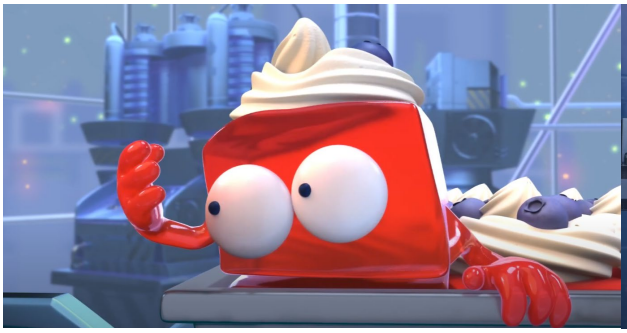
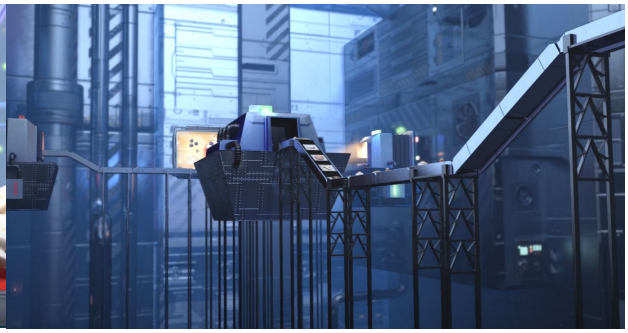
Populating and texturing a massive 3D environment quickly and efficiently.

1. Abstract

This tech paper is intended to guide you and serve as a good steppingstone to quickly and efficiently populate your environment during a production time crunch by recycling parts of your modeled assets and texturing them using a trim sheet workflow. Not only will I go over the key aspects of the development and implementation of this pipeline workflow, but I will also do my best to go over the myriad of issues that we had to face and overcome to populate Tippy Topper's massive factory background shots, as well as provide you with a step by step of how we went about dealing with those issues.

2. Introduction:

During the production of Tippy Topper, our team set out to create a factory setting designed around the idea of a 'too-massive-to-conceive' operation that continues endlessly past what our Jello Character, 'Philip' can see. However, creating a believable environment of such scale came with its own set of issues and difficulties that we had to address. Moreover, we had to find a way to make a pipeline that worked to populate the environment in a short amount of time while still looking cohesive and meeting the standards we set in our production style guide.

To achieve this, it was important for us to keep a modular approach for most of our background environment assets, both in 2D and 3D. This way, we could reuse parts of our assets with slight tweaks and adjustments all throughout our shots without breaking the sense of immersion and uniqueness to each section of our factory.

In this document you will find a guide to the variety of tools and procedures that Tippy Topper used in our production to quicken the development of background assets and set extension and will (hopefully) get you going to populate your massive environment as quickly and efficiently as possible.

I recommend you use this as a steppingstone to get you started, but make sure to do what works best to solve your individual production's problems and do some extra digging online to take your workflows to the next level.

3. Workflows:

Step one to develop a good workflow for your team, is to set aside some time to research, concept and test possible solutions for your specific problems. Remember that each production is different, and even if you are dealing with the same types of issues as Tippy Topper did, there will always be problems that are specific to each production. So, you must start by doing some extra research of your own and set aside time for concepting and testing different approaches and possible solutions. I cannot emphasize this enough.

For Tippy Topper specifically, our set dressing consisted of 3D assets such as pastry models, pipes, conveyor belts, and background machines, as well as 2D matte paintings that were placed behind all our set dressing assets. We decided that a mix of 2D, and 3D assets would give the best results for our production considering that most of our team members had a strong background in digital painting and we could not afford to spend much more time modeling and texturing individual assets for set dressing.

> **Note:** In this tech paper I will mostly go over the development of our background machinery assets and set dressing.

- For the 2D matte painting documentation, please refer to my previous tech paper *"Creating and integrating matte paintings for set extension."*
- For documentation about modular pipes and conveyor belts please refer to Paige Thorsen's tech paper *"So you've still decided to make your factory endless."*

Tippy Topper's custom kitbashing kit

First of all, what is kit bashing and how do you eat it?

Well, the term derives from model making and it is a technique that has been used in both digital and traditional VFX throughout history. Most notably in Star Wars' practical effects and maquettes. Here's a broad definition of it:

> "Kitbashing or model bashing is a practice whereby a new scale model is created by taking pieces out of commercial kits. These pieces may be added to a custom project or to another kit. For professional modelmakers, kitbashing is popular to create concept models for detailing movie special effects." (Kitbashing)

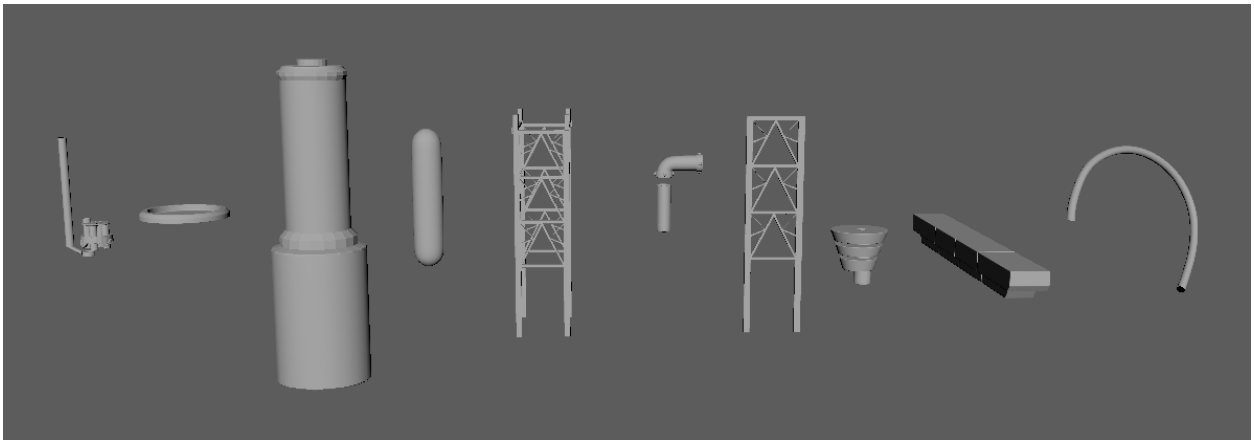
Star Wars' Milennium Falcon greeble details (left), Paul Huston and David Grell kitbashing and adding greeblies to Milennium Falcon 5 foot model (Right.

Why kitbash?

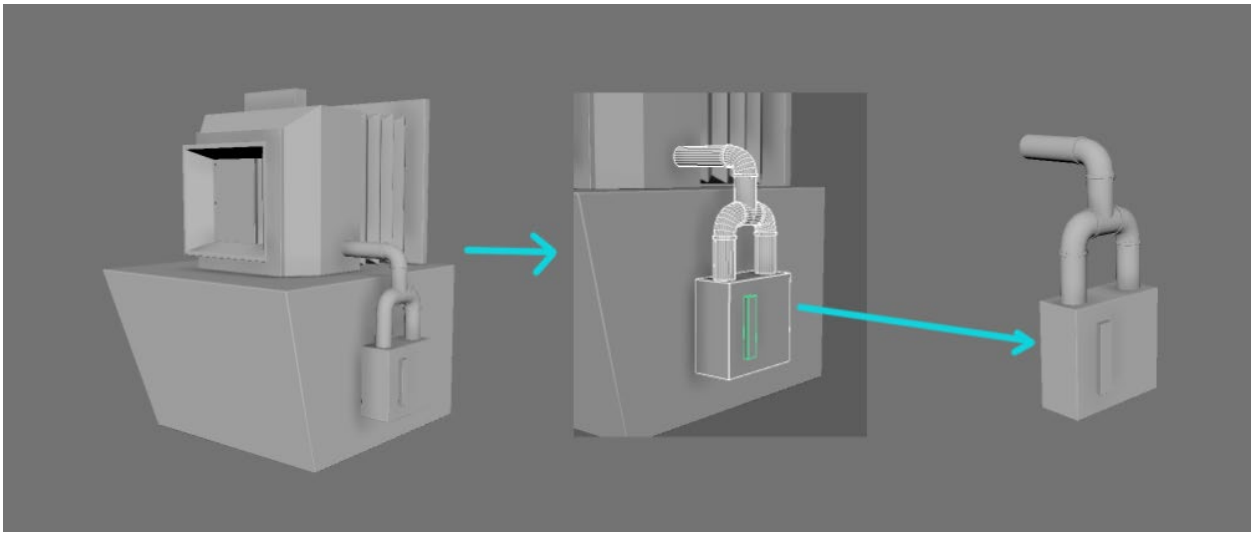
Well… Speed. We took the kitbash approach mainly because it would allow our production artists to create background assets very quickly without having to worry about the technical aspects of manually modeling new background assets. The use of this technique also came with the added benefits of keeping our assets cohesive in terms of shape language, since we were reusing pieces of geometry from assets that had already been approved by the leadership team.

How to prep a kitbash kit

The process is pretty straightforward. Basically, all I did was go through all our asset files one by one and selected pieces of models that I liked and exported them into their own file with a name describing what the individual piece looked like.

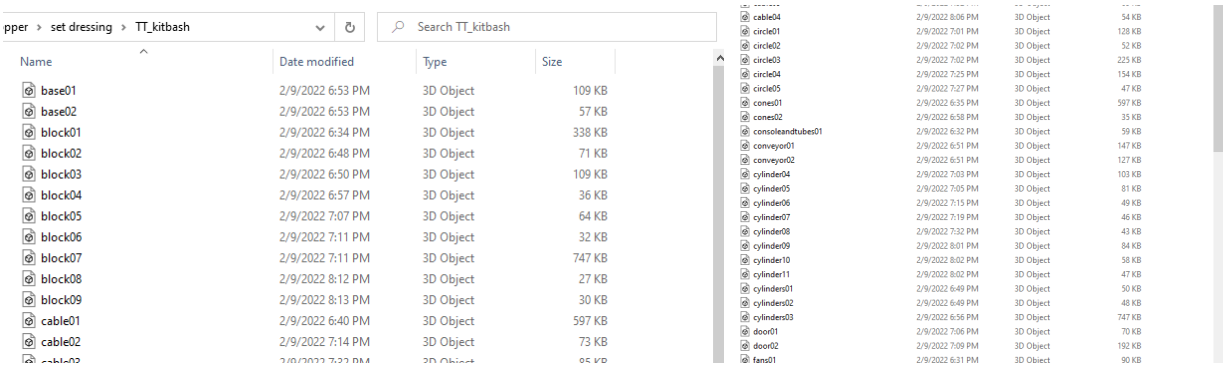


These are some examples of the pieces of geometry included in the Tippy Topper Kitbash Kit.

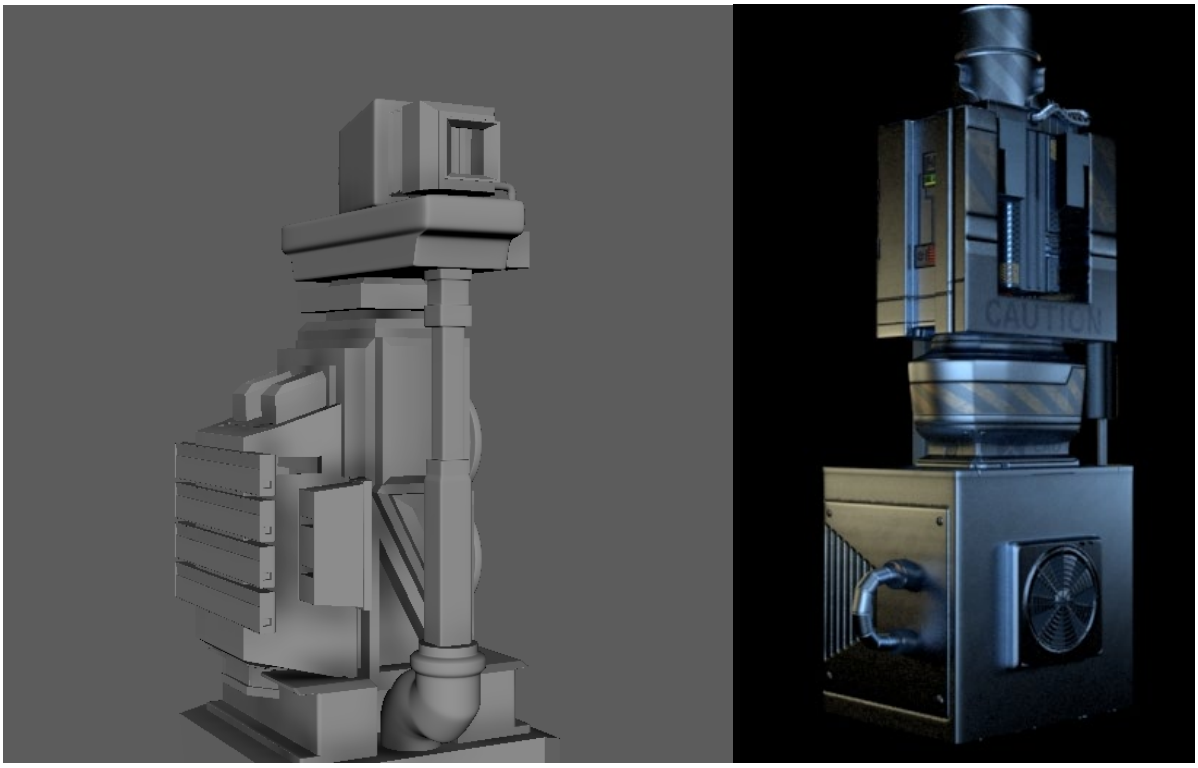


Left to right, full sorter door asset model, selected piece of geometry, extracted piece in its own file.

After going though all files and taking small pieces out of the models, I ended up with a decent size library of asset pieces that could just be imported together into a scene to make more Machinery by simply rotating, scaling and translating each piece and arranging them together to make Machine-like structures that could be textured and placed in our backgrounds for set dressing.



Tippy Topper Kitbash library.



(Left) Kitbashed background machine example with no textures. (Right) Another kitbashed background machine example with trim sheet textures applied.

Trim Sheet development

Now that we have background models, we need to texture and surface them. For this, we could rearrange the UVs to avoid overlap and prep the models to be textured in a software such as substance painter, just like any other assets. However, to speed things up our production decided to use a trim sheet workflow instead. Then again, let's answer some questions before diving into the process.

What are trim sheets and how do you eat them?

> "A 'Trim sheet' is used to describe a texture set which contains a collection of repeating and reusable designs or patterns. These patterns can then be mapped to various assets by splitting UVs or kitbashing assets together." (Trim Sheets)

Trim sheet example by Joe Rodrigues on Artstation. First two images from left to right are the two trim sheets used. Last imageis the final model with trim sheet textures applied.

Why use Trim Sheets?

Tippy Topper kitbashed background machinery assets by Frank Orta.

There are multiple benefits of using trim sheets, but for our production specifically, we decided to go with this workflow for the same reason as we decided to use kitbashing: speed.

Using trim sheets would allow us to reuse the same material across multiple models and stay within our theme of modularity and recycling of assets. Moreover, using trim sheets brought instant cohesion to our backgrounds; since all of our assets used the same materials, the factory as a whole felt more unified in terms of textures and colors.

It is worth noting that we only used trim sheets for our background assets and some of our set dressing elements. For the vast majority of our other assets, we used unique textures in a more traditional workflow to provide a better sense of uniqueness to the assets that would be closer to camera in our short. While the use of trim sheets can add an extra degree of modularity to your production pipeline and save you and your team lots of time; their use should be well thought out and carefully planned, as well as only be applied to some of your assets and not all of them.

