



JANUARY 12, 2021

DES-204 3D DESIGN FOR GAMES

DIORAMA

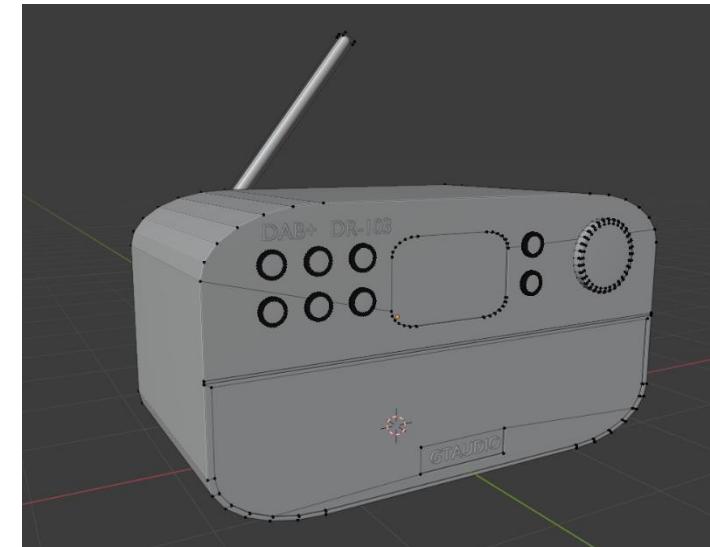
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1904017

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Weekly Tasks

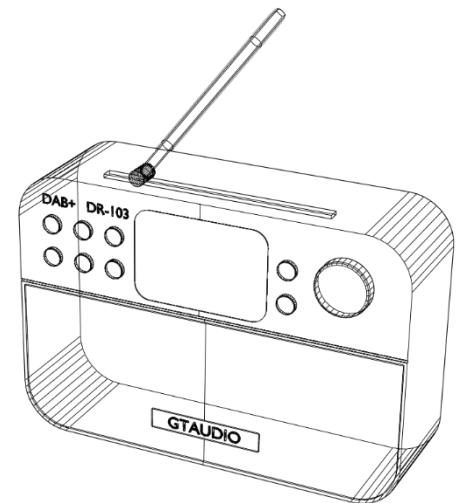
Week 1 – Radio Model



Reference Images: [GTMEDIA DR-103](#)

For my first attempt at the radio used the above reference image, in the end I had 1,740 Faces and 4,152 Triangles.

For feedback I was told about adding smoothing groups, fixing the front faces where I had added Booleans.

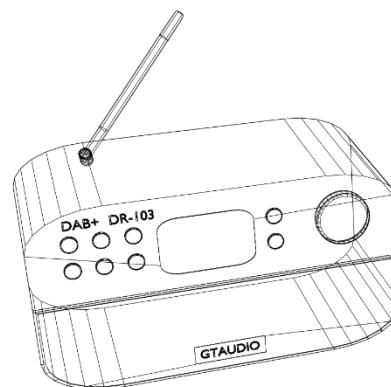


Reference Images: [GTMEDIA DR-103](#)

After feedback, I re-modelled the entire radio, I realised it was a little “fat” so I slimmed it down

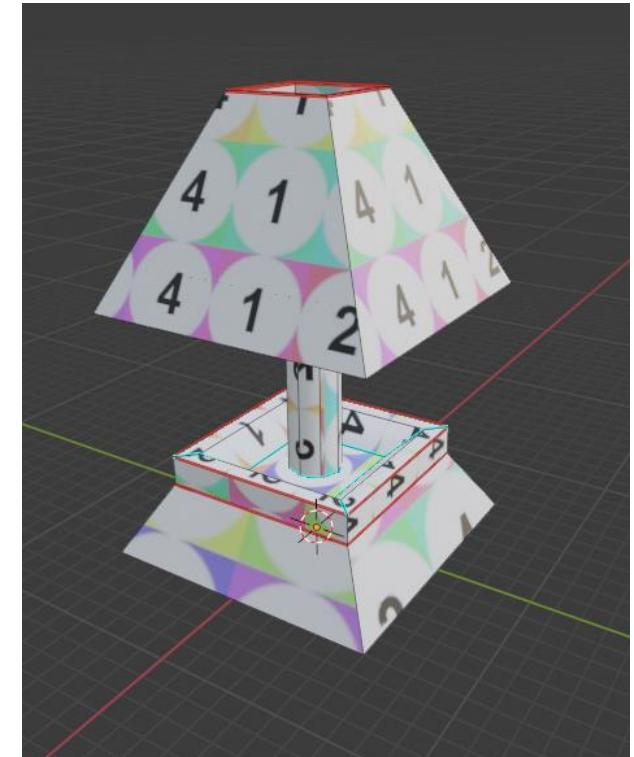
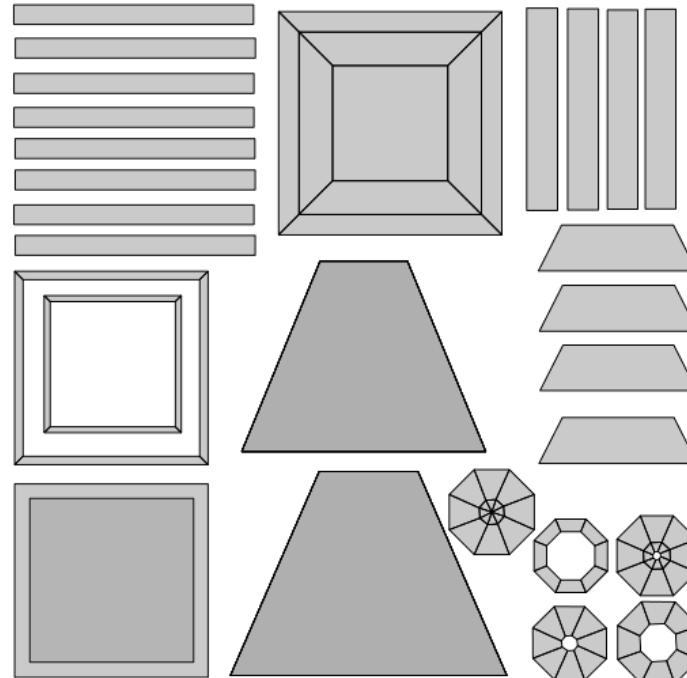
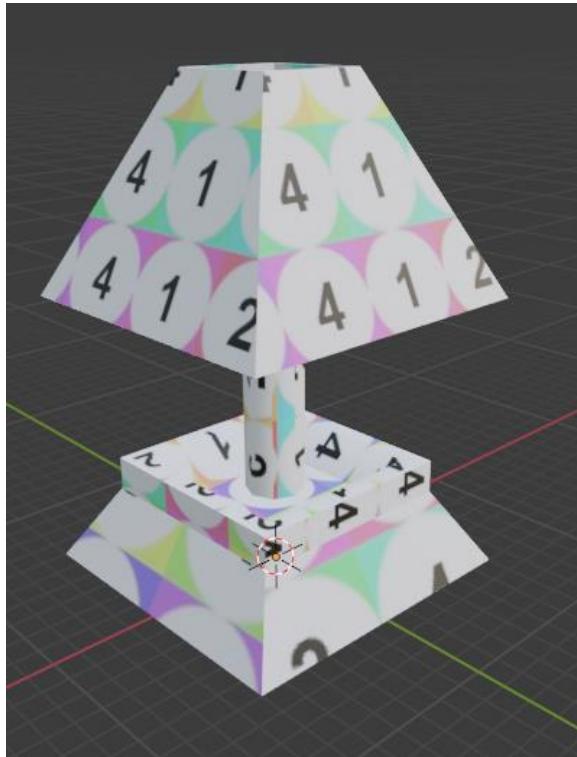
I added smoothing groups as instructed.

This model had 1,208 Faces and 3,232 Triangles.



Comparison Render (Left – Old | Right - New)

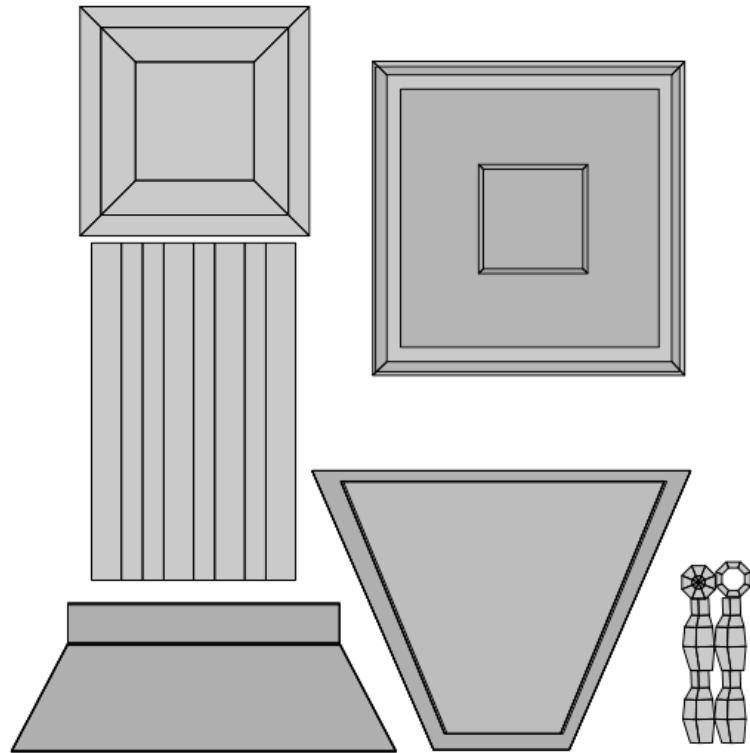
Week 2 - Lamp UV Unwrap



For week 2's task, we were assigned to unwrap the above lamp.

I have very little experience in UV-unwrapping so I wasn't expecting it to be perfect

From feedback I was told about the texel density being off on certain faces, I didn't even know what that meant.



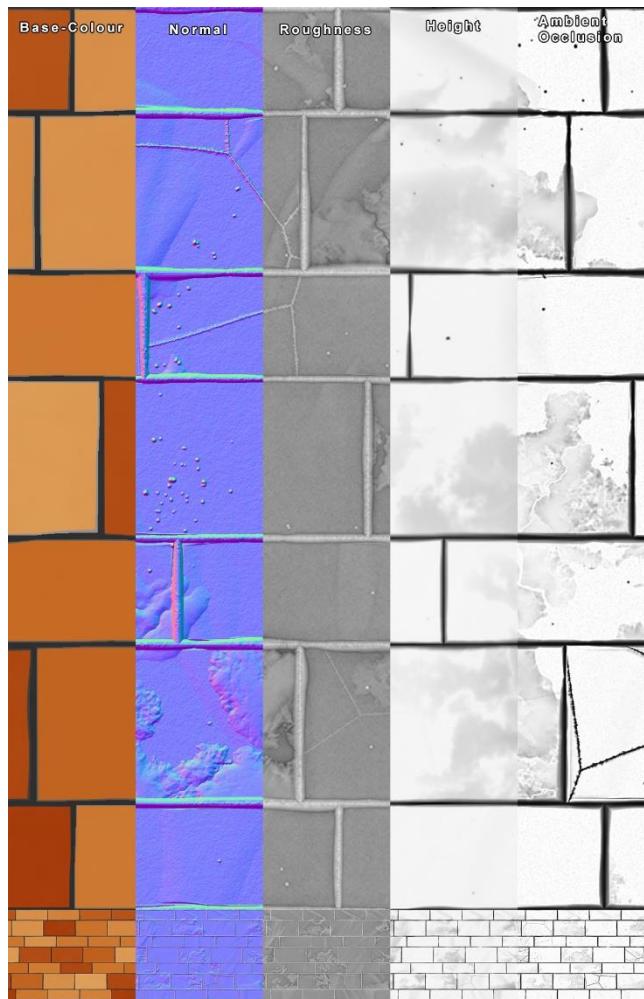
After looking into texel density I re-unwrapped the whole object. This time with a more consistent texel density.

I layered more faces on top of each other allowing for a larger texel density.

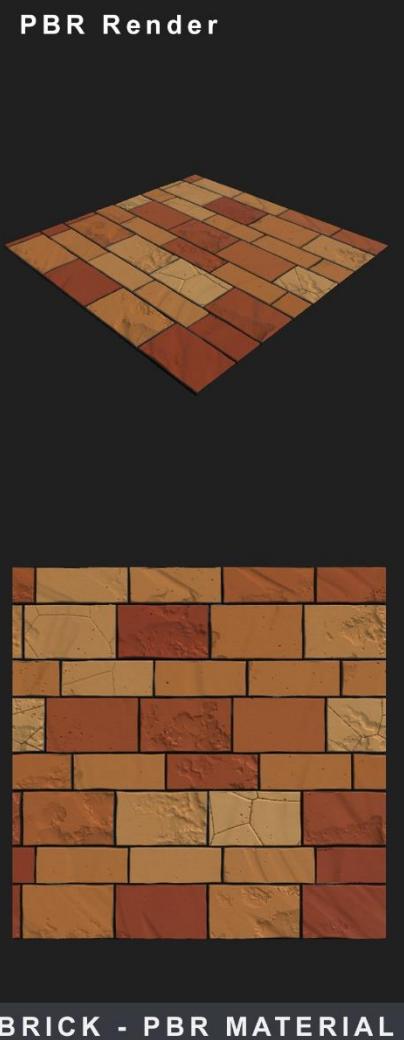
Week 3 - Substance Designer



Brick Wall Renders

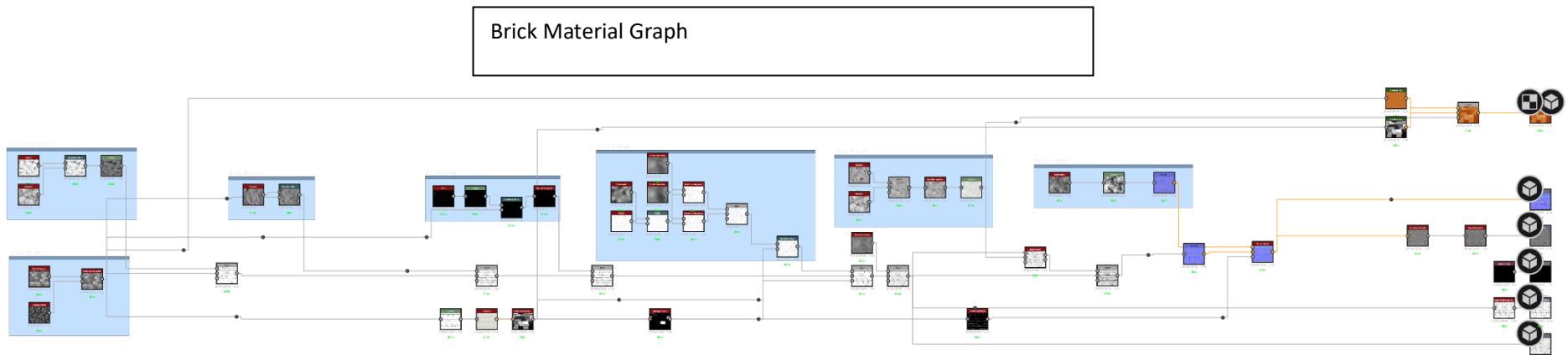


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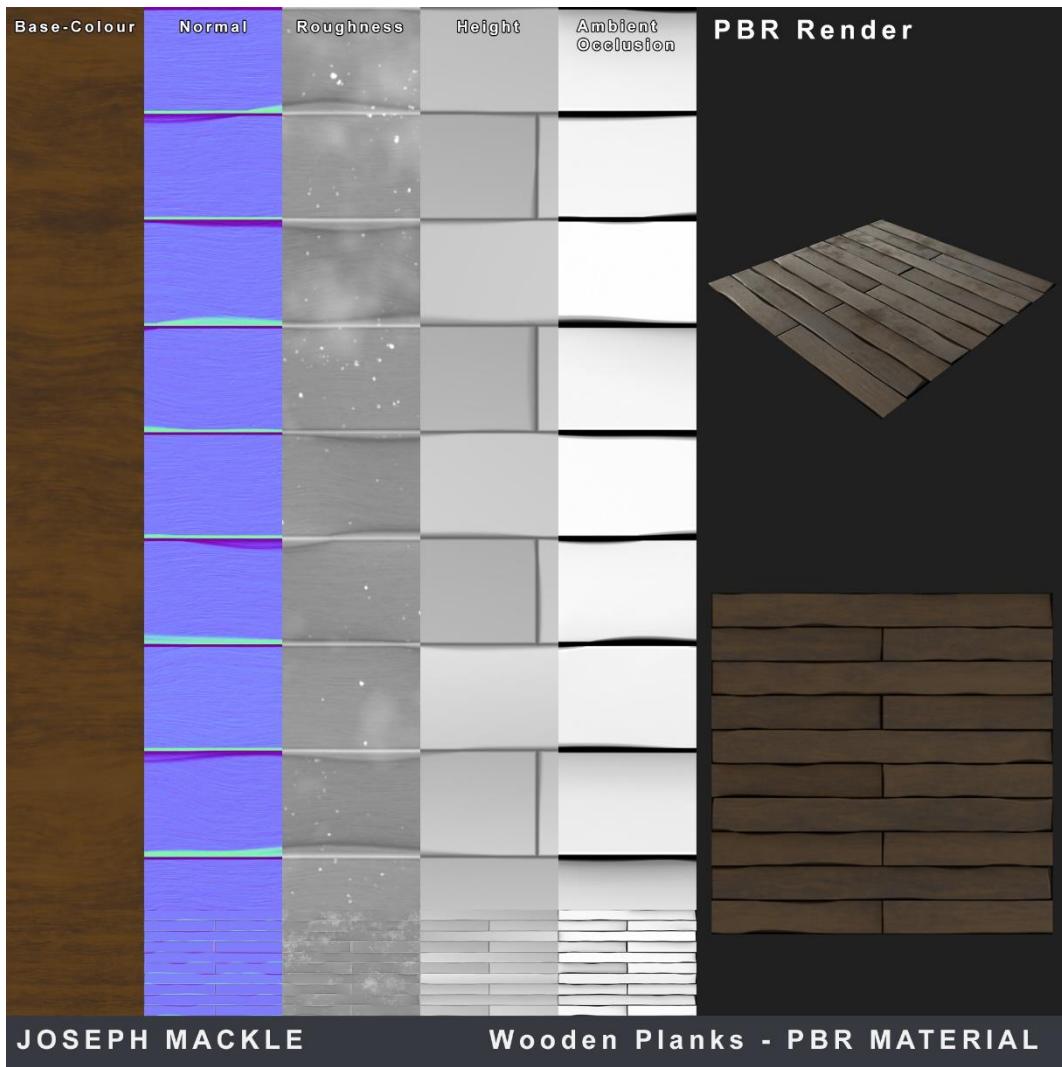
BRICK - PBR MATERIAL

Brick Map Materials





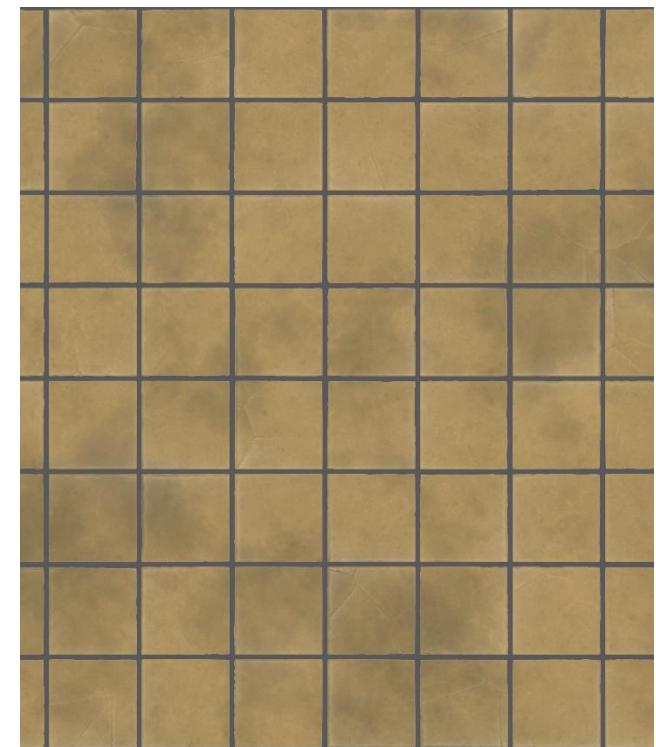
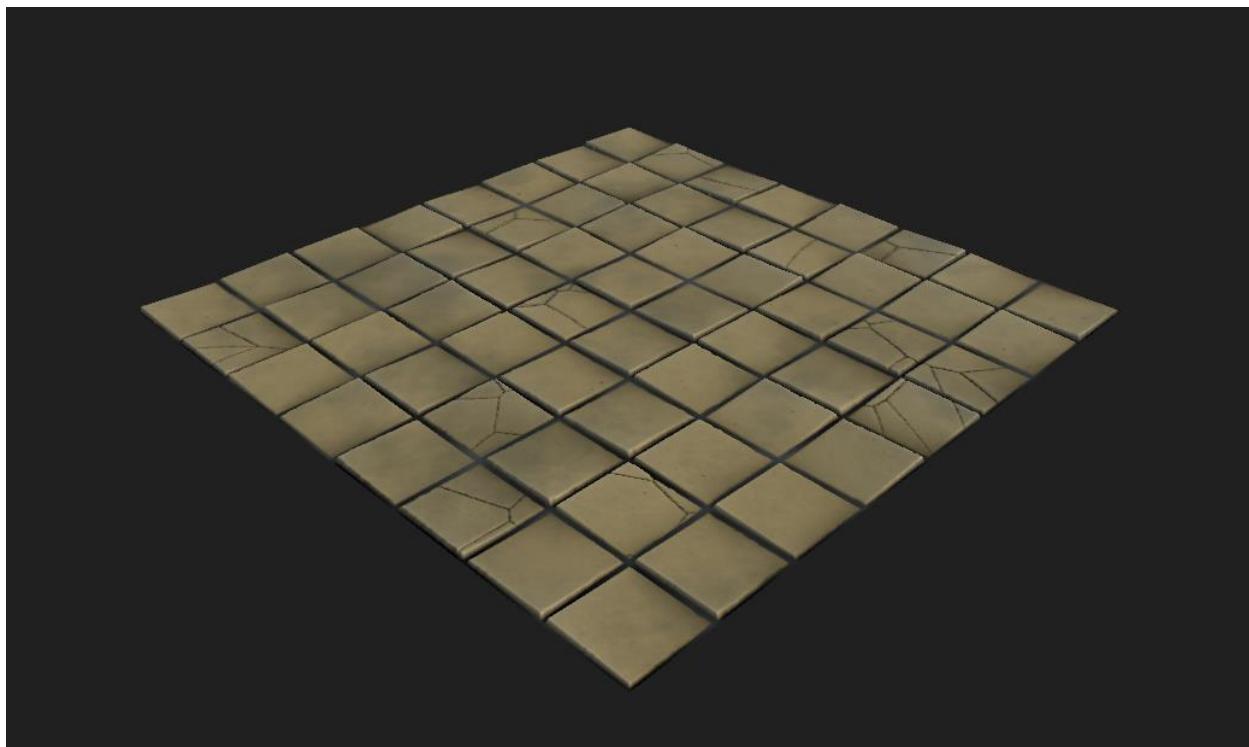
Wood Plank Renders



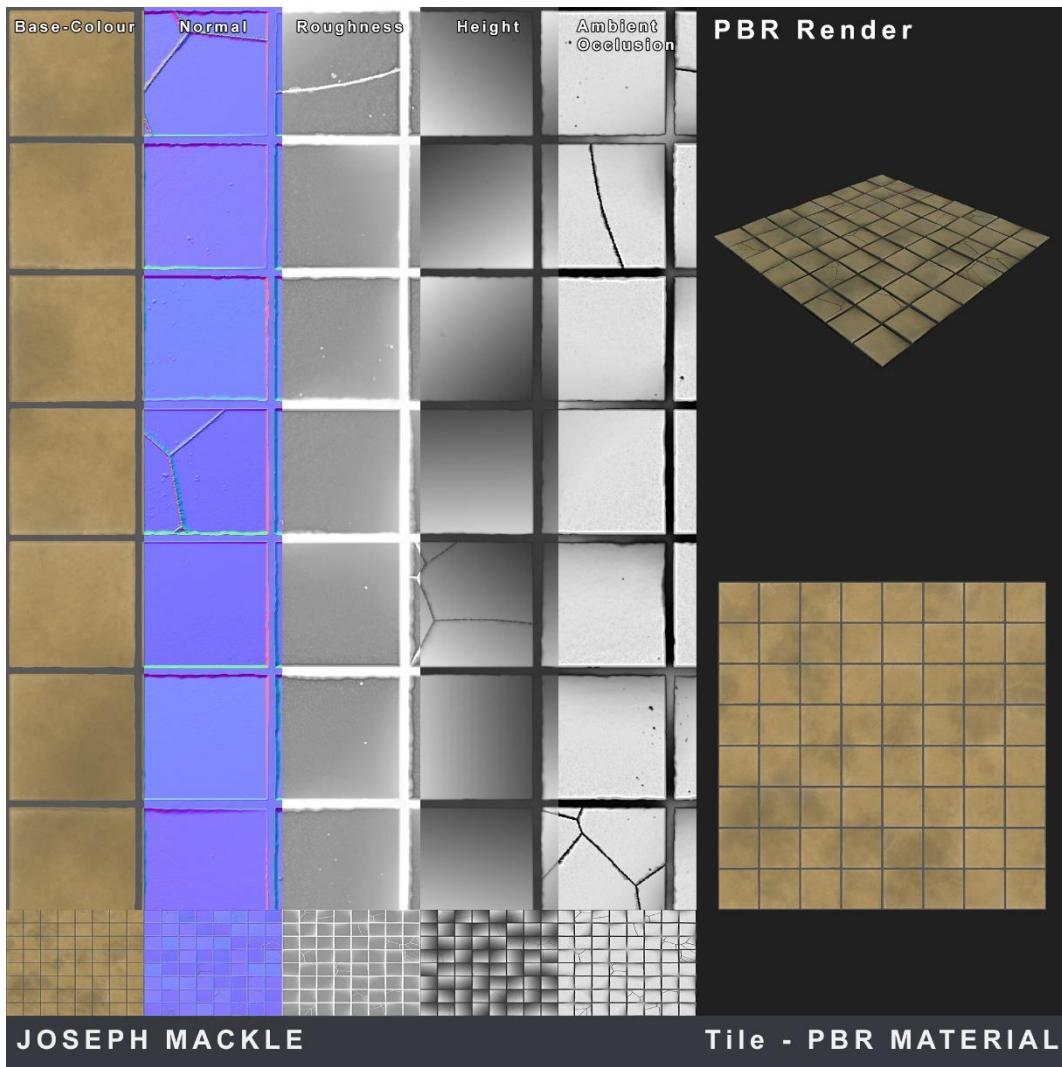
Wood Map Materials

Wooden Plank Graph



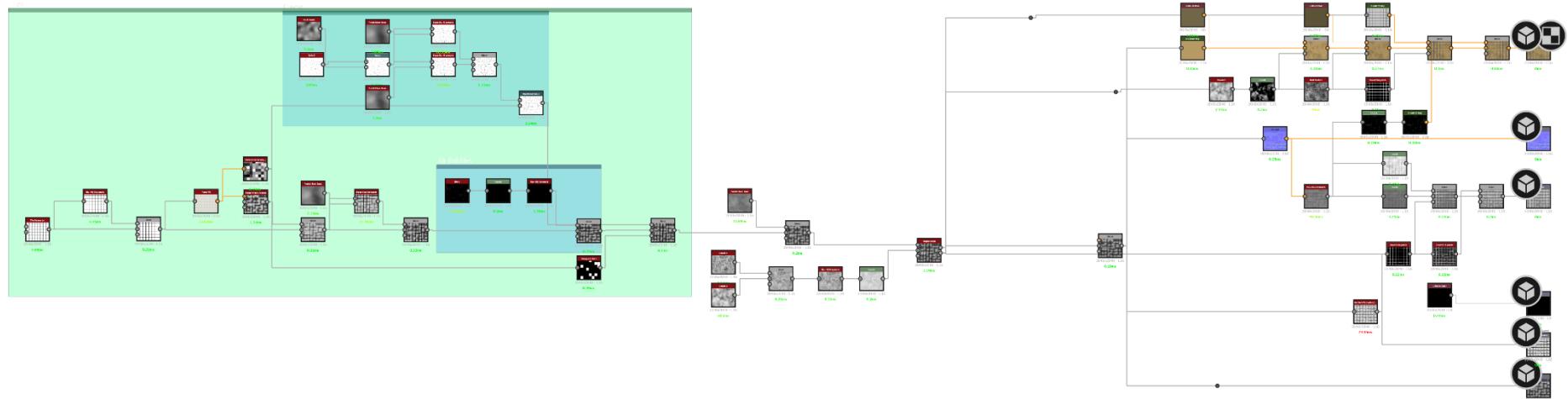


Tile Render



Tile Map Materials

Tile Graph



Week 8 – Modular Street Lighting



I did small adjustments in this scene, I thought it was way too blown out to begin with, so I toned it down a little, as well as the ambient light fill, it was a bit blown out and the shadows were not very dark, so I darkened them a little.

Diorama Research

Since this is a Diorama of my own room, I was able to work from my own room, I also took pictures to help when I was not there. I know I won't be able to add every object there is, I hope to add the basic ones such as the bed, desk, shelf and then work on adding a few smaller things.



Video's I have used (in no particular order) :

<https://youtu.be/XpN7SfkXQOO>

<https://youtu.be/LjRgrcKzGZE>

<https://youtu.be/qQnk3z99368>

<https://youtu.be/nb7cUowakXA>

<https://youtu.be/iiXmfapTJao>

<https://youtu.be/7O0AFgZtAJs>

<https://youtu.be/GnjPD6zeAqA>

<https://youtu.be/Jj5nXcq7enQ>

<https://youtu.be/s2MOx1lteik>

<https://youtu.be/QHVOauzTAyE>

<https://youtu.be/yjlUDiKF6Jg>

<https://youtu.be/uGVHULqOymA>

<https://youtu.be/HwljuqMjEDw>

<https://youtu.be/81RwJK1AY3o>

<https://youtu.be/NfqNYxD1UsM>

<https://youtu.be/8CpD7Vqg2TA>

<https://youtu.be/Q0KT-6Lda2g>

<https://youtu.be/sqZrpriwllg>

<https://youtu.be/AeOQZWEi1gU>

<https://youtu.be/jjWw3thpnxc>

<https://youtu.be/CLWvqkMaaFs>

<https://youtu.be/F6J8KiOqKq4>

<https://youtu.be/rExWeJ73nSU>

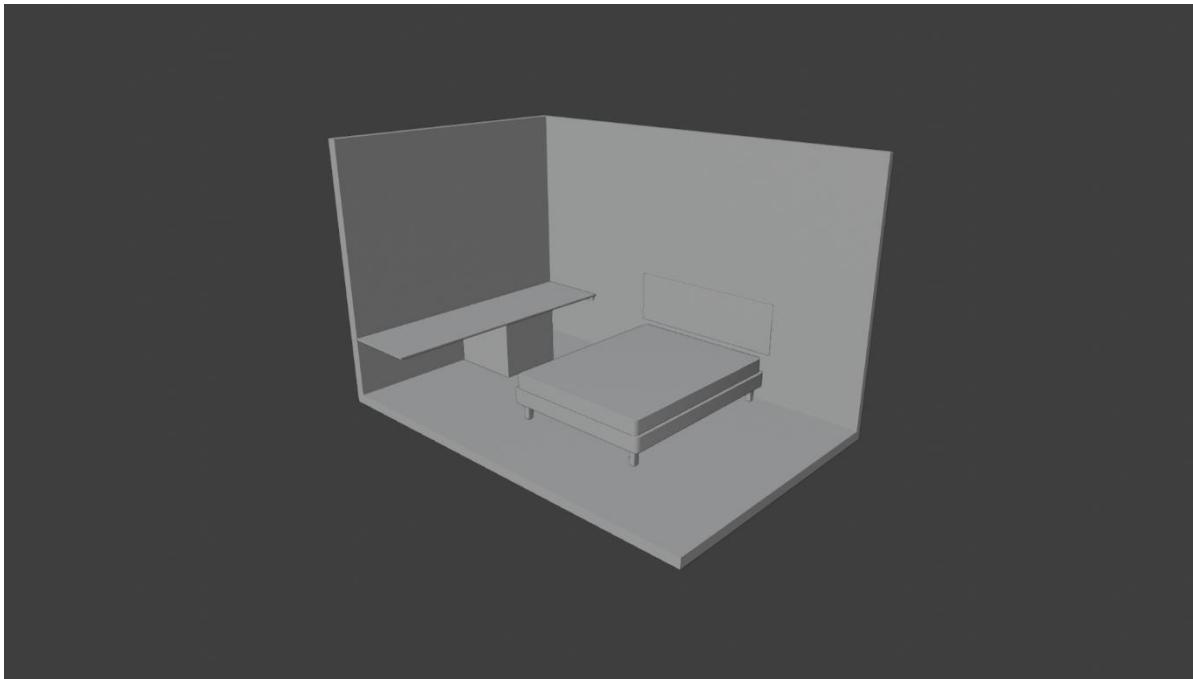
<https://youtu.be/aifPCHQIH2w>

While not all where put to use, they did help overall, I was able to use bits of knowledge I had gathered from watching them to apply in different areas.

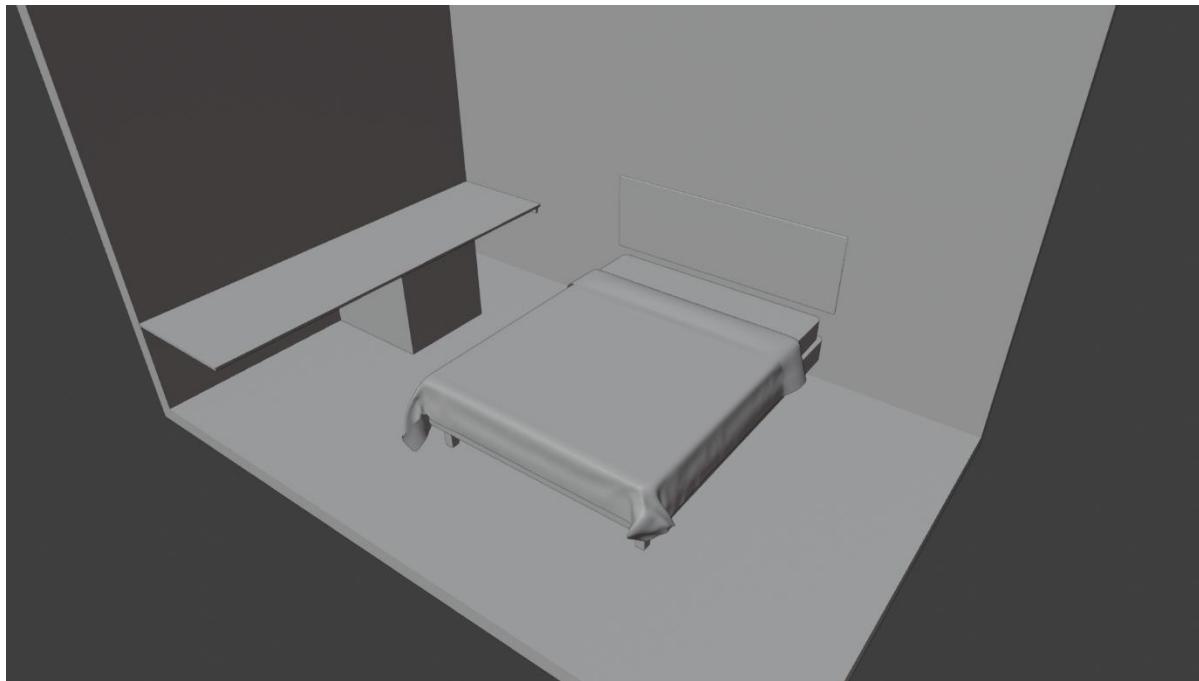
Diorama Development Process

I started off with a simple blockout of the level, I can already tell the room height is incorrect and will adjust it in the future. I used simple primitives for this blockout, consisting of a plane for the room with extruded edges to create the walls, and a cube scaled for each other object.

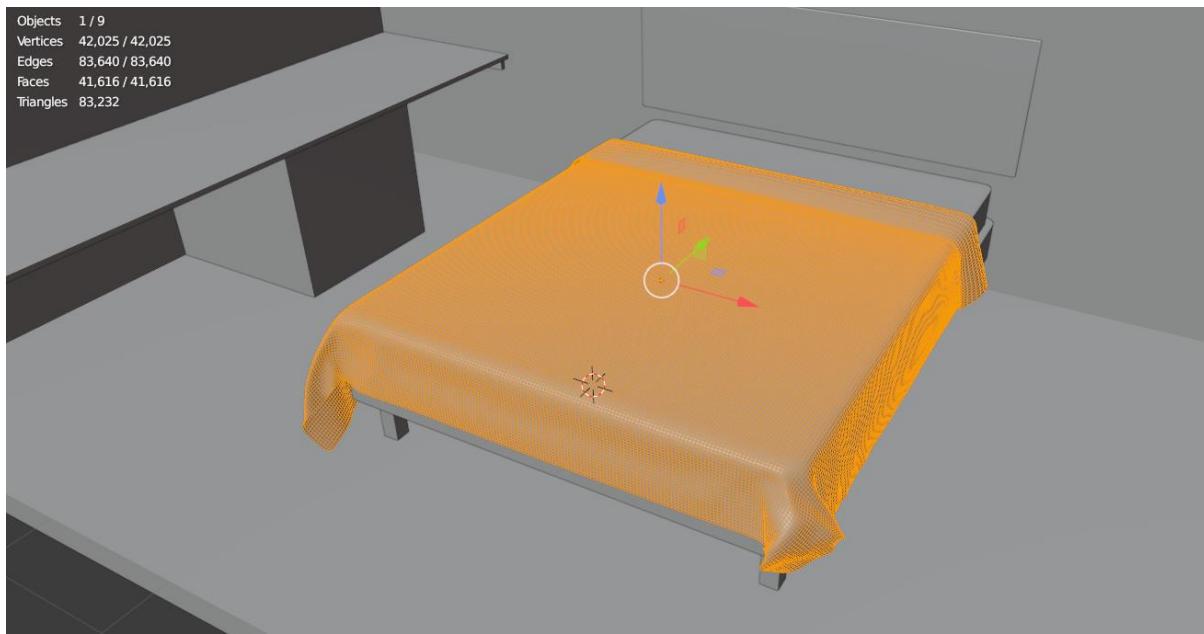
For the feet of the bed, they are a simple cube that uses the mirror modifier to place them in the same place on different axis.



