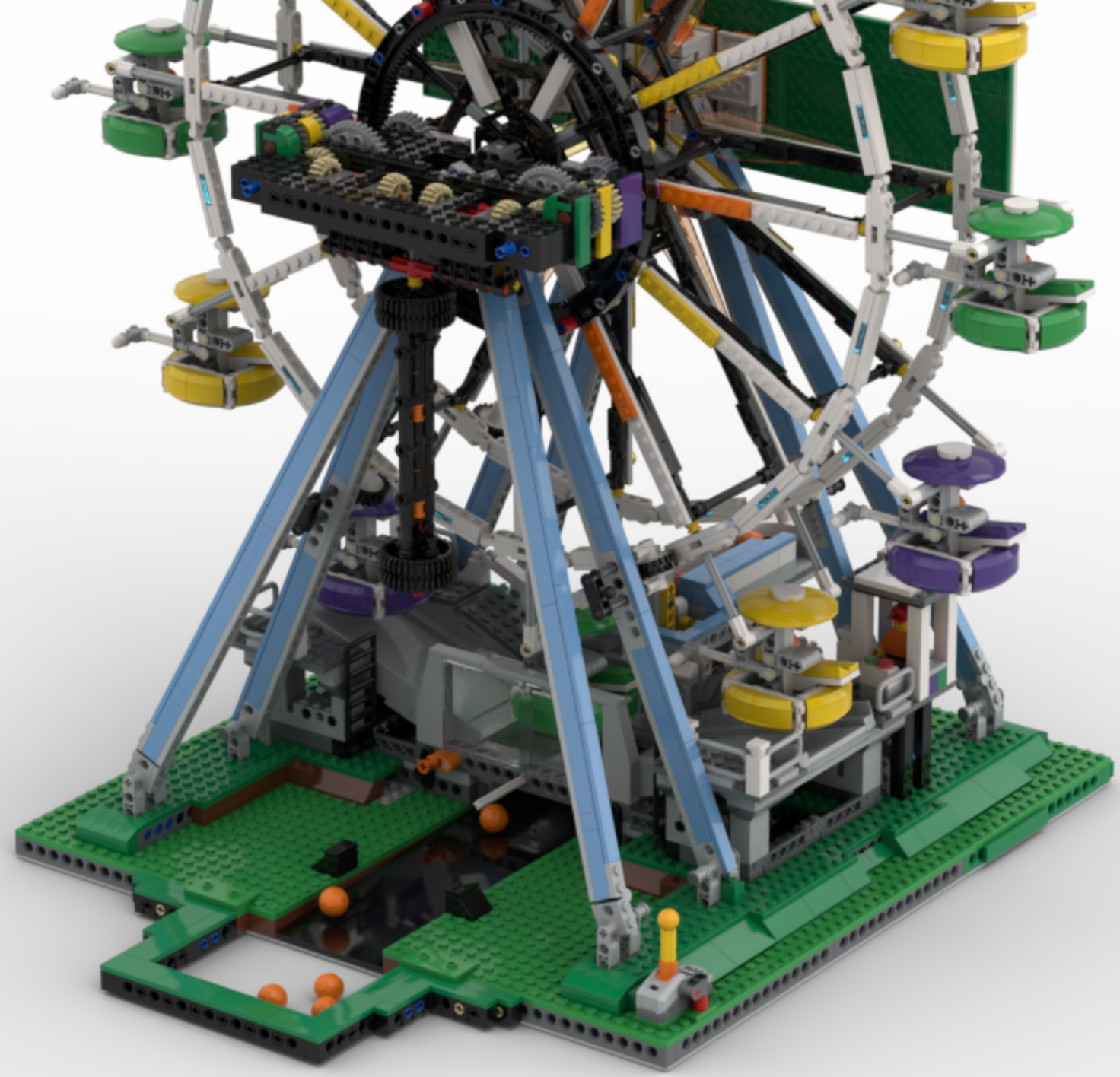


GBC

Ball Corral

Most of the balls that don’t load into the *Gondolas* correctly will drop out between the *Sloping Platforms*, roll down the black ramp and come to rest in the *Ball Corral, where* they can be collected, and placed back into the *Feeder Module*.





Main Drive Shaft

Principally an effort to reduce twisting of what would have otherwise been a long axle from the *Power Delivery Assembly* driving the Ferris Wheel, this drive shaft is more rigid.

The black 3L pins with Stop Bush at the bottom can be pulled up, to disconnect the two bottom gears. If you leave the bottom-most gear on top of the *Power Delivery Assembly* (not yet built) you can easily remove and re-attach the *Power Delivery Assembly* if required.

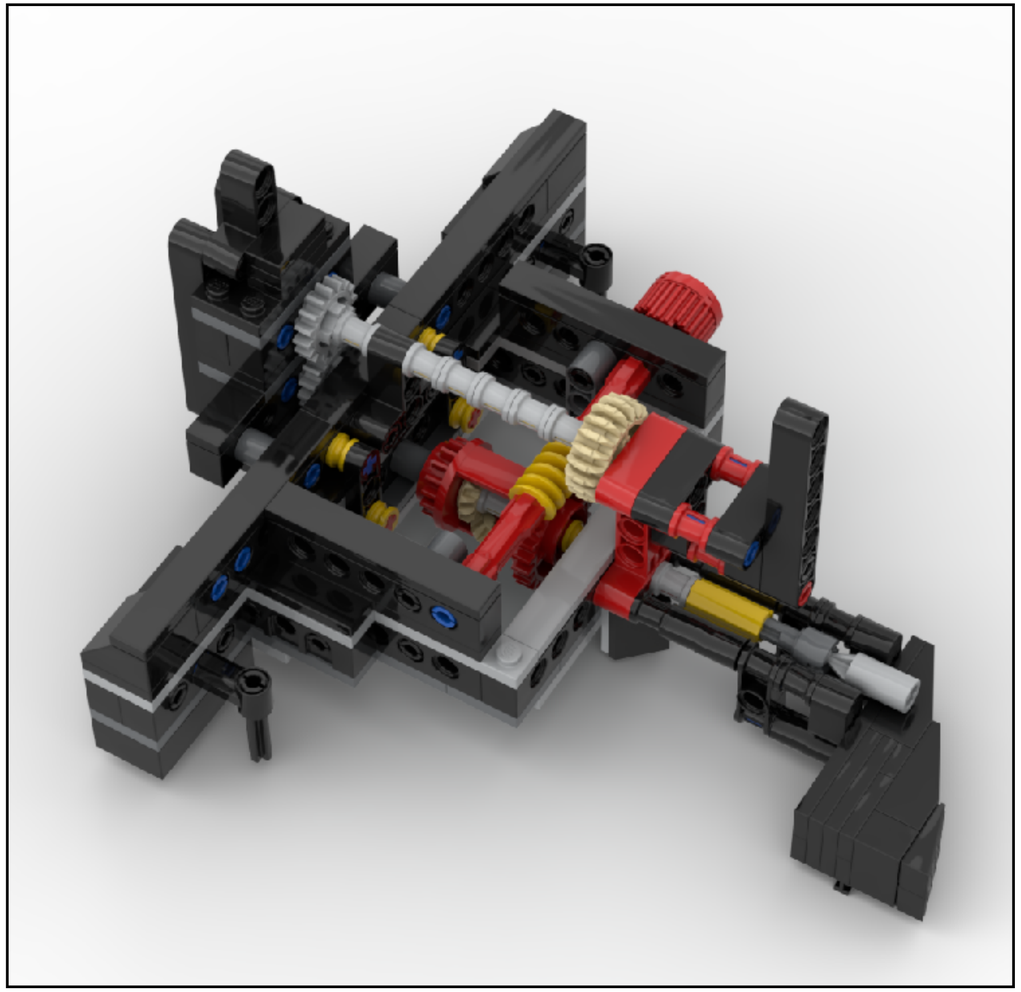
Timing Assembly and Support Frame

The black slopes at the front are used to guide balls away from the differential and down to the curved section of the *Ball Corral*.

The red knob is used to make small adjustments to the position of the differential, which alters the timing between the *Ball Loader Steps* and the *Gondolas*. Use this to “dial in” the correct timing to load the balls reliably.

This structure also bears the weight of the *Power Delivery Assembly*.

After building, set aside. It will be attached to the *PDA* (see next page) before adding it to the rest of the build.