Remember that ‘variety is the spice of life.’ A little bit of extra time spent adding details to your assets can go a long way to build a believable, lived-in environment.

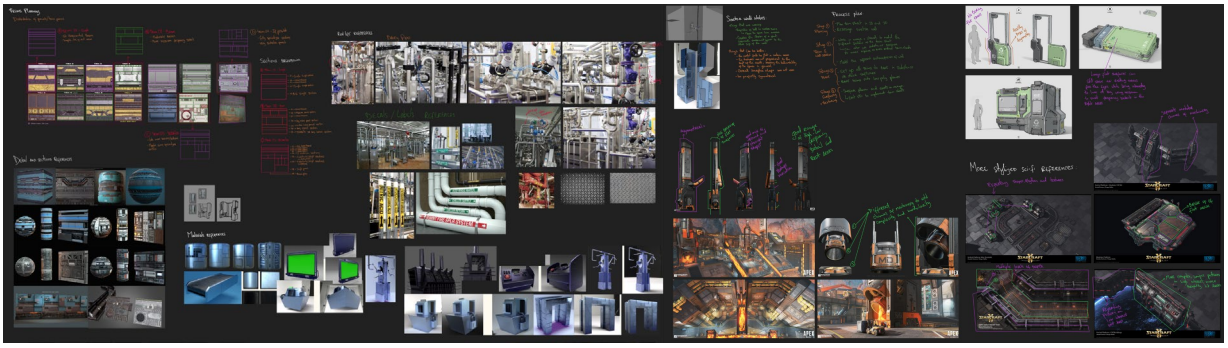
Tippy Topper work in progress composited shots of the 'good' and 'bad' doors (right and left respectively), showing the trim sheet textured wall behind them.

Now that we know the 'What' and 'Why,' let's jump into 'How' we can make some trim sheets.

There are multiple different approaches to create trim sheets depending on how they will be used as well as the style you're going for and the skillset of the artist working on them. For instance, you can make them using only photoshop, you could make them procedurally in a program like substance designer, or you could model/sculpt them using a 3d package like Zbrush and Maya. You can even use a mix of multiple methods depending on what you're looking for and your personal preference.

However, for the sake of this guide, we'll stick to Tippy Topper's trim sheet method, for which I used Maya and Zbrush for modeling the different sections and Substance Painter for baking and texturing afterwards.

a) Trim Sheet planning



Mood boards for trim sheet references and notes by Santiago Levy for Tippy Topper production.

Like with anything else, it doesn't hurt to set aside time in the beginning to do some extra research, collect references, write down ideas and plan ahead before starting to work on your assets. The extra prep in the beginning will also help you identify potential hurdles that you might encounter and keep you on track later on, so you allocate your worktime more efficiently.

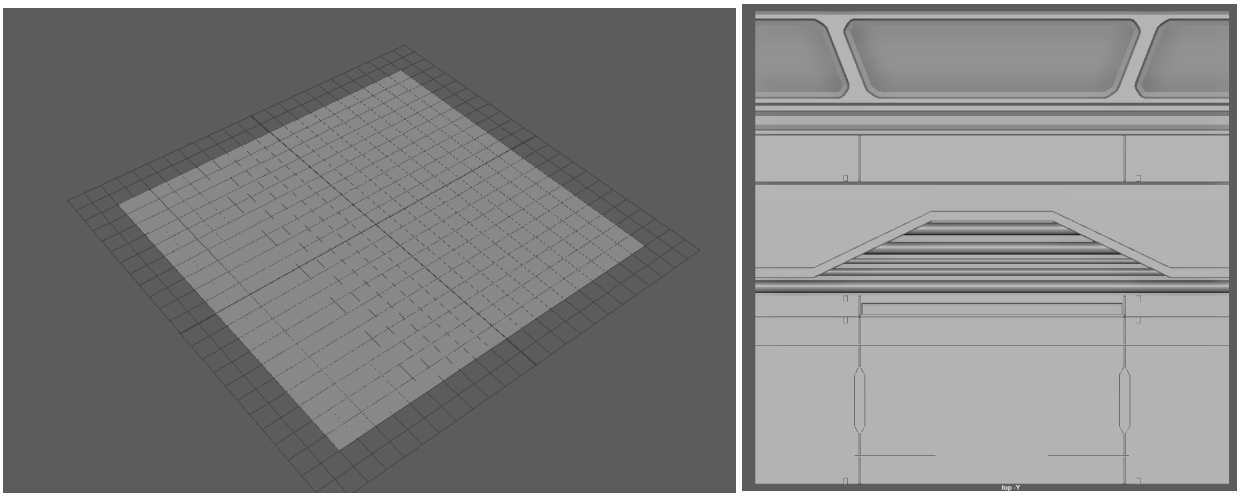
This especially helped me figure out how many trim sheets I would have to make for the things we wanted to do, as well as identify what sorts of elements we wanted to have on our trim sheets, so our factory environment felt believable within the context of our style and story.

Real life references of dairy pipes and food processing plants for Tippy Topper.

For instance, we knew that we wanted “factory machinery” type of textures and elements on our trim sheets, but that description is too vague and doesn’t contribute much to the design aspects of production in a practical sense. So, after doing some research on dairy processing plants I was able to figure out exactly what kinds of pipes, valves, decals, and metals I had to aim for. Which saved me some brainstorming time later on, since I already knew what I had to model.

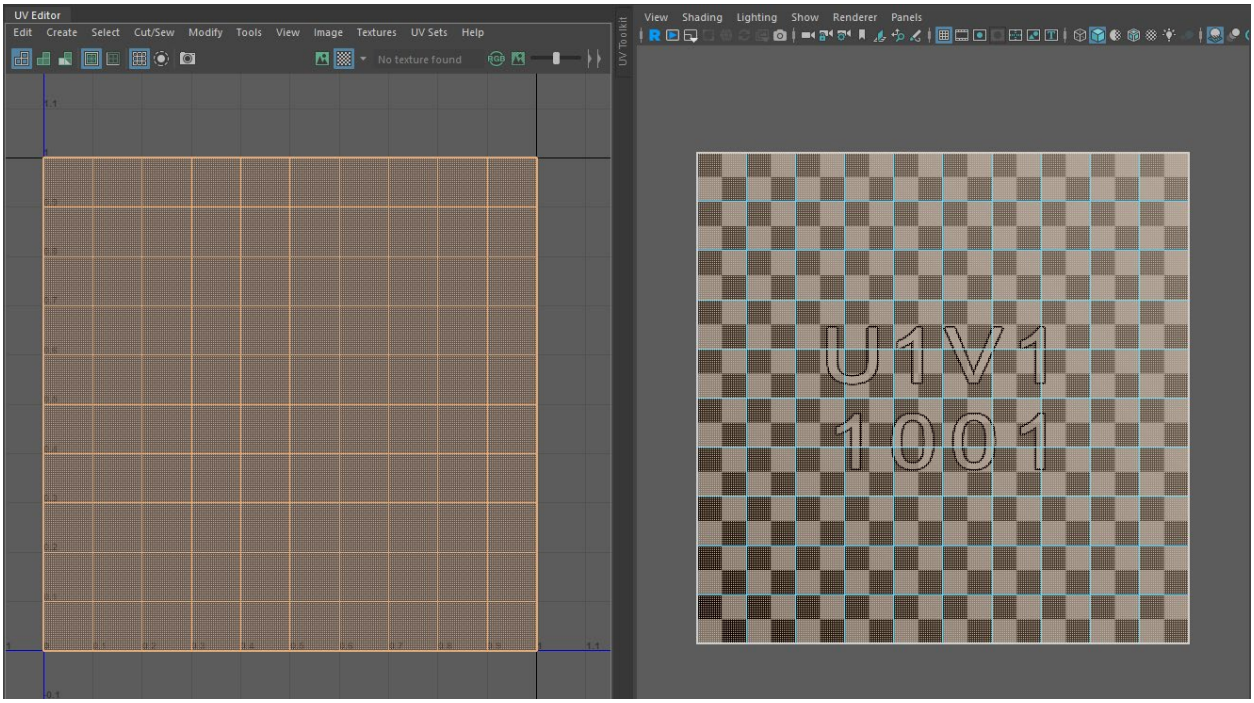
Compilation of Tippy Topper textured assets, used as reference for the types of roughness and color qualities of the metals to be made for the trim sheets.

b) Trim sheet size blocking and rough modeling



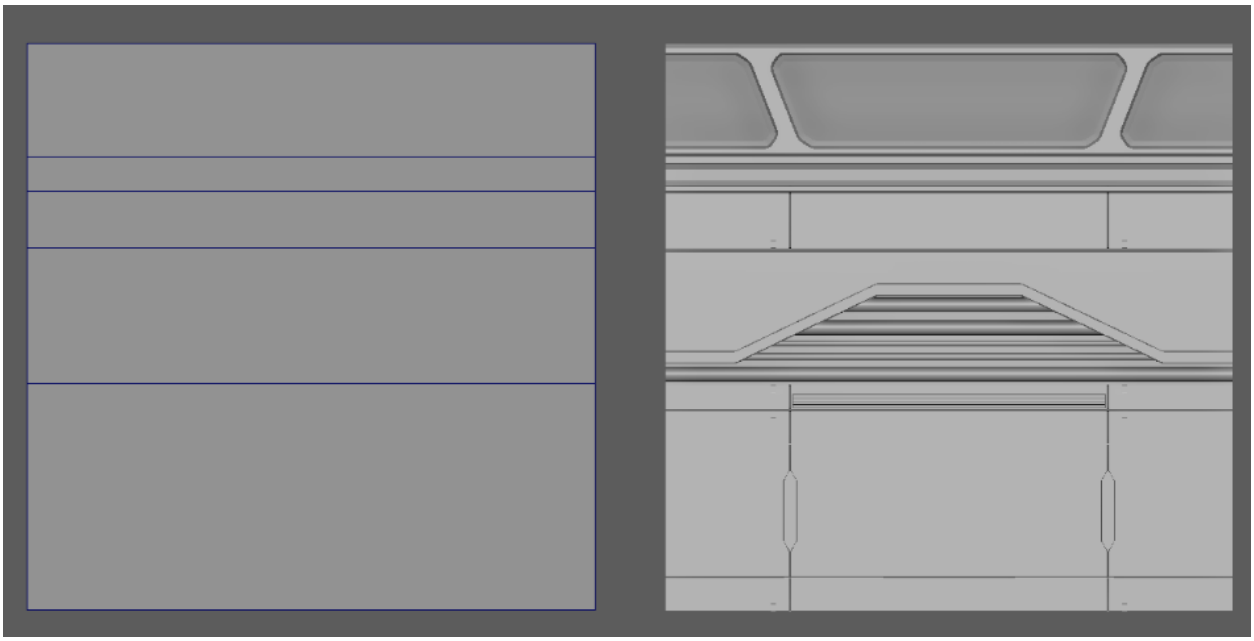
Single plane in maya viewport, 20 by 20 units HxW (left) Finished rough blockout of trim sheet 01 in Maya (Right).

For this part you will create a plane which will be used as your low poly model to bake down to. I made mine a perfect square of 20 units of height by 20 units width. Since it's just a plane with no edits yet, it should have a perfectly squared UVs as shown in the images below.

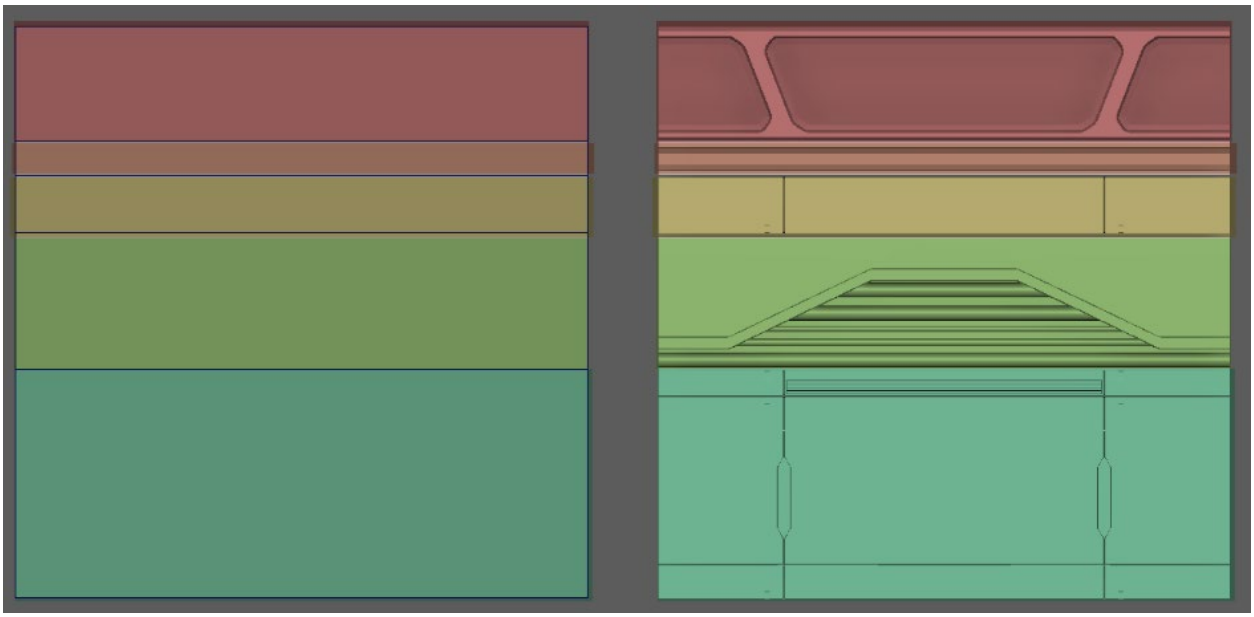


UV shell as seen in the UV editor (Left) 3D plane as seen on the viewport with UV shell selected and checker map enabled (Right).

After this, we will duplicate the model, and hide the original. We want to keep the original UV'd plane and not work directly on it, as it will be used later on to bake down our high poly model. After doing so, we will take our duplicate version, rename it to something else, and use edgelopps to divide the plane into different sections corresponding to the different parts of our trim sheet.



Side by side comparison of starting 3D plane with added edgeloops (left) and final blockout model (right).



