New API to Modify Visual Appearance of Materials in Revit

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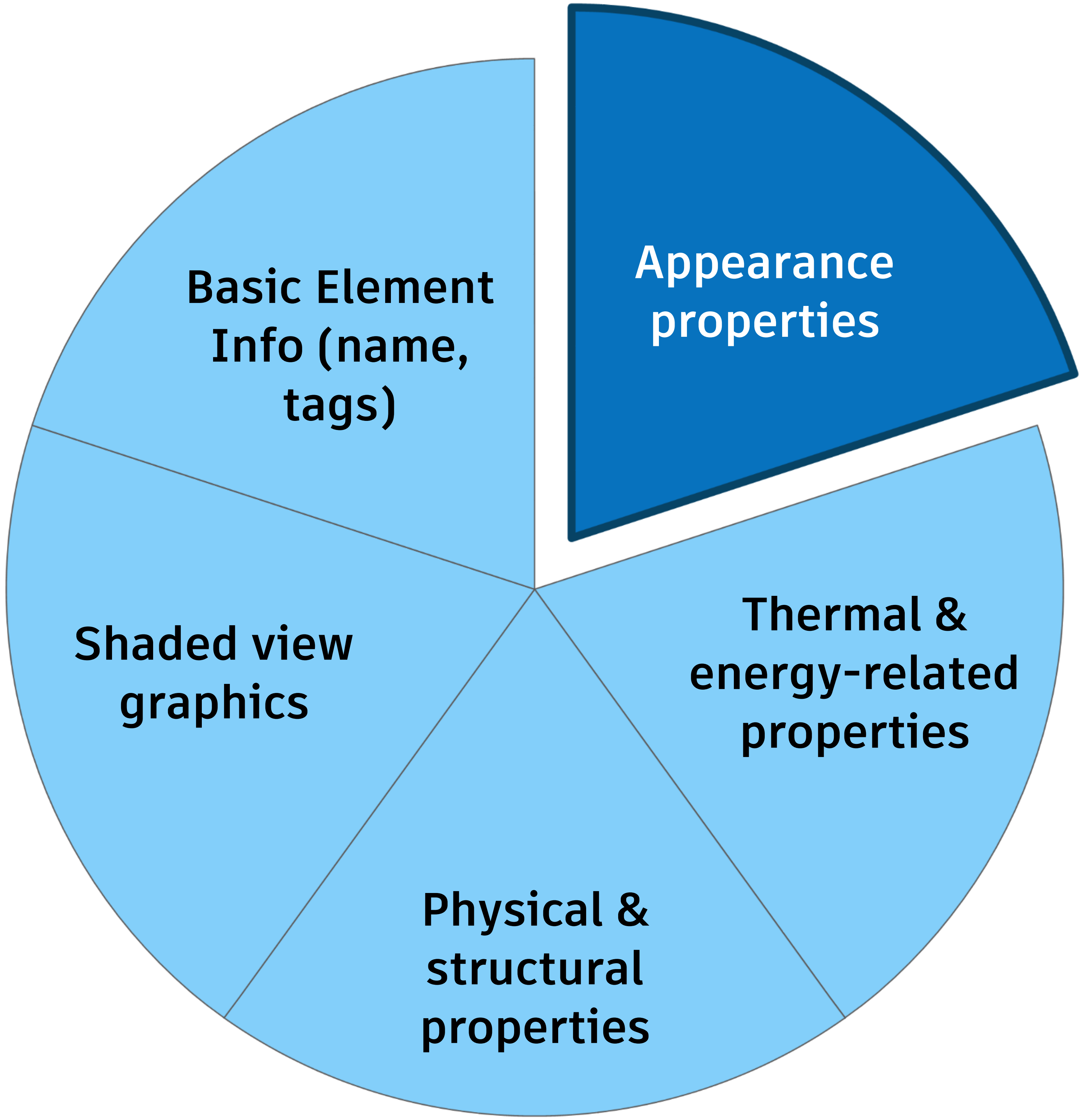
Learning Objectives