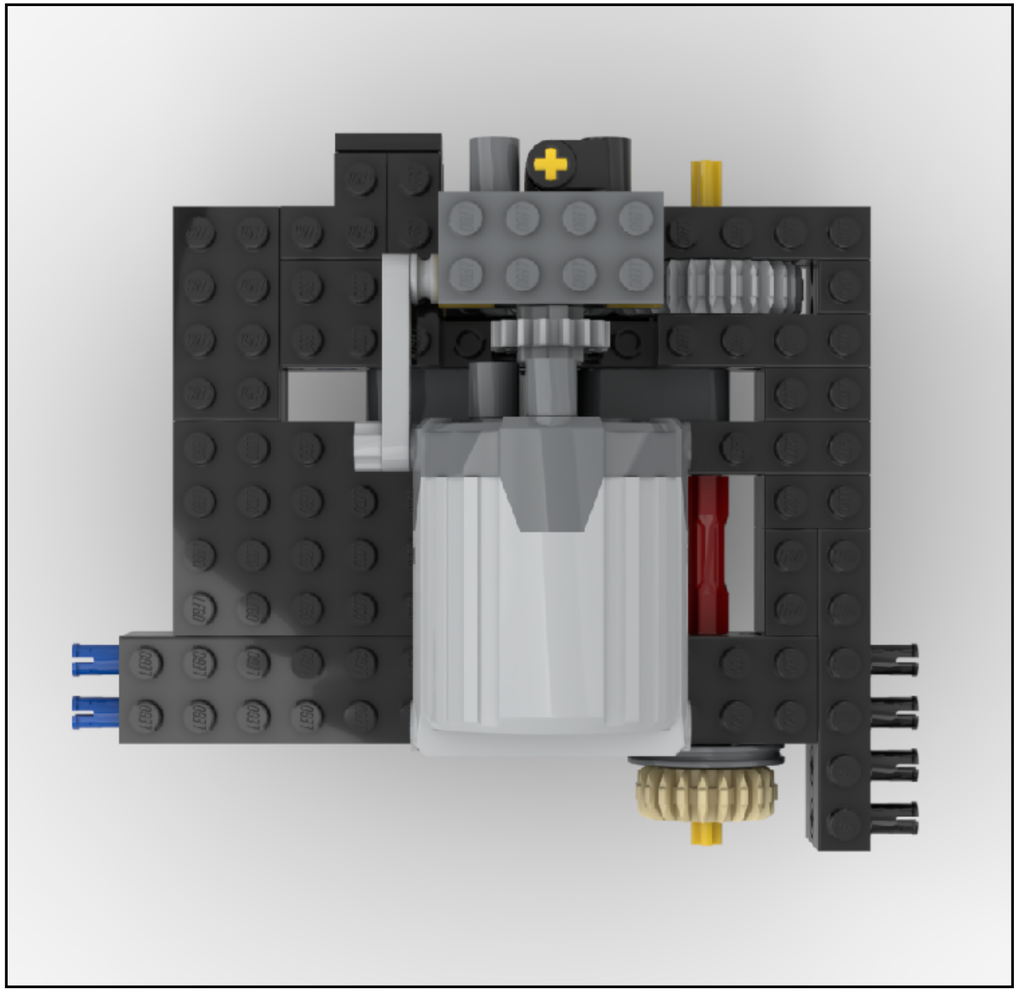
Power Delivery Assembly

This gearbox converts the output of the two XL motors - at full speed on a *Lego Train Controller* - to 60rpm along the vertical axle, which is then transferred to the *Ball Loader* via the *Timing Assembly* below it without additional gearing for a 1 ball per second loading speed.

60rpm is also delivered to the *Gear Rack* above which is then re-geared to rotate the ferris wheel 5rpm, with 12 gondolas, for 60 balls per minute.

Attach the *PDA* to the *Timing Assembly,* build and attach the two *Motor Support Struts* (not shown here), and then add them as one assembly to the rest of the build.

Note: This module seems to run fine on only one motor, but i'm concerned about over-burdening a single expensive motor for long durations (all day at a show). It is fine to just remove a motor. No other changes required. I prefer to reduce the burden on a single motor and share the load.



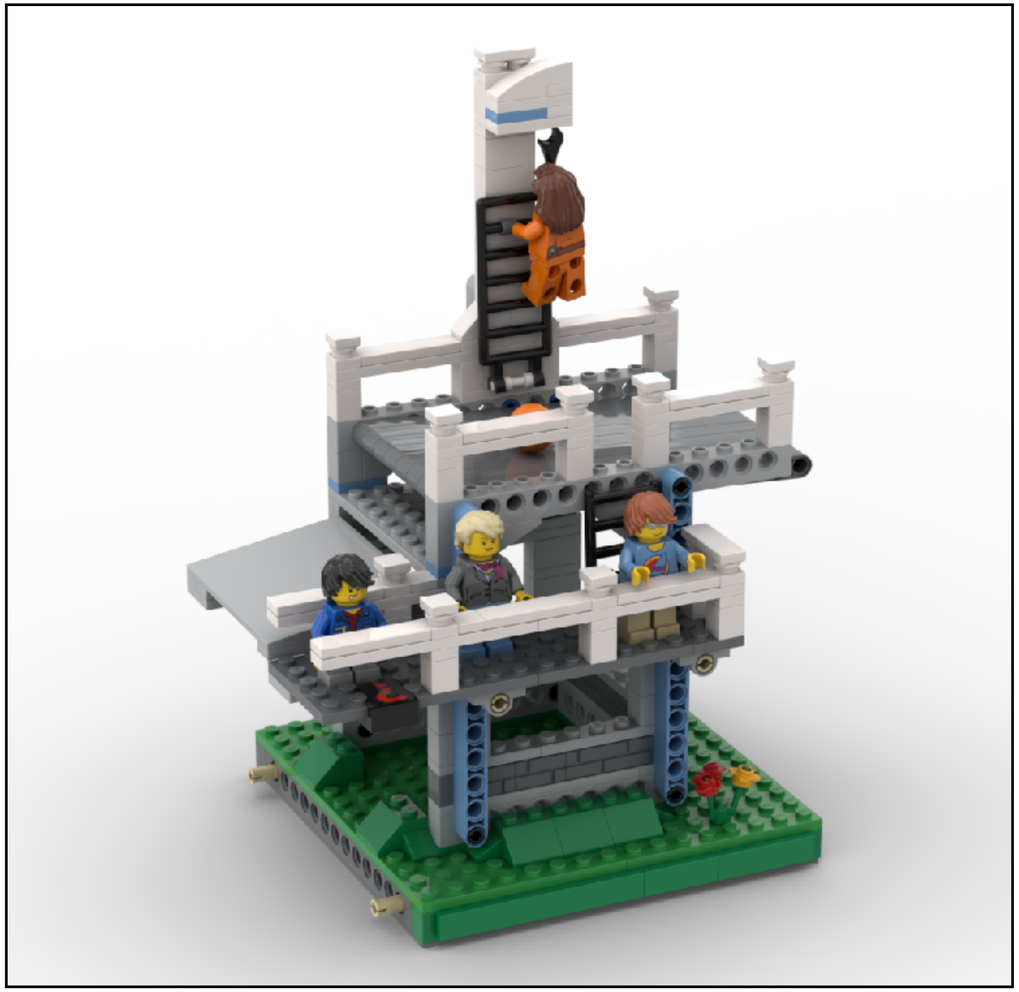
Unloading Ramp

The extra components of this GBC are built upon seperate base plates that do exist, however neither their cost or availability has been a consideration during design.

Cutting baseplates to custom sizes with a *Box Cutter* is relatively easy (using a 16L brick as a guiding edge) and that is my preference when I built this GBC.

The *Feeder Ramp Support* requires an 8x8 baseplate, which *does not exist*. It has been designed to be structurally sound without a baseplate. Personally, I used a box cutter…

Minifigures used in Studio are an approximation of the figures that came with the original 10247 Ferris Wheel set.

