



Marvel's Spider-Man: Procedural Lighting Tools

GDC March 2019



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MARVEL

SPIDER-MAN



Procedural Lighting

What is Procedural in this context?

Procedural refers to algorithmic methods of creating data, as opposed to manual.



Procedural Lighting

How can procedural lighting techniques augment the hard work of lighting artists by doing some of the bulk heavy lifting and free up artist time to focus on creating great content?



Procedural Lighting

Procedural Lighting Workflows

1) Light Placement



Procedural Lighting

Procedural Lighting Workflows

- 1) Light Placement
- 2) Light Probe Placement



Procedural Lighting

Procedural Lighting Workflows

- 1) Light Placement
- 2) Light Probe Placement
- 3) Light Grid Generation



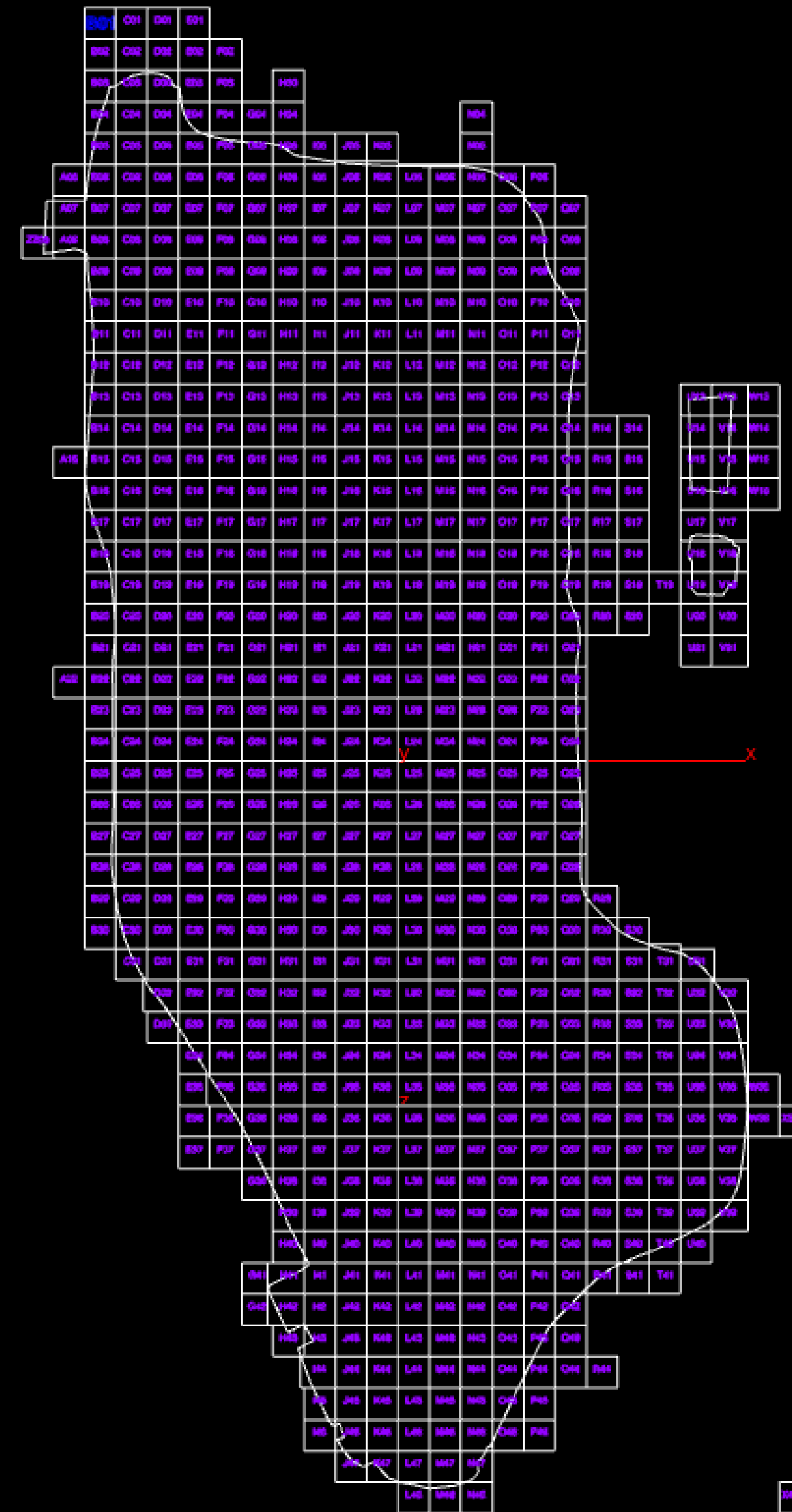
Procedural Lighting



Open World Tiles

726 tiles in the open world.

Each tile is 128x128 meters in size.



Light Grids

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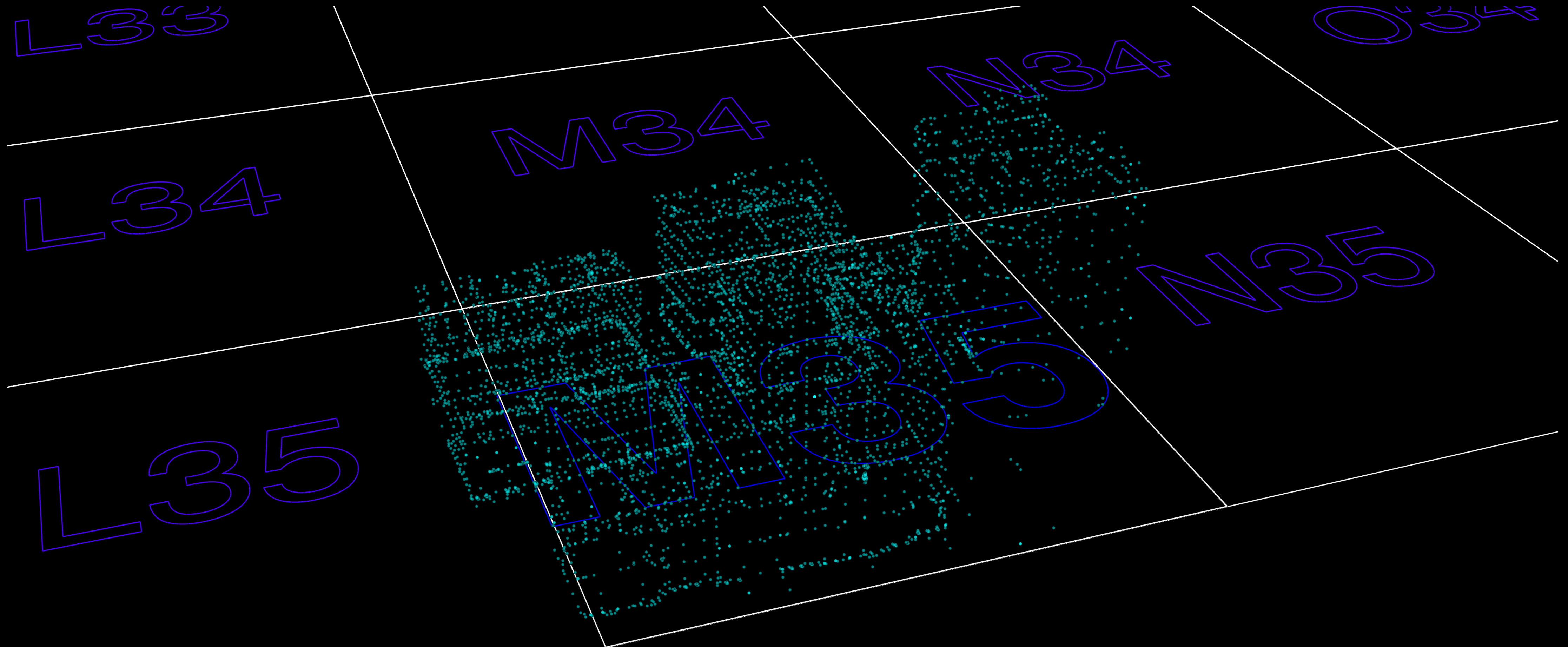


Point Clouds

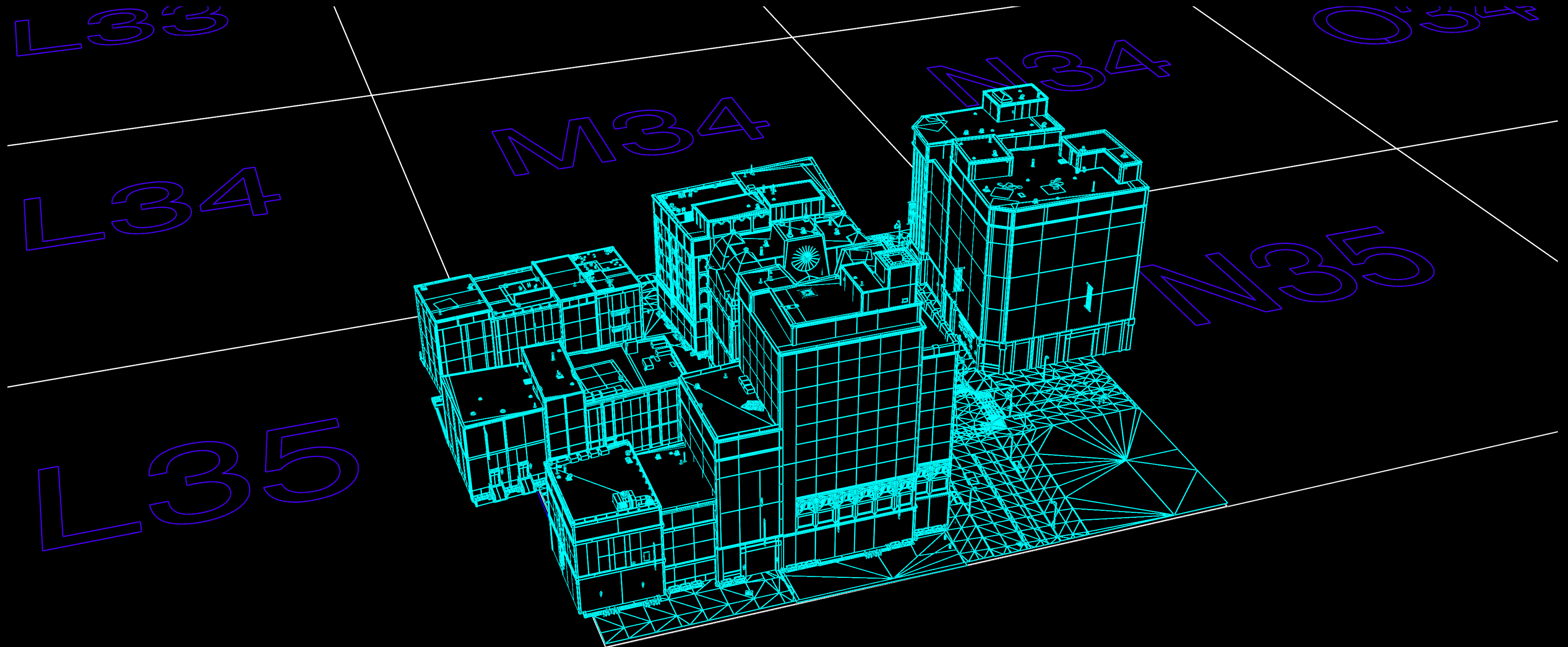
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		D32	E32	F32	G32	H32	I32	J32	K32	L32	M32	N32	O32
		D33	E33	F33	G33	H33	I33	J33	K33	L33	M33	N33	O33
			E34	F34	G34	H34	I34	J34	K34	L34	M34	N34	O34
			E35	F35	G35	H35	I35	J35	K35	L35	M35	N35	O35
			E36	F36	G36	H36							
			E37	F37									



