

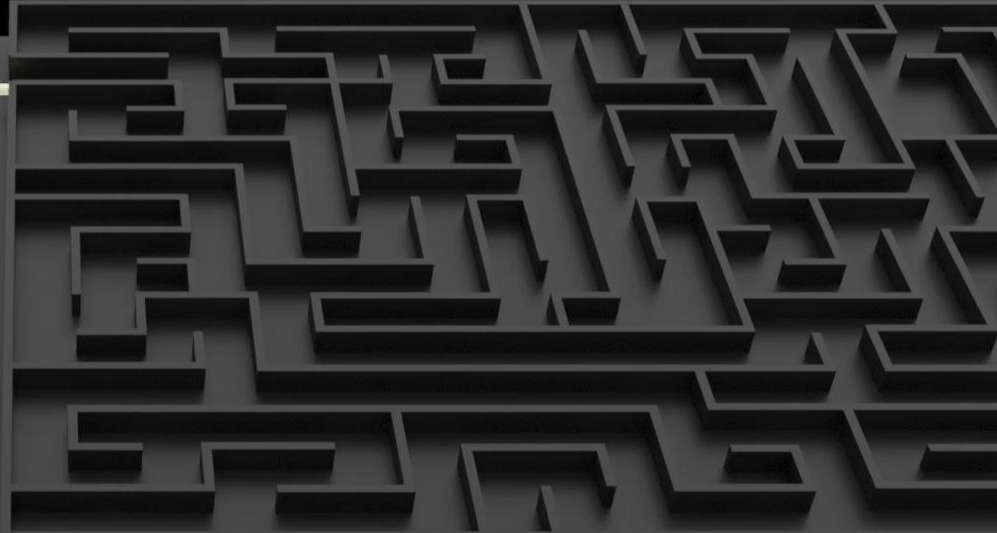
Construction Sequence Animations

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Revit .



Time

Animations are all about timing

How long is the animation?

When is the deadline?

How fast is your computer?

Will there be changes?



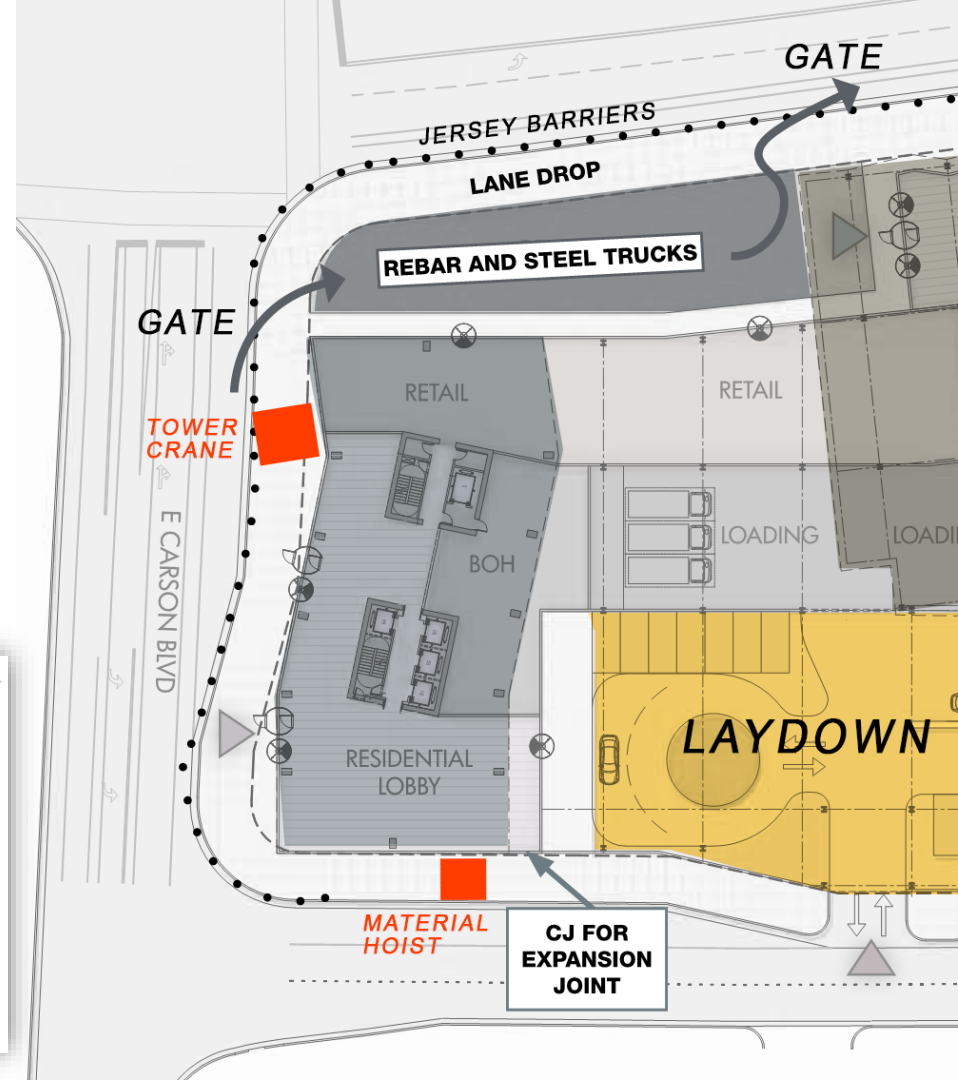
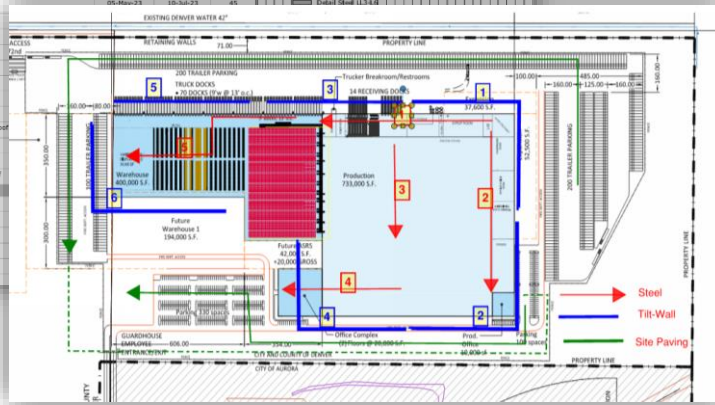
Managing Expectations and Division of Labor

Gather the Inputs

What do you have to work with?

- Gantt Charts
- Pour Diagrams
- Steel Erection Diagrams
- Revit/Rhino/SketchUp Models
- Site Logistics

Activity Name	Start	Finish	Remaining Duration
Structure	27-Jan-23	17-May-24	335
A2200 Set Up Core Climbing System	27-Jan-23	23-Feb-23	20
A2190 Slab on Grade L3 - L6	17-Feb-23	09-Mar-23	15
A2210 Concrete Core L3.3 - L6	24-Feb-23	27-Apr-23	45
A2100 Structural Steel L3.3 to L6	28-Apr-23	30-Jun-23	45
A2220 Low Rise Concrete Core L7 - L25	28-Apr-23	12-Sep-23	95
A3200 Detail Steel L3-L6	06-May-23	10-Jul-23	41



