



LOST WORLDS: ARTIC BASE

MATERIAL CREATION

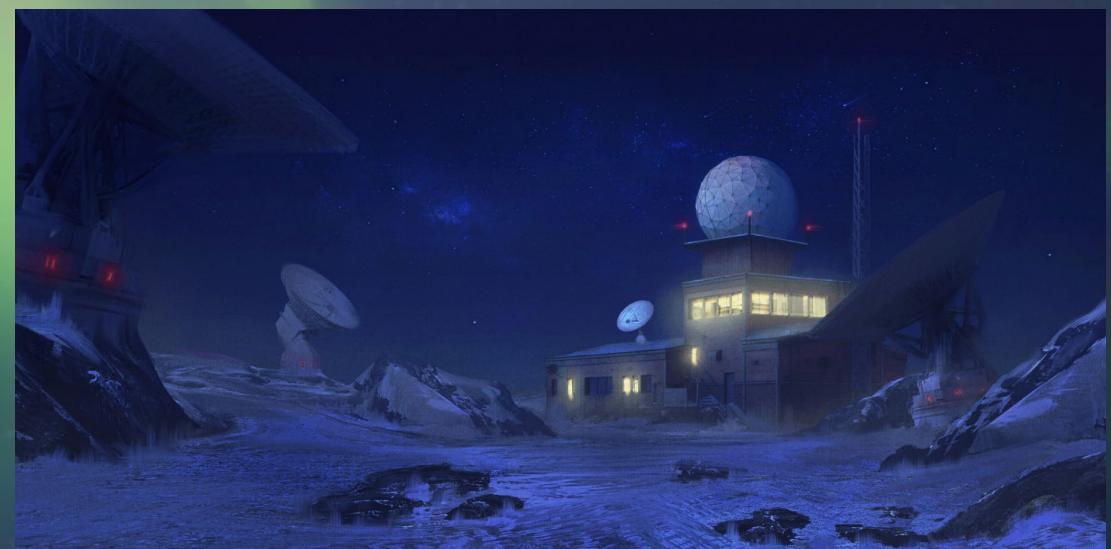
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2019/2020

THEME BREAKDOWN AND PROJECT SUMMARY

Material Creation

- From the theme "Lost Worlds", two main ideas were prototyped, and the main idea of developing a modular research station in the artic was chosen.
- The unreal scene would feature a sci fi inspired small research station/communications outpost in the middle of the arctic tundra, with a massive blizzard as setting.
- The outpost structure is a prefabricated modular building deployed by scientists or explorers to monitor a certain area for research. Featuring survivalist equipment, generators, radar dishes, comms towers and a heavy emphasis on functionality as part of the structure itself.
- Surrounding the base, a massive snowstorm approaches making all the cloth and fabric flap against the wind.
- The scene is lit from halogen lights and from the bright swirls of the aurora borealis.



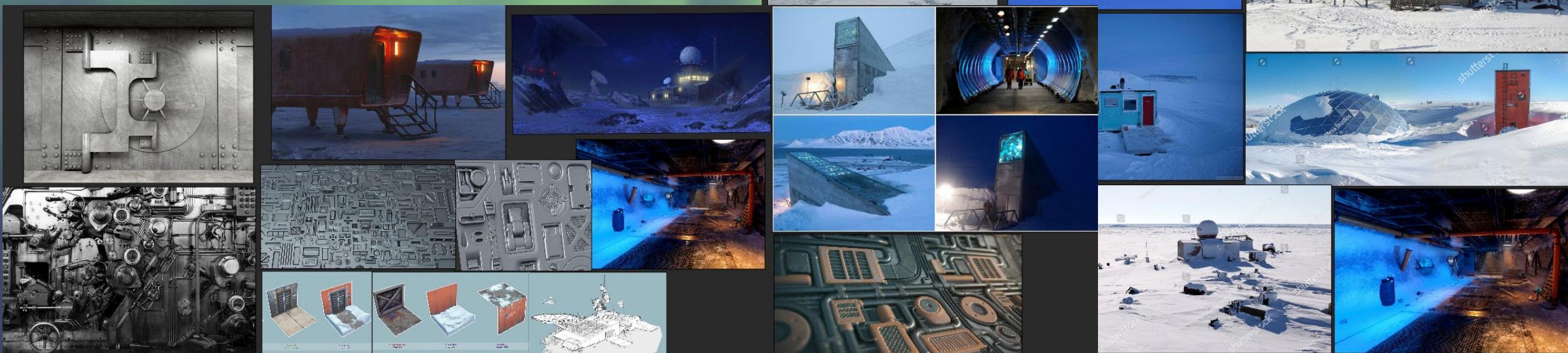
RESEARCH: FORM, PROFILE AND FUNCTION

Material Creation

Researching into modular sci fi structures stationed in harsh environments, produced a mood board of images that inspired the final design of the base.

I wanted to be able to capture the hard surface details of these sci fi structures and have them be tweakable in real time in engine through a custom decal material.

I also wanted to vertex paint the snow and ice in my hard surface mesh, to emulate the harsh conditions of these structures.



RESEARCH: FORM, PROFILE AND FUNCTION

Material Creation

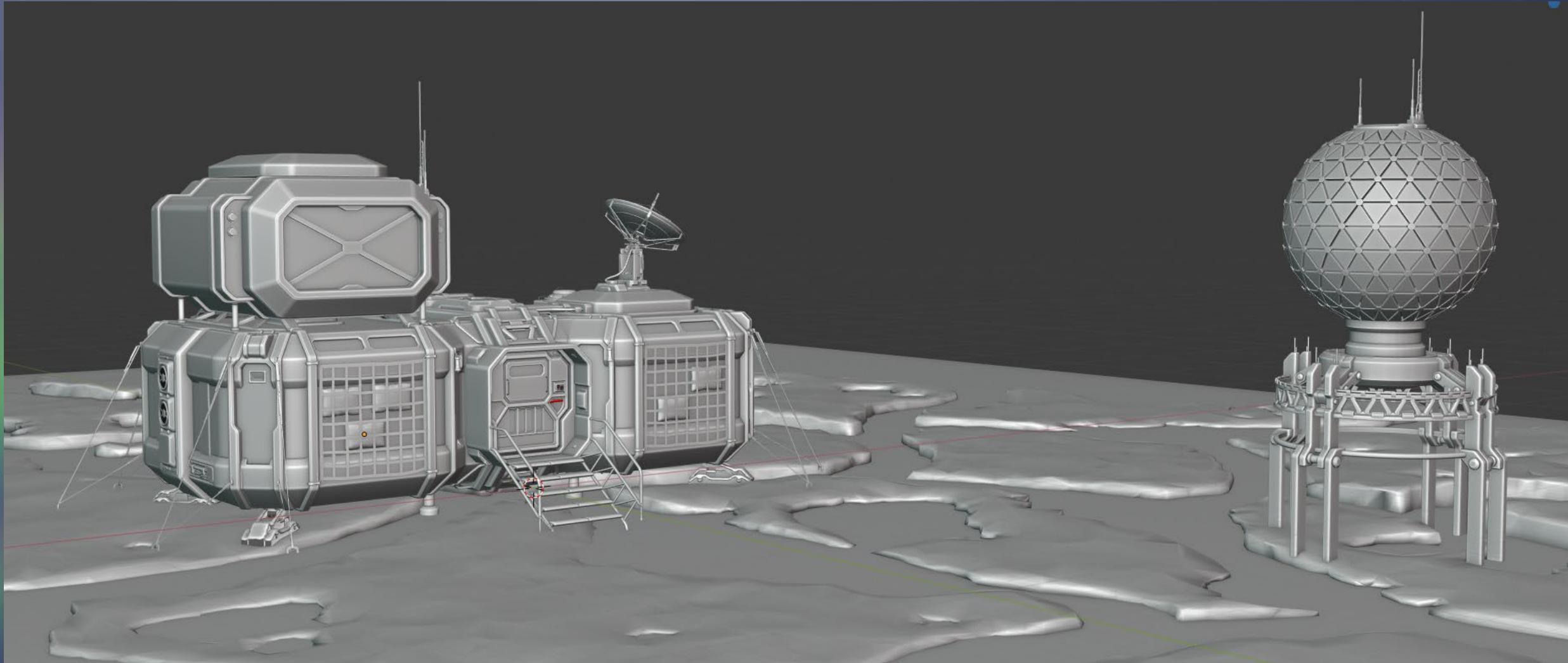
For the natural formations of the artic, I researched ice formations of all types, snow covering and how I could capture these procedurally as best as possible.