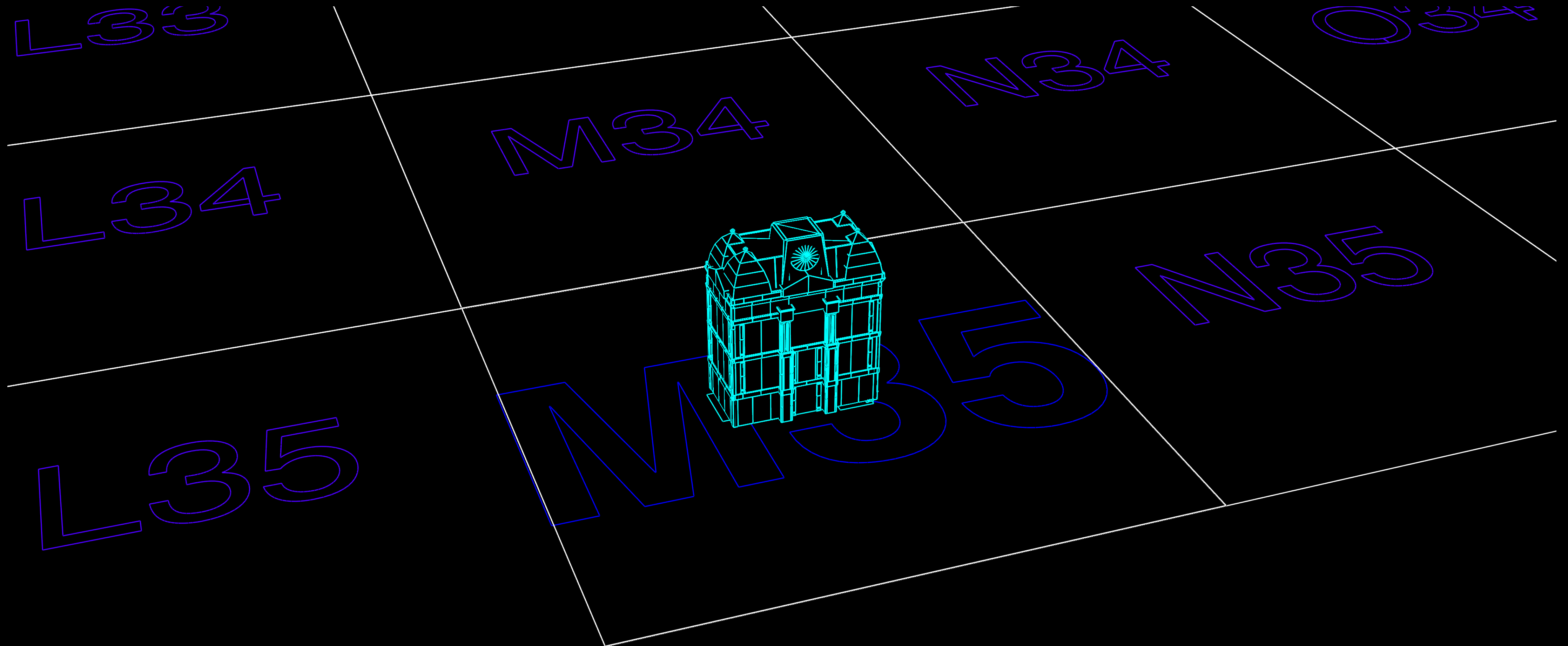
Point Clouds



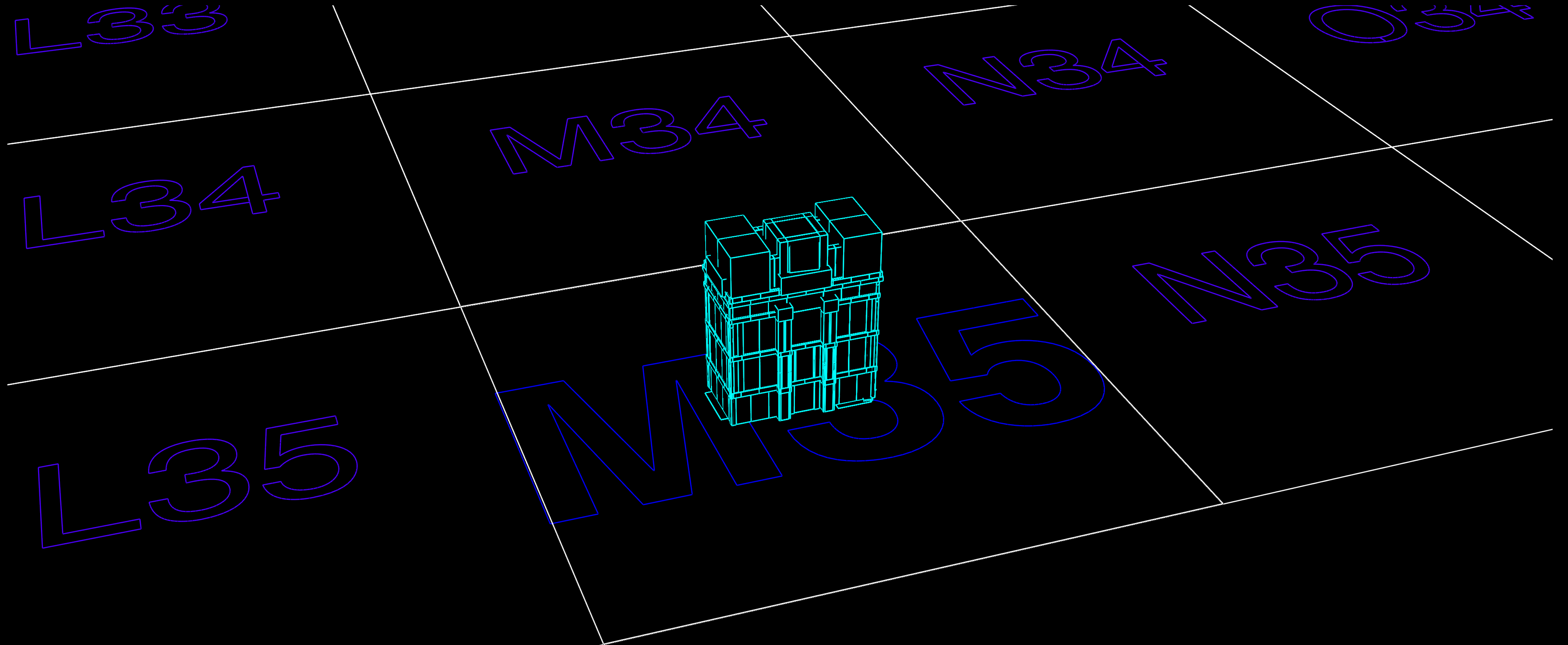
Geometry



Geometry

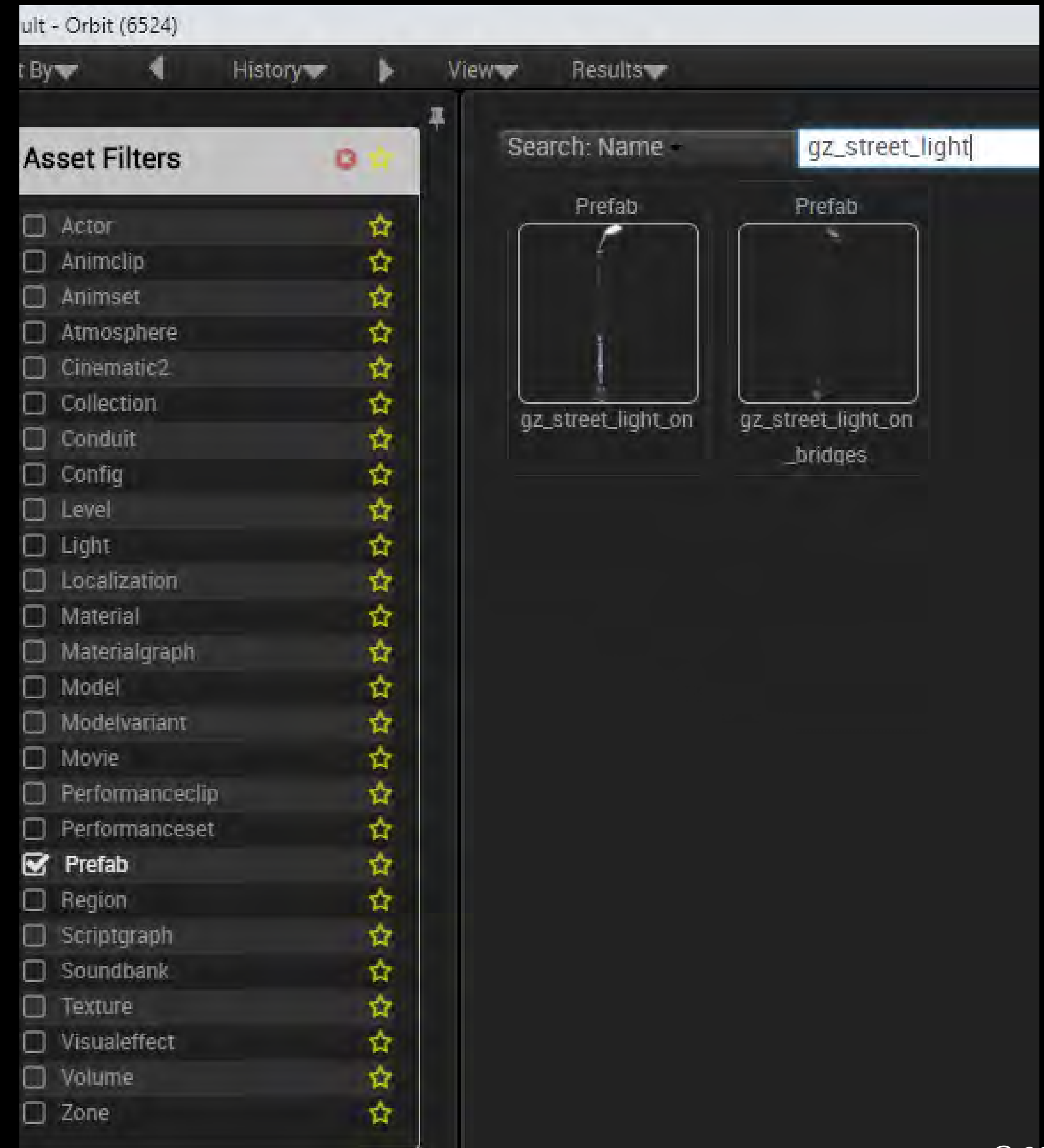


Geometry



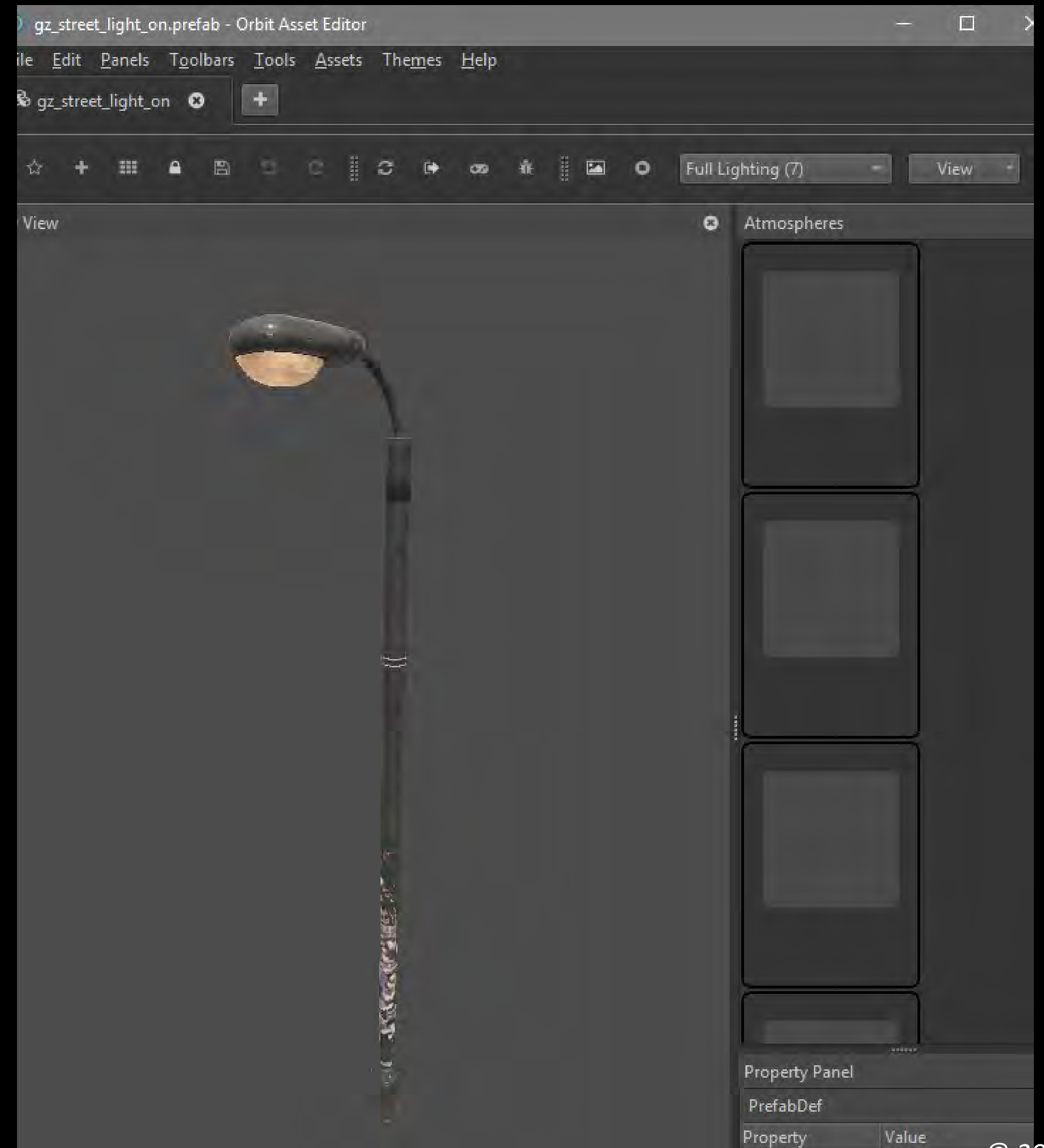
Prefabricated Instances

Assets are browsable through the Insomniac Vault.

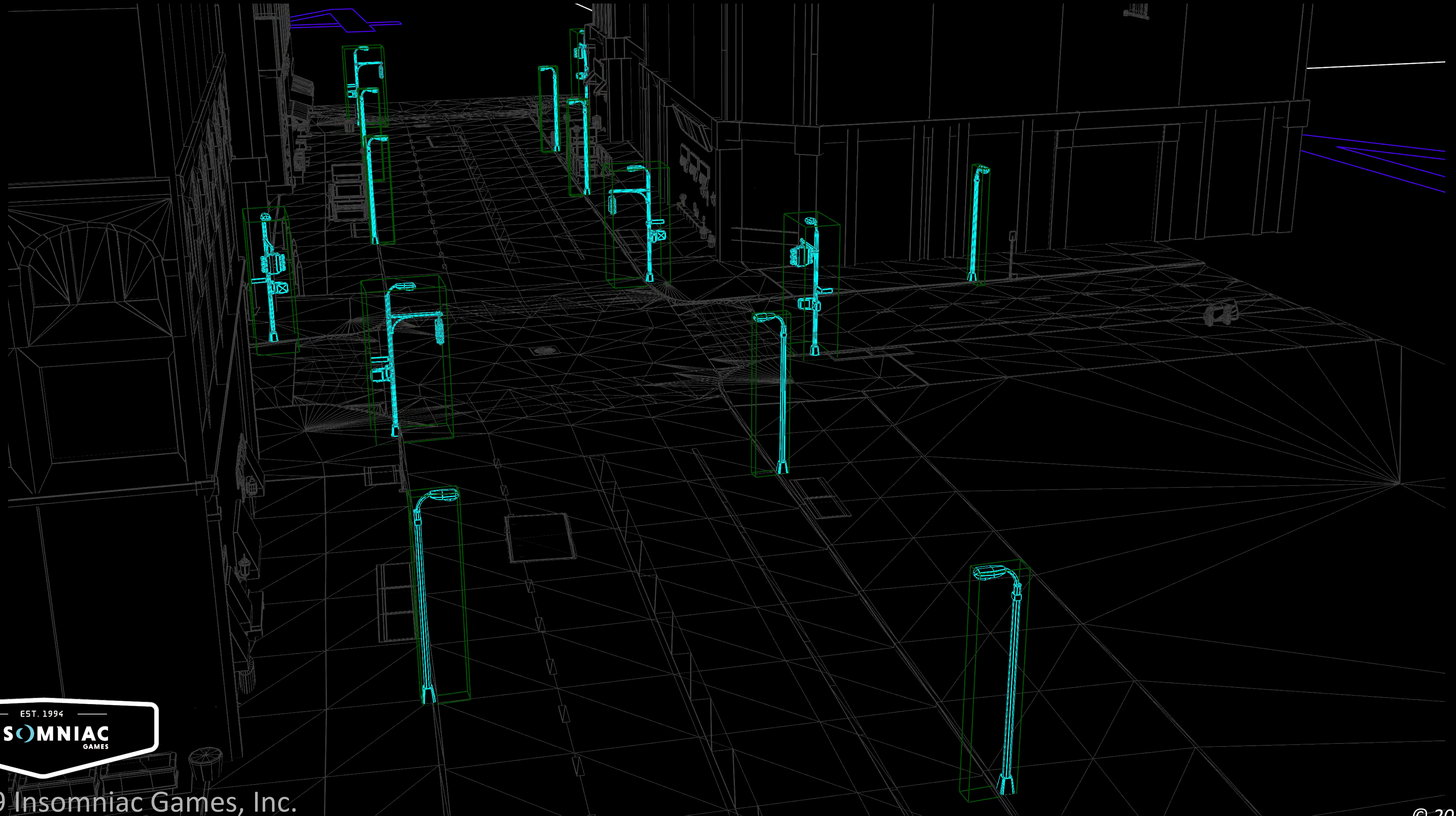


Prefabricated Instances

Assets are browsable through the Insomniac Vault.