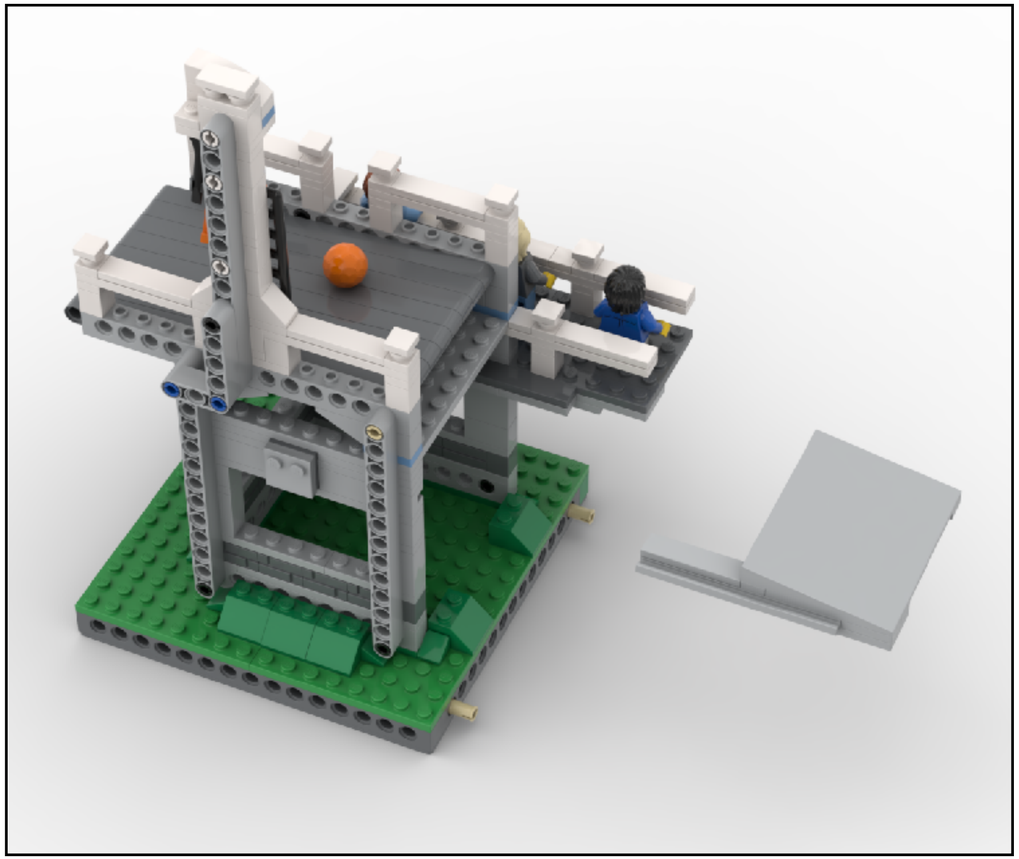


Ball Diverter

This slide-out slope is optional. It doesn't happen often, but occasionally a ball will unload *oddly*, and drop between the *Unloading Ramp* and the main *Ferris Wheel Slopes*.

One of my aims with the overall design of this GBC was to reduce the amount of poking around required to retrieve balls that do not proceed through the module in the correct manner.

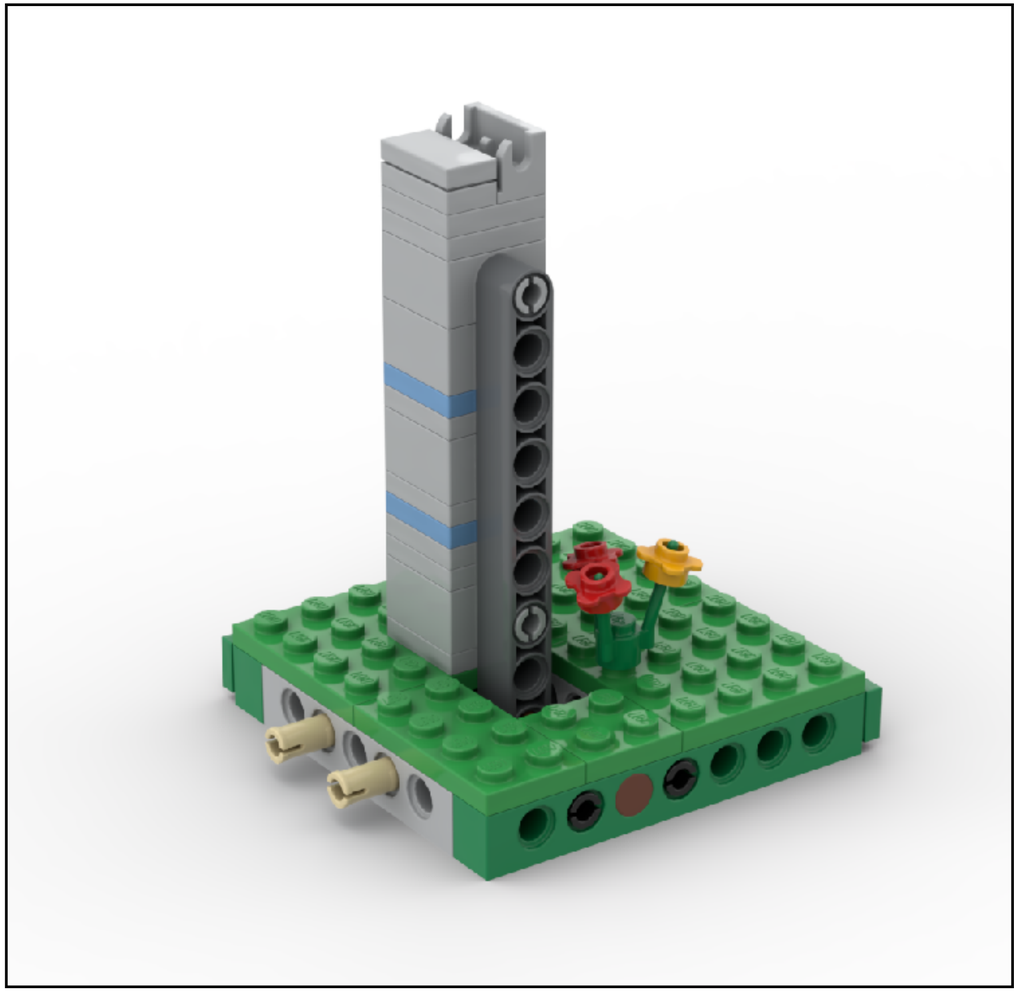
This slope, when positioned as shown in the previous page redirects the wayward balls so they roll down to the black ramp, rather than getting stuck underneath this unloading ramp.



GBC

Feeder Ramp Support

This small support holds the *Feeder Ramp* in place. As mentioned, no 8x8 baseplate exists, or is required, but custom cut one if that suits you.



GBC

Decorations for Base Structure

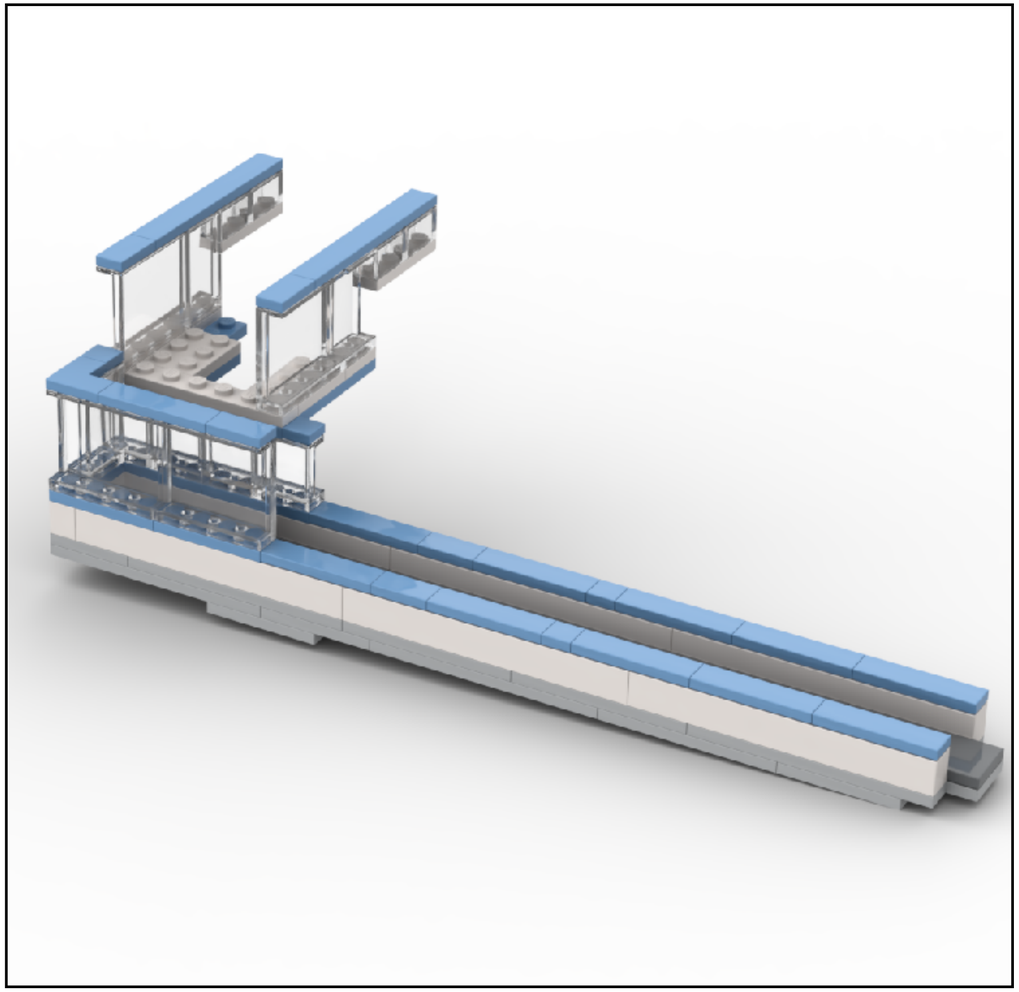
This is the appropriate time to add the decorations from the original 10247 Lego Ferris Wheel set if you have them, or your own to suit.