Learn how to

- use new API to modify visual appearance of Materials in Revit
- navigate coding workflow to edit appearance assets
- use multiple schemas for regular and advanced materials in Revit
- write a sample plug-in for basic modification of the visual appearance of Revit materials

The Basics

Materials API



Basic Element Info (name, tags)

Appearance properties

Shaded view graphics

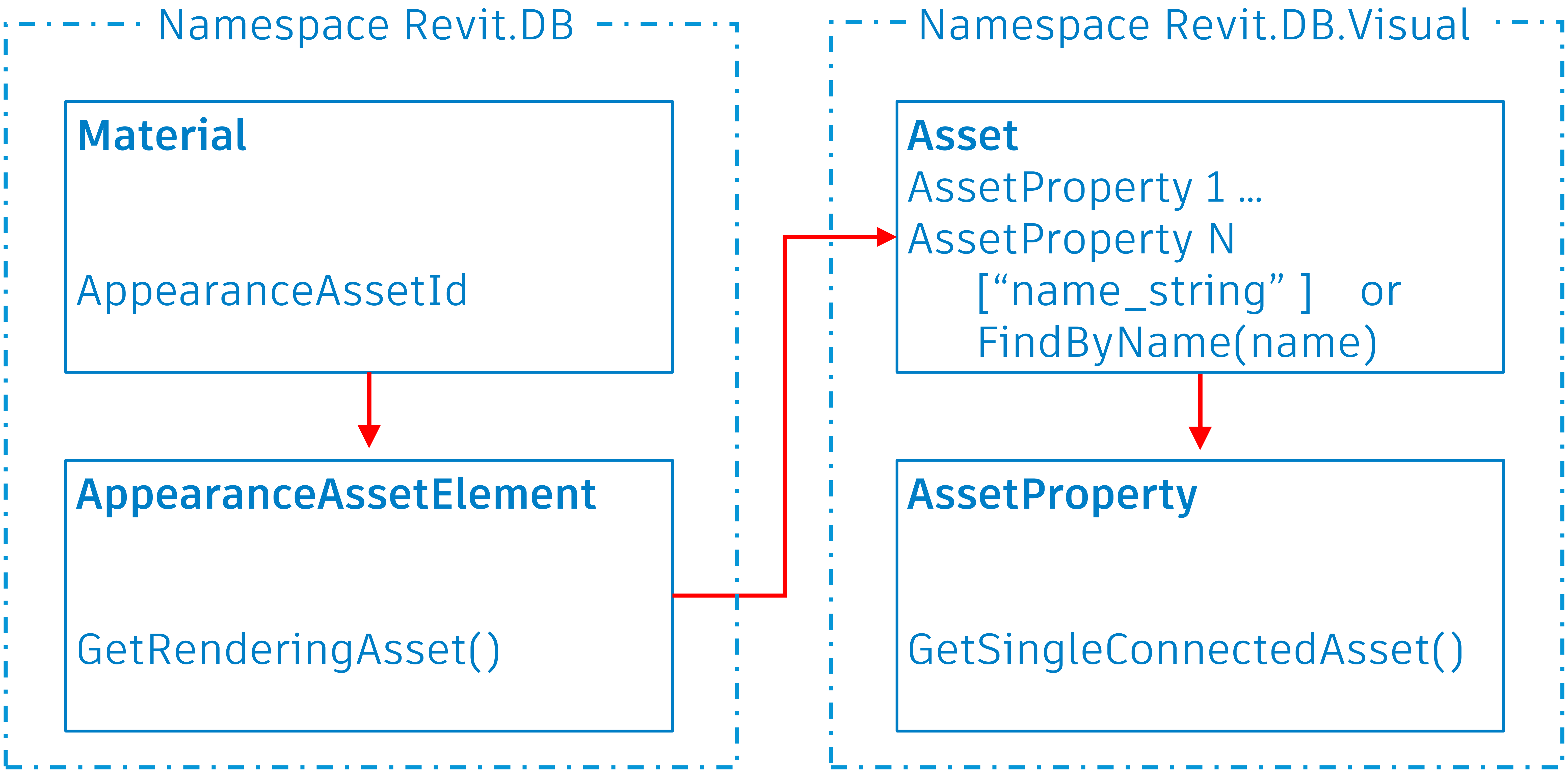
Thermal & energy-related properties

Physical & structural properties

Terminology

TERM	DEFINITION
Revit Material	An element representing a material, made of a collection of property sets
Asset	The class representing a package of properties
Appearance Asset	Asset representing visual material properties
Appearance Asset Element	An element that stores an appearance asset
Asset Property	One particular property of an asset

Material API building blocks



Namespace Revit.DB

Material

AppearanceAssetId

AppearanceAssetElement

GetRenderingAsset()