I also wanted to emulate the waviness and emissive flow of the aurora borealis.



RESEARCH: ASSET BREAKDOWN

Material Creation



Alongside the creation of the mesh for the Modeling and Sculpting Module, I modeled my base hardsurface and organic meshes and then focused on adding tertiary details in the form of decals for materials. These would be created by baking down from a high poly asset mesh into reusable opacity masked textures, simulating depth with a parallax shader.

RESEARCH: SUITABLE TECHNIQUE/PROCESS FOR MATERIAL CREATION

Material Creation

BASE HARDSURFACE MATERIALS + ICE SHADER

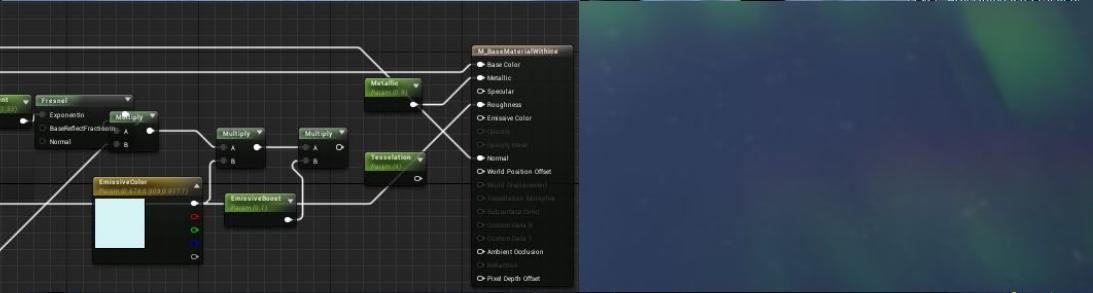
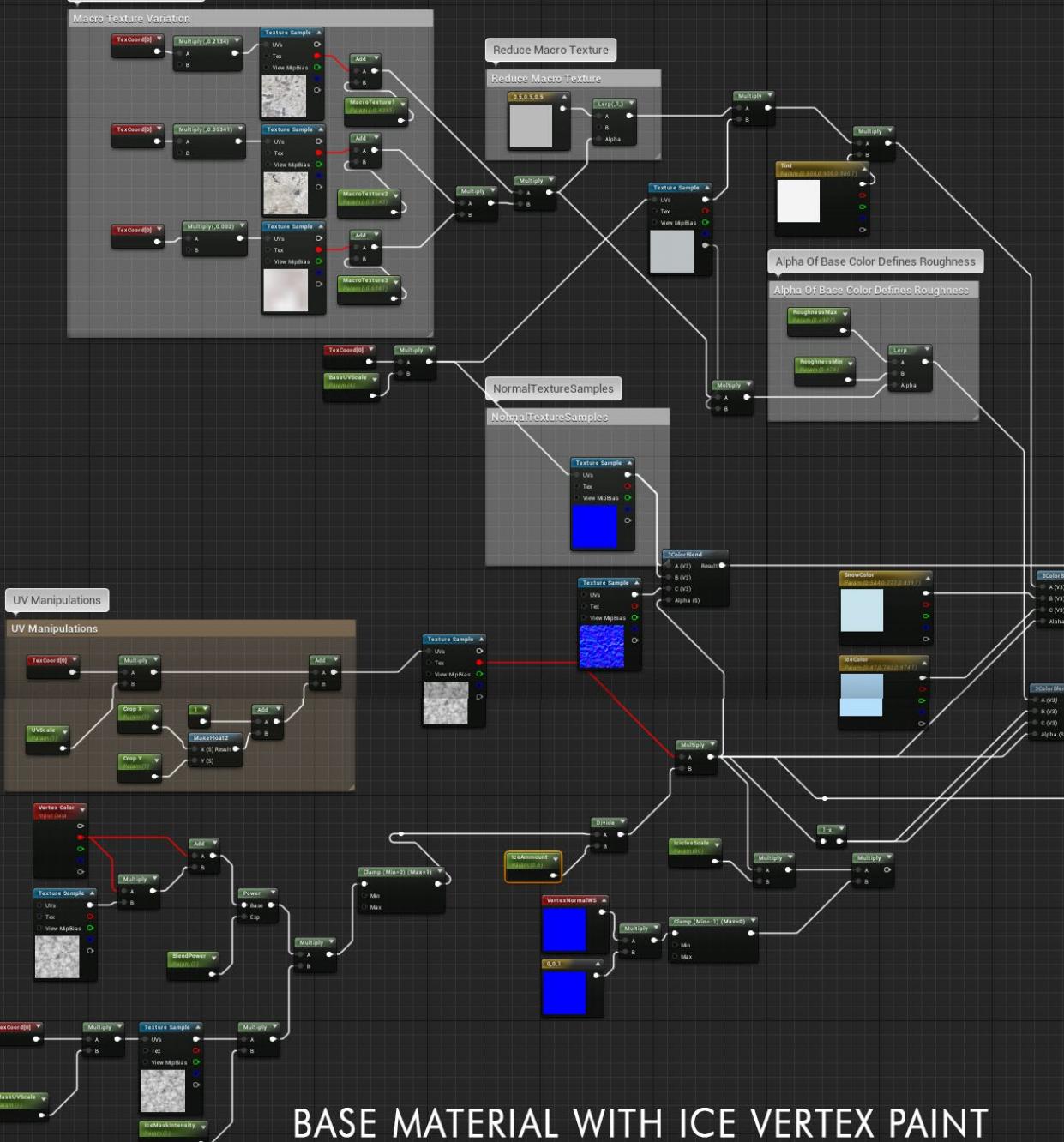
The material creation process for the main base resulted from creating the base textures as tileable materials, with different levels of macro textures to add variation. I tried to simulate a painted scuffed metal look. This was one using substance painter combining different smart materials to achieve the desired result and exporting the textures for use in unreal, then creating a material that allowed me to tweak each value in real time.