From here I tried out cloth animations, I started on the bedsheets:

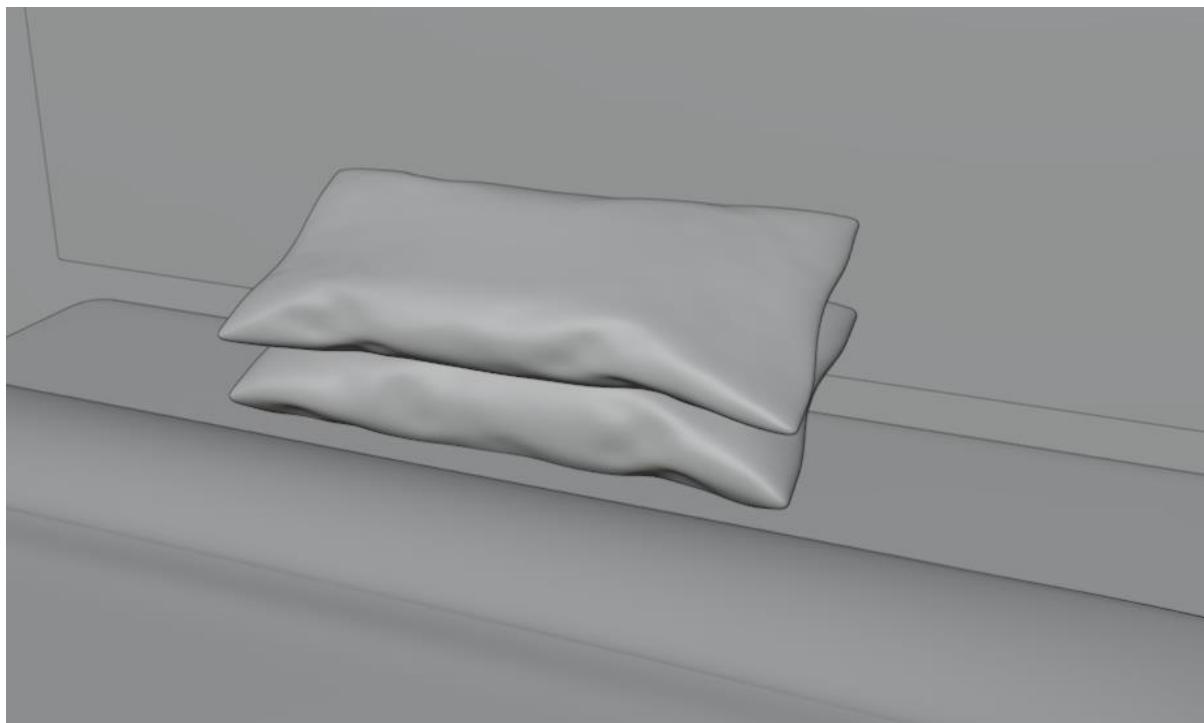


For my first cloth animation, I was content with it, but I knew it needed some work for improvement. The main improvement being to lower the poly count, as it is sitting on 41,616 Faces and 83,232 Triangles, which is way too much for how low effort it looks.

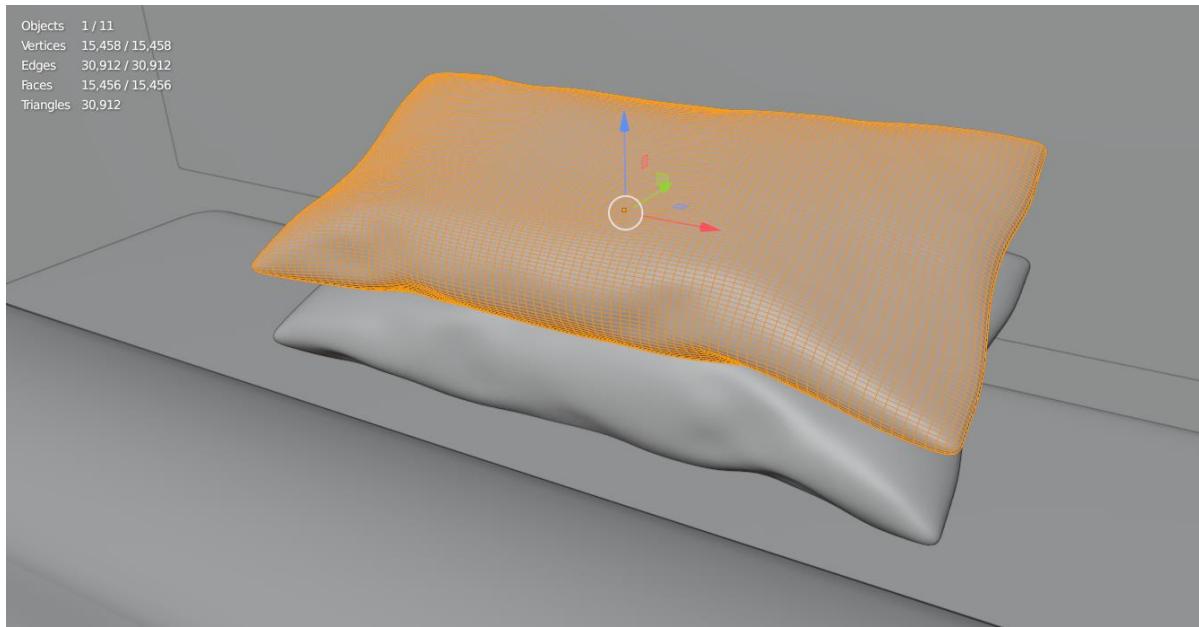


I left for now as I know I can come back and improve it further, I then worked on the pillow simulations:

I like how they turned out, they seemed pretty good to me.



However, I was facing the same problem of the face and triangle count being way too high:



I then began to work on the wall shelf in the scene, I modelled this object through array modelling which allows me to easily align and duplicate object, I then finished it with a full small bevel to the whole object.

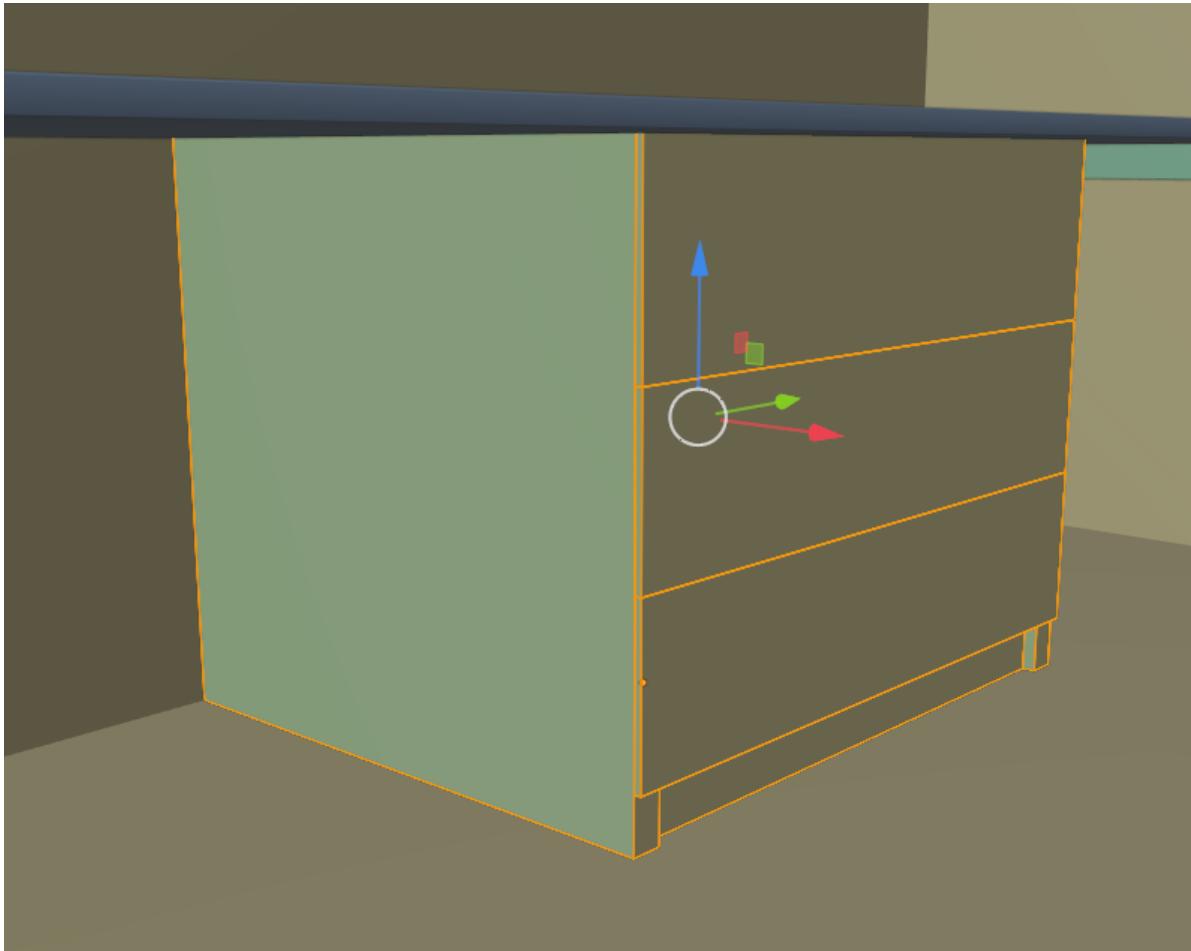
This object has 1,371 Faces and 2,632 Triangles, which considering the bevel is understandable, it bumped it up quite a bit.



I Then re-worked the under-desk drawer:

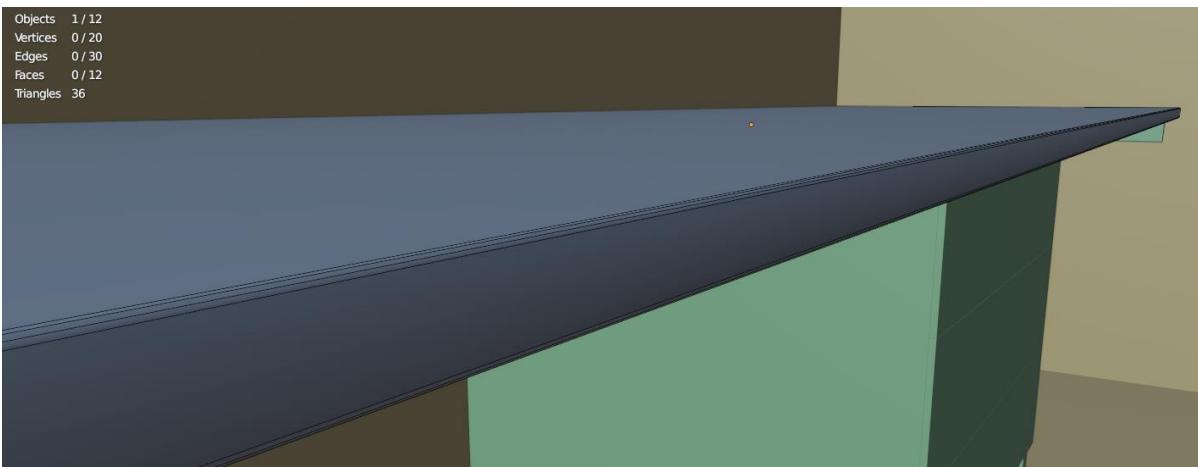
I used the same process as the wall shelf, I modelled these using arrays, it is more time consuming this way, but the result is better, I do need to improve my modelling through arrays as I have never done it before.

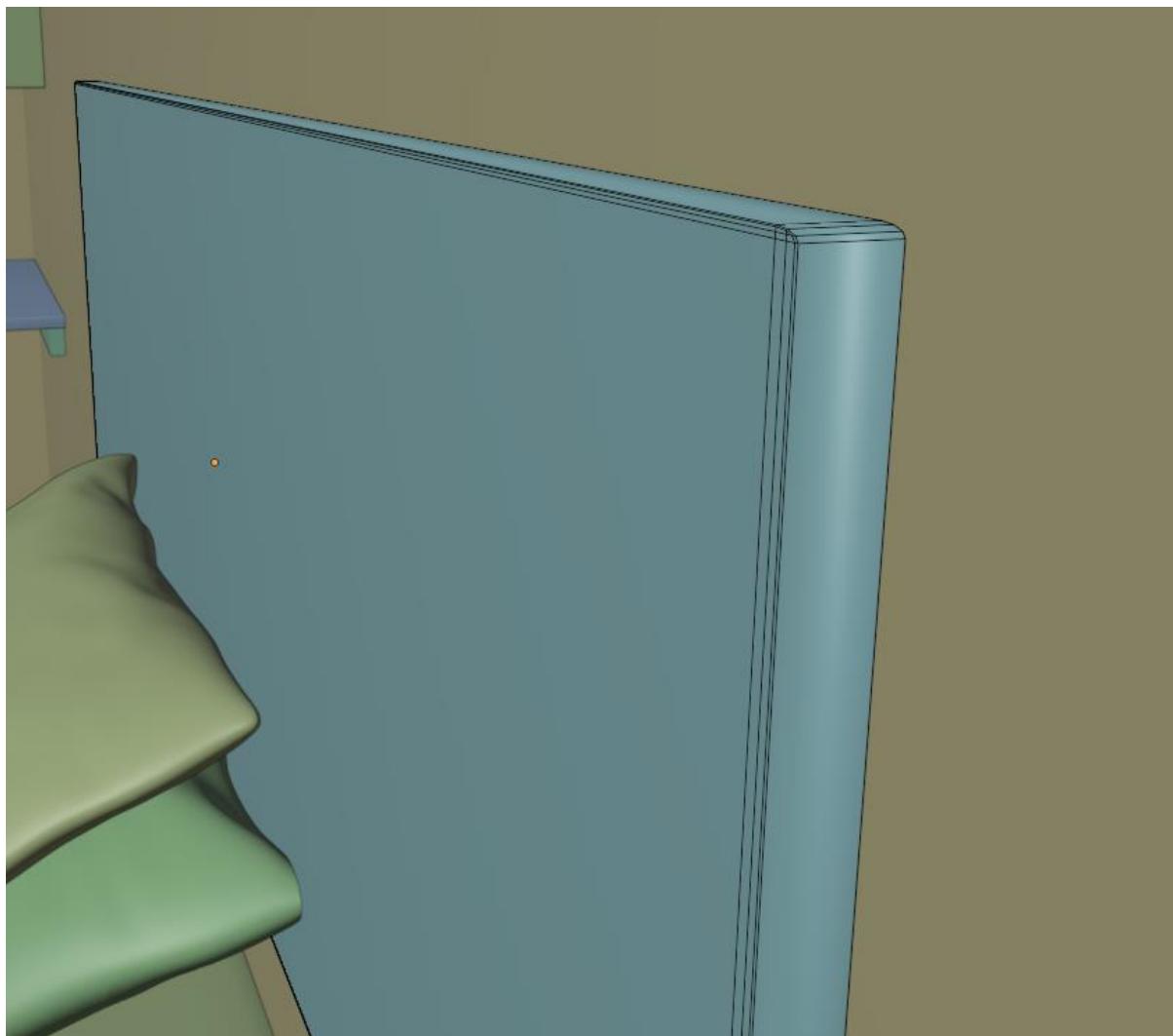
This object has 784 Faces and 1,504 Triangles, it is a basic looking object, so I understand why it is low, I also only applied a bevel to the drawers themselves to make them stand out more.



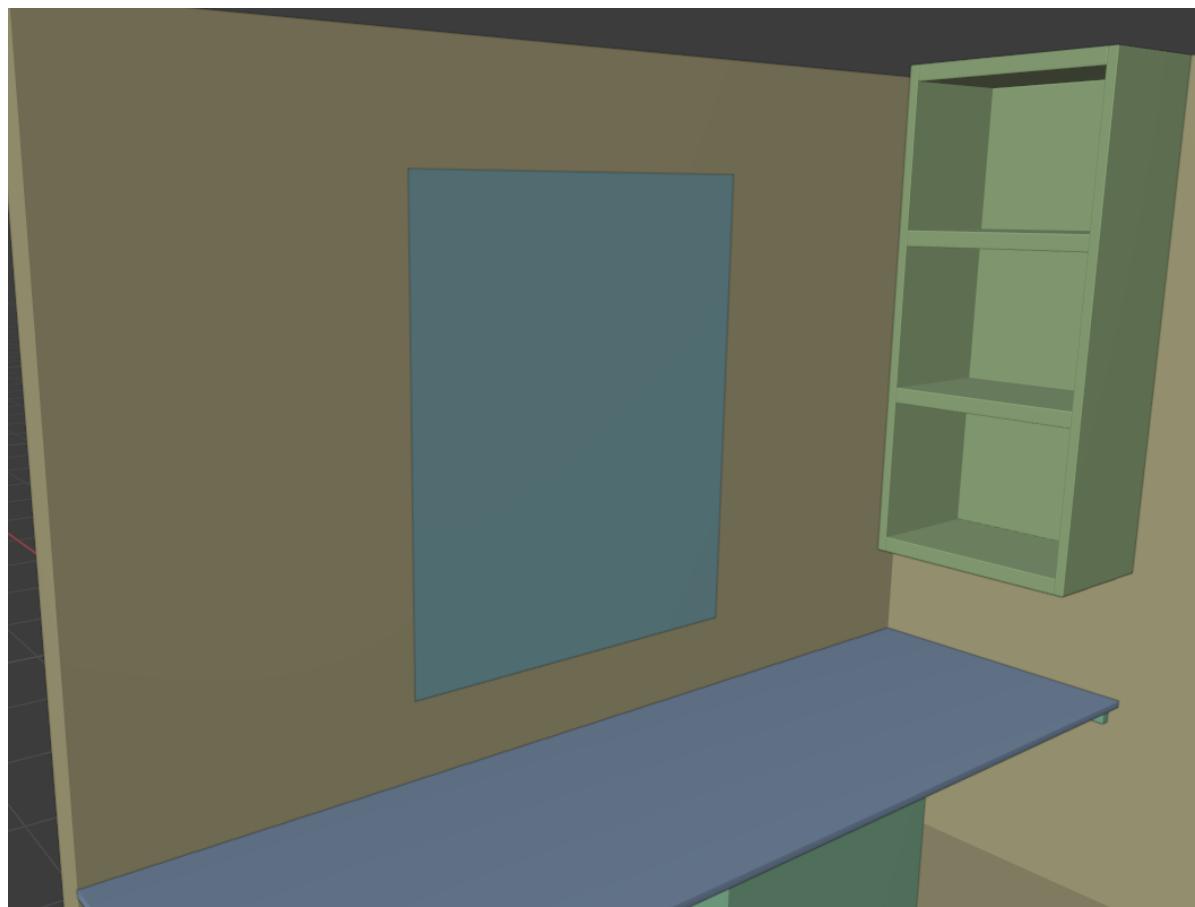
As a final touch up for now I bevelled the desk and bed backboard:

Objects 1 / 12
Vertices 0 / 20
Edges 0 / 30
Faces 0 / 12
Triangles 36





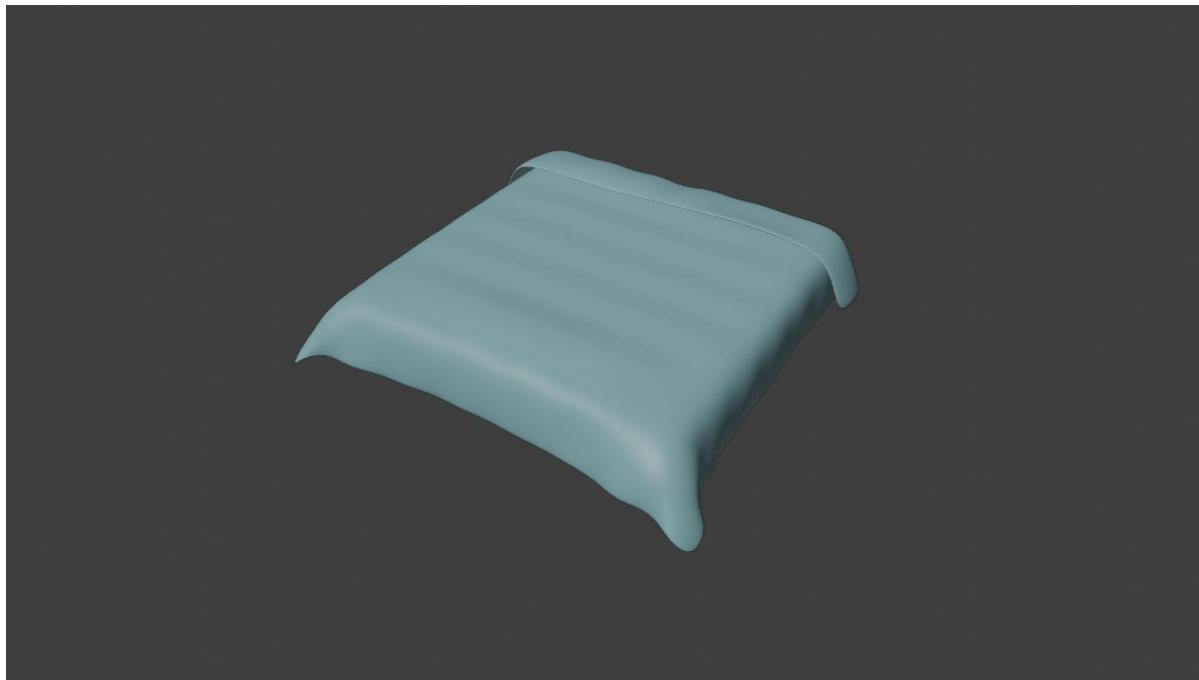
I then added a primitive cube and scaled on the Z axis to give a window blockout, I'll then Boolean this into the wall to give a window.

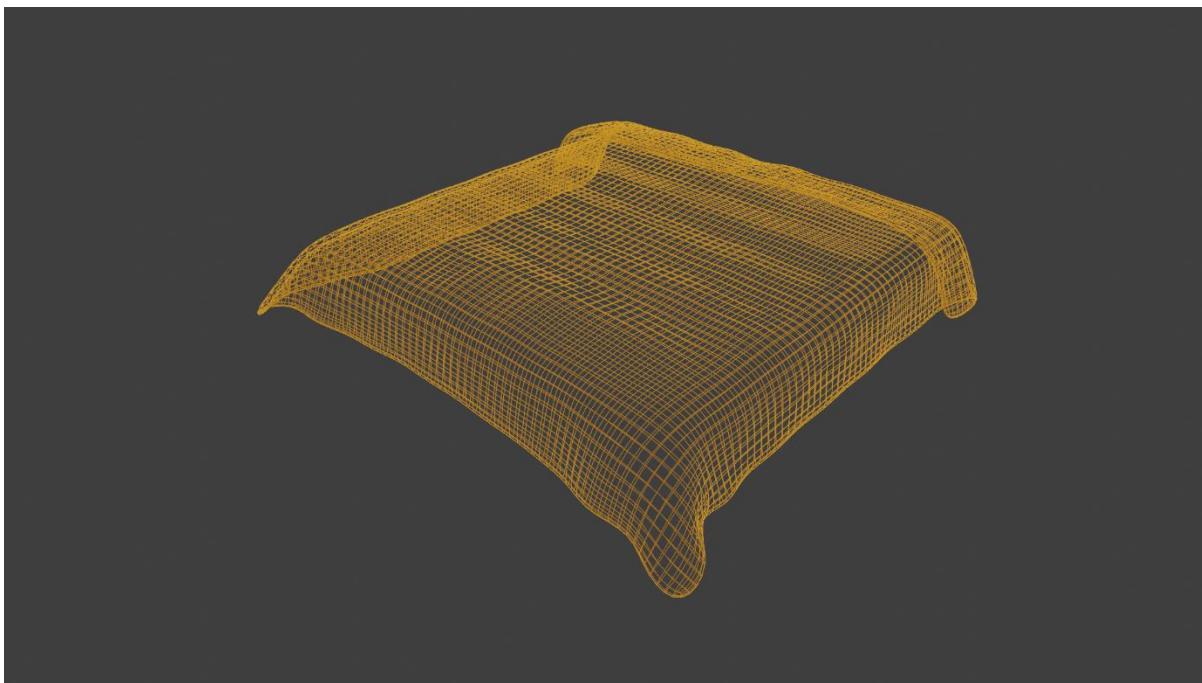


Early Iterations

I spent some time re-working the bedsheets animation, I watched a few tutorials on YouTube that helped me out:

I was able to reduce the Face count to 9,216 and the Triangles to 18,432, Which is significantly lower than beforehand, whilst also looking much better in my opinion.

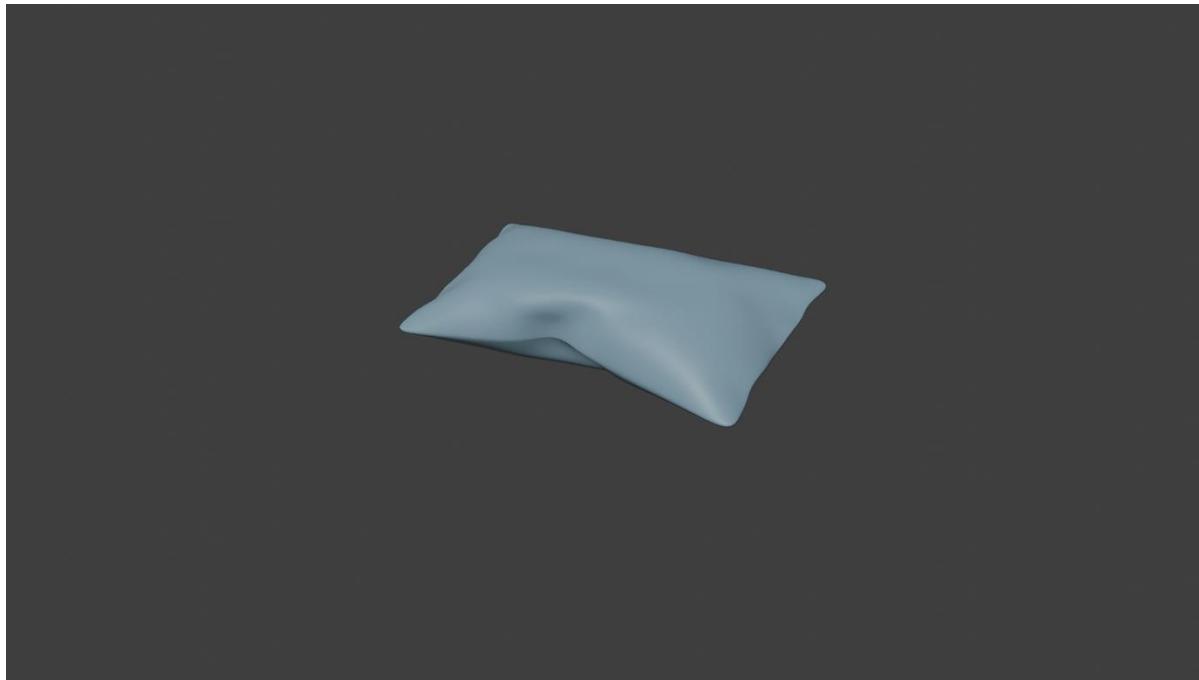


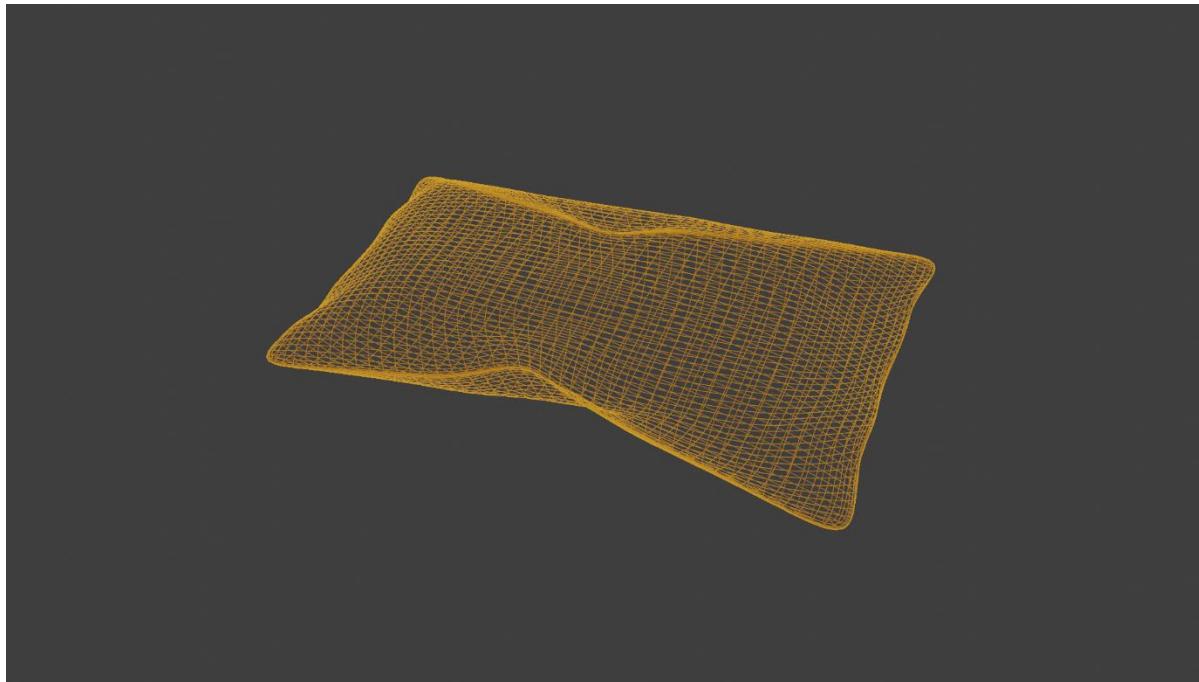


I also decided to re-work the pillows:

I was able to reduce the faces on the pillow to 5,280 and the Triangles to 10,560 which again is a good dip in poly count for them.

They are still quite high, and I am not sure if I will be able to reduce them by anymore, since they are simulations, they need to have a lot of sub-divisions to properly work.





Videos used for cloth animation:

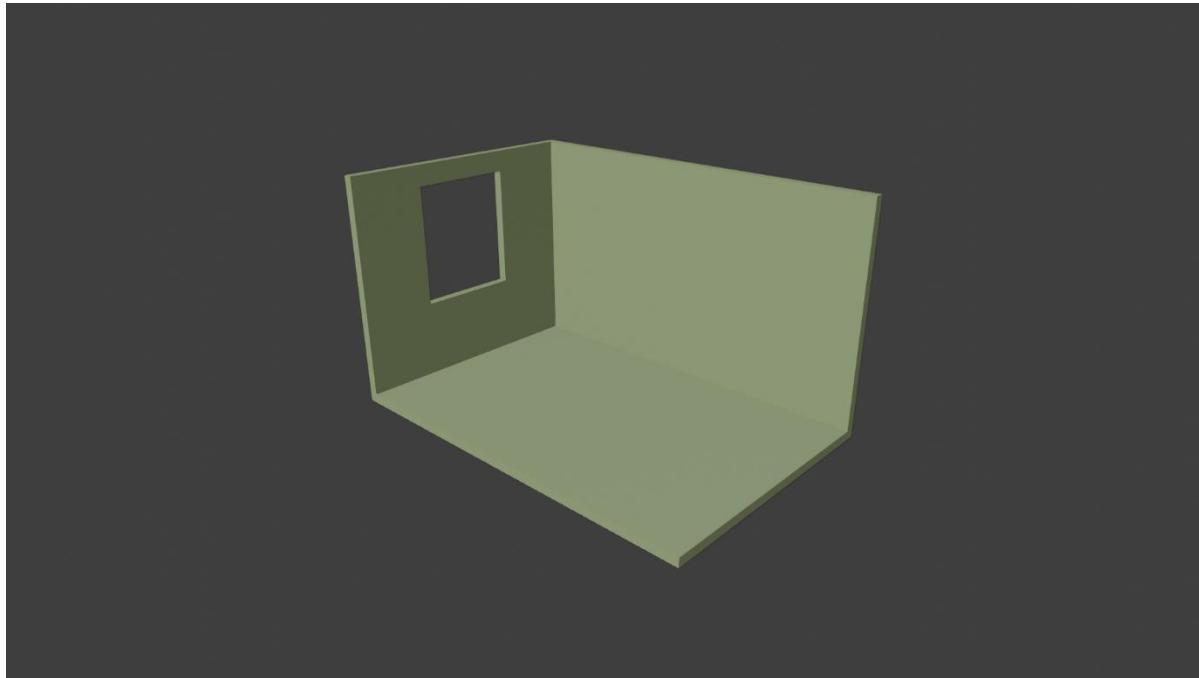
<https://youtu.be/Jj5nXcq7enQ?list=PLR1AwcuqTSJY3FcrQGPXbmvbEbqwCyhzx>

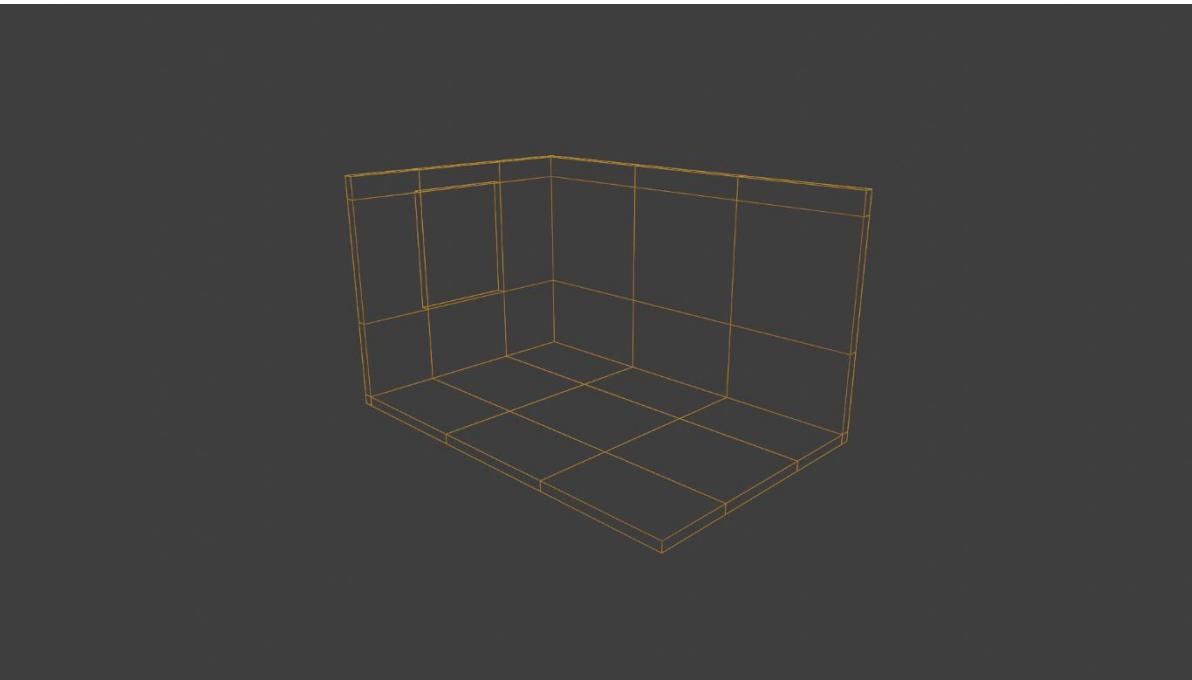
<https://youtu.be/LjRgrcKzGZE?list=PLR1AwcuqTSJY3FcrQGPXbmvbEbqwCyhzx>

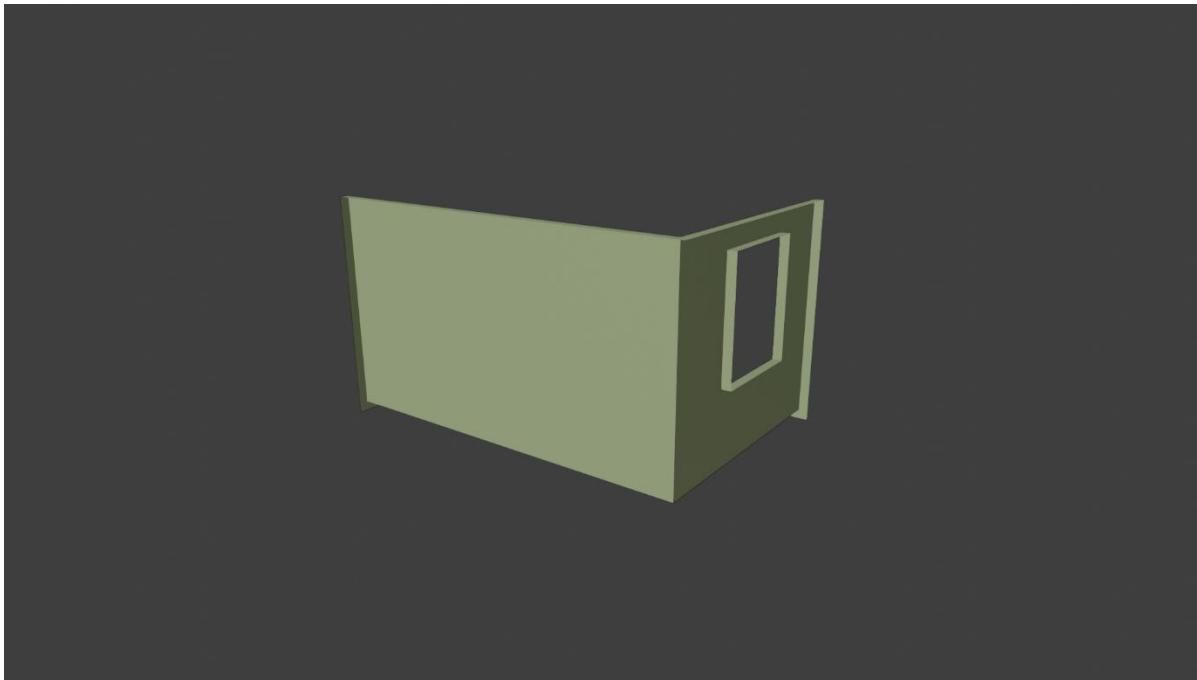
<https://youtu.be/GnjPD6zeAqA>

<https://youtu.be/7O0AFgZtAJs>

I then rebuilt the entire room-frame, I was not happy with the original way I did it, this time around I applied loop cuts to each side and adjusted them to on the wall where the window would be so I could simple just delete the face rather than apply a Boolean to it.



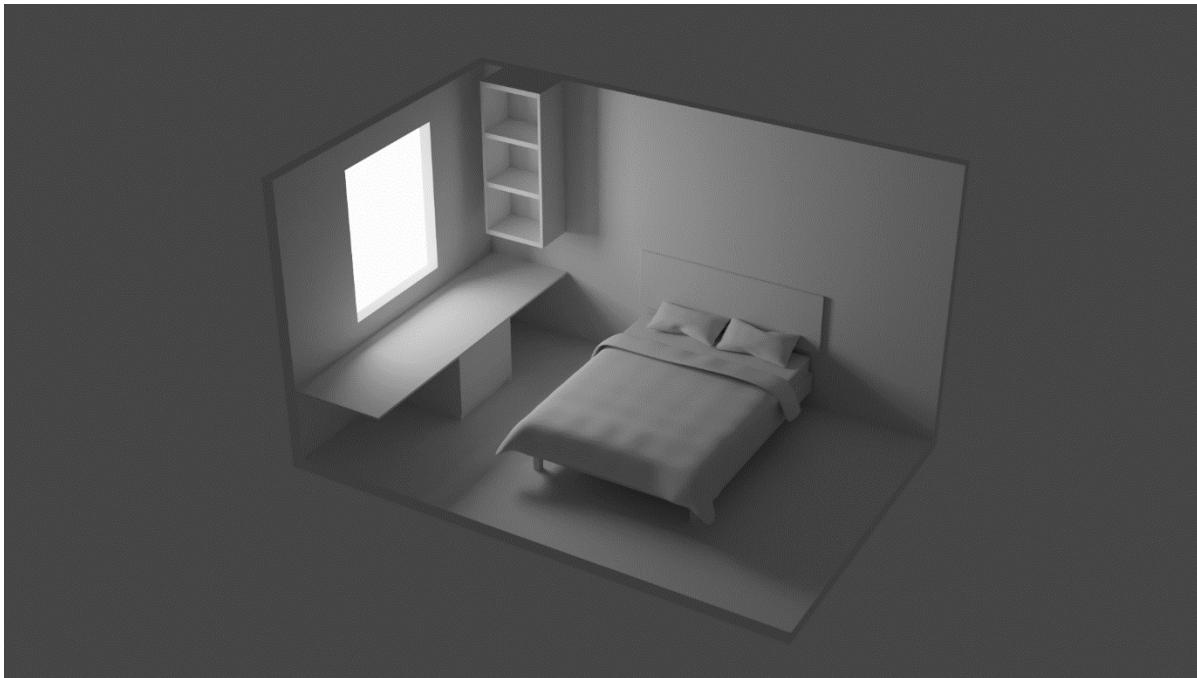




I also removed the rear faces of the room to save on some process/render power, since they will not be seen they will not be needed.