Namespace Revit.DB.Visual

Asset

AssetProperty 1 …

AssetProperty N

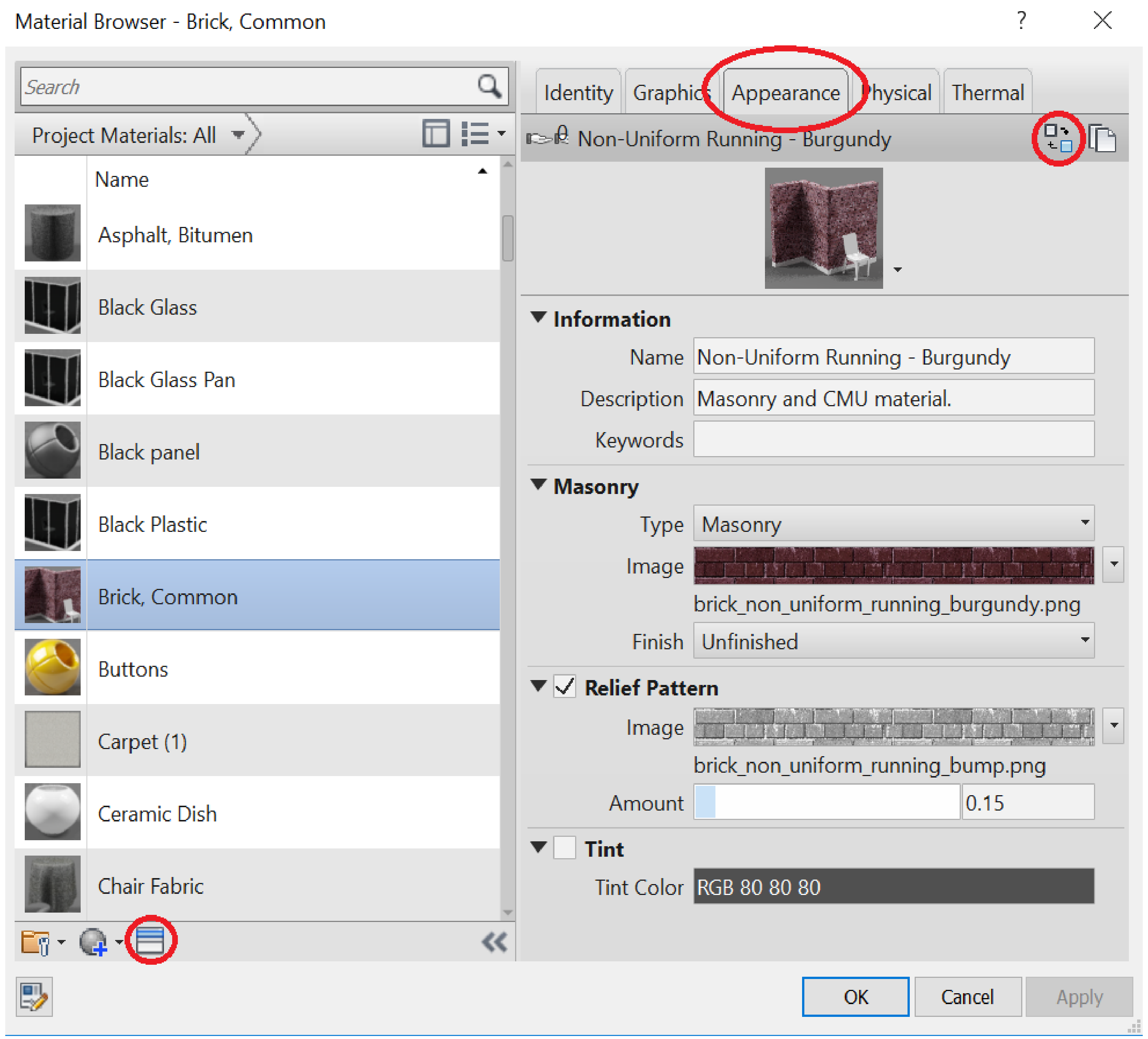
[“name_string”] or

FindByName(name)

AssetProperty

GetSingleConnectedAsset()

Visual Materials UI



Material Browser - Brick, Common

Search

Project Materials: All

Name
Asphalt, Bitumen
Black Glass
Black Glass Pan
Black panel
Black Plastic
Brick, Common
Buttons
Carpet (1)
Ceramic Dish
Chair Fabric

Identity | Graphics | Appearance | Physical | Thermal

Non-Uniform Running - Burgundy

Information

Name: Non-Uniform Running - Burgundy

Description: Masonry and CMU material.

Keywords:

Masonry

Type: Masonry

Image: brick_non_uniform_running_burgundy.png

Finish: Unfinished

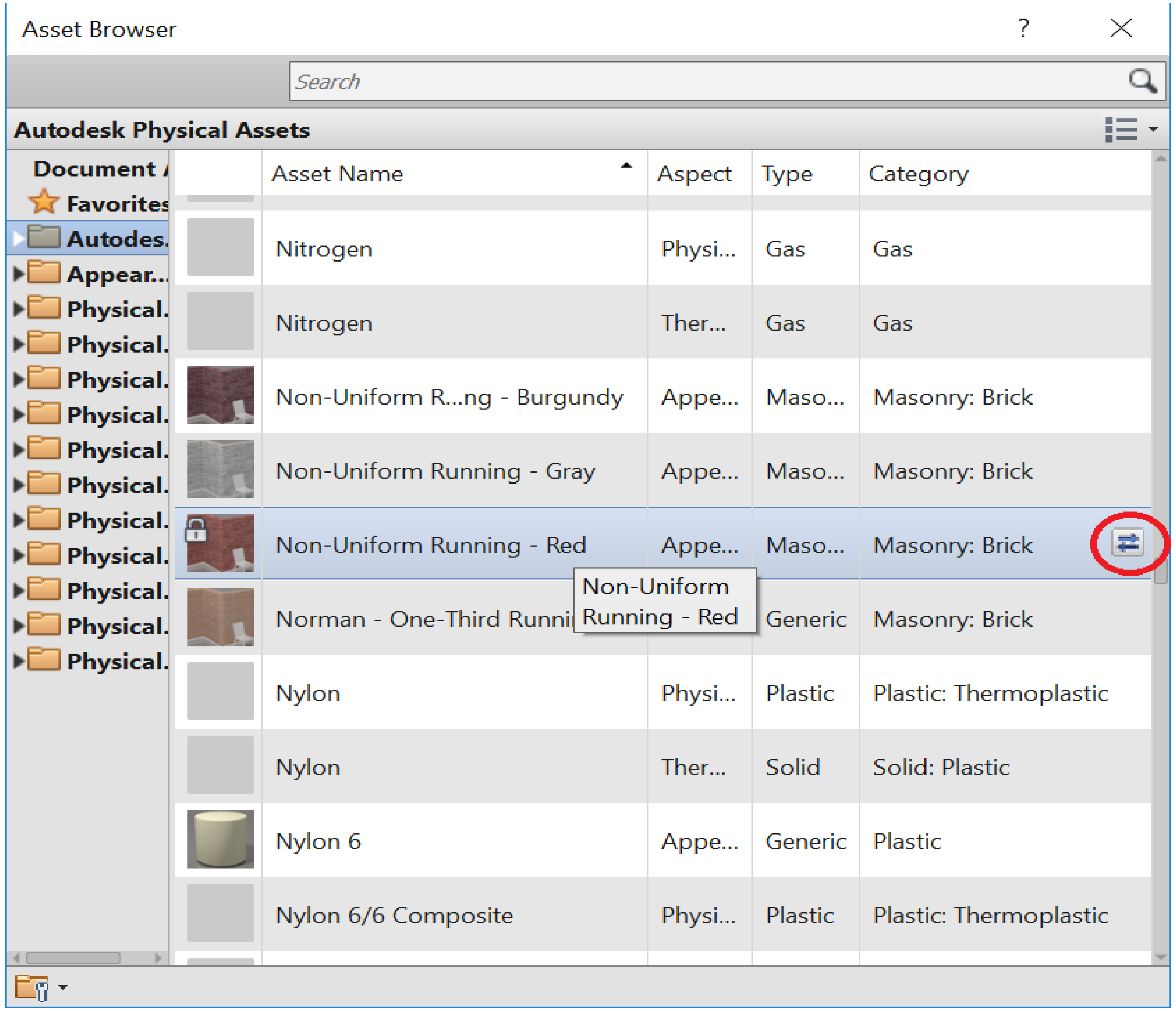
☑ **Relief Pattern**

Image: brick_non_uniform_running_bump.png

Amount: 0.15

□ **Tint**

Tint Color: RGB 80 80 80



Asset Browser

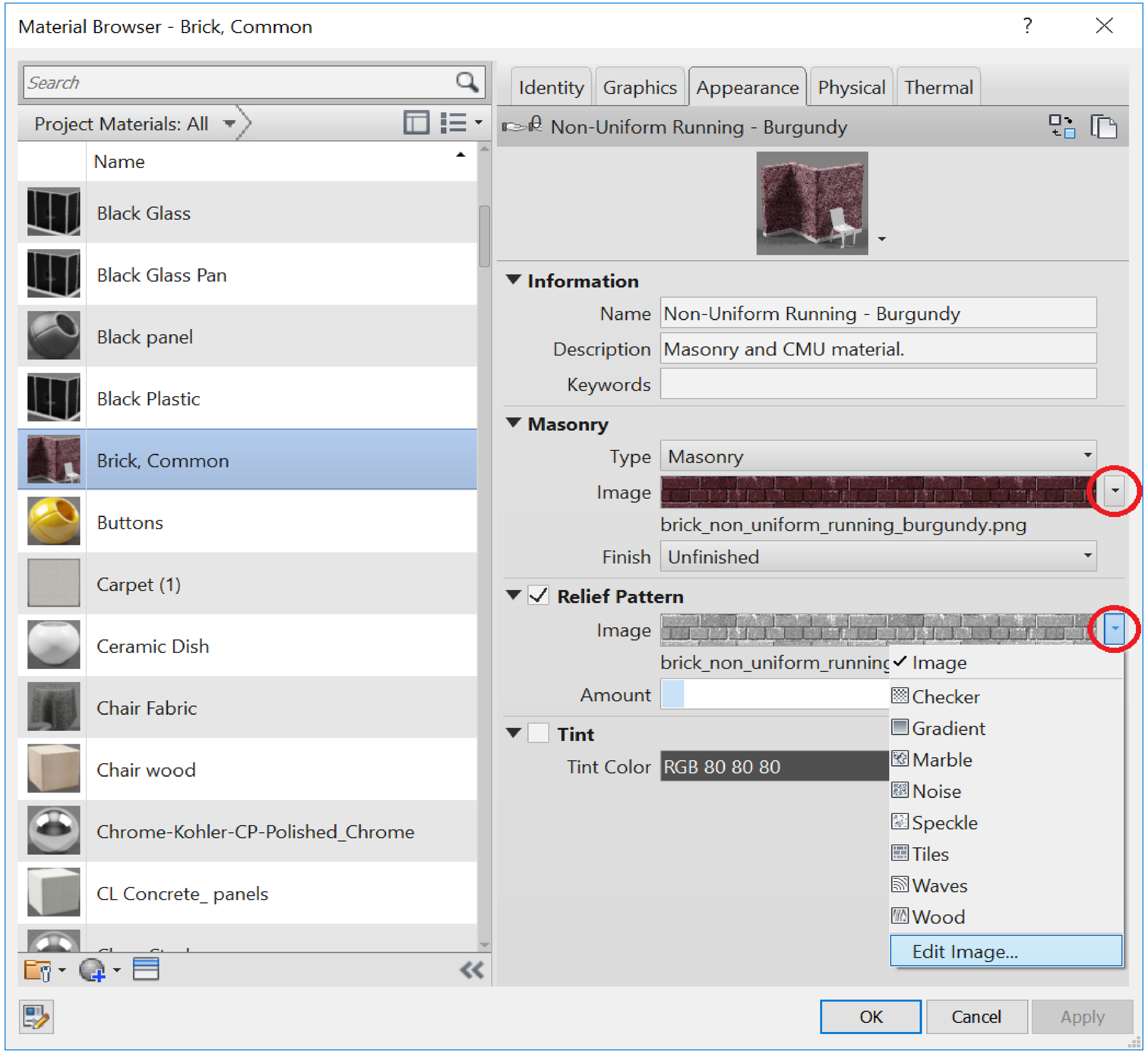
Search

Autodesk Physical Assets

- Document A...
- Favorites
- Autodes...
- Appear...
- Physical...
- Physical...
- Physical...
- Physical...
- Physical...
- Physical...