Organize the Process

Create a Master file that gathers all of the scheduling data

Utilize formulas to control the entire layout

Output activities to another list to create views in Revit using Dynamo

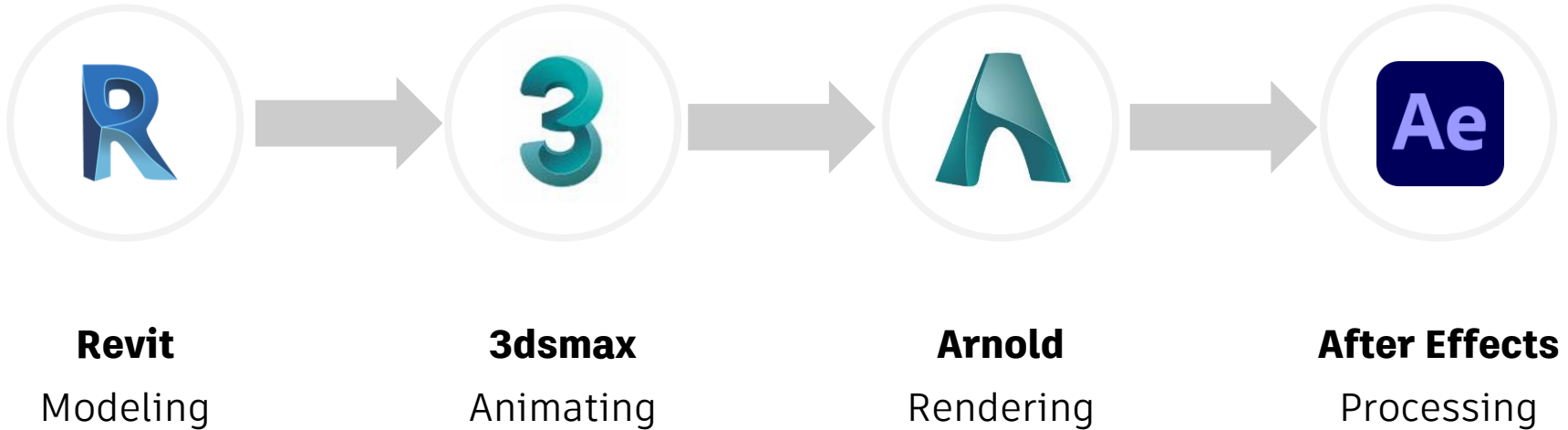
Model Breakdown		Mass Excavation	Core Excavation Residential Tower 1	Drilled Piers - South	Core Excavation Office Tower	Drilled Piers - North	Erect Residential Tower Crane	Erect Office Tower Crane
1		A1130	A3370	A1160	A3380	A3420	A4300	A4310
2								
3								
4								
5	40 Earliest frame	40	315	340	415	440	340	440
6	251 Latest Frame	415	440	465	540	565	415	515
7	Frames per week							
8								
9	8/15/2022	40						
10	8/22/2022	65						
11	8/29/2022	90						
12	9/5/2022	115						
13	9/12/2022	140						
14	9/19/2022	165						
15	9/26/2022	190						
16	10/3/2022	215						
17	10/10/2022	240						
18	10/17/2022	265						
19	10/24/2022	290						
20	10/31/2022	315	315					
21	11/7/2022	340	340	340			340	
22	11/14/2022	365	365	365			365	
23	11/21/2022	390	390	390			390	
24	11/28/2022	415	415	415	415		415	
25	12/5/2022	440		440	440	440		440
26	12/12/2022	465		465	465	465		465
27	12/19/2022	490			490	490		490
28	12/26/2022	515			515	515		515
29	1/2/2023	540			540	540		
30	1/9/2023	565				565		
31	1/16/2023	590						
32	1/23/2023	615						
33	1/30/2023	640						
34	2/6/2023	665						
35	2/13/2023	690						
36	2/20/2023	715						
37	2/27/2023	740						
38	3/6/2023	765						
39	3/13/2023	790						
40	3/20/2023	815						
41	3/27/2023	840						
42	4/3/2023	865						
43	4/10/2023	890						



Plan out the Construction Sequence

Animation Process

Simple Right?



Animation Process

Reality is messier

Is the background a drone video? An
Infraworks model? Or modeled in 3dsmax?

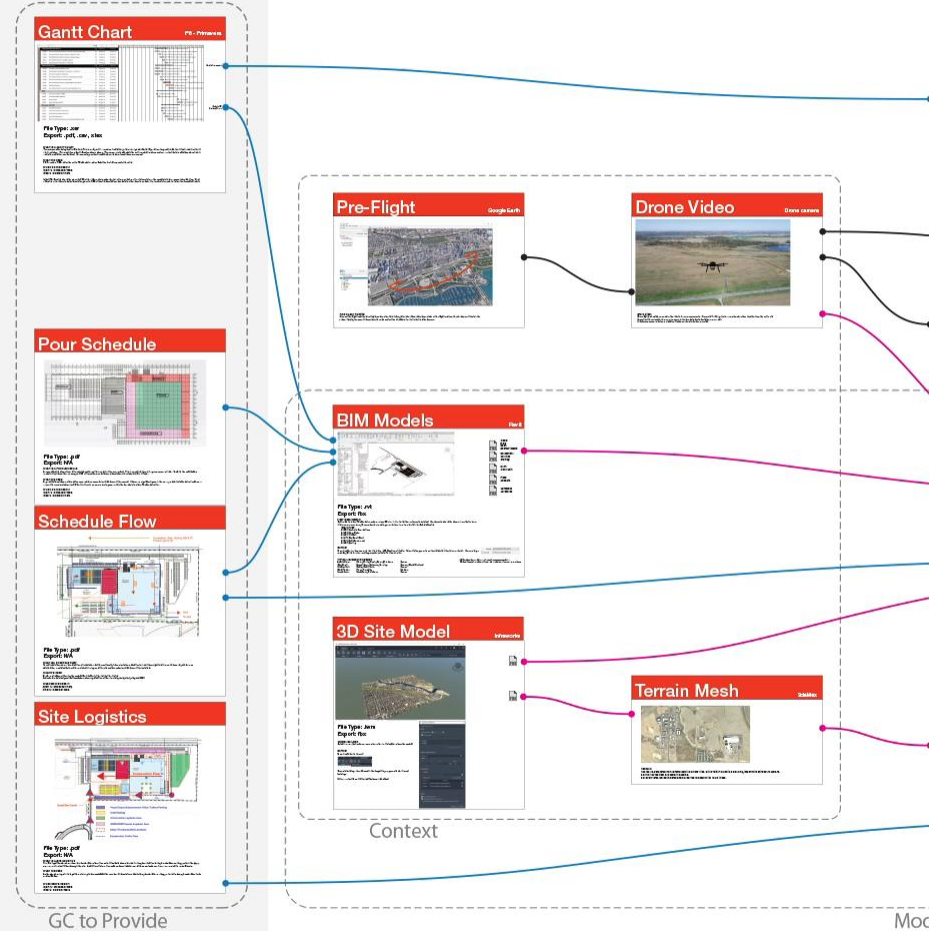
Do we need an Infraworks model?

Are there multiple videos?

How will it be shown? Online? mp4 ? Ppt?

Will there be changes once started? YES!

INPUTS



Generate Views in Revit

Slices of the model

- Use scope boxes

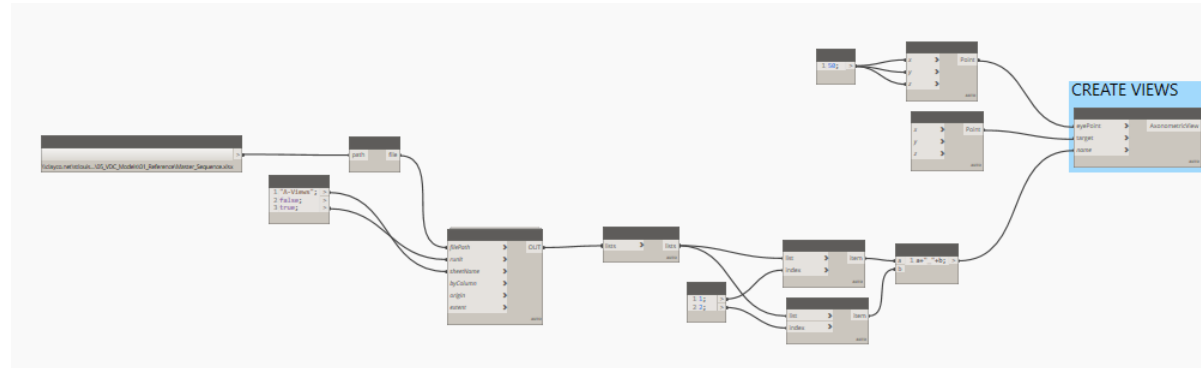
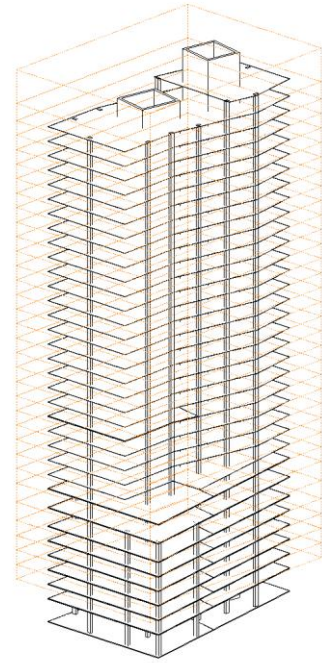
Align with Activities from the schedule