Added to the main material, I would also develop a vertex paint controlled show shader for creating snow scuffing around the base, that allows for real time control, defining which areas of the base would be most affected by the elements. This proved more effective than a height based solution and allowed for finer tweaks to the more complex areas of the base.

I also played with displacement and tessellation to reinforce the snow material, but these proved conflicting with the decal workflow intended for the project.

Material Creation

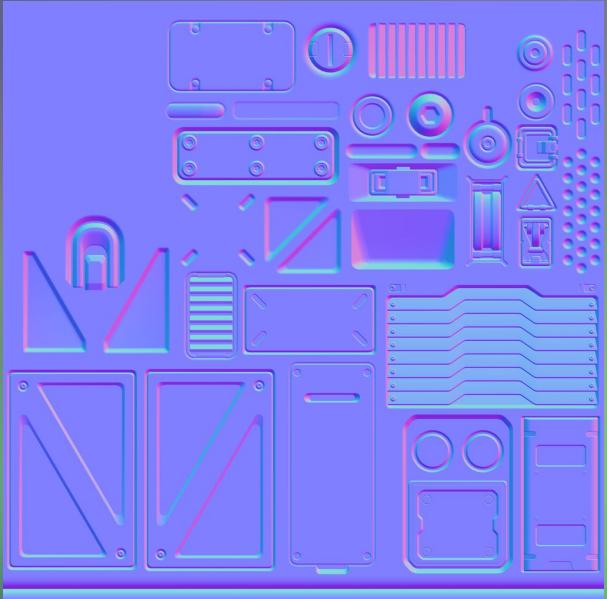


RESEARCH: SUITABLE TECHNIQUE/PROCESS FOR MATERIAL CREATION

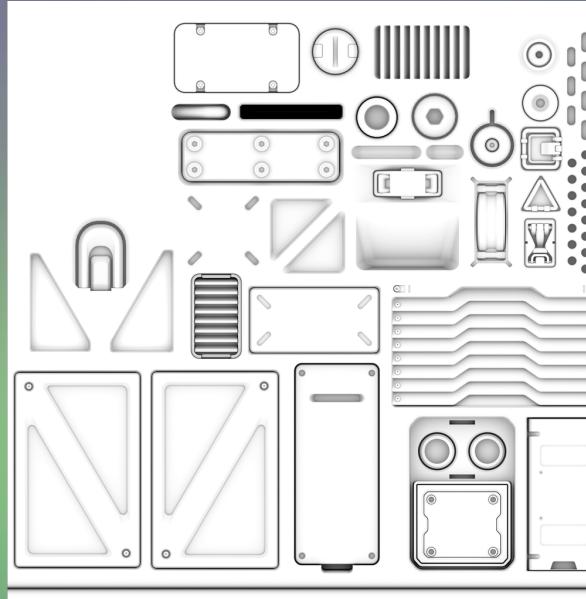
DECAL WORKFLOW

Material Creation

A workflow based on overlaying the base mesh with polygon cards mapped to parallax occluded decals was used.



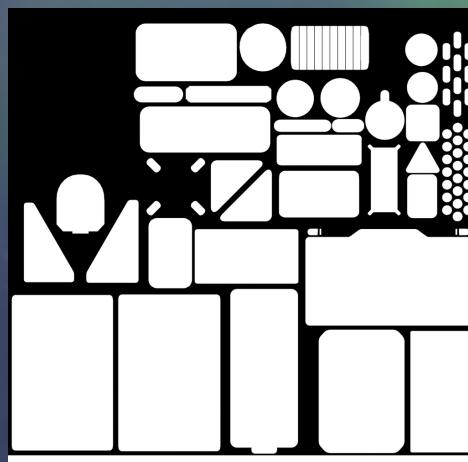
Normal and AO Bakes



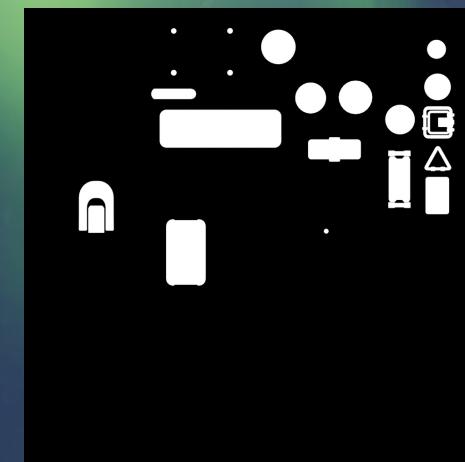
Heightmap for parallax



Separate Simple Info decals
w/o Parallax



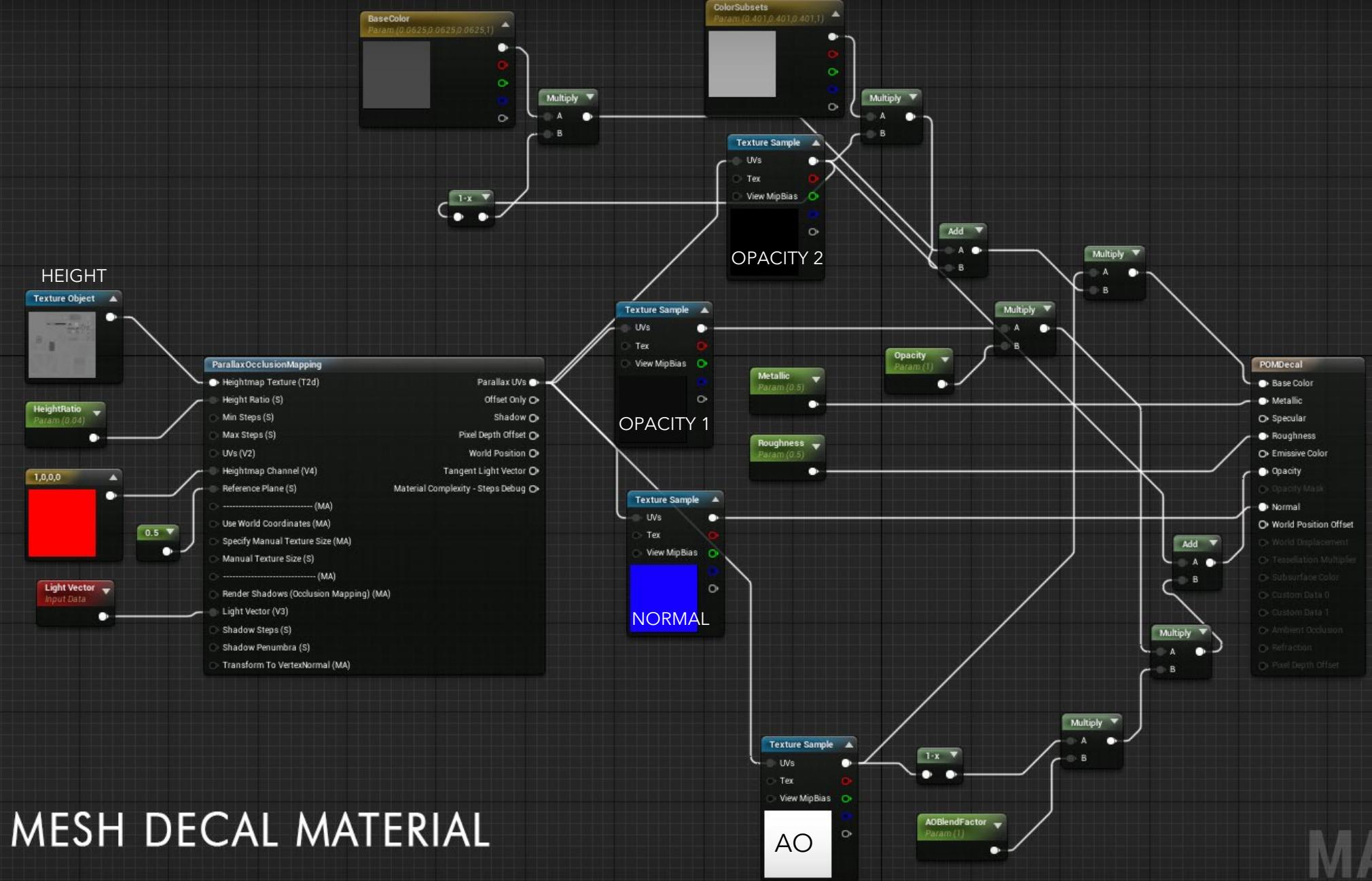
Occlusion maps for blending
with the material
underneath(left), and a
separate map (right) to isolate
parts of the material to tweak
in real time independently.