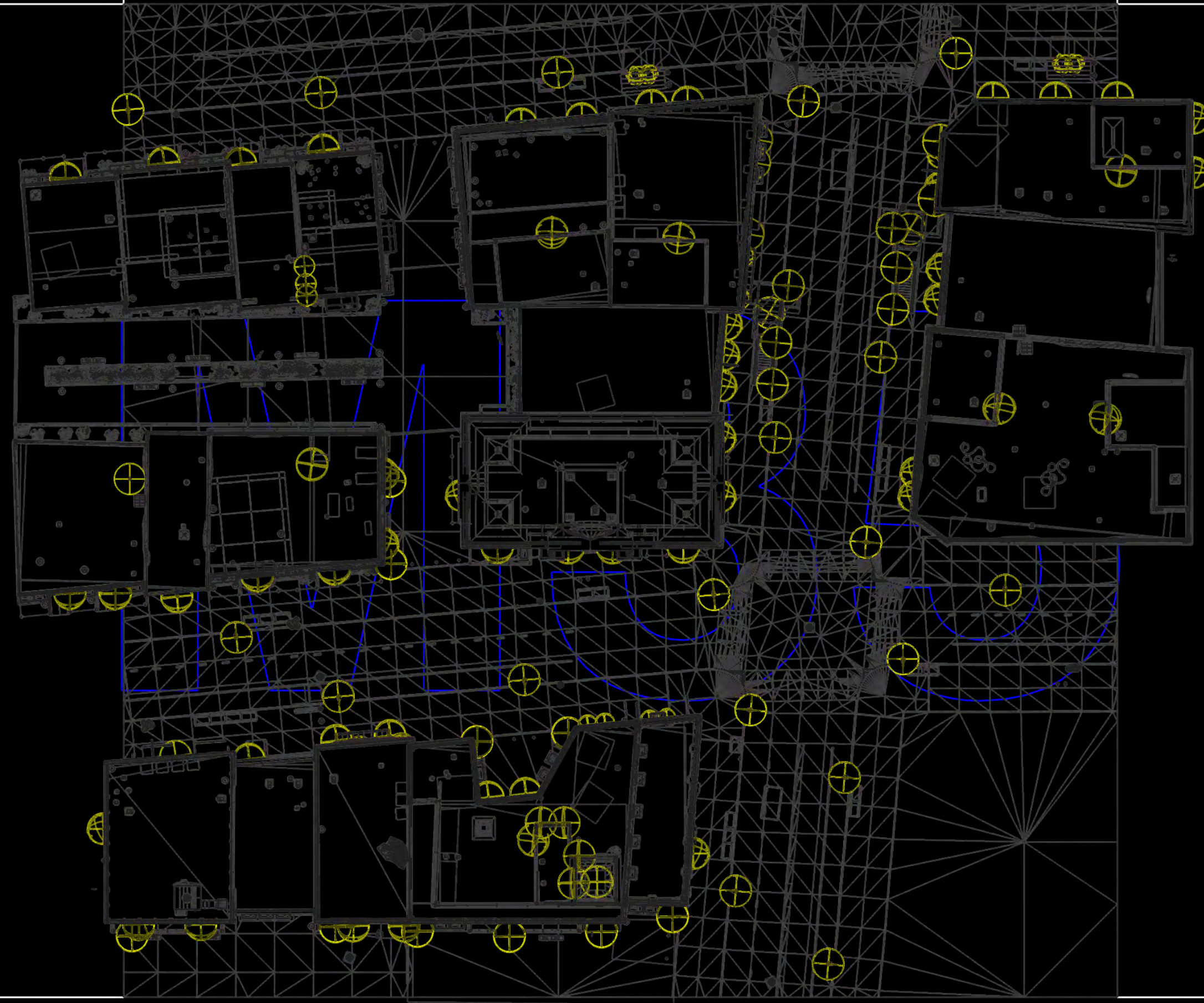


Procedural Placement



Procedural Placement

L35

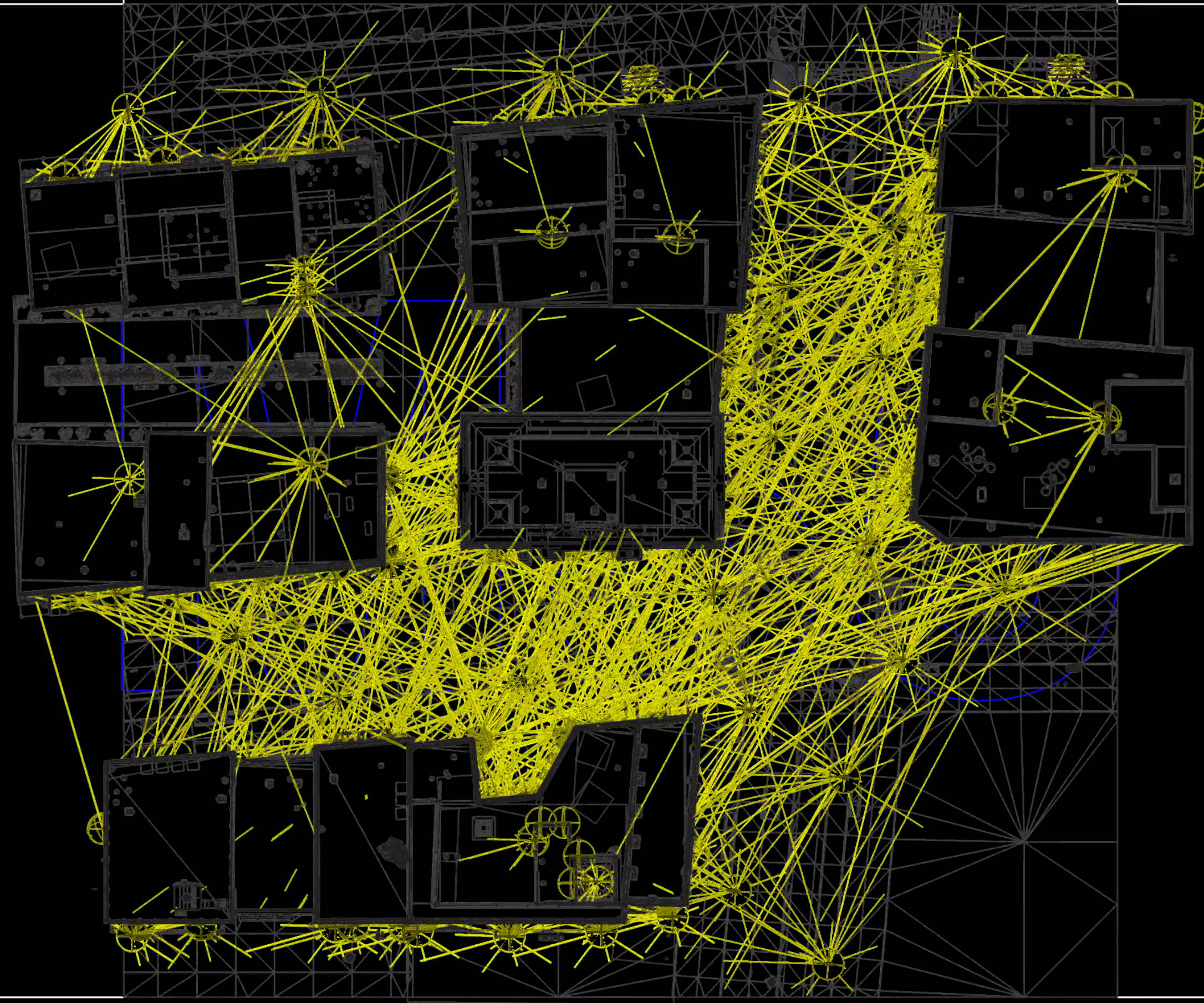


N35



Procedural Placement

L35

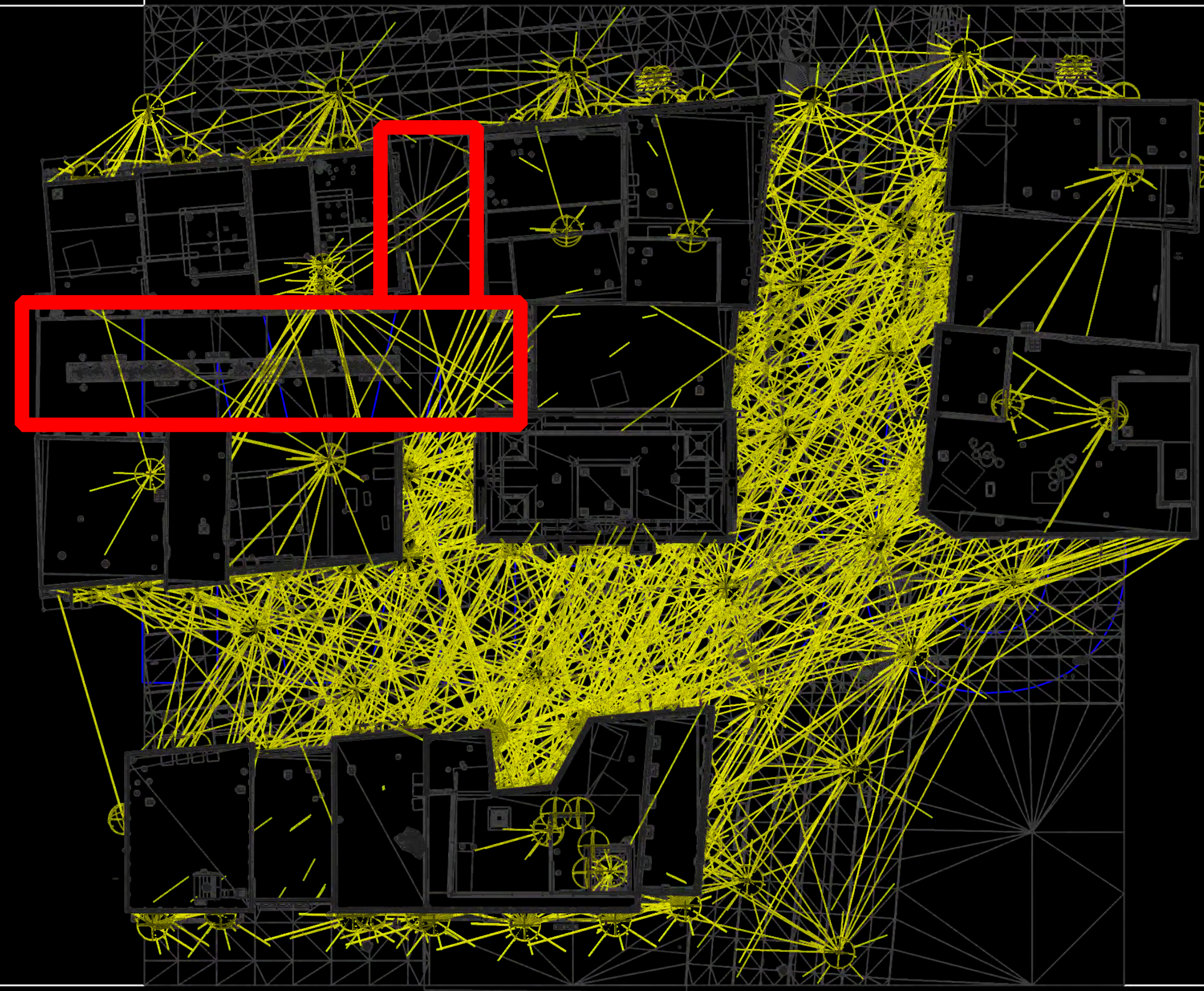


N35



Procedural Placement

L35

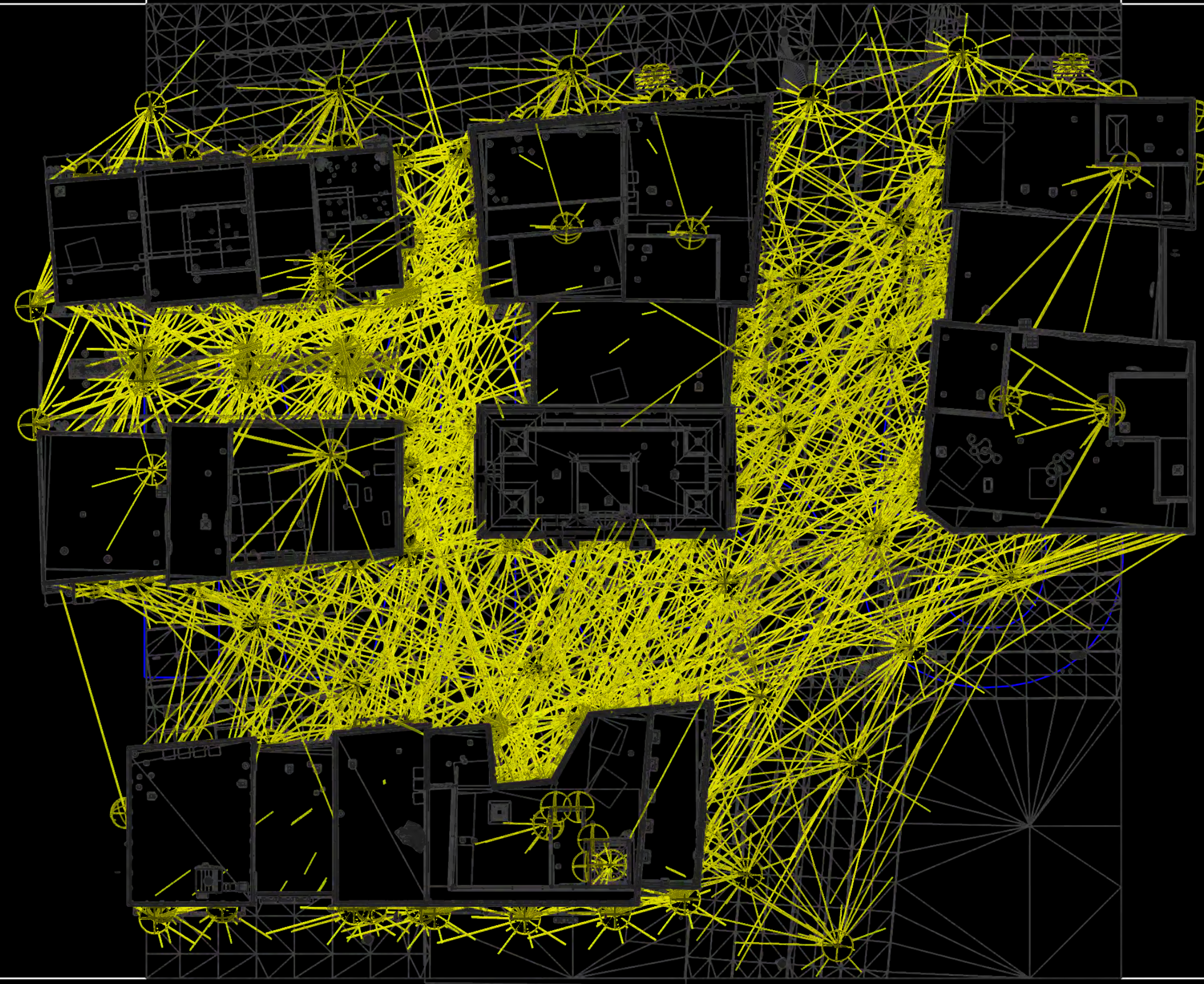


N35



Procedural Placement

L35



N35



Light Probes



Light Probes

34

M'34

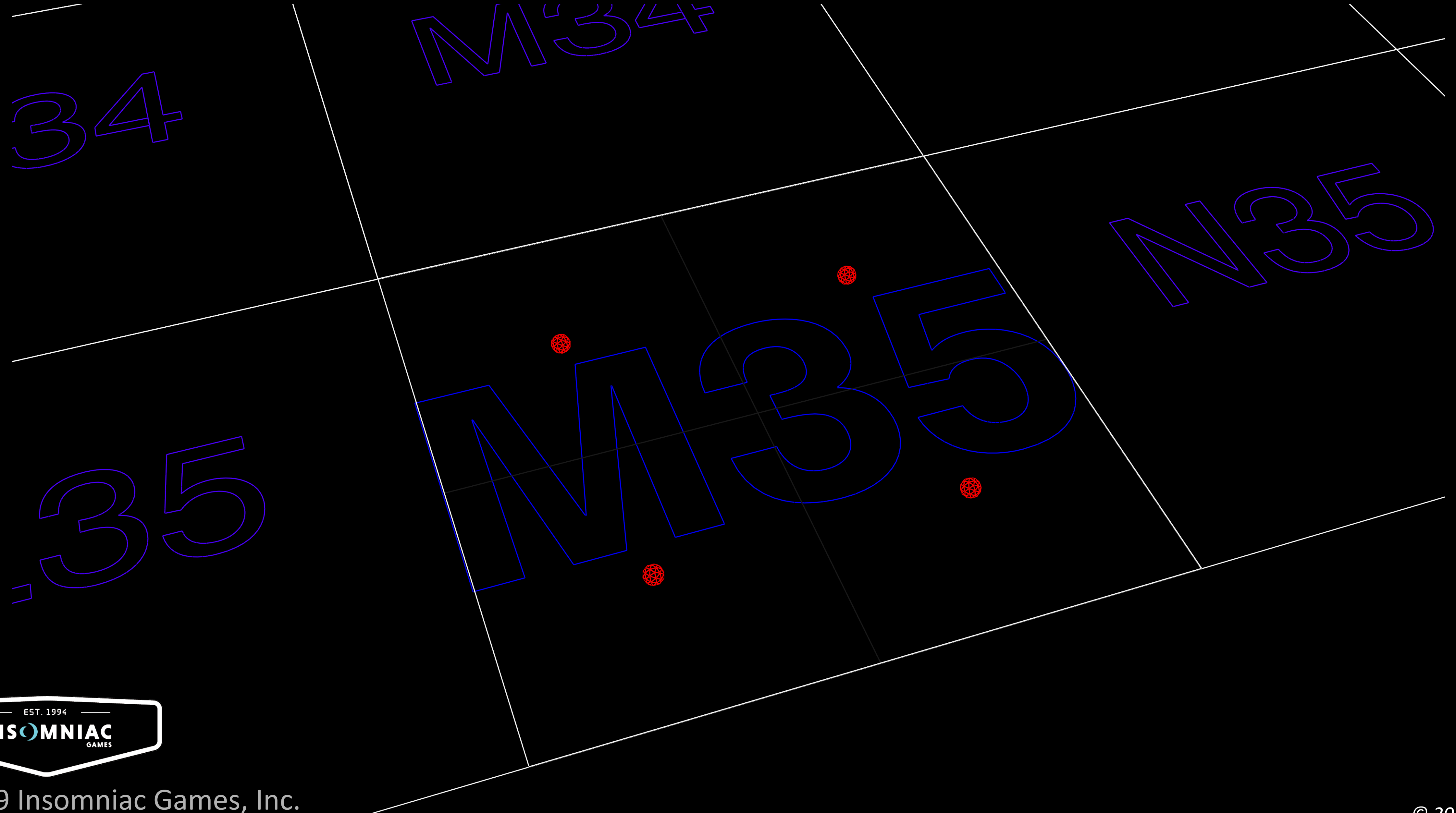
N35

.35

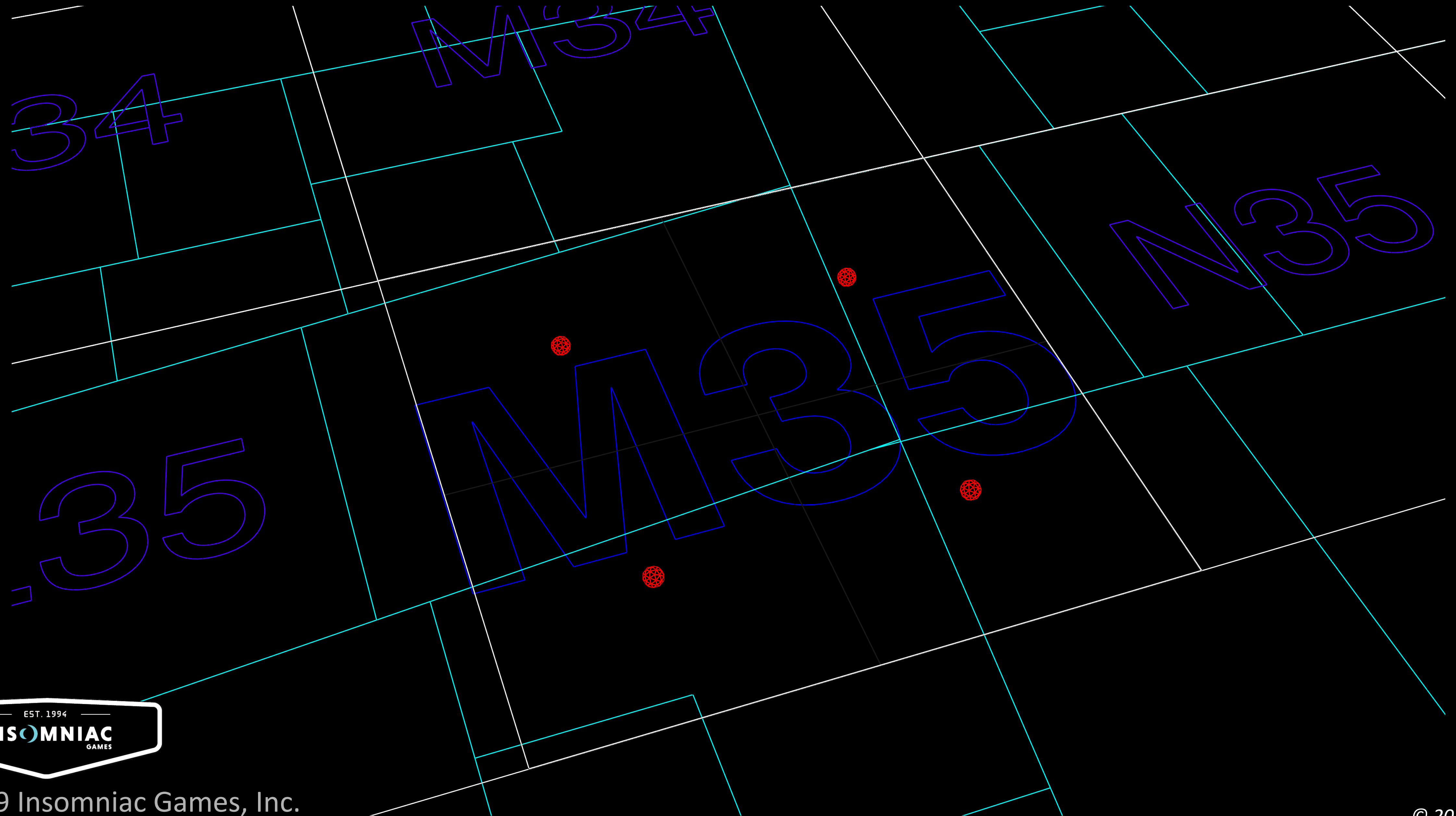
M35



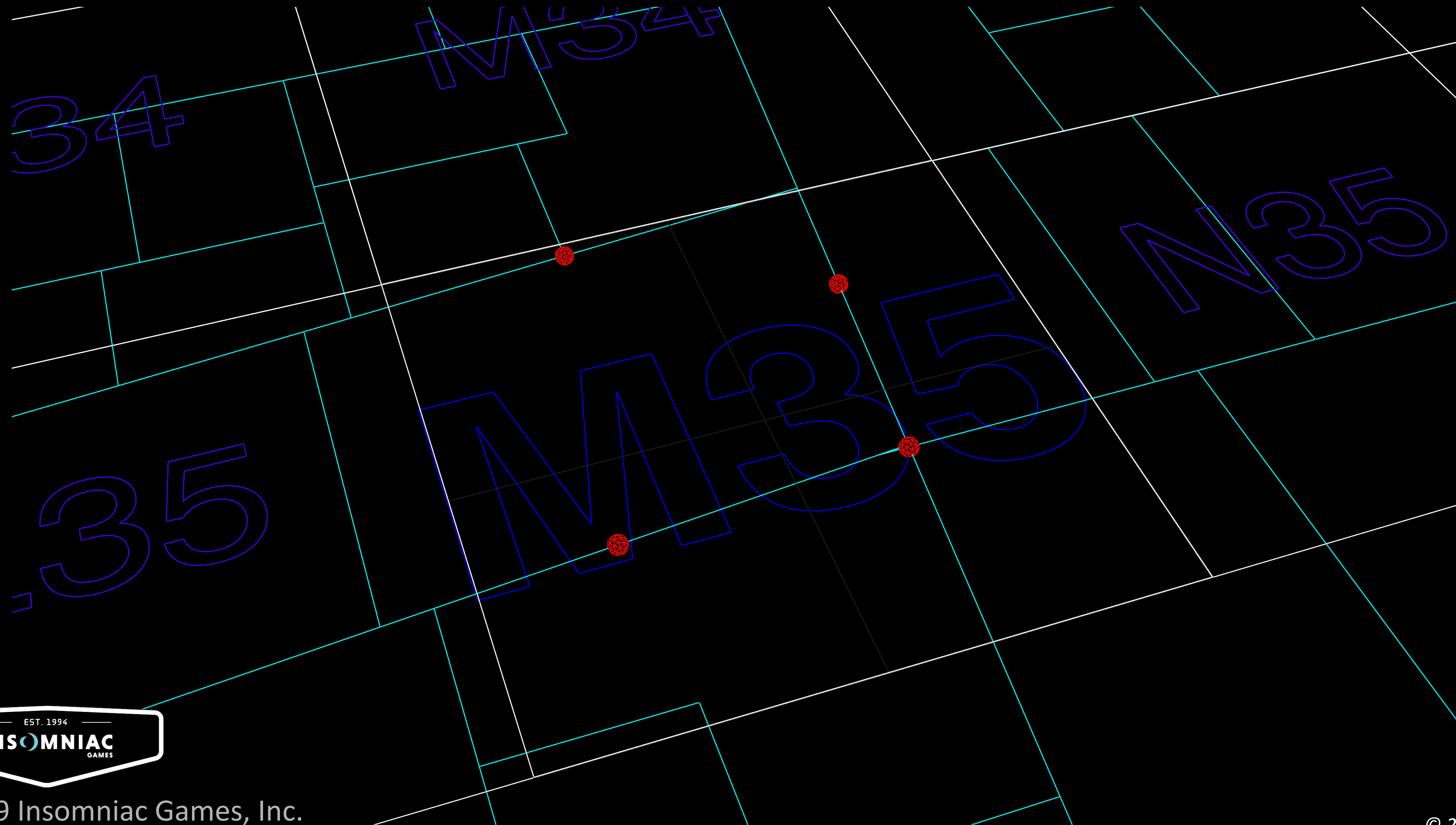
Light Probes



Light Probes



Light Probes



Light Probes

L35



N35



Light Probes

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Light Probes



Light Probes



Light Probes



Light Probes



Light Probes



Light Probes



Light Probes

Technical Info

- Each face of the cube map is rendered at 512x512 resolution
- We take advantage of MIP mapping to convolve the cube map down five levels
- Each MIP level represents an amount of glossiness
- Regardless of glossiness of the surface, the final result is quantized to one of the convolved MIPs



