

# DESCRIPTION

The curve world effect is achieved by using a custom shader and subgraph along with a a custom curved world manager script. All of these put together create the effect of a “curved” or “bended” 3D world.

Three types of curves have been provided:

- Vertical
- Horizontal
- Twisted

The effect is **run on the GPU per vertex making** it **very cheap to render** effect and perfect for Mobile or Low End hardware. **However this does mean there are some requirements** when authoring 3D models, along with any other shaders being used in the scene on 3D geometry needing to include the custom curved world subgraph node.

The effect created is the same way [“Subway Surfers”](#) and [“Animal Crossing”](#) creates its effect, along with how their 3D models are created.

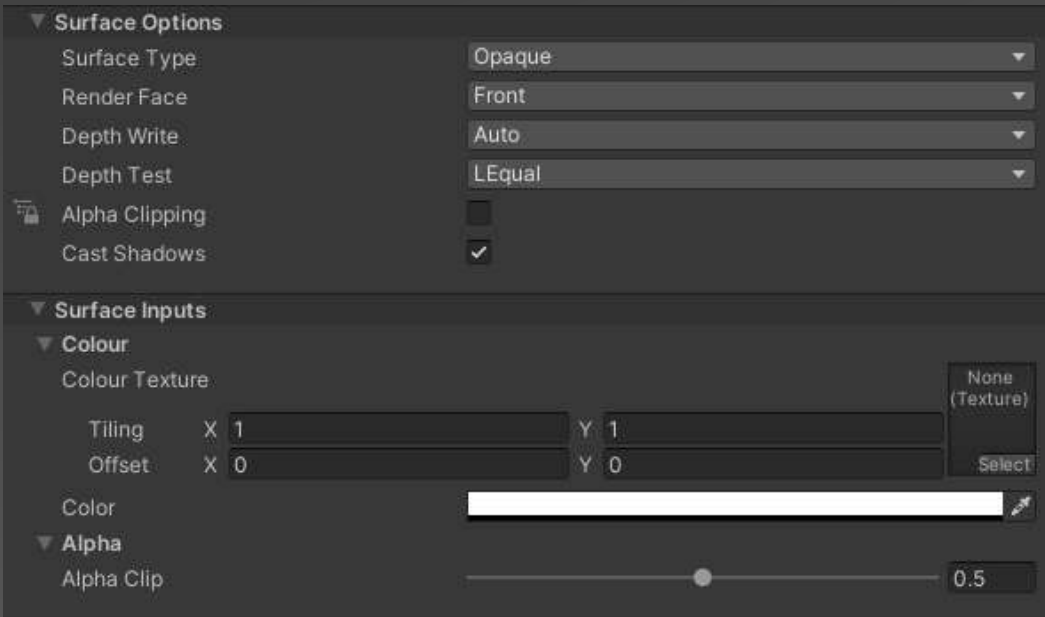
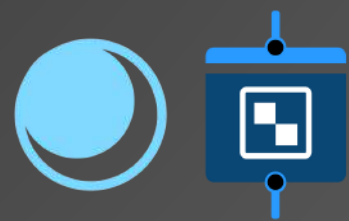
The below pages contain all the documentation and information needed to get the desired effect.

# UNITY MATERIAL

## CURVED WORLD UNLIT

## PROPERTY BREAKDOWN

sh\_curved\_world\_unlit.shadergraph



### SURFACE PROPERTIES

This contains all the inputs for the unlit curved world material.

It has optional transparency/ alpha clip as well as a texture and colour input.

Any object which uses this shader will have the curved world effect applied to it. The actual curvature amount is controlled through the manager. This is so all materials using the shader effect have the same curve amount values.

Examples of the effect in action with different values for the Horizontal, Vertical and Twist curvature amounts.