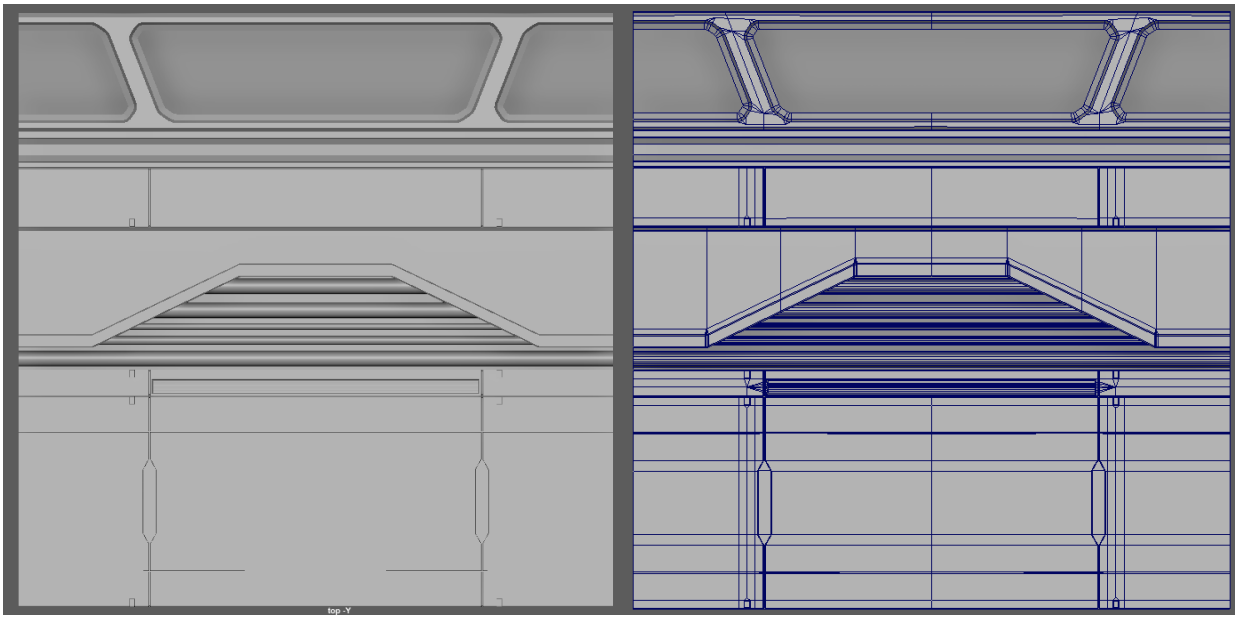
Side by side comparison of starting 3D plane with added edgeloops (left) and final blockout model (right). With colored codes for each section of the trim sheet.

The next step is to detach the edgeloops on the plane and separate each section of it into it's own object.

From this step onward it is just a matter of modeling out the rough shapes of the trim sheet that you want to make until you are satisfied with your model.

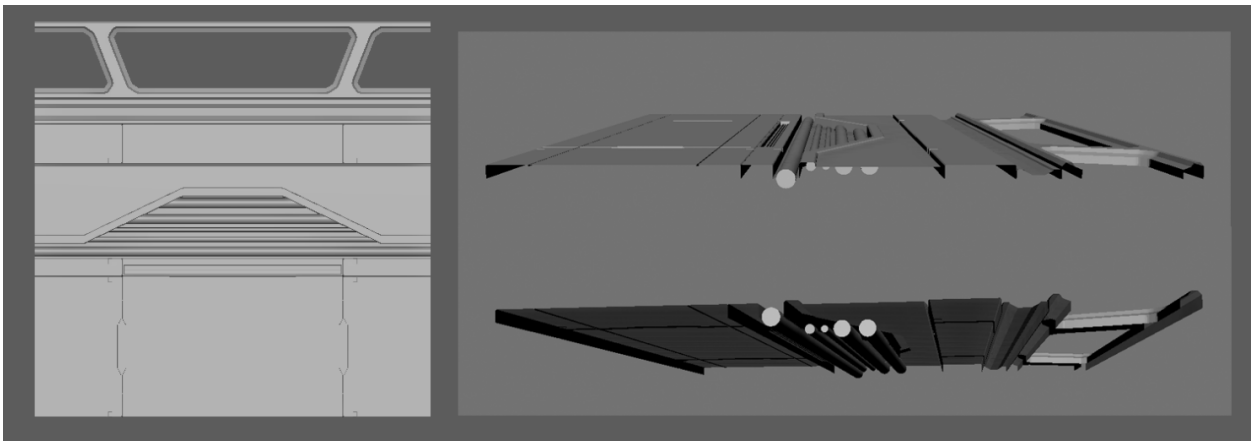
> **Note:** For this workflow in particular, it is worth noting that following proper modeling practices such as avoiding ngons in your mesh, while helpful is not a huge deal, as this model will be

triangulated and taken into zbrush after doing the rough blockout for sculpting. However, if there are any ngons or tris on the model, you have to make sure that they are placed on completely flat 90 deegree angled surfaces and away from the edges. That way you'll ensure that your normals know what to do and react to light properly. That being said, if you're still not too sure about your modeling skills, it is always safer to stick to quads.



Finished rough model blockout (left) Finished rough model blockout with wireframe enabled (right).

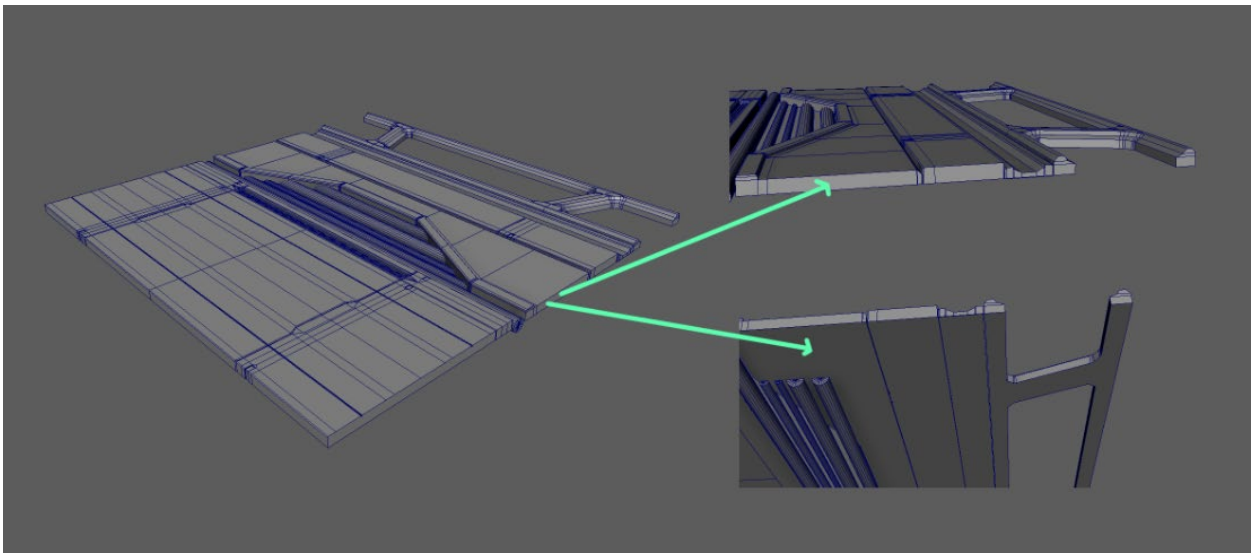
c) Trim rough model export to Zbrush



Rough model for trim sheet (left) side perspective view showing open bottom and sides of the trim sheet (right).

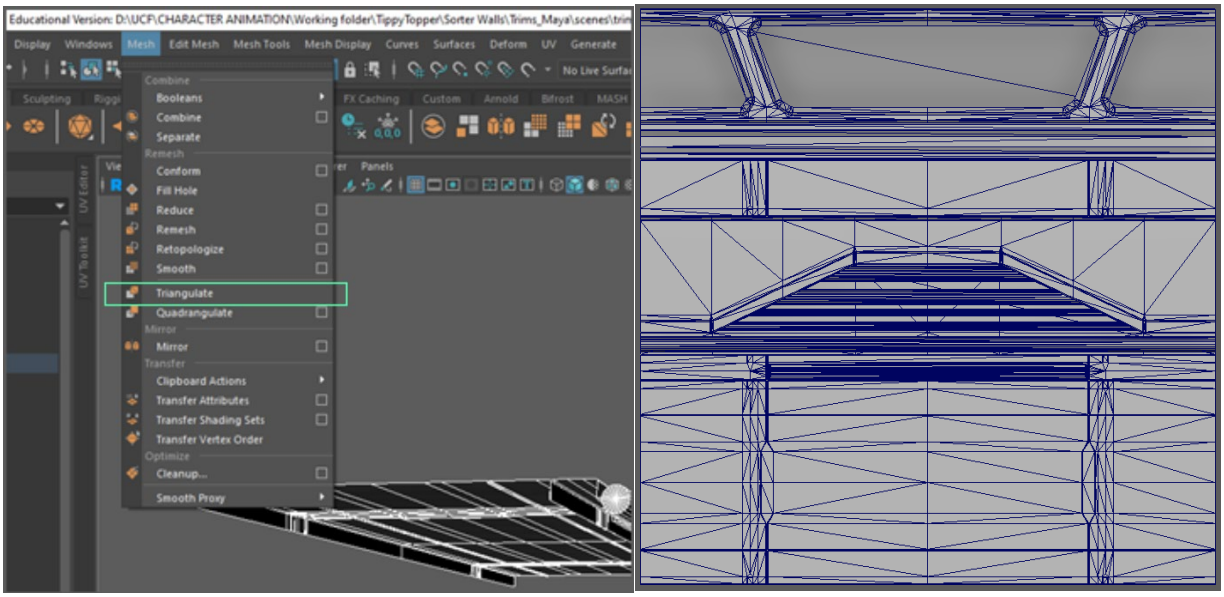
Once you're satisfied with your model, it is time prepare to export out of maya into zbrush for detailing and polish. To do so, make sure you close out the back and sides of your meshes to the best of your ability. I recommend doing it manually rather than using the 'fill holes' operation, just to avoid any

complications with your mesh. Closing all the holes in your mesh will help avoid some issues when dynameshing the model inside of zbrush.



Perspective view of the trim sheet model (left) side perspective view of trim sheet model, showing the sides closed off (top-right) side perspective view of trim sheet model, showing the back closed off (bottom-right).

Next, select all of your sections of trim sheet and triangulate them by going to Mesh > triangulate.

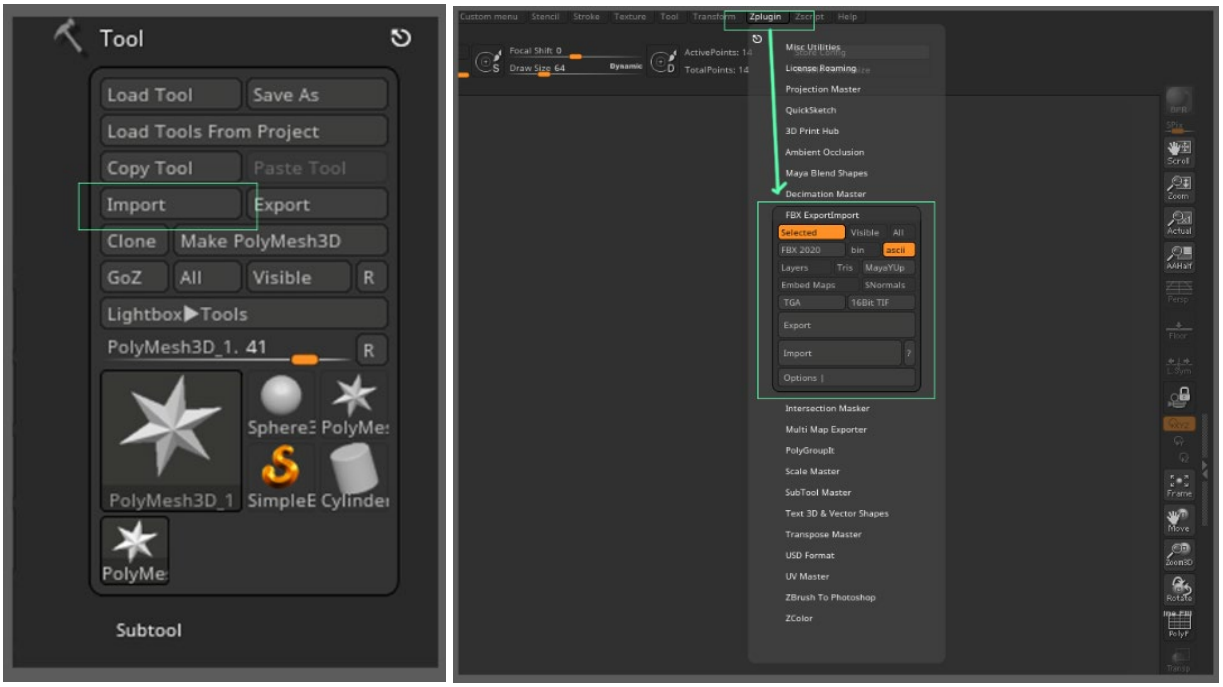


Mesh > triangulate option in Maya (Left) Resulting triangulated mesh top view in Maya viewport (Right).

Once you have closed the holes in your model and triangulated the mesh, you can select your trim sheet model and export your selection as either FBX or OBJ, you may try either format and use what works best for you. In my case, FBX worked fine. This doesn't have to include your low poly mesh (the original plane that we made in the beginning); as mentioned before, this model will only be used in substance for baking once our high poly mesh is finished in Zbrush.

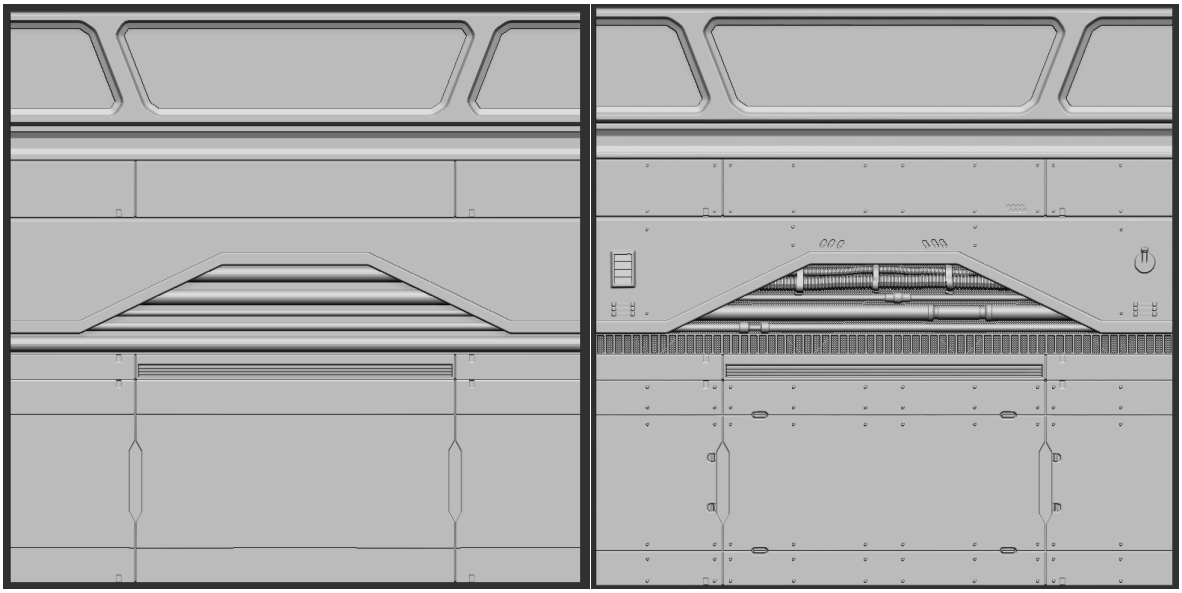
d) Importing to Zbrush

Once in Zbrush you may import your mesh through the import button in the tool menu if you're importing an obj, or through the FBX ExportImport plugin located in the zplugin menu.



Import option for OBJ files (Left) FBX ExportImport plugin and zplugin menu (Right).

Tips and tools to polish and refine your high poly mesh in Zbrush



Imported rough base mesh (left) finished high poly mesh after detailing and polishing in zbrush (right).

Disclaimer: I won't go into every single step of how to detail your mesh in Zbrush for this guide, as it would take way too many pages to go over everything and there's plenty of Zbrush resources online to

get better at Zbrush. Instead, I will share some useful resources that will help step up your Zbrush game and explain all of that stuff better and faster than I ever could in this tech paper.