IG-Impostors



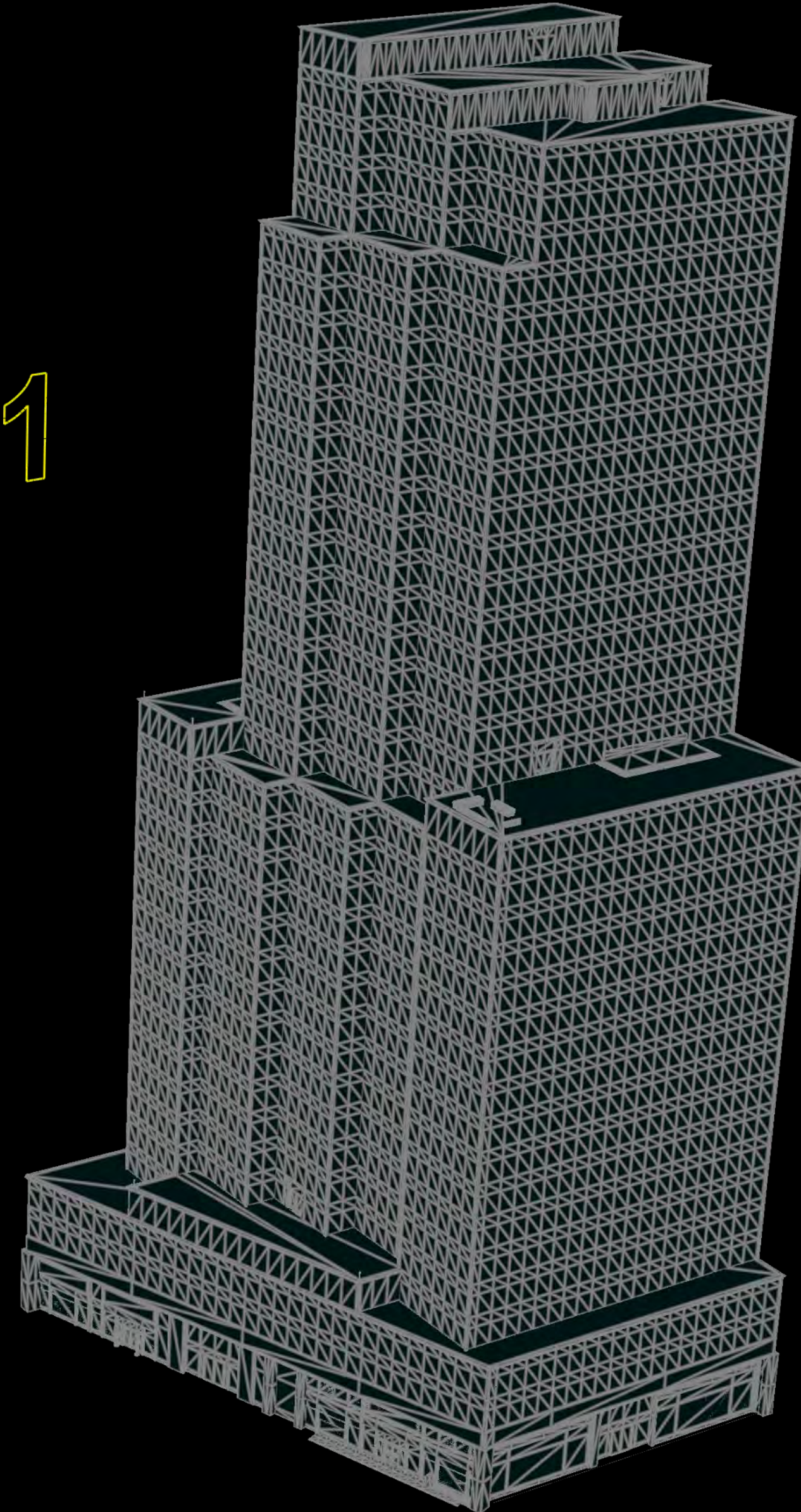
IG-Impostors

- Always maintain fidelity under all circumstances
- Eliminate far clipping plane draw-in
- Maintain geometric relief details of the source assets
- Support fully emissive and reflective surfaces
- Transition as seamlessly as possible between high-res instanced geometry and the corresponding IG-Impostor.
- Inform other game systems using the persistent IG-Impostor cache