Following this we are going to add supports and ramps, which restrict access to this area of the build, so its easiest to add the decorations now.

GBC

Feeder Ramp

This ramp transfers the balls from the *Feeder Module* to the *Ball Loader*. The clear walls on top are to reduce the number of wayward balls due to the occasional odd bounce.



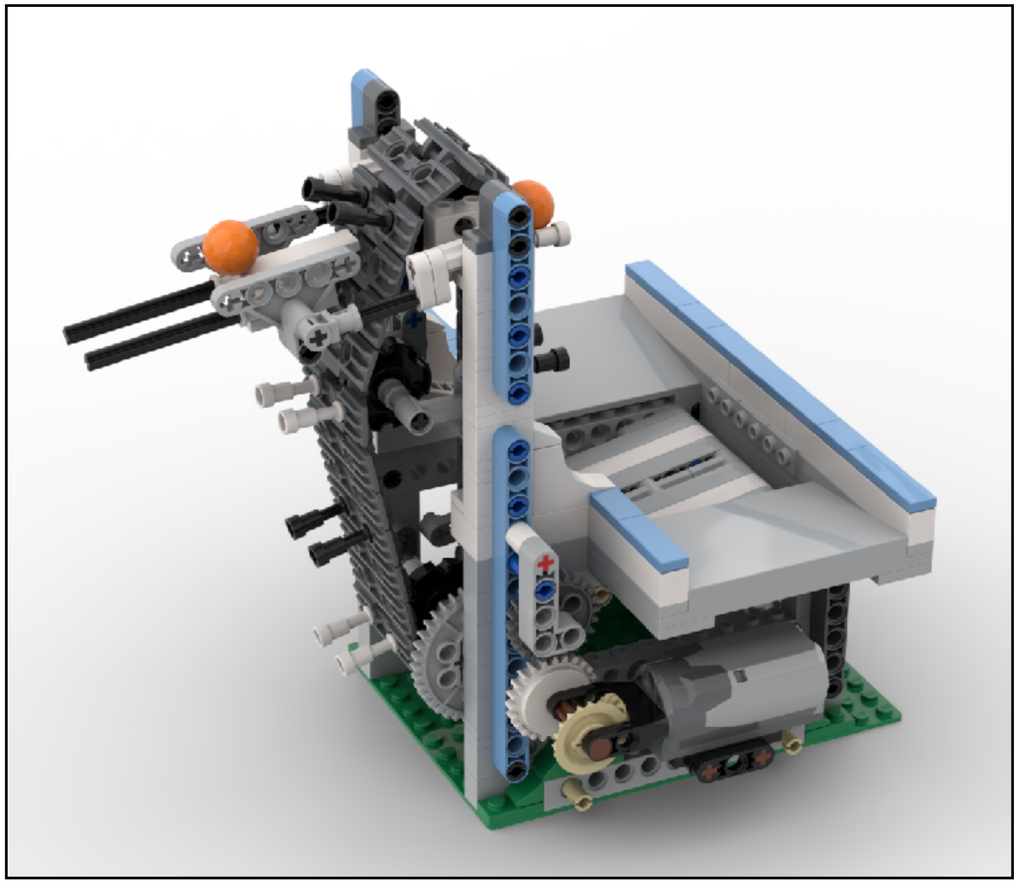
GBC

Feeder Module - GBP WM01 (Modified)

Matt Norman's Great Ball Pit Workshop Module 01 is a reliable, versatile design that I have modified to suit the Ferris Wheel.

The slope on the left side allows for balls which have failed to load into *Gondolas* properly, an opportunity to be pushed up the Ferris Wheel ramp by the *Gondola*, and routed back to this *Feeder Module*.

The clutch reduces the chaos if a ball jams during unloading, and the extra sprocket wheel helps tension the tread correctly for this modified version of the module.



EBC

FINISHED! If you don't intend to build the extra components to run the Ferris Wheel as a standalone display, there's nothing more to build, but take a look at the photos near the end of this document for suggestions on routing the *Power Functions* cables, and to see how I transport the entire module.

If you haven't already done so, you'll need to tune the timing of the *Ball Loader* to synchronise it with the *Gondolas* as they pass the loading ramp.

Rotating the *red knob* on the side of the *Timing Assembly* will load the balls earlier or later (depending on which way you turn it), in small increments. It may take a little while to find the "sweet spot".

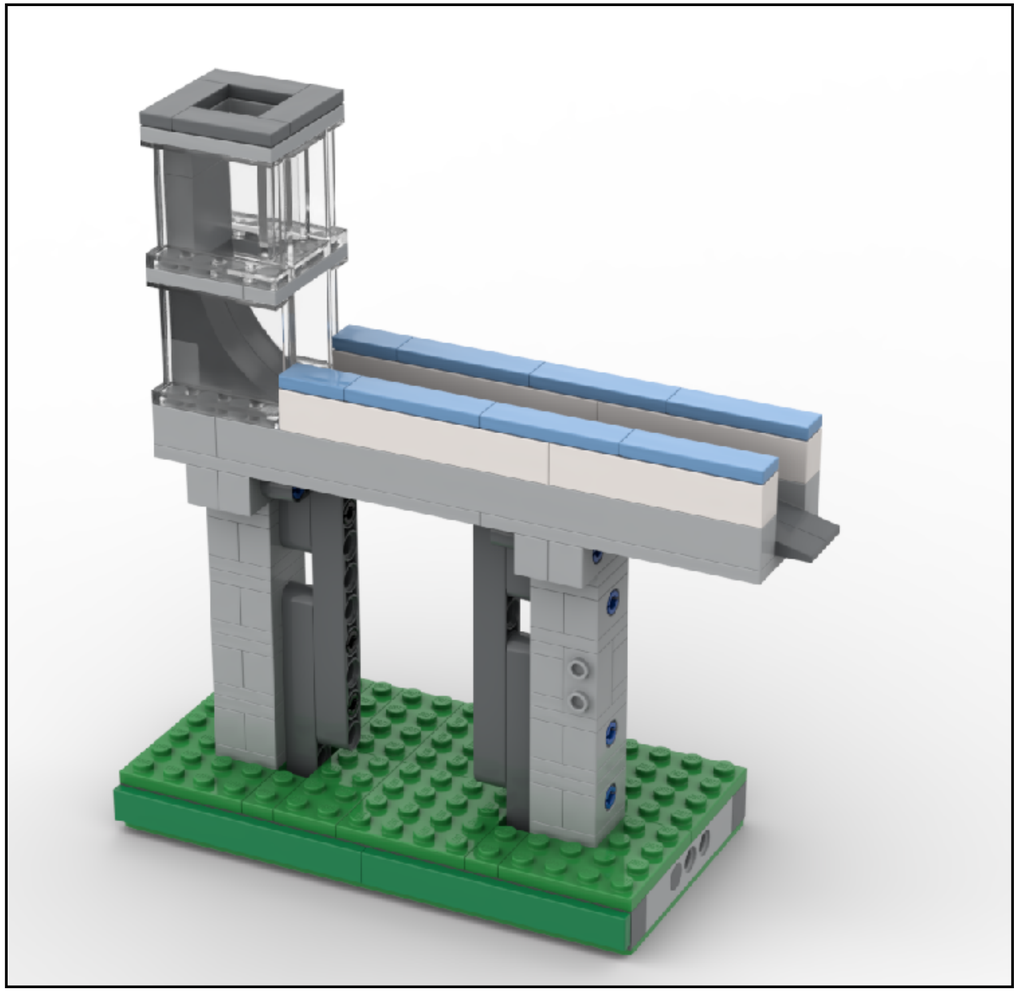
Continue on to the next page to complete the *Standalone* version of this GBC.

Ball Return Bridge

This small bridge completes the “loop” for the returning balls, depositing them back into the *Feeder Module*.