Models used are from “KENNEY” - Hexagon Kit



# UNITY SHADER

## UNLIT SHADERGRAPH

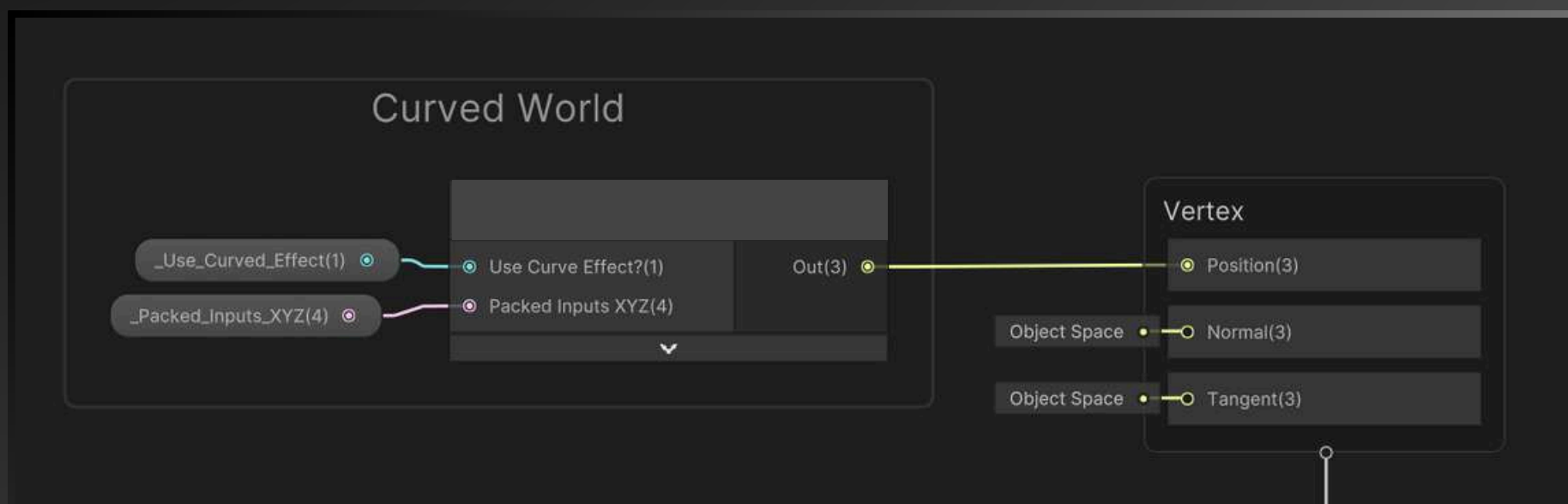
sh\_curved\_world\_unlit.shadergraph



**For the effect to work, it relies on two parts**, the custom subgraph node and two global shader properties set per shader. This custom node should be used in all shaders used in the 3D scene so the Unity standard shader cannot be used with the curved world effect unless it is modified.