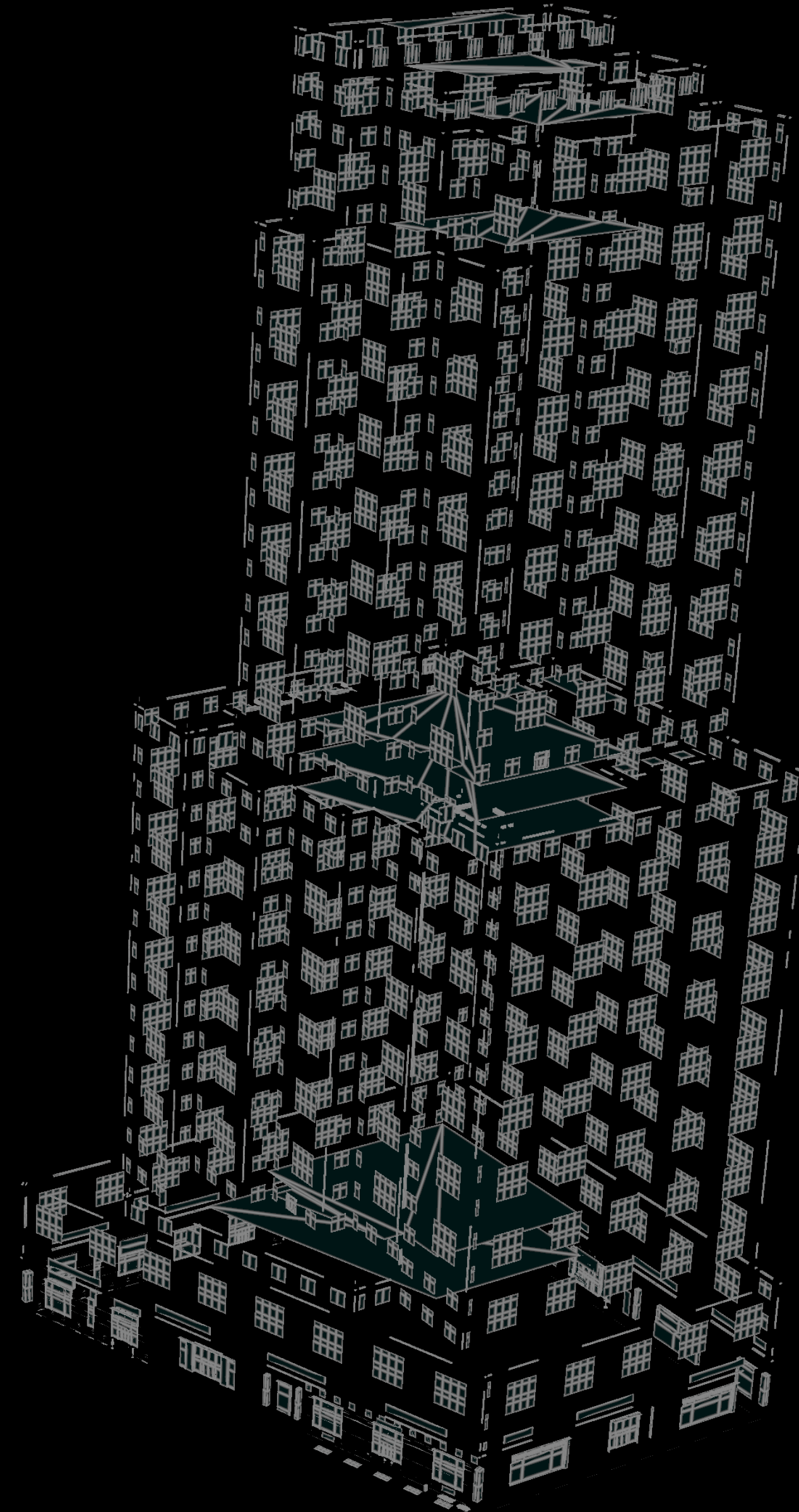
High LOD Geometry

Points: 109822
Polys: 152411
Model Inst: 1611



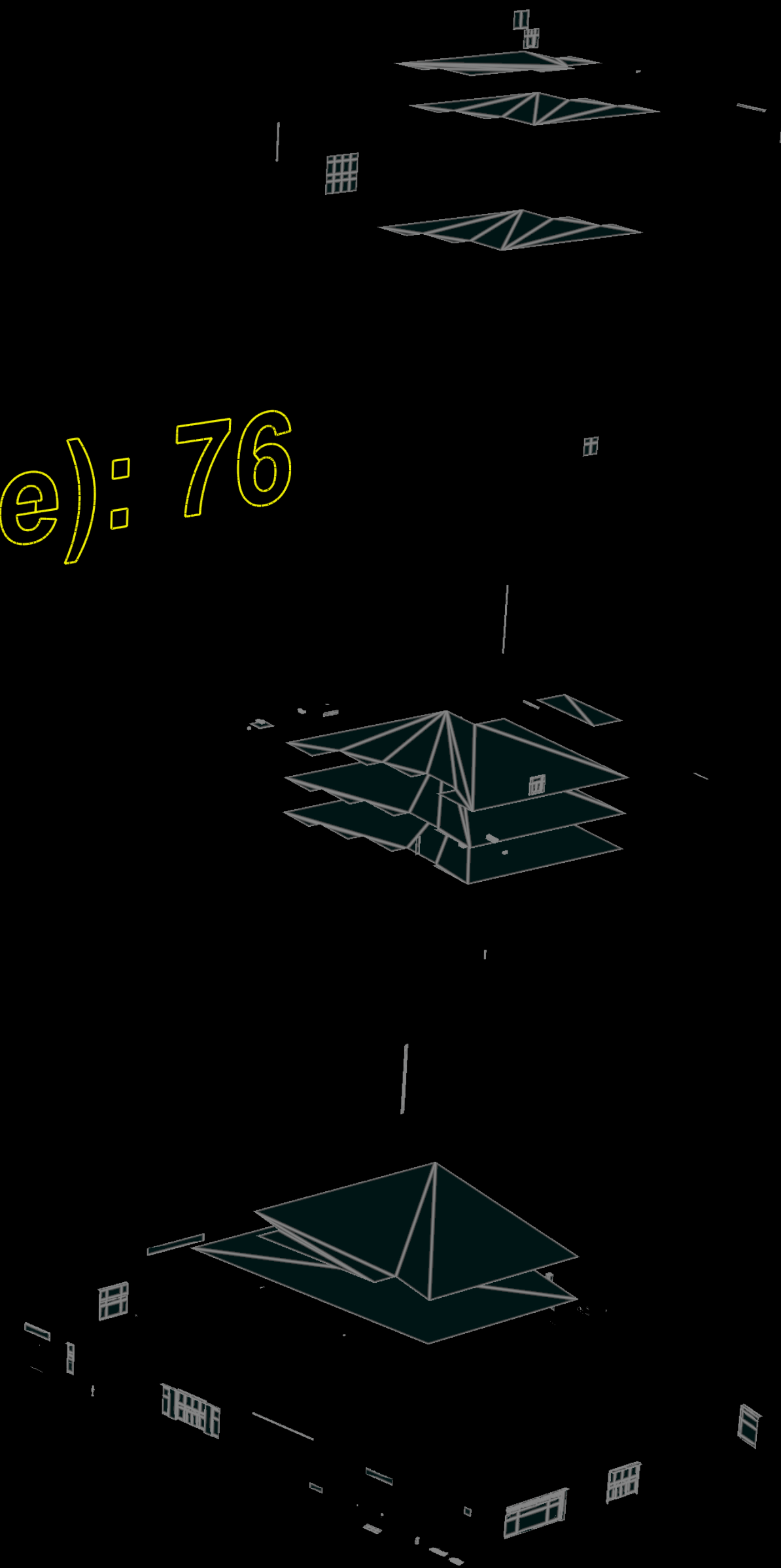
High LOD Geometry

Points: 109822
Polys: 152411
Model Inst: 1611



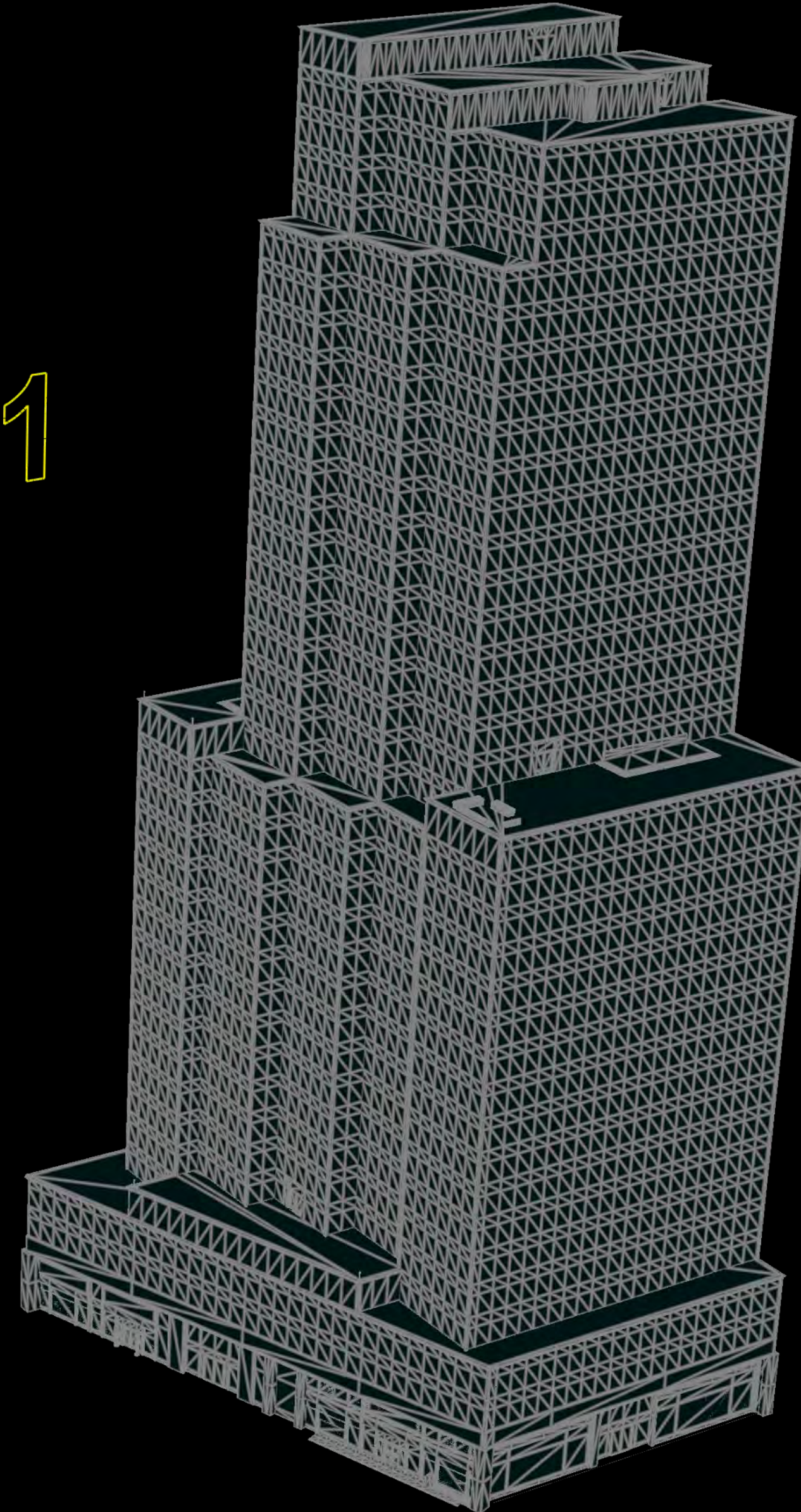
High LOD Geometry

Points: 109822
Polys: 152411
Model Inst (unique): 76



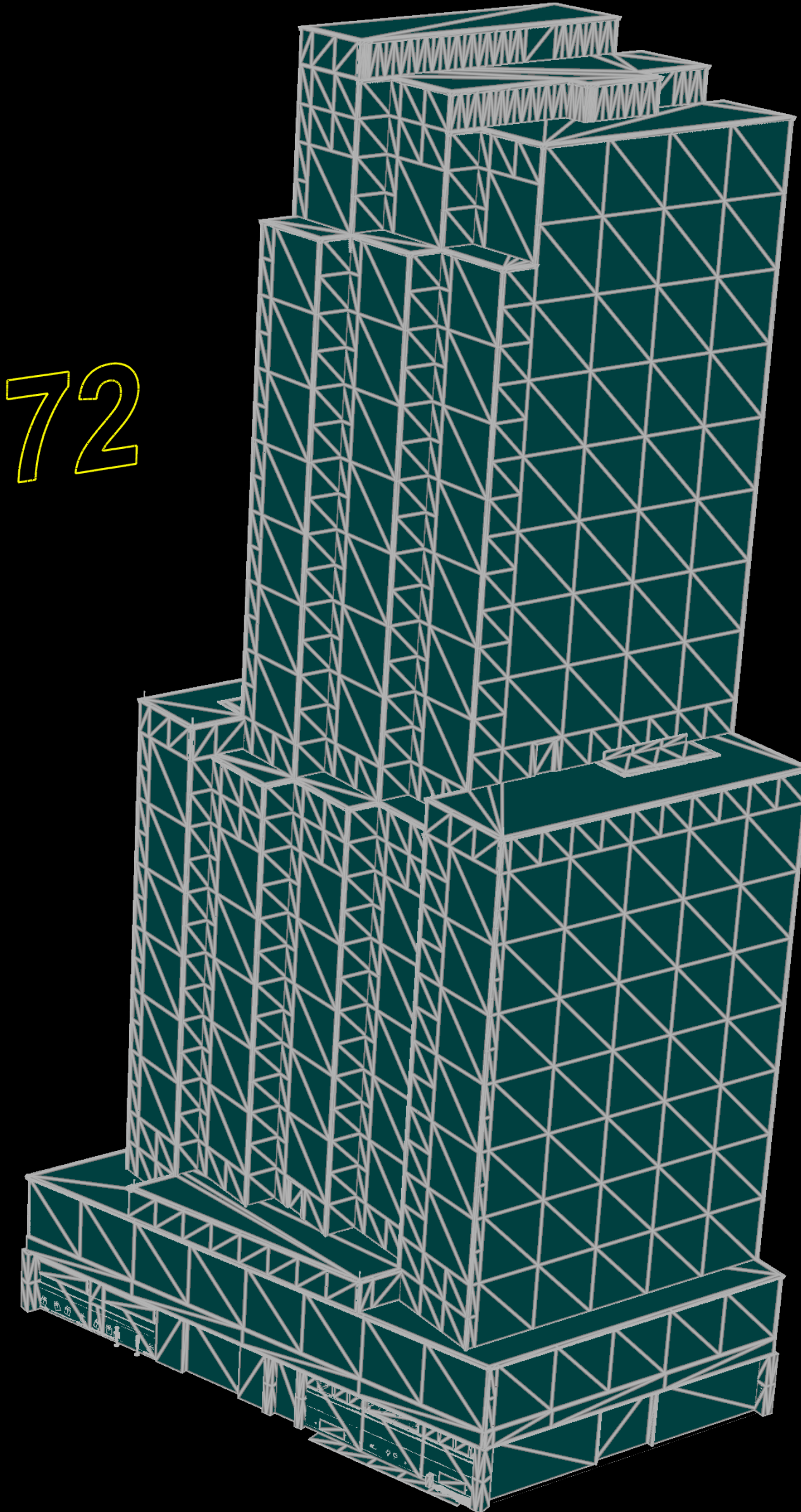
Geometry

Points: 109822
Polys: 152411
Model Inst: 1611

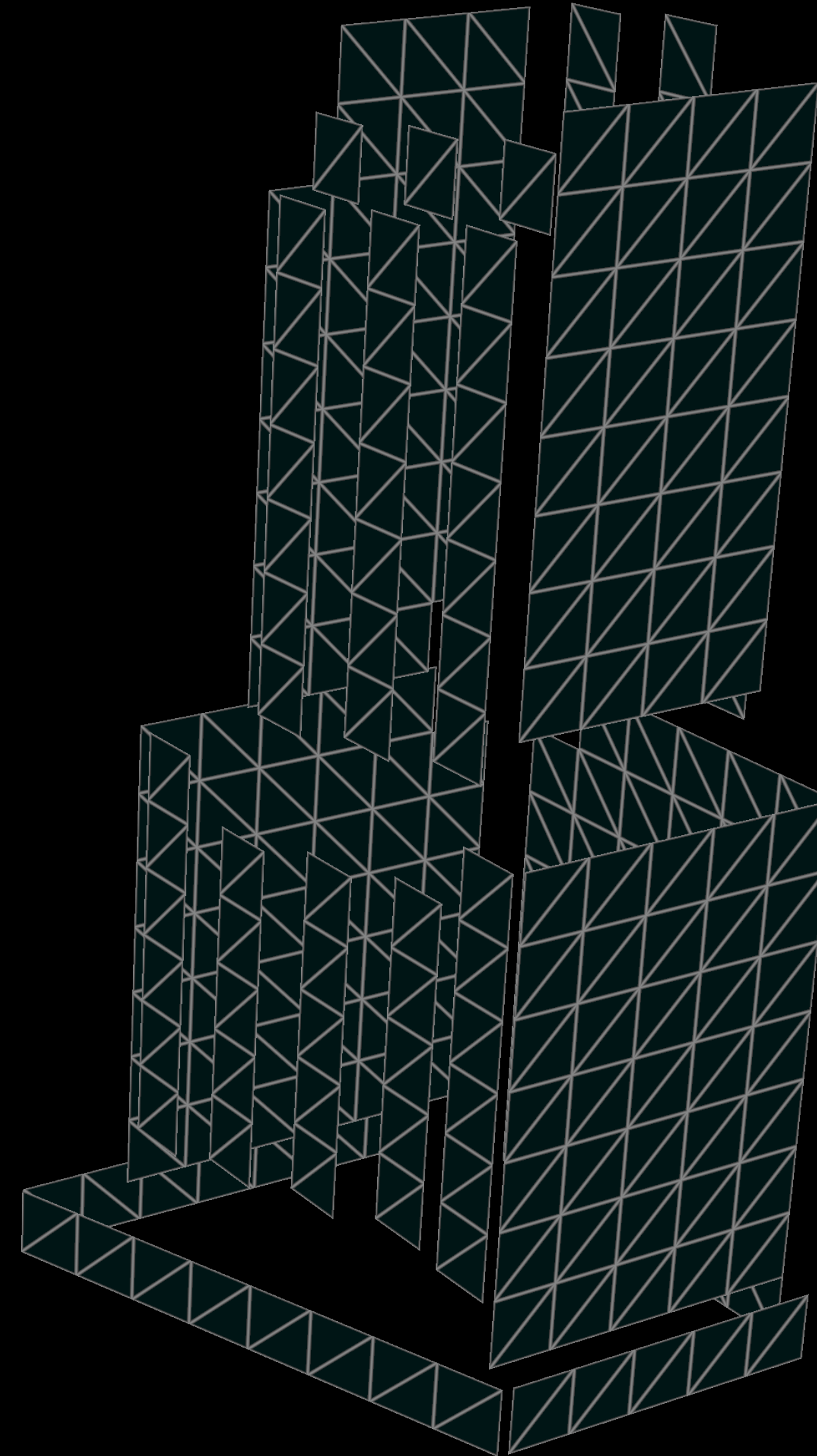


Low LOD Geometry

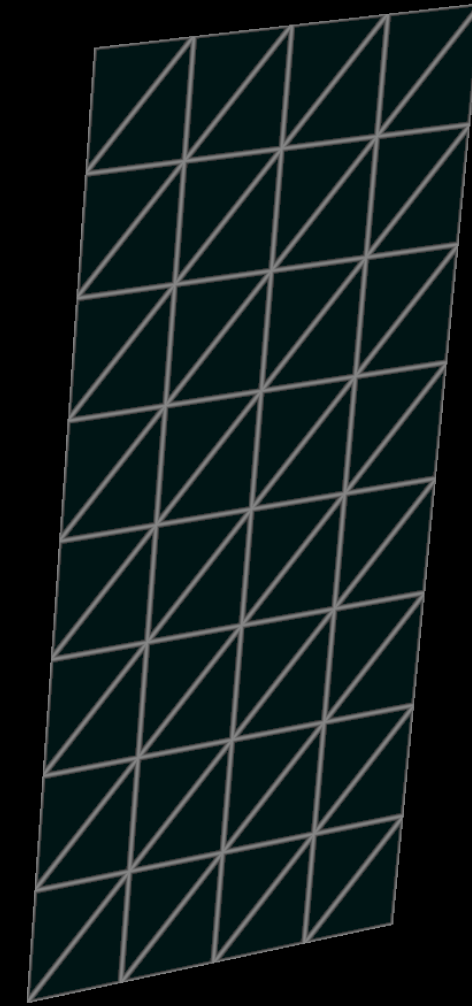
Points: 55972
Polys: 92399
Model Inst: 55972