DecalMachine - Tool to help
with repetitive tasks of decal
placement and creation

RESEARCH: SUITABLE TECHNIQUE/PROCESS FOR MATERIAL CREATION

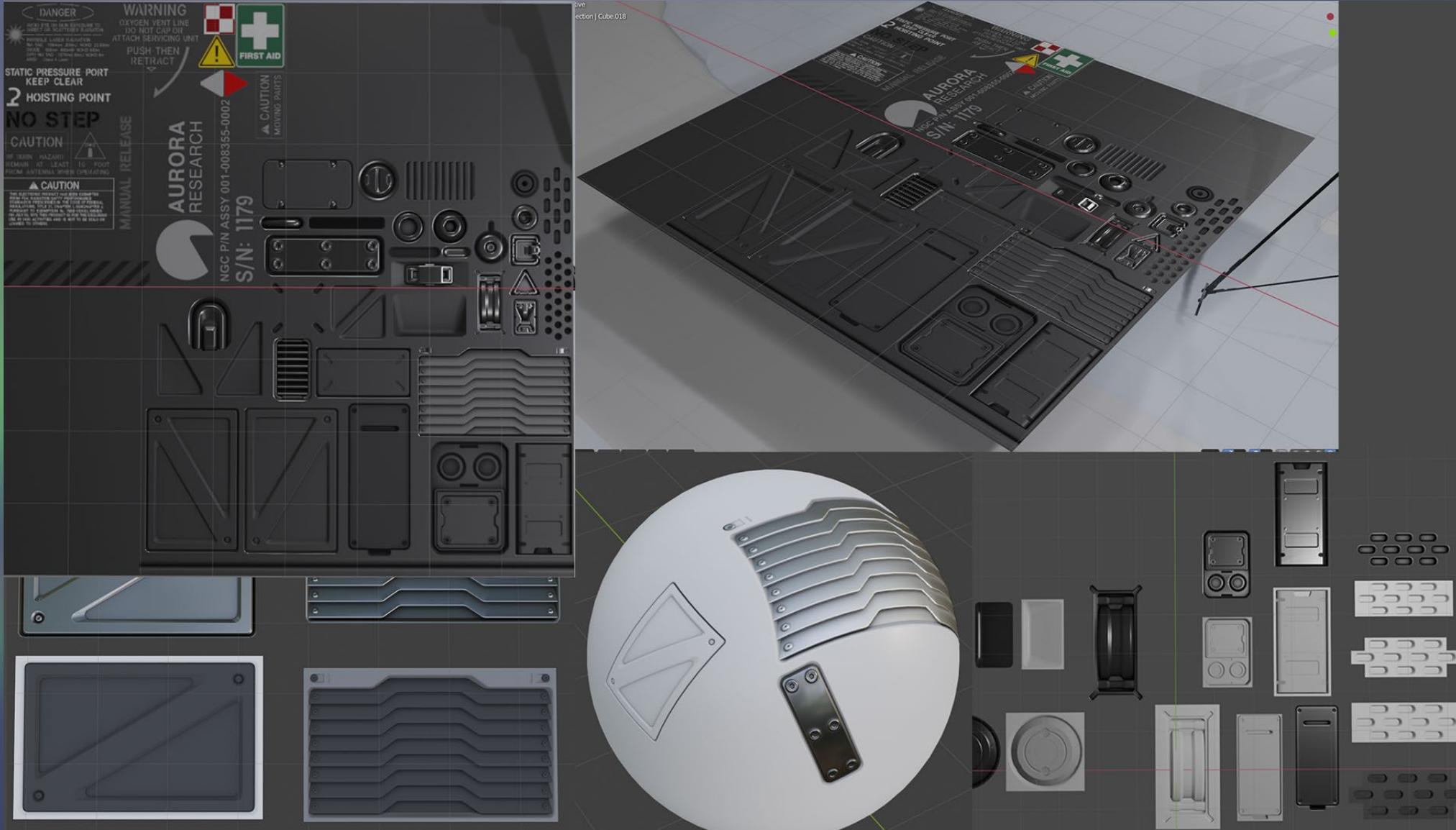
Material Creation



PIPELINE - DECALS

Material Creation

DECAL WORKFLOW



To create the decals I used blender and decalmachine. I created high poly meshes and then bake them into simple planes, and use the resulting textures as a decal atlas.