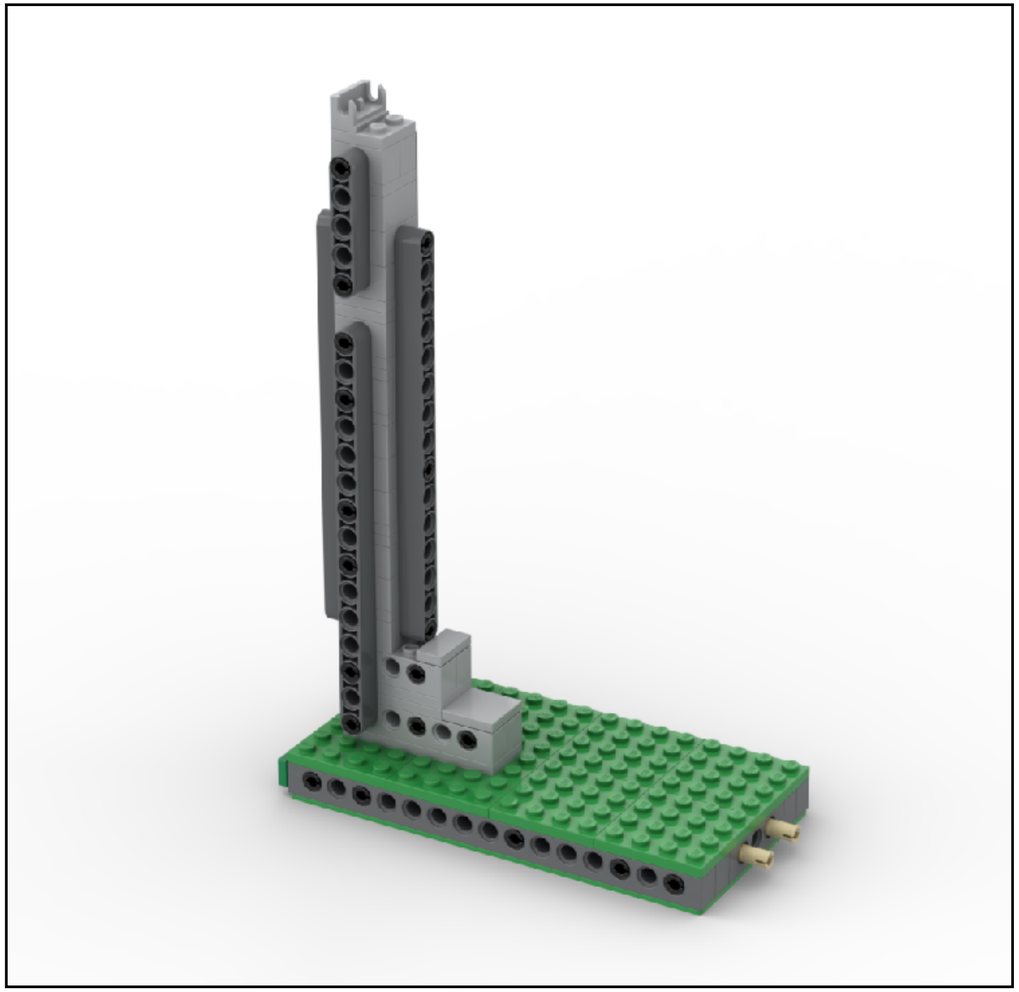
The technic lift arms may be excessive, but I prefer the different parts of a module to be sturdy, so they travel better.

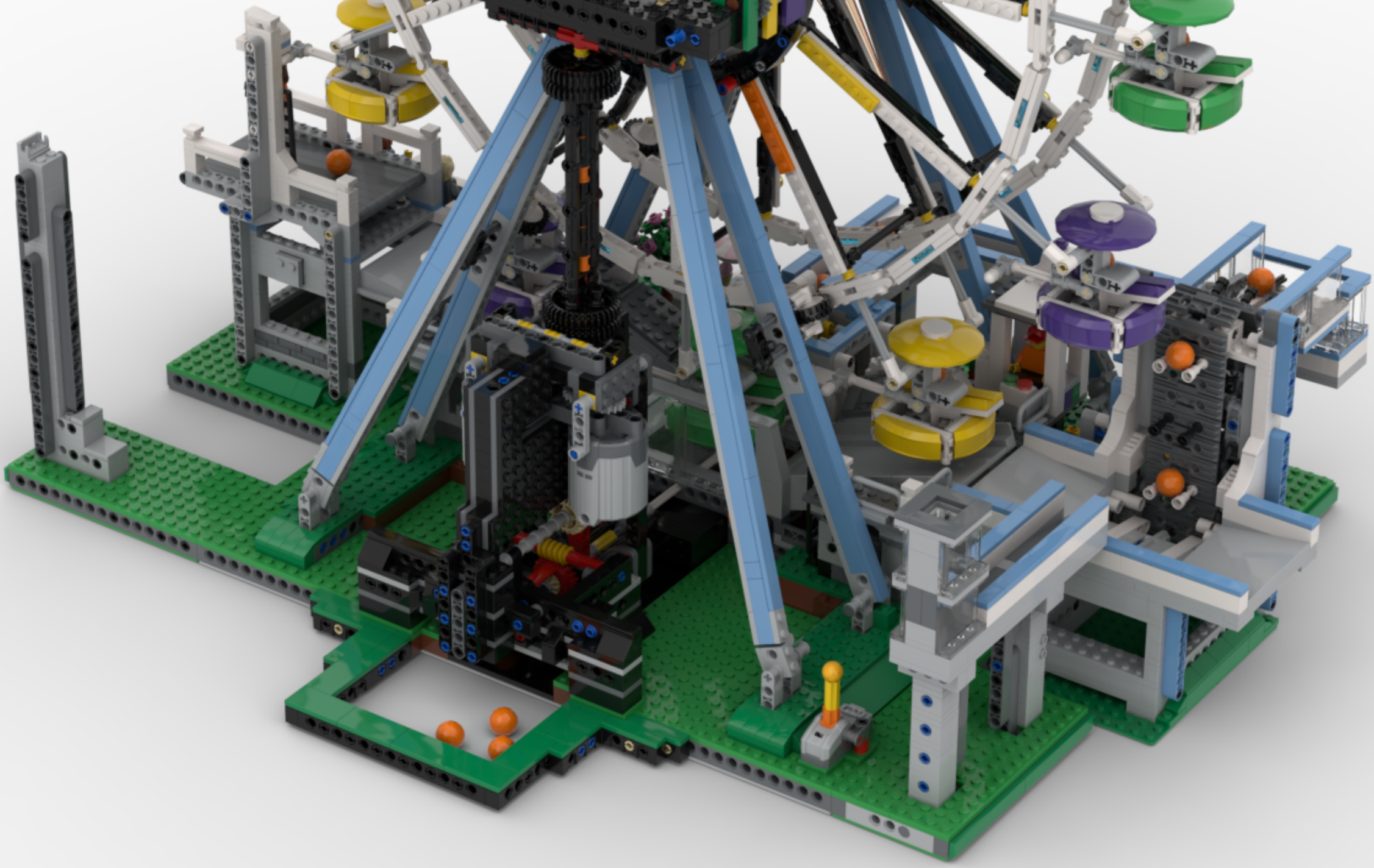
The two studs on the side of the front support column can be used for attaching PF extension cable connectors, for tidy cable arrangement.