Low LOD Geometry

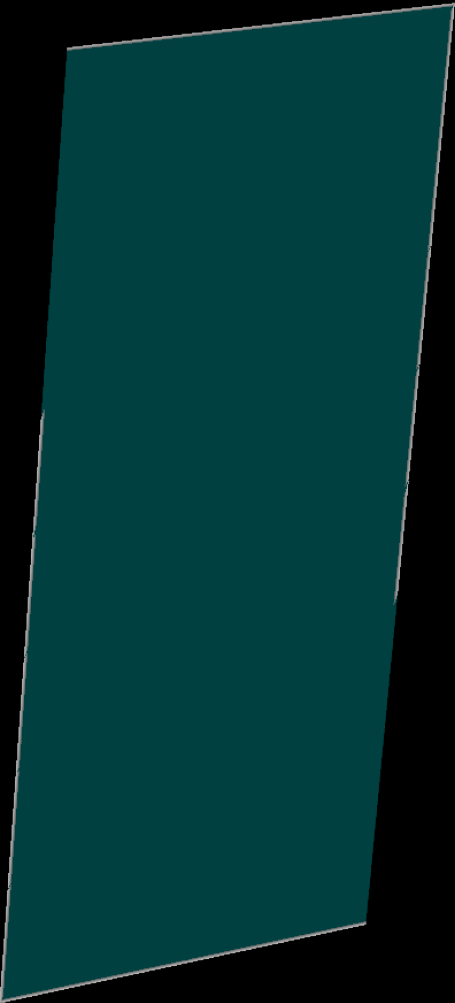


Low LOD Geometry

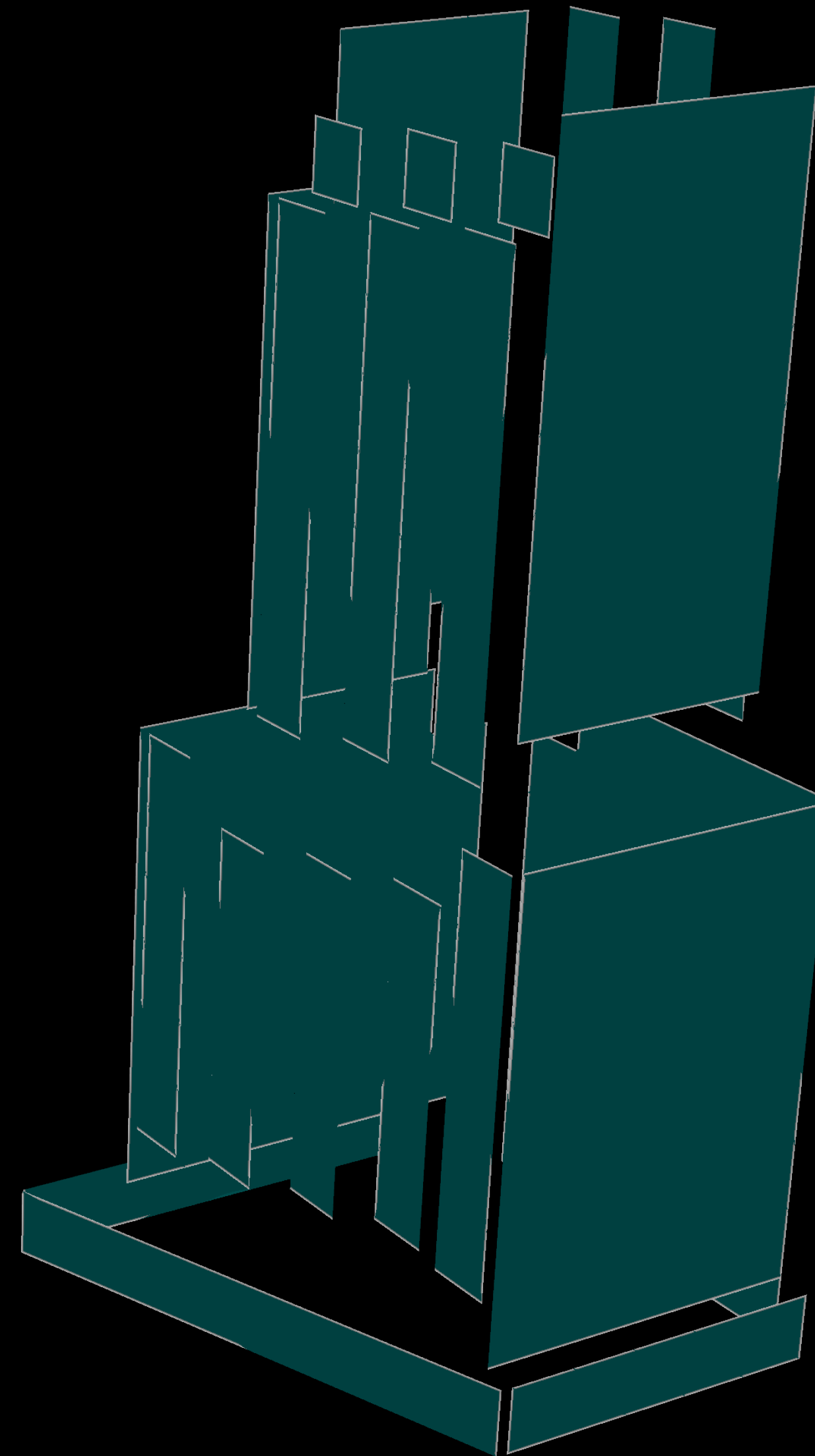




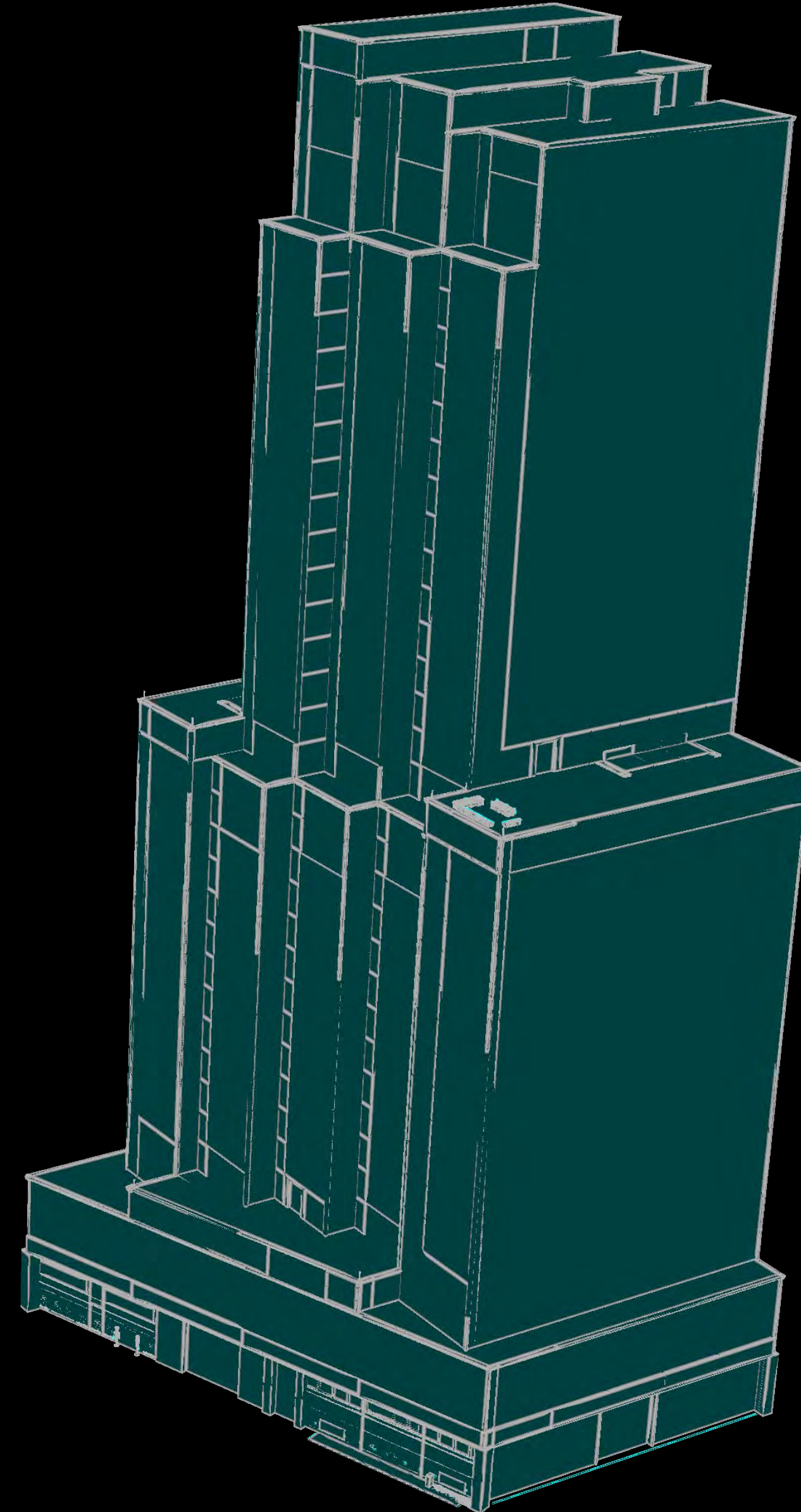
Low LOD Geometry



Low LOD Geometry

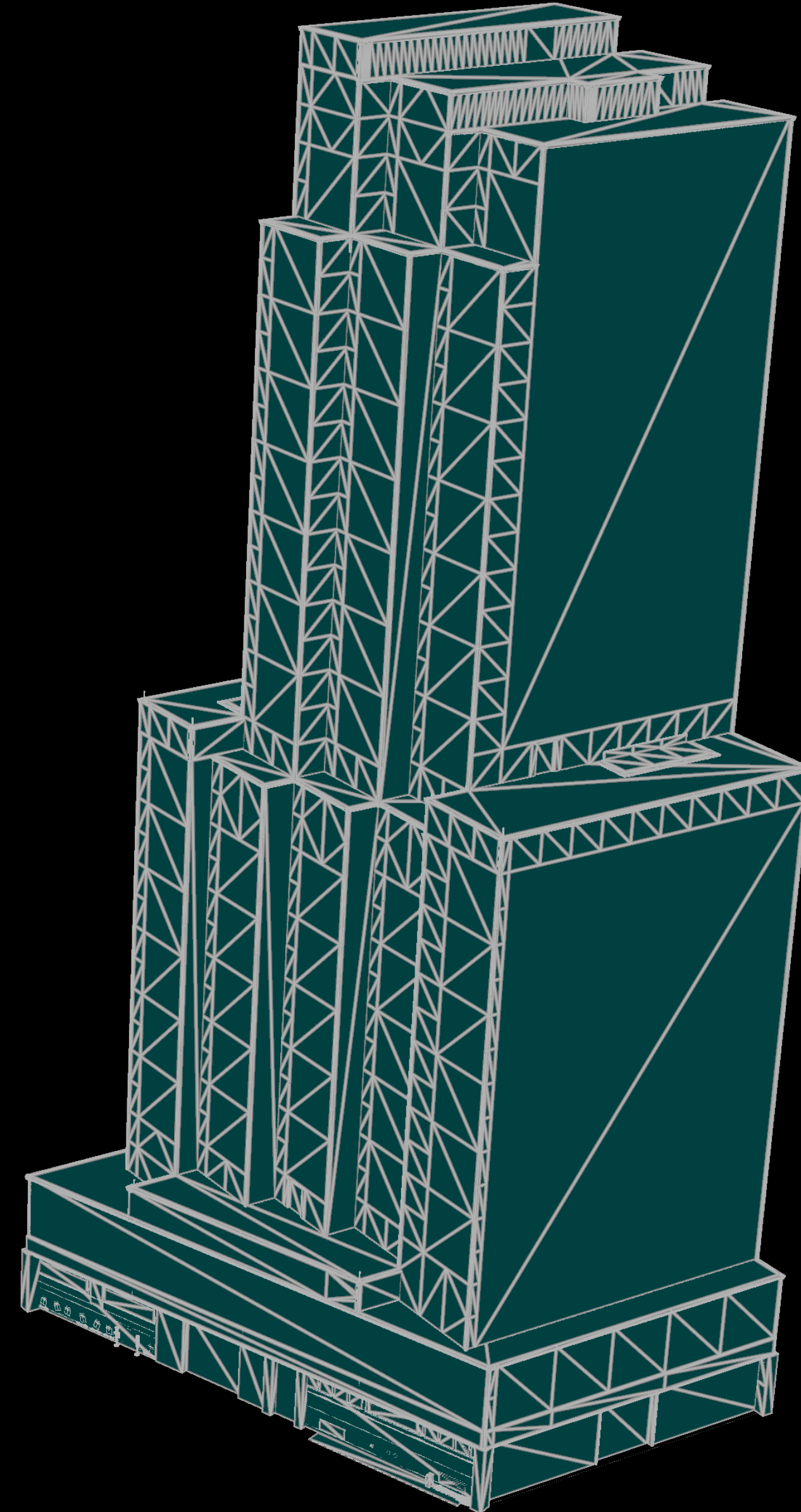


Low LOD Geometry



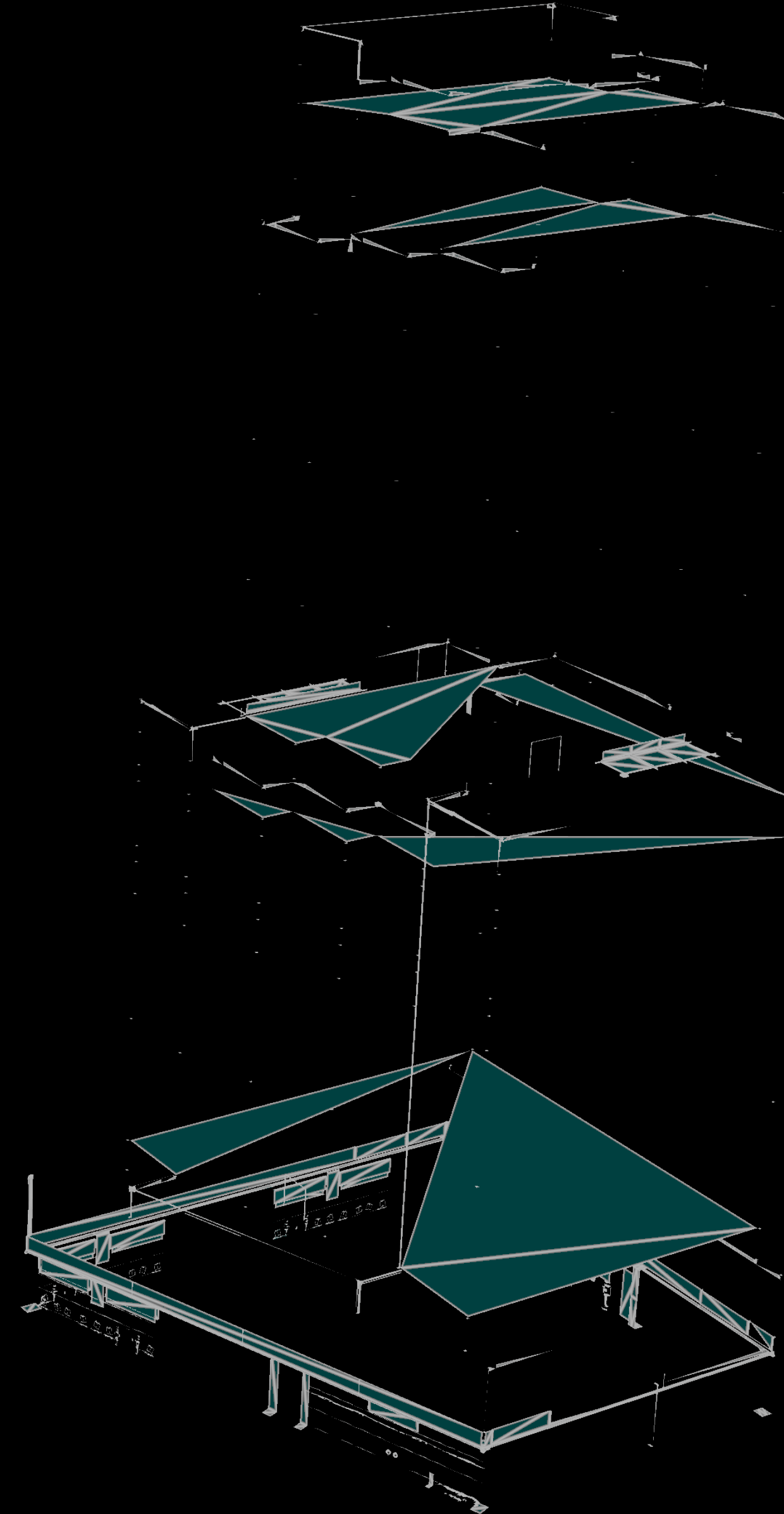
Low LOD Geometry

Points: 24562
Polys: 28134



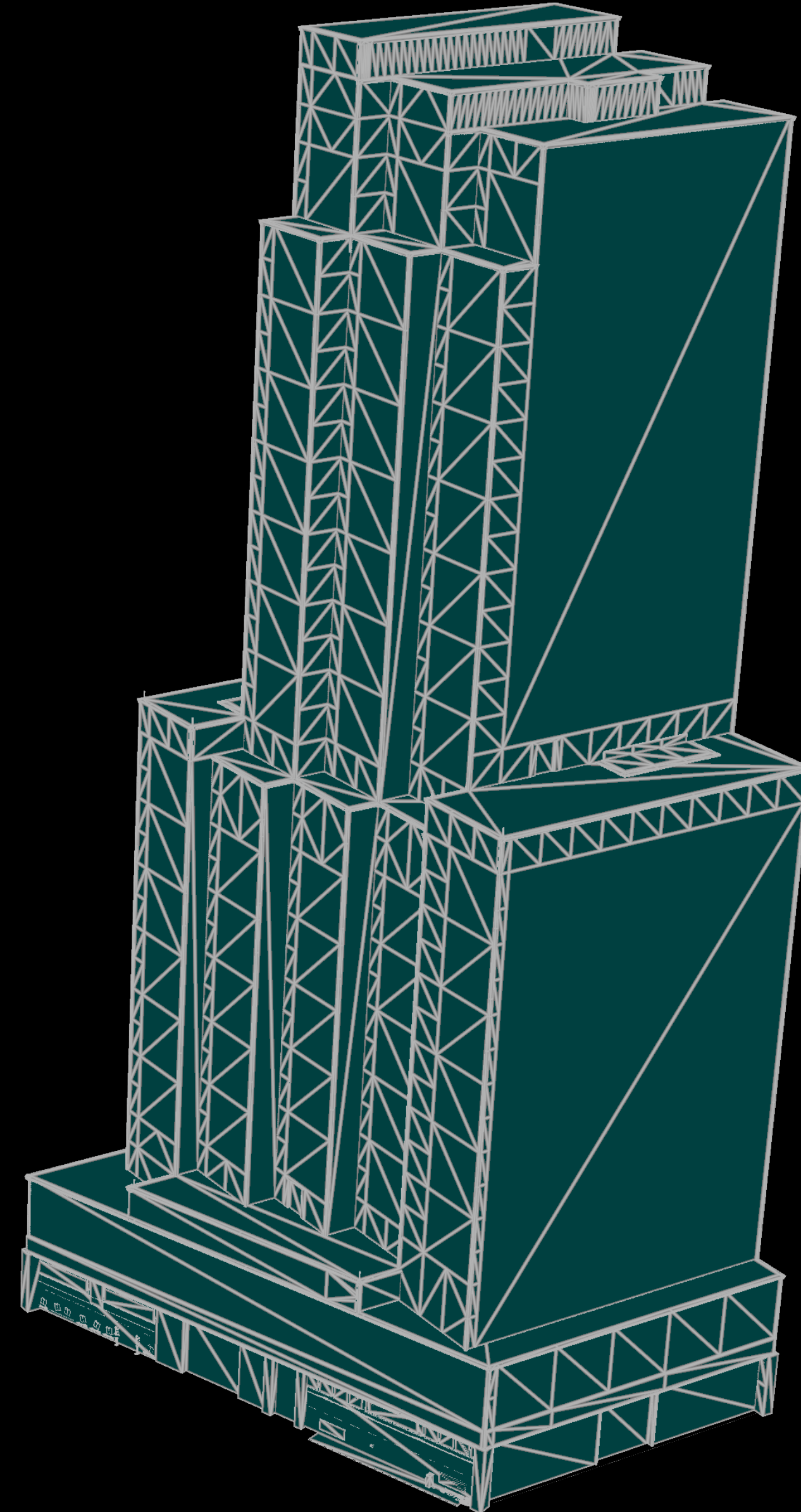
Occluded Geometry

Points: 8352
Polys: 5445



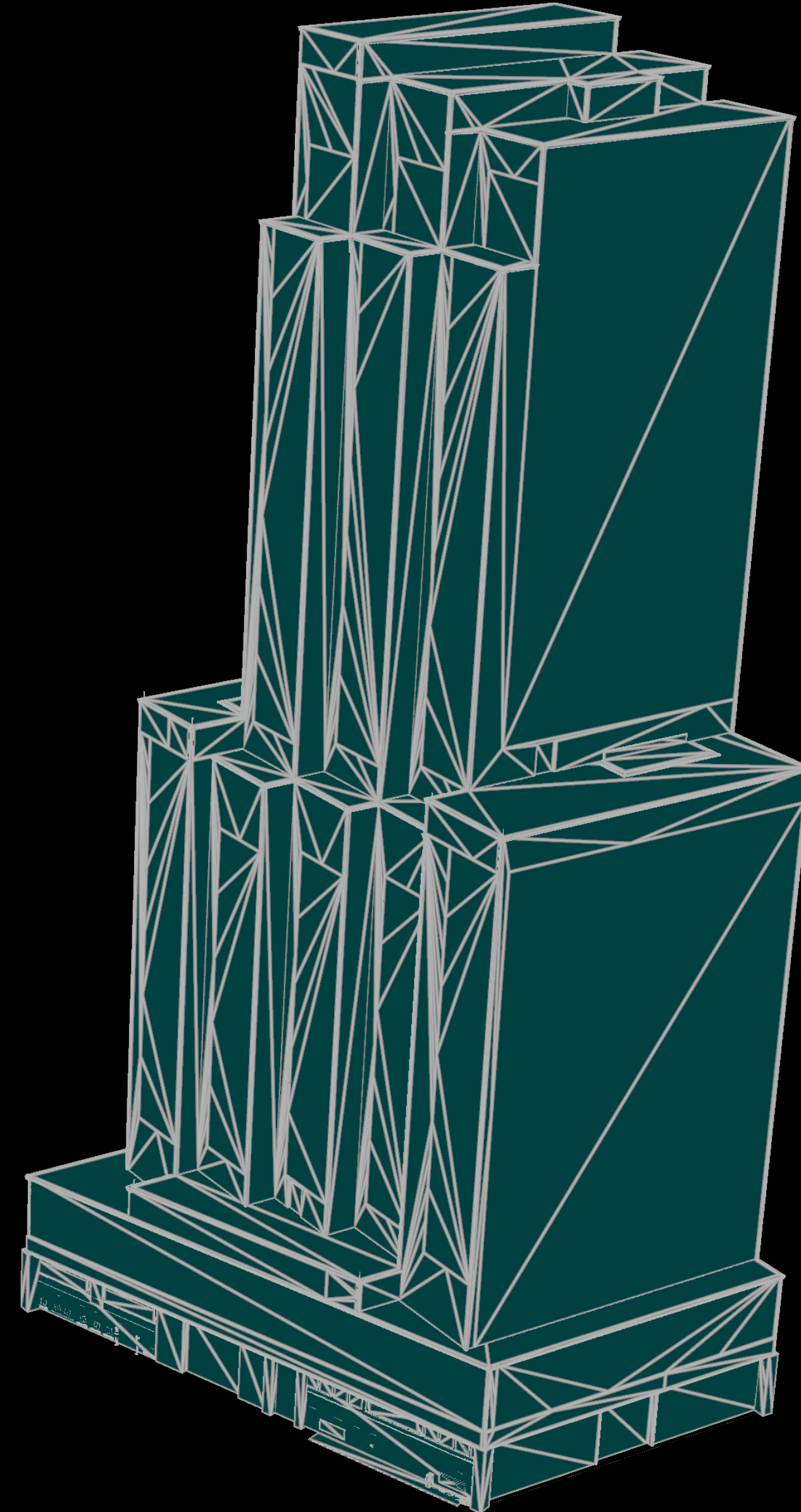
Occlusion Removal

Points: 11338