I will also go over the general steps I took to work on the mesh and the specific tools and settings that helped me the most when working on this trim sheet. I will also go over some things to consider and how to work around certain issues that I ran into when working on this trim sheet inside of Zbrush.

Now, back to our trim sheet:

1. First thing you want to do is duplicate your mesh and then **split your duplicated mesh** into different subtools using the subtool menu option 'split to parts' and **then Dynamesh** each subtool one by one making sure they get enough resolution to retain clean edges (if you're working on a hard surface trim sheet).

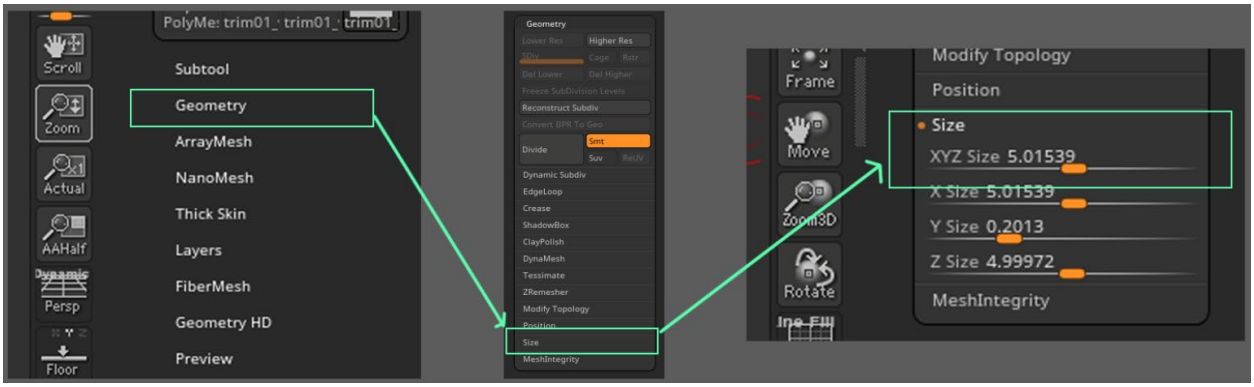
   > **Note:** don't worry too much about polycount here, this mesh will be decimated later and used just to bake in substance, so just make sure the mesh looks good and the polycount is not too high so as to slow down your computer. (Zbrush is great at handling dense meshes though)

One issue I ran into here was not getting enough resolution on my mesh after Dynameshing, so my edges were not as clean as I wanted. This is easily fixable by increasing your mesh scale before splitting it to parts. (Which is why we duplicated the mesh first before splitting it, that way we always have a backup if we mess up).

To scale up your mesh go to **Geometry > Size** and then scale up your mesh using the XYZ Size slider.

__Make sure to write down the original scale of your mesh beforehand__ We will need to downscale back to the initial scale before exporting out of Zbrush.

Then repeat step one after you have scaled up your mesh. You should now be able to get more resolution out of your Dynamesh and get better results.



Location of geometry size tool in zbrush.

2. If everything goes well, you can start to work on your individual Dynameshed sections now.

Some useful tips and tools I would recommend:

Live Booleans: really easy and fast way of adding detail to your mesh, especially useful for hard surface modeling in Zbrush. Just make sure to apply your Booleans before getting ready to export.

Polygroups: One of the strongest features of Zbrush if used correctly.

- Make sure to use the Polygroups menu options to create groups for the different surfaces and pieces of your mesh.

Deformation Menu: polish, polish by groups, polish crisp edges, relax, inflate, mirror.

- Combining masking, Polygroups and deformation menu options can help speed up your process by a lot.

Mirror and weld: to fix symmetry issues. The symmetry in Zbrush applies only from left to right, so sometimes you will have to mirror your geometry using the deformation menu and then mirror and weld to fix some issues.

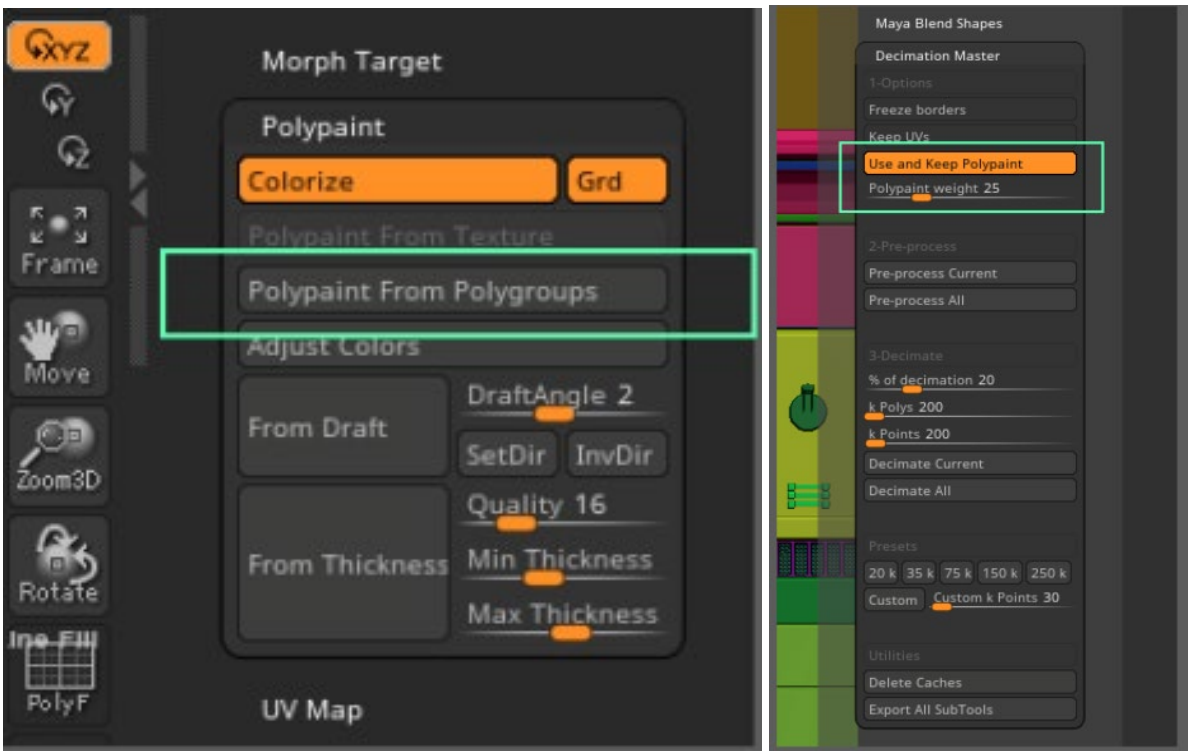
Useful brushes: Zmodeler, Hpolish, TrimDynamic, DamStandard, Move Brush.

Zremesher + Crease tools: Zremesher can be a bit hit or miss sometimes, but when used with polygroups and the crease tools (found under geometry menu) you can get some really nice results.

e) Creating ID maps for substance inside of Zbrush

To create our ID maps in Zbrush we'll have to select **polypaint > polypaint from Polygroups**. This will paint our model based on the color of its Polygroups. And then we will decimate the subtool using the decimation master, found in the zplugin menu. Make sure to select the "**Use and Keep Polypaint**" option so you don't lose your color information during the decimation process.

To decimate, pre-process the current tool (it may take a while depending on the polycount), and then Decimate to the desired polycount. We do this to avoid issues with substance painter. Substance can handle pretty dense meshes, but it's still good practice to decimate your mesh to avoid loading issues and crashes when baking in substance.



Polypaint from Polygroups option (left) Decimation master and "use and keep polypaint option" (right).

f) Exporting high poly mesh from Zbrush

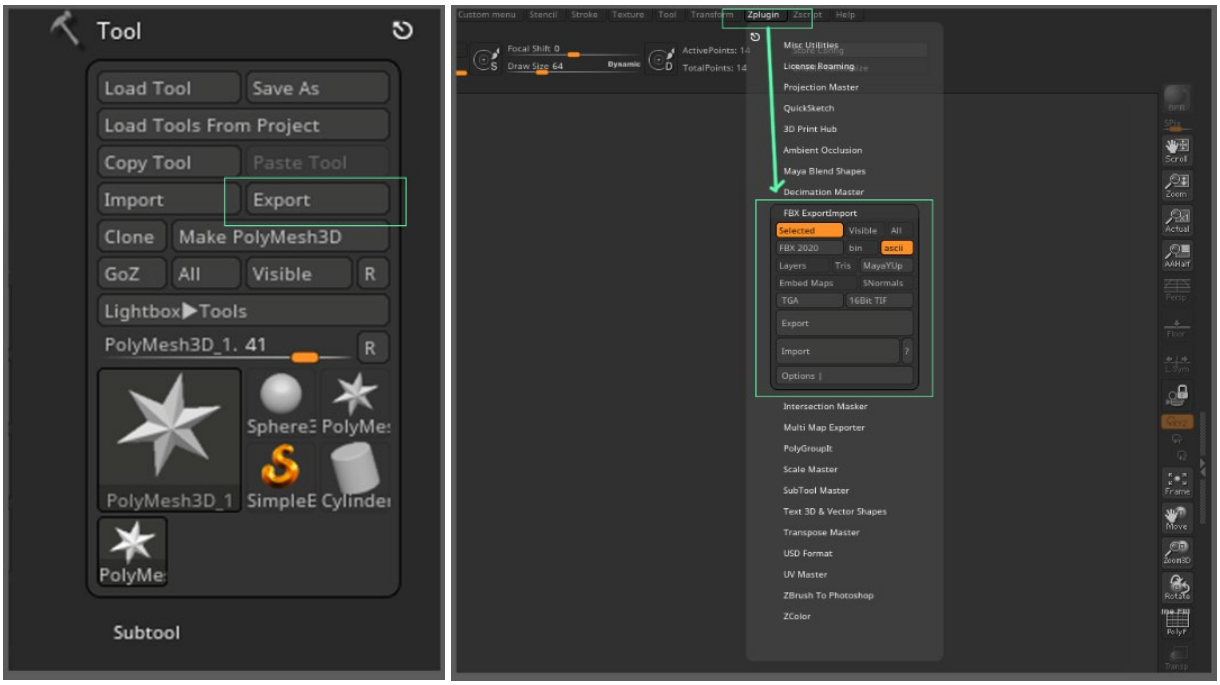
To export your mesh, you will want to combine all of your decimated and colorful subtools into a single subtool.

> **Note:** If you upscaled your mesh in Zbrush before Dynameshing it then you will have to **scale it back to its original size**. (Remember when I told you to write down the original size before scaling it up? This is why we did that).

If you didn't upscale your mesh before Dynameshing, then your mesh should still be set to the same scale as your low poly mesh from Maya and you should be good to go.

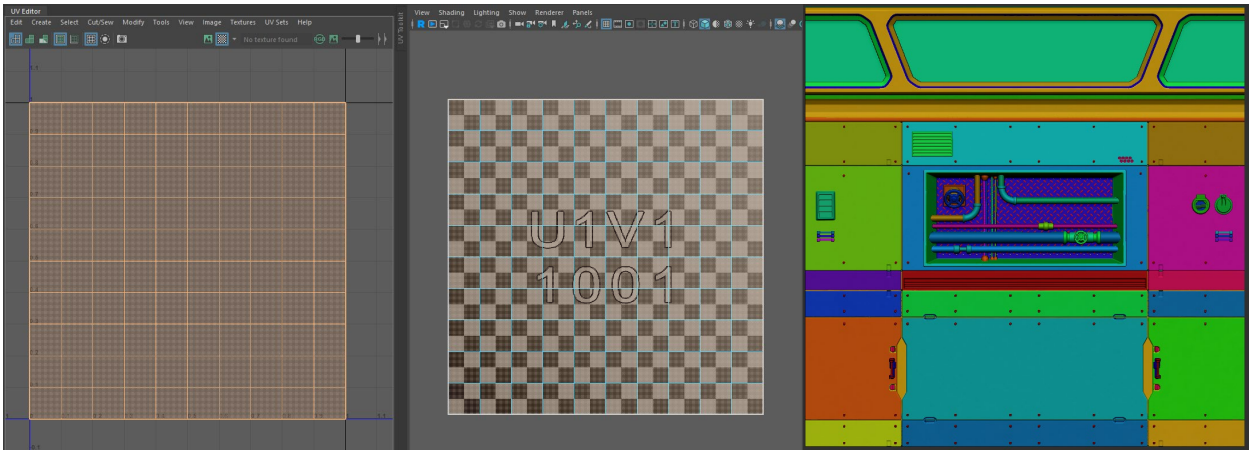
Once your mesh is combined and at the right scale, you can export your mesh, again using the tool menu if you want to use OBJ or using the FBX ImportExport plugin under the zplugin menu if you want to use FBX.

I have found that sometimes I get better results by exporting as OBJ, and sometimes FBX works better for me. So make sure to try both if you run into any issues importing into substance.



Export option for OBJ files (Left) FBX ExportImport plugin and zplugin menu (Right).

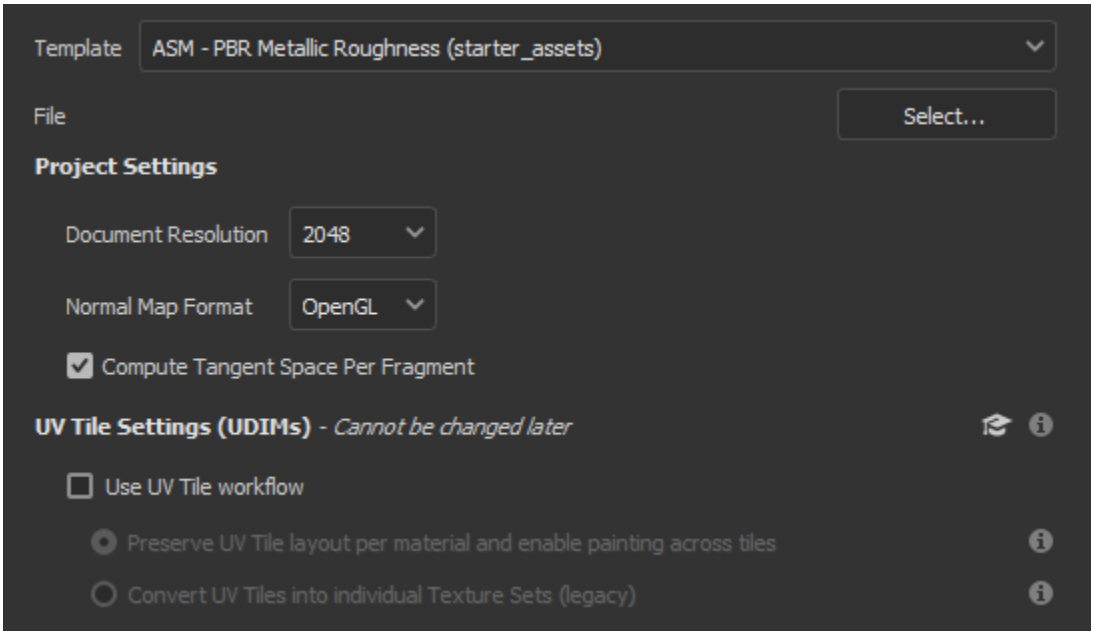
g) Baking high poly to low poly mesh in Substance Painter



UV shell as seen in the UV editor (Left) 3D plane (low poly mesh) as seen on the viewport with UV shell selected and checker map enabled (Center) High poly Mesh with ID maps as seen in zbrush (Right).