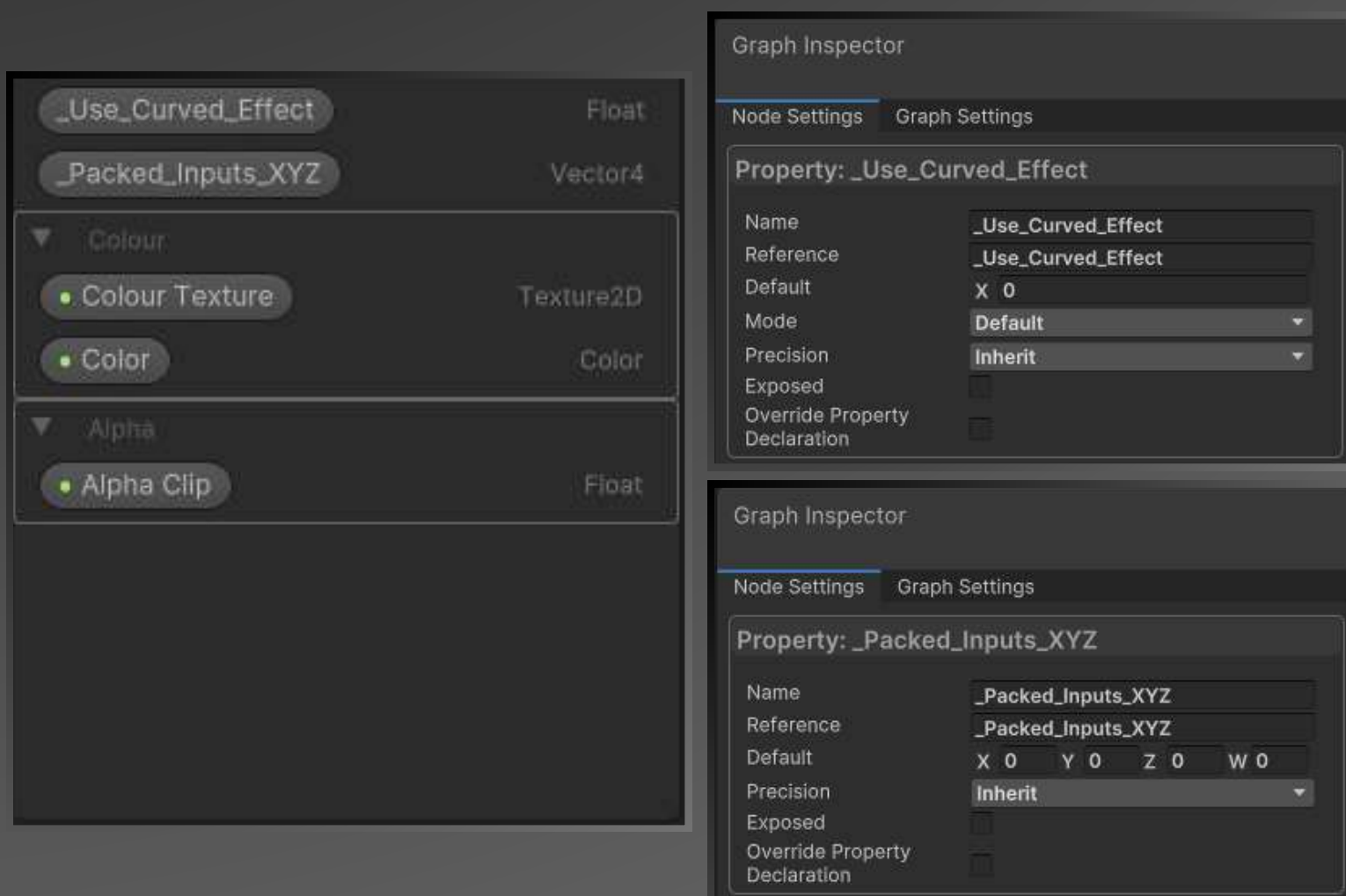
### CUSTOM SUBGRAPH NODE IN UNLIT SHADER

The custom subgraph node should be placed in all shaders and plugged into the vertex position block node input.



### GLOBAL SHADER PROPERTIES

Along with the custom subgraph node, two global shader properties should also be made. These should be set to be disabled as this allows the properties to be accessed globally through scripting.