Stand-alone Return Ramp Support

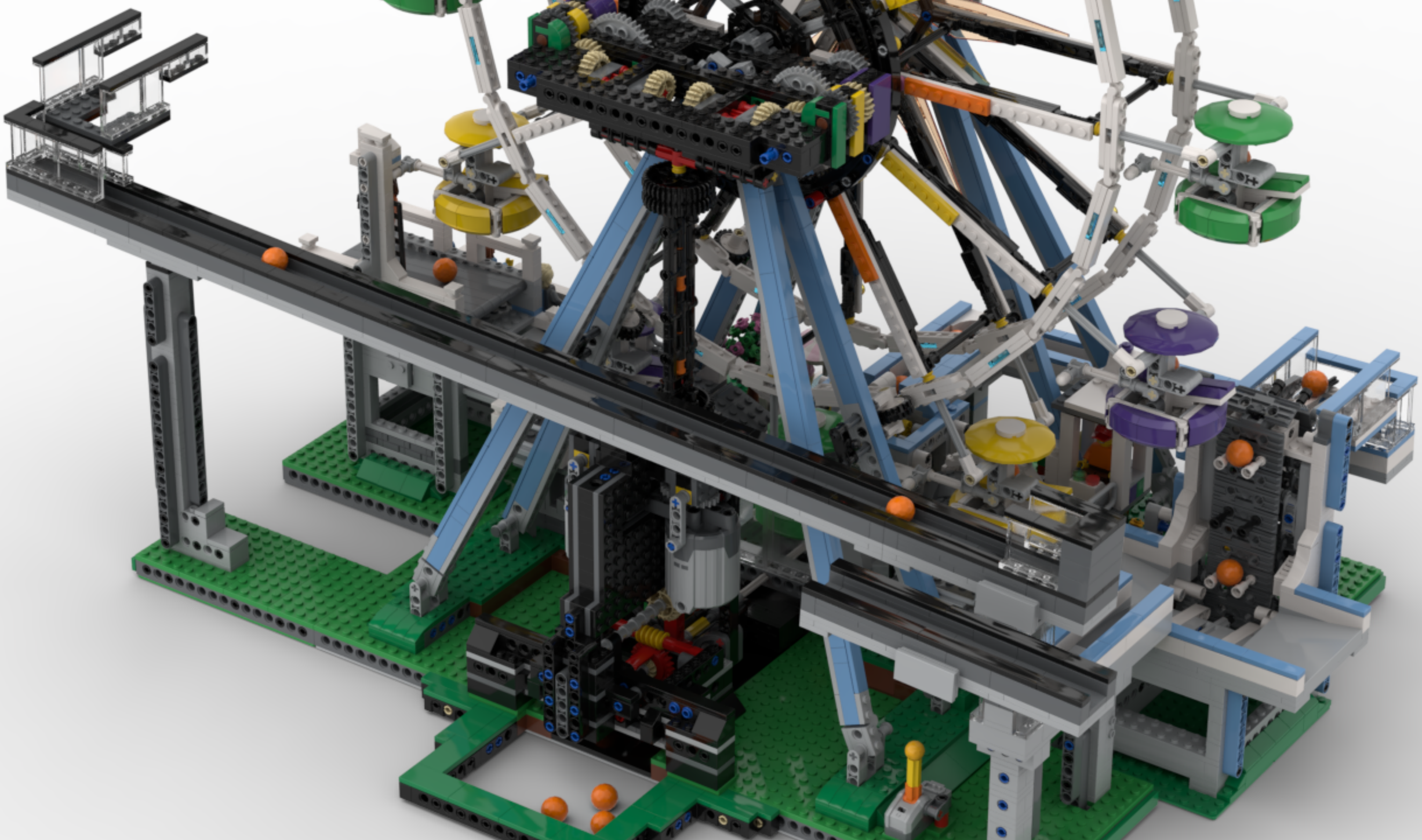
This support column holds the return ramp in the correct position. The hinge may need to be adjusted back or forward a half stud if the balls do not exit the bottom of the *Return Ramp* properly.





Stand-alone Return Ramp

Balls unloaded from the *Return Module* are delivered back to the *Ball Return Bridge* via this ramp. Note the Bump on the top of the *Power Delivery Assembly*. This return ramp should sit directly on that bump for extra support. The lower end can be disconnected, and swapped for the alternate shown here, which I use to pass balls to another module (when using the *Ferris Wheel* to do a U-turn on the table)



Stand-alone Return Module - GBP WM01 (Modified)

Another Matt Norman conveyor, modified to suit the ferris wheel is the last component to build, completing the stand-alone GBC. It is essentially the same as the *Feeder Module* already built, with an extended “neck”. The number of treads required might be off by one or two. (doing treads accurately in *Studio* is overly time-consuming)

GBC

Power Functions Cable Routing

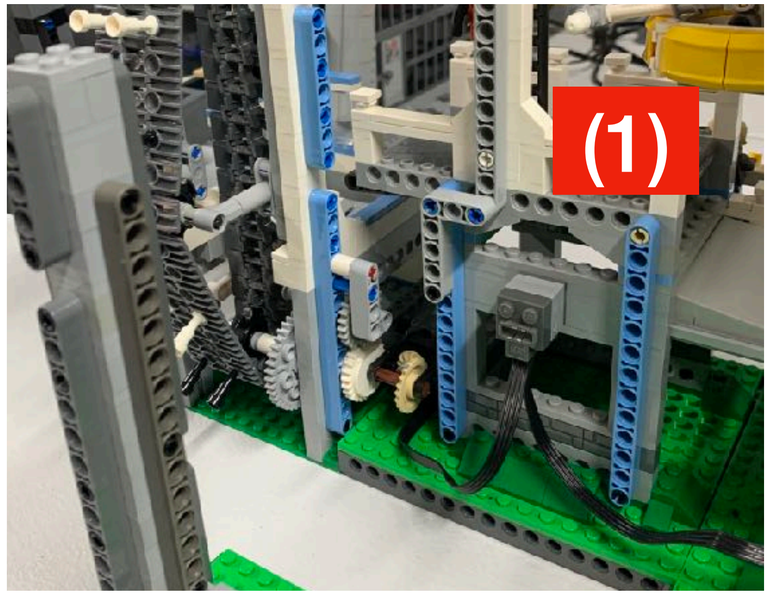
Either in a loop, or stand-alone, I run all sections of this module on a single train controller, or (custom AC hard-wired) battery pack, as detailed below, and shown on photos on the following pages.

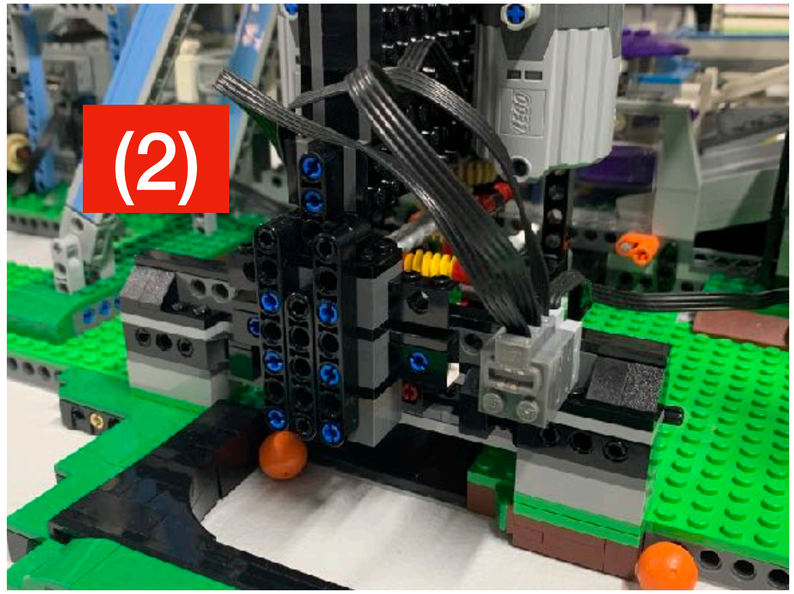
The *Stand-alone Return Module* is connected to a long *PF Extension cable* (1), which goes around behind the *Power Delivery Assembly* (2) and is connected to the motors (3) and a short *PF Extension cable* (4).

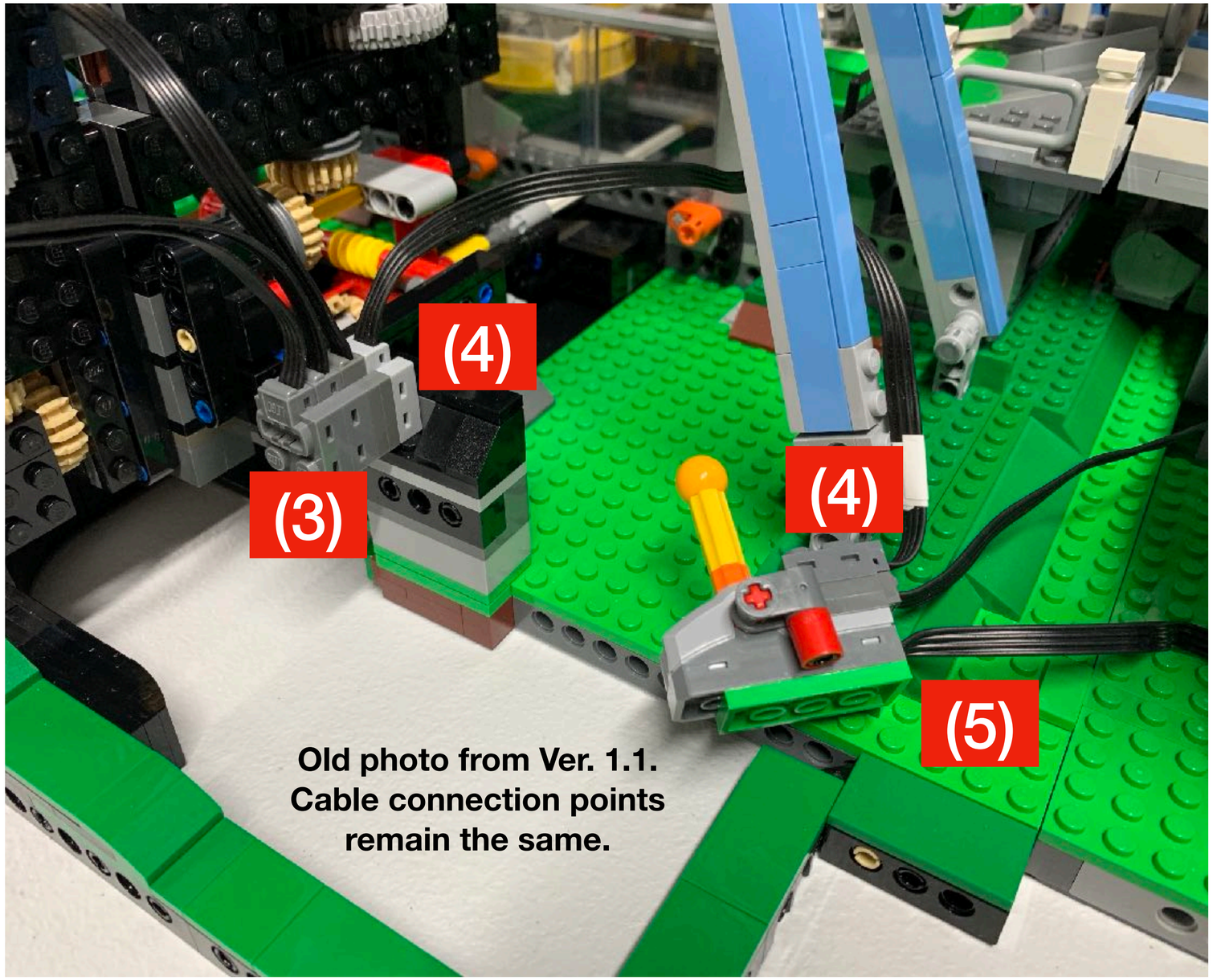
The motor from the *Feeder Module,* along with the short *PF Extension cable,* are connected onto the switch (5) which provides a single point to turn the entire module on and off, and prevents the module from running backward.