1. At this point we should have a low poly mesh (the original UV'd 3D plane we made in Maya during our block-out stage) and our high poly mesh which was exported from Zbrush with polypaint to use as ID maps.

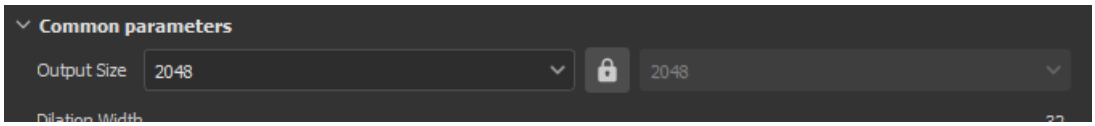
Note that during the zbrush stage I ended up changing the design of the trim sheet for the middle sections in order to bring it closer to a factory setting and away from a 'spacey' sci-fi direction. Be sure to always keep iterating and adjusting based on your initial research and feedback from your team.



Substance Painter settings.

2. Now, we will export the low poly plane mesh from Maya and load a new substance file with it. Make sure to select OpenGL and have **"use UV tile workflow" unchecked.**

3. Then, go to texture settings > bake maps and set up your bake.
    a. Make sure to do a low-resolution bake first by lowering your output size to something like 512 to test your settings before doing the full bake.

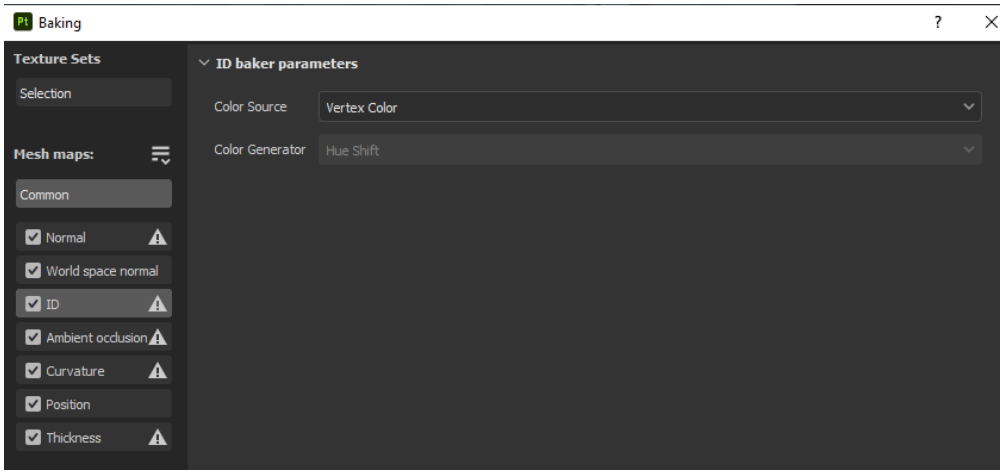


Output size settings.

    b. Then import your high poly mesh by clicking on the "high definition meshes" icon with the "use low poly mesh as high poly mesh" un-checked.

Import high poly mesh button.

c. After loading your high poly mesh, select your ID maps settings and change the color source to “vertex color.” This is the setting that will tell substance to read in our polypaint information as ID maps.

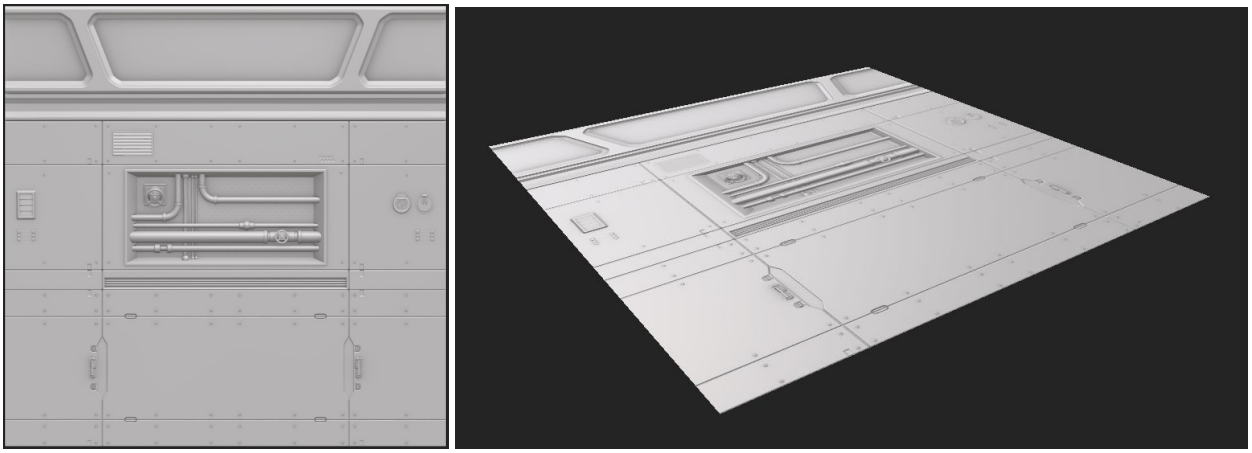


ID Maps bake settings.

d. Depending on your mesh you might have to tweak the frontal and rear distance of your bake in order to get cleaner results out of your bake. In this stage you’ll have to do some test bakes to find what works best for your meshes, but the settings that worked best for me were 0.3 Max frontal and 0.1 Max rear.

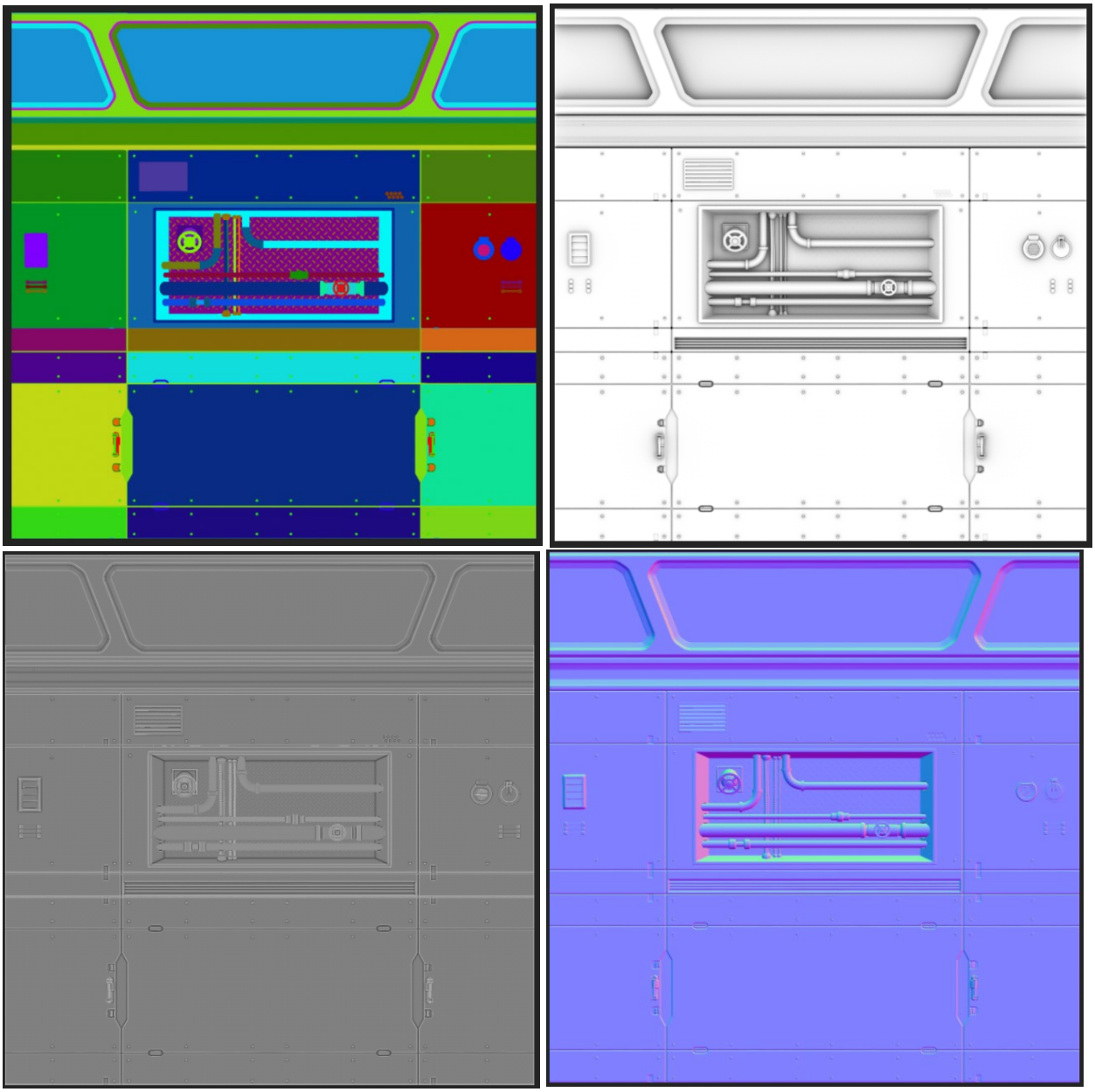
Max Frontal and Rear distance bake settings.

And voila! Hopefully at this point you’ll have a nicely baked mesh to texture in substance.



Bake results substance viewport front view (Left) substance viewport perspective view (Right).

Now you can proceed to texture the trim sheet just like you would anything else in substance painter.



ID, AO, Curvature and Normal Maps after bake.

Just like with zbrush, there's plenty of tutorials online for texturing that will go over things better than I could here, so I won't go over the texturing process for the trim sheet.

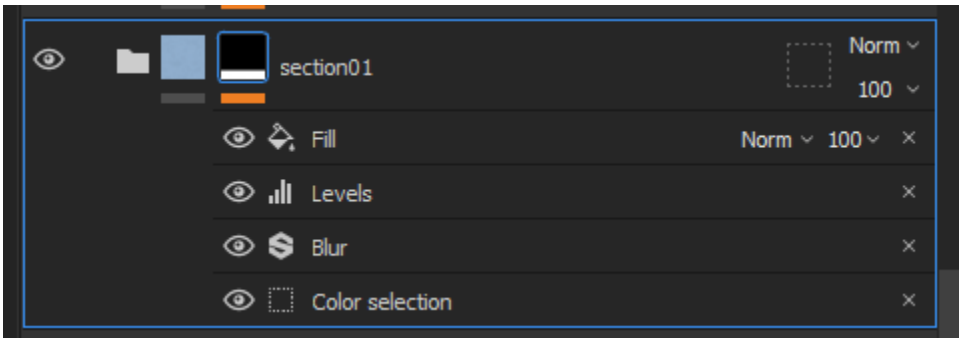
What if your ID maps still don't mask things quite as cleanly as you expected?

I did the best I could in zbrush to get clean ID maps, but still ended up getting some artifacting and masking issues once I baked everything in Substance. There's a couple things you can do to work around these issues and fix your maps if you're on a time crunch and must get these trims down as quickly as possible.

1. **Take your mesh maps out of substance and edit them in Photoshop.** I recommend leaving this as a last resource to fix these issues because if you do it this way and have to change your trim sheet's model later, you will have to redo all your edited maps again by hand EVERY TIME. Which is definitely not a great solution in the long term. However, as mentioned before, sometimes if you find yourself at your last straws during a crunch period and just need to get it done, this will do the trick. Just import your IDs into photoshop and manually paint your ID map to get exactly what you need. Then all you have to do is reimport the edited map into substance and replace your file's mesh maps with the new ones.

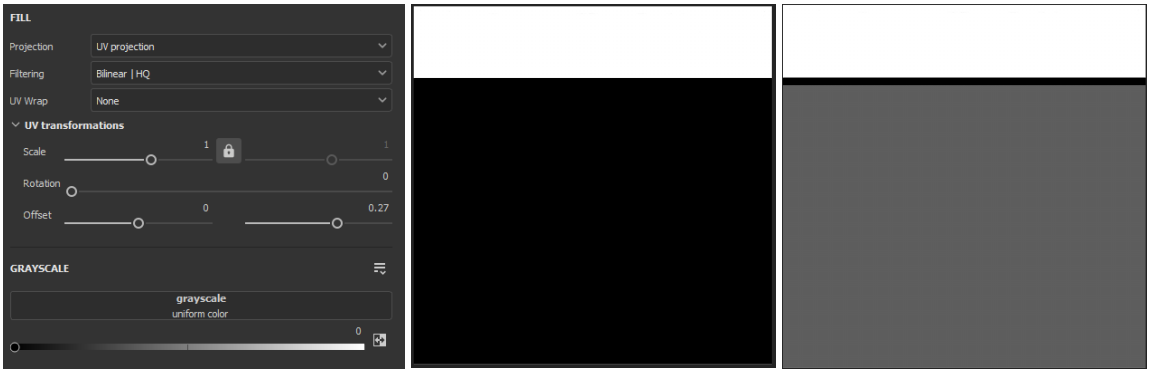
   Note: this works for any texture map, so this is a (somewhat) quick and dirty way of fixing any map including AO, Curvature, Normals, IDs, anything.

2. **Use a layer mask and add a blur filter, levels filter and a fill to it.** I found this this adjustment combo to be really helpful when working with messy IDs in substance.



Layer mask setup inside of substance painter.

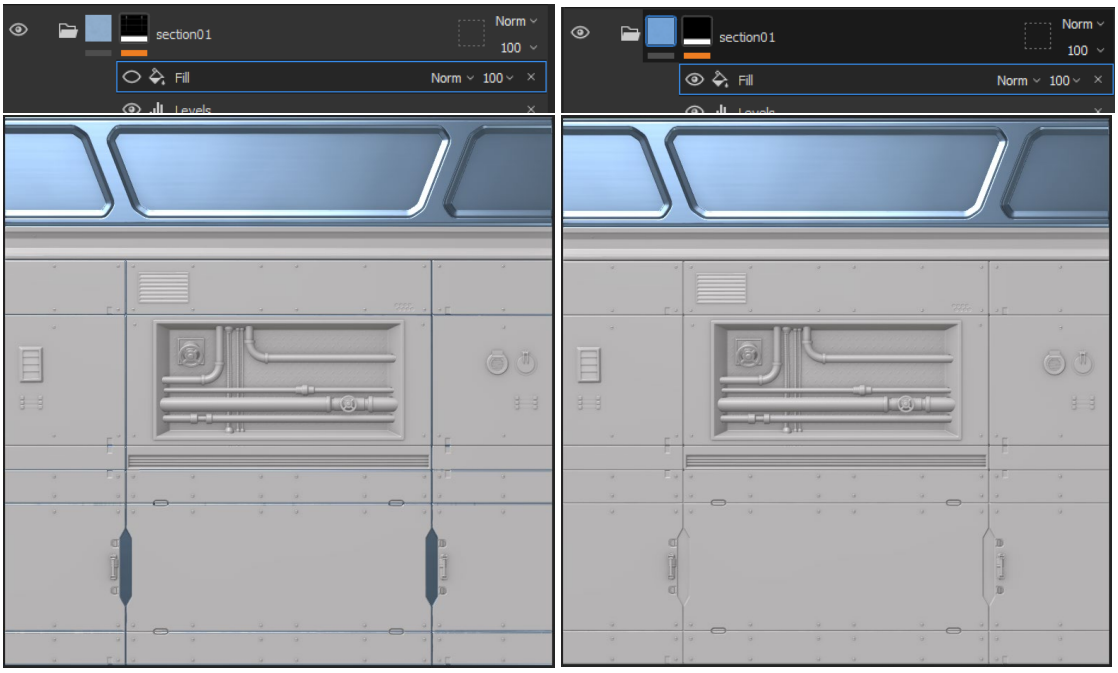
You will use the mask **Fill** as a rectangular mask that you can translate, scale and offset to cover specific areas of your mask that your ID did not mask out. Just make sure to select "None" in the "UV Wrap" section so the mask doesn't tile and acts as a single rectangular shape instead.