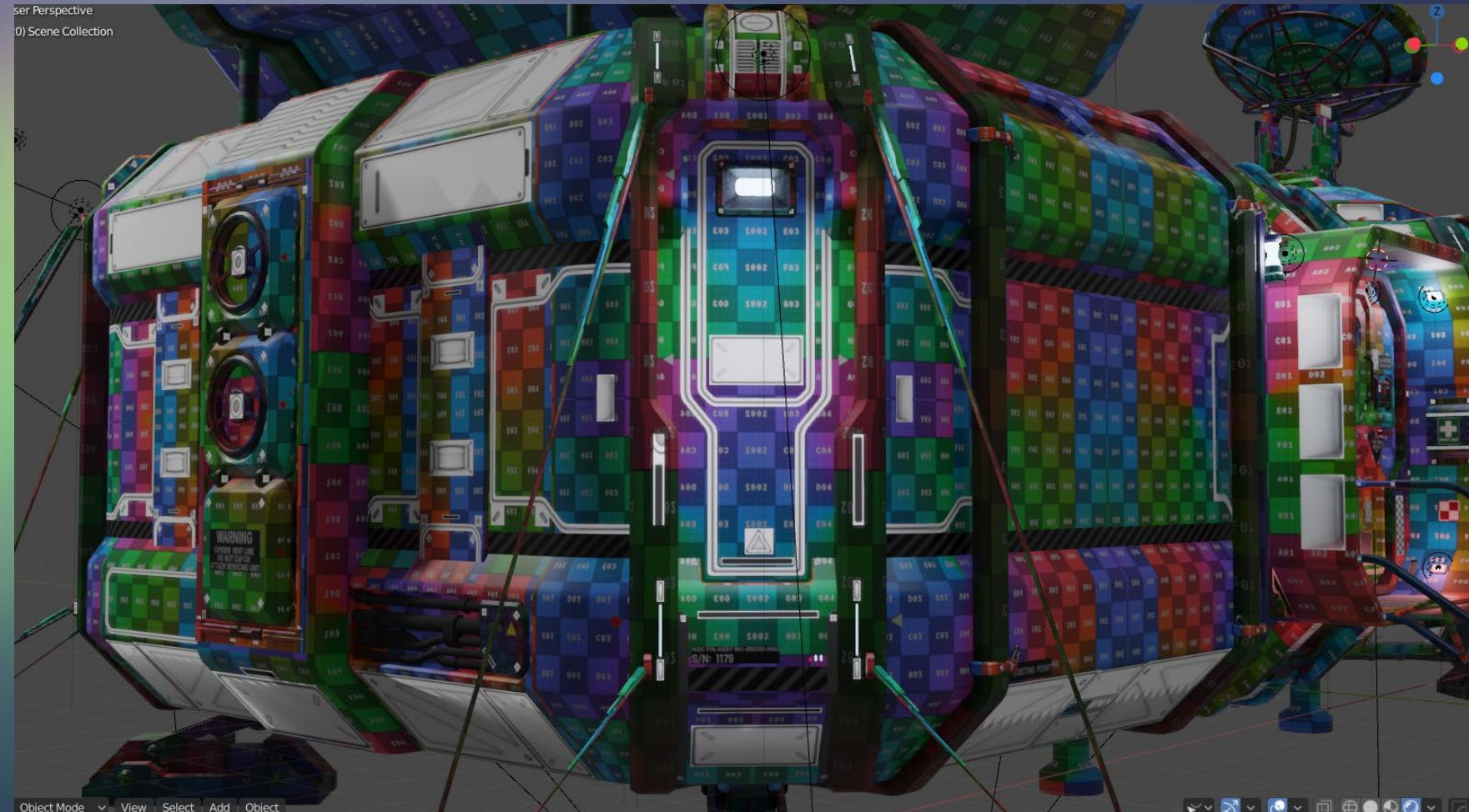
The resulting textures would be used with a Parallax shader with masked Opacity maps to simulate depth.

This would result in believable small tertiary details such as panels, panel lines, screws and vents.

DECAL WORKFLOW

My decal pipeline allowed for full control over the decals color, roughness and metalness parameters separate from the base materials, or blended with an opacity parameter to overlay the underlying materials.

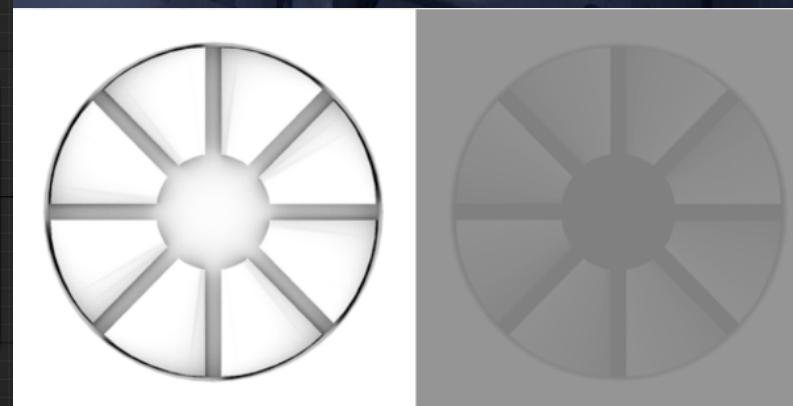
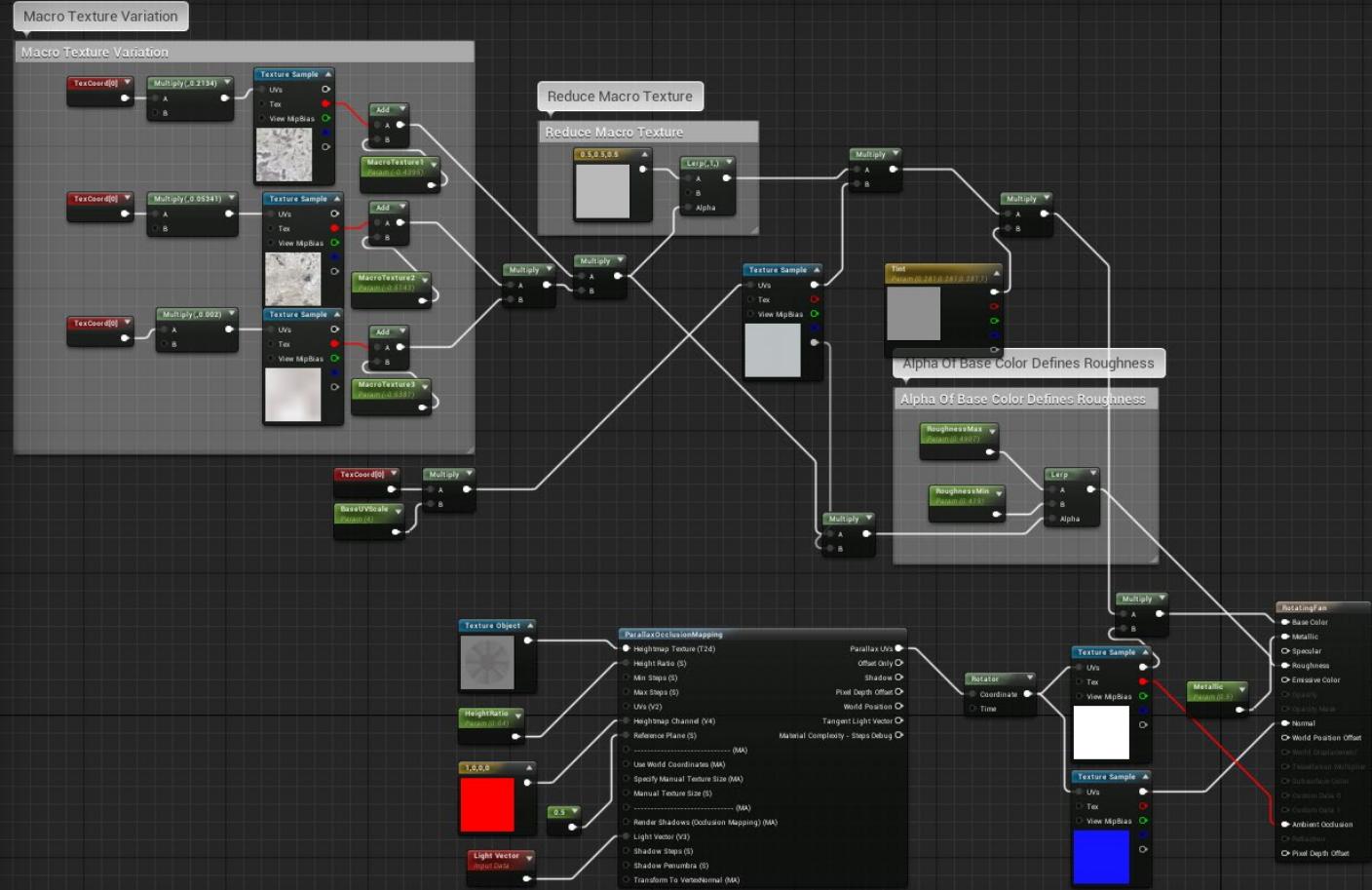
The tertiary details of the model were constructed almost exclusively with this technique, which allowed for detail textures to remain crisp and detailed in engine, while still retaining a very optimized model when compared to the regular high to low bake workflow.