- L05 Structure
- L12 Exterior Skin
- L17 Building Core

Export each view to FBX

3D Views

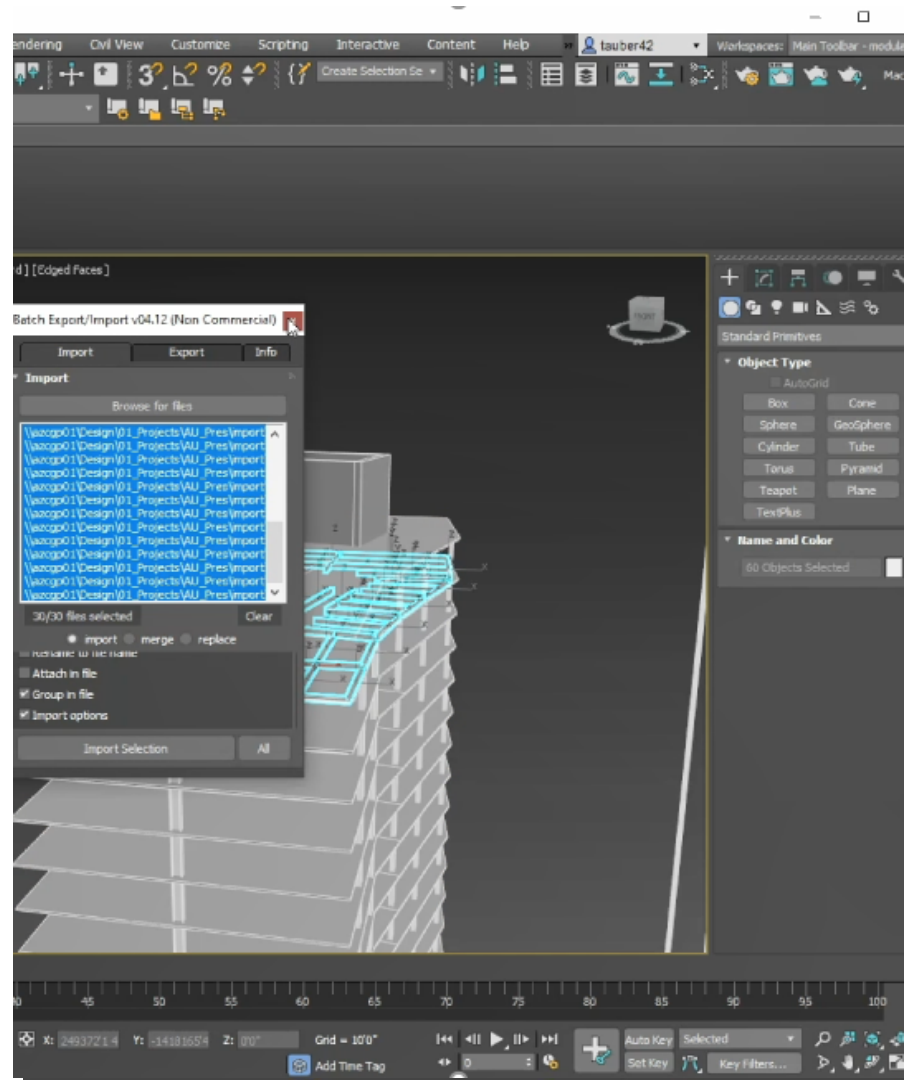
- ... CIP L08 Amenity Deck
- ... CIP Slab Podium
- ... Columns-Office Tower
- ... Columns-Podium
- ... Columns-South Tower
- ... Core-Office Tower
- ... Core-Podium
- ... Core-South Tower
- ... Grade Beams
- ... Steel-Office Tower
- ... Steel-Office-L09
- ... Steel-Office-L10
- ... Steel-Office-L11
- ... Steel-Office-L12
- ... Steel-Office-L14
- ... Steel-Office-L15
- ... Steel-Office-L16
- ... Steel-Office-L17
- ... Steel-Office-L18
- ... Steel-Office-L19
- ... Steel-Office-L20
- ... Steel-Office-L21
- ... Steel-Office-L22
- ... Steel-Office-L23
- ... Steel-Office-L24
- ... Steel-Office-L25
- ... Steel-Office-L26
- ... Steel-Office-L27
- ... Steel-Office-L28
- ... Steel-Office-L29
- ... Steel-Office-L30



Import FBX to 3dsmax

Use Maxscript to bring in multiple FBX files
Assigns a layer and a group to each event

- This quickens the animation process

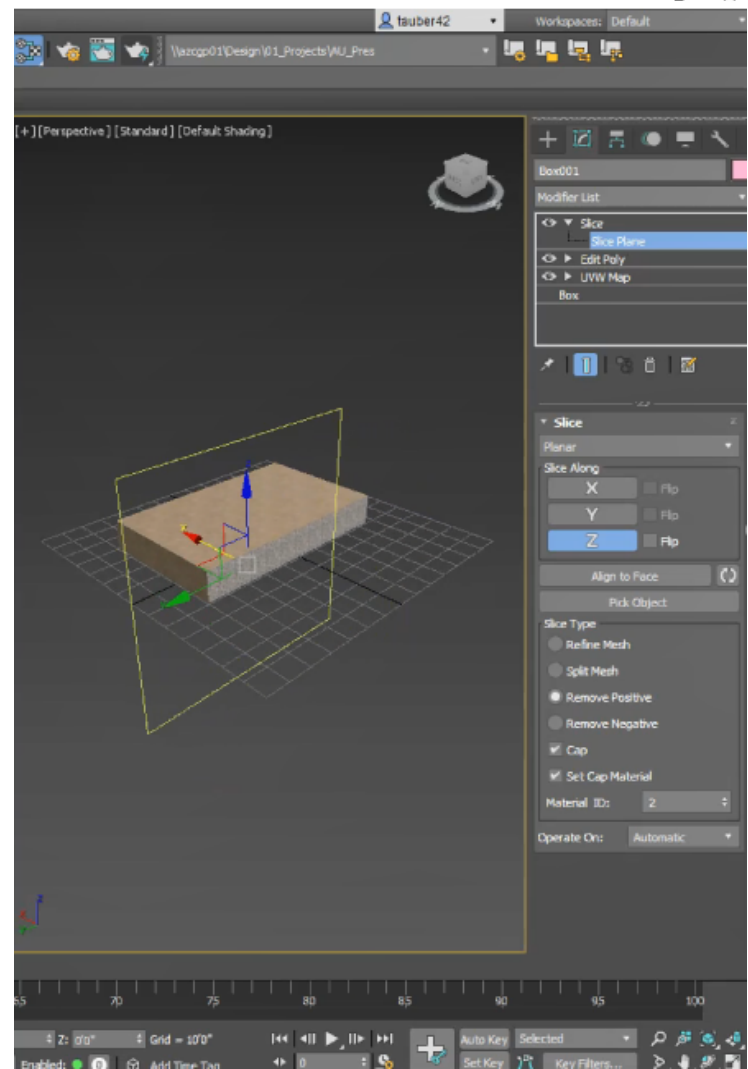


Animation Tips & Tricks

Slice Plane

The Slice plane splits a model or group and removes a portion of it from view.