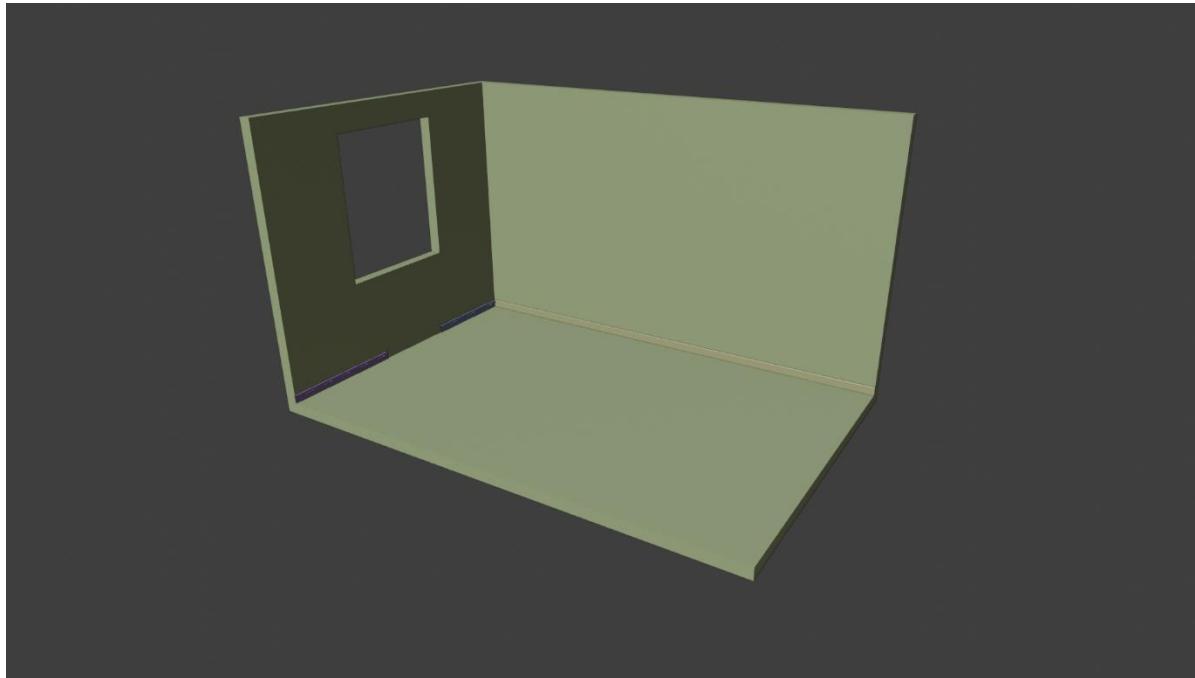
Continued Development

After doing some iterations on some objects in the scene, I added a place outside of the window and applied an emission shader to it and did my first render inside of Blender:

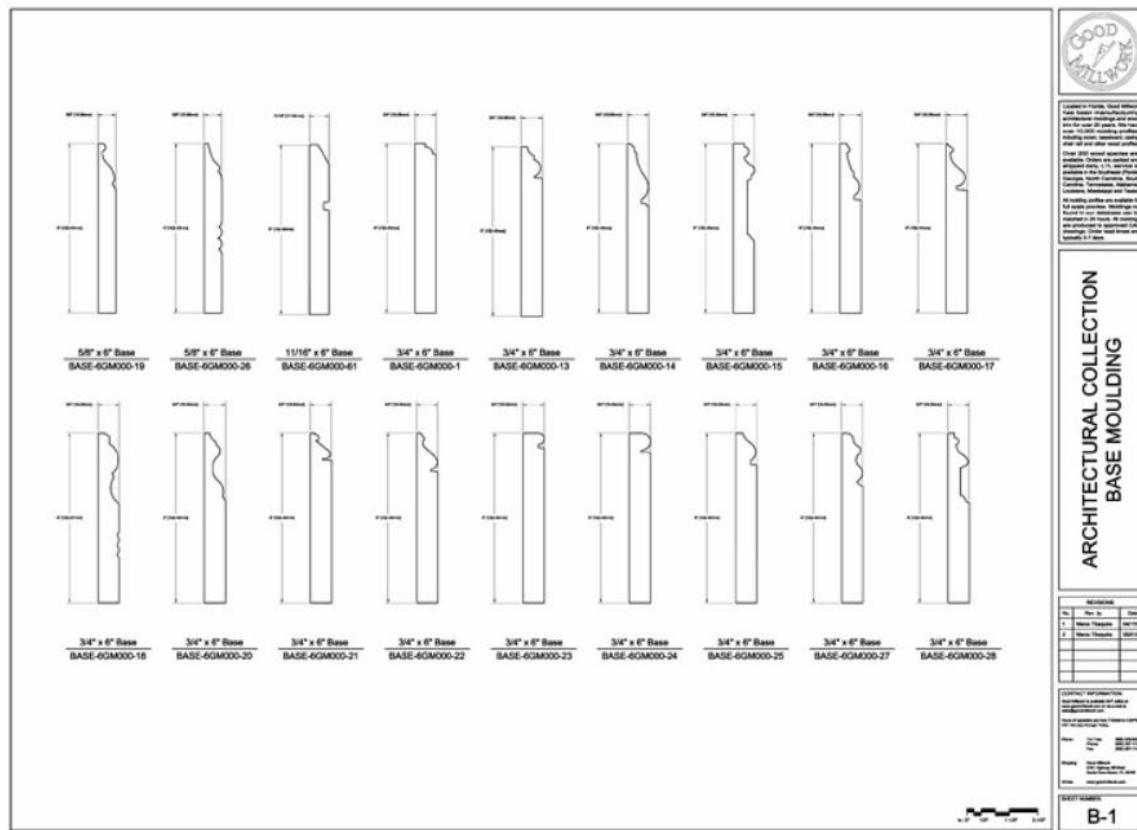


I am happy with how it looks; I already feel my modelling skills are improving as I have learned new ways of doing things, iterating is something I can see a lot of happening throughout the development process.

I then moved onto adding a small detail, skirting, I thought the room was missing something, it needed something to break the wall from the floor and that was exactly it:

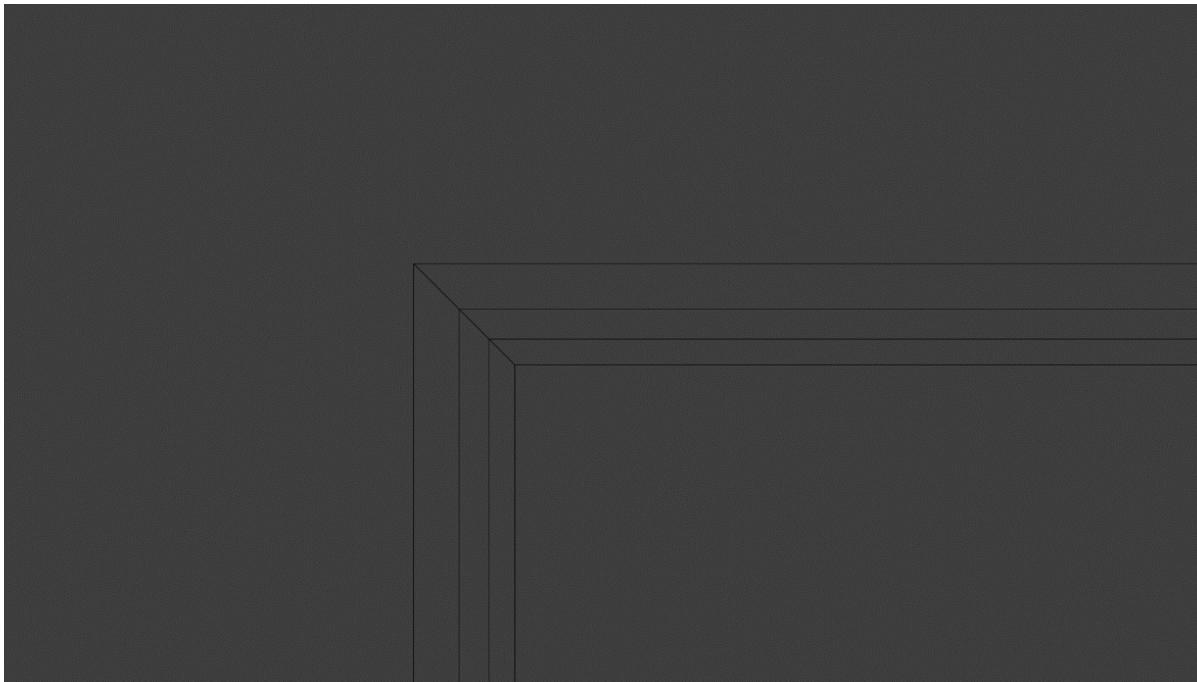


I modelled the skirting using real-world dimensions using the following image:



I used the 3rd image on the first row.





For the corner I used the shear tool, which allows me to adjust it to the angle I want whilst keeping the correct scale of the object.

Scale Iteration

After modelling the skirting, I soon discovered my scale was off, the image I used was to scale and it showed when I added the skirting in.

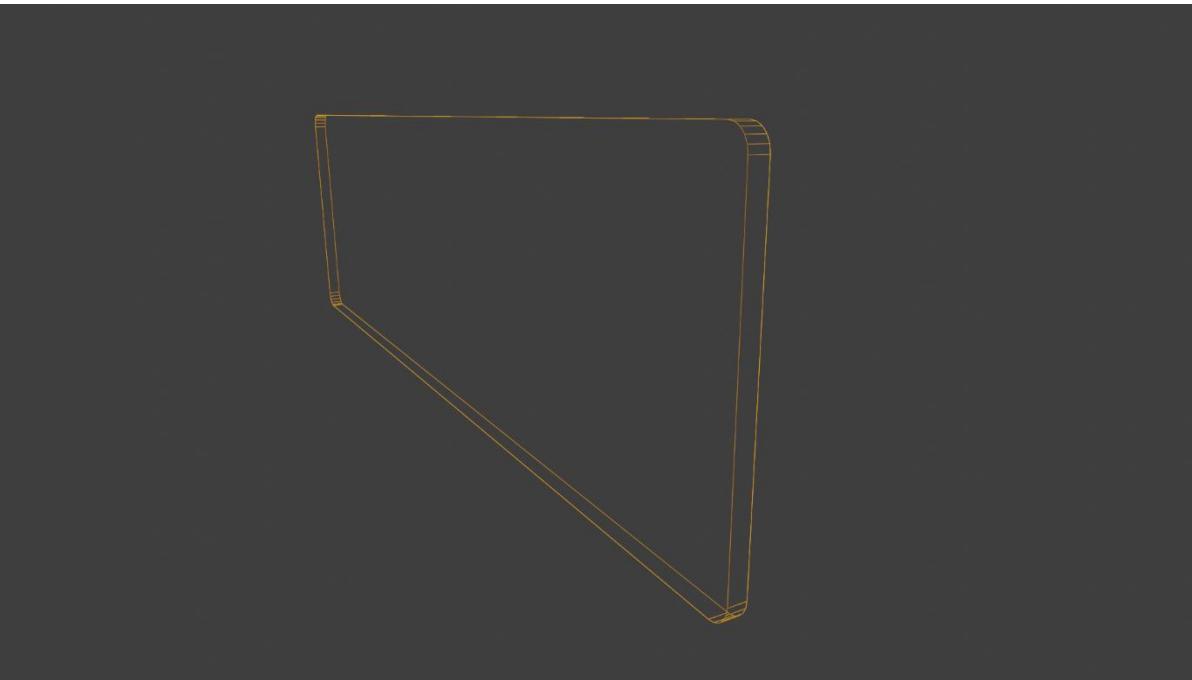
I spent a good amount of time re-scaling all objects in the scene, the room was 8M x 5M, which is incorrect, I also do not have exact measurements for my room, so I looked up average room heights which came to be 2.4M, I used this to eyeball the size of my room, which I ended with 5M x 3M, which appeared to look correct.

For the bed the scale was also incorrect, looked up bed sizes and based mine off of it:

I went between Double and King-sized with mine being 200cmx140cm and a thickness of 20cm

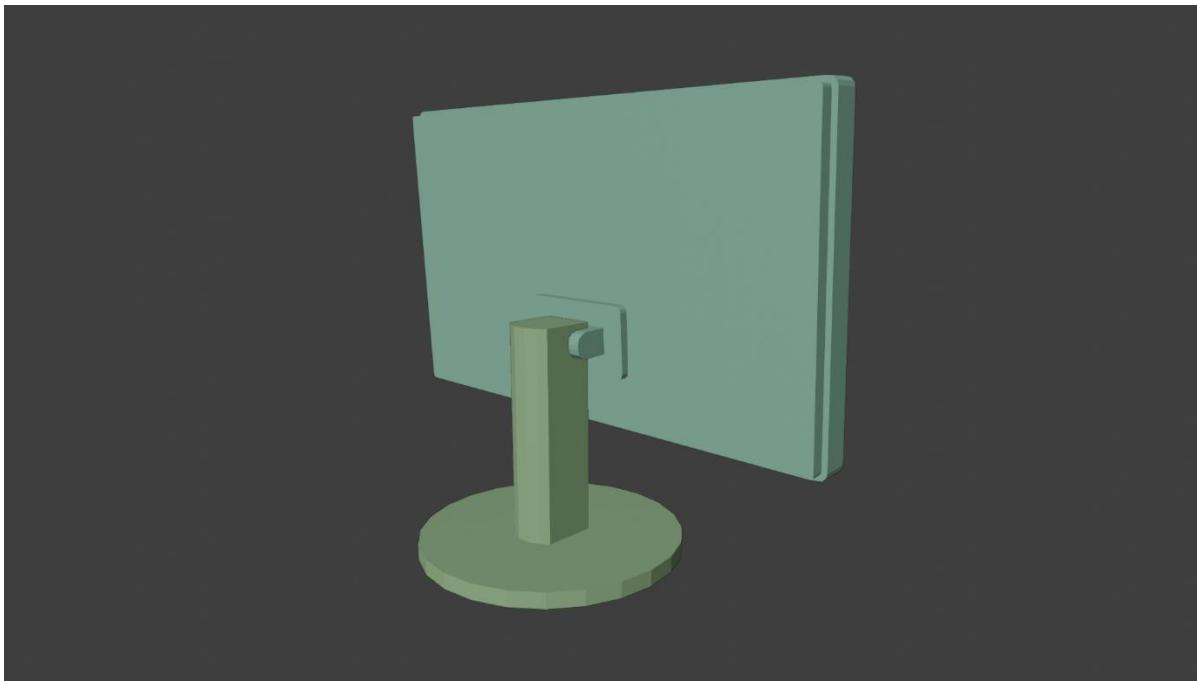
Typical UK bed sizes		
	Imperial	Metric
Small single	2'6" x 6'3"	75 x 190cm
Single	3' x 6'3"	90 x 190cm
Small double	4' x 6'3"	120 x 190cm
Double	4'6" x 6'3"	135 x 190cm
King-size	5' x 6'6"	150 x 200cm
Super king-size	6' x 6'6"	180 x 200cm

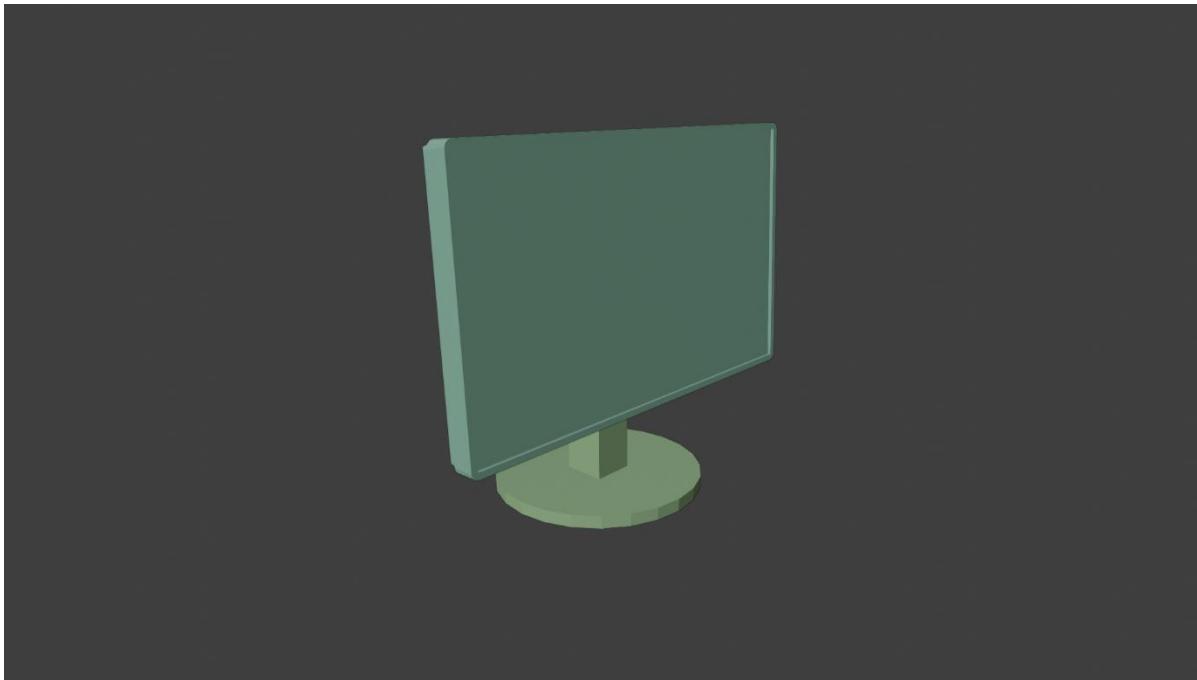
I also did a quick re-model of the bed backboard, I noticed the bevel was incorrectly done and this was because my scaling was incorrect, I never set the scale to (1,1,1) and this caused the bevel to place incorrectly.



Continued Development

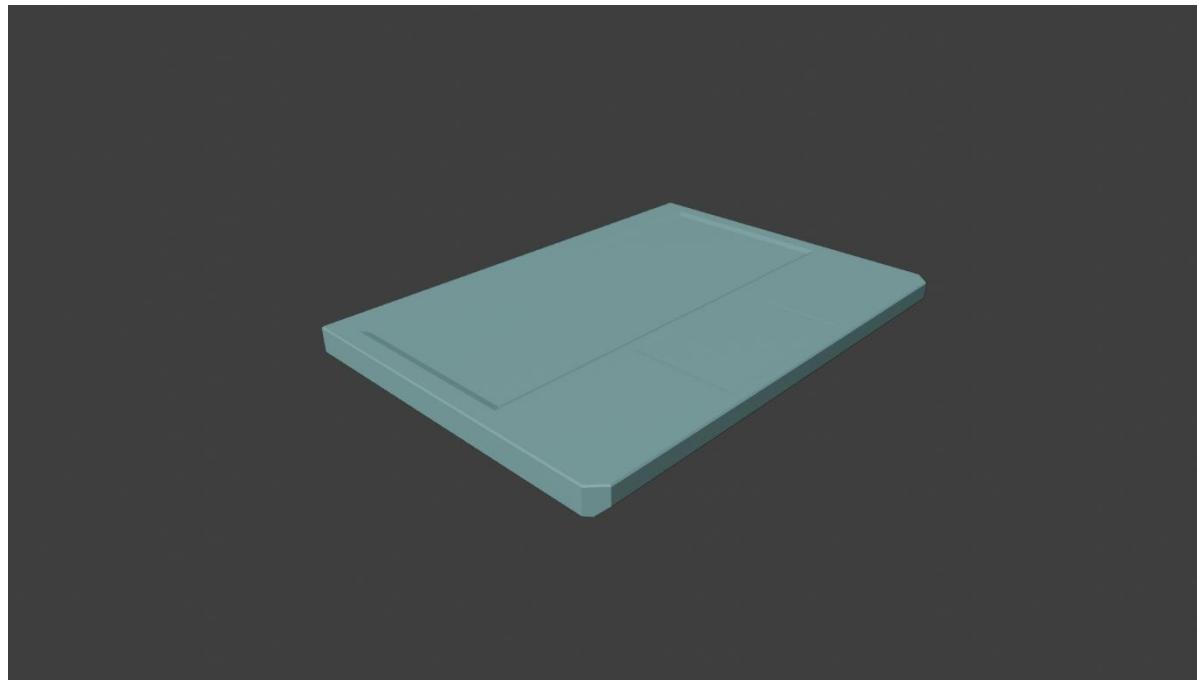
After re-adjusting my whole scene to be correctly scaled, I then worked on modelling a monitor, I looked the model I had and got the dimensions for it, I scaled the monitor as accurately as possible:

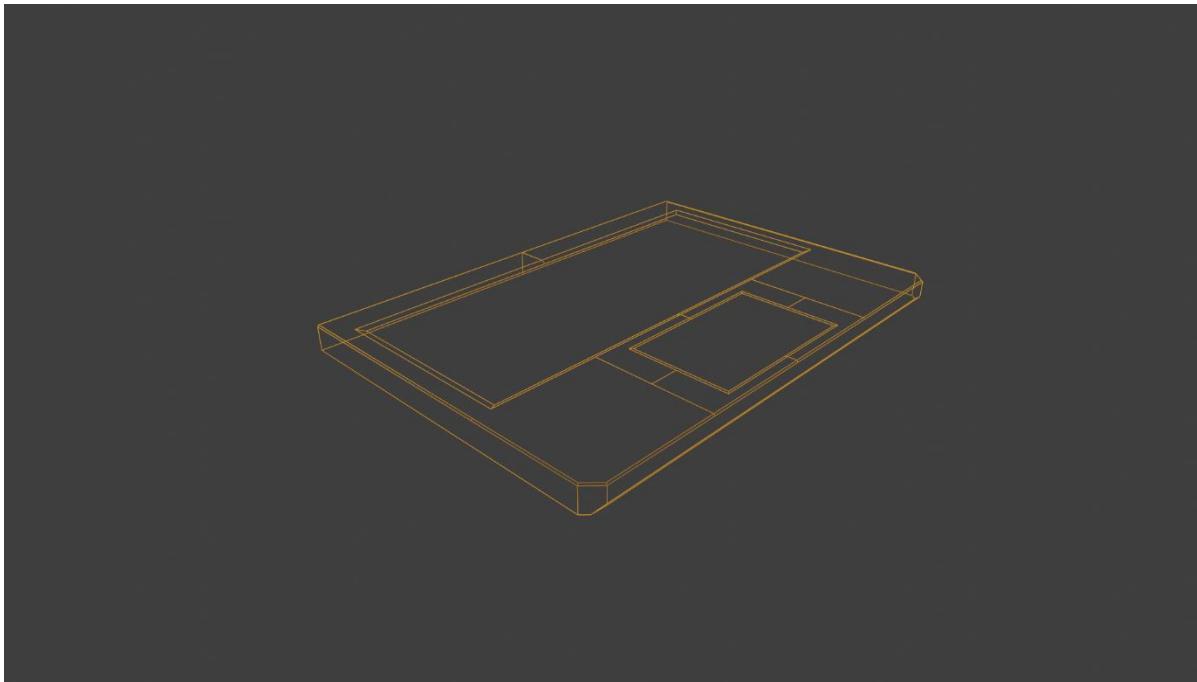




I am happy with how this turned out, I do believe it could use some small re-works in the future.

I also began to model my laptop:



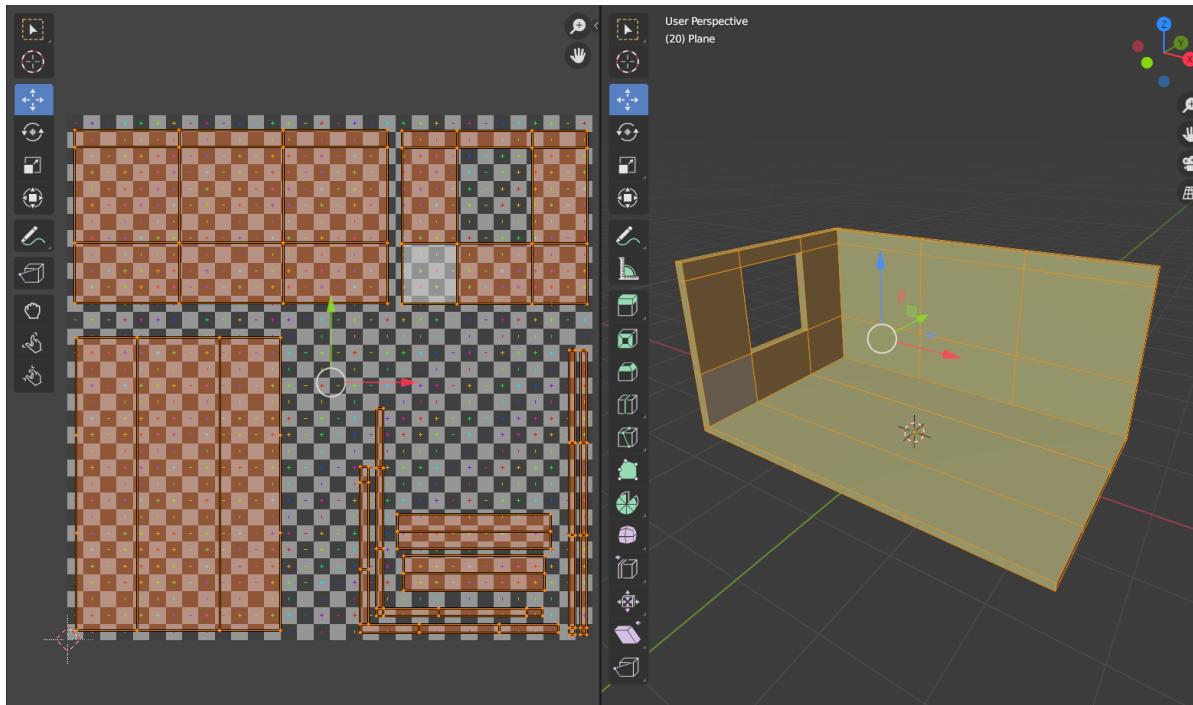


I didn't get the screen done as I felt I was approaching this wrong, I was going too detailed, even though in the final render it won't really be that noticeable, it's more to just fill in some space, so I will be re-modelling this to make it a bit simpler.

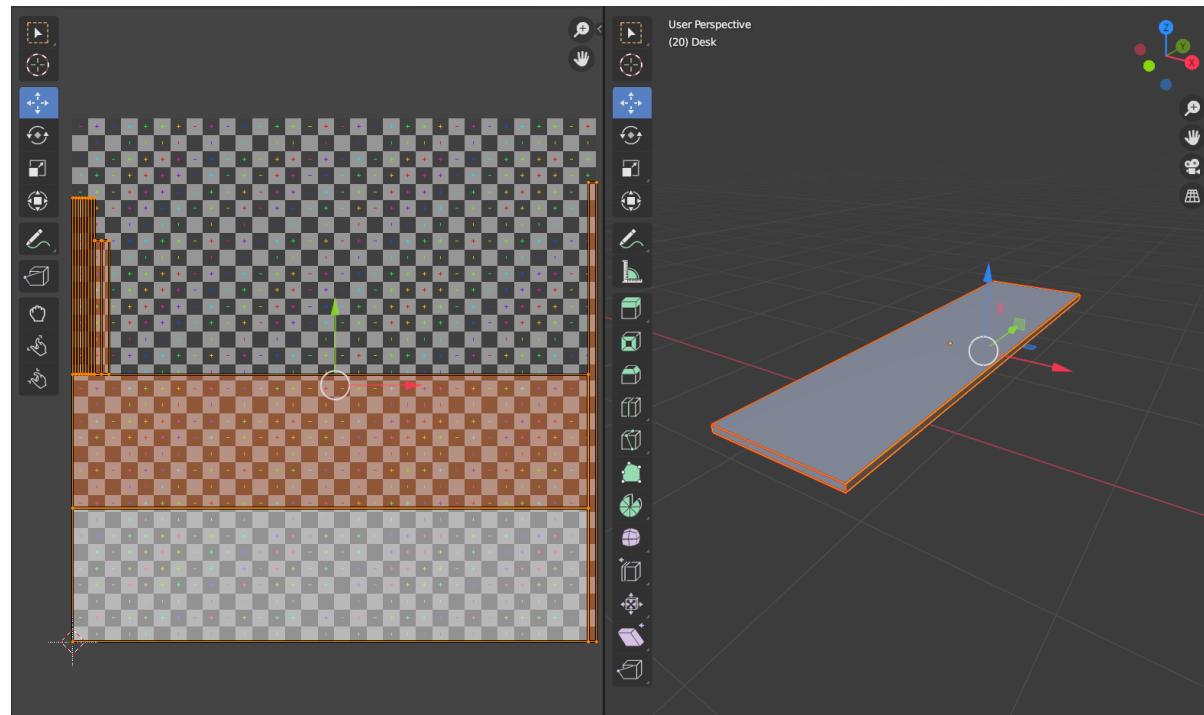
UV-Unwrapping

My knowledge in uv-unwrapping is not very good, I have not worked with it much in the past years, I know it is very tedious and annoying to do. I have a lot of learning to do, It will mostly be learning as I go along though, I think the best way for me to improve with it is to just do it and iterate as I go along.

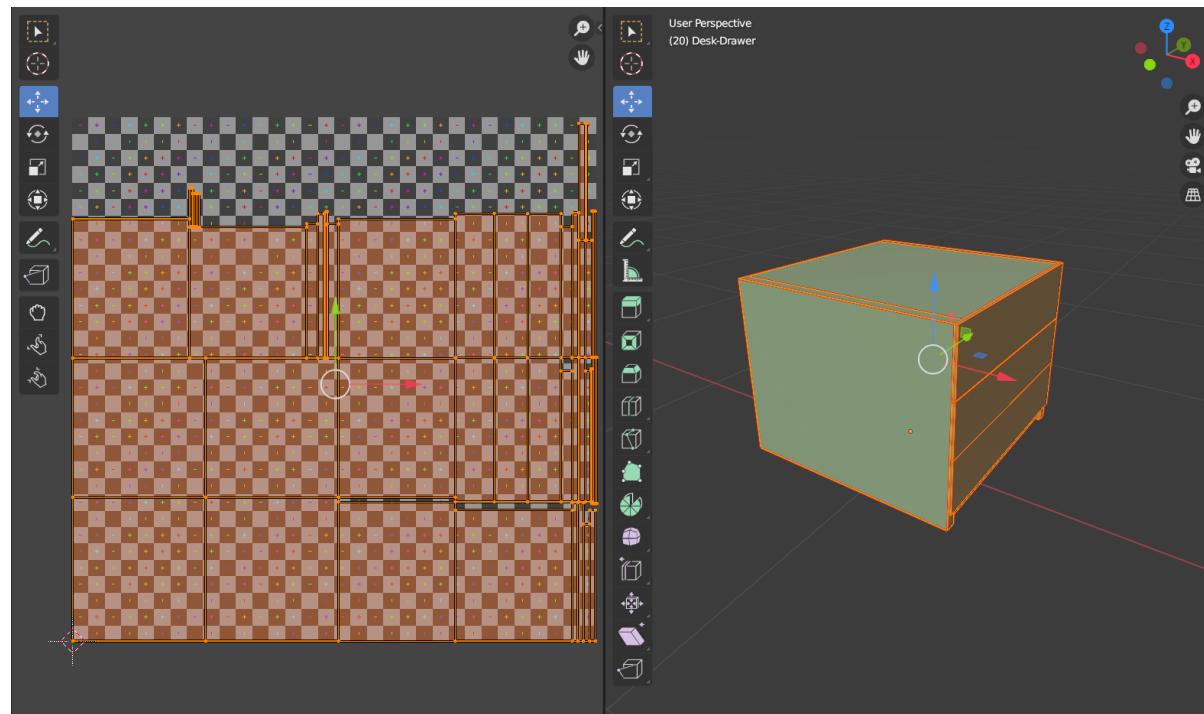
Room UV:



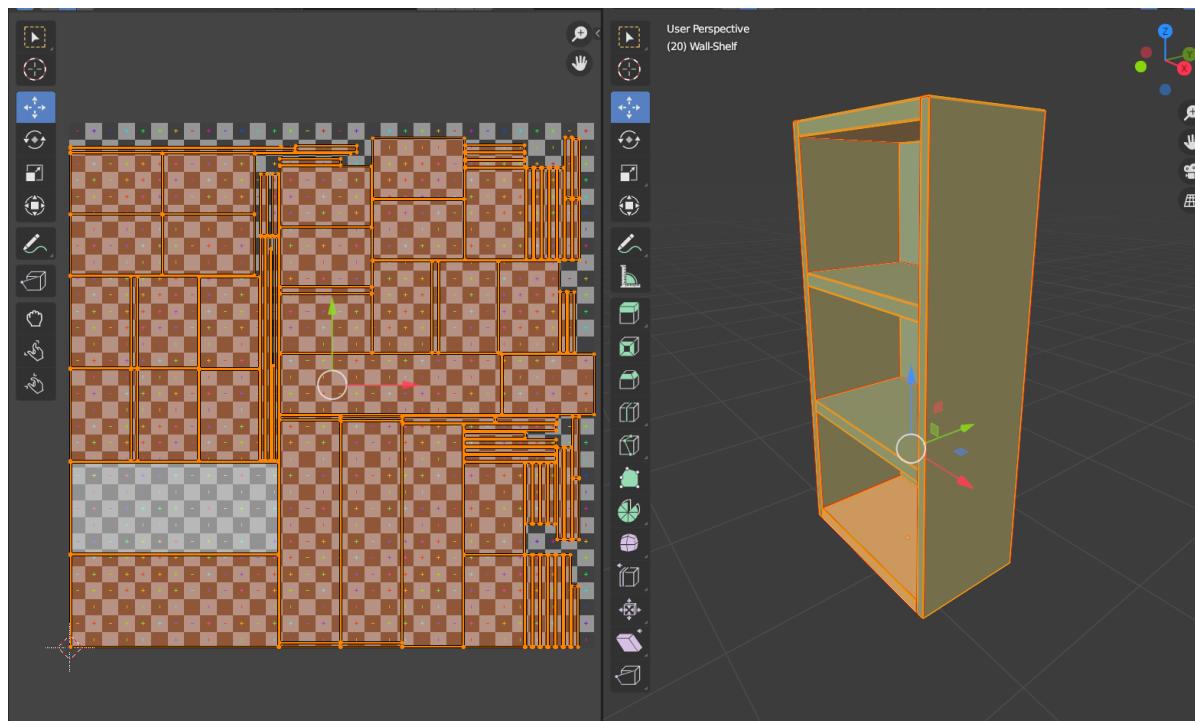
Desk UV:



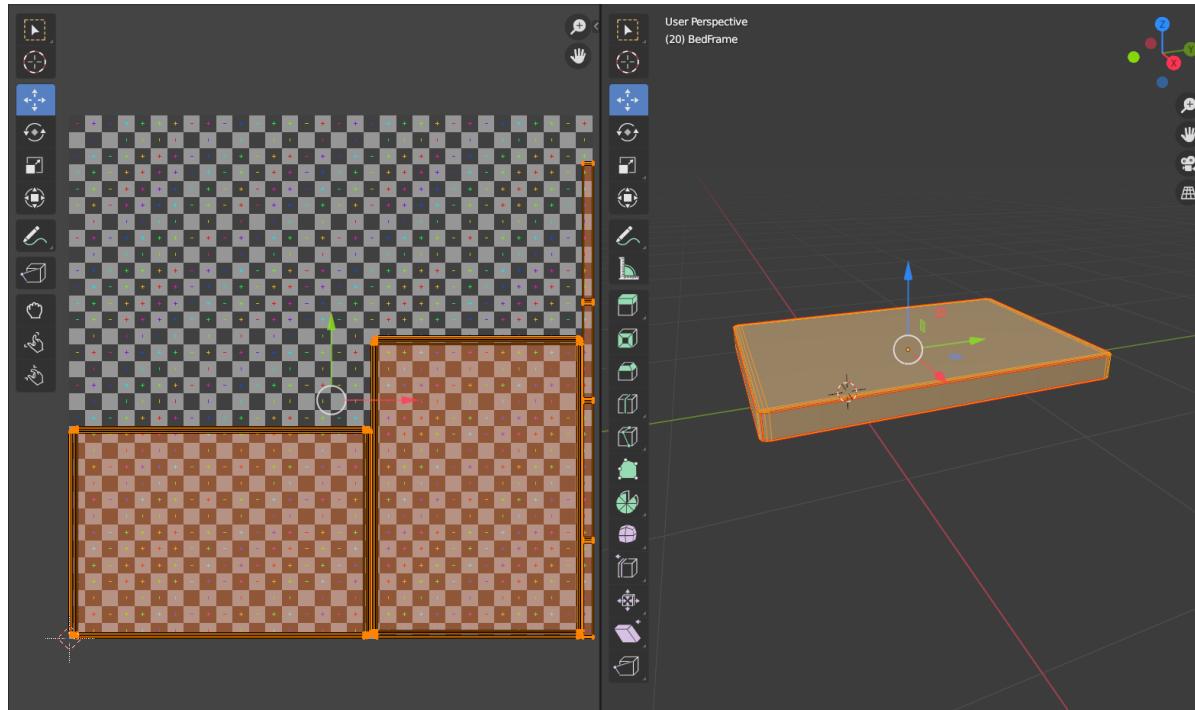
Drawer UV:



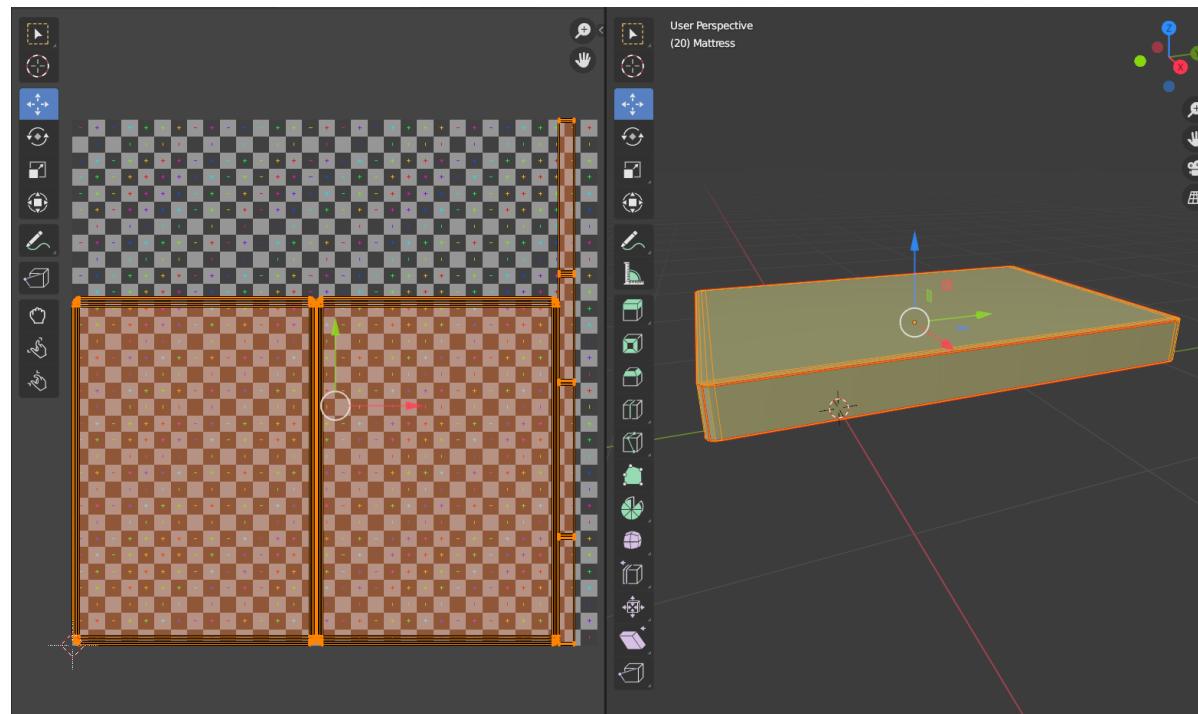
Wall-shelf UV:



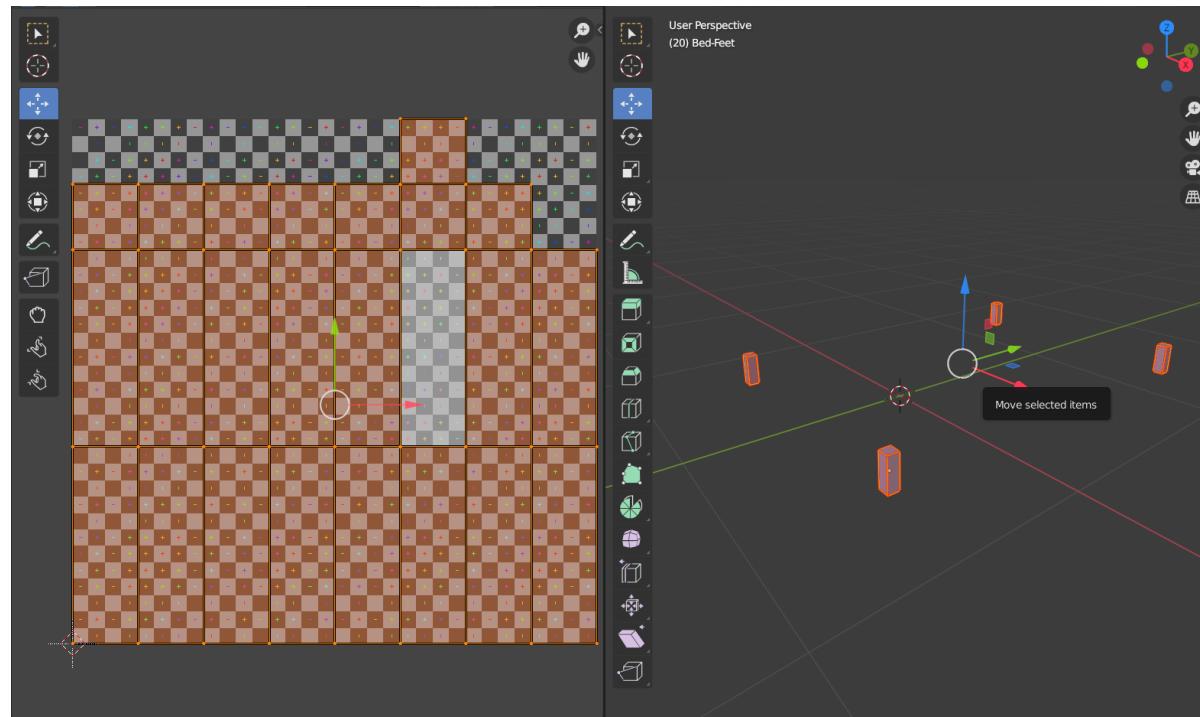
Mattress Base UV:



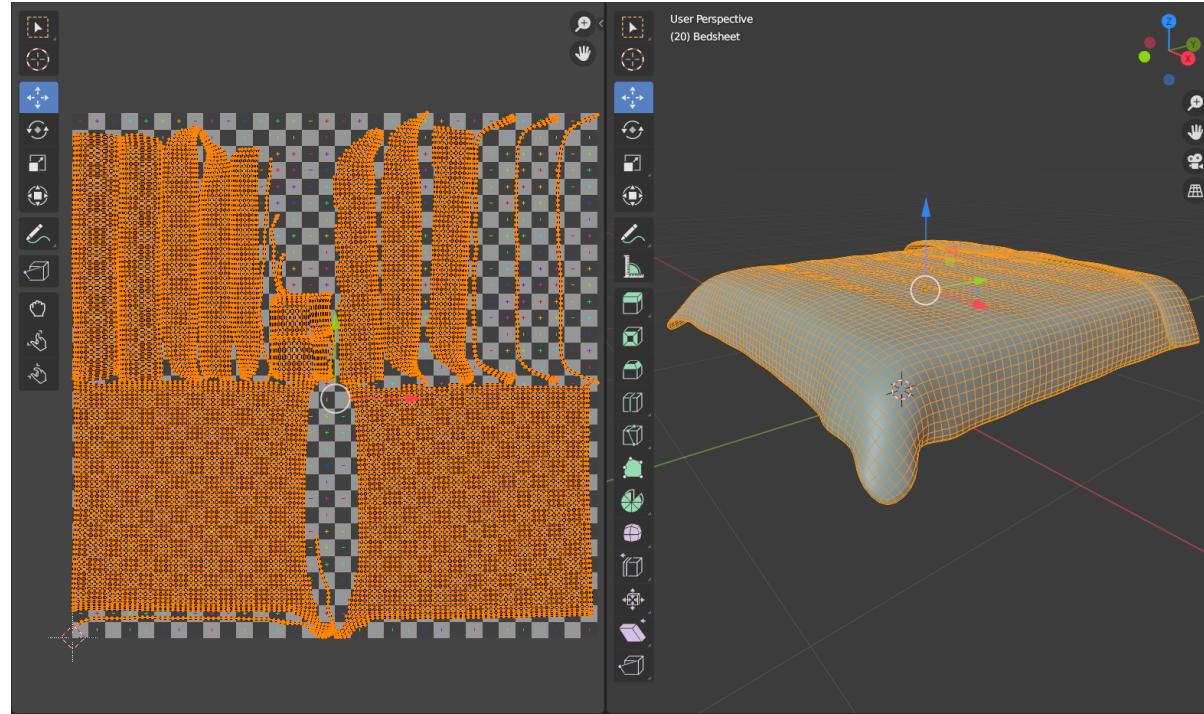
Mattress UV:



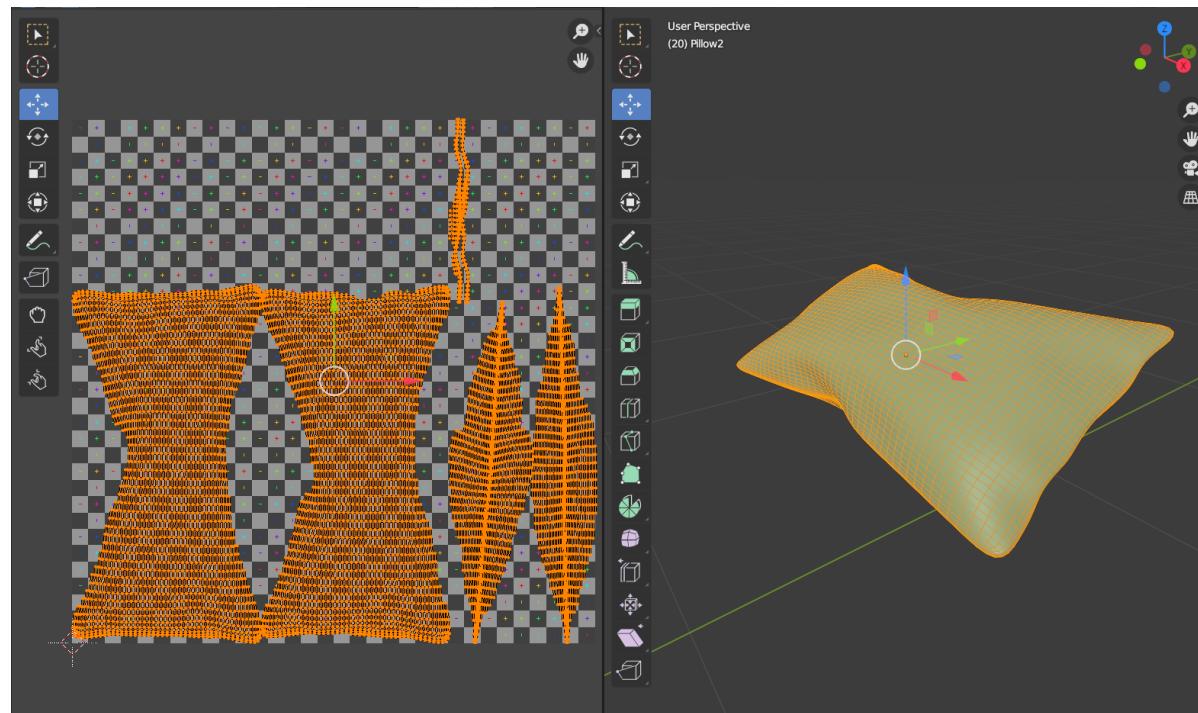
Bed-Feet UV:



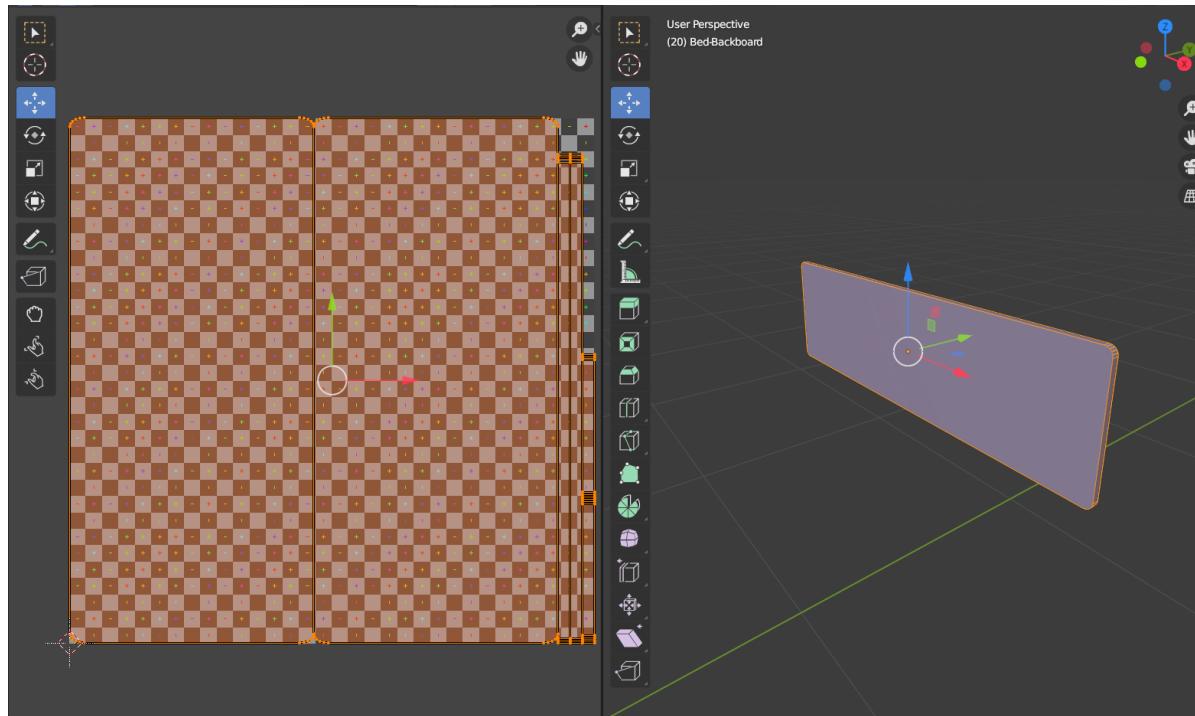
Bedsheet UV:



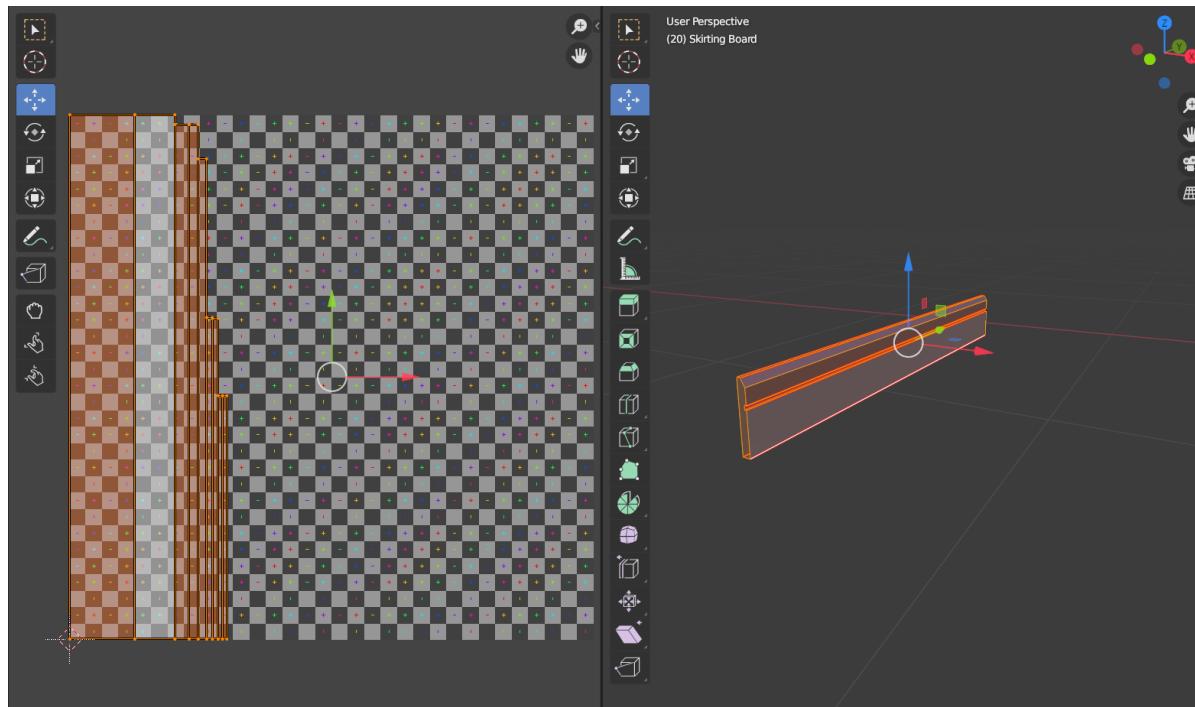
Pillow UV:

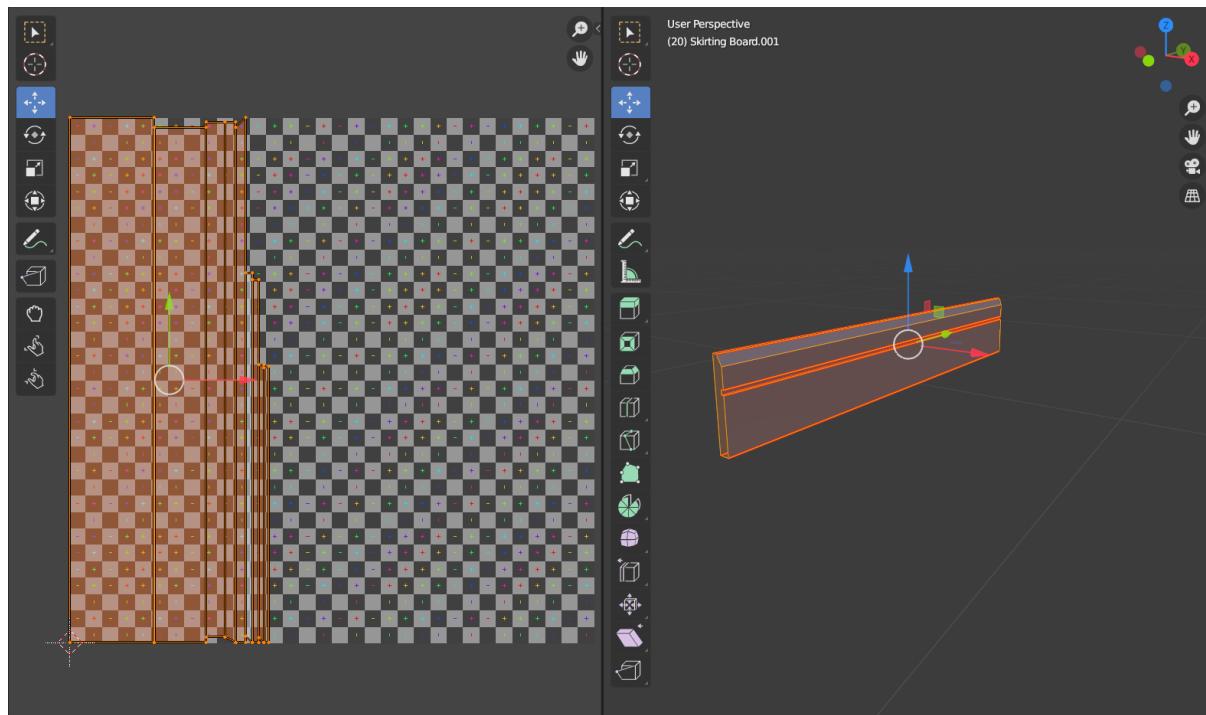


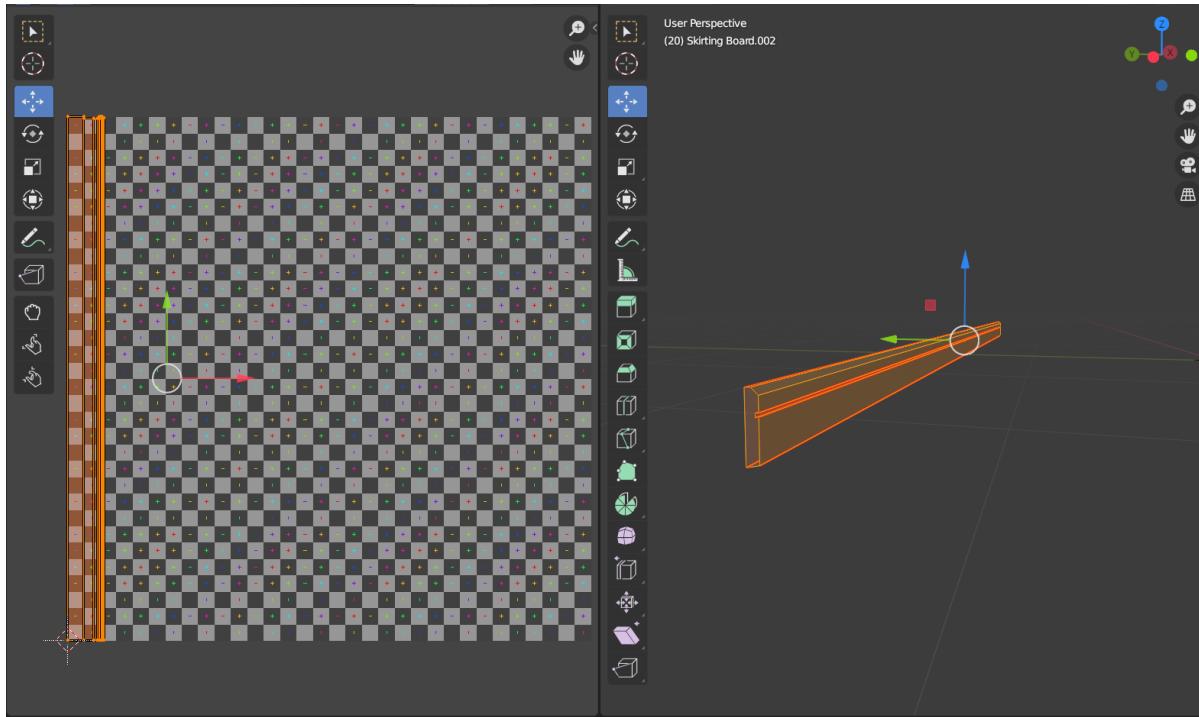
Backboard UV:



Skirting UV:







I can see a few issues with the skirting alone, The density is wrong from piece to piece, I am not sure how to fix this at the moment so I will have to look into it more.

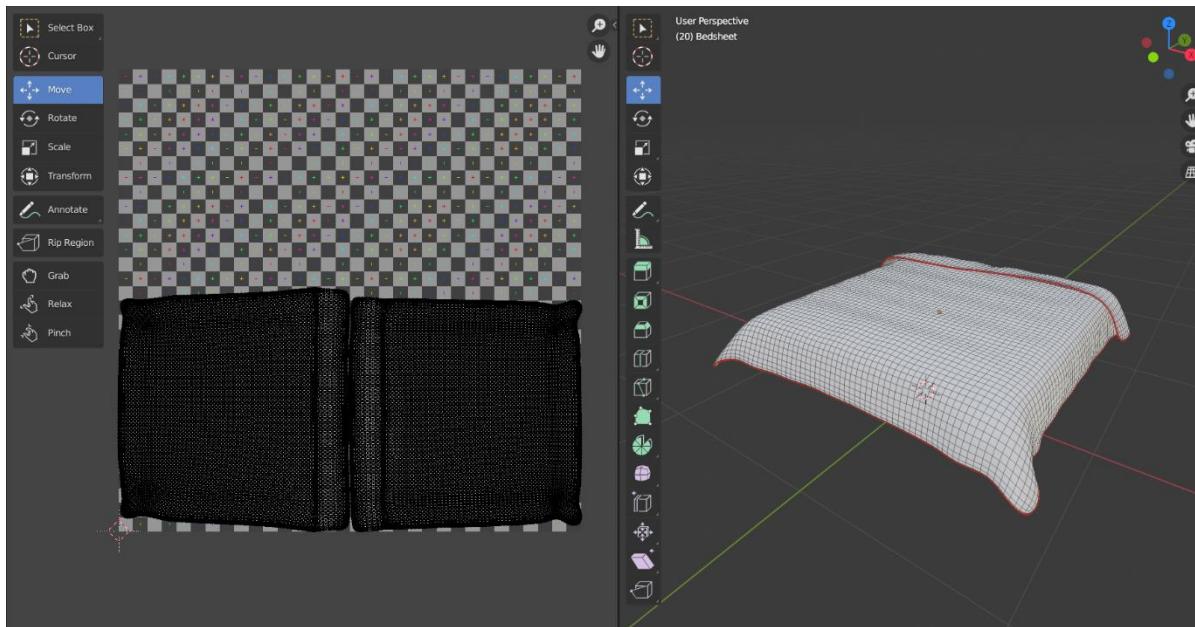
Overall, there are some objects that need to be re-wrapped, as I can see a few issues being caused later on when texturing.

UV-Unwrapping Improvements

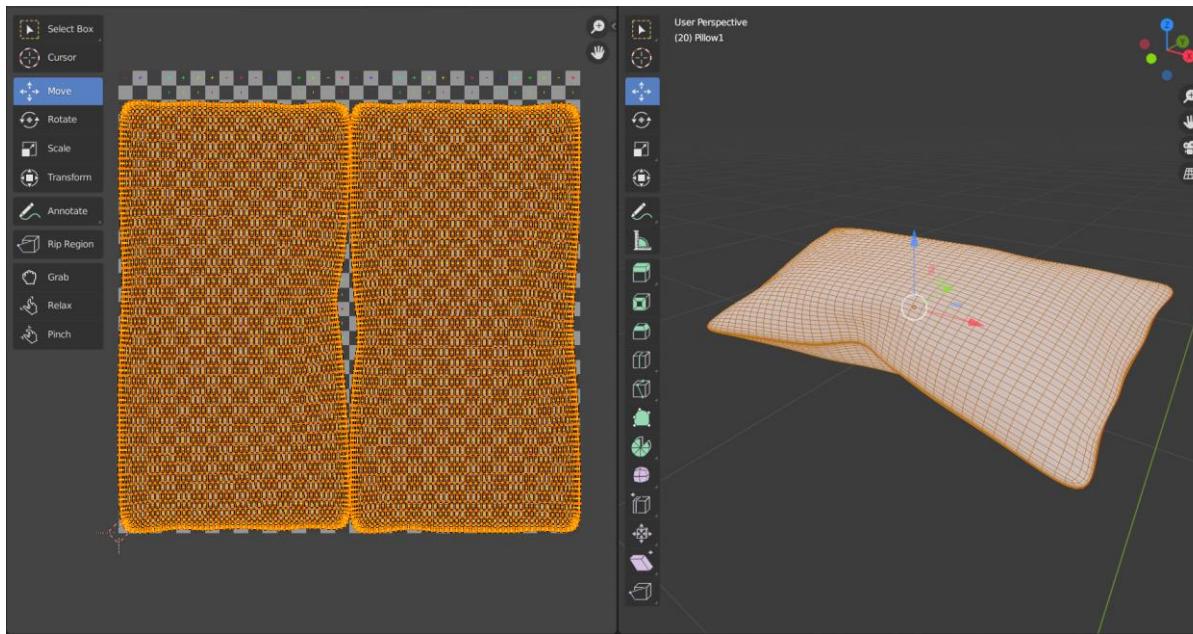
I spent came back to the un-wrapping and re-worked some objects and their maps to make them more readable.

Bedsheet UV:

I applied seam around the edge of the bedsheet, as in real-life both sides are seamed and different, when I unwrapped it this way, I just got 2 faces, which worked pretty well compared the last unwrap.



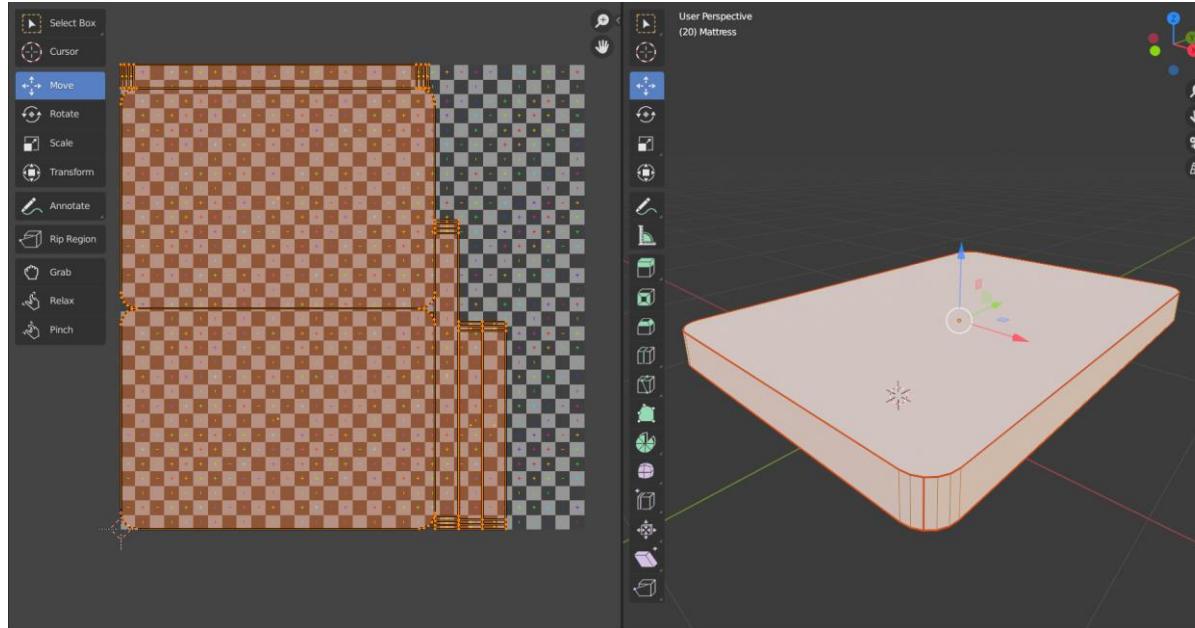
Pillow UV:



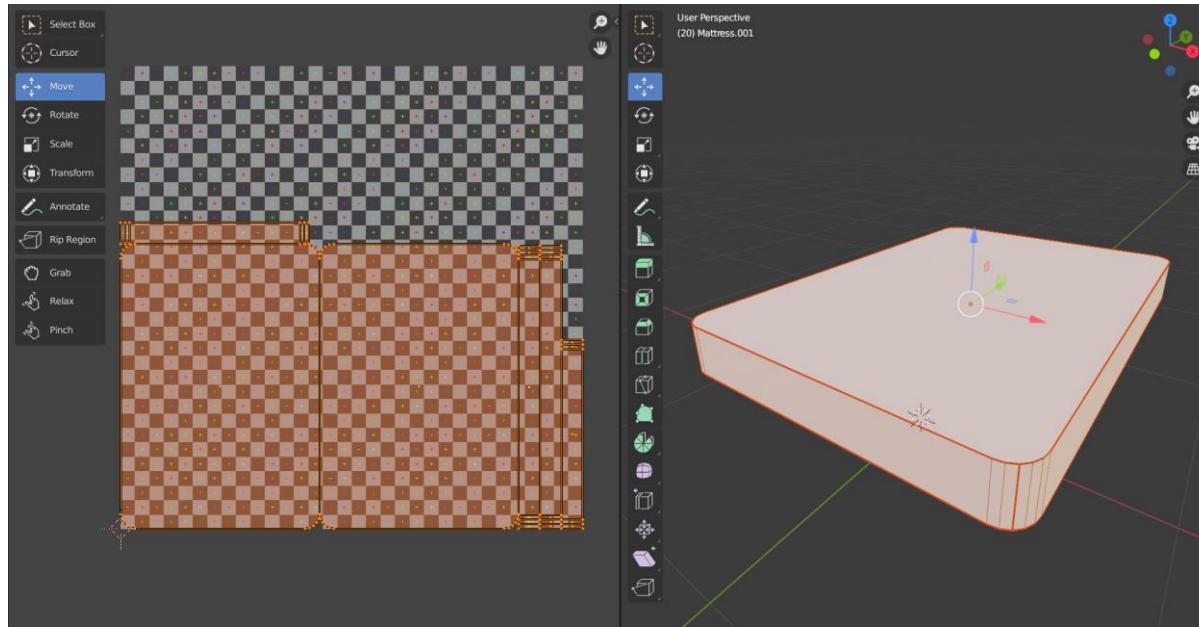
I reworked the pillow just how I did the bedsheets, by applying a seam around the middle edge and unwrapping it, once again it makes sense to do it this way as pillows also have a visible seam around the middle where the material meets.

I re-modelled my mattress base and mattress objects, just like the backboard, the bevel was incorrect, so I modelled it from scratch, it did not take long to do, I then uv-unwrapped them again, the layouts are slightly different in the 1:1 UV space due to the slight height difference between them.

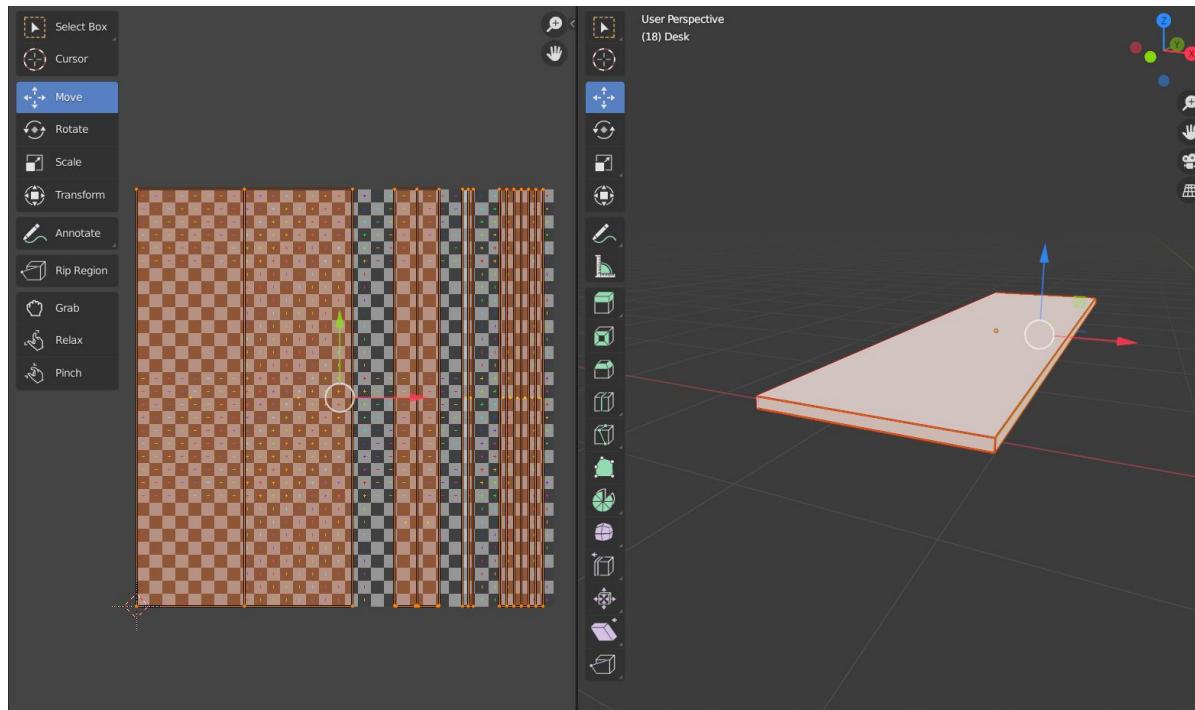
Mattress Base UV:



Mattress UV:

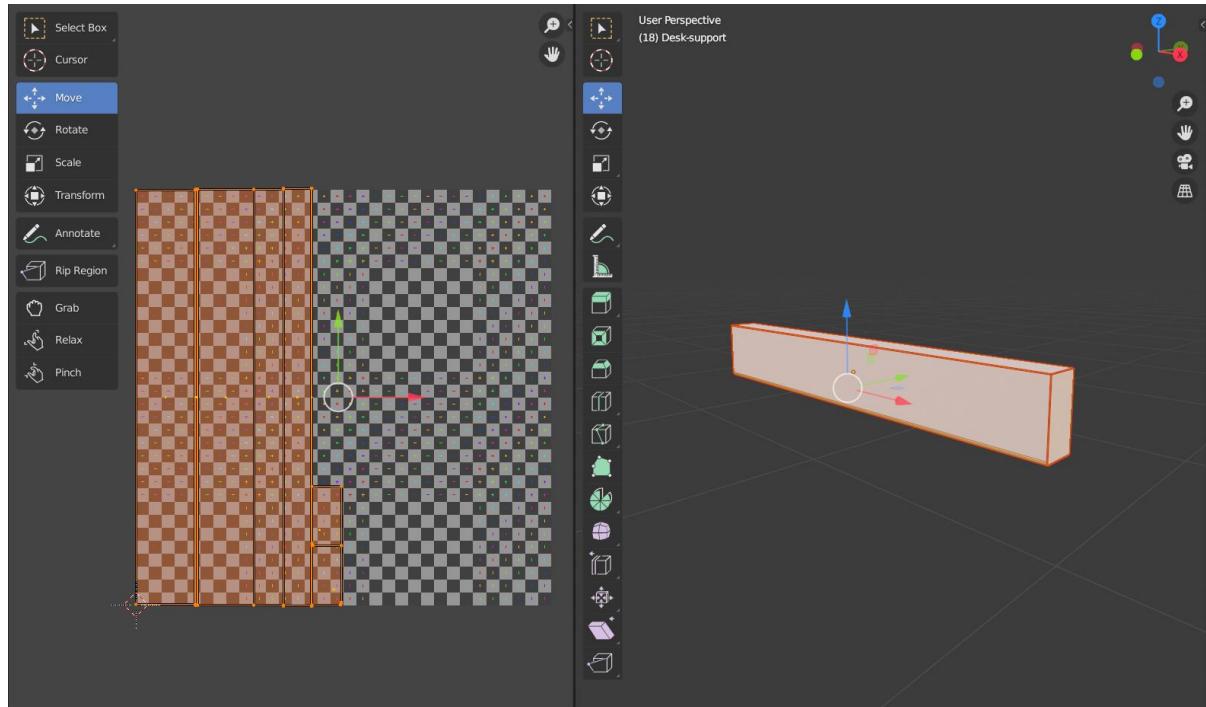


Desk UV:



I applied a few seams around the desk as the material does not blend over the edges, since it is artificial wood, it's applied in strips.

Desk Support UV:



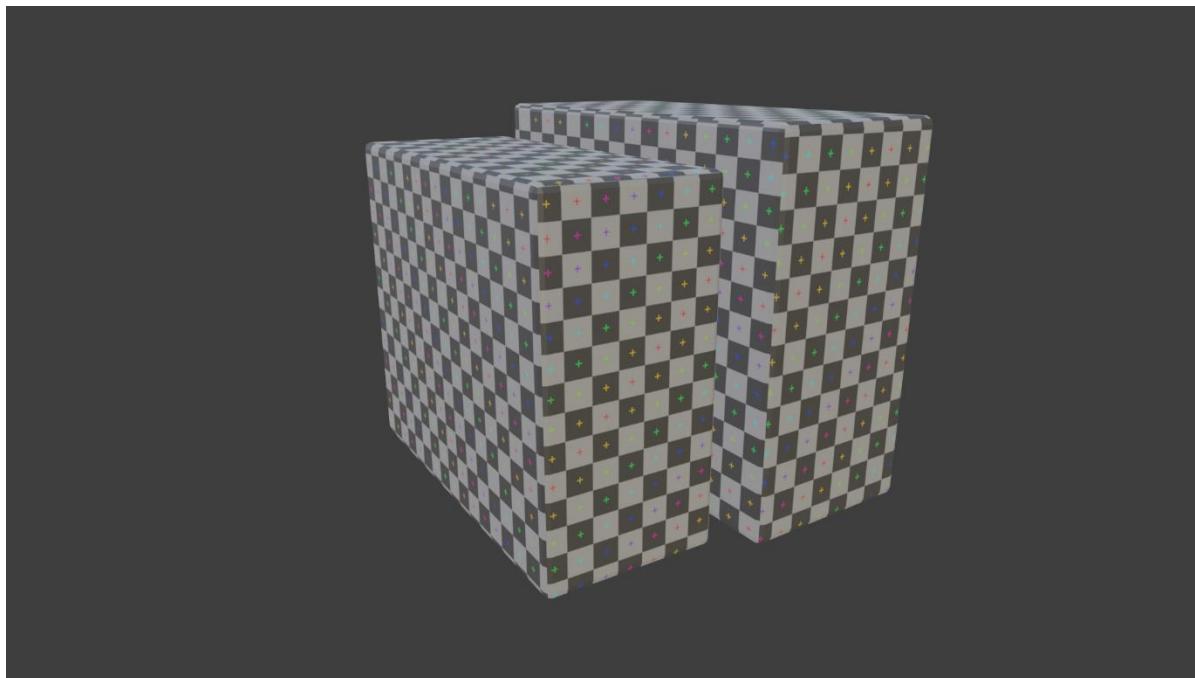
I forgot to originally unwrap this object, I applied seams again and did an unwrap

Continued Development

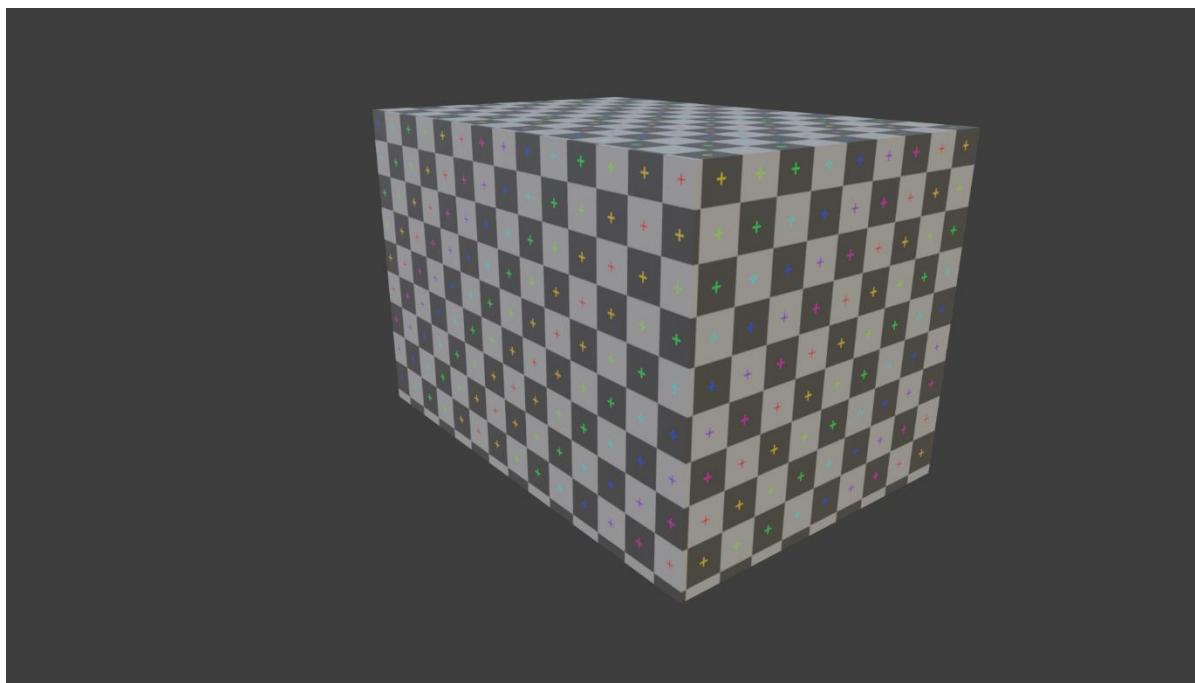
After working on UV's and learning a few new things whilst doing it, like seams and what their use is, as well as packing the uv space, it took some time, but I know a little more than I did before, I have still to improve as they are not perfect unwraps but that is how the learning process goes.