PIPELINE - ROTATING PARALAX TEXTURE DECAL WORKFLOW

Material Creation

For a specific use case of the parallax shader, I tested simulating a rotating fan completely using parallax materials. This was done using a rotator and the same parallax process used for the other decals to create a fan.

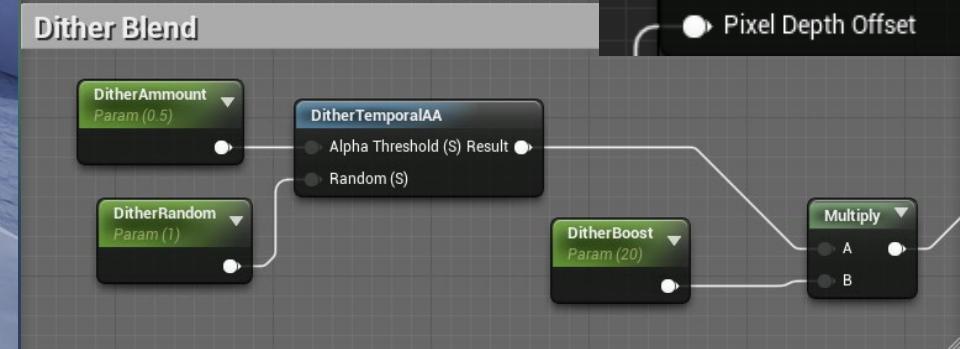


PIPELINE - SNOW AND ICE

Material Creation

For the snow and ice, I would need to create tileable snow textures as well as texture bakes of the ice platforms to create more believable ice. These two different assets would be merged with a dither blend based on their pixel depth. Several other blending solutions were studied but this proved to be the simplest for the desired effect.

I would use Quixel Mixer to rapidly prototype the tileable snow materials, as the layering system provided ease of use to create believable snow in a short amount of time. For the ice platforms I used high to low bakes from the dense Houdini generated meshes, to better define the noise and waviness of the ice formations.

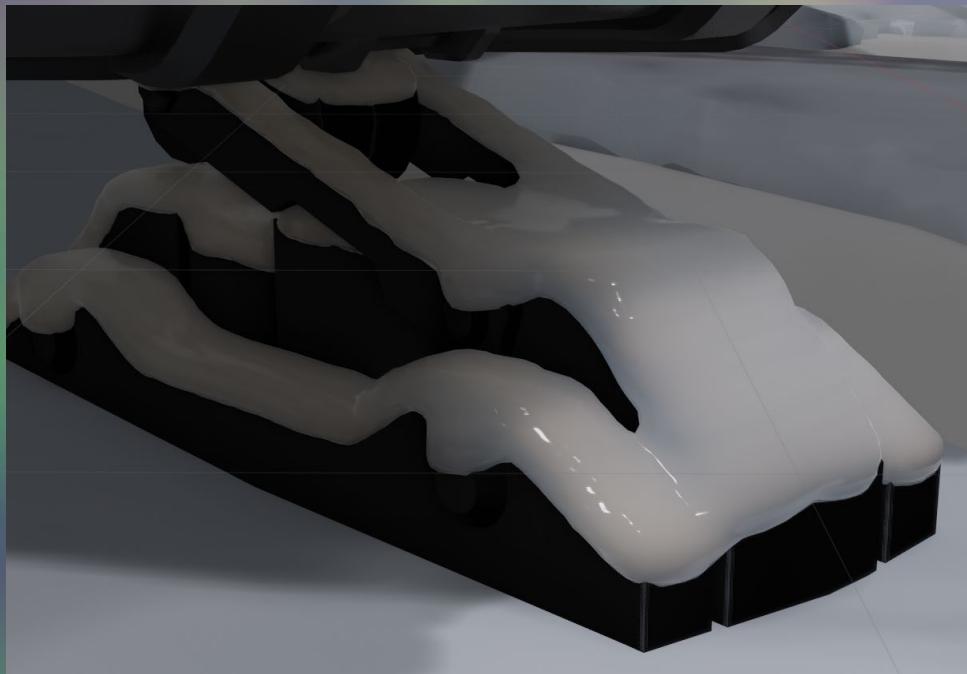


RESEARCH: VISUAL DEVELOPMENT OF MATERIALS

SNOW AND ICE

Material Creation

Another solution was tested for creating visible snow on top of the existing meshes. This was a fully procedural method consisting of creating the snow meshes from simulated particles in blender, then using a tessellated height based displacement to create icicles with a material in engine.



Snow particle simulation generates the mesh



Initial tests of vertex paint + tessellated height displacement + subsurface scattering



End result of created material for added realism to the generated snow mesh

PIPELINE - HIGH TO LOW BAKES

Material Creation

FABRIC GEAR BAGS



For this project I also explored the regular high to low bake workflow, and used substance painter to create cloth materials with dirt and snow, and used paintable decals to create different variants of the same asset. This workflow proves valid for these types of props, especially given their organic nature.

PIPELINE - MOVING TEXTURES

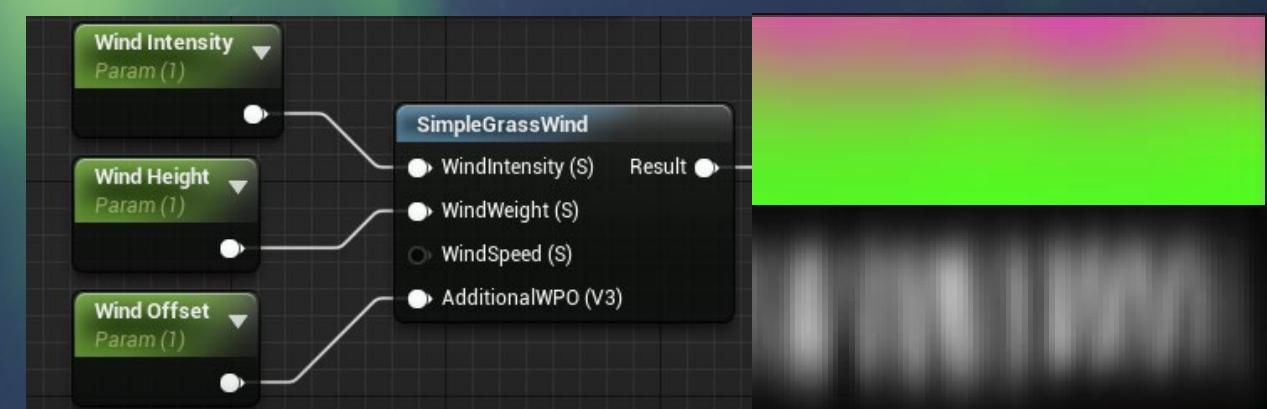
Material Creation

AURORA BOREALIS



To create the effect of the aurora borealis I used an emissive material with custom color and opacity maps to create simulate the rippling folds in the sky, applied to a curved mesh plane.