- Animating this slice plane introduces objects gradually

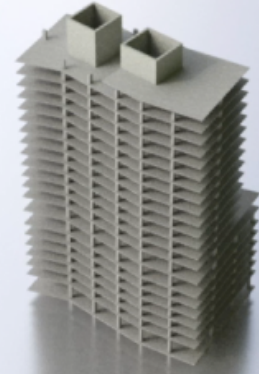


Animation Tips & Tricks

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Animation Tips & Tricks

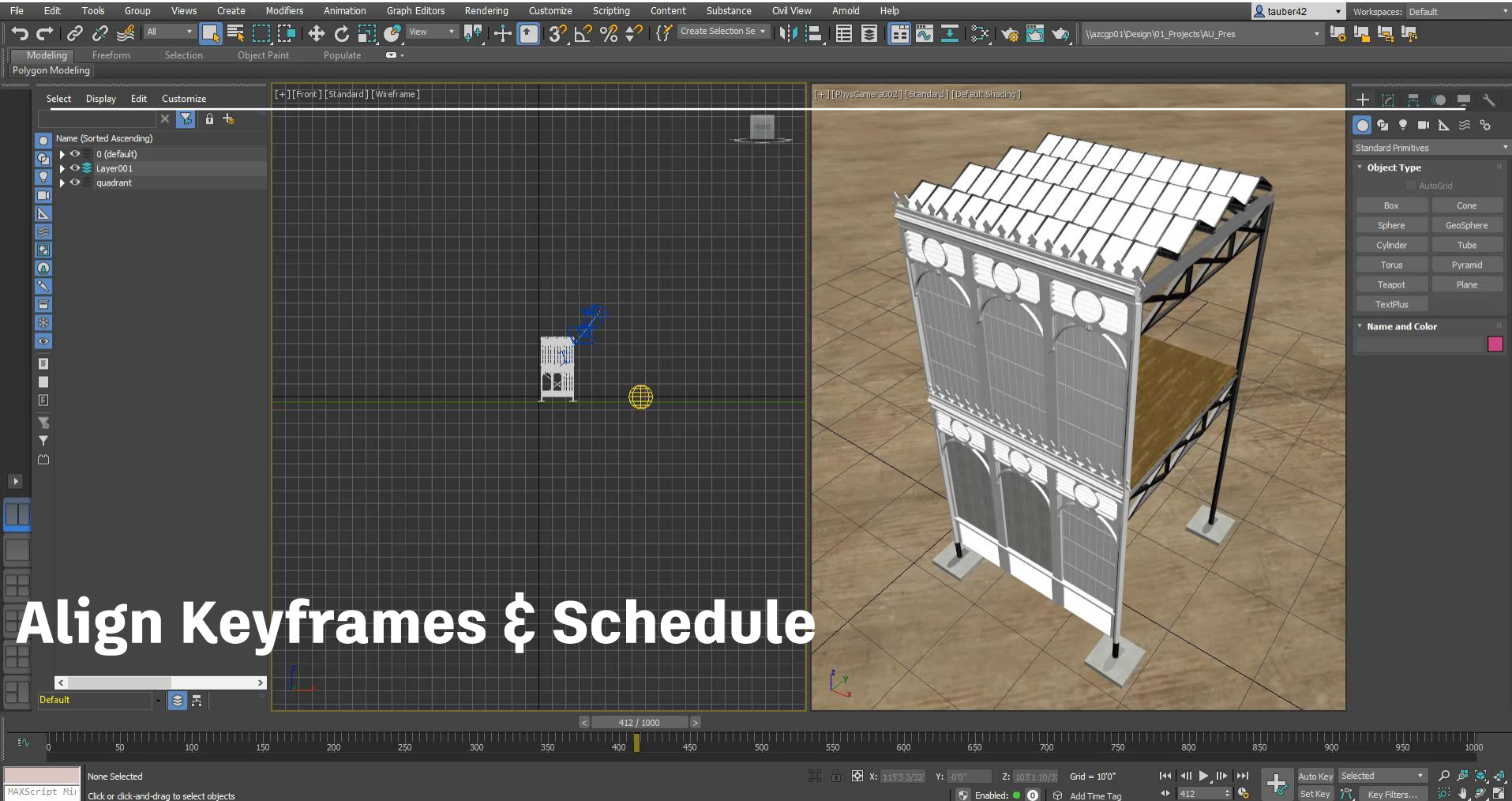
Keyframe Offset

Animate everything at once and then use a Maxscript to offset these keyframes

Note that Arnold does not have the ability to animate opacity at a Layer level, so we generally hide objects out of sight until they are brought in



Align Keyframes & Schedule





Build a Quality Library

Create a Material Library

Textures

Makes renderings “real”

Use seamless textures only

If the camera is far from the object, only use a base color to save rendering time



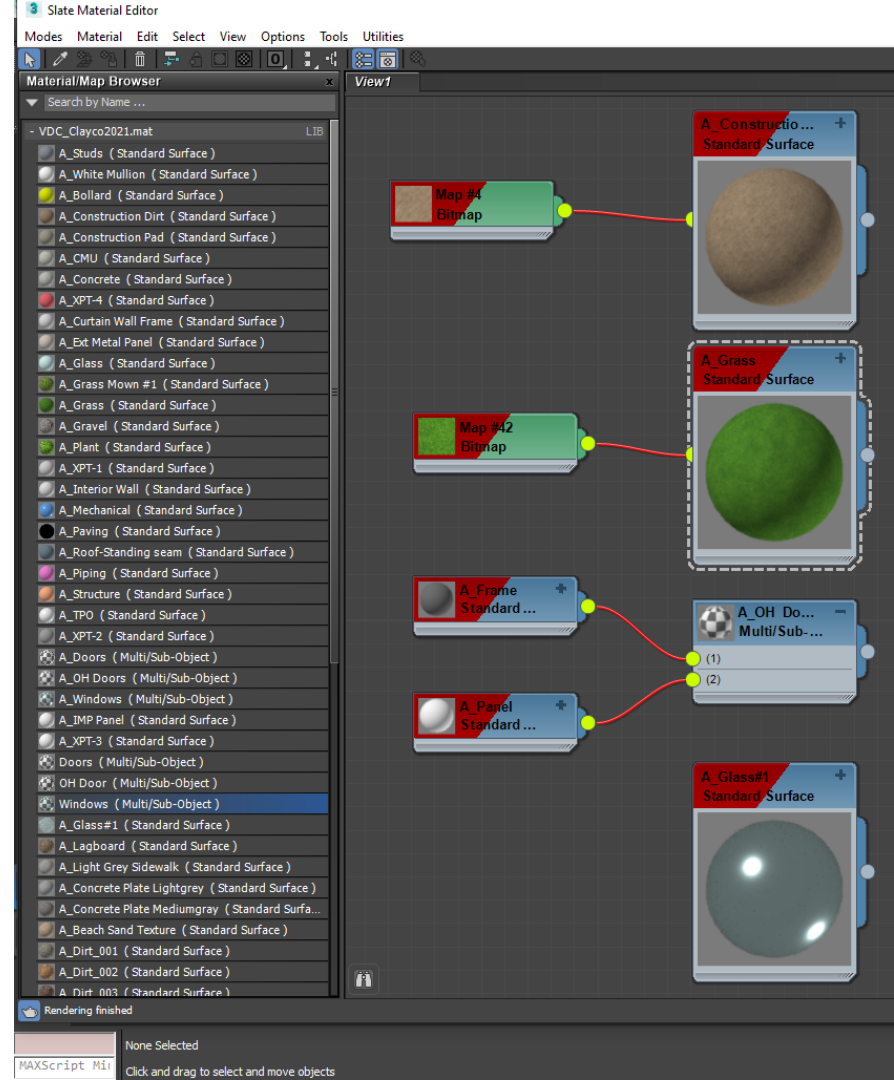
Create a Material Library

ADSKLIB

By saving your materials in an ADSKLIB file you allow others to work with exactly the same palette.