I then modelled some simple boxes and applied a checker texture so I can see in the 3D view how they look unwrapped.

These boxes have a simple bevel on them as they are larger and more prominent in the scene, I also plan to take these into substance painter to practice with, as I have never used that program before, so I want to start simple.



This box will sit up on the shelf, but since it is smaller and less prominent, I did not bevel, this will also help with substance painter when I get to that.



I went back to my monitor and re-modelled it as well:

I used a reference image directly from the site to model with, it was helpful getting the size I wanted. Since I used an inset as the back face, I created angled edges so I used the knife tool to add new edges so I can get rid of these edges:

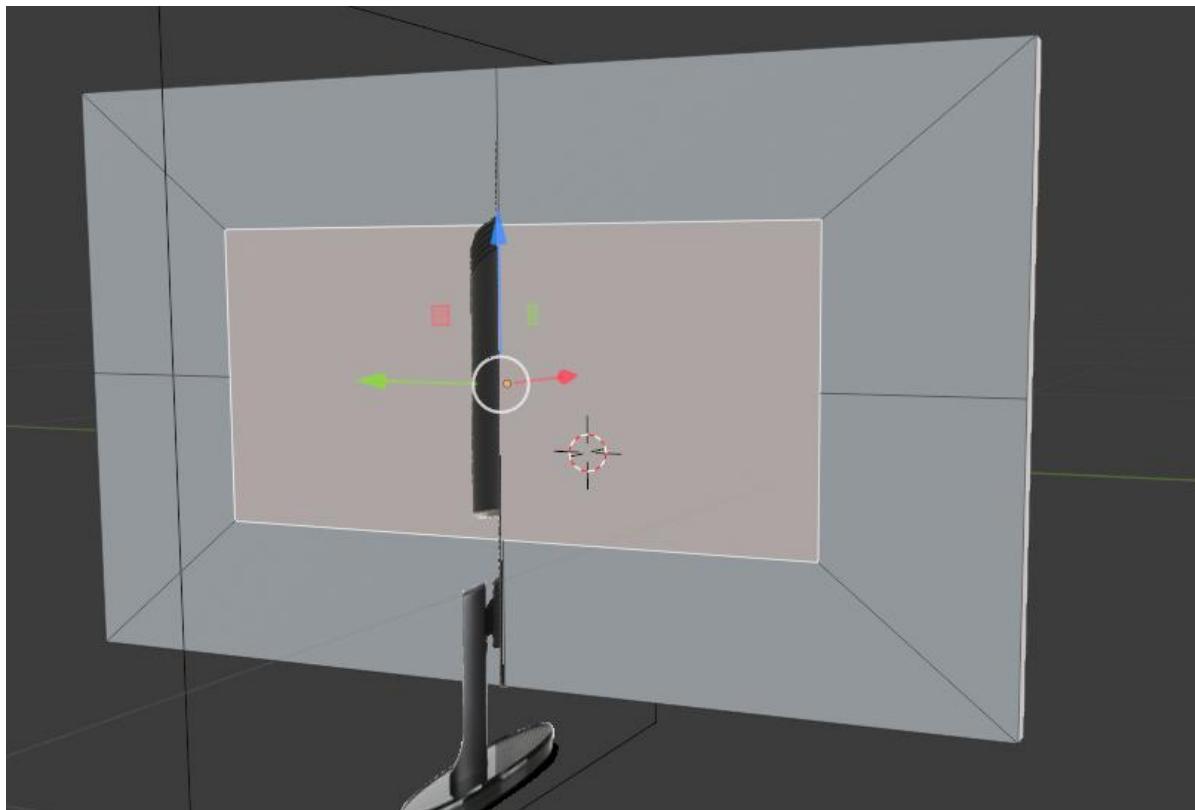
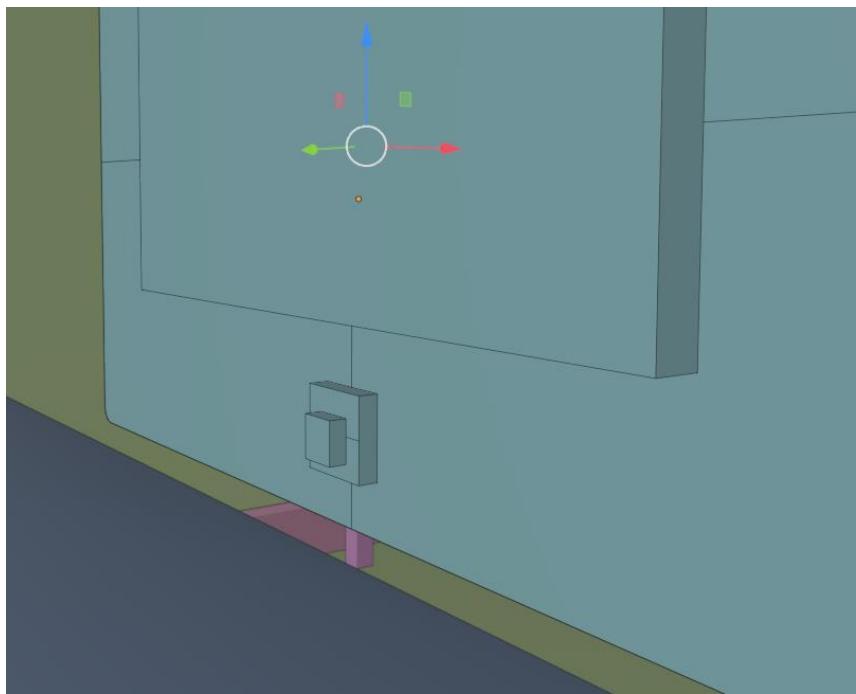
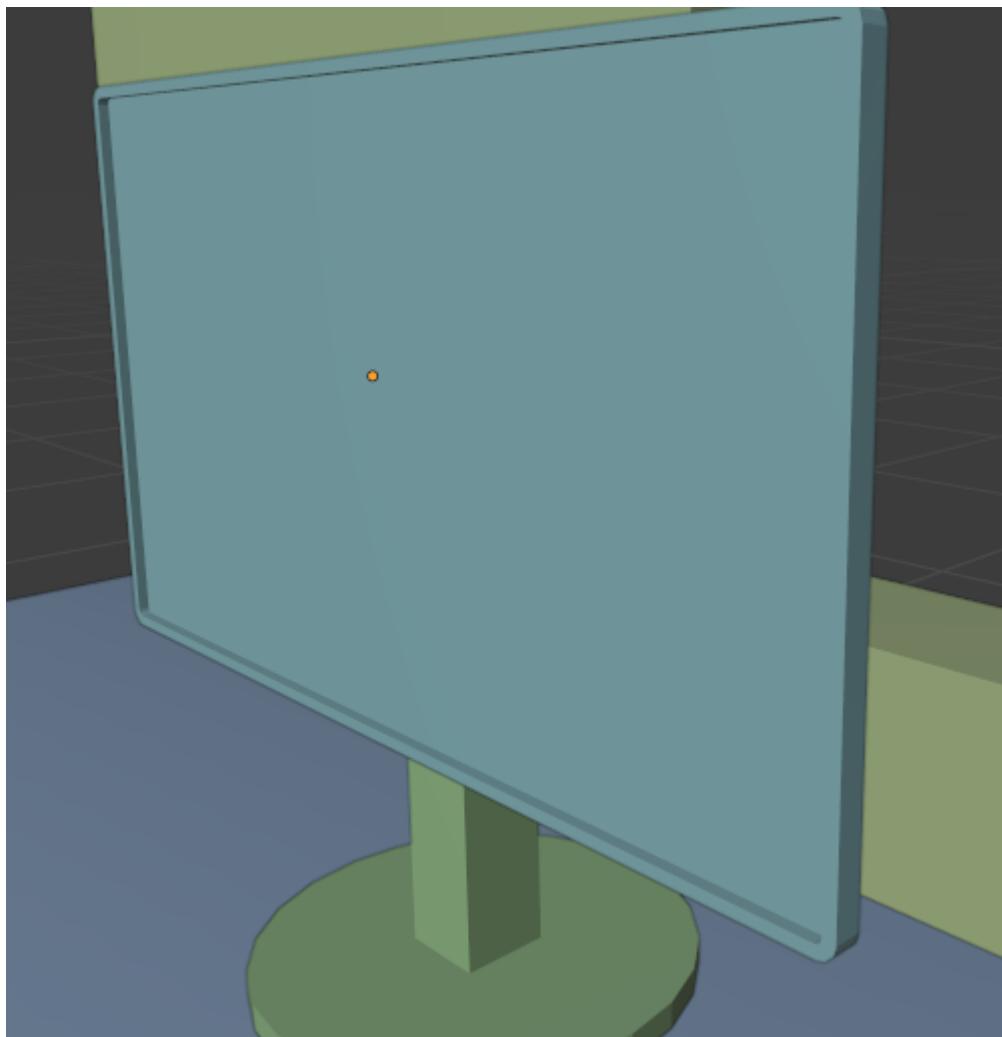


Image used: <https://www.acer.com/ac/en/GB/content/model/UM.WW3EE.001>

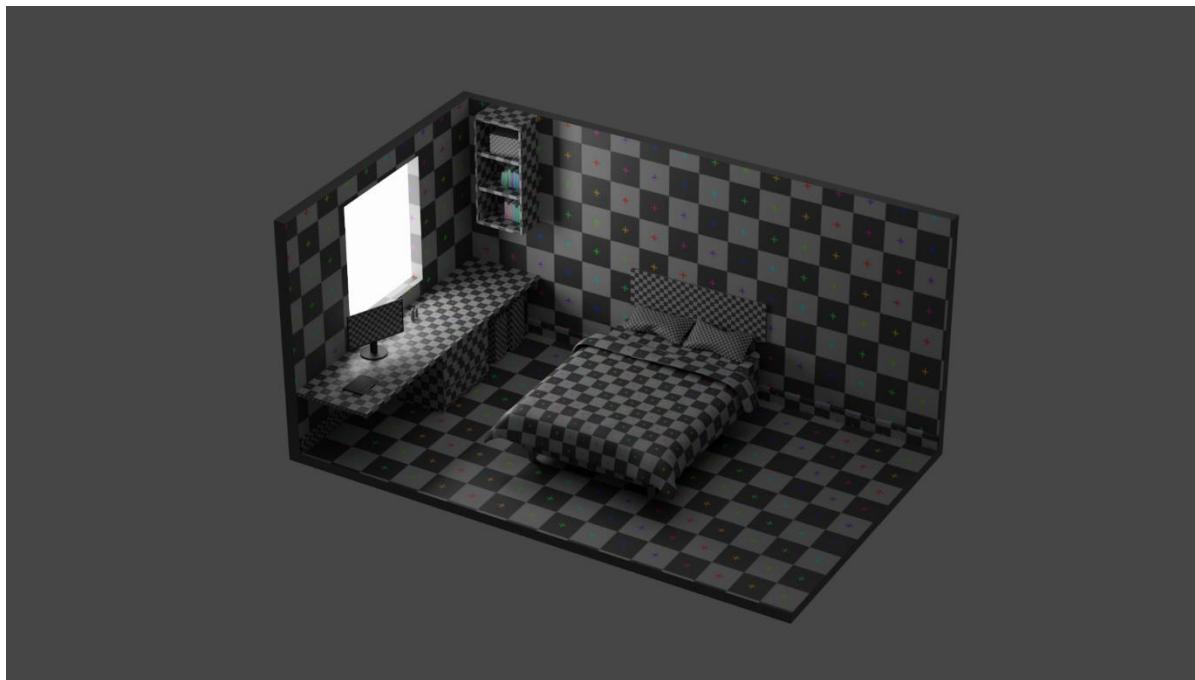




The same applies to the front of the monitor, I inset the face to create the monitor frame.

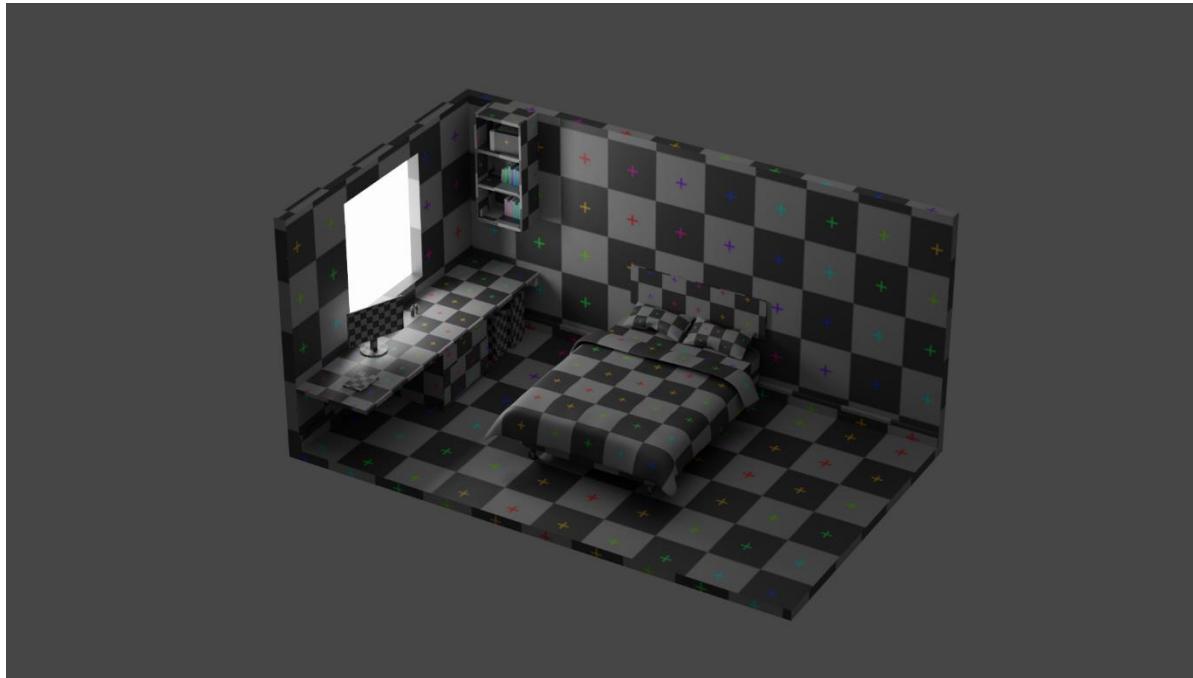
I then learned that my Texel density was wrong throughout the scene, I got feedback on this from a classmate who helped explain it to me and ways to resolve it.

Before:



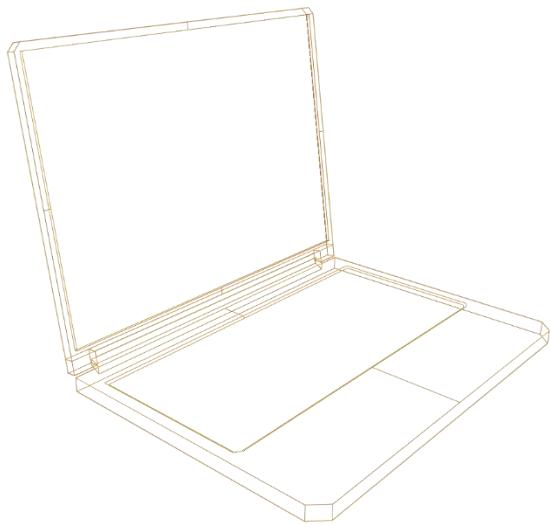
After Texel Density rework:

I am a lot happier with how it looks now, the UV's being equal across most objects, some smaller objects have a larger density for more detailing such as the boxes.



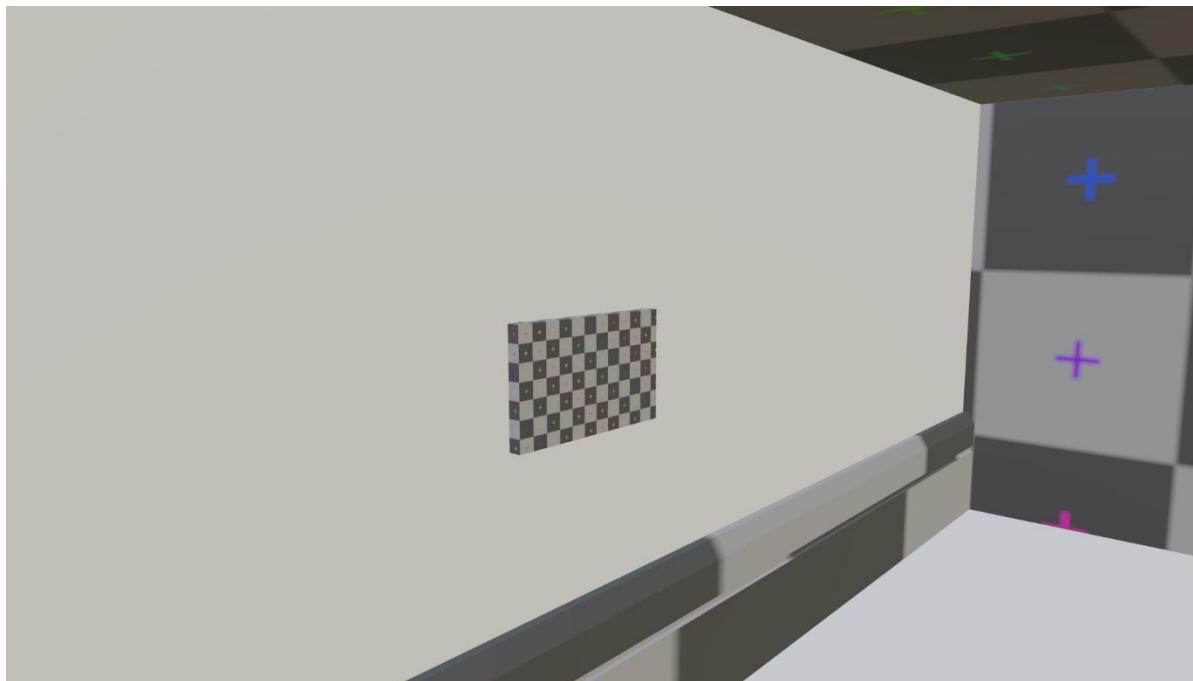
I then went back and re-modelled the laptop:



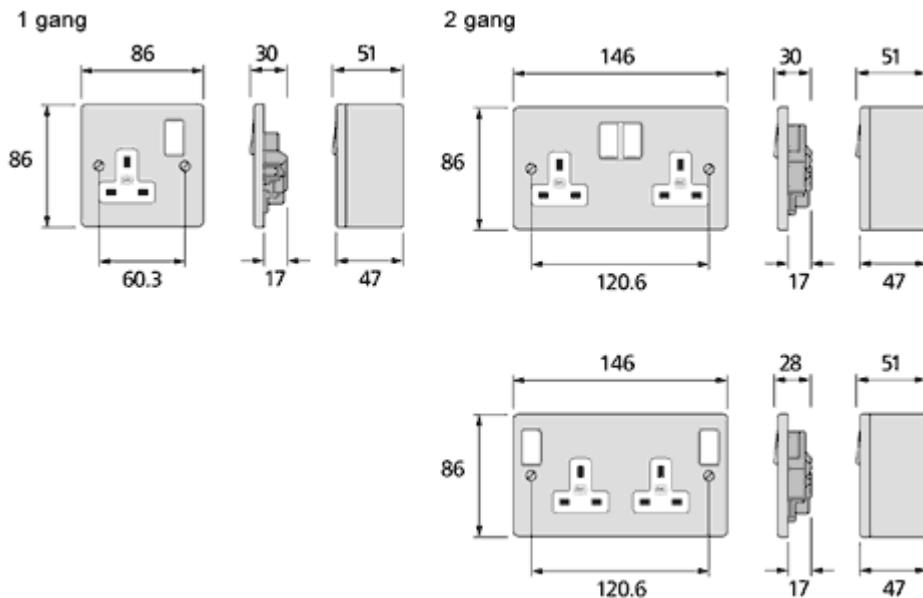


This laptop model has 43 Faces and 150 Triangles. I like the end result of this laptop, it is a lot simpler, but it fits in well enough the way it is.

Another small object I thought would add to the room is a wall-socket:



It is a simple cube just scaled down; I once again used a reference image to dial the sizes in:



I then modelled a simple window frame:



Texture Creation

Substance Designer:

Wood:

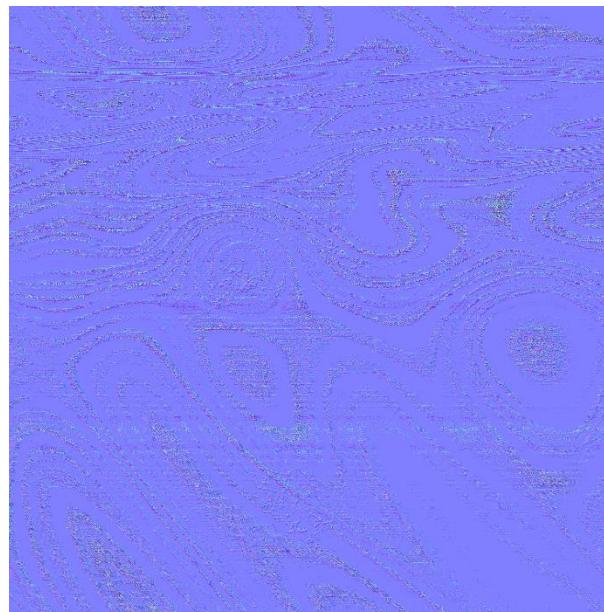
For this material, I was creating it for the objects in my room such as desk, drawer, shelf, and backboard.

Maps:

Base Colour:



Normal:



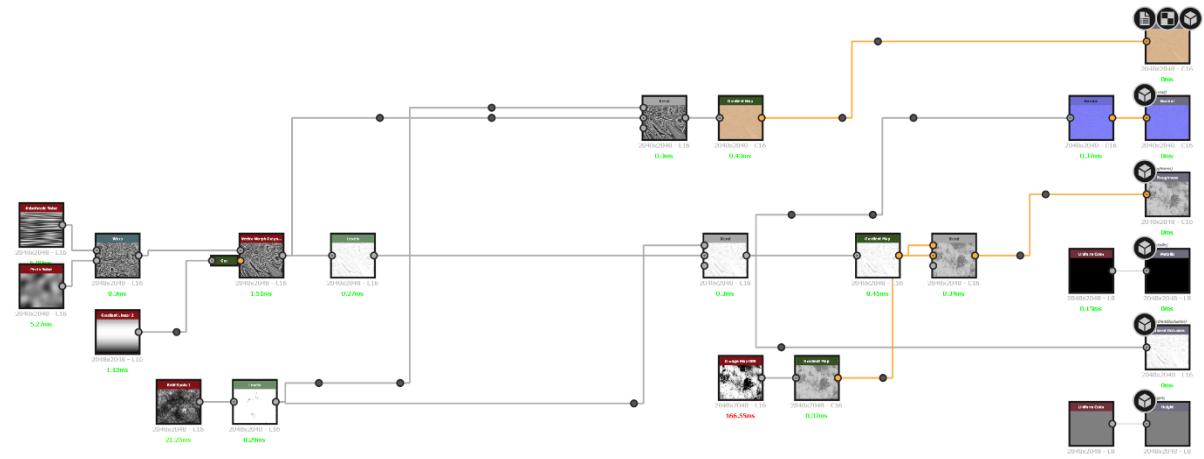
Ambient Occlusion:



Roughness:



Graph:

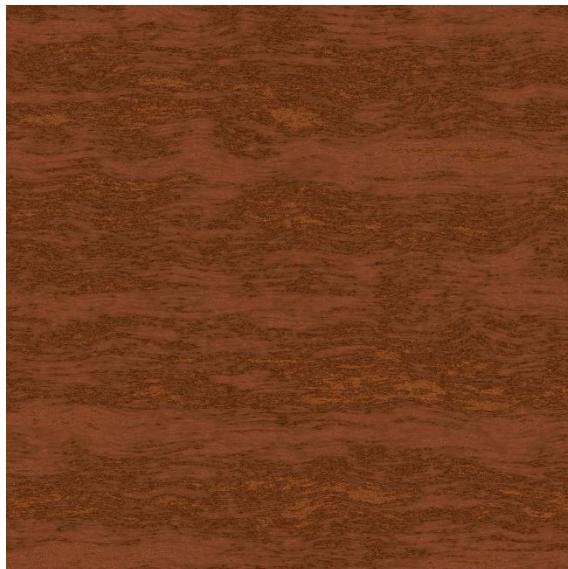


Wooden Floor:

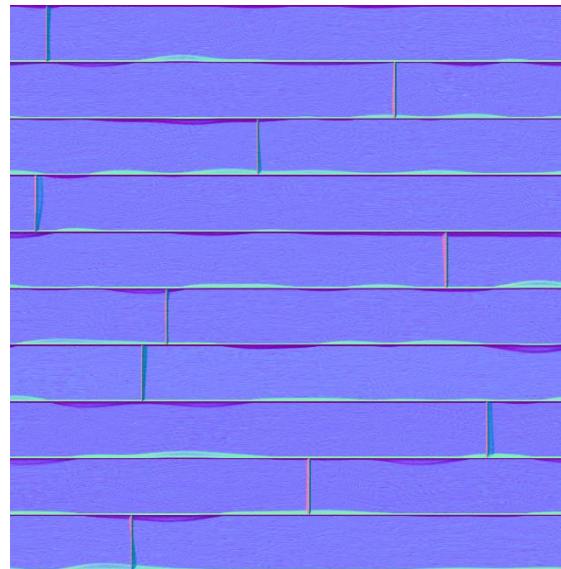
For the wooden floor, I used task 3 to create a wooden floor, I re-used this material I created and made some small adjustments to the colour:

Maps:

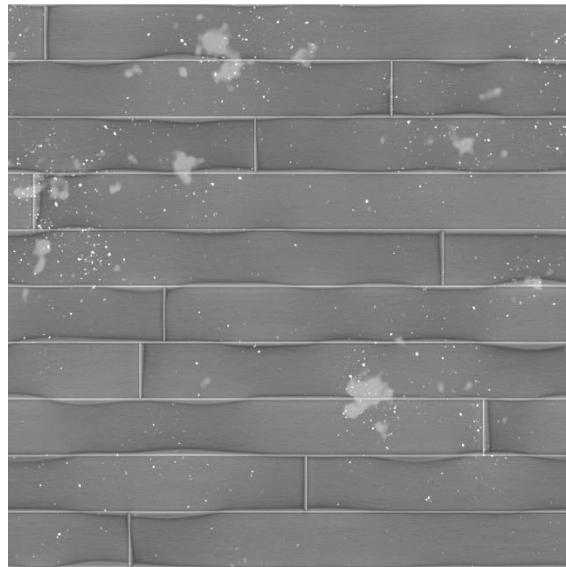
Base Colour:



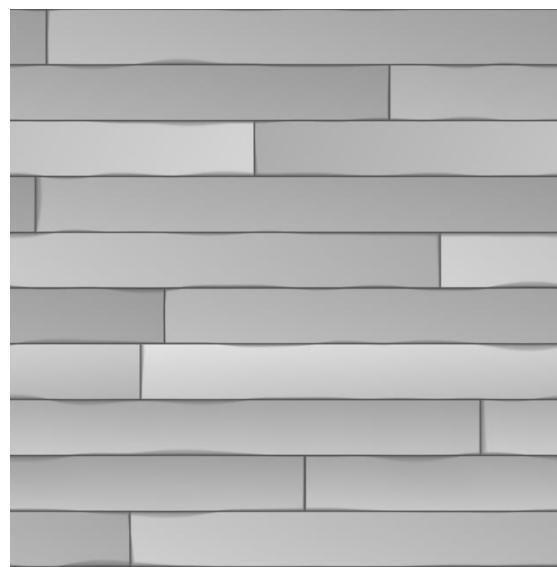
Normal:



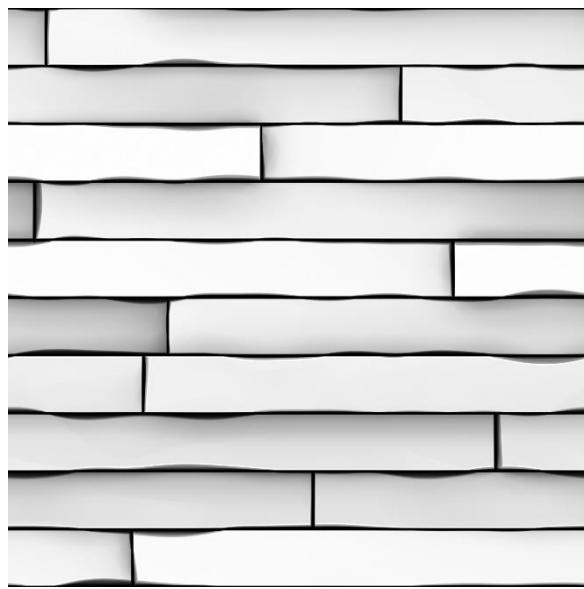
Roughness:



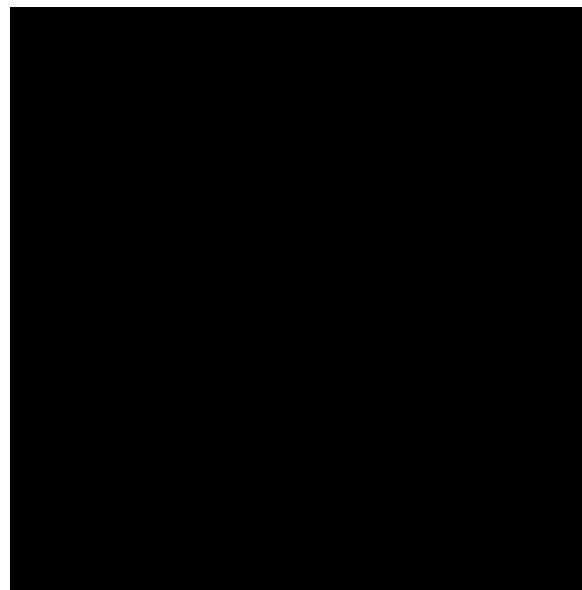
Height:



Ambient Occlusion:



Metallic:



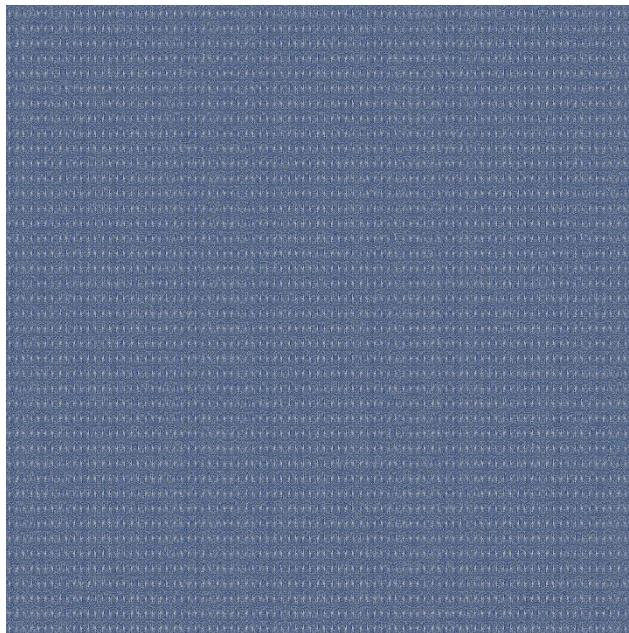
Wool Fabric:

I used a tutorial to help me create this wool fabric material that I would use on my bedsheets and pillows:

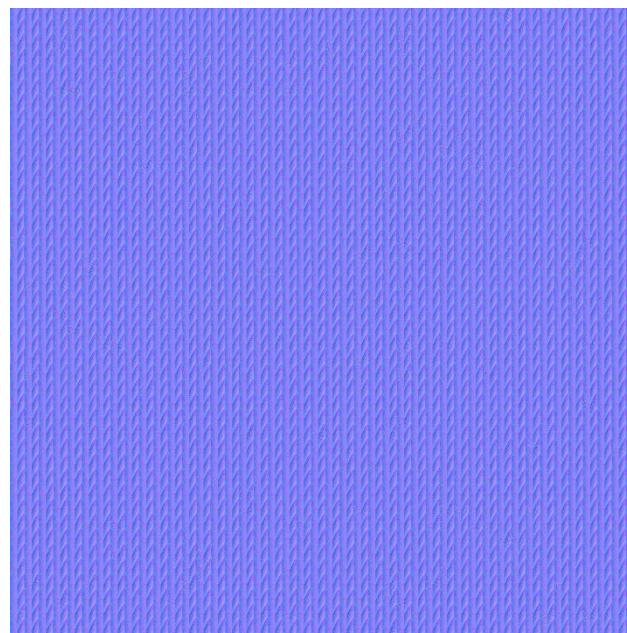
<https://youtu.be/NfqNYxD1UsM>

Maps:

Base Colour:



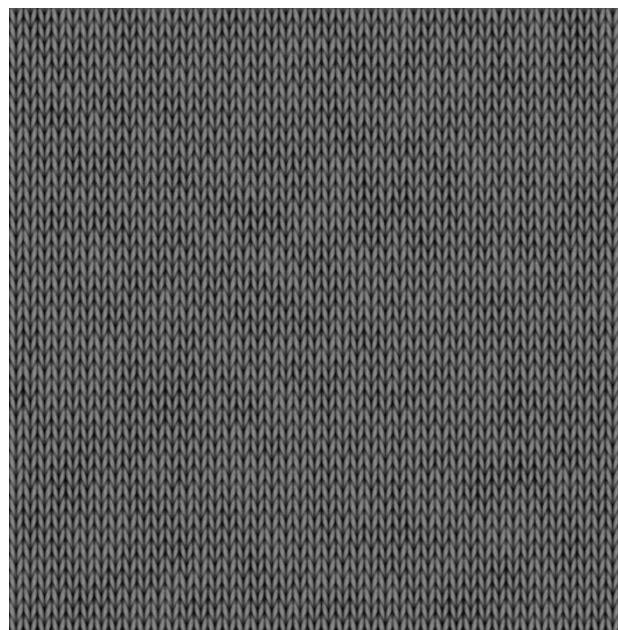
Normal:



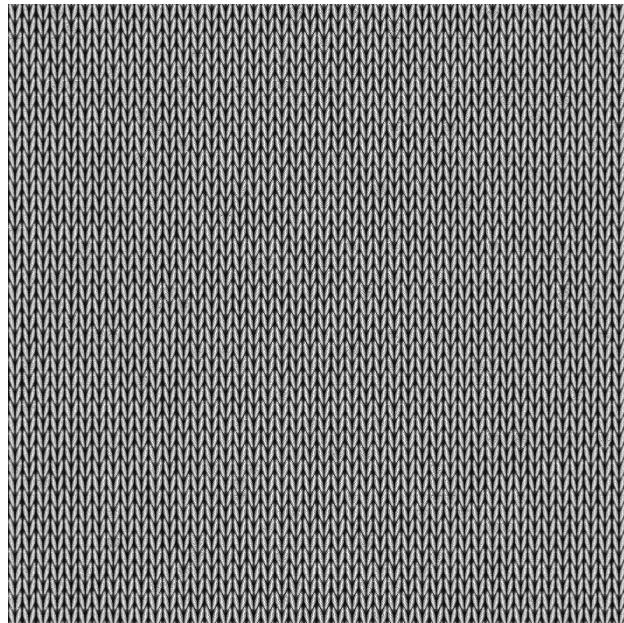
Roughness:



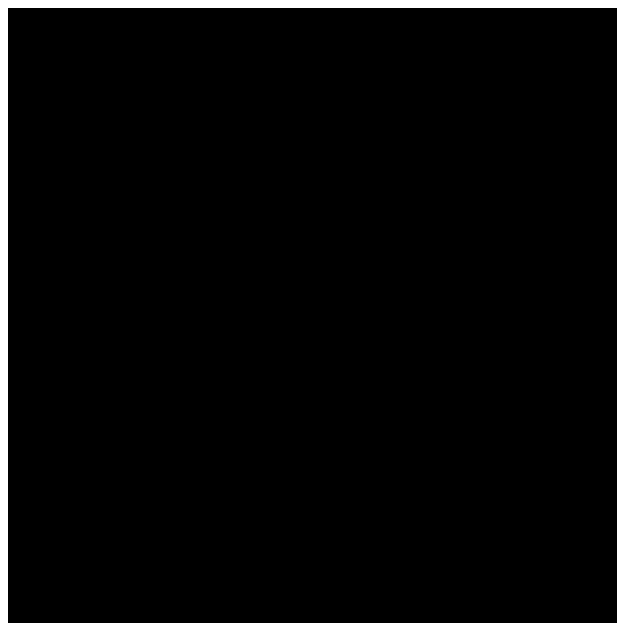
Height:



Ambient Occlusion:



Metallic:



Substance Painter:

Wall Material:

For my first-time using substance painter I did a very basic wall material, using colour and roughness, I used dirt and scratches for small detail

Base Colour:



Roughness:



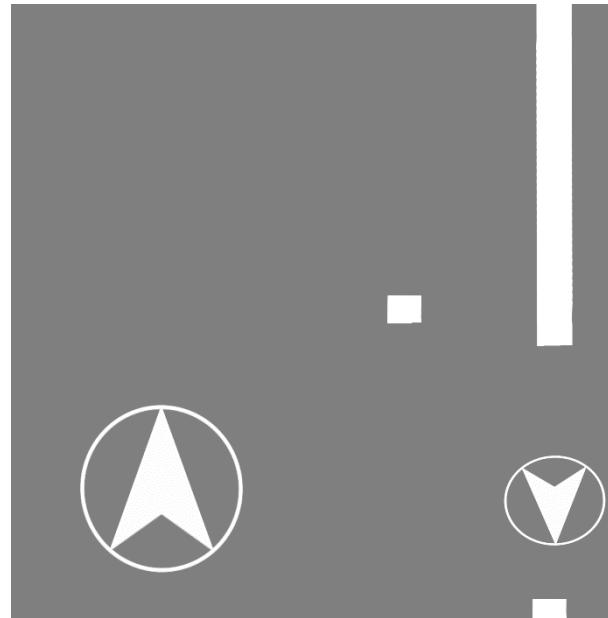
Large Box Material:

For my box materials, I used alphas for stamping to give more added detail to the materials. I used smart materials to create the ground dirt and edge ware.