Polys: 9526

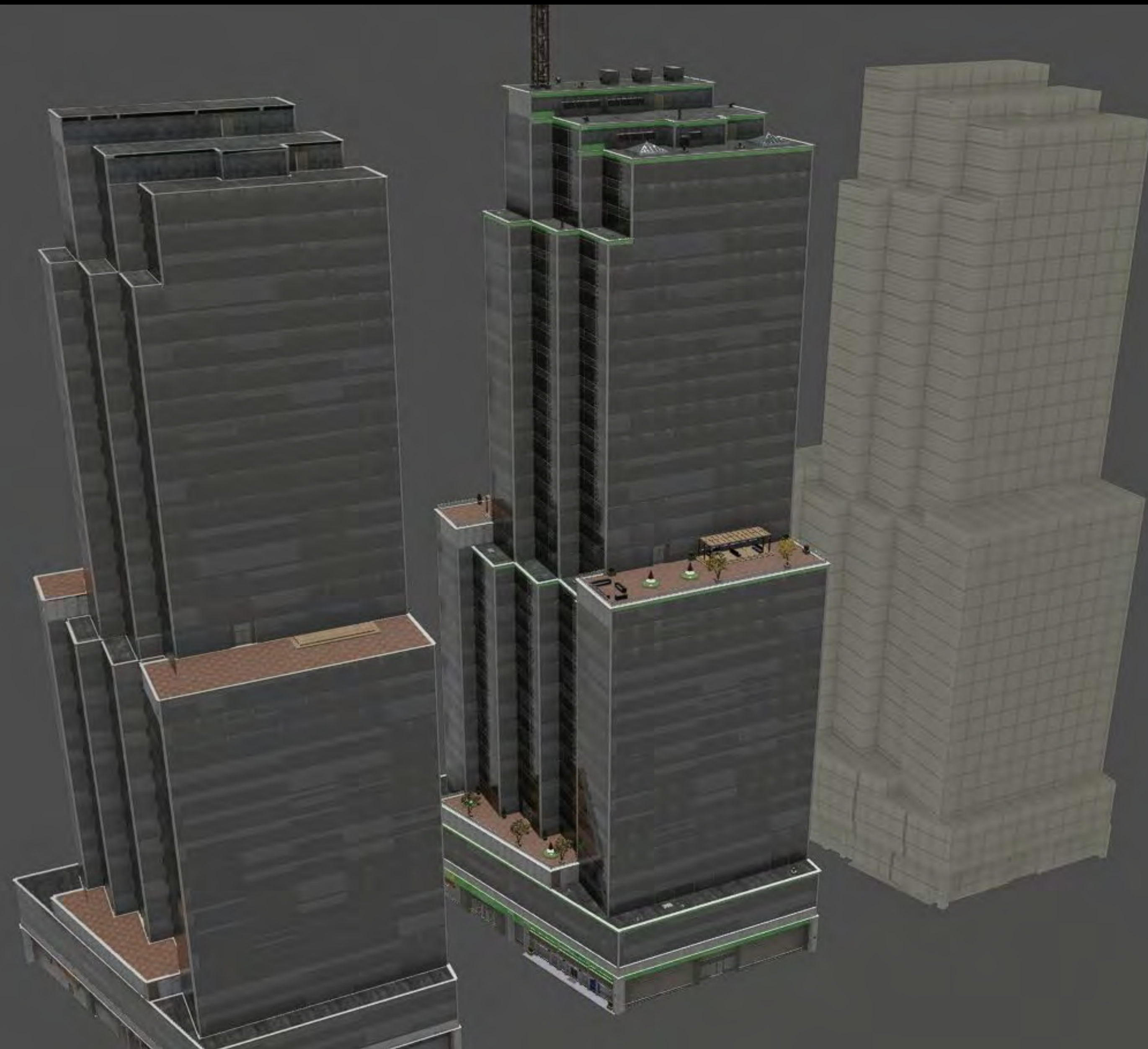


IG-Impostor Geometry – Final Optimize

Points: 6712
Polys: 4999



IG-Impostor Texture Capture



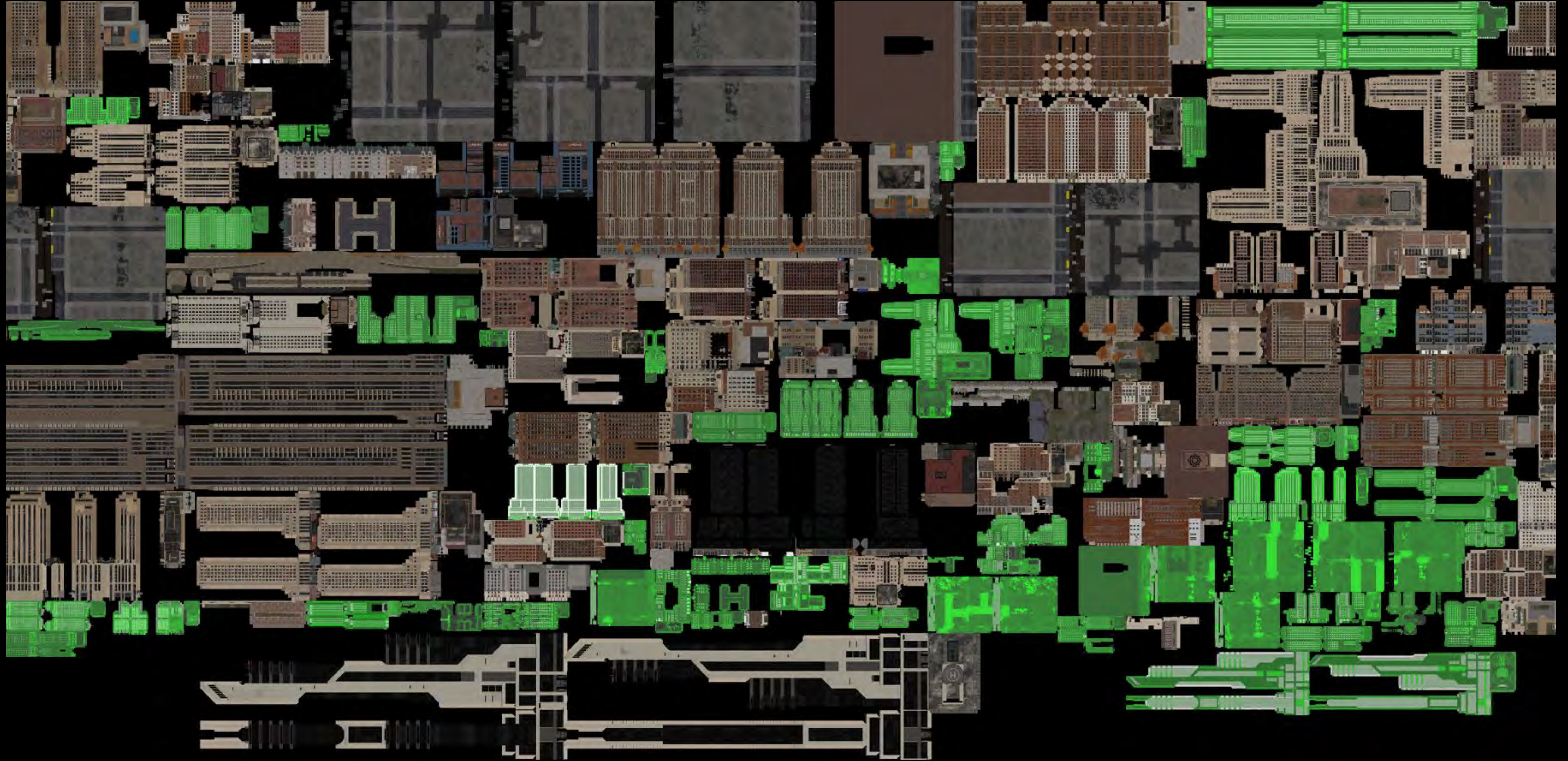
IG-Impostor Texture Capture



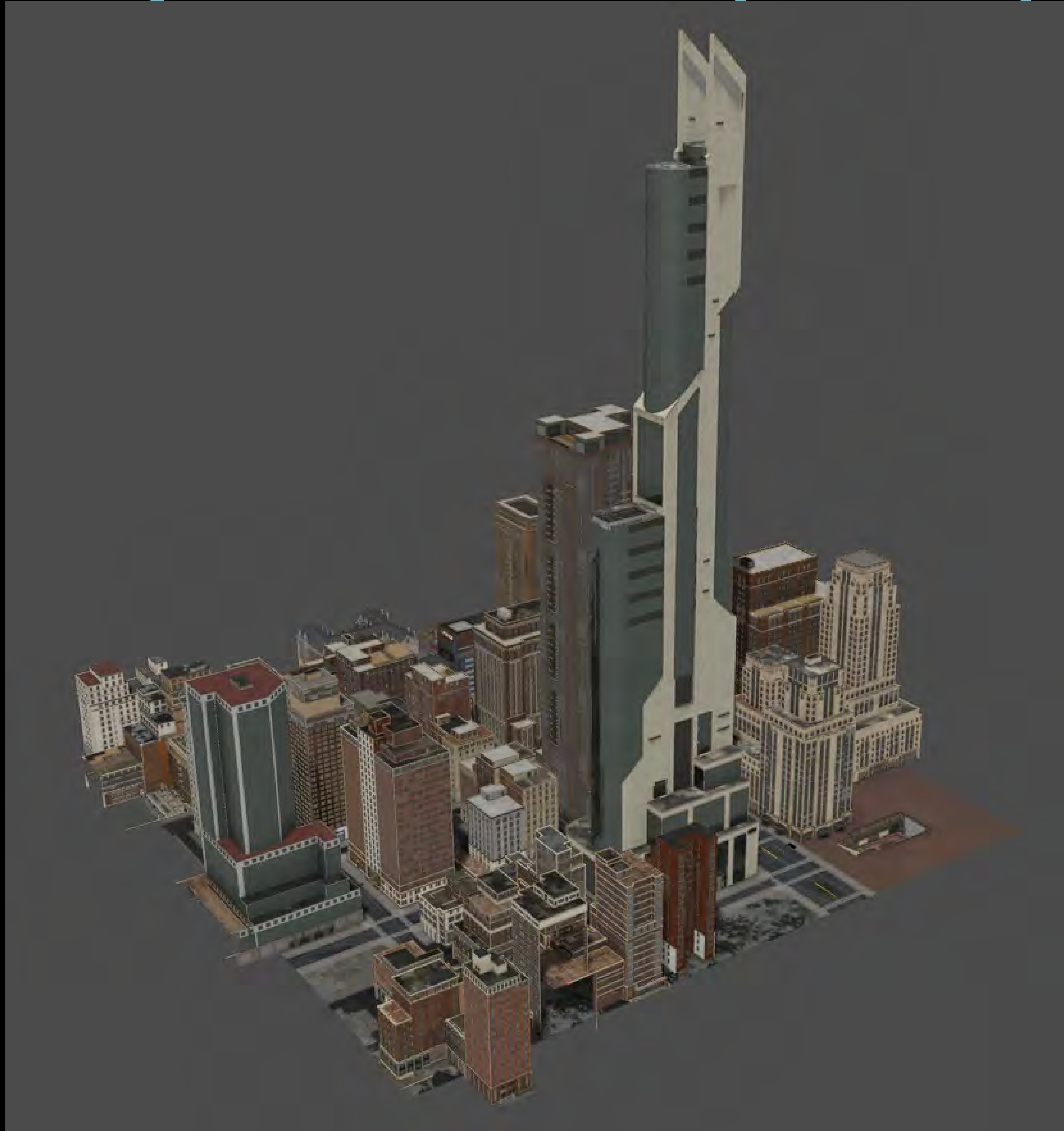
IG-Impostor Texture Capture



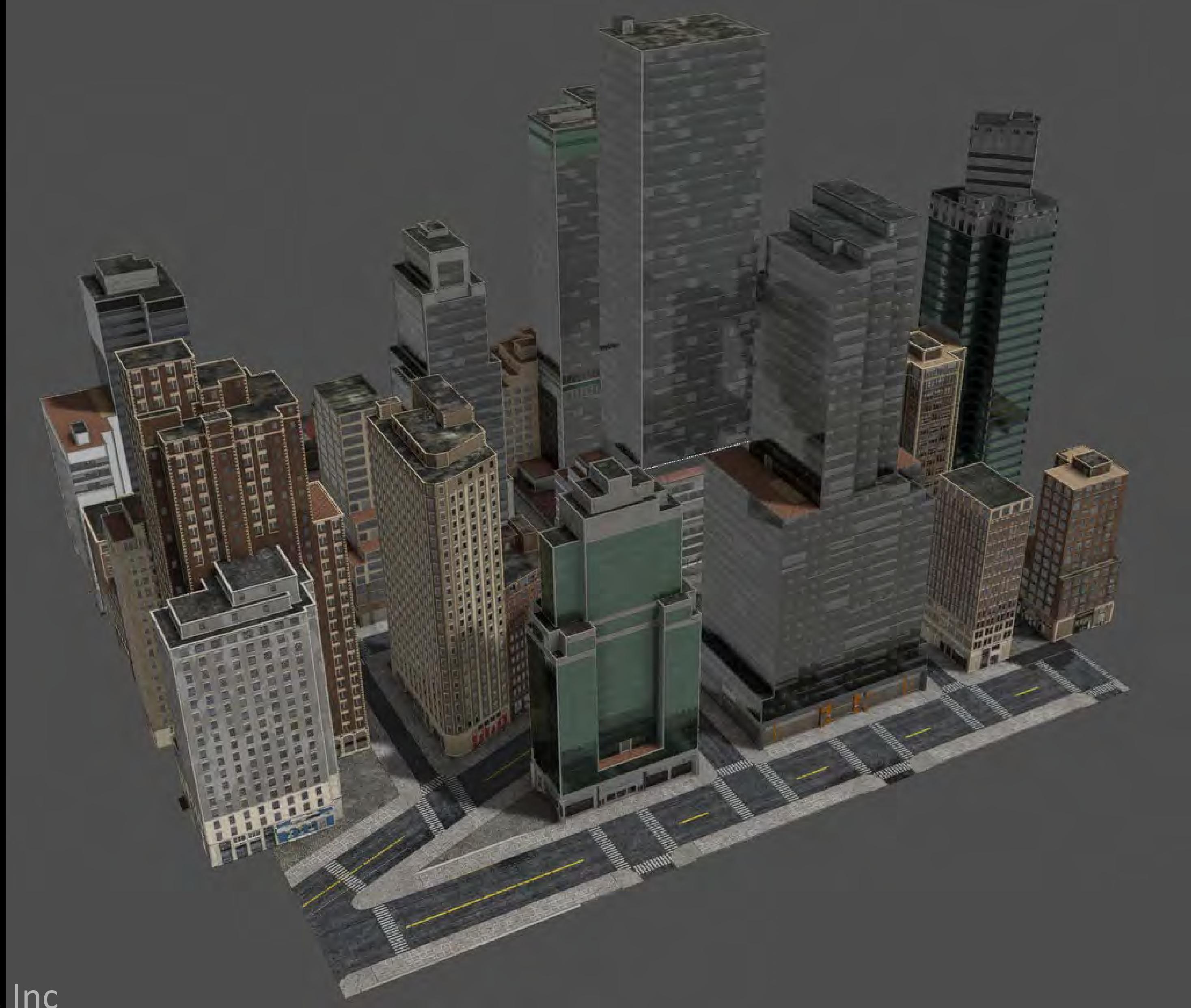
Impostor Zone Atlas



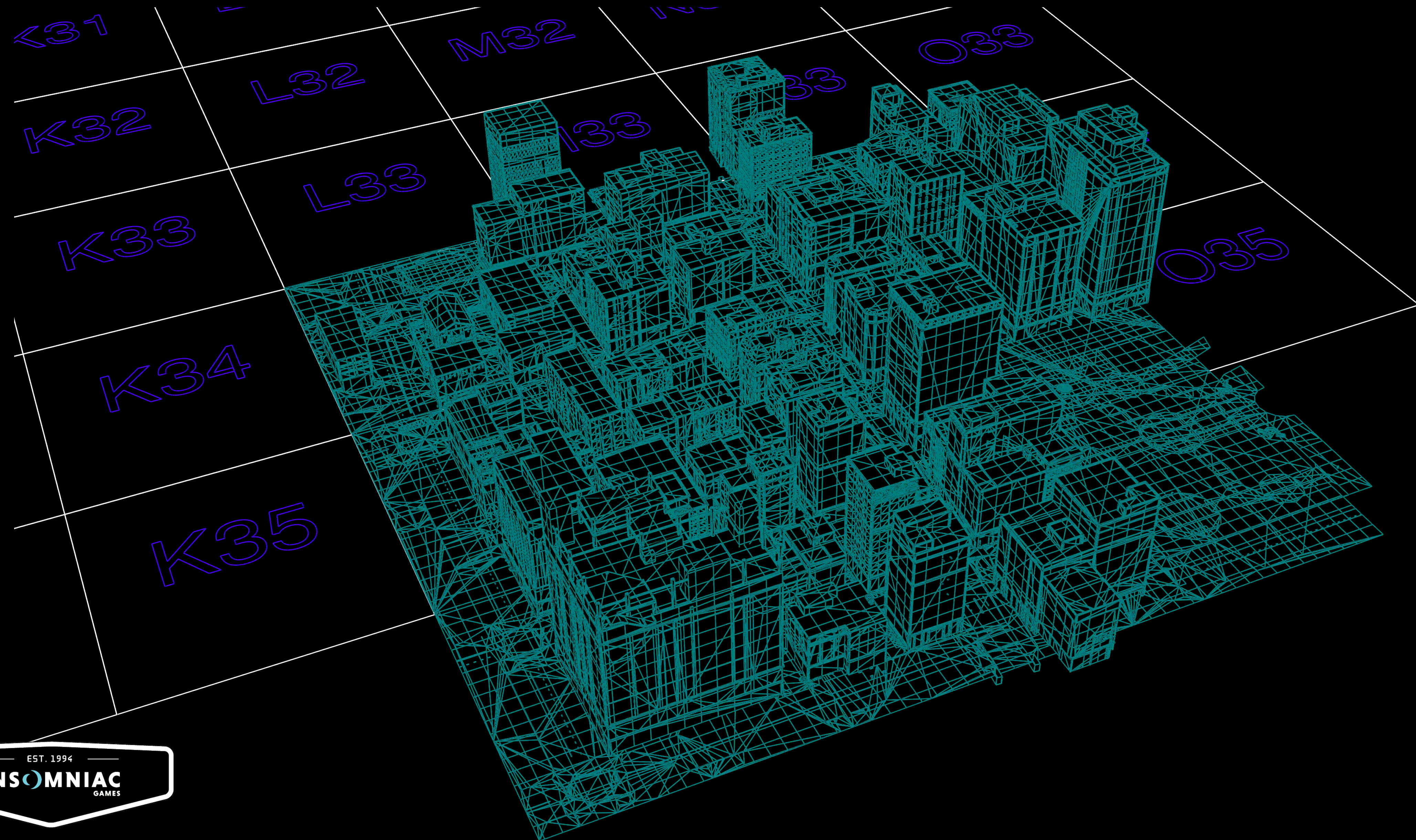
Impostor Zone (9 tiles)



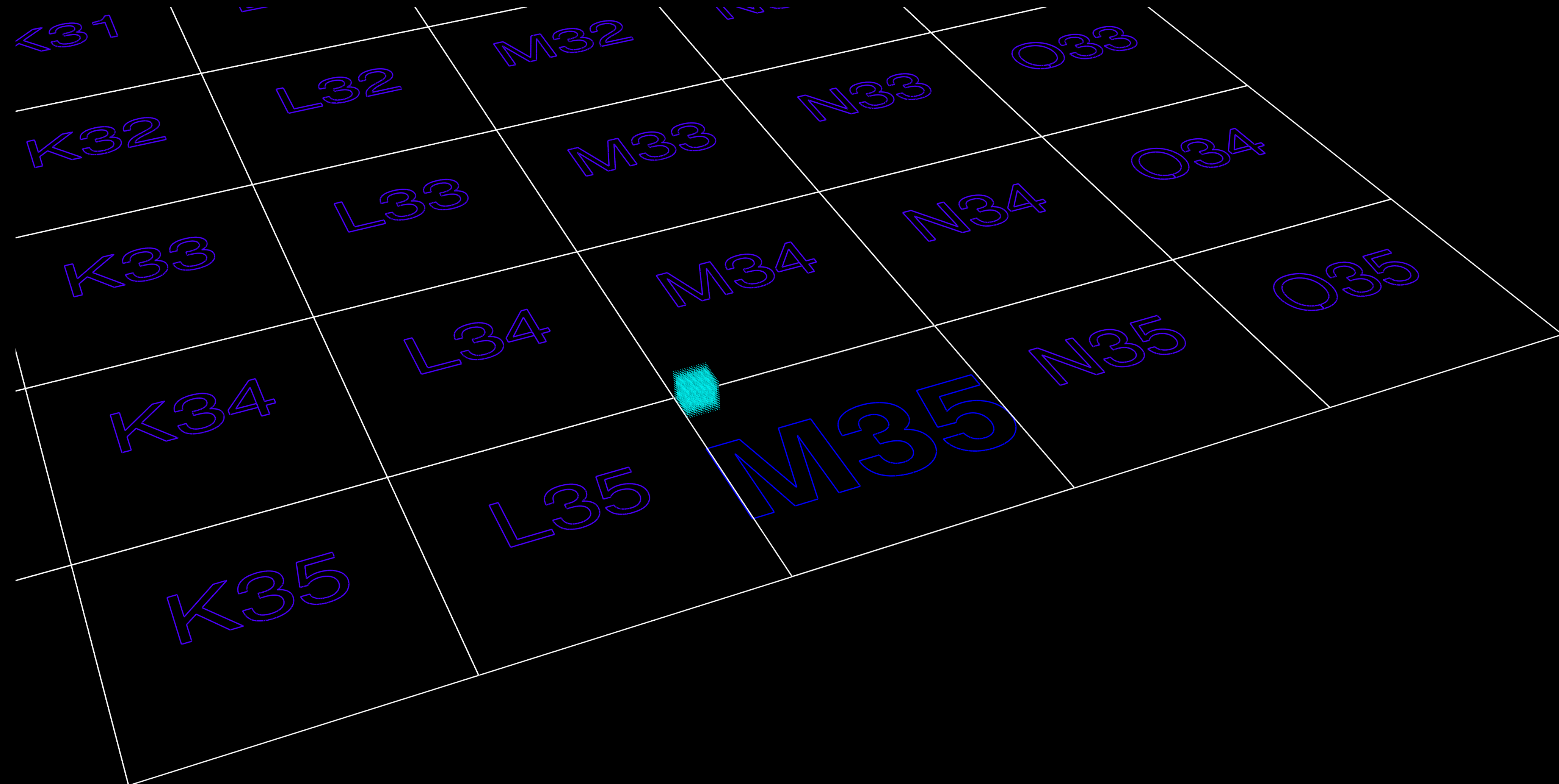
Low LOD Impostor Zone (9 tiles)