Create unique ADSKLIB files for large projects with unique materials

Use the same textures in Revit and Enscape



Model Library

Build

- Any reused objects should be stored in a model library on your server

Buy

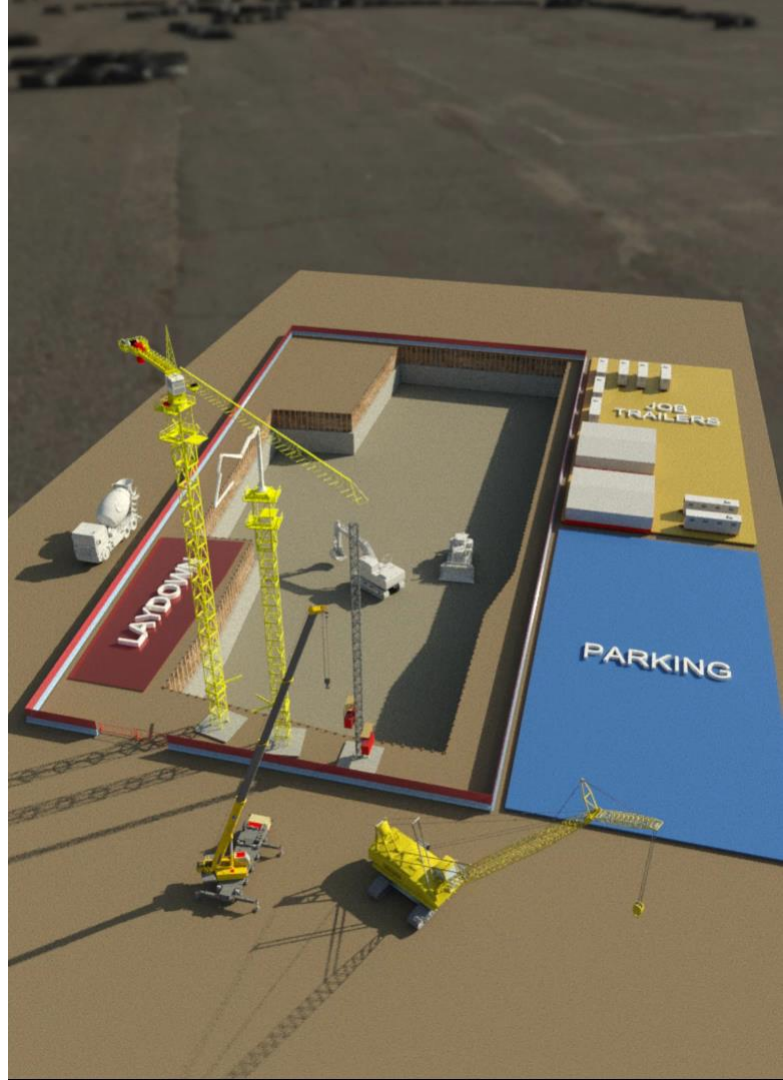
- It sometimes faster/cheaper to purchase collections of models like construction equipment

Simplify

- The fewer faces the faster the render

Rig

- A well-organized model with dummies and Kinematics can make animating a breeze



Arnold Renderer Basics

Trifecta of good rendering

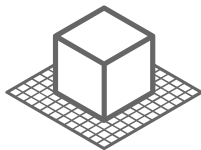
Keep it simple

Lights



One HDRI Light

Materials



Basic Arnold materials

Camera



Physical Camera

Lights

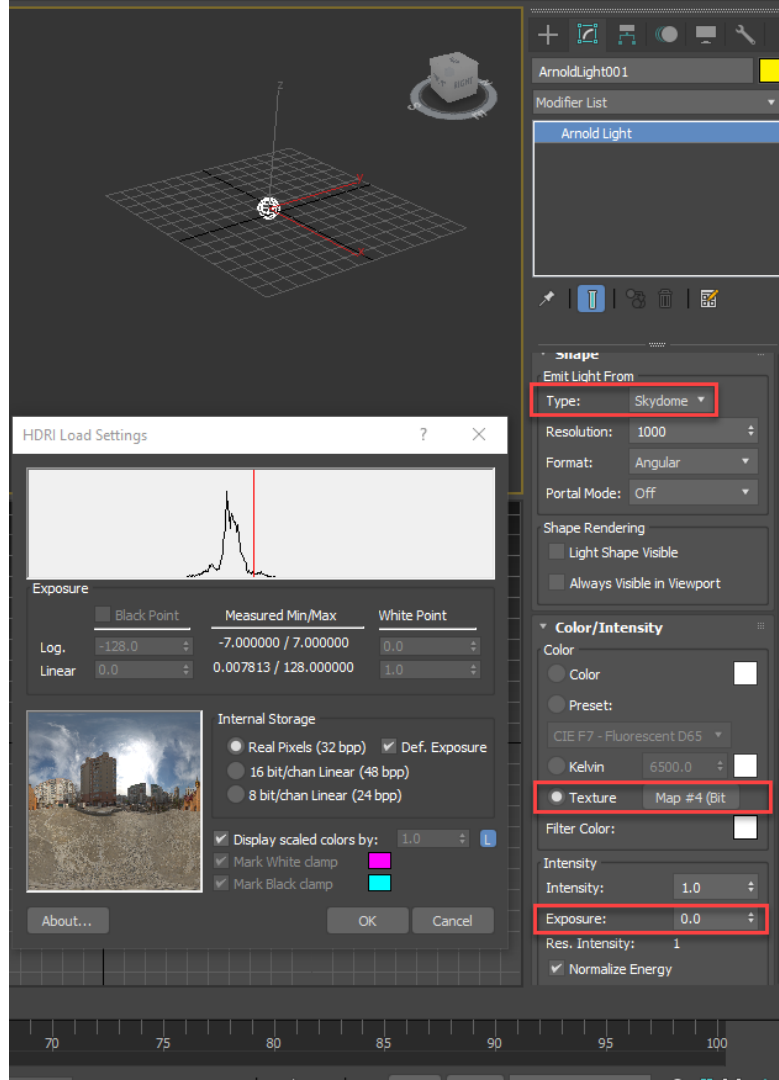
Skydome Type

- Casts lighting from all directions
- Great for Ambient Occlusion

HDRI Texture

- Casts direct sunlight with shadows
- Fills in ambient lighting with sky and ground lighting
- Fastest way to achieve realistic lighting

Exposure = 0.0EV



Cameras

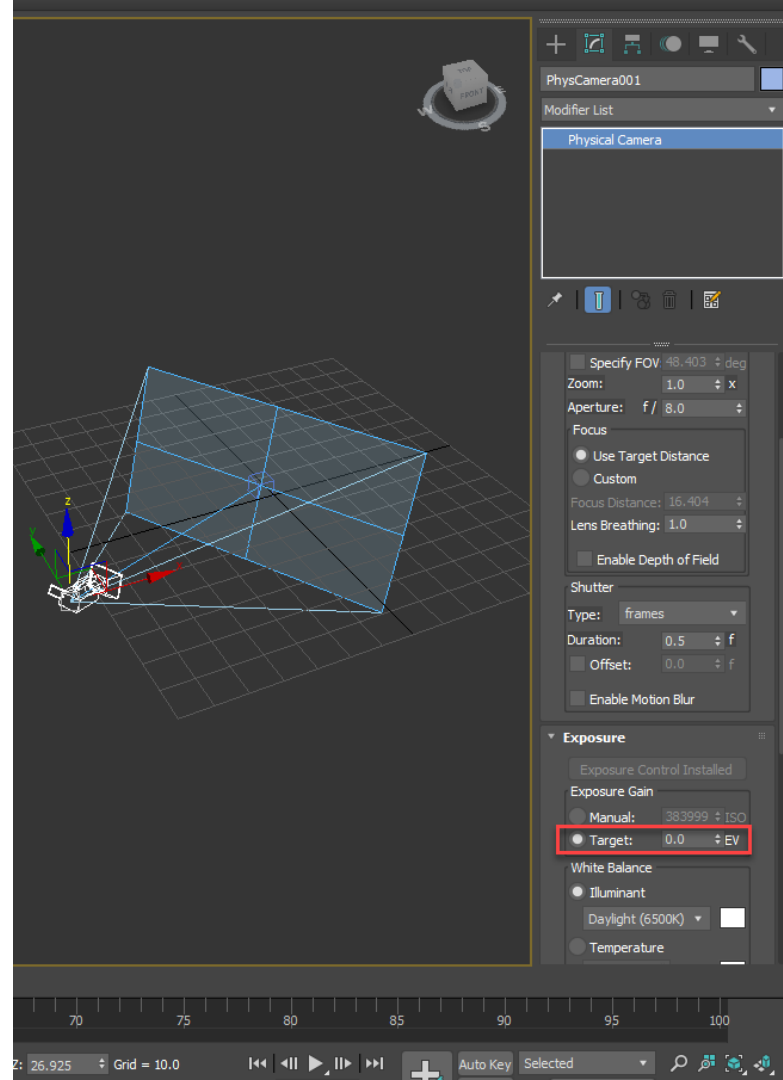
Physical Camera

Full Photography control

- Presets cameras available
- Aperture, Focal length, Shutter speed and Exposure able to be adjusted