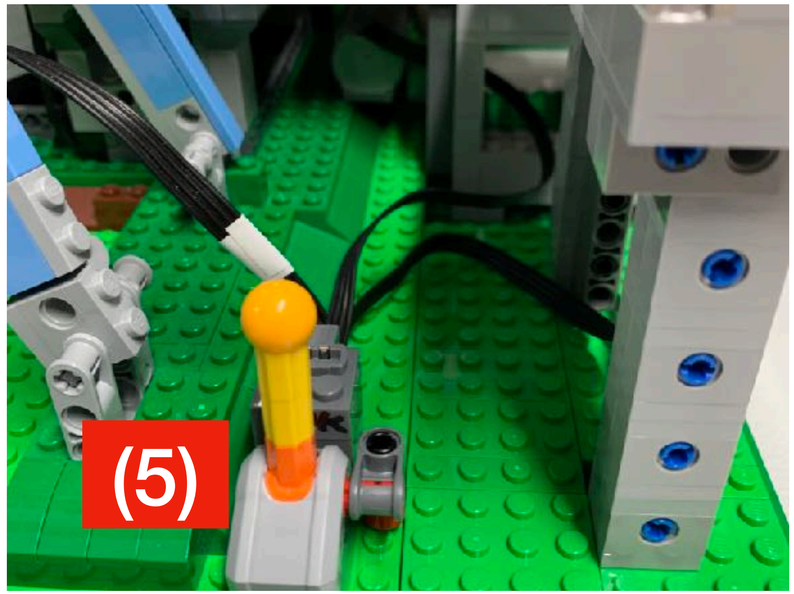
The switch's power cable is then either connected directly to a battery box, or is mounted underneath the *Ball Return Bridge* (6) for further connection via *PF Extension cable* to a train controller.

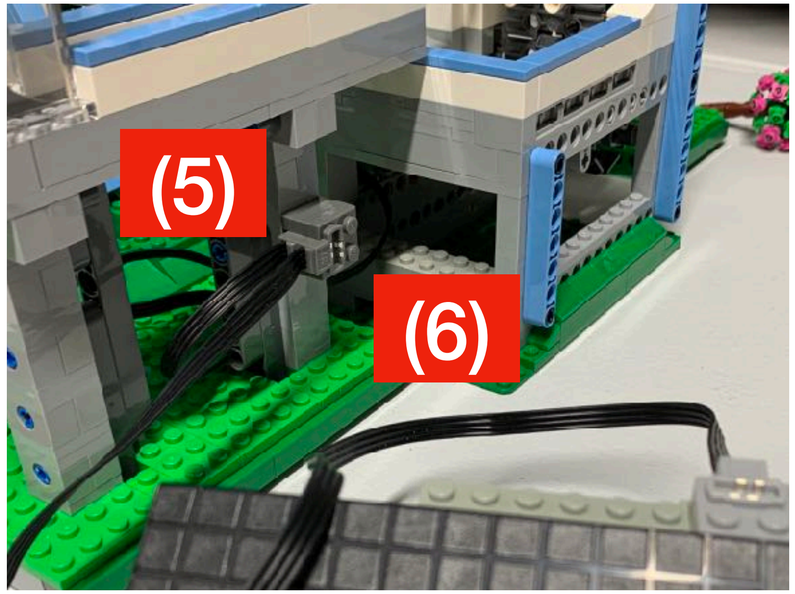
(1)
(2)


(1)


(2)


(4)
(3)
(4)
(5)
Old photo from Ver. 1.1.
Cable connection points
remain the same.

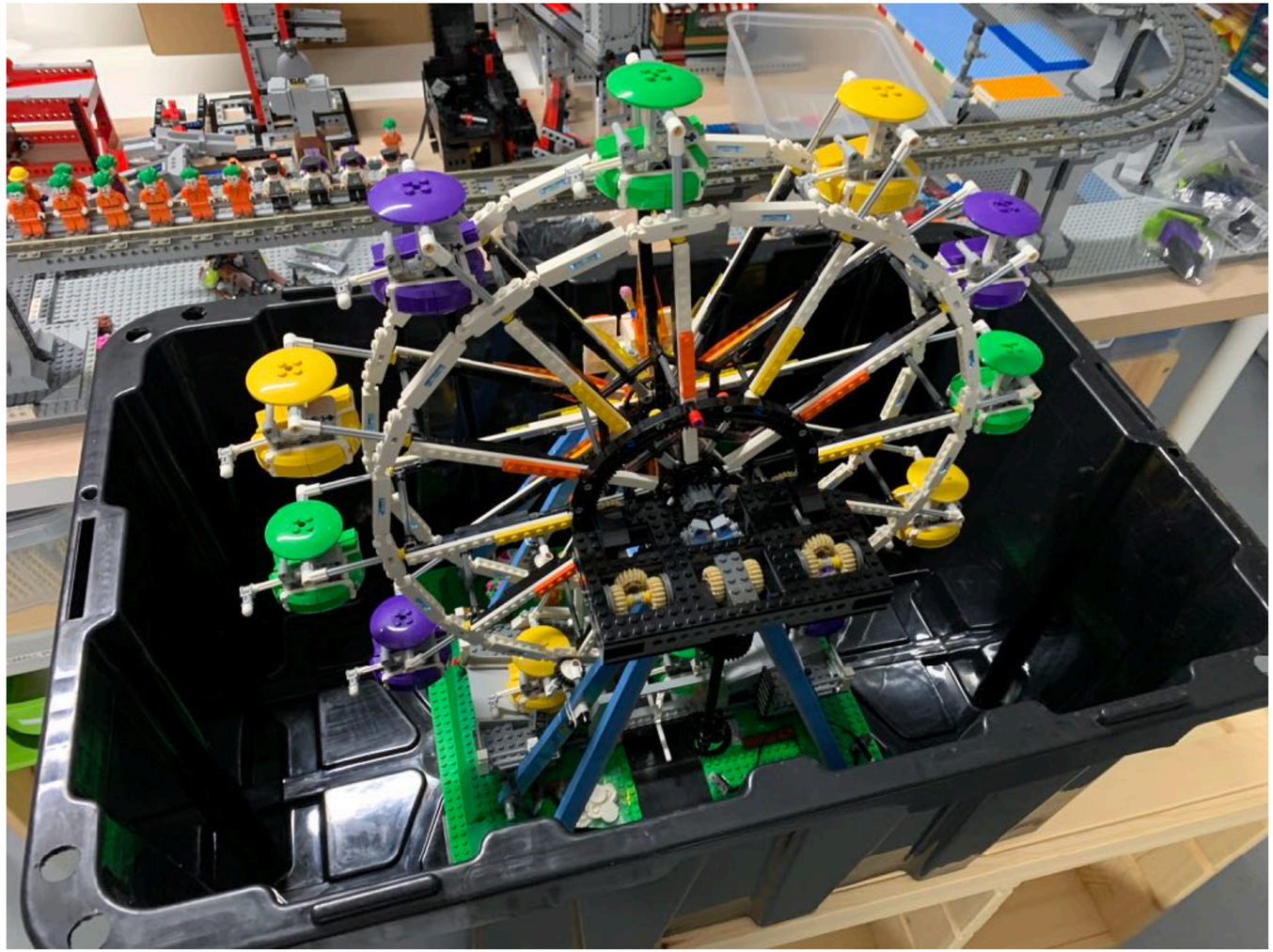

(5)