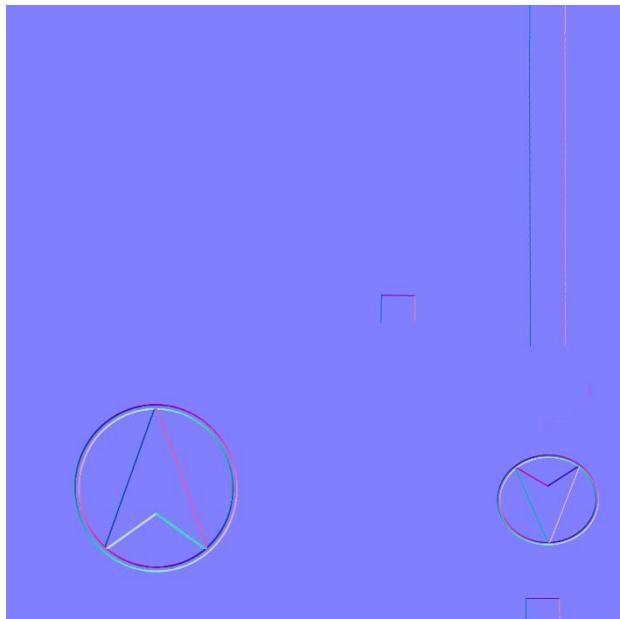
Base Colour:



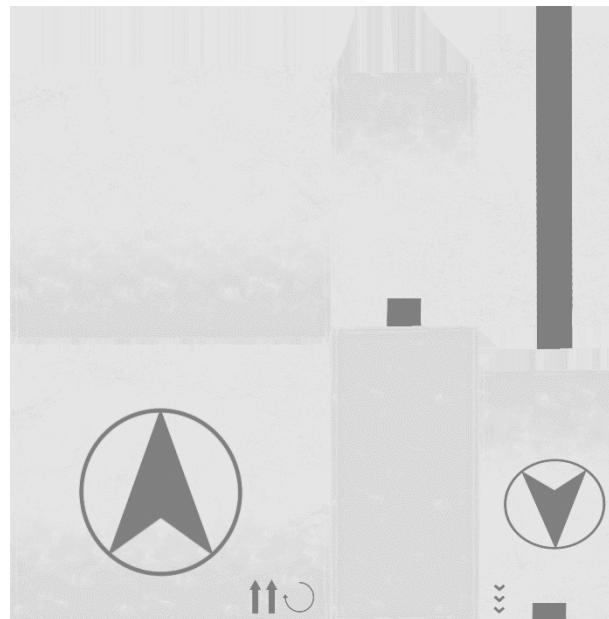
Height:



Normal:



Roughness:



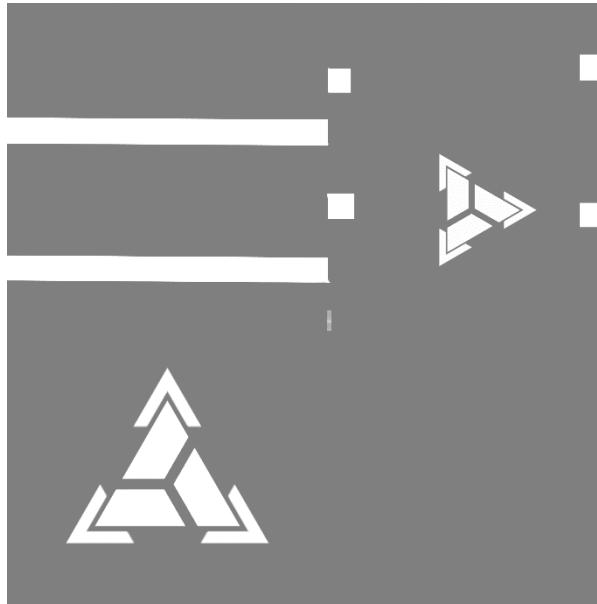
Medium Box Material:

I used the same techniques applied on the large box.

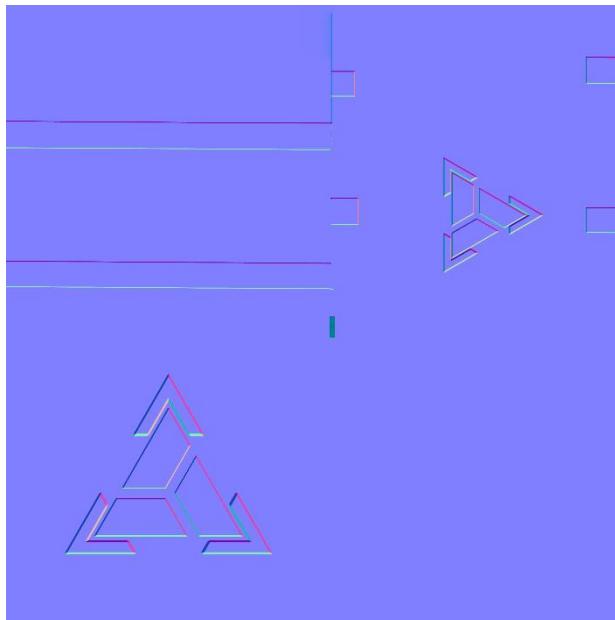
Base Colour:



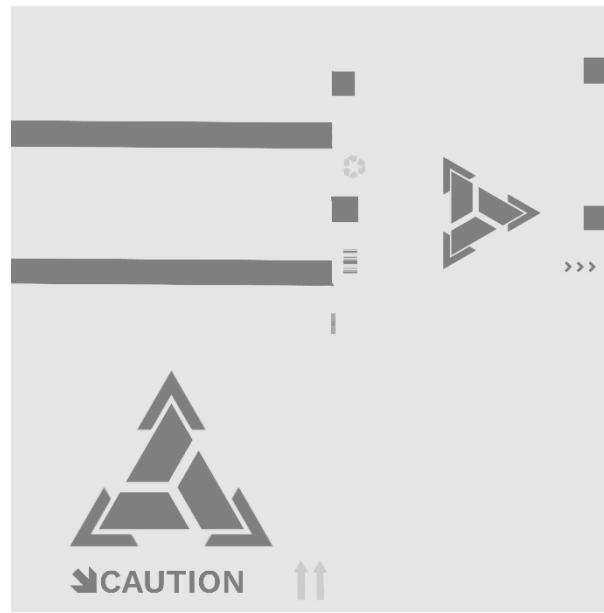
Height:



Normal:



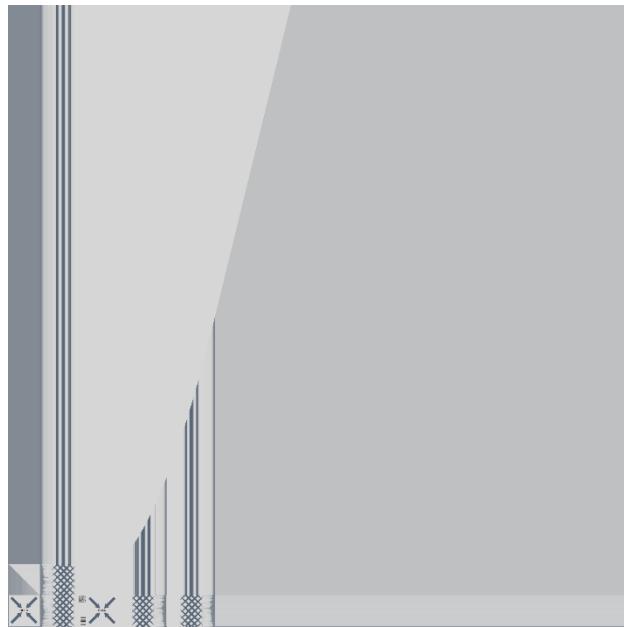
Roughness:



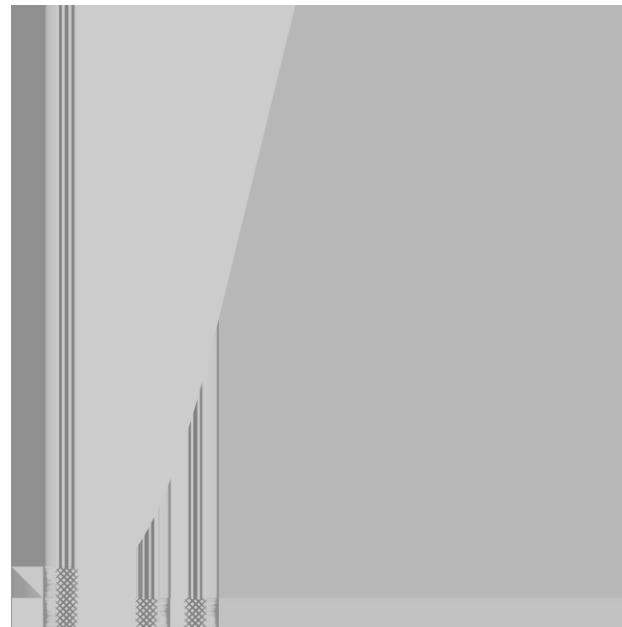
Small Box Material:

I am not too sure as to what exactly is going in these maps, I see there is obviously something wrong but in UE4 they appear to be fine, I'm not too sure what is happening.

Base Colour:



Roughness:



Mattress Base Material:

For the mattress base, I wanted a blue strip that indents around the side of the object, I used a height map to indent it in. I applied a light bit of grunge to the roughness map to give it a bit more detail.

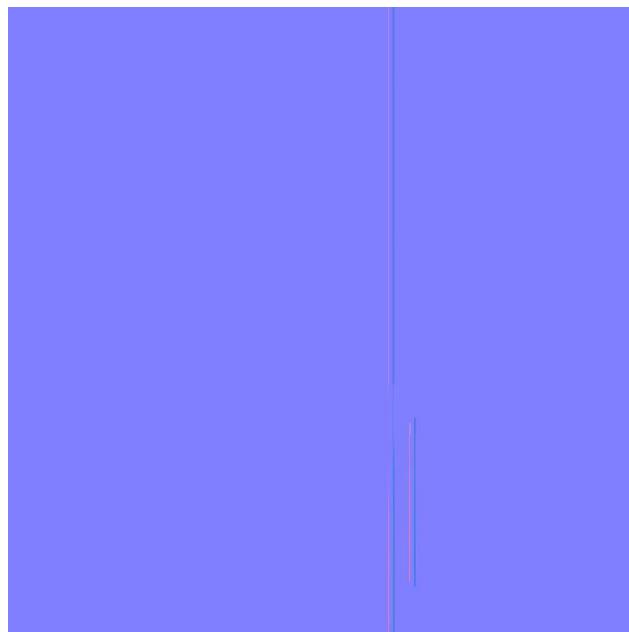
Base Colour:



Height Map:



Normal:



Roughness:



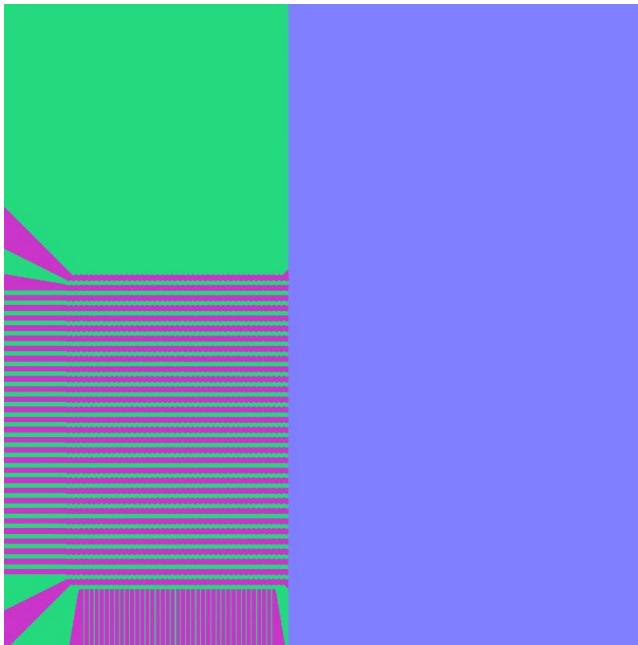
Mattress Material:

Once again the map seems to be having issues but in UE4 it appears to be applying correctly, I am once again not sure what is happening. I applied a bit of gunge again to add some roughness, the normal map is used to create an alpha map that puts fibres across the face of the object.

Base Colour:



Normal:



Roughness:



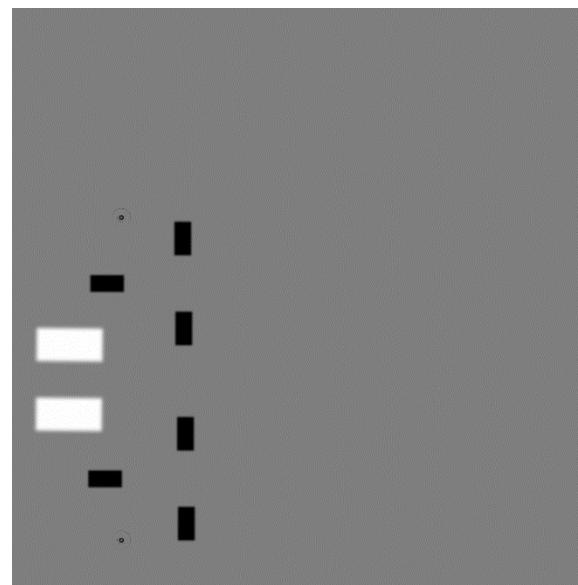
Wall Socket Material:

For the wall socket, I used brushes on various different maps to get what I was looking, I think it turned out really well and whilst it might be less noticeable in UE4 it does help the scene. I used the roughness for a very small detail that is the centre of the screw holes, they are small to the point it doesn't really serve a purpose.

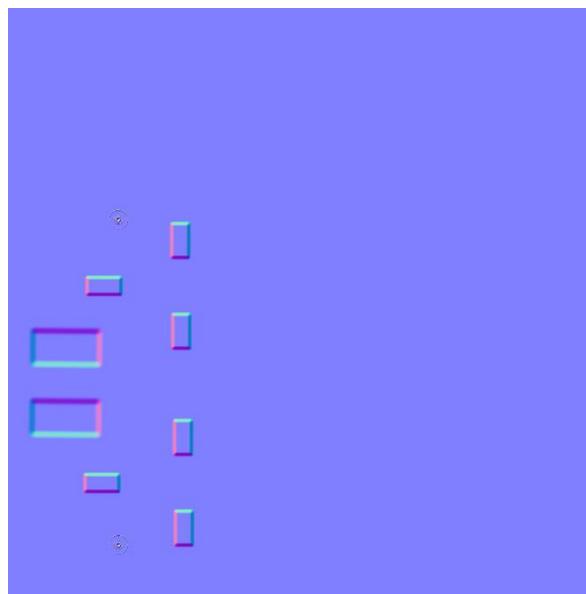
Base Colour:



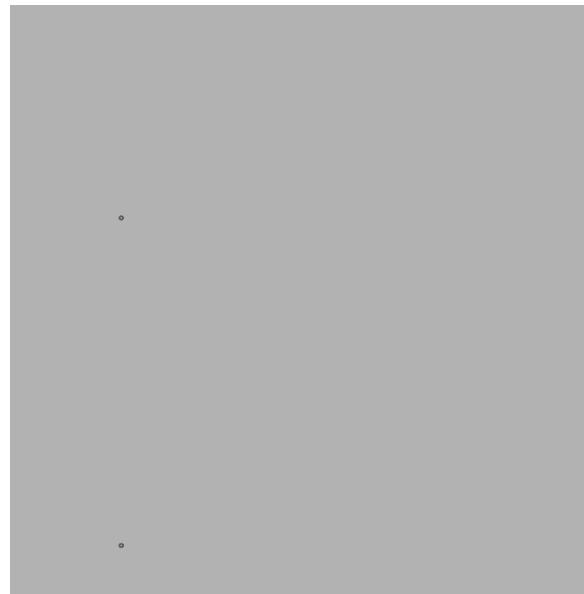
Height:



Normal:



Roughness:



For all models that use “wood” they are using the same texture created with a slight adjustment made inside of UE4, I applied a 3vector on-top of the base colour and multiplied them together to allow to change the tint of the wood, I did this to the skirting, window, and bed feet, they all use the same material applied to the desk, desk support, desk drawer, wall shelf, and backboard

Example:

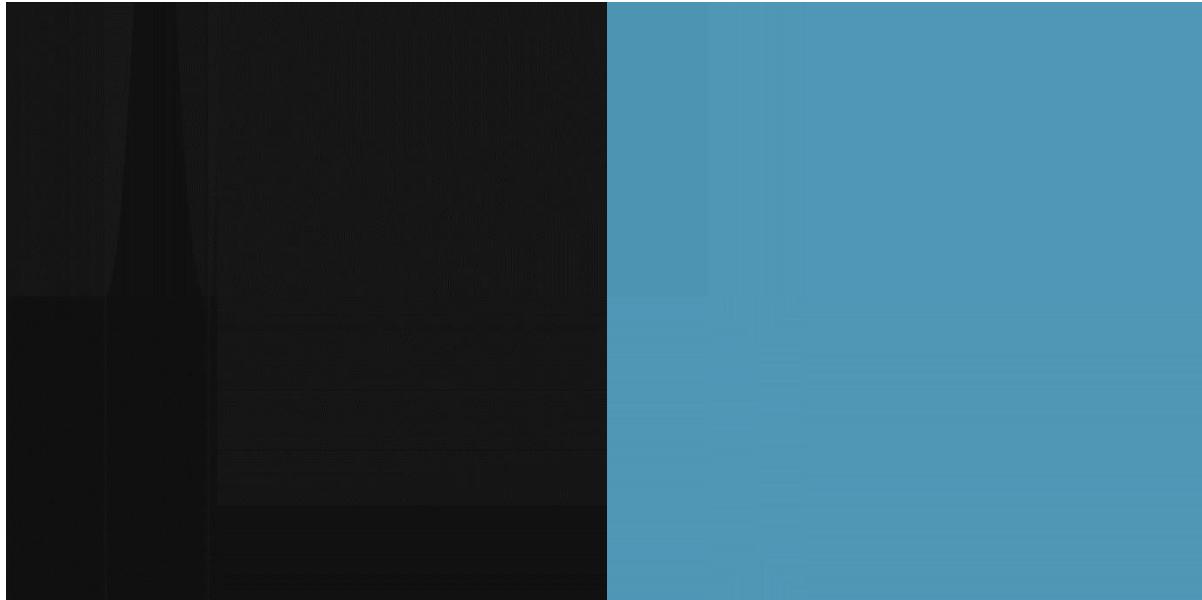


Wood_M is the original Material, Wood_M_2 is the material with a slight adjustment and the skirting material only uses the roughness and normal map.

Mouse Mat Materials:

Base colour:

Mat



Mat rim:

Normal:

Mat:

Mat Rim:



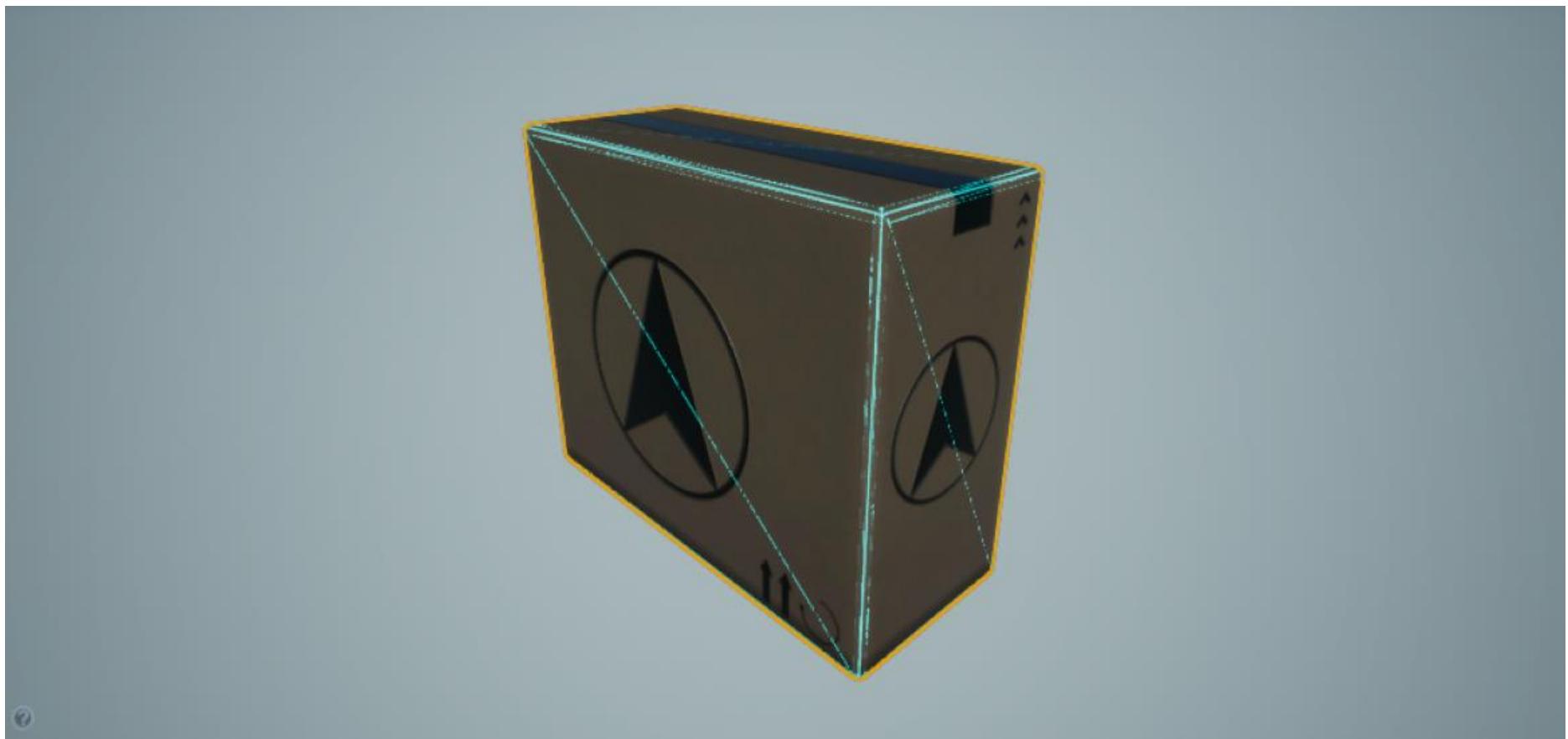
I probably did not need to use a normal map for this, since it something so small and not really noticeable it probably would not be needed.

Final Individual Models

Large Box:

```
LOD: 0
Current Screen Size: 0.511058
Triangles: 108
Vertices: 216
UV Channels: 2
Approx Size: 62x30x50
Num Collision Primitives: 1
```





Medium Box:

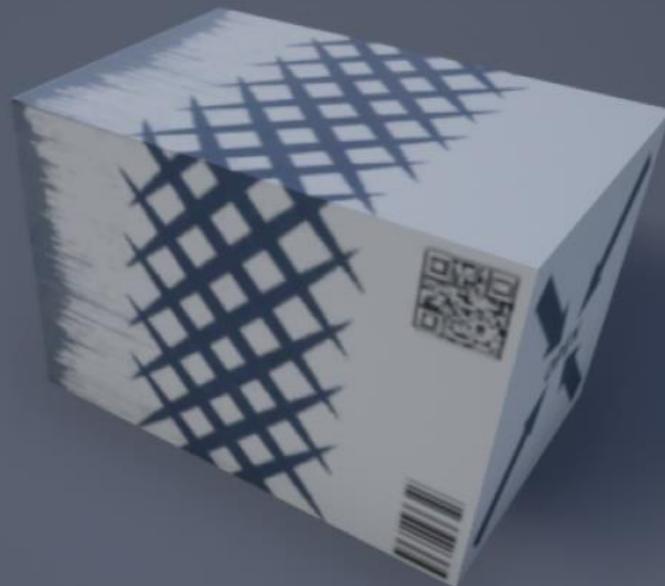
LOD: 0
Current Screen Size: 0.445753
Triangles: 108
Vertices: 216
UV Channels: 2
Approx Size: 55x26x45
Num Collision Primitives: 1

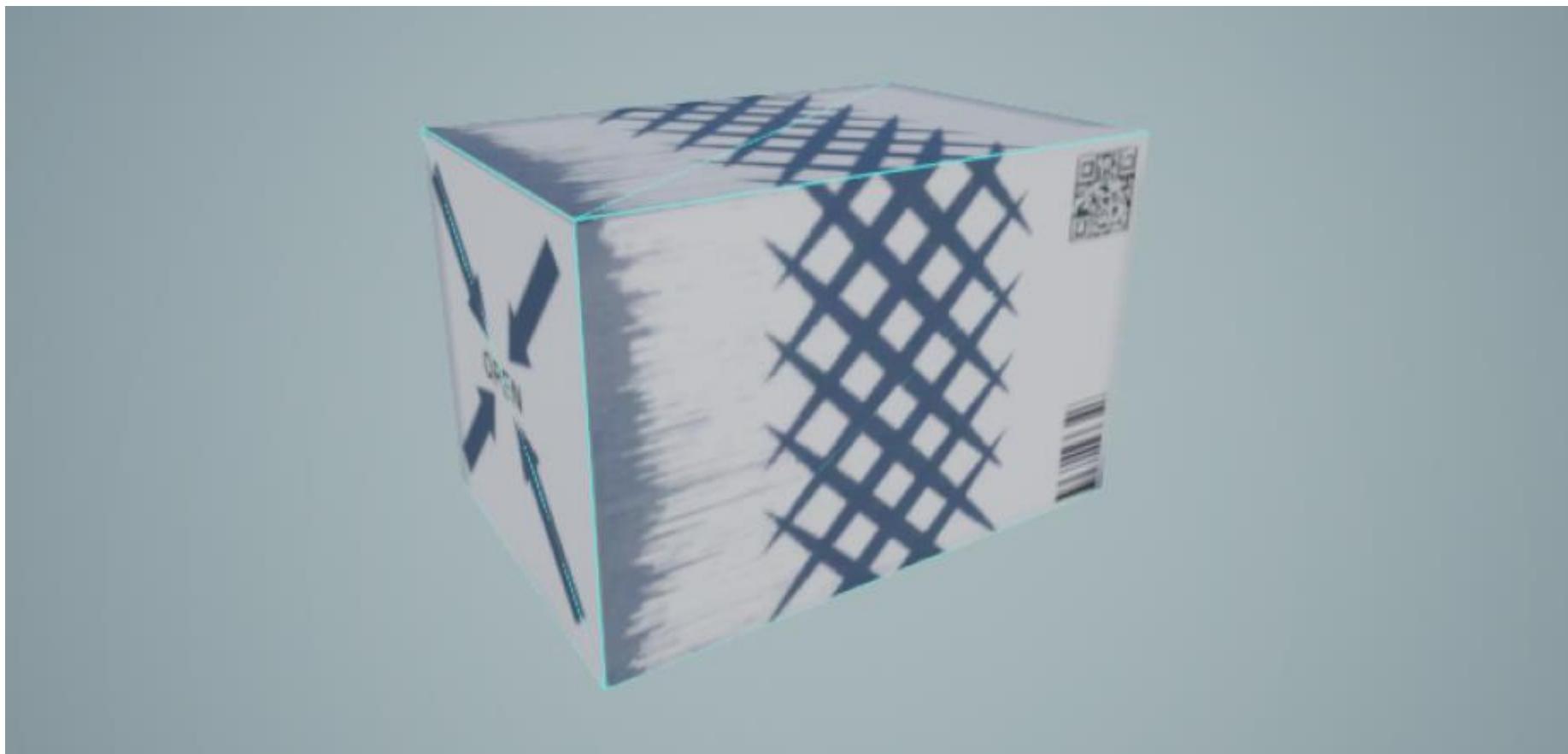




Small Box:

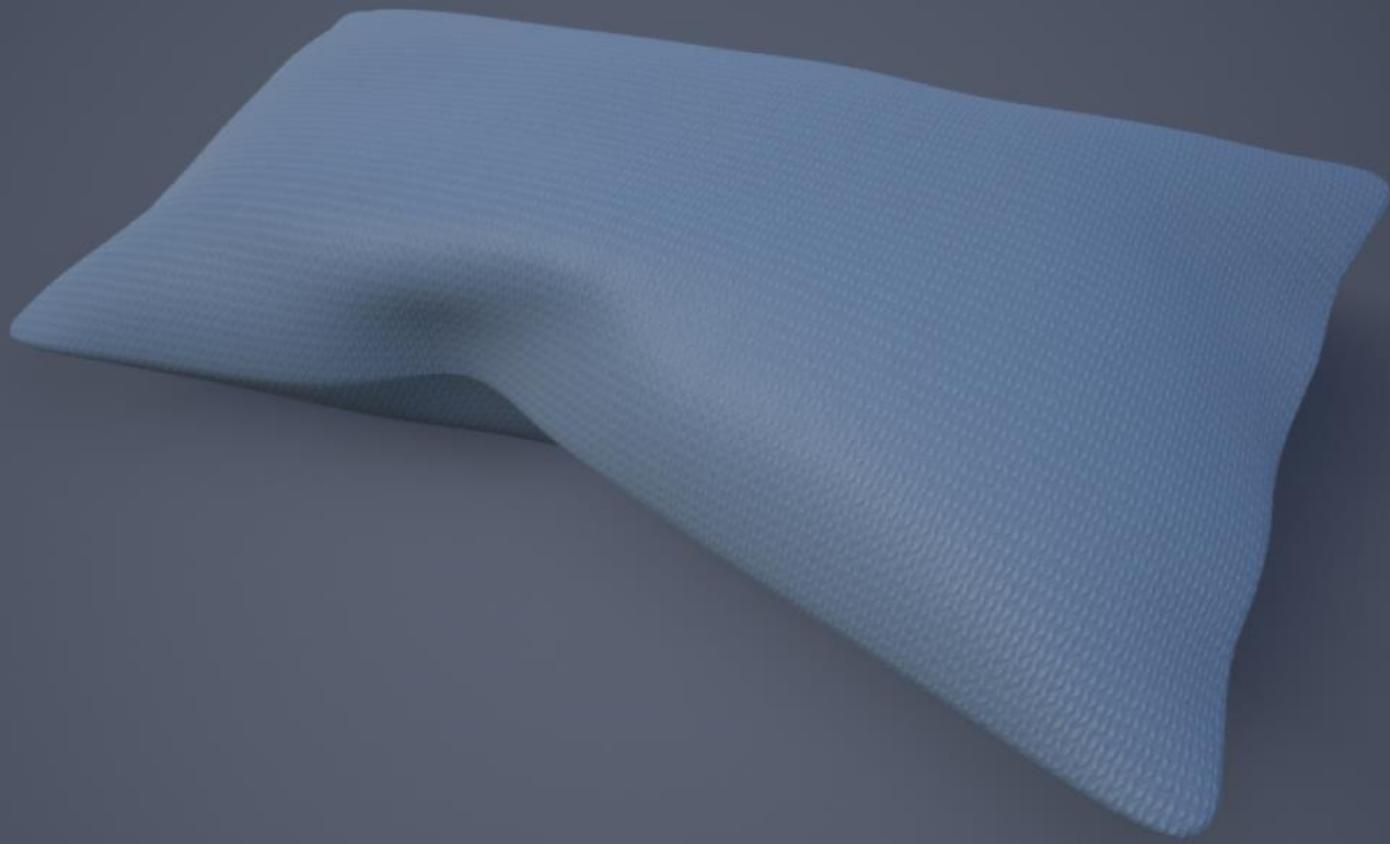
LOD: 0
Current Screen Size: 0.491321
Triangles: 12
Vertices: 24
UV Channels: 2
Approx Size: 31x22x20
Num Collision Primitives: 1

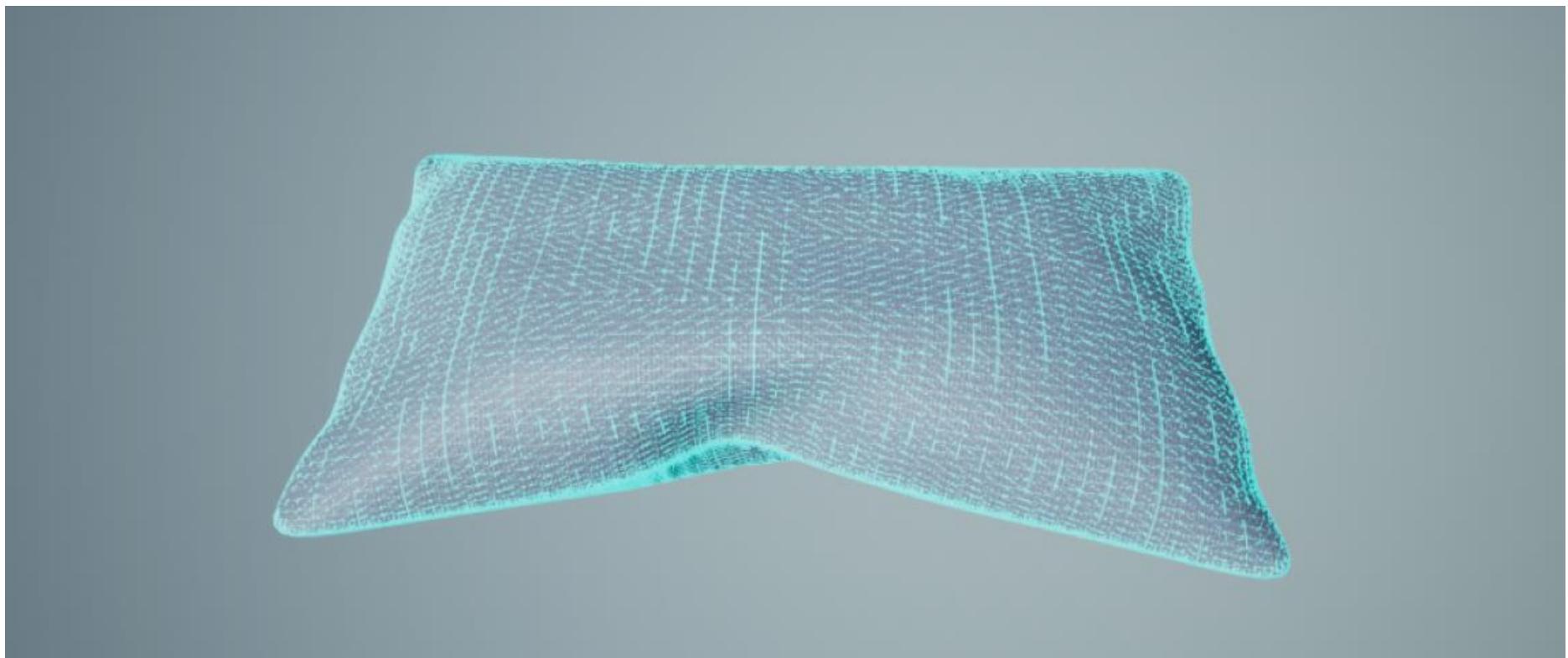




Pillow:

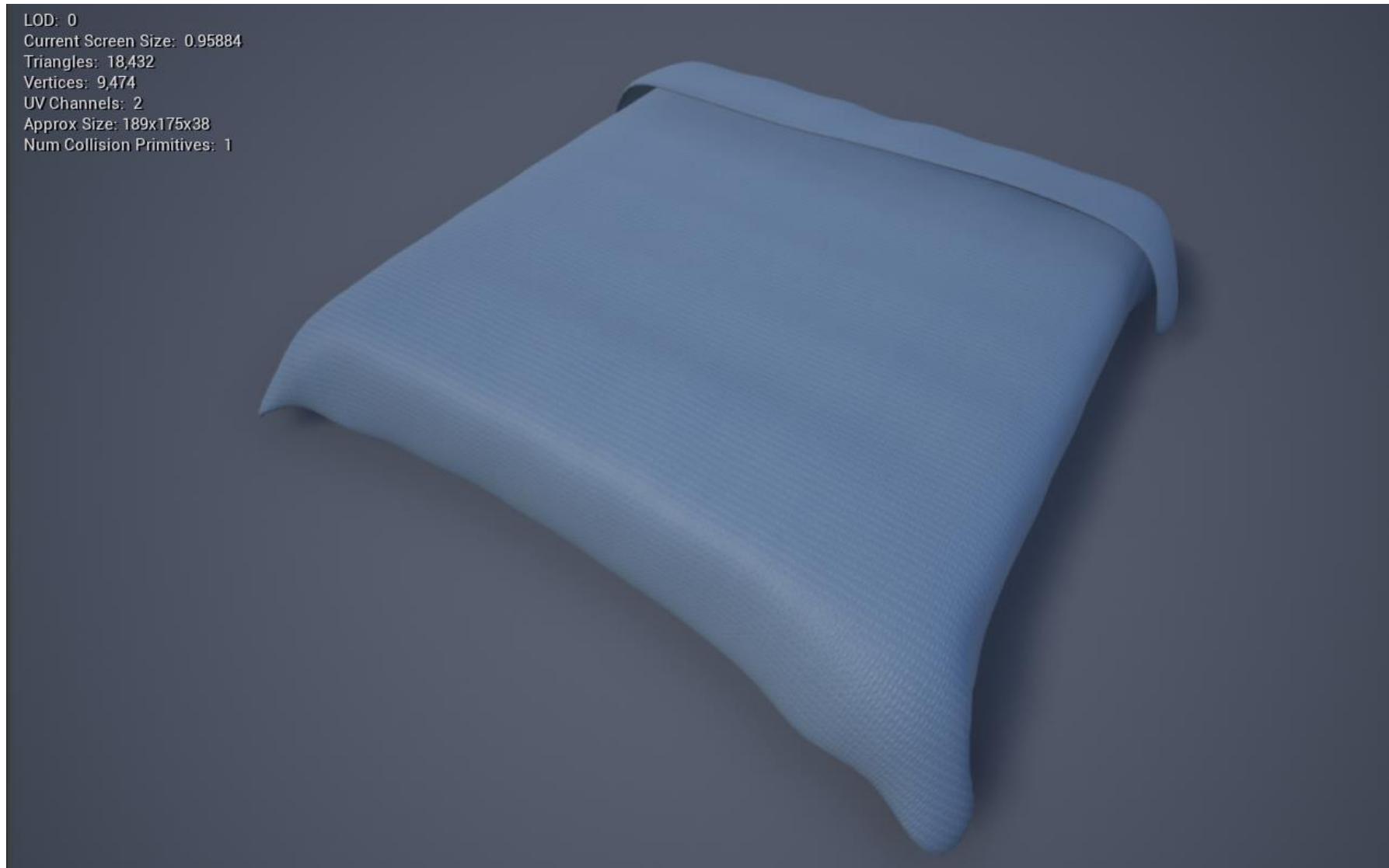
LOD: 0
Current Screen Size: 0.998186
Triangles: 10,560
Vertices: 5,458
UV Channels: 2
Approx Size: 61x30x17
Num Collision Primitives: 1