Exposure

- Set Camera Exposure to 0.0 EV



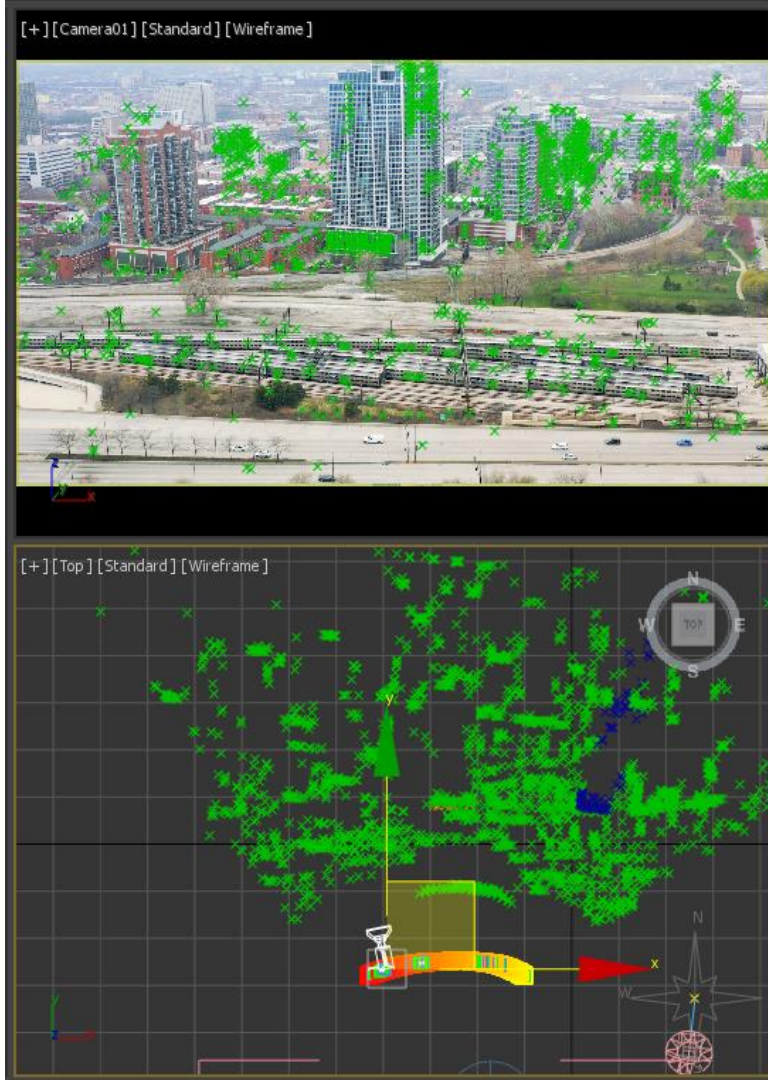
Cameras

Drones

Using External solutions such as Syntheyes, we can generate 3D cameras using drone footage.

- Tracker points follow color queues in the image sequence and are able to calculate image depth
- Tracker points can be used to align 3D models with existing structures

Image sequence can also be brought in as a background (as shown) in the Rendering: Environment section of 3dsmax.



Arnold Materials

Arnold Standard Surface works the best

- Base Color – What color is it?
- Specular/Roughness – How shiny is it?
- Metalness - How reflective is it?
- Transmission – How Opaque is it?

PBR (Physically Based Rendering) Shaders can also be useful and are available for download online.

Press (M) to open the Material Browser



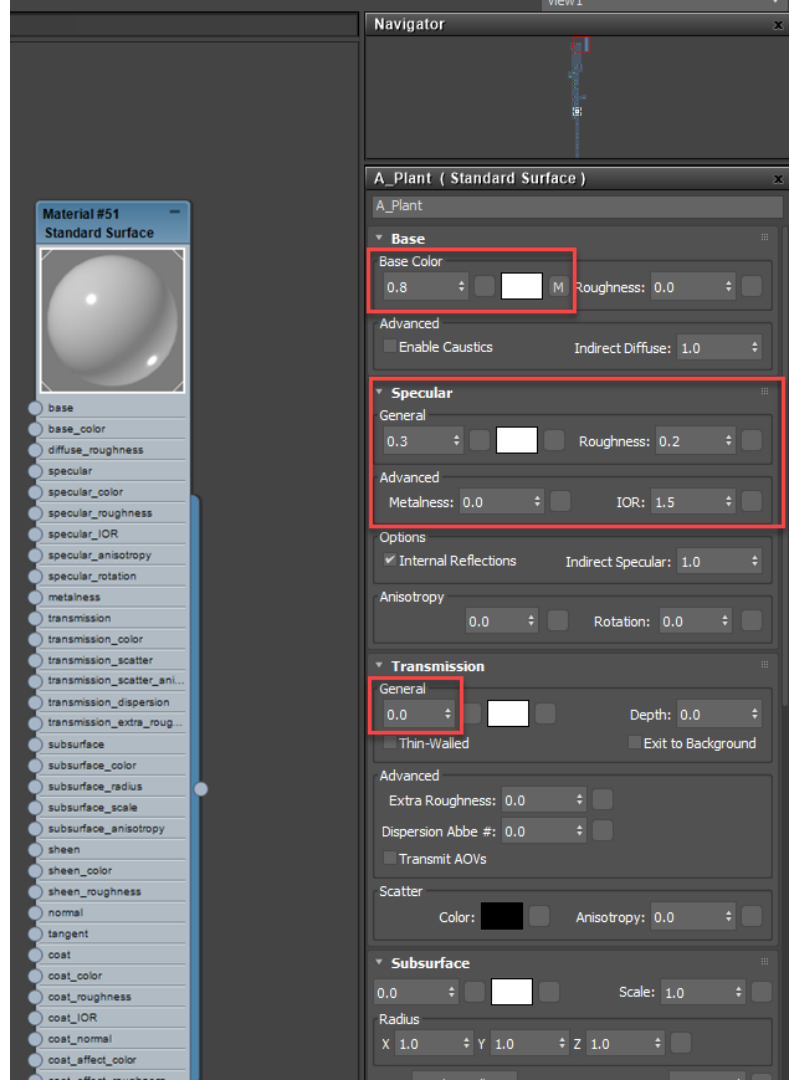
Arnold Materials

Avoid the default Autodesk materials that Revit assigns.

Keep it Simple

- Materials are a huge rabbit hole and there is much to learn.

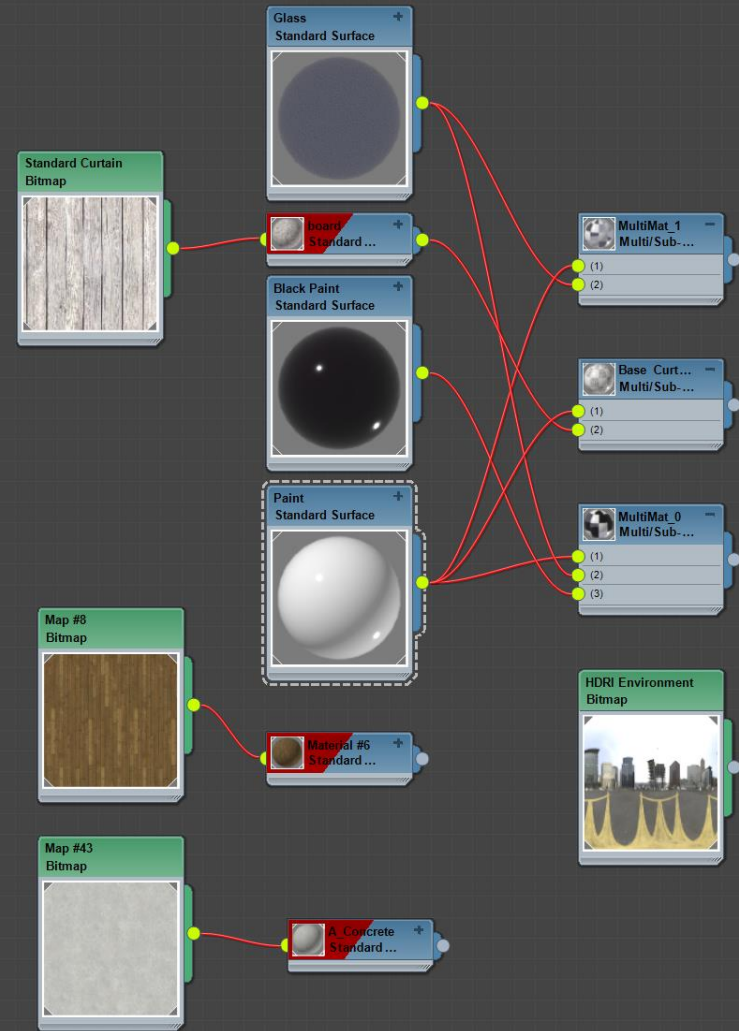
Good Quality materials are worth the time to build to render quickly



Arnold Materials

Multi/SubObject

Multi/SubObject Materials are a great way to work with Revit family Exports.