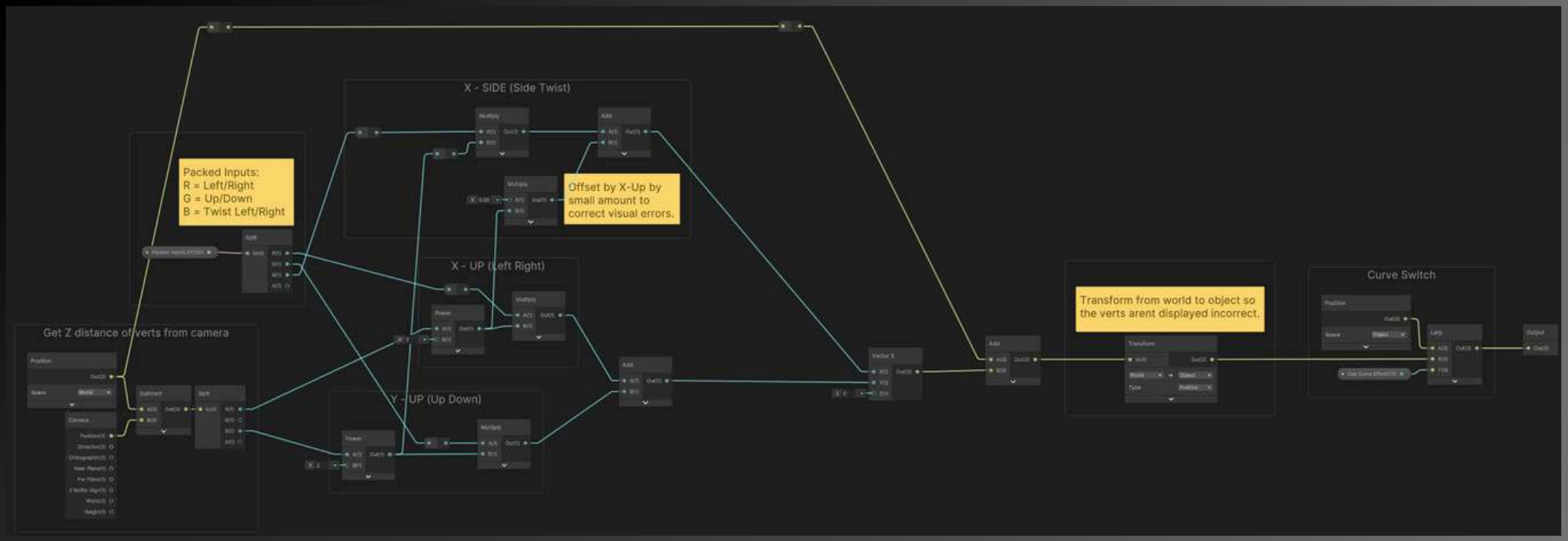
# UNITY SUBGRAPH

## SHADERGRAPH SUBGRAPH

sub\_graph\_curved\_world.shadersubgraph



The main curve effect is done in the custom subgraph node. If you open the graph it contains documentation on how the effect works



# CURVED MANAGAER

## C# SCRIPT

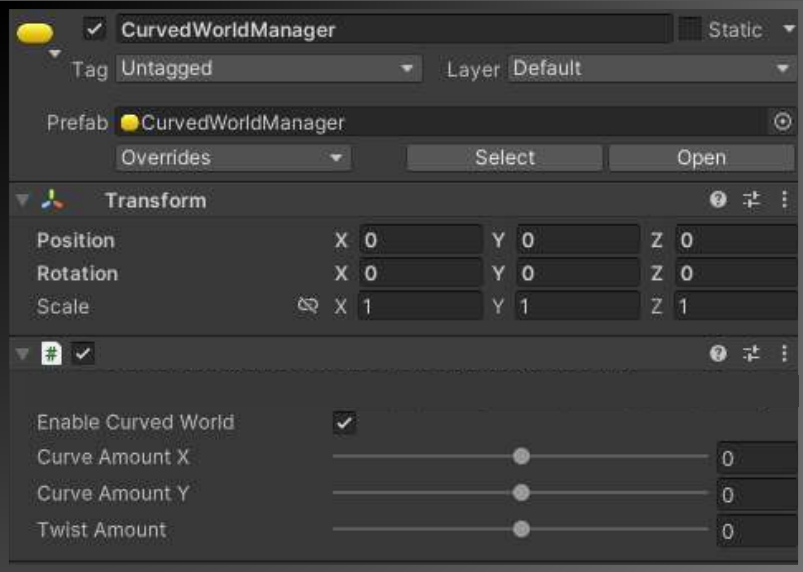


script\_curved\_world\_manager.cs

To control the effect, use the **script\_danielyunus96\_curved\_world\_manager.cs** # script or place the **prefab\_danielyunus96\_curved\_world\_manager.prefab** in the scene.

This controls the curve effect globally for all shaders instead of having to change each material one by one.

The script also contains a custom rendering frustum which is used to make sure objects are not culled too early. The default perspective frustum culls meshes too early. As the effect is done on the GPU, the CPU has no concept of the curve which causes visual popping when meshes reach the end of the curve. Instead this script forces the camera frustum to be orthographic, whilst maintaining the cameras perspective FOV.