In order to simulate movement without real animation, I used unreal's "SimpleGrassWind" Shader to directly alter the world position offset. The included parameters proved enough to simulate a believable effect.

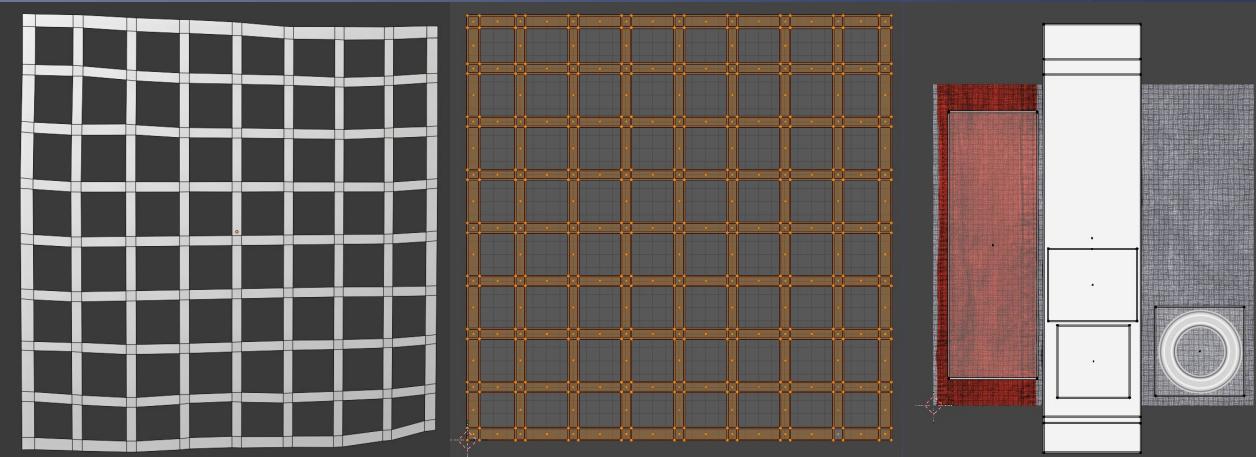


PIPELINE - MOVING TEXTURES

FABRIC STRAPS WAVING

In order to simulate a cloth fabric straps in a performant and yet believable way I created two different UV sets for the mesh. UV0 containing a full UV of each separate quad, and UV1 combining all into a tileable texture created in photoshop from photo reference of real cloth materials.

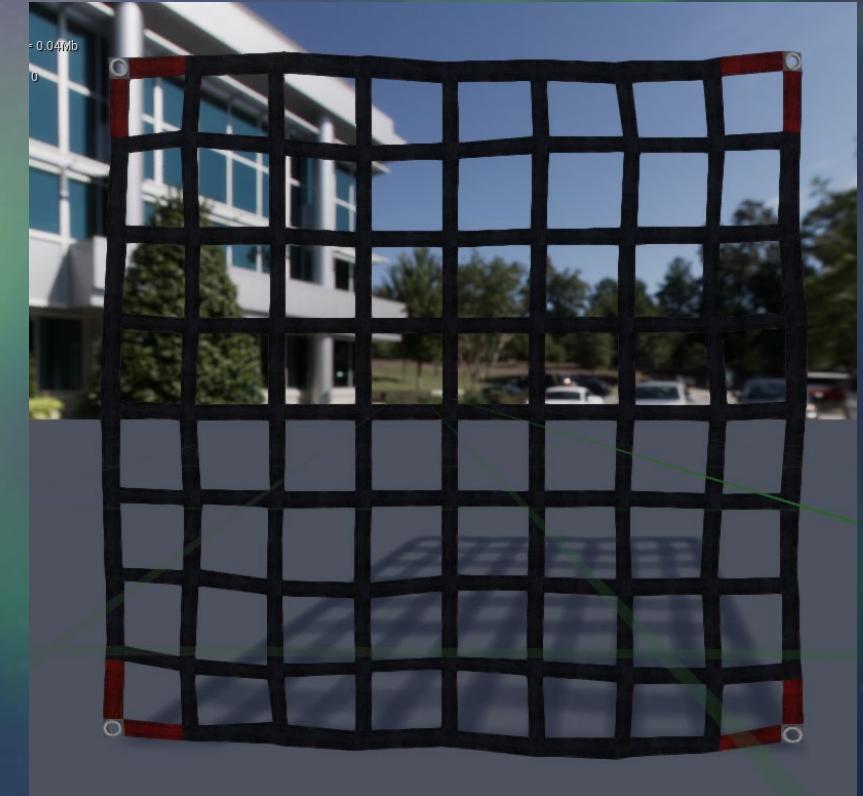
This allowed me to retain an efficient texture budget, while avoiding transparency maps, making rendering even more performant.