Render Output Settings

Exposure

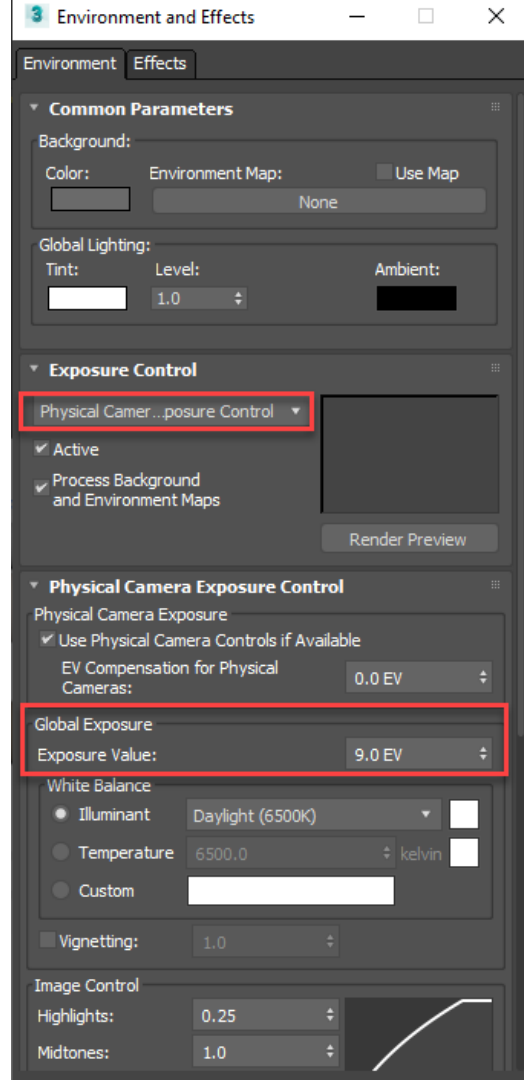
Set Exposure Control to **Physical Camera Exposure Control**

Control all Camera exposure globally in the Environment dialog box

By default 3dsmax adds exposure values to Camera and Lights which need to be wiped clean.

Exposure Value between 9.0 – 11.0 EV will give a balanced look to the scene.

Press (8) to open the Environment Panel



Render Output Settings

Render Setup

Range

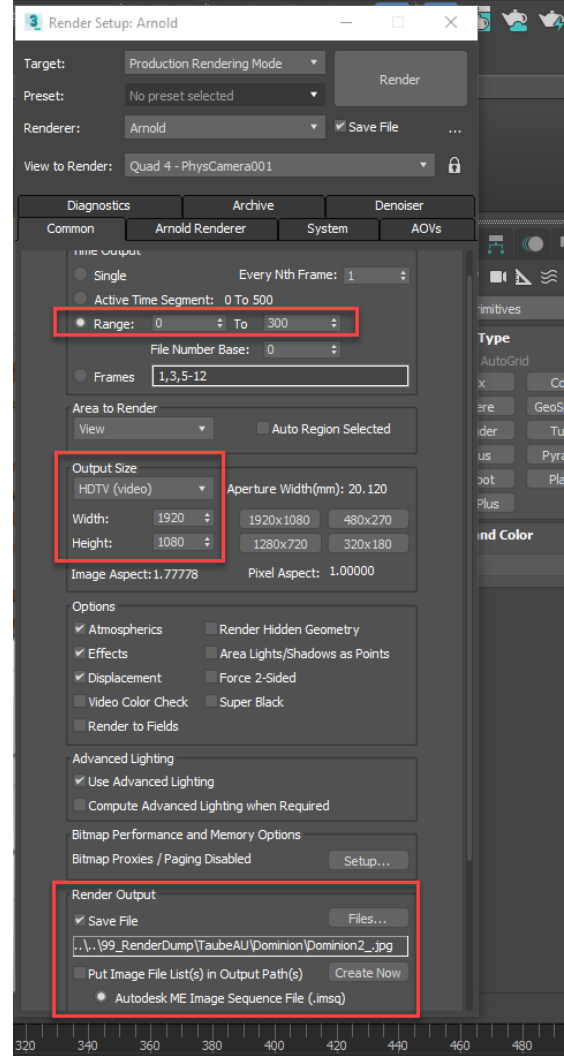
Set which frames will be rendered

Output size

1920x1080 (HDTV) is sufficiently detailed but small enough to render quickly.

Render Output

Set folder location to dump all of the images



Render Output Settings

Render Setup

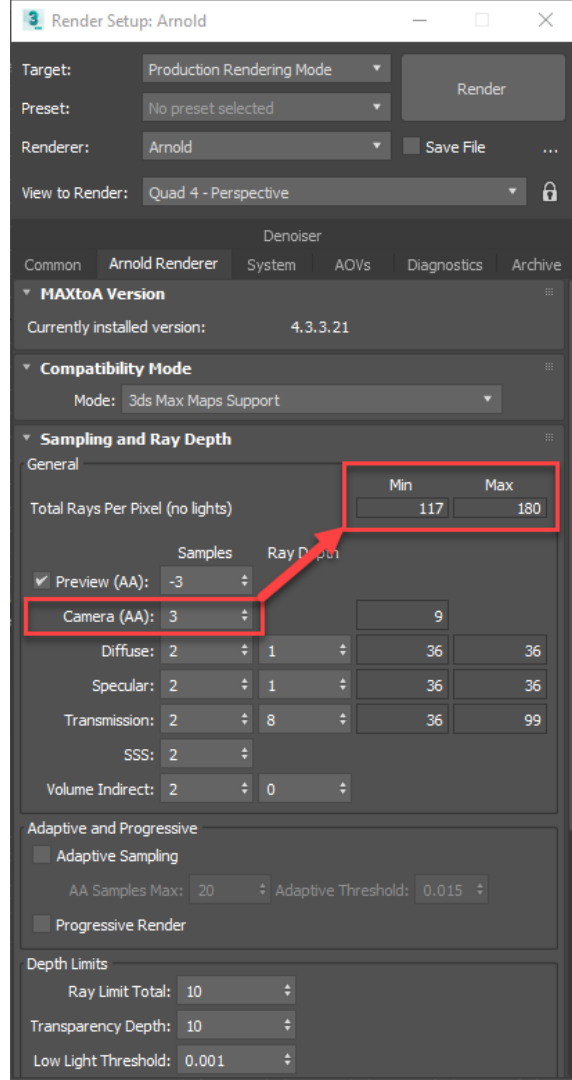
Arnold Render Tab

Camera (AA) has the greatest affect on your rendering

- Too Low – the render is grainy and pixelated
- Too High – the render takes too long

System Tab

Can toggle between a GPU or CPU render.