Mask Fill settings (left) final mask (center) Mask fill turned grey to show what part of the trim sheet is being afected by it (right).

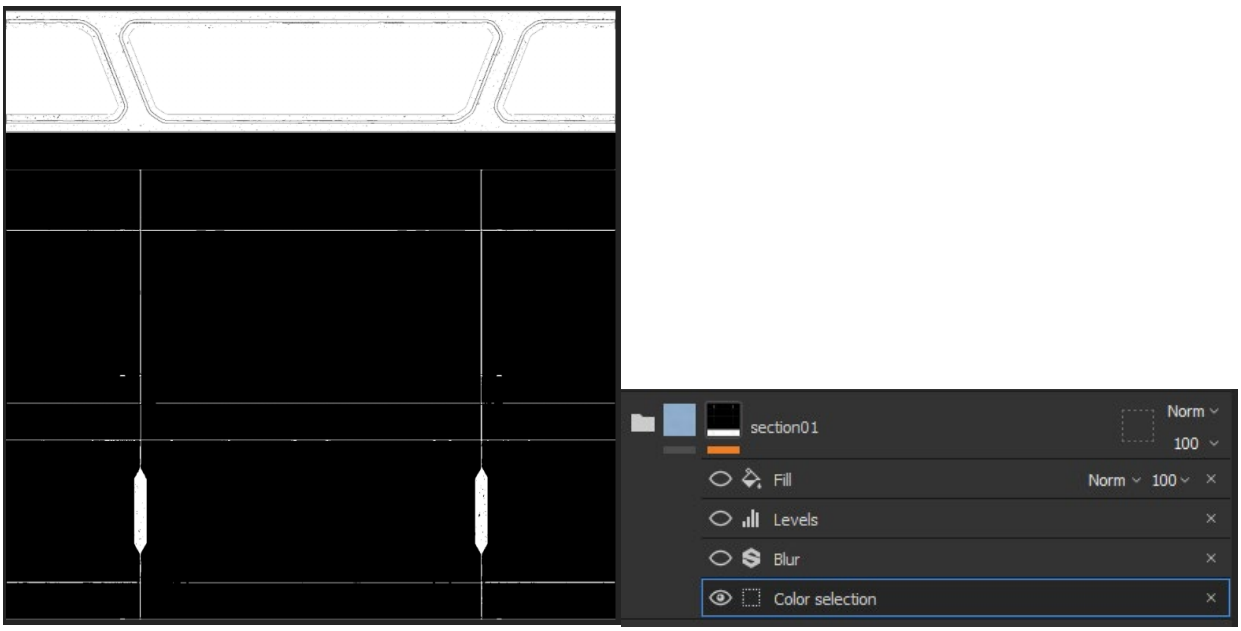
Note in the image above that the white part is the part not being masked out and thus, the area that will be affected by the color of the layer. While the black part is what's being masked out.

The third image is meant to show the shape of the mask Fill, which I changed from bacl to grey to show exactly what the fill is covering.

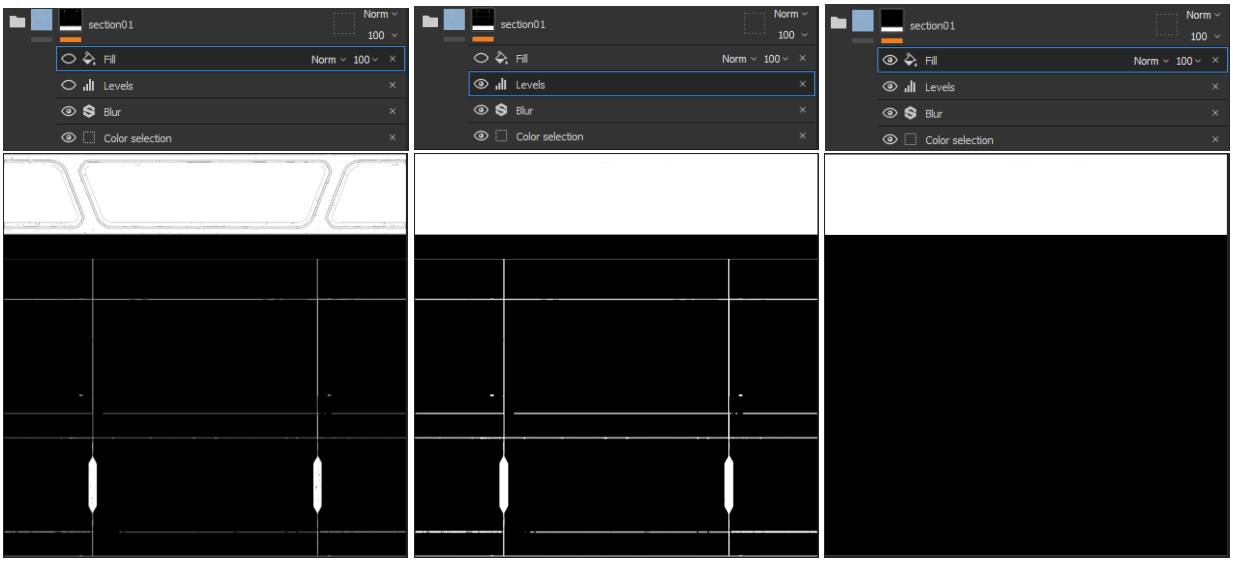


*Mask Fill **disabled**. The layer is affecting some areas in the trim sheet that we don't want it to affect. (left)*
*Mask Fill **enabled**. The layer affects only the areas of the trim sheet that we want it to affect. (right)*

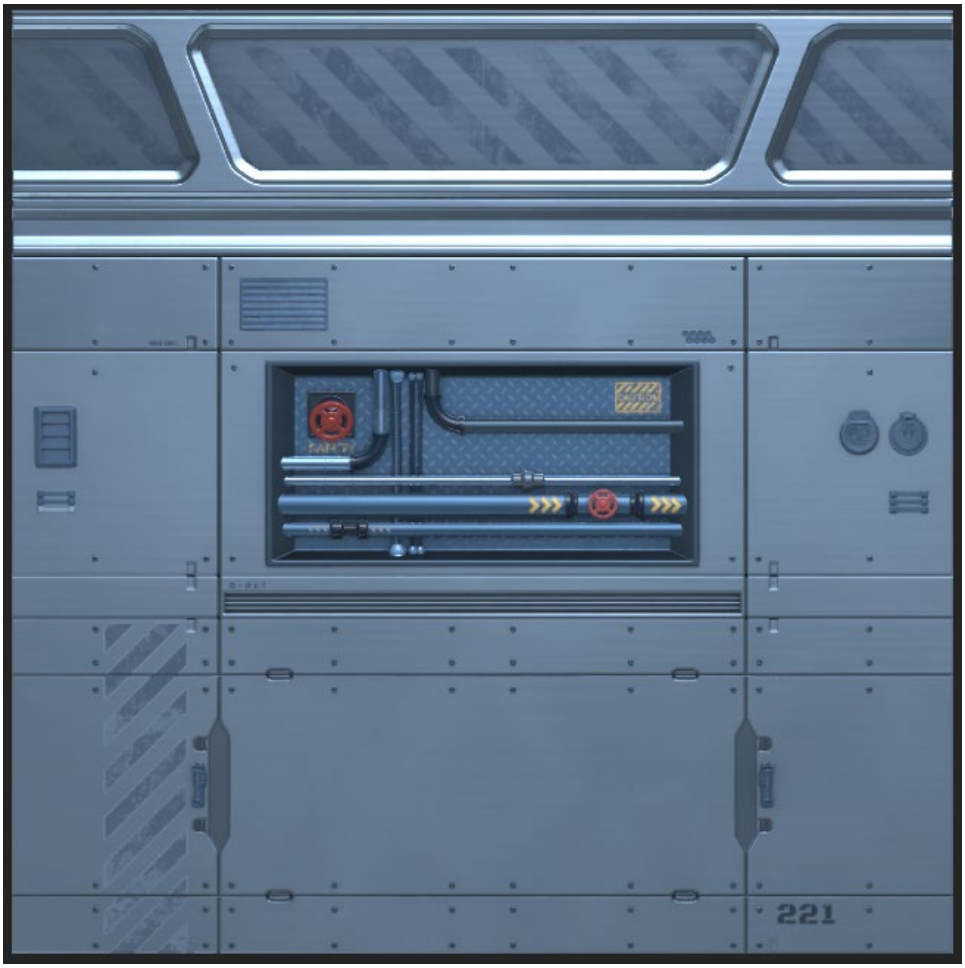
Then, using the **levels** and **blur** filters will give you just a little bit more control over your mask's edges. The way this little combo works is the blur filter will create some extra gray values around your edges by bluring it, which you can then edit using the levels to move the edge along those values. Sometimes you can also use it to clean up your mask of some tiny artifacts and some values that you don't want in it.



Initial mask, with only color selection enabled.



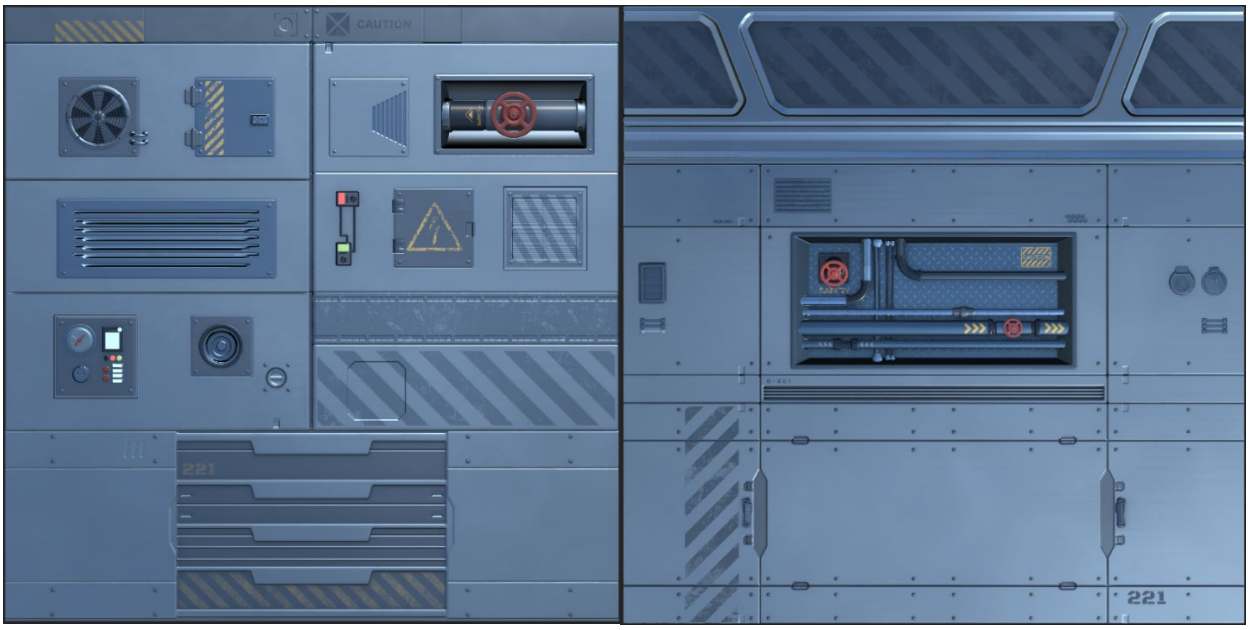
Only blur enabled (left) Levels and Blur enabled (center) Blur, Levels and Fill enabled (right)



Finished textures for trim sheet as seen in substance viewport with default PBR metallic roughness shader settings.

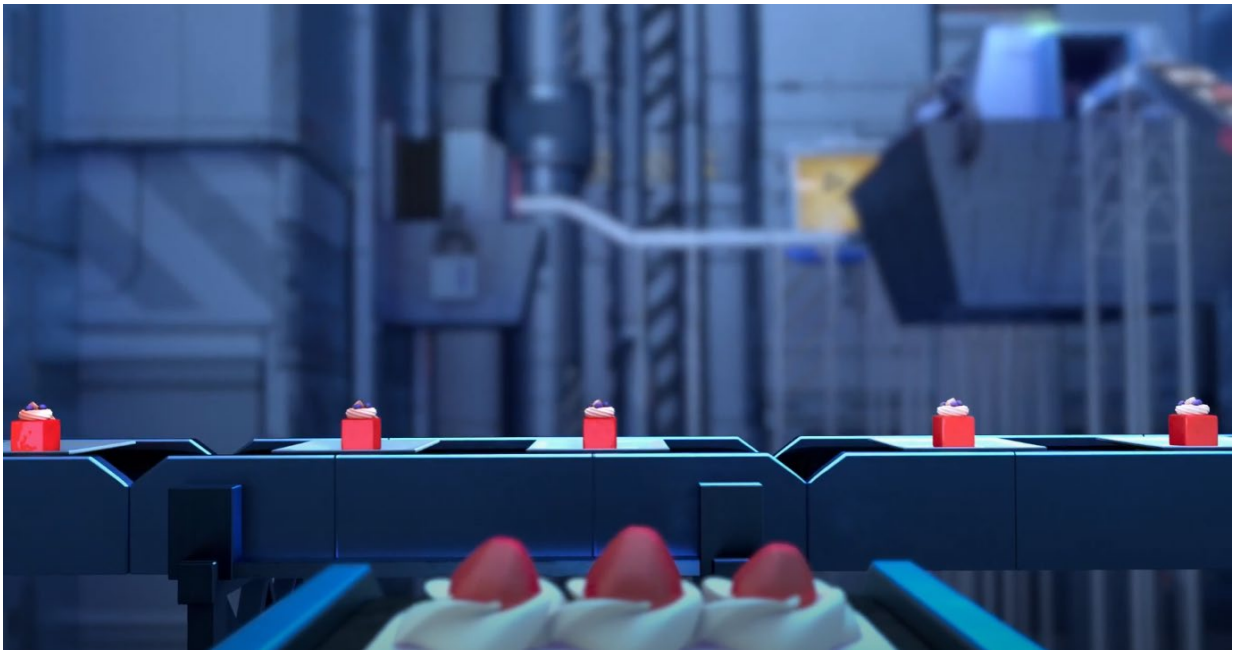
After texturing our trim sheet, we will export our maps the same way we would any other set of textures with the appropriate export settings for the render engine we will use.

Now that we have trim sheets, how do we implement them?