MESH

UV0

UV1

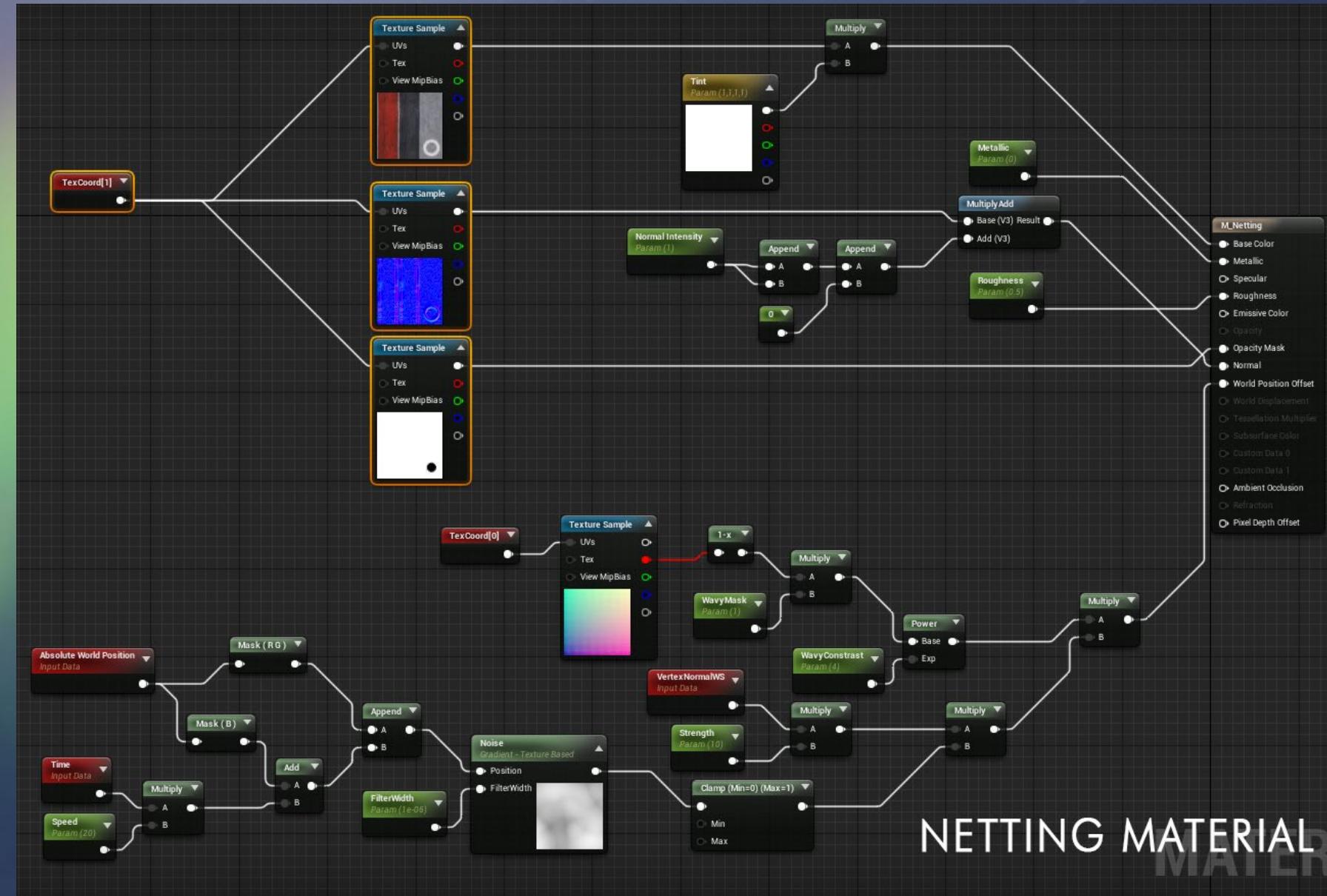


PIPELINE - MOVING TEXTURES

Material Creation

FABRIC STRAPS WAVING

To simulate the waving wind on the mesh, I used a similar solution to the aurora, by manipulating the world position offset. This time I used a world position map of UV0, to manipulate the UV coordinates using a gradient noise map. This made it seem like wind was consistently panning through the straps. I could control the waving speed and strength through real time exposed parameters.



BLIZZARD AND SMOKE MATERIALS



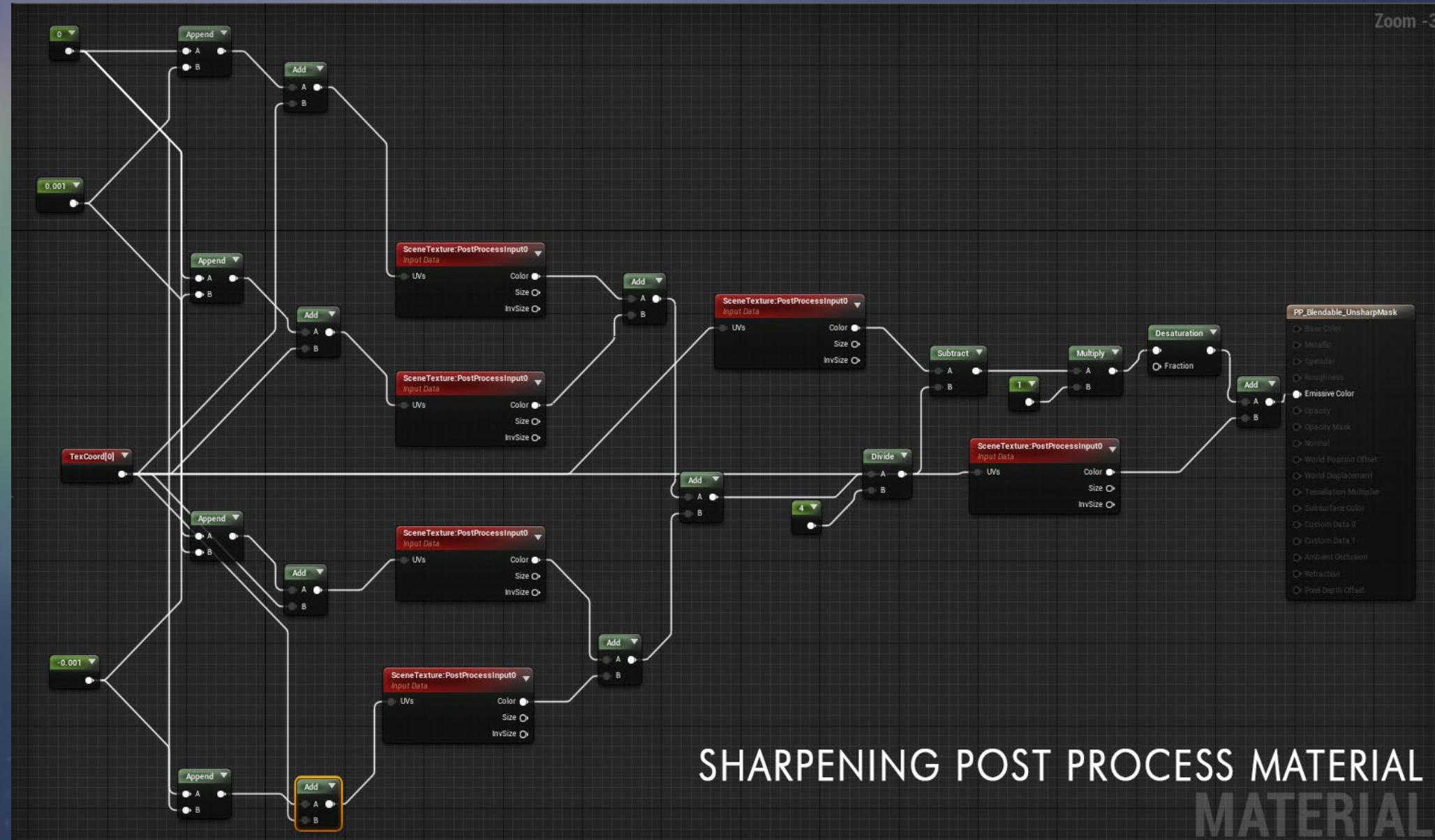
For the smoke effects of the vents, and the blizzard effects I simply used the particles that come bundled with unreal in the examples of the particles demo, and tweaked some values in the particle editor. I did not create or use any original textures. This helped add a different flair to the overall scene and make a more believable snowy blizzard environment when combined with exponential height fog.

PIPELINE - POST PROCESS

POST PROCESS SHARPEN MATERIAL

Material Creation

I followed Ervin Jesse's tutorial on creating a sharpen effect with a post process material. The technique takes the current screen texture output and uses a blurred, or "unsharp", negative image to create a mask of the original image. The unsharp mask is then combined with the positive (original) image, creating an image that is less blurry than the original.



FINAL THOUGHTS AND SELF CRITIQUE

Material Creation

This was the first project that allowed me to used mesh decals to create a scene. From defining the materials in engine to refining the process of creating and using decals in my 3D package, I learned valuable lessons and techniques the will surely guide any future work. I was able to experiment with techniques in unreal that I never used before, and identified several aspects in which I can improve. Using displacement to enhance the snow blend material created will surely be a next step in the created scene, as well as enhancing the believability of the snow using speckles, subsurface scattering and other effects. For the base itself, with more time I will try and improve the metal materials and further refine them with added grunge and edge wear. I will need to adapt my workflow to make use of these techniques.

Overall, I am satisfied with my end result but can't wait to have more time to improve it.



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Material Creation

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