Post Processing

After Effects

Render Setup

The Master Schedule is used to highlight Activities in the animation

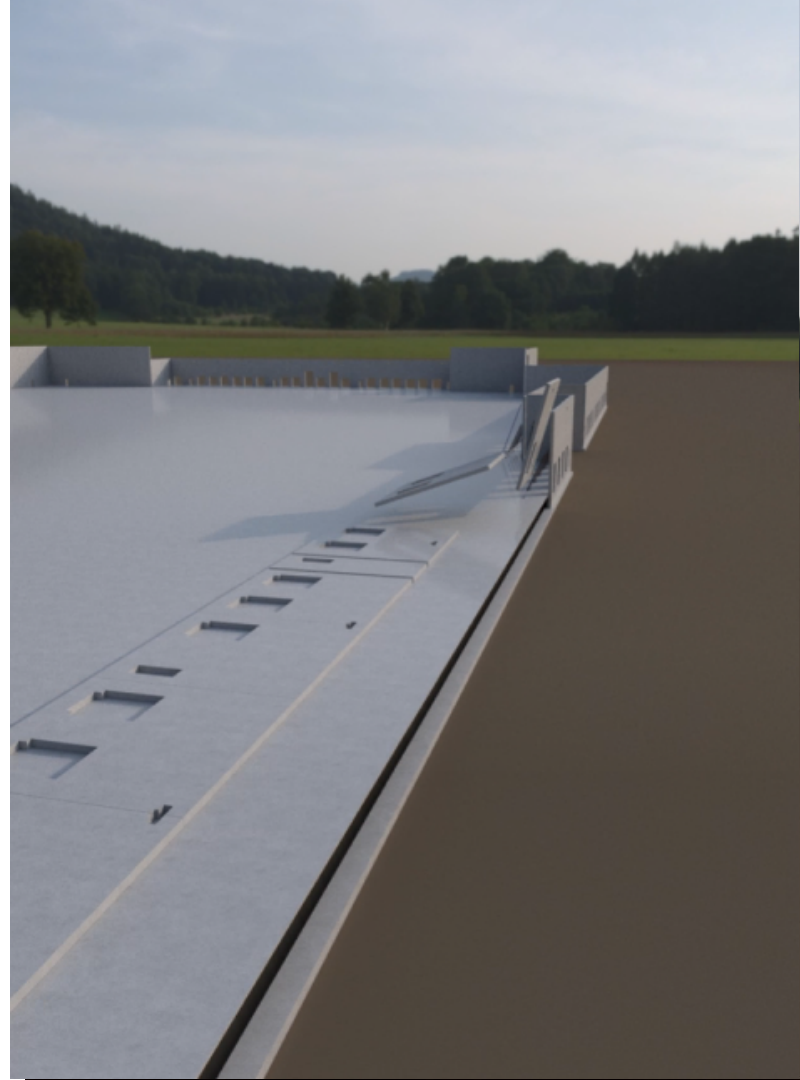
A timeline is shown at the bottom so that the video can be paused at any moment to see which activities are active at that time

- Orange is active
- Green is finishing
- Black is completed

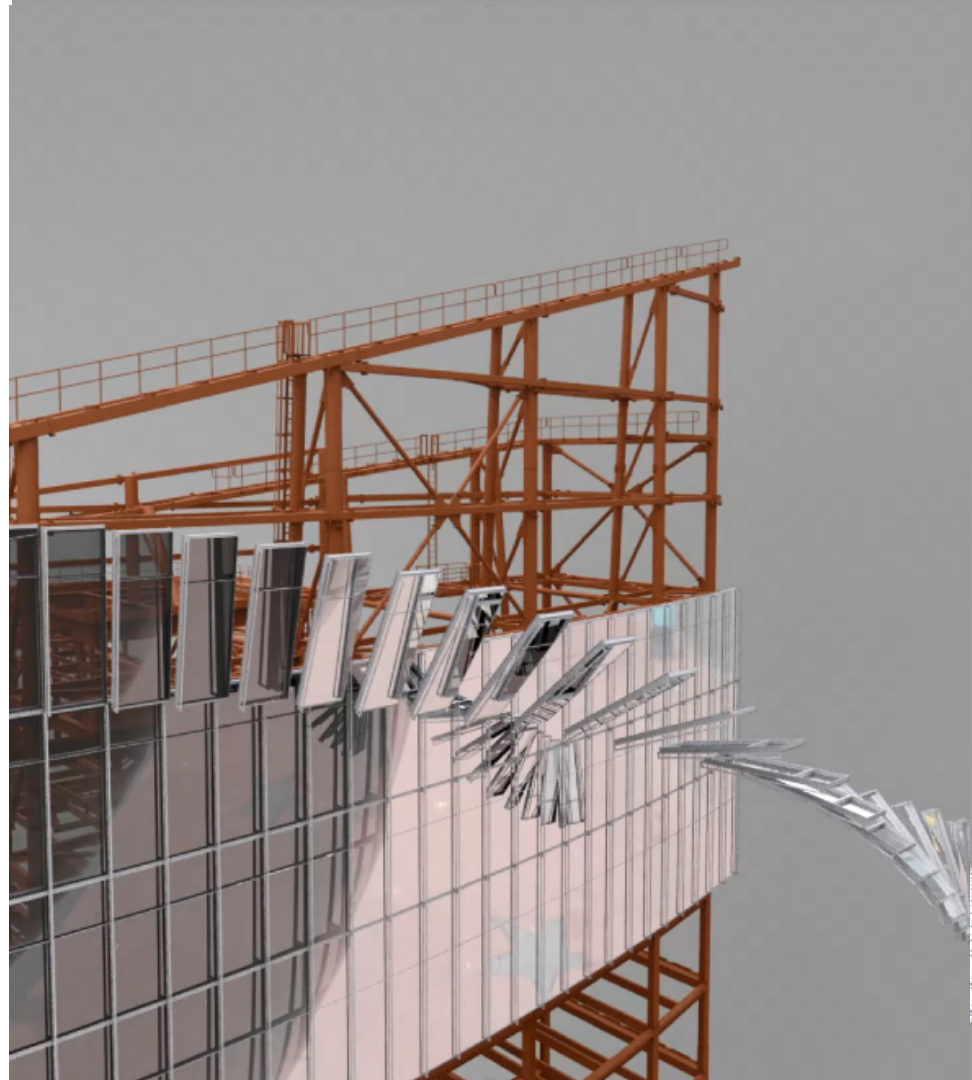


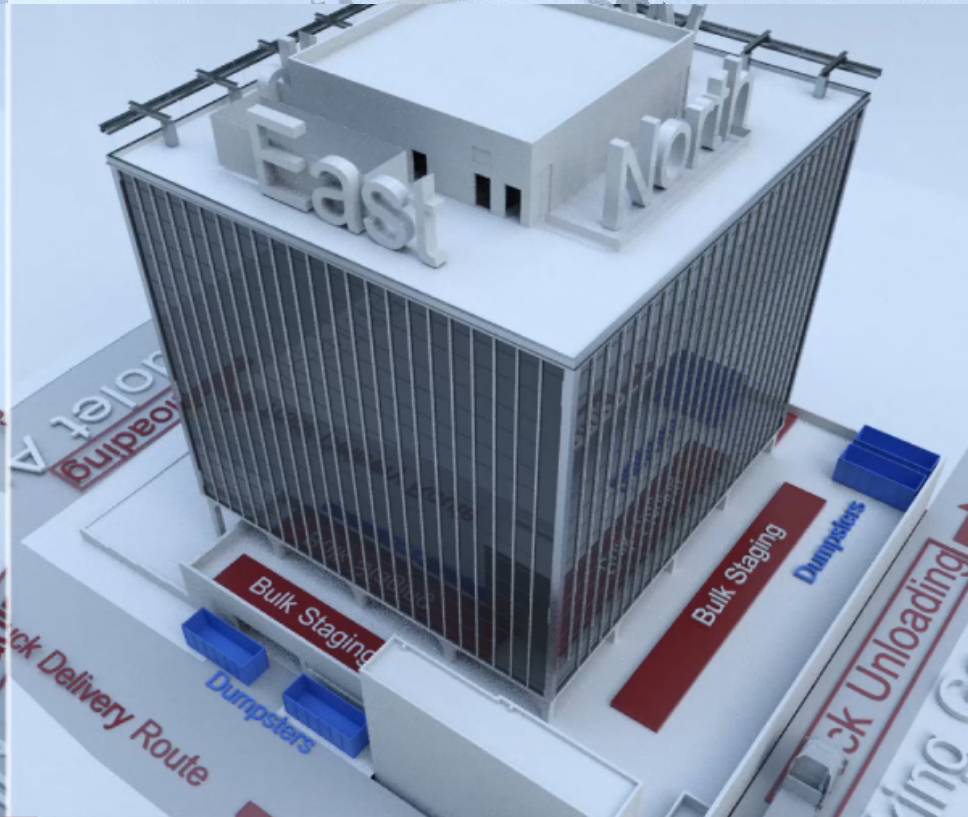
Examples

Examples



Examples





The background of the slide features four abstract, dark gray, three-dimensional geometric shapes in the corners. These shapes resemble stylized, faceted crystals or architectural elements, each with sharp edges and reflective surfaces that catch the light, creating bright highlights and deep shadows. They are positioned in the top-left, top-right, bottom-left, and bottom-right corners, framing the central text.

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