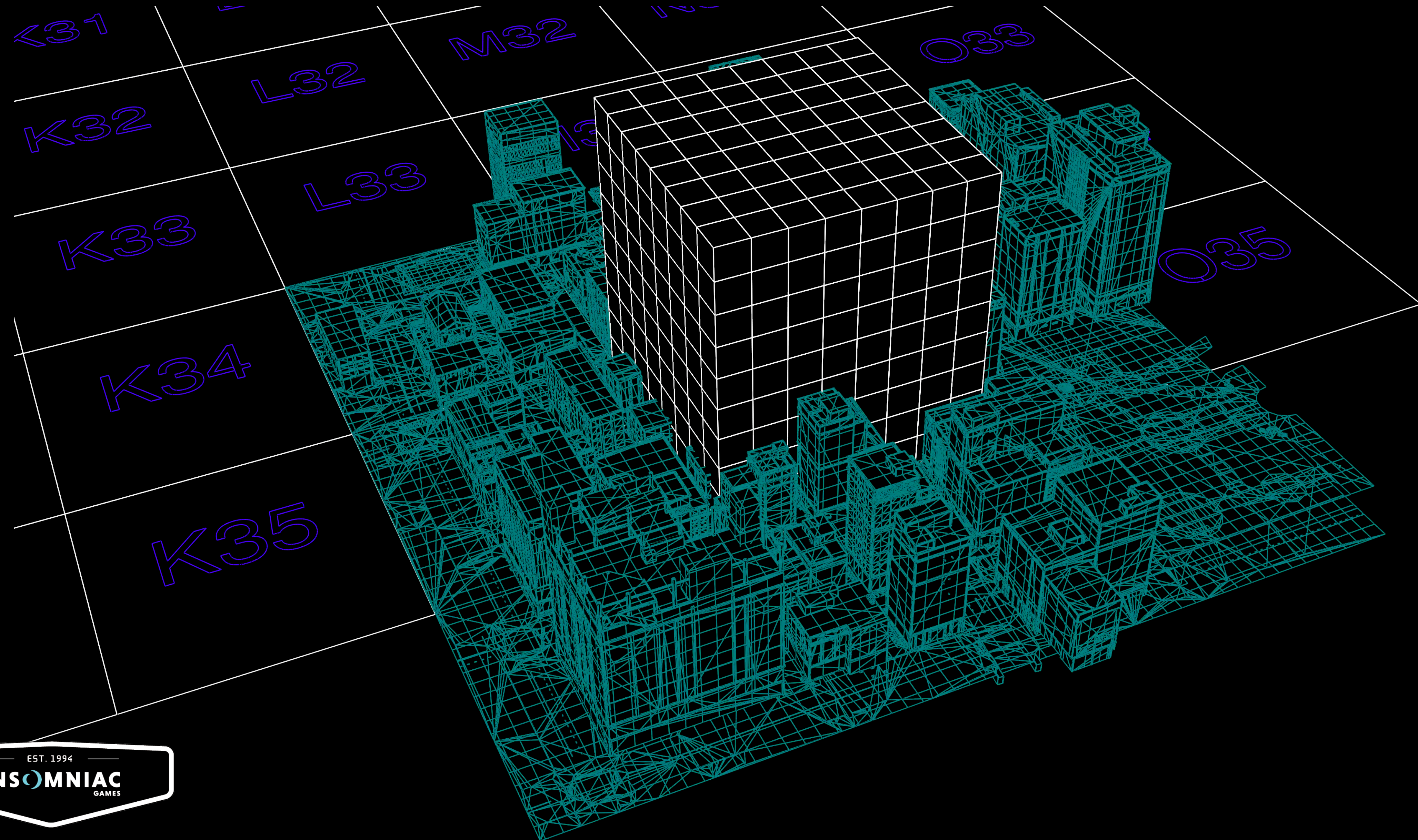
Light Grids



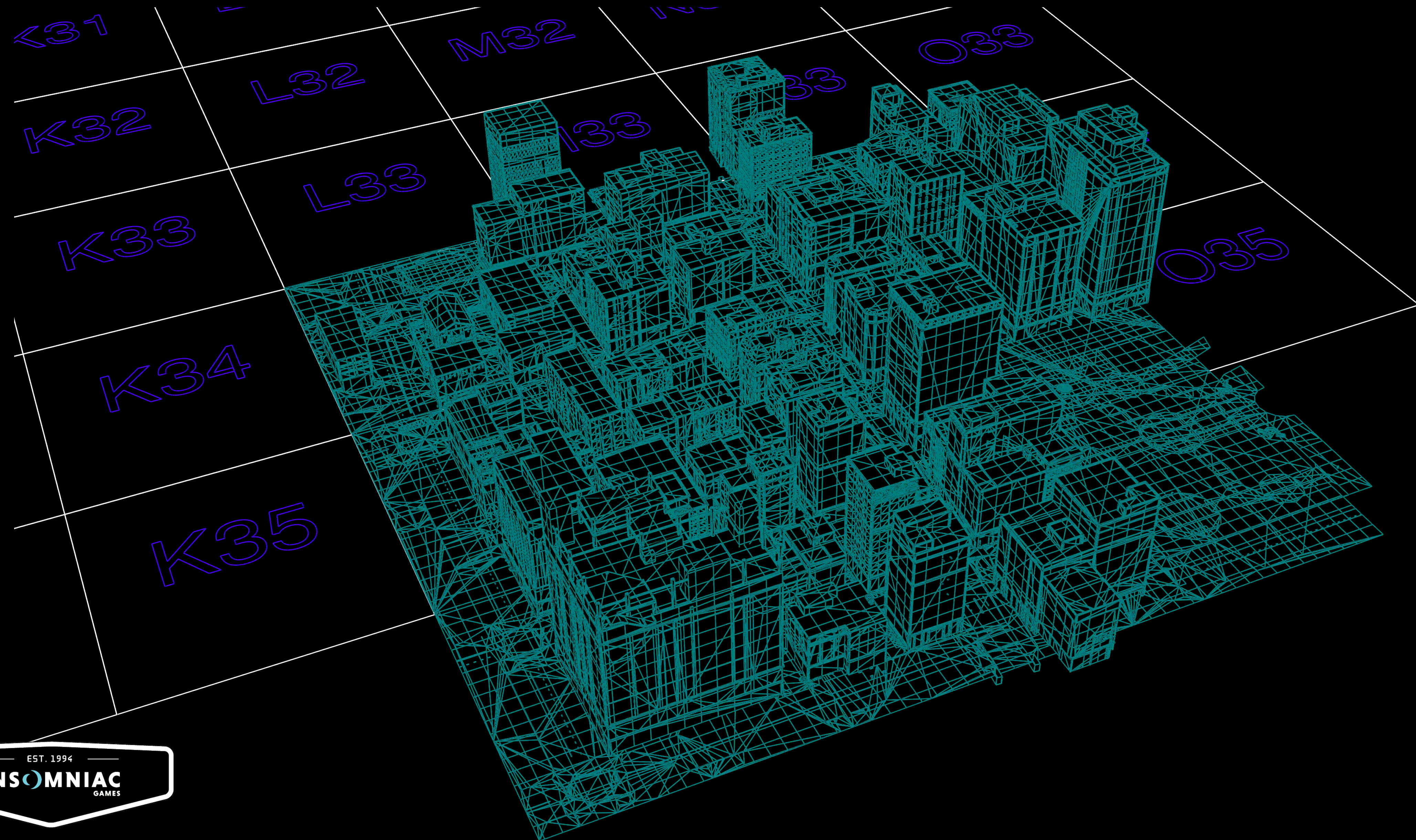
Light Grids



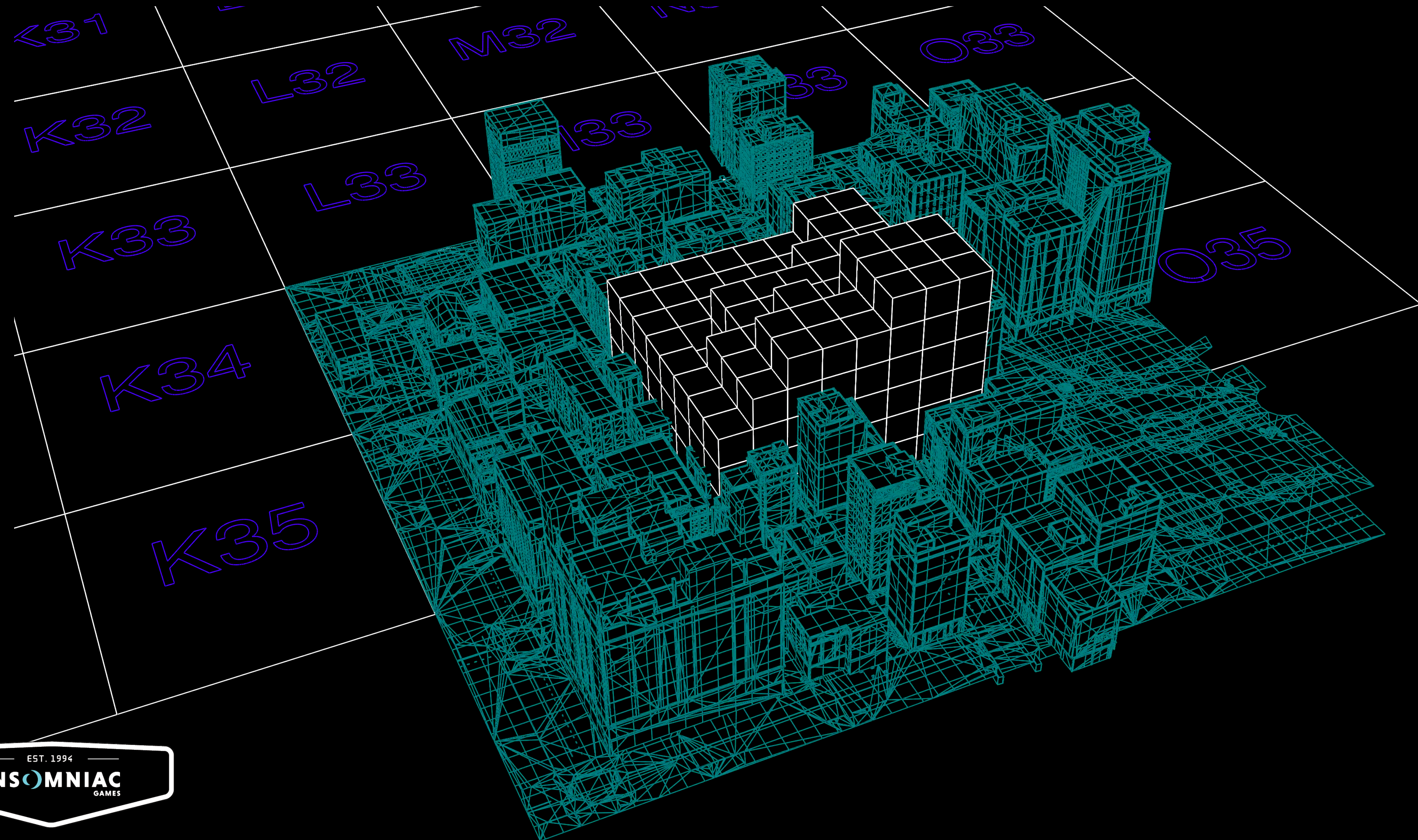
Light Grids



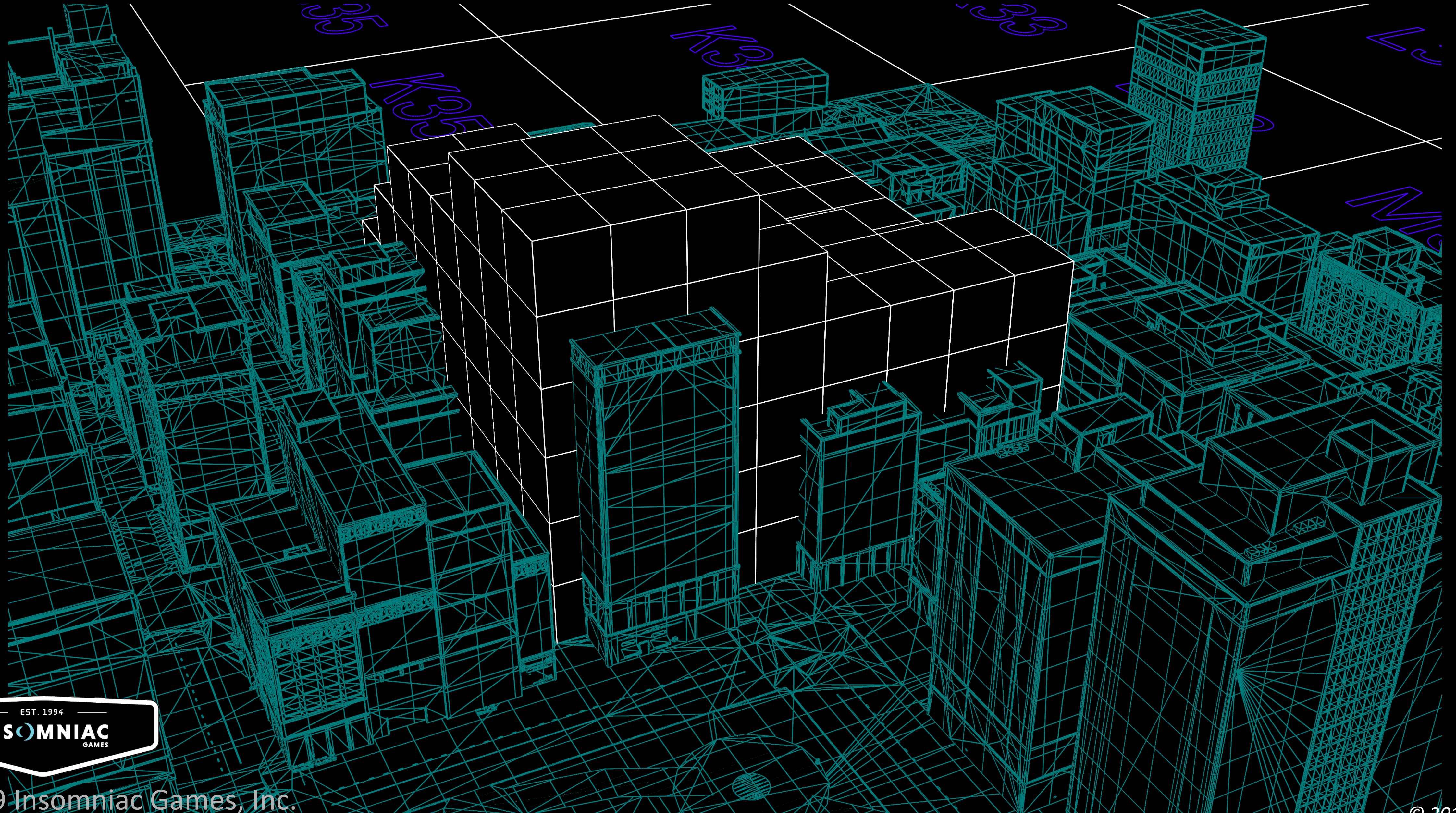
Light Grids



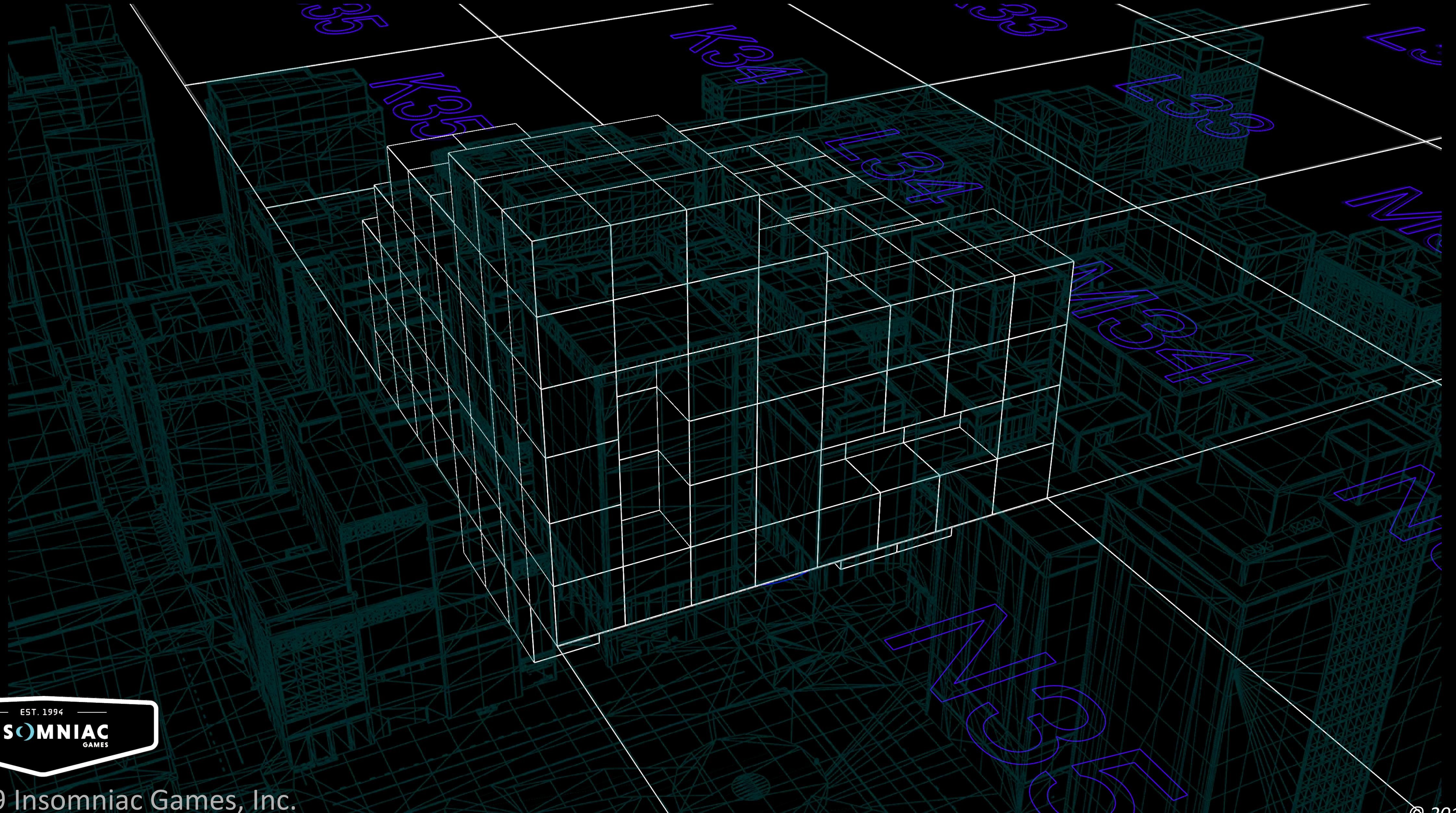
Light Grids



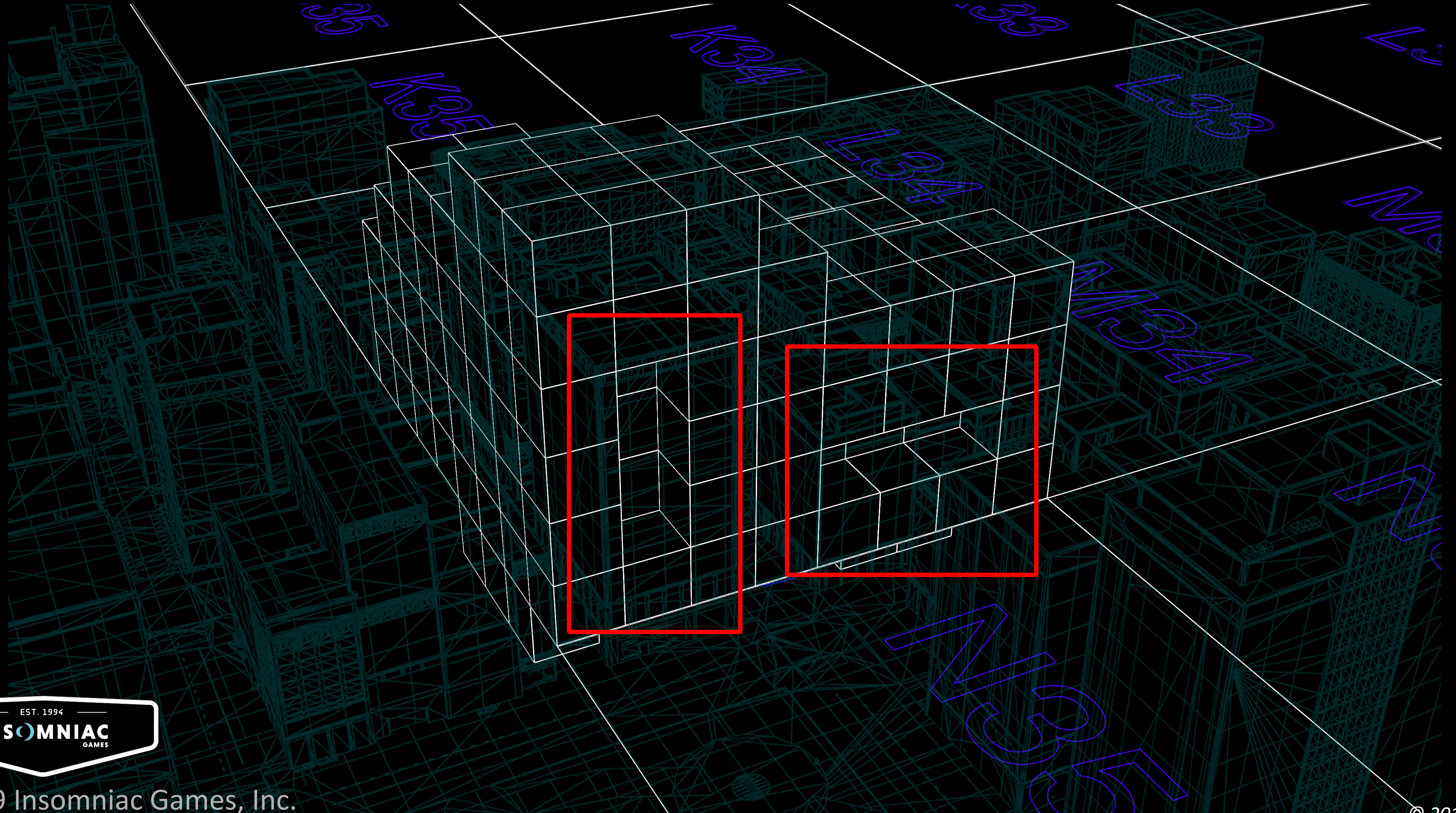
Light Grids



Light Grids



Light Grids



Light Grids



Light Grids

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Light Grids

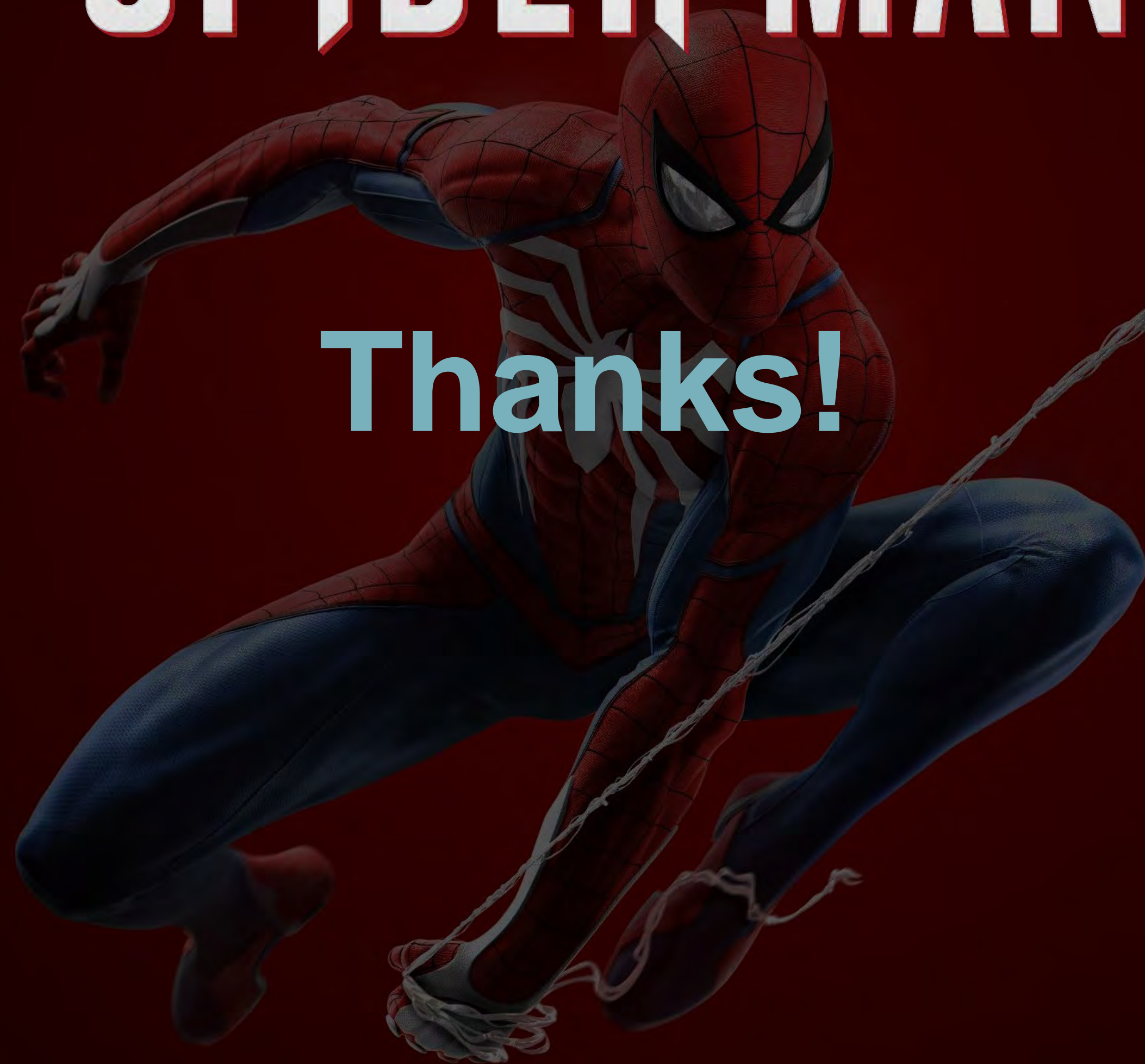
Technical Info

- 4096 samples per capture volume
- Each sample generates a cube map at 256x256 pixels per face
- Each face of the cube map is convolved down to a single HDR color value representing the diffuse term and a directional vector
- Color value and direction data is highly compressible



MARVEL

SPIDER-MAN



Thanks!