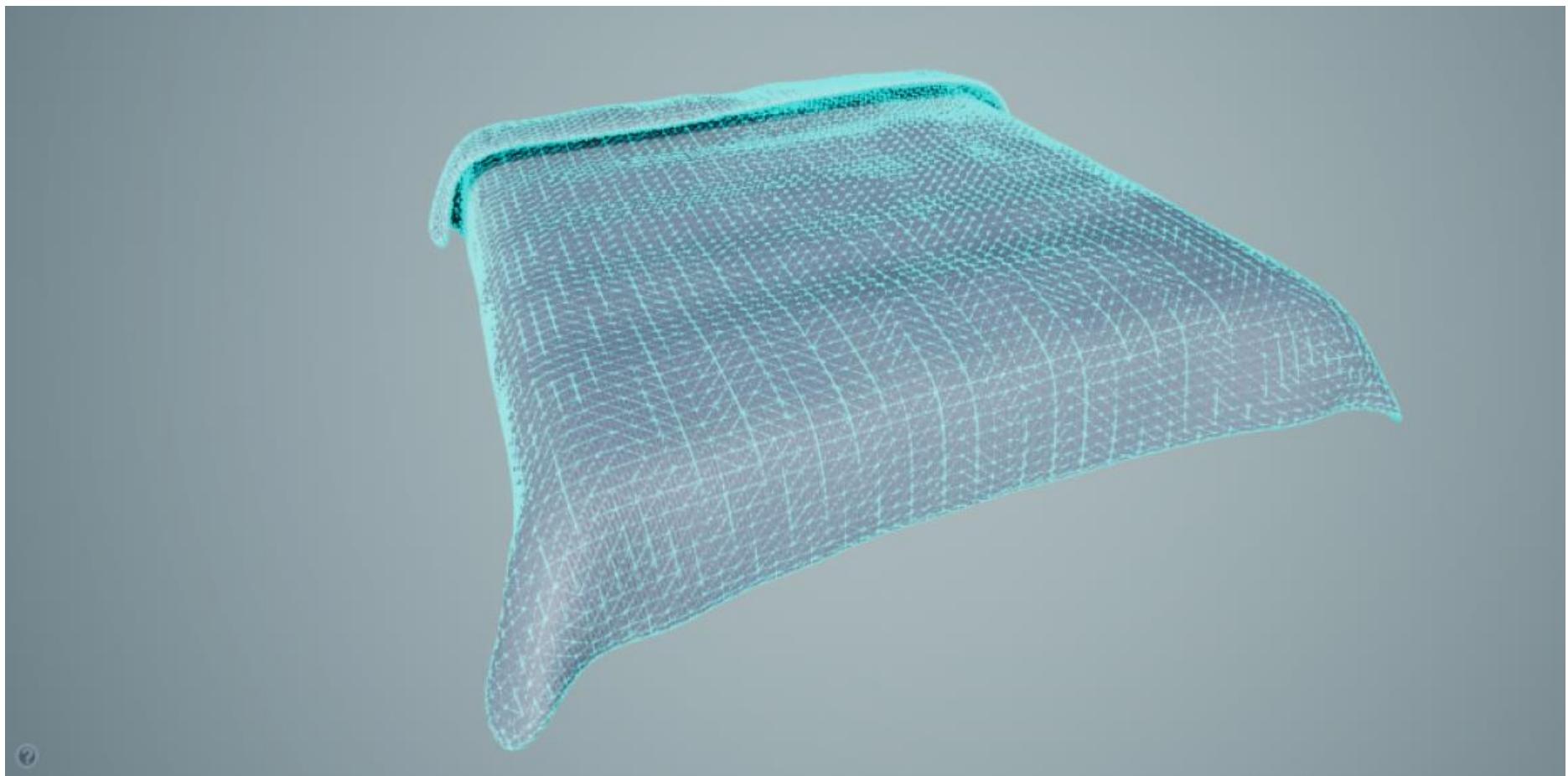




Bedsheet:

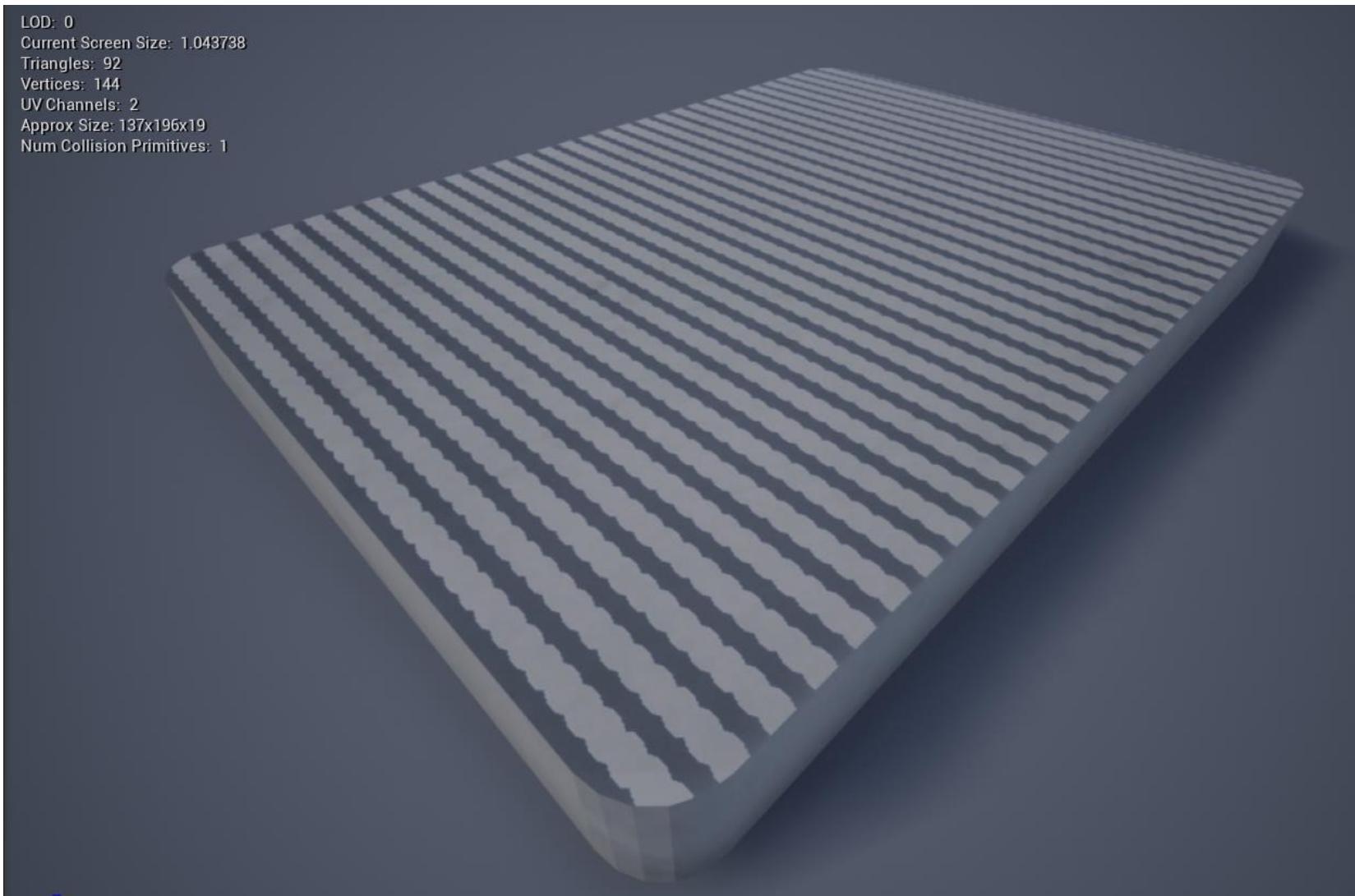
LOD: 0
Current Screen Size: 0.95884
Triangles: 18,432
Vertices: 9,474
UV Channels: 2
Approx Size: 189x175x38
Num Collision Primitives: 1

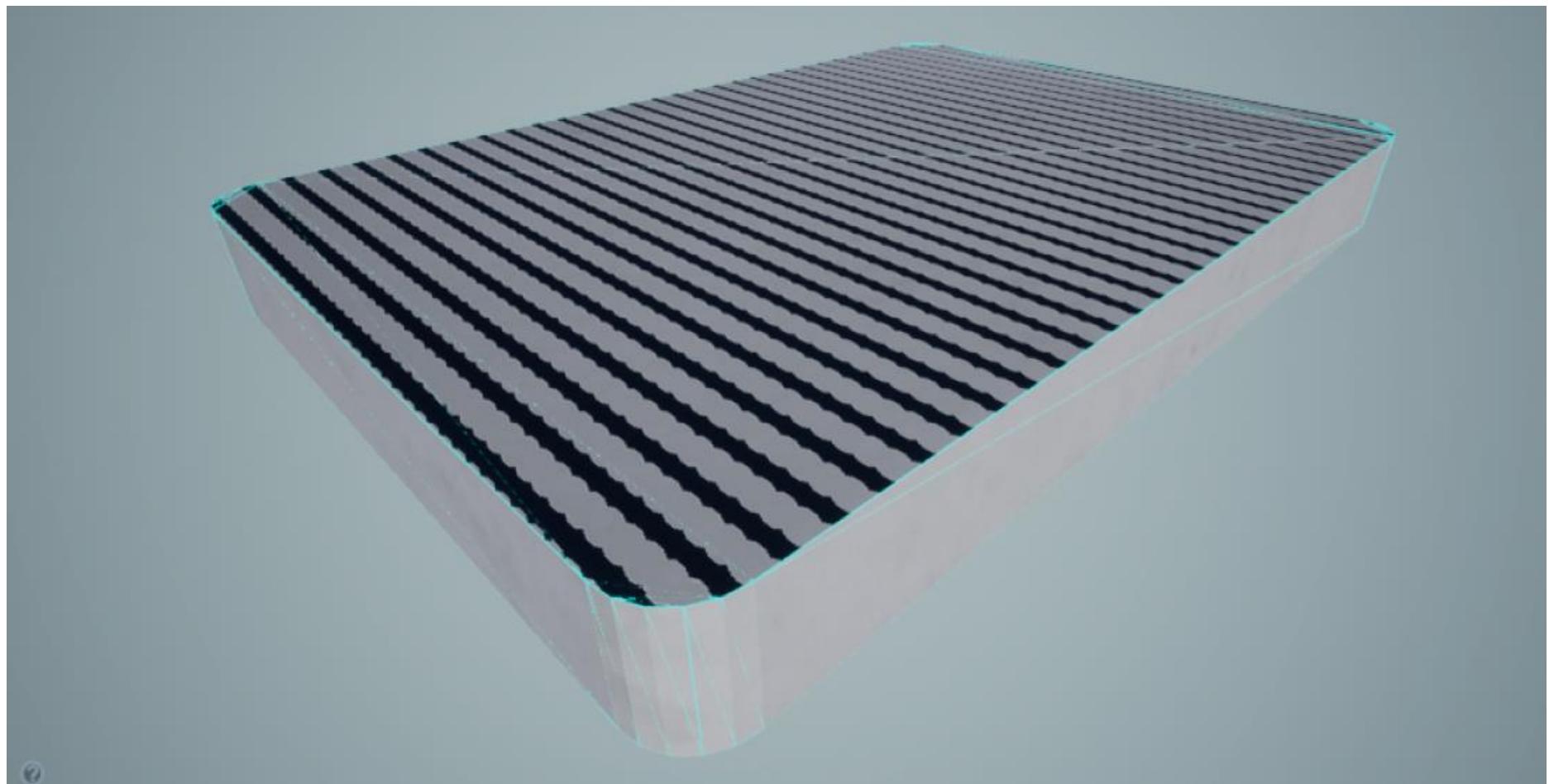




Mattress:

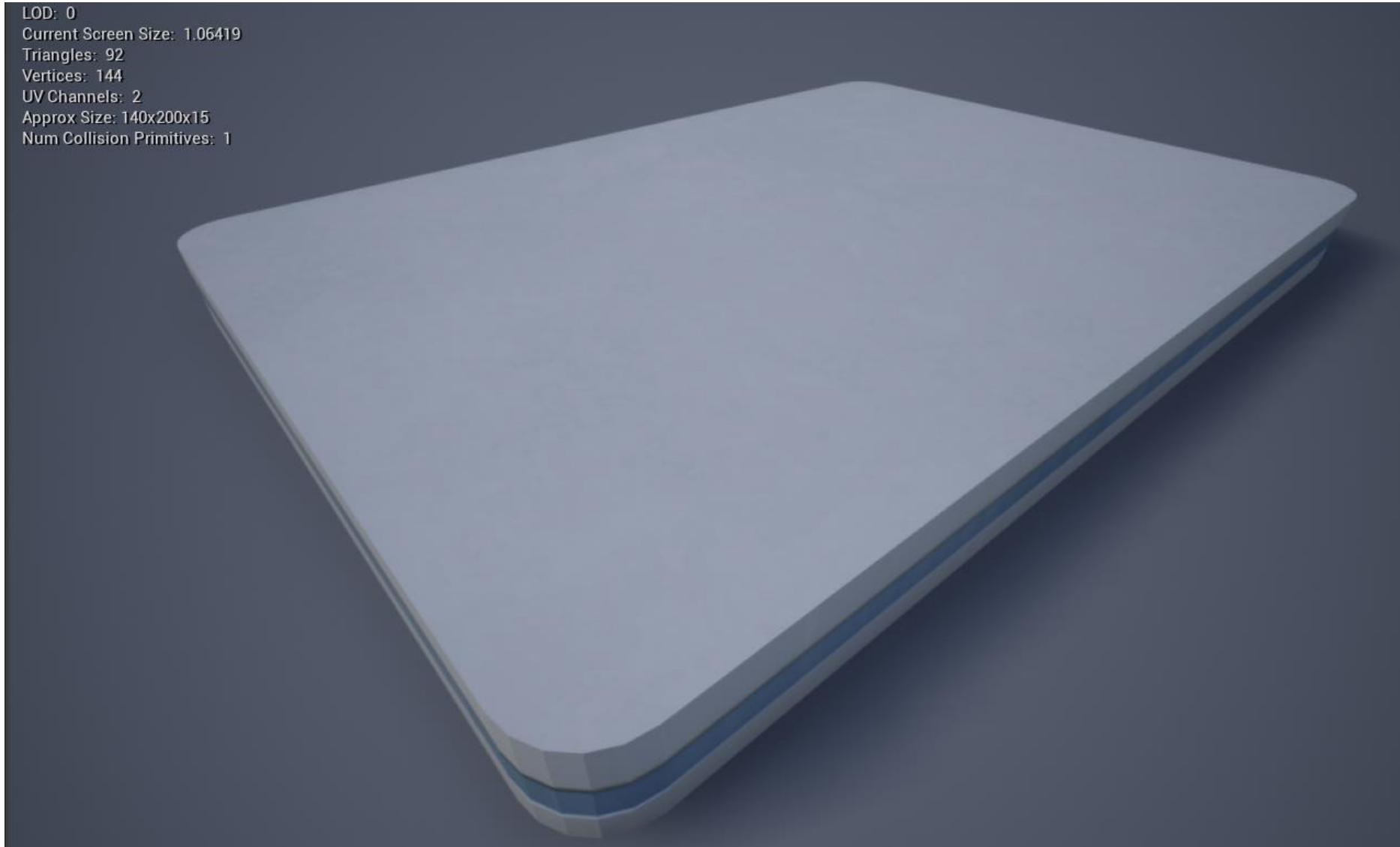
LOD: 0
Current Screen Size: 1.043738
Triangles: 92
Vertices: 144
UV Channels: 2
Approx Size: 137x196x19
Num Collision Primitives: 1

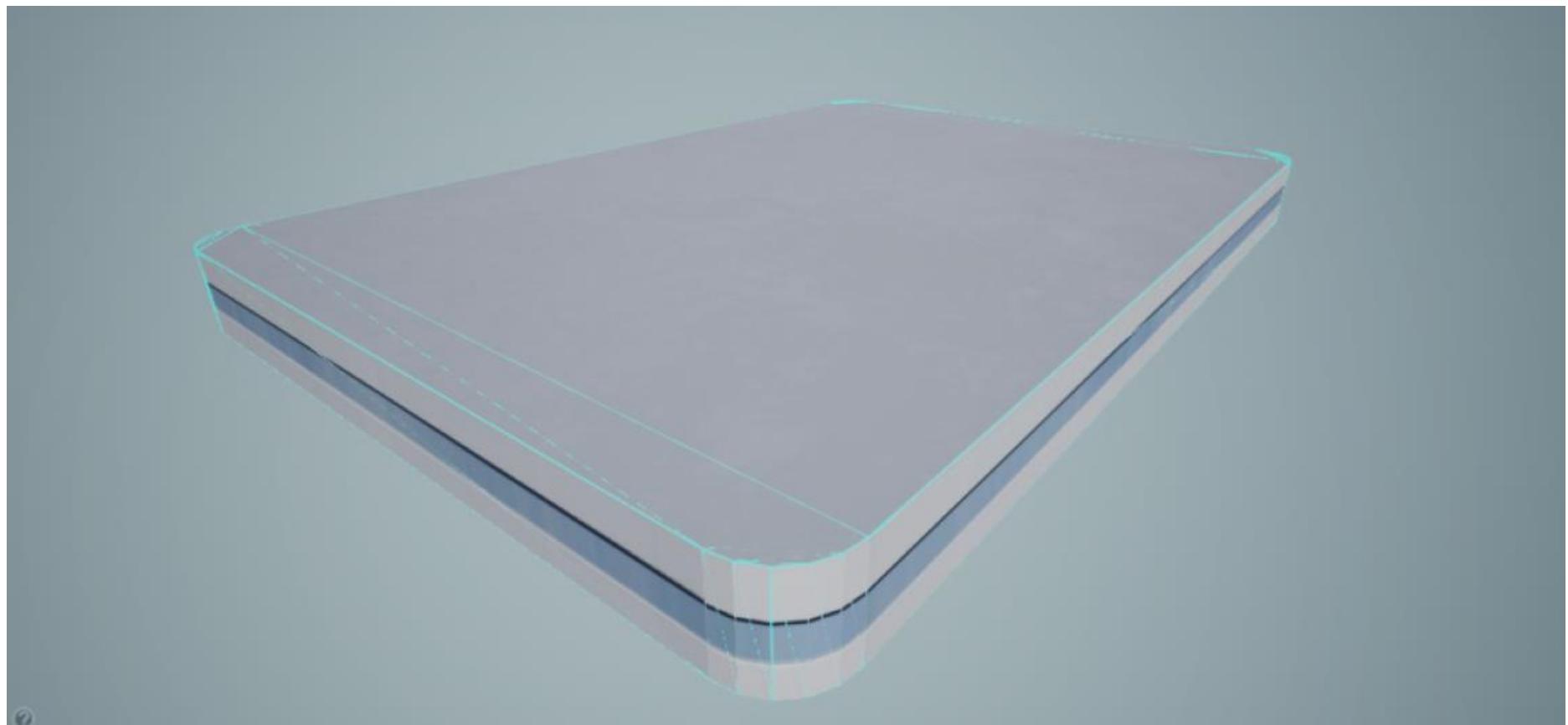




Mattress Base:

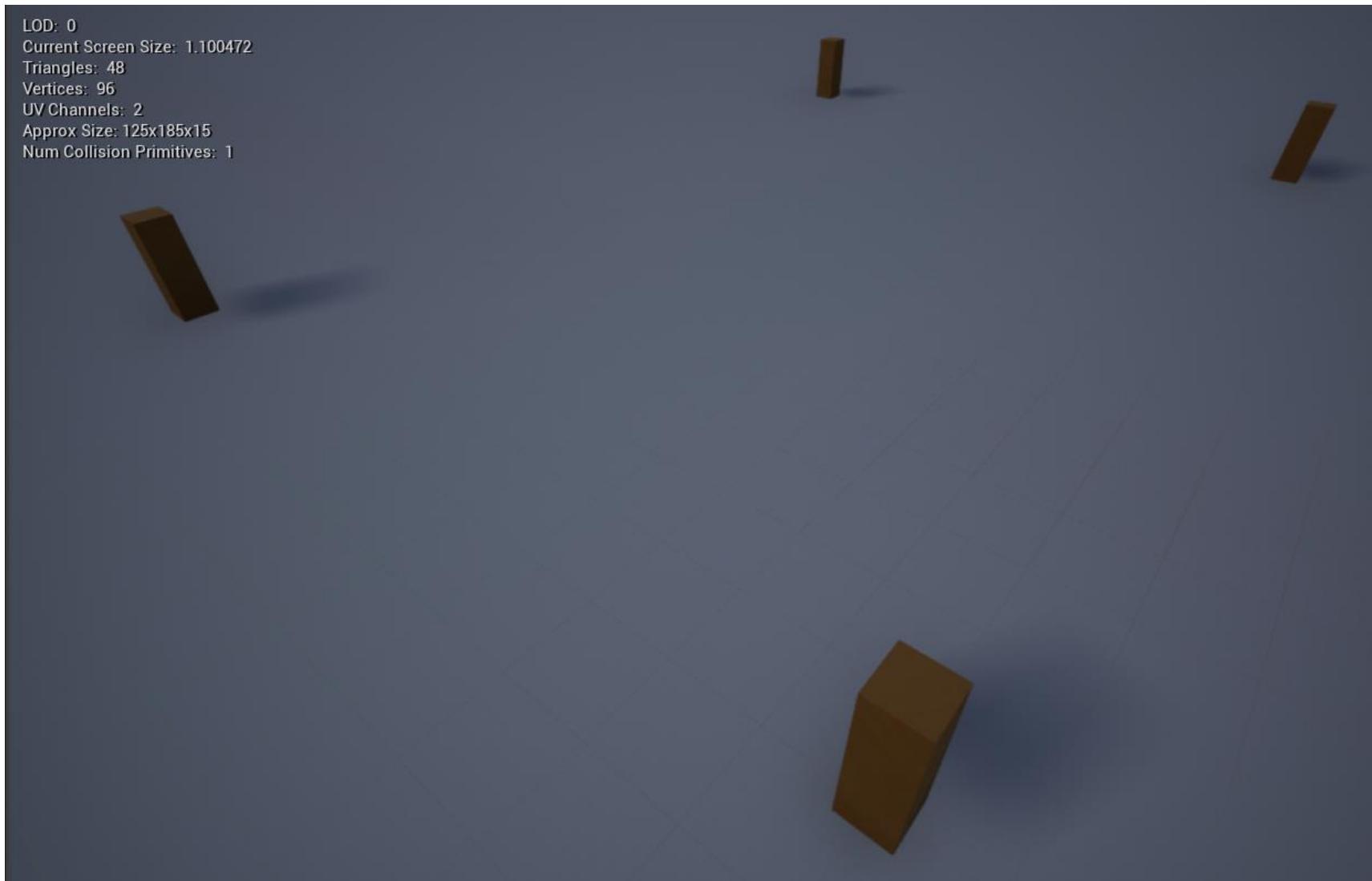
LOD: 0
Current Screen Size: 1.06419
Triangles: 92
Vertices: 144
UV Channels: 2
Approx Size: 140x200x15
Num Collision Primitives: 1

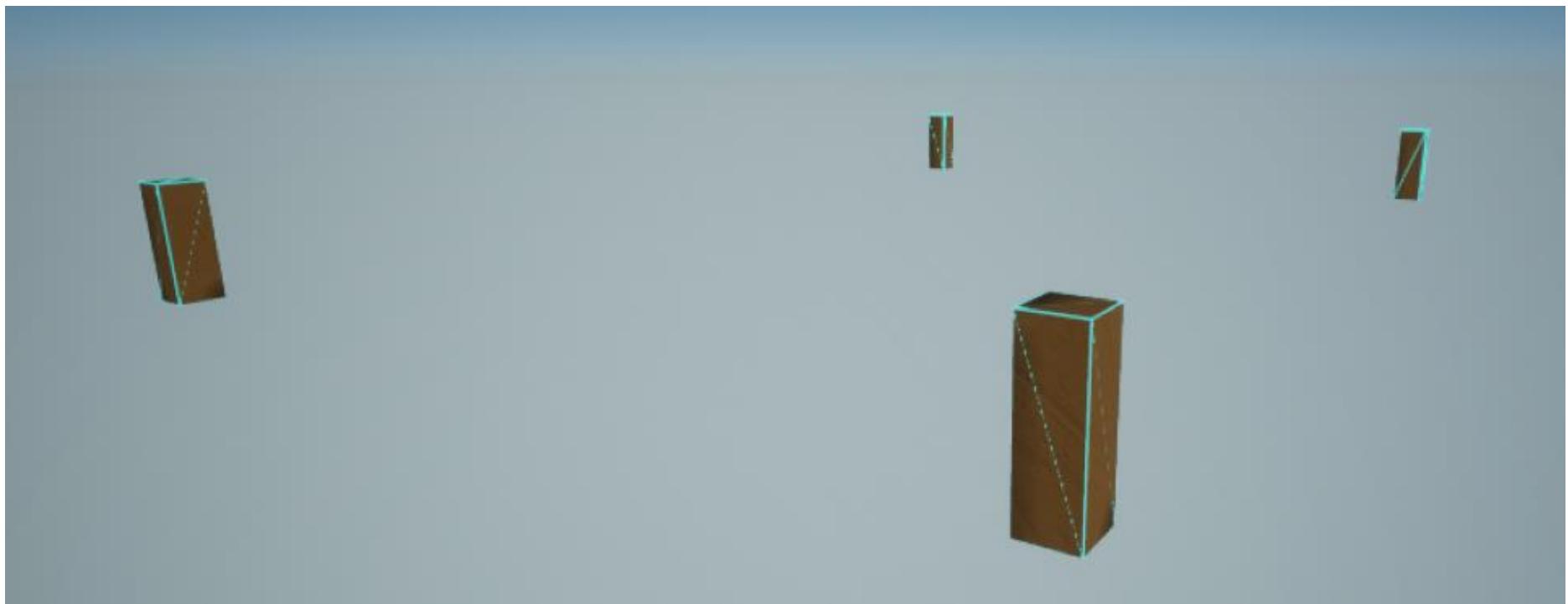




Bed-feet:

LOD: 0
Current Screen Size: 1.100472
Triangles: 48
Vertices: 96
UV Channels: 2
Approx Size: 125x185x15
Num Collision Primitives: 1

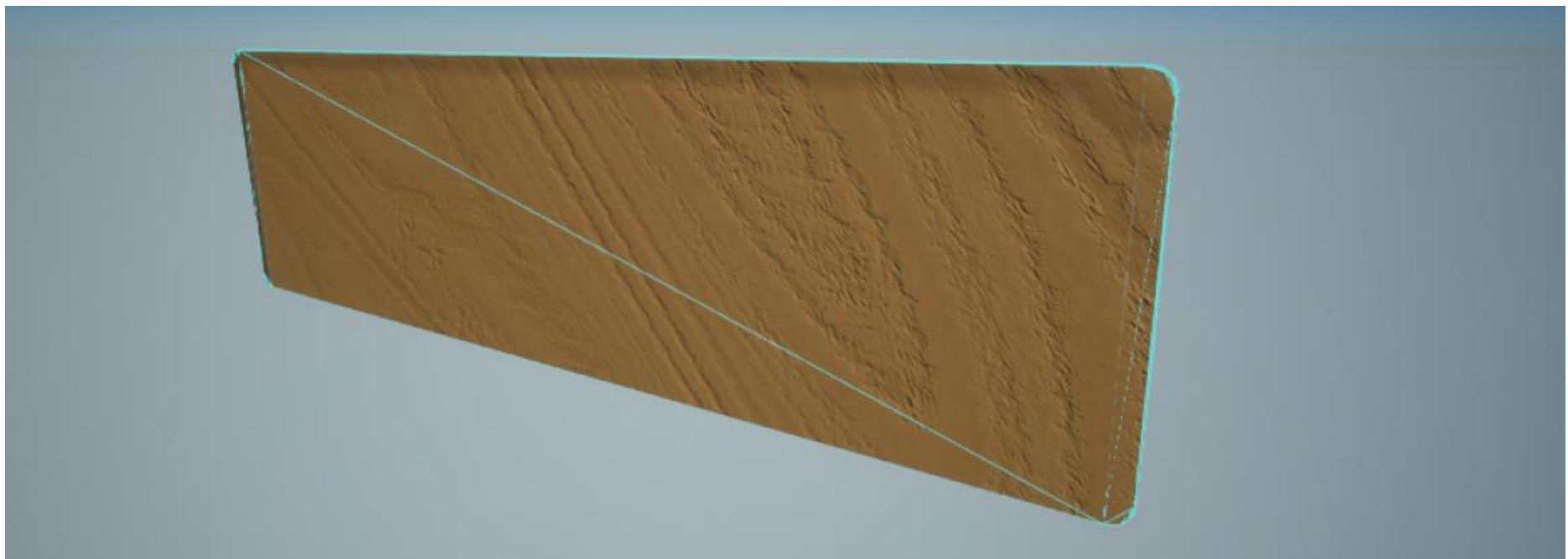




Backboard:

```
LOD: 0
Current Screen Size: 1.082424
Triangles: 92
Vertices: 144
UV Channels: 2
Approx Size: 140x2x40
Num Collision Primitives: 1
```

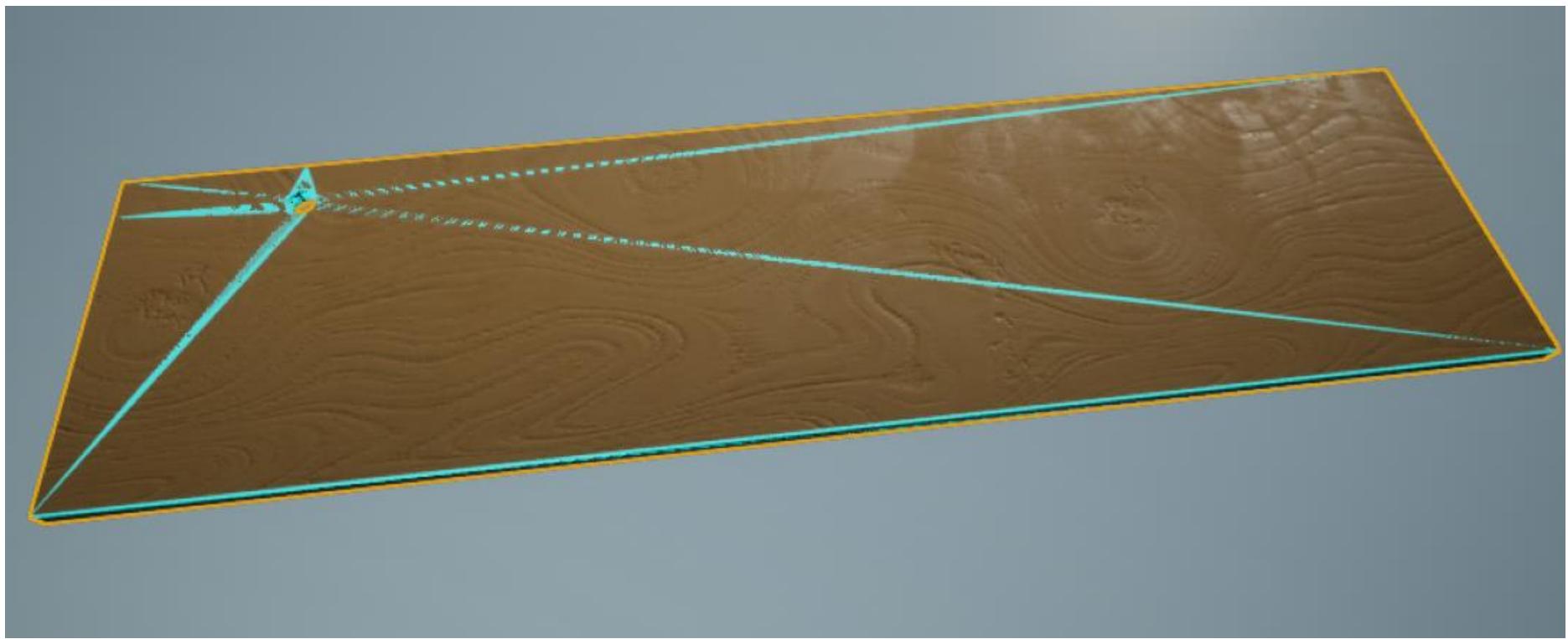




Desk:

LOD: 0
Current Screen Size: 1.20937
Triangles: 172
Vertices: 252
UV Channels: 2
Approx Size: 75x289x4
Num Collision Primitives: 1

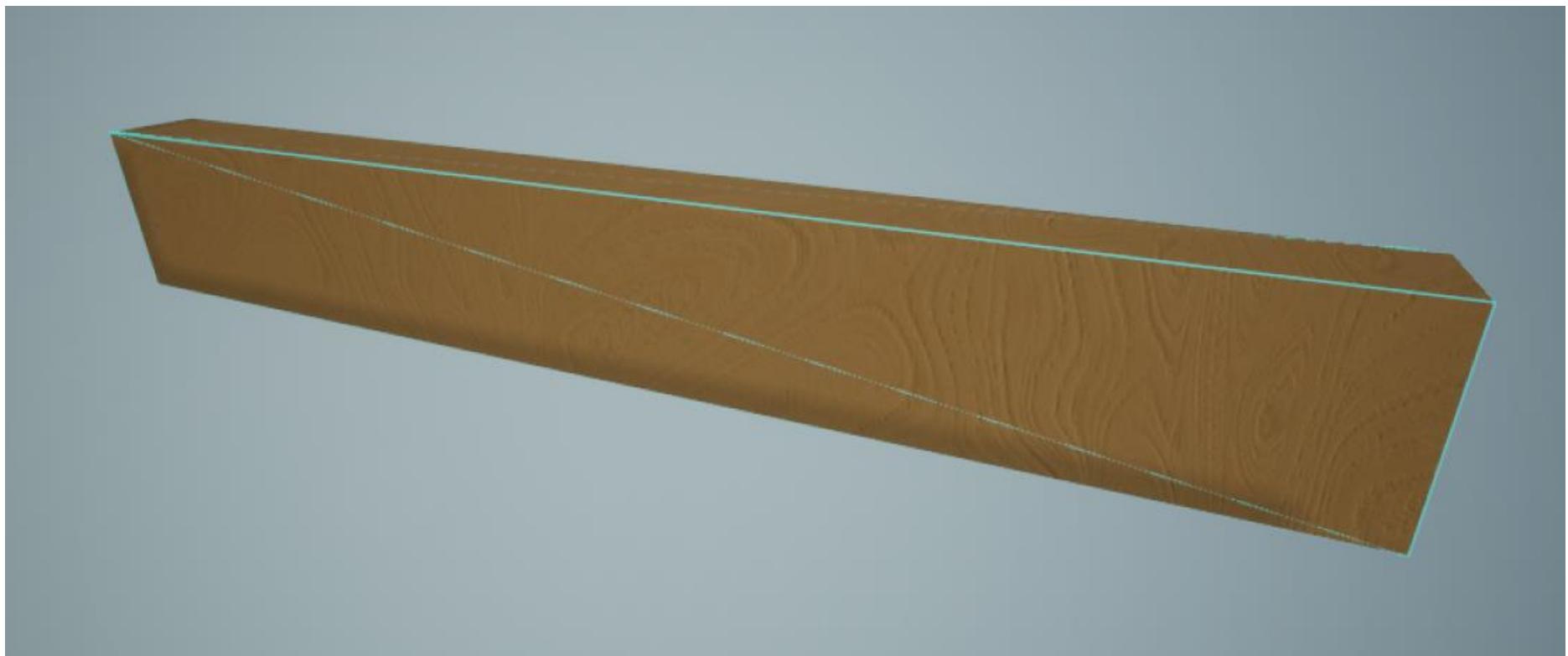




Desk Support:

LOD: 0
Current Screen Size: 1.154768
Triangles: 28
Vertices: 48
UV Channels: 2
Approx Size: 70x5x10
Num Collision Primitives: 1

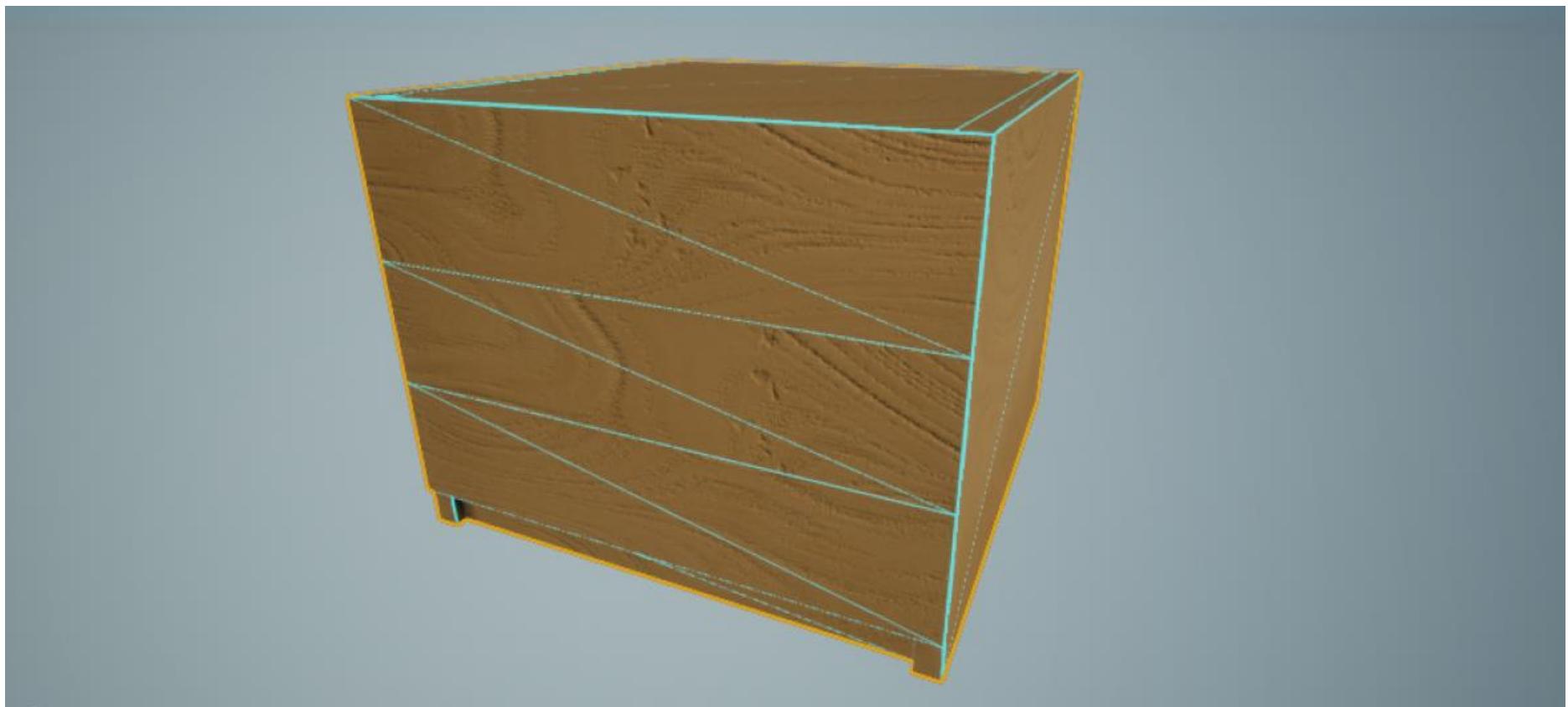




Desk Drawer:

LOD: 0
Current Screen Size: 0.682715
Triangles: 1,504
Vertices: 3,072
UV Channels: 2
Approx Size: 74x75x60
Num Collision Primitives: 1