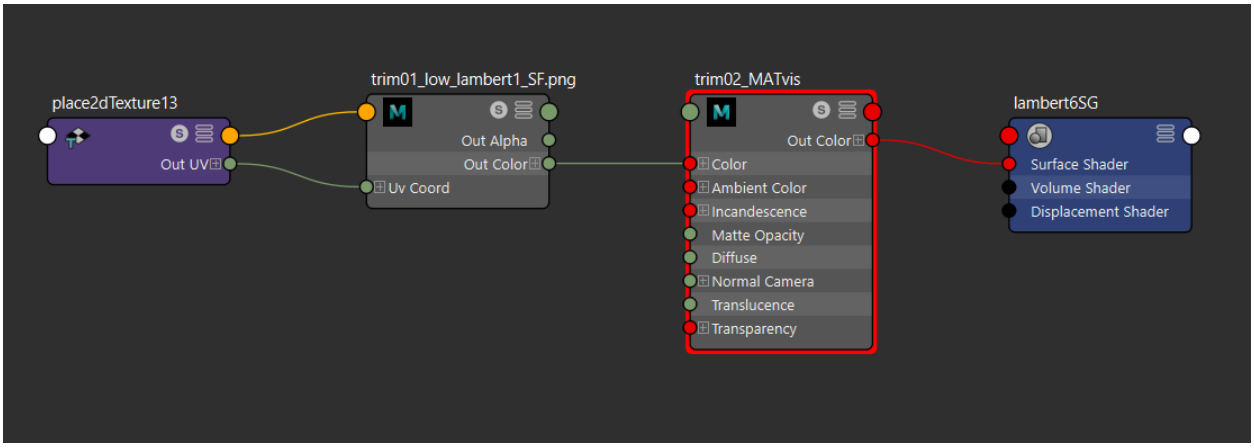
Final trim sheets used for Tippy Topper's factory walls and set dressing assets.

The way you actually texture/surface your assets using trim sheets and the specific settings that you use will vary depending on the type of rendering engine that you use, as well as the intended use of the trim sheet and the needs of your production specifically. Again, you'll very likely have to do some extra digging online to adjust the workflow to fit your production's needs. For the purposes of this guide, I will go over the process we used for Tippy Topper, which was rendered using Renderman 24.



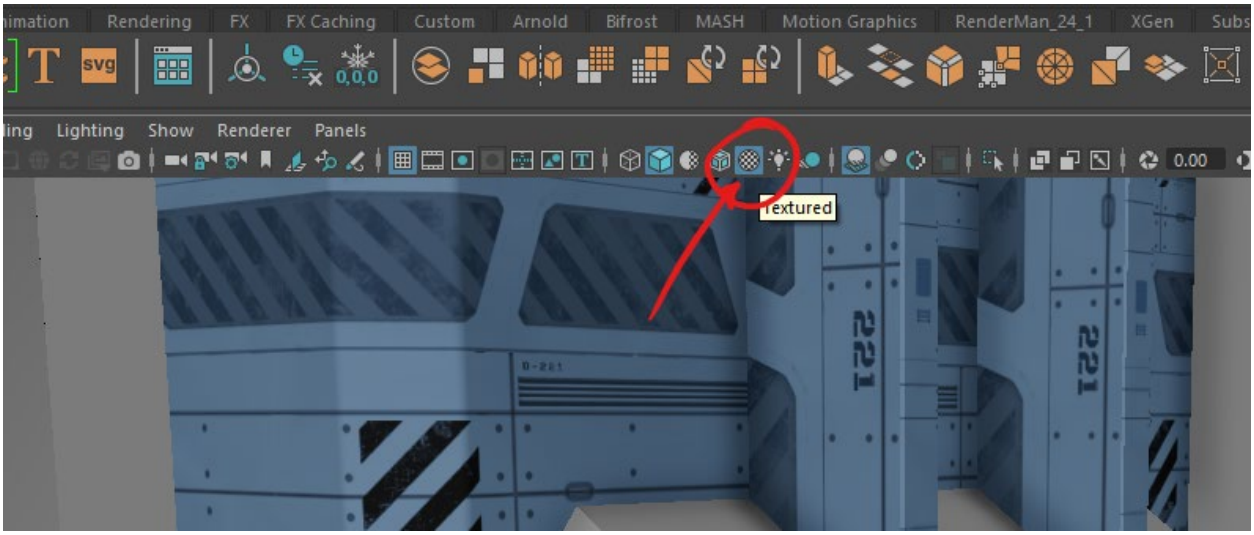
Composited work in progress shot from Tippy Topper showing the trim sheet textured assets in the background of the shot.

There's a couple of key things to keep in mind when working with trim sheets in renderman. The first thing to consider is that renderman won't let you see your textures in your viewport without doing an IPR render of your asset. This might be okay depending on how powerful your computer is, but for the average setup, this will heavily slow down your process and is simply not a good way to work on your trim sheets, especially if you're on a time crunch and can't afford to wait for render times and deal with lag while you move UV's around.



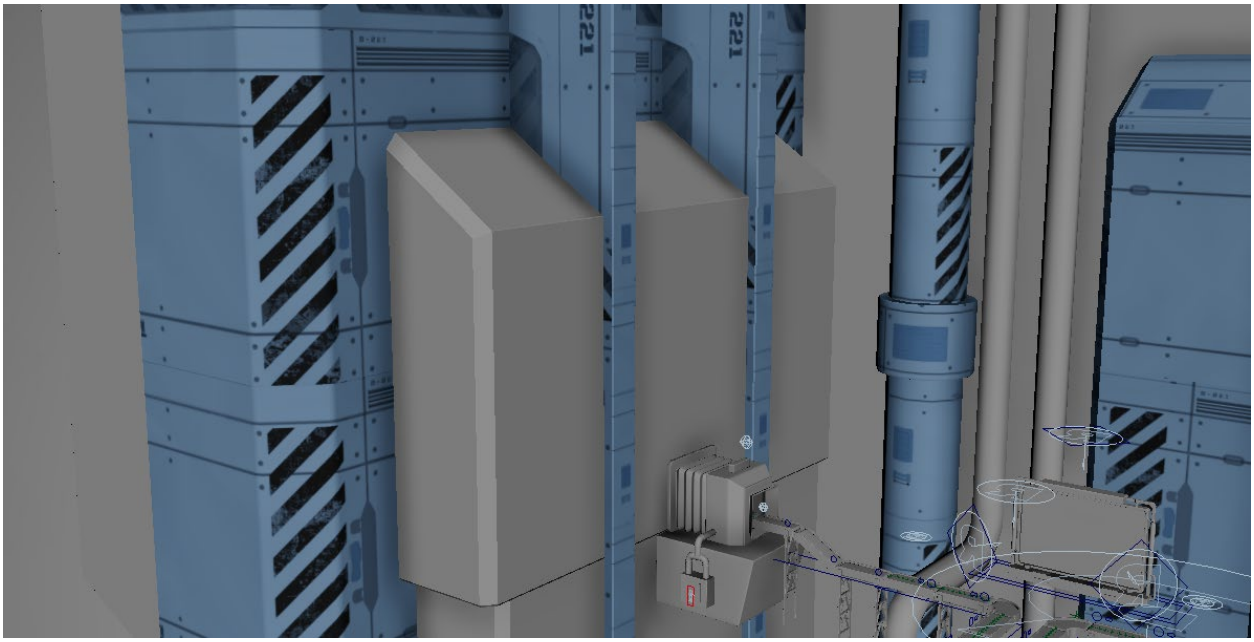
Trim sheet Lambert setup in the hypershader.

The way I was able to get around this issue was to take one of my texture maps and apply it to my assets using a lambert's color channel. Then I turned on the textures in my maya viewport.



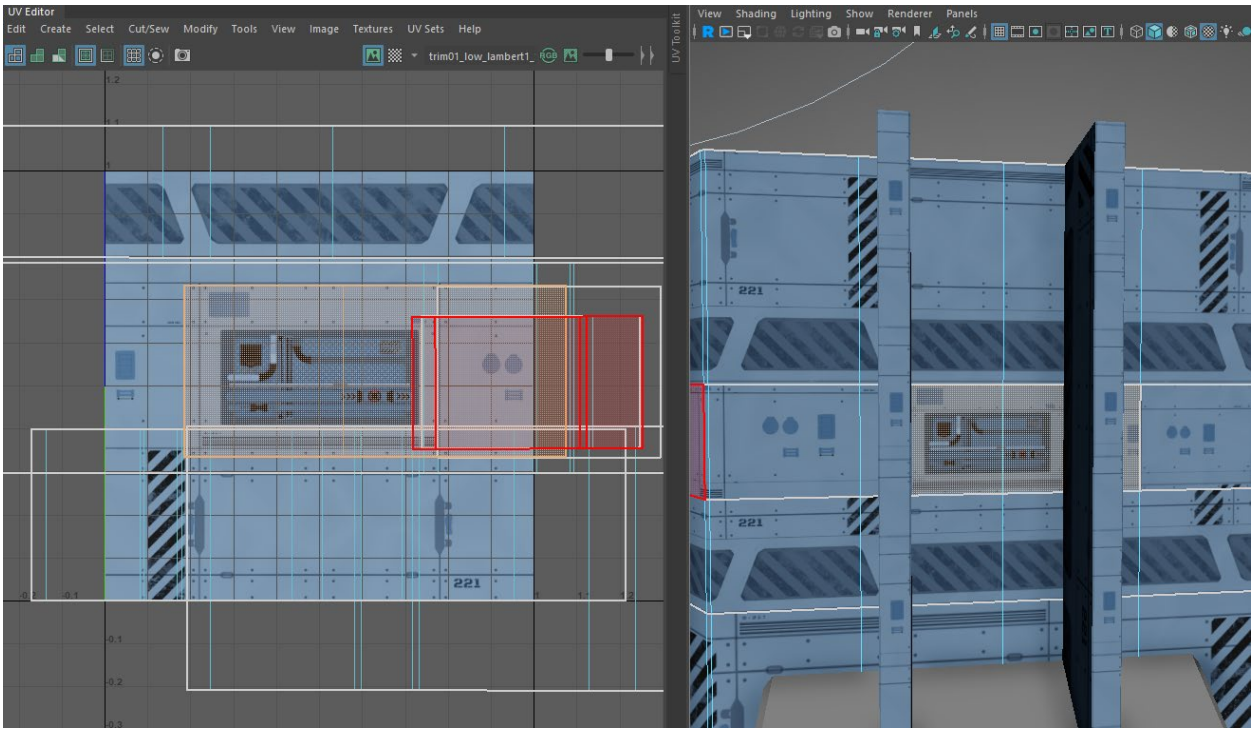
Texture button in the Maya viewport.

Enabling this after setting up your lambert material will let you see the textures as you edit and move your UV's around in real time with no lag, allowing you to work fast with no hassle.



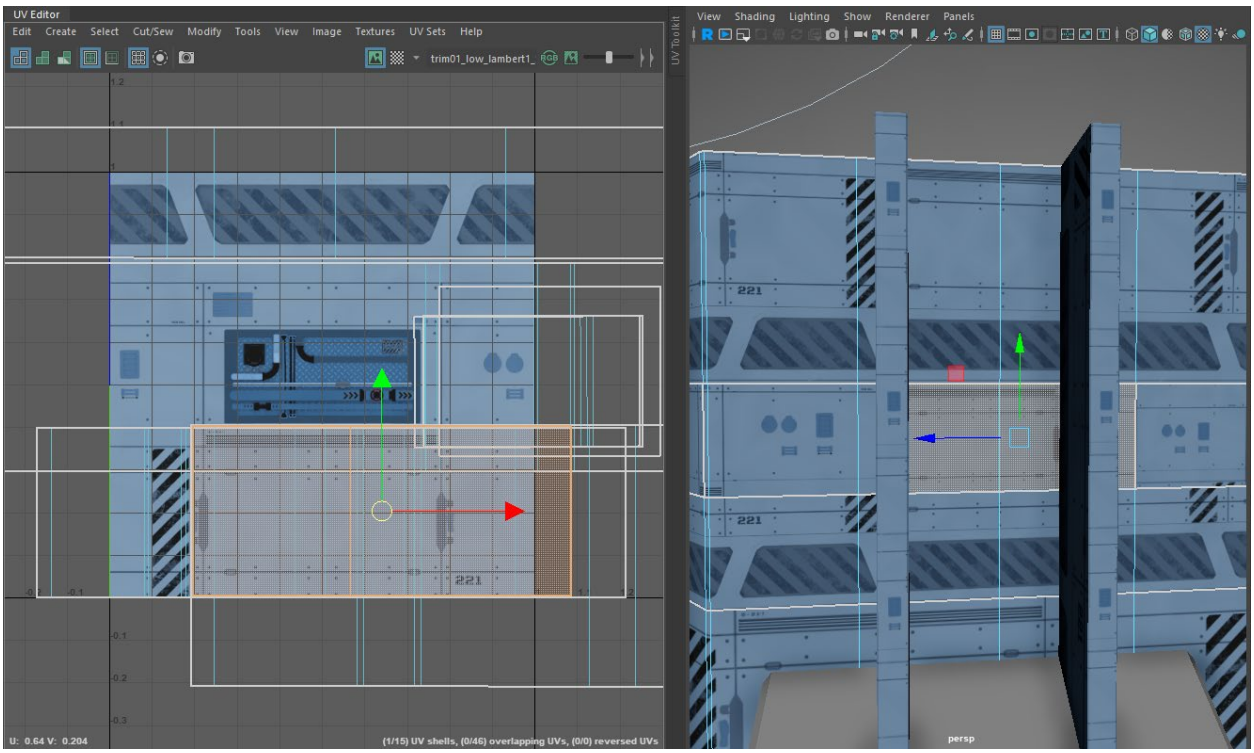
Lambert setup as seen in the viewport. Colored assets have the lambert applied, while the gray assets have PxrSurface textures applied, making them not visible in the viewport.

To actually use the trim sheets once you apply the textures to your asset, you will have to cut seams as needed to match your trim sheet's different sections. See the image below.



UV editor view (left) viewport view (right).

Notice how the textures change as I move the UV shell around. The goal is to cut seams and place your UV shells strategically to apply specific sections of your trim sheet to the model.

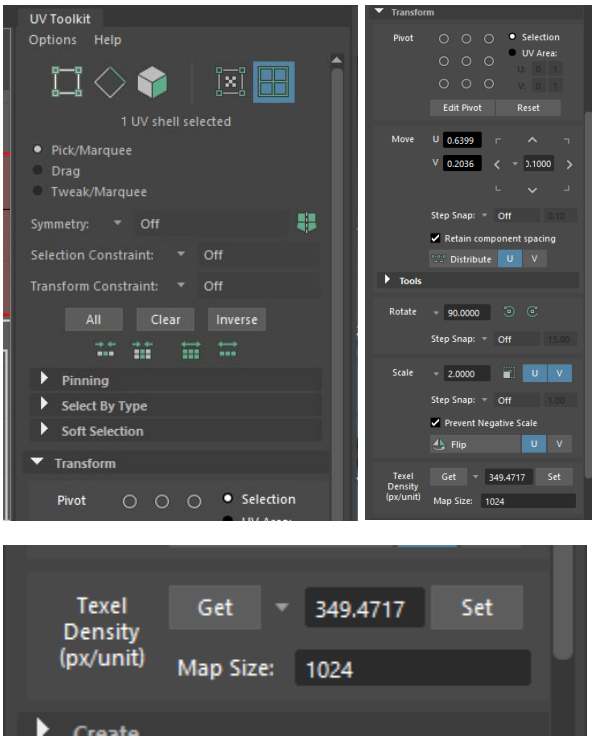


UV editor view (left) viewport view (right).

Always try to be mindful of where these seams are placed and pay close attentionto your texel density across the entire model to ensure that the scale of your textures makes sense in relation to one another as well as in context of the size of the asset in the 3D space and the assets around it.

In other words, make sure the scale of your textures makes sense and don't just mindlesly scale your UV shells. Always make sure to step back from your model and look at it in context of the environment assets that will be around it.