# BEST PRACTICES

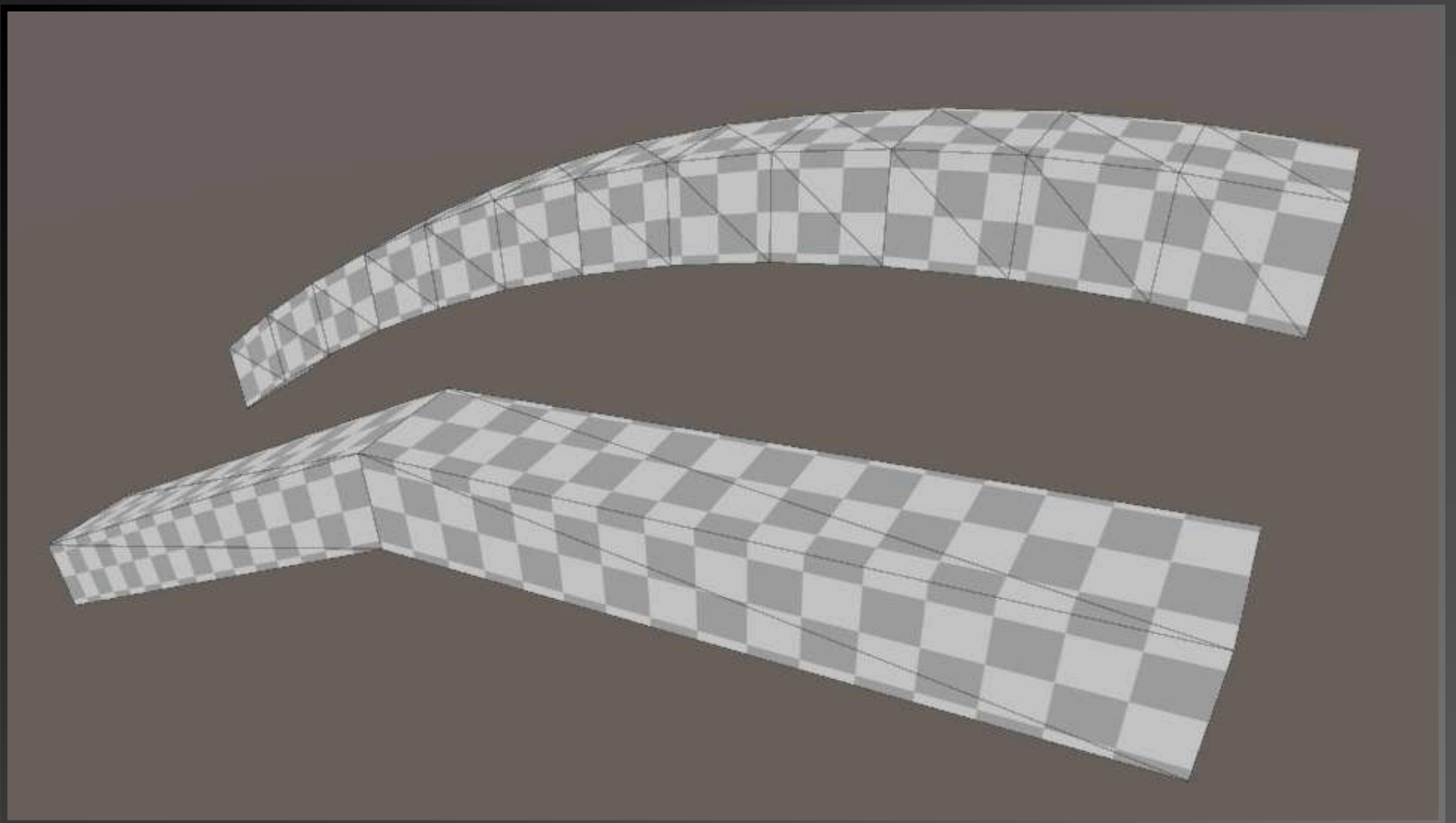
## 3D MESHES



### PART 1

As the effect is done per vertex, the lower the vert count your mesh is, the worse the effect will look. This doesn't mean your meshes have to be high poly, but long or wide meshes should be subdivided so the bend will work on them.

Below is an example of two long cubes, one with less subdivisions and another with more subdivisions. As you can see, the one with higher subdivisions bends better. This not only makes the vertical curve better but also the horizontal and twisted.



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# BEST PRACTICES

## 3D MESHES



### PART 2

Along with low subdivisions, unwelded verts or manifold geometry causes visual issues.

Instead, meshes more like “water tight” ones should be used, meaning all vertices are welded.

The left image is where meshes have been placed on the top of faces without welding the verts. As the shadows are baked, the higher the curve amount causes the underside of the light bake texture to show which causing dark spots.

The right image has all overlapping or resting geometry welded together, this means that we don't get any vertex splitting or offsetting as the curve increases, meaning no dark spots.



This could also be fixed by not baking the shadows/ making the shadows less dark. Or by using a lower curvature strength. Simple screen space AO provided in Unity URP could be used instead to give shadows to building objects.

### NOTE

This does not mean all environment meshes need to be joined; i.e. the floor doesn't need to be welded to the houses.

Only individual meshes need welding and only if they are large, for instance the buildings. Small meshes like plants/plant pots are fine to be left un-welded.