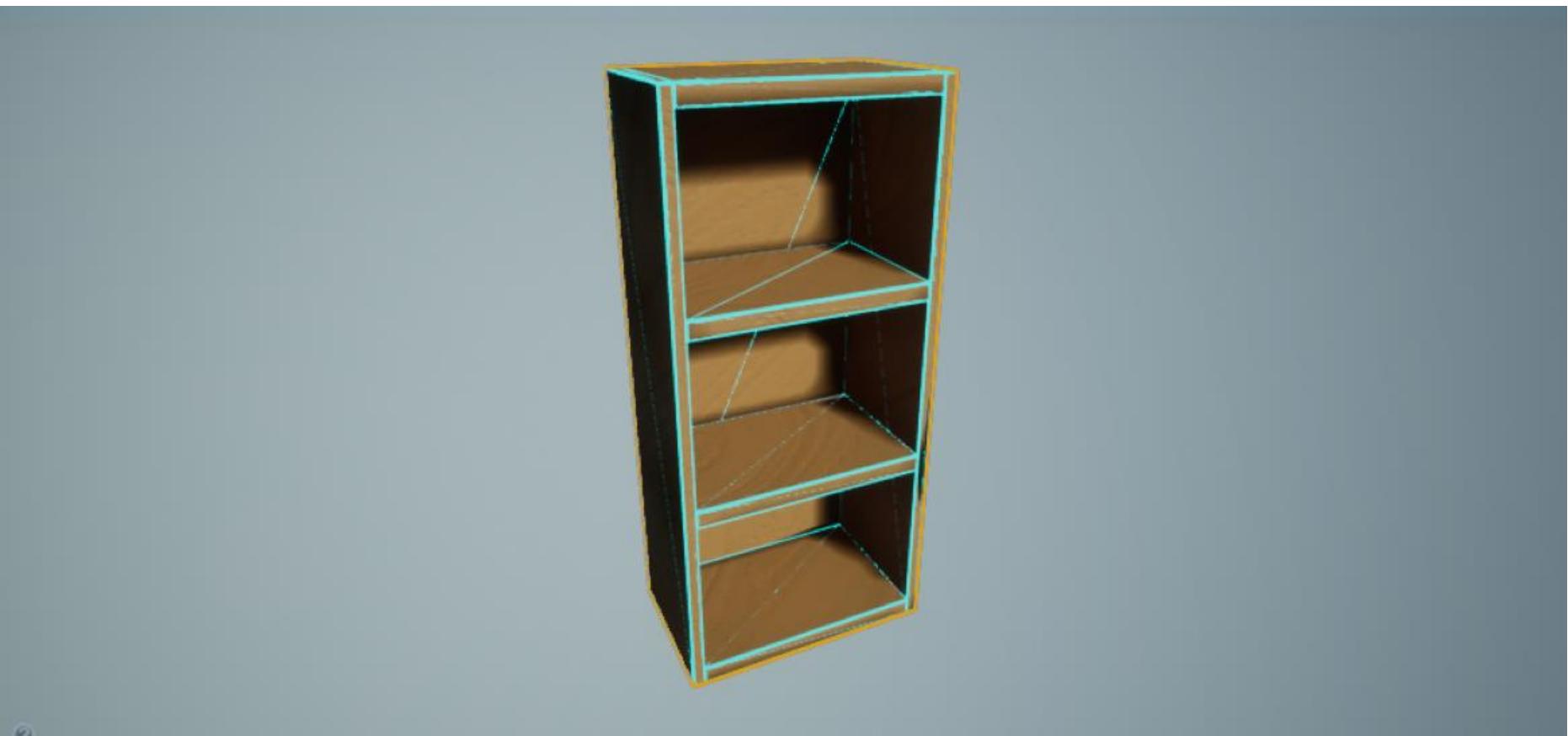




Wall-Shelf:

LOD: 0
Current Screen Size: 0.600468
Triangles: 2,632
Vertices: 5,376
UV Channels: 2
Approx Size: 50x30x110
Num Collision Primitives: 1





Monitor:

LOD: 0
Current Screen Size: 0.868786
Triangles: 320
Vertices: 488
UV Channels: 2
Approx Size: 29x53x48
Num Collision Primitives: 1

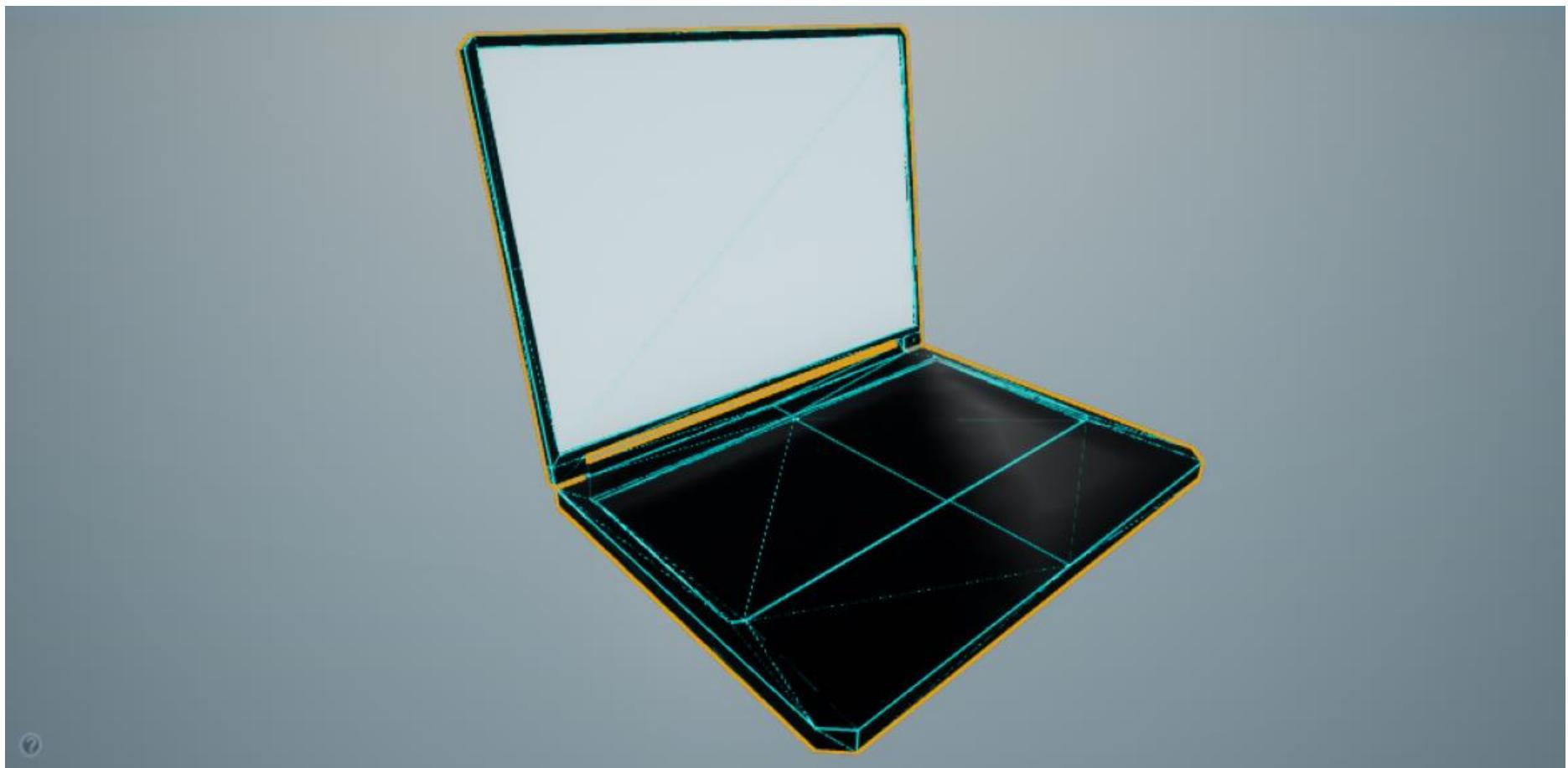




Laptop:

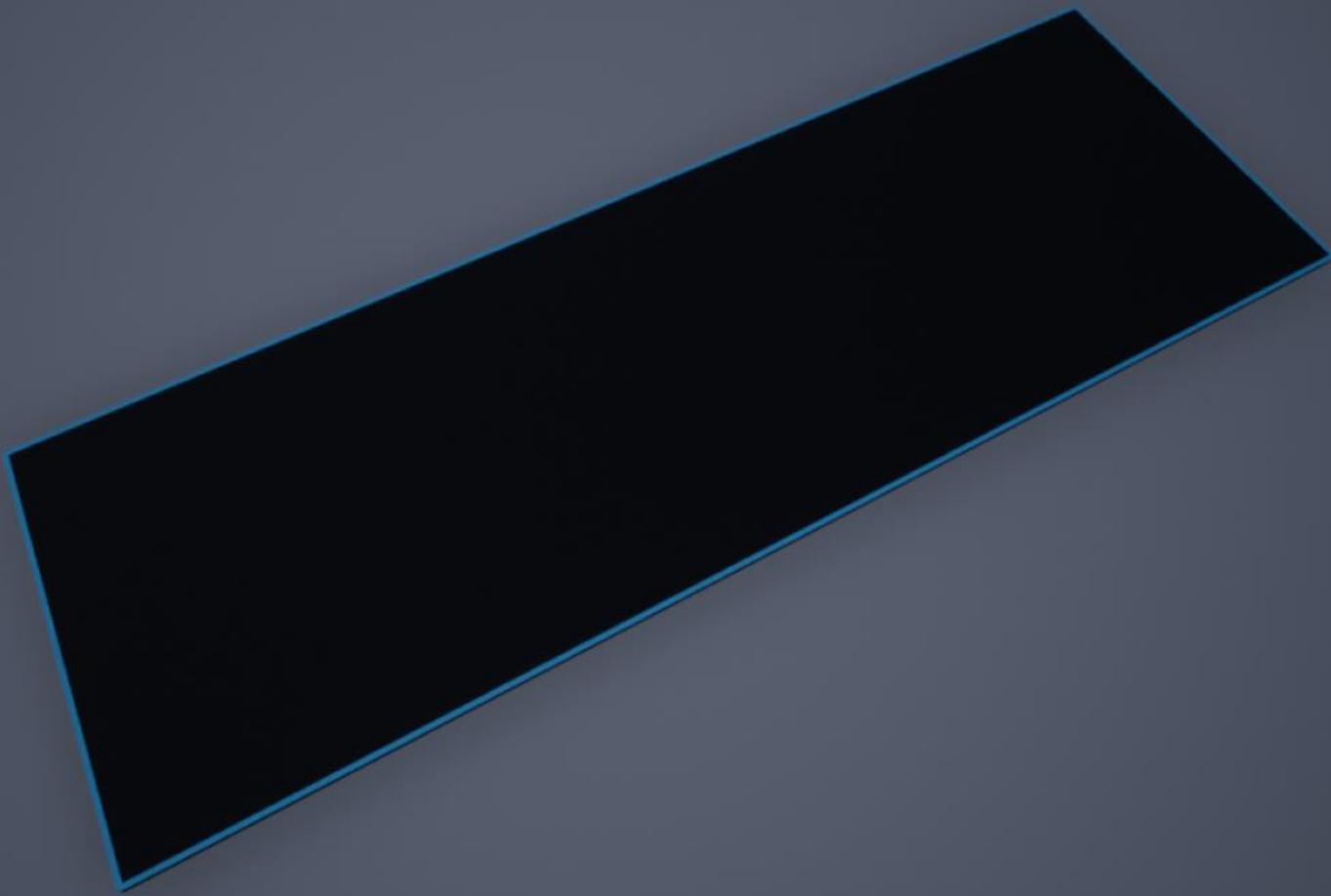
```
LOD: 0  
Current Screen Size: 0.770728  
Triangles: 150  
Vertices: 211  
UV Channels: 2  
Approx Size: 23x28x21  
Num Collision Primitives: 1
```

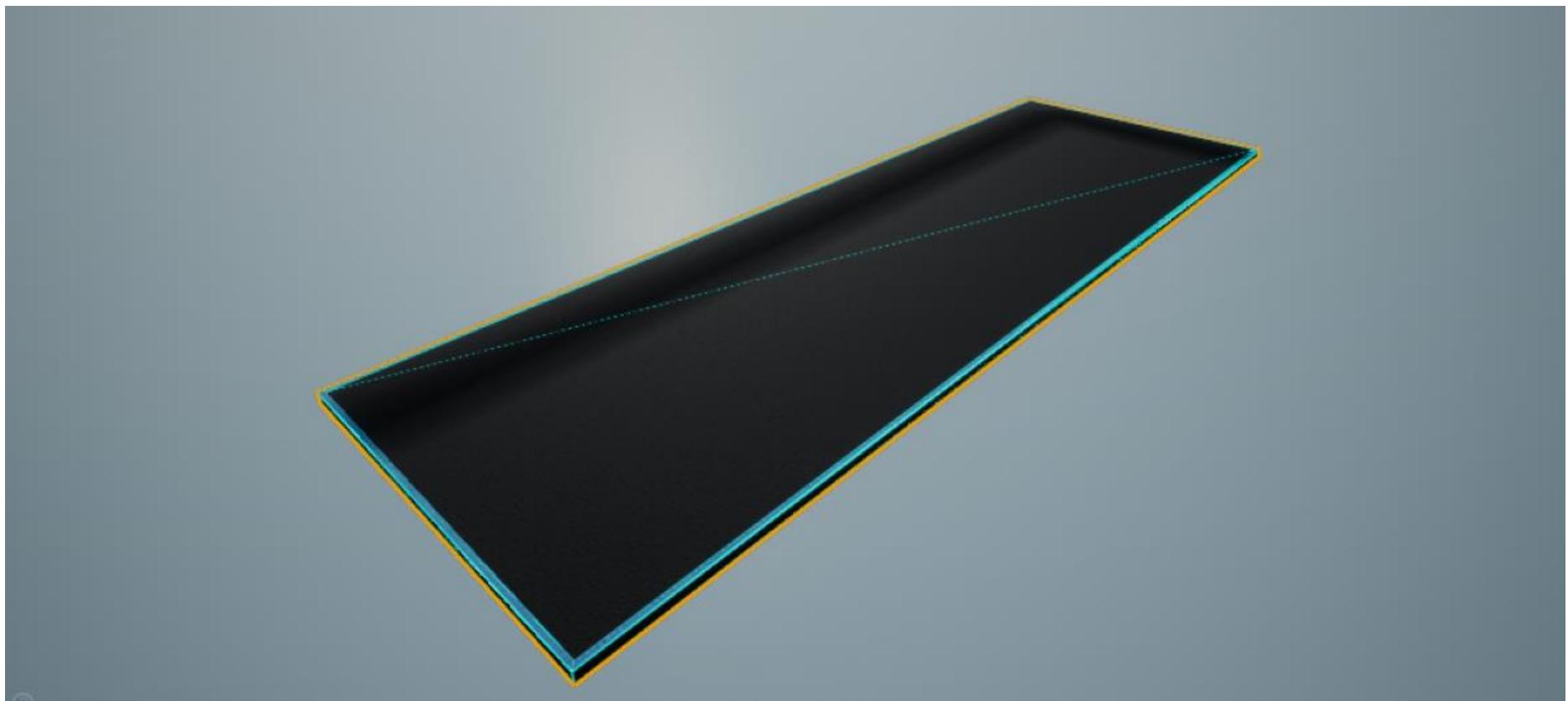




Mouse Mat:

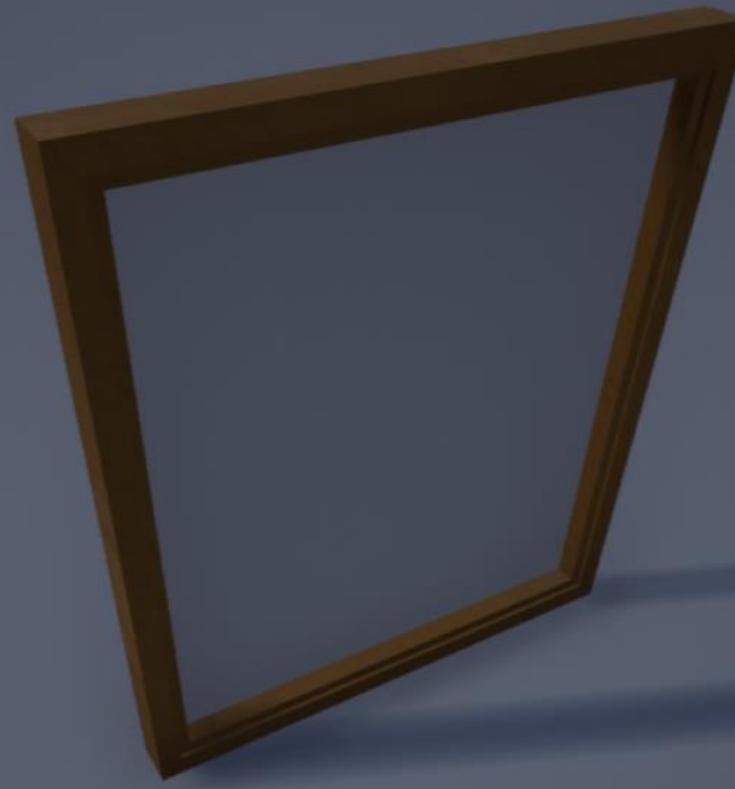
LOD: 0
Current Screen Size: 1.055102
Triangles: 20
Vertices: 28
UV Channels: 2
Approx Size: 16x51x0
Num Collision Primitives: 1

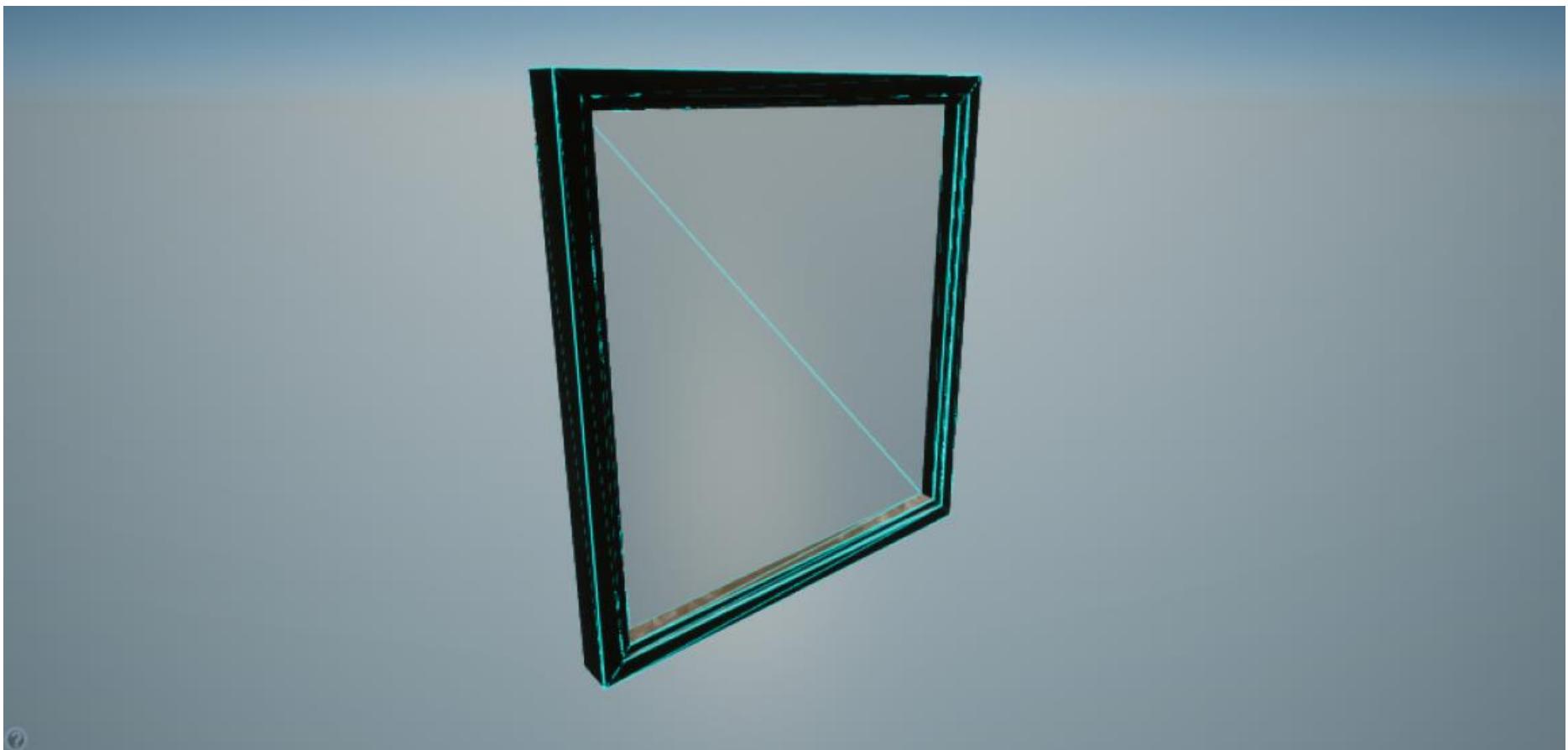




Window:

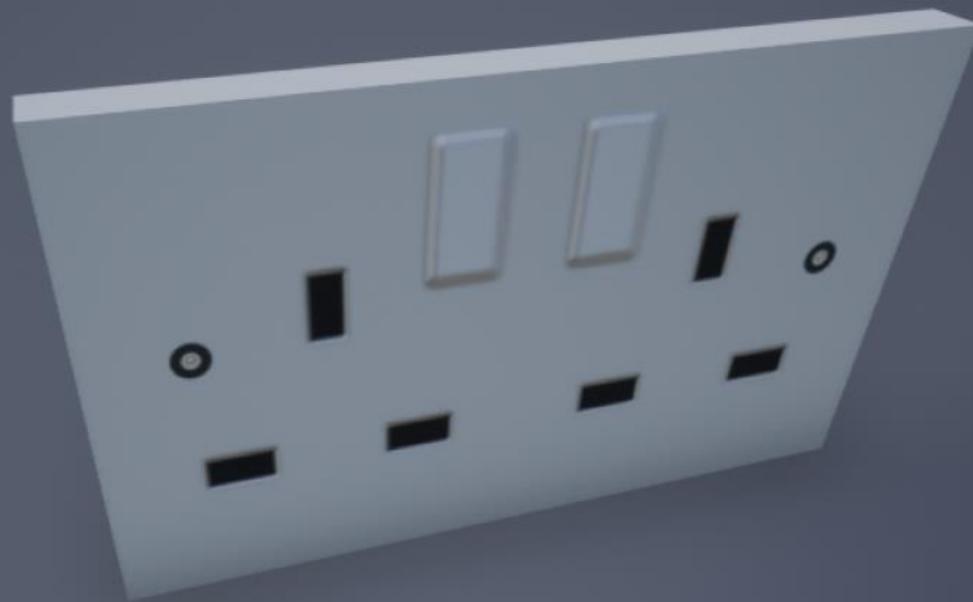
LOD: 0
Current Screen Size: 0.662026
Triangles: 42
Vertices: 68
UV Channels: 2
Approx Size: 9x117x127
Num Collision Primitives: 1

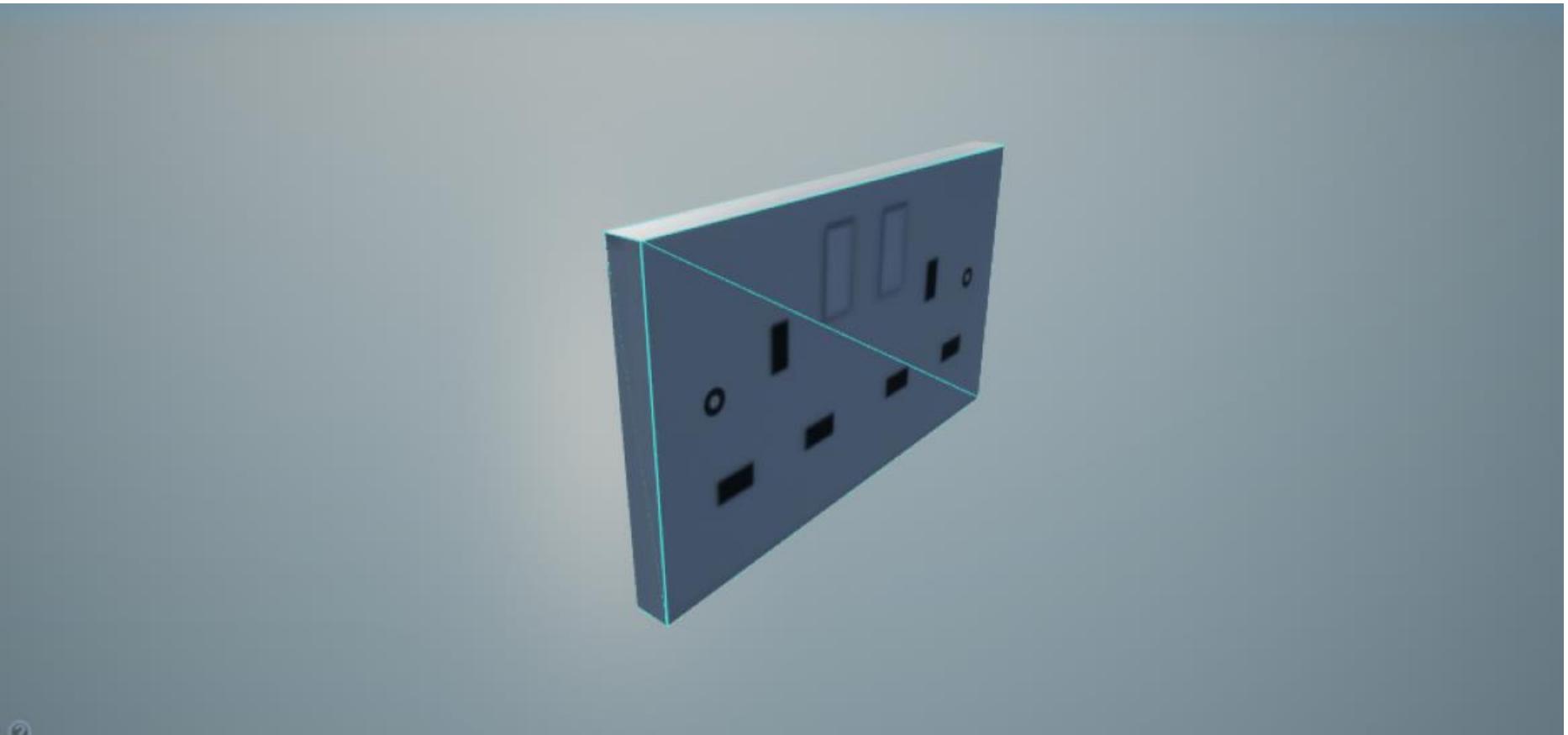




Wall-Socket:

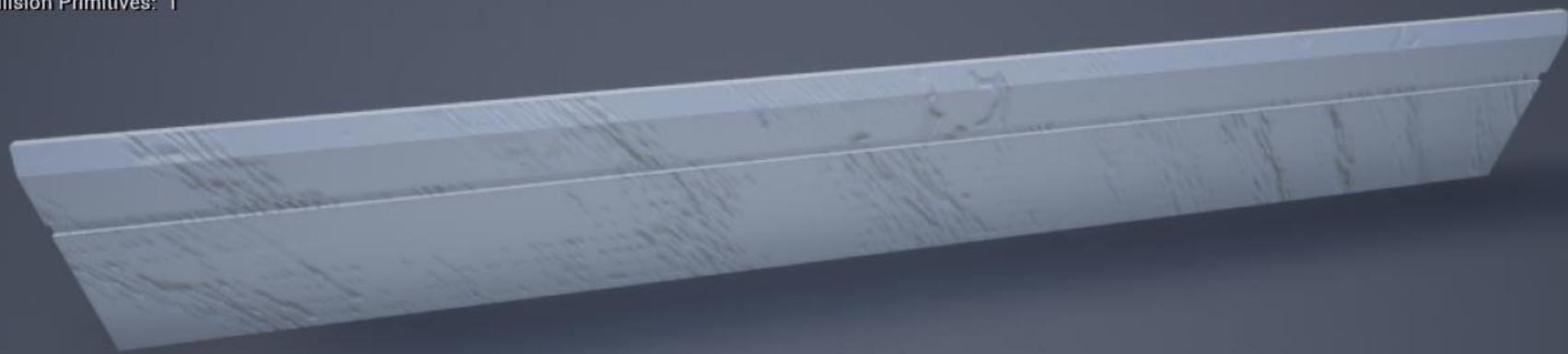
LOD: 0
Current Screen Size: 0.71837
Triangles: 12
Vertices: 24
UV Channels: 2
Approx Size: 1x14x8
Num Collision Primitives: 1





Skirting:

LOD: 0
Current Screen Size: 1.16391
Triangles: 18
Vertices: 36
UV Channels: 2
Approx Size: 1x120x14
Num Collision Primitives: 1



LOD: 0

Current Screen Size: 1.16763

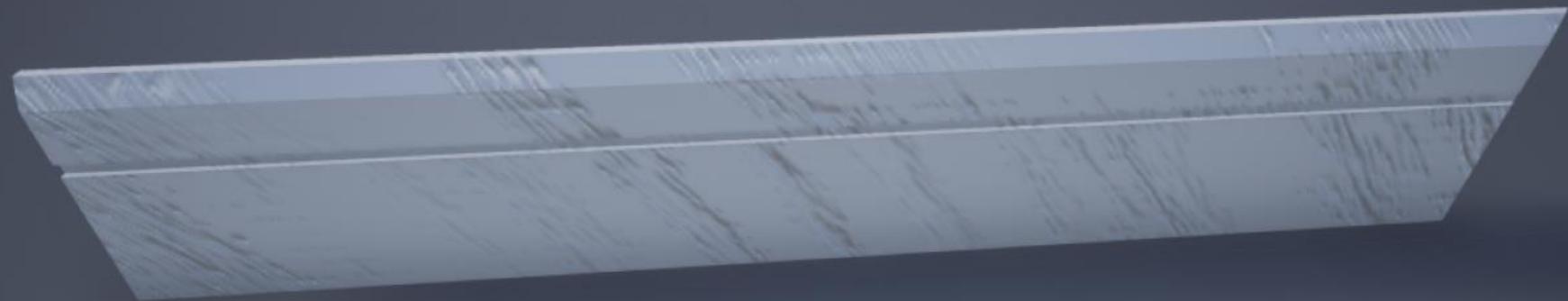
Triangles: 18

Vertices: 36

UV Channels: 2

Approx Size: 1x93x14

Num Collision Primitives: 1



LOD: 0

Current Screen Size: 1.328775

Triangles: 18

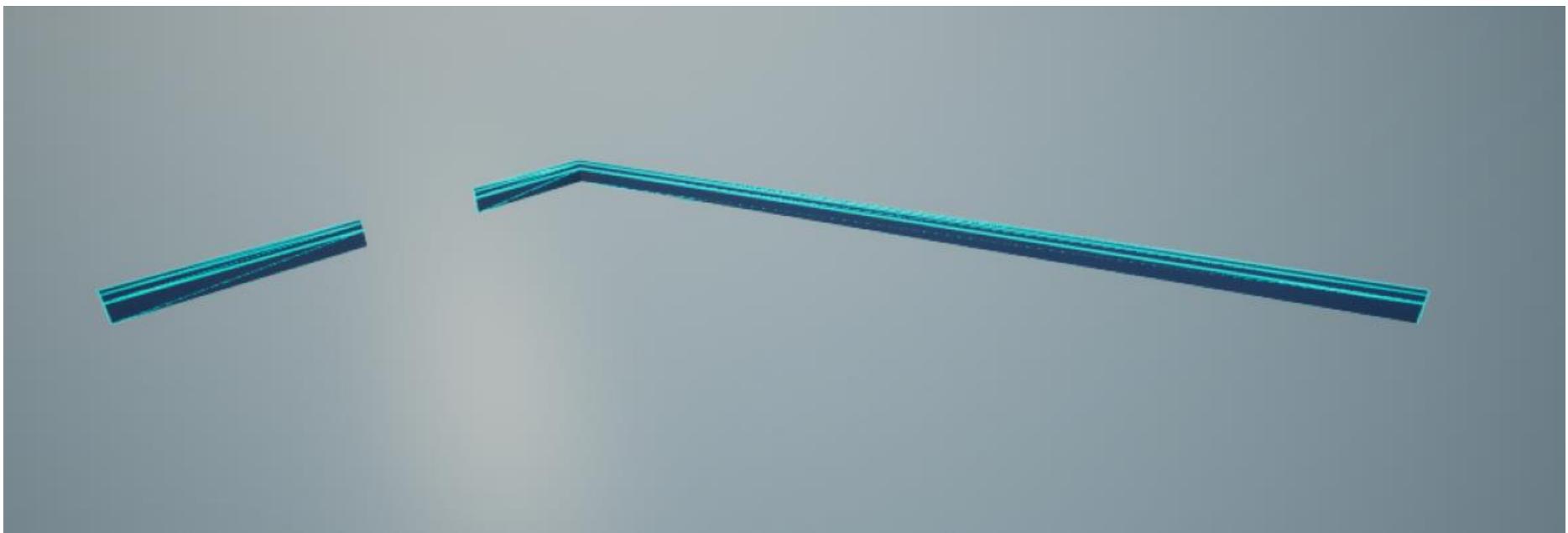
Vertices: 36

UV Channels: 2

Approx Size: 487x1x14

Num Collision Primitives: 1

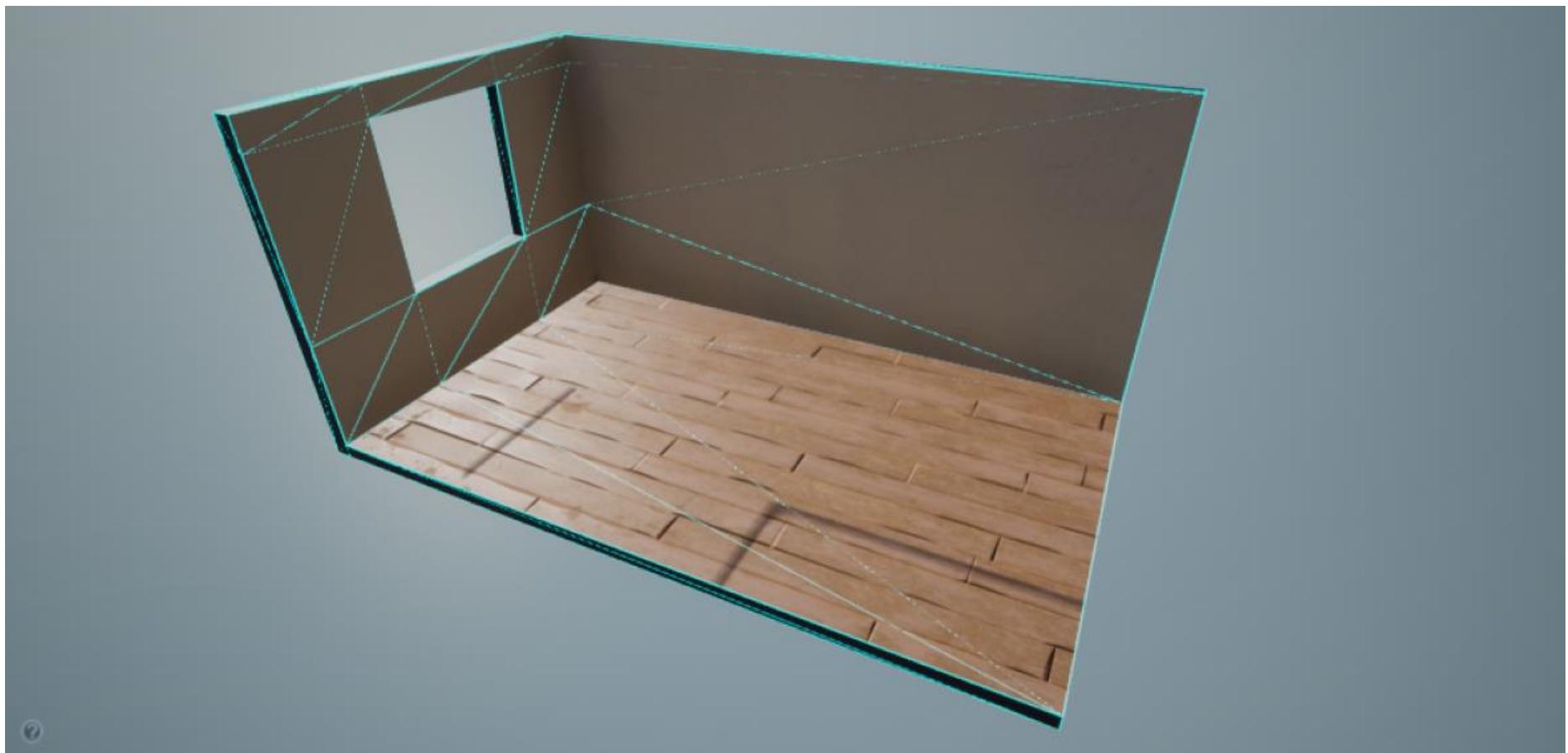




Room Walls:

LOD: 0
Current Screen Size: 0.955766
Triangles: 51
Vertices: 69
UV Channels: 2
Approx Size: 500x300x240
Num Collision Primitives: 1





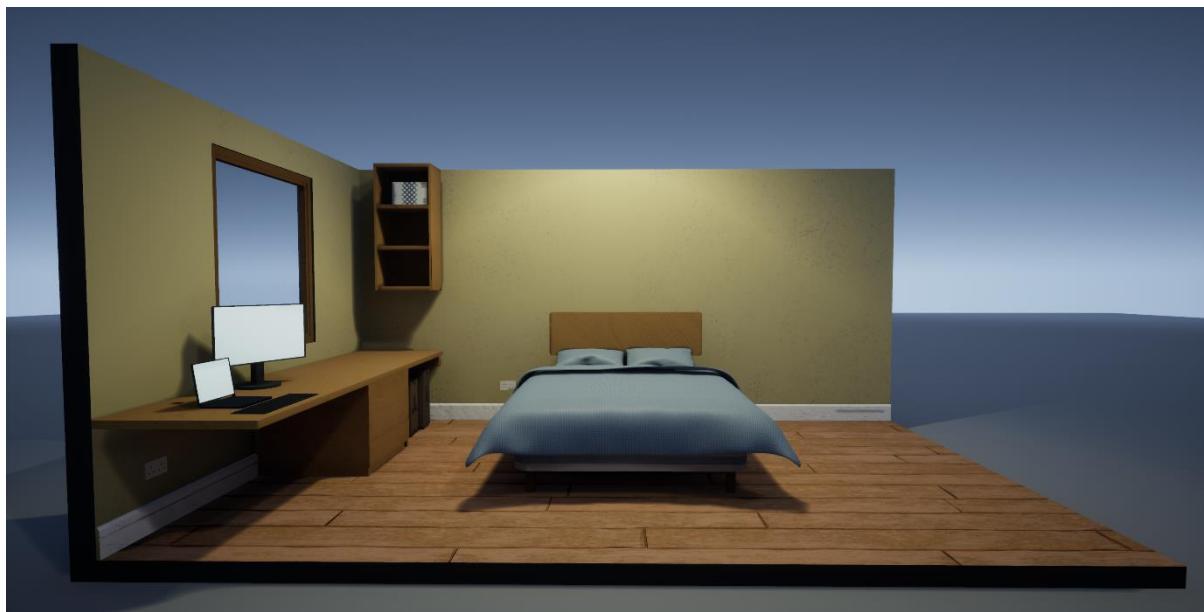
Final Renders













Reflection

I have learned a lot throughout the development of this project, from basic modelling techniques to texture design/creation, I still had my struggled and issues, I have still a lot of improving to do but I can say I am better than I was beforehand, I learned about UE4 and their lighting, it helped me set-up my scene and get the lighting I wanted to showcase my work. I used 2 completely new programs; substance designer and painter, I went from not knowing a thing about them to a moderate understanding and I wish to continue learning more about them and their uses.

I wish to develop upon what I have learned for more projects that may come in the future, I have many improvements to make and new things to learn as I do. My UV skills are gradually getting better, I am starting to have a good understanding of them and how to work with them, although not perfect.

Overall, I am happy with my final result, I wish I had more time to create but I may continue in my personal time to improve what is already there as it will be a good learning opportunity.

One thing I need to do more off is gathering feedback at multiple stages, I only got small feedback on a few things here and there although it did help, I should have gathered more, something I wish to do in the future as well.