You can check your texel density by going to **transform** under your **UV toolkit** menu and hitting the **"get"** button while having a UV shell selected. You can then apply this texel scale to other shells by selecting them and hitting **"set."**



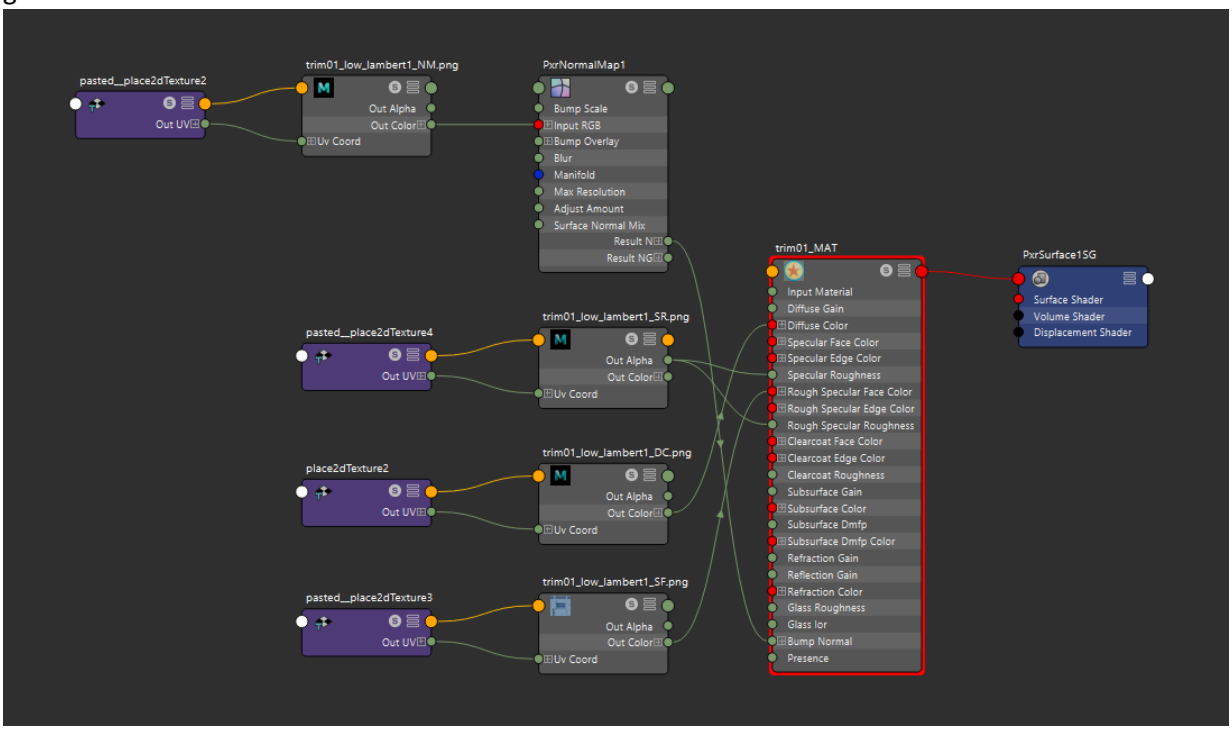
Location of the texel density tools.

Some other settings and tips to keep in mind when working with trim sheets in renderman:

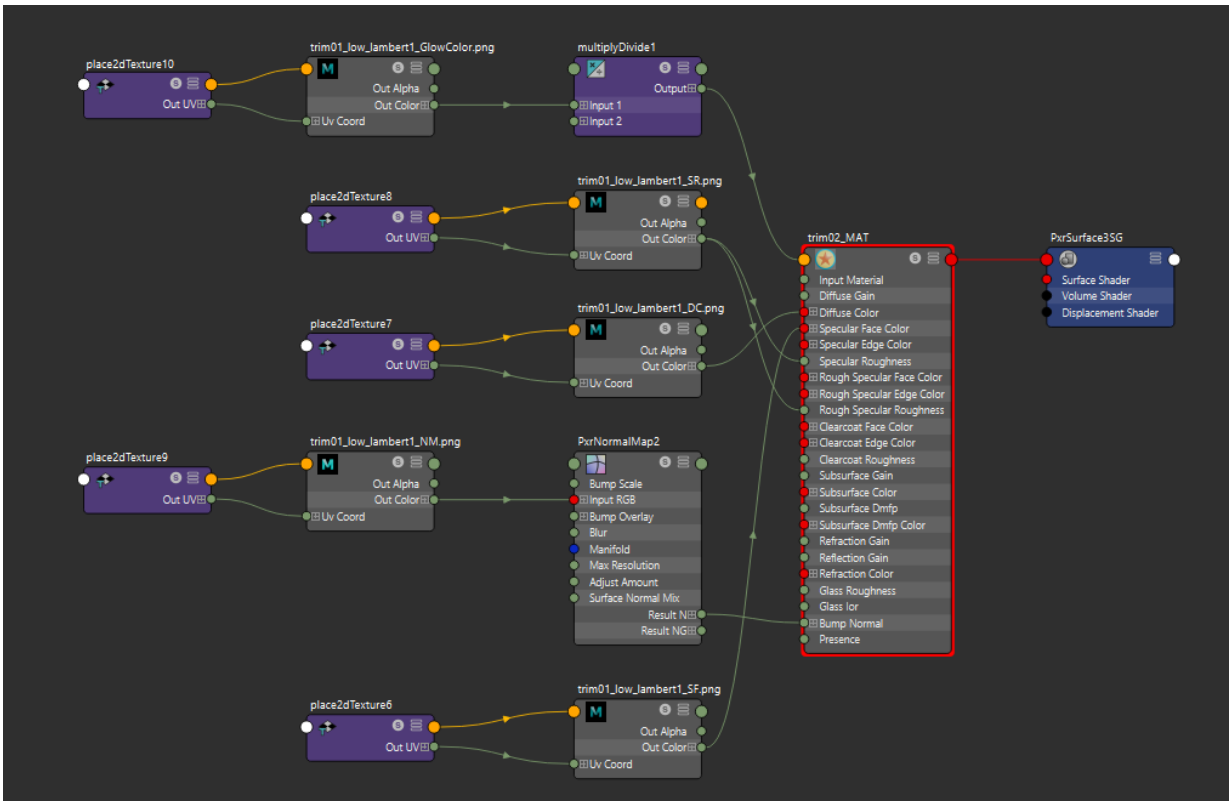
Friendly reminder: make sure to apply your PxrSurface materials to everything once you're done working with your trim sheets and UVs.

Here's the setup I use to surface the assets with the trim sheets in renderman. Note that I used a multiply divide node in one of the trim sheet graphs to get the buttons and panels in it to light up and

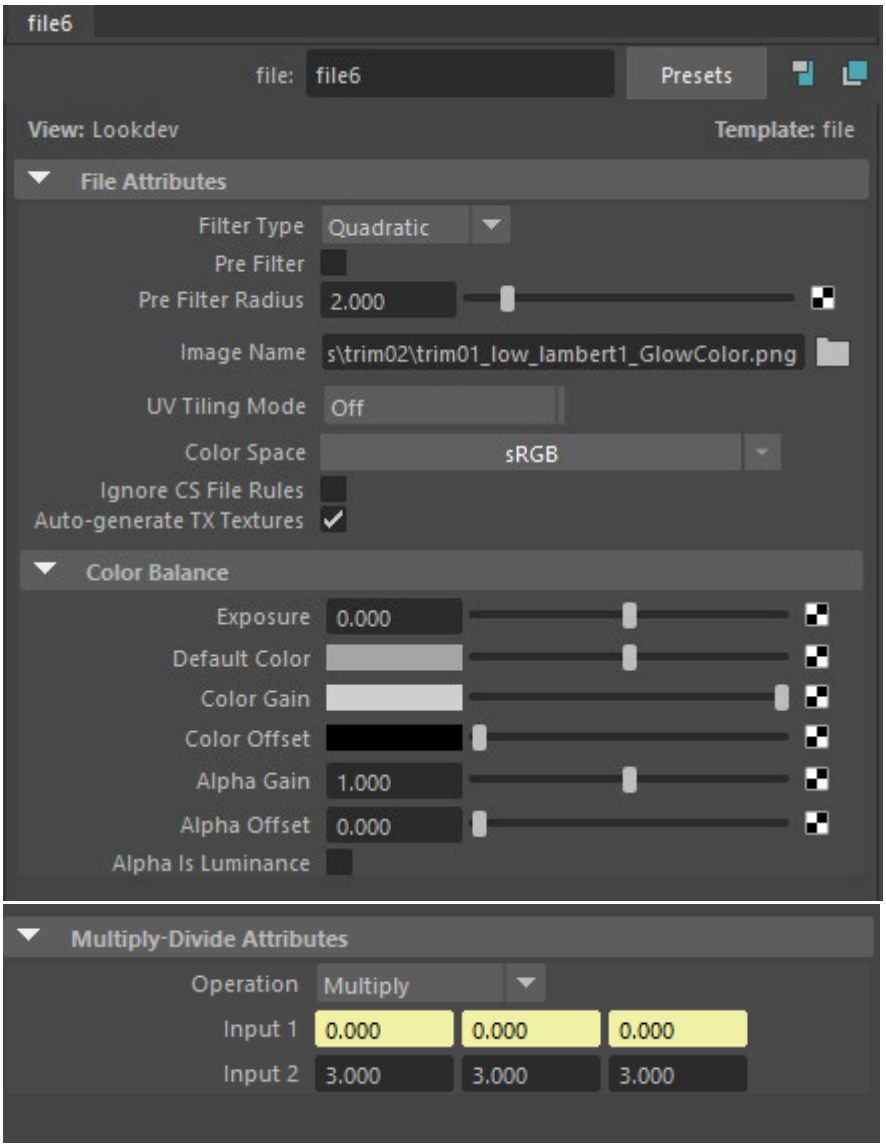
glow in renders.



Trim 01 PxrSurface Material setup in the hypershader.



Trim 02 PxrSurface Material setup in the hypershader. With additional MultiplyDivide node for glow.

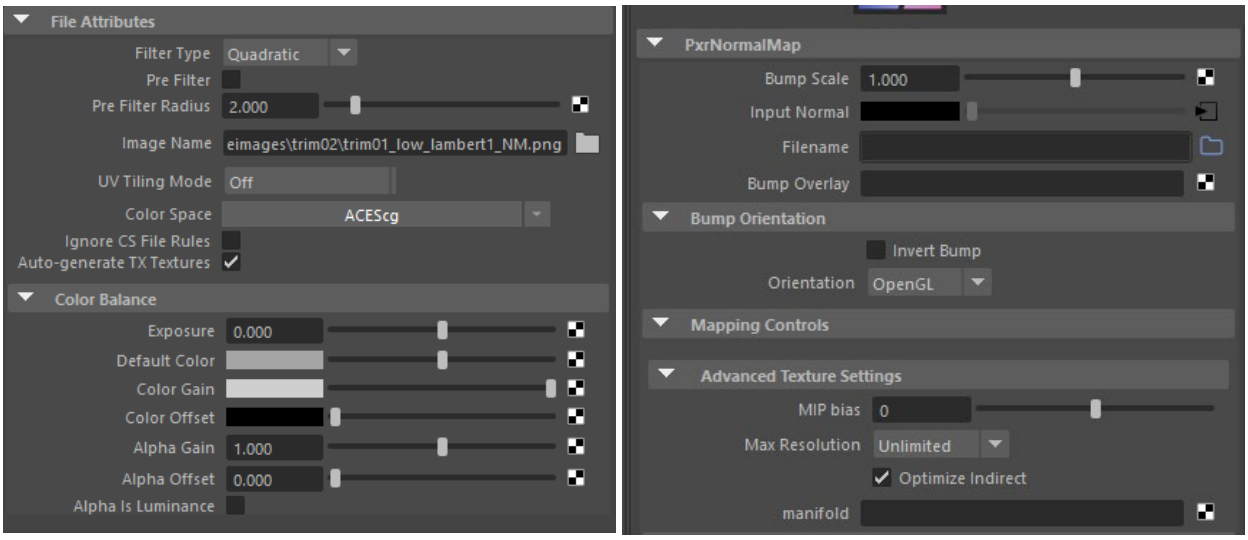


Glow file texture node settings (top) and MultiplyDivide node settings (bottom)

Fixing normal and tiling issues

We also had some normal issues during our production, which made our textures look way darker than they should have and react to light incorrectly. This was due to our normals not being linearized. This is an easy fix that you can avoid by setting your color space to ACEScg in the file texture node and making sure you have OpenGL selected in the PxrNormal node.

Also worth noting, make sure to have your UV tiling mode set to “off” in your file texture node. This way your textures will tile and your trim sheets will work as intended.



File texture node setup (left) PxrNormal node setup (right).

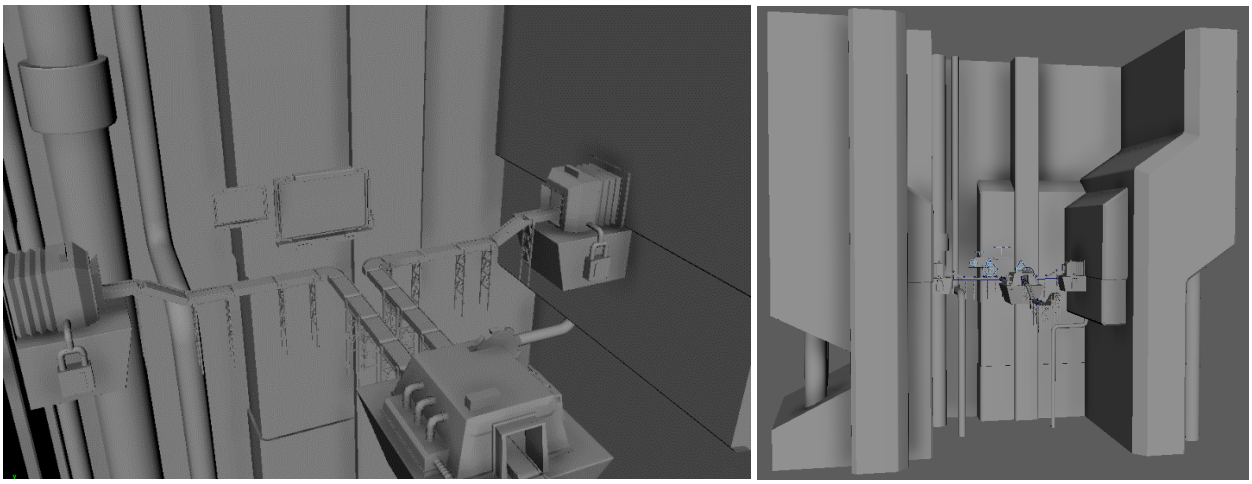
And that's it! That's all I have for you regarding trim sheets in Renderman. Hopefully you found this useful or at least interesting to read.

I doubt this will solve every possible issue you can have while creating a massive environment for your short film, but at least you'll know how to deal with this set of issues if you ever come across them!

Creating a massive environment can be an extremely stressful and daunting task, but it is also really satisfying and rewarding when you finally get to end of it. Remember that you have tons of resources at your disposal. Just take it one step at a time.

Also, make sure to check out the bibliography for some extra useful resources the I found throughout our production that could be useful to you while working on your trim sheets and environment assets. These sources include anything from YouTube videos, to articles and official documentation.

Good luck, you got this!



Work in progress Maya viewport screenshots of untextured models for Tippy Topper's factory environment.

Work in progress renders of textured assets from Tippy Topper's factory environment.

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Thank you for reading!