(5)
(6)

Module Transport

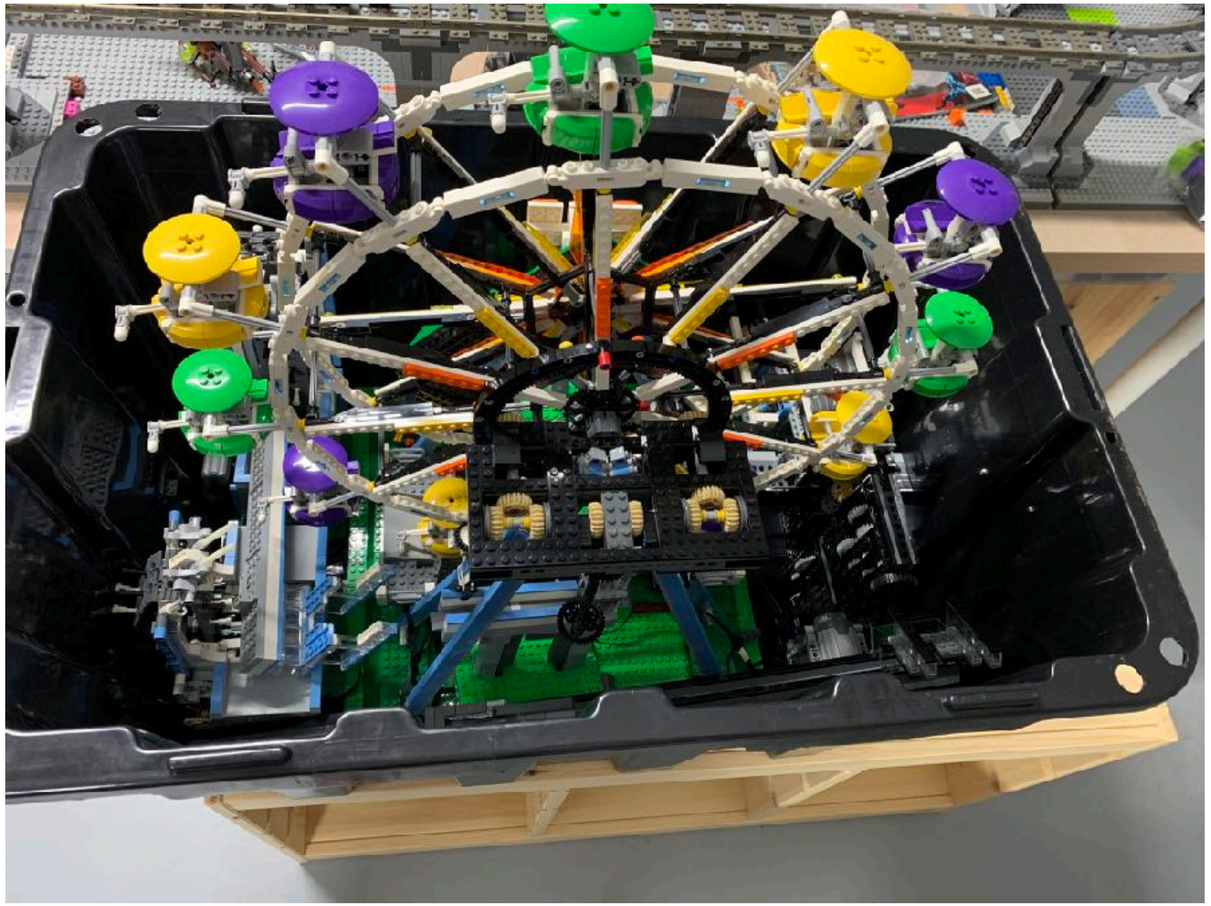
Co-incidentally, I found that two of the standard crates I use to transport GBC modules - when tied together - were the perfect size to transport all of the components together. Disassembly and packing takes about five minutes. Shown here are the details of the specific crate I use. Visible are the four raised plastic lumps that align into slots in the lid of the container. Using a dremel I removed these lumps on *one* of the containers, and cut slots that matched the lid. When the containers are placed together, they lock into each other.

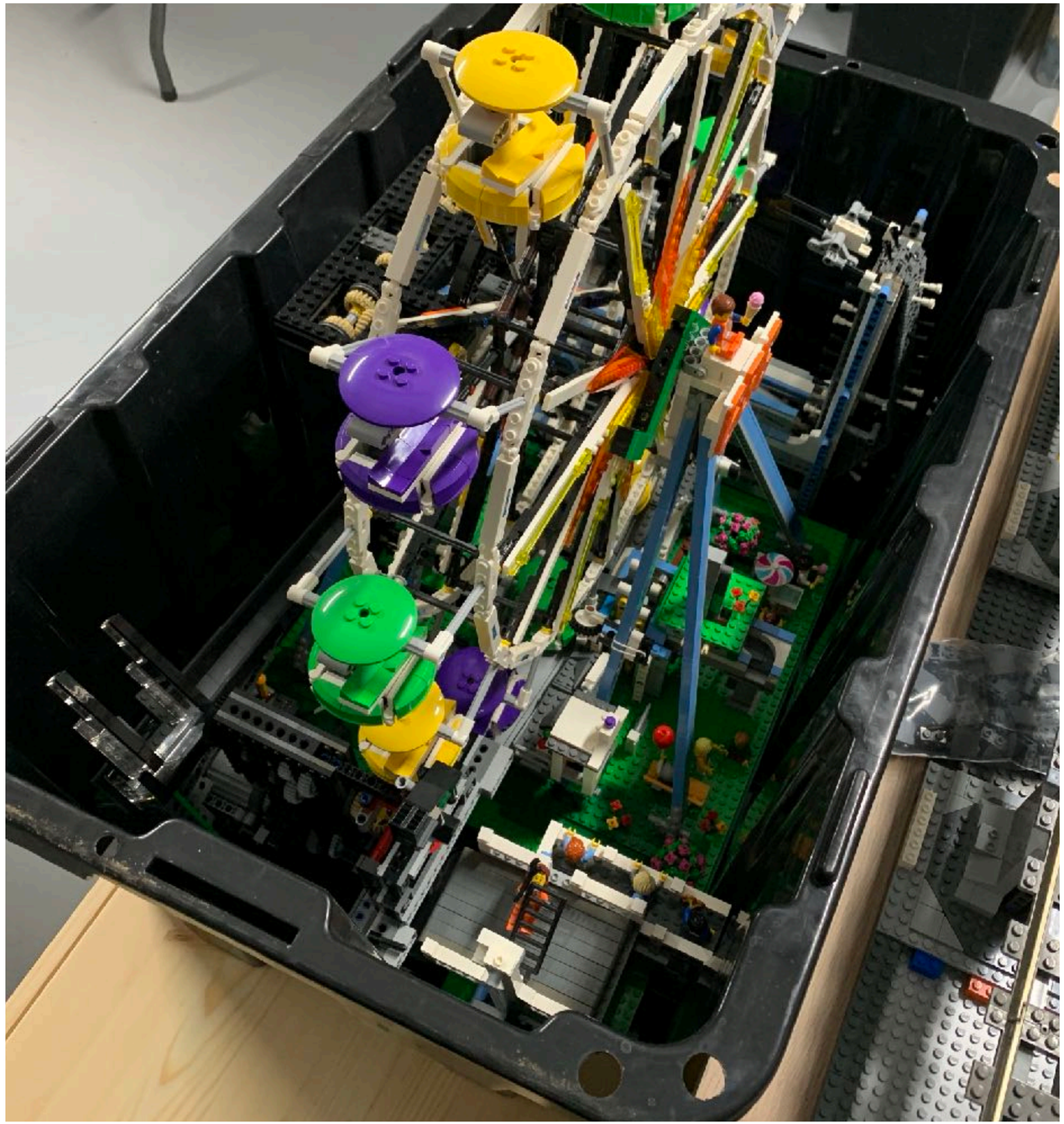
On each corner of both crates I have drilled two holes that align across both crates. Velcro straps through these holes are used to hold the top and bottom crates together during transport.



The main baseplate and ferris wheel structure are placed into the centre of the crate first.

All remaining components fit neatly around the main structure. Version 1.1 is shown in these photos. Version 2.0 motor and gear components use less space.





Both crates are stacked together. Stickers (from Amazon) hopefully help keep the GBC right-way-up. Velcro cable ties secure the two crates together and are quick and easy to attach and remove.

GBC