- Physical...
- Physical...
- Physical...
- Physical...

Asset Name	Aspect	Type	Category
Nitrogen	Physi...	Gas	Gas
Nitrogen	Ther...	Gas	Gas
Non-Uniform R...ng - Burgundy	Appe...	Maso...	Masonry: Brick
Non-Uniform Running - Gray	Appe...	Maso...	Masonry: Brick
Non-Uniform Running - Red	Appe...	Maso...	Masonry: Brick
Norman - One-Third Runni...		Generic	Masonry: Brick
Nylon	Physi...	Plastic	Plastic: Thermoplastic
Nylon	Ther...	Solid	Solid: Plastic
Nylon 6	Appe...	Generic	Plastic
Nylon 6/6 Composite	Physi...	Plastic	Plastic: Thermoplastic

Visual Materials UI (continued)



Material Browser - Brick, Common

Project Materials: All

Name
Black Glass
Black Glass Pan
Black panel
Black Plastic
Brick, Common
Buttons
Carpet (1)
Ceramic Dish
Chair Fabric
Chair wood
Chrome-Kohler-CP-Polished_Chrome
CL Concrete_ panels

Non-Uniform Running - Burgundy

Information

Name: Non-Uniform Running - Burgundy

Description: Masonry and CMU material.

Keywords:

Masonry

Type: Masonry

Image: brick_non_uniform_running_burgundy.png

Finish: Unfinished

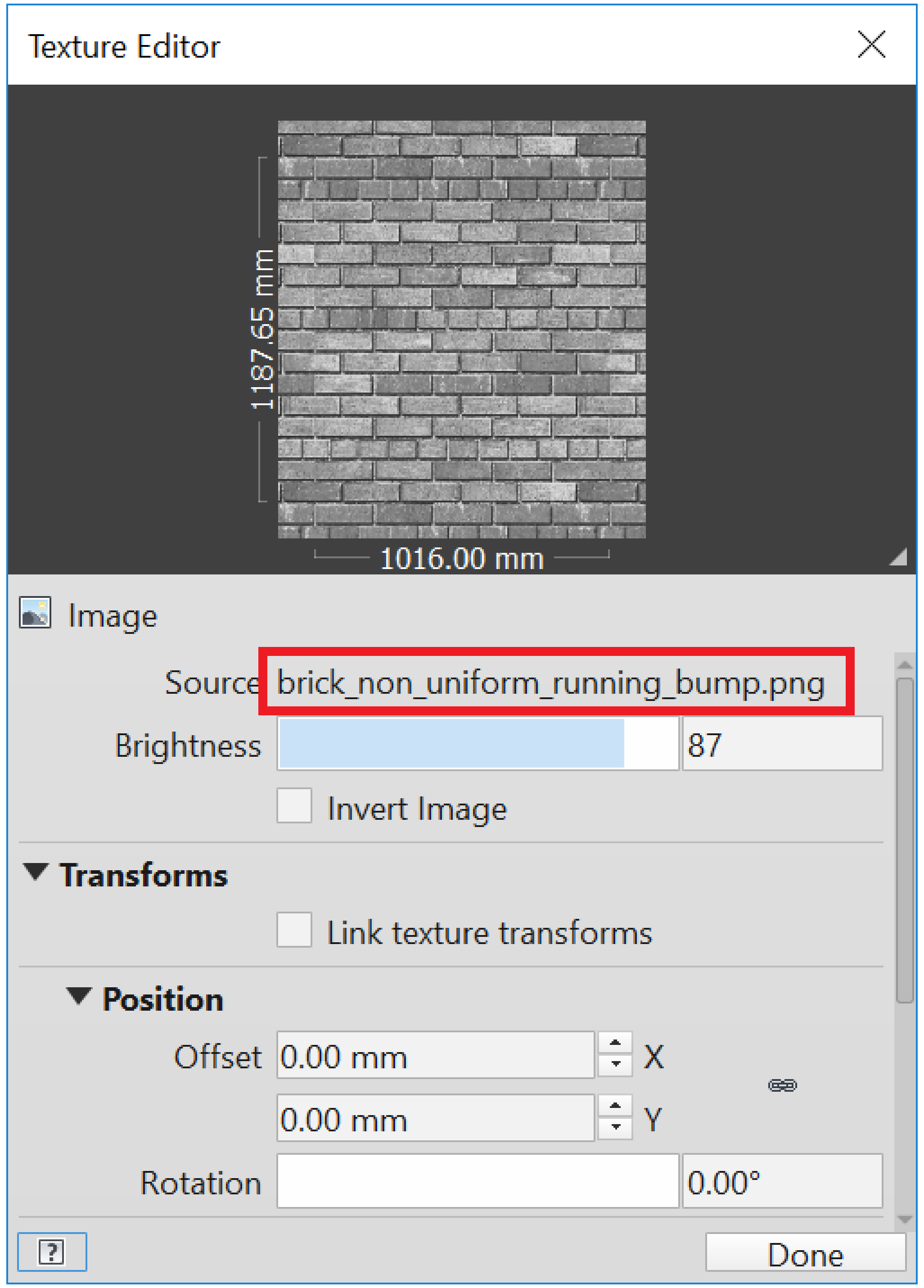
☑ Relief Pattern

Image: brick_non_uniform_running

Amount:

□ Tint

Tint Color: RGB 80 80 80



Texture Editor

1187.65 mm

1016.00 mm

Image

Source: brick_non_uniform_running_bump.png

Brightness: 87

□ Invert Image

Transforms

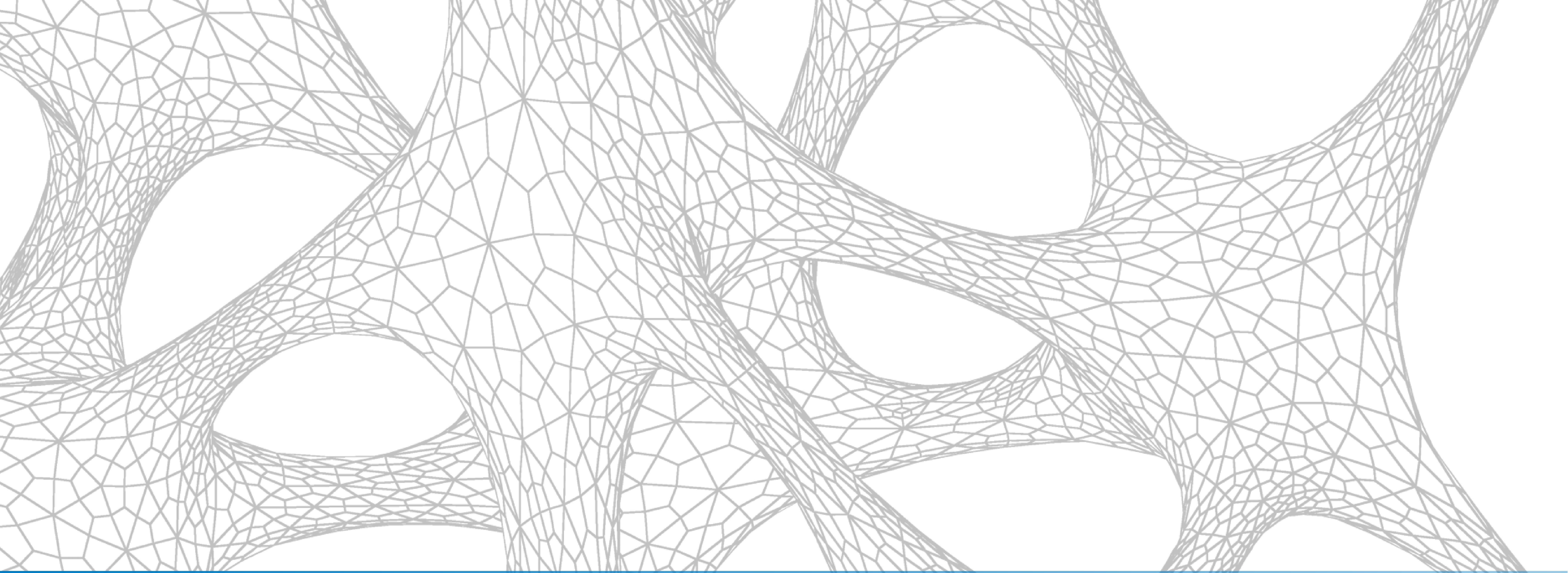
□ Link texture transforms

Position

Offset: 0.00 mm X

0.00 mm Y

Rotation: 0.00°



New Editing Capabilities in Materials API

Edit Scope

- **AppearanceAssetEditScope**
  - Start()
  - Commit()
  - Cancel()

Contains one Asset

(plus all connected Assets)

New Writable Properties

- AssetPropertyString.Value
- AssetPropertyBoolean.Value
- AssetPropertyInteger.Value
- AssetPropertyDouble.Value
- AssetPropertyFloat.Value
- AssetPropertyEnum.Value
- AssetPropertyDistance.Value (not always in feet)

New Methods

- AssetPropertyDoubleArray3d.SetValueAsXYZ()
- AssetPropertyDoubleArray4d.SetValueAsDoubles()
- AssetPropertyDoubleArray4d.SetValueAsColor()

- AssetPropertyList - add, insert, remove

Coding Workflow to Edit a Color

```
using(AppearanceAssetEditScope editScope
                    = new AppearanceAssetEditScope(document))
{
    Asset editableAsset = editScope.Start(assetElem.Id);

    AssetPropertyDoubleArray4d genericDiffuseProperty
        = editableAsset["generic_diffuse"] as AssetPropertyDoubleArray4d;

    genericDiffuseProperty.SetValueAsColor(color);

    editScope.Commit(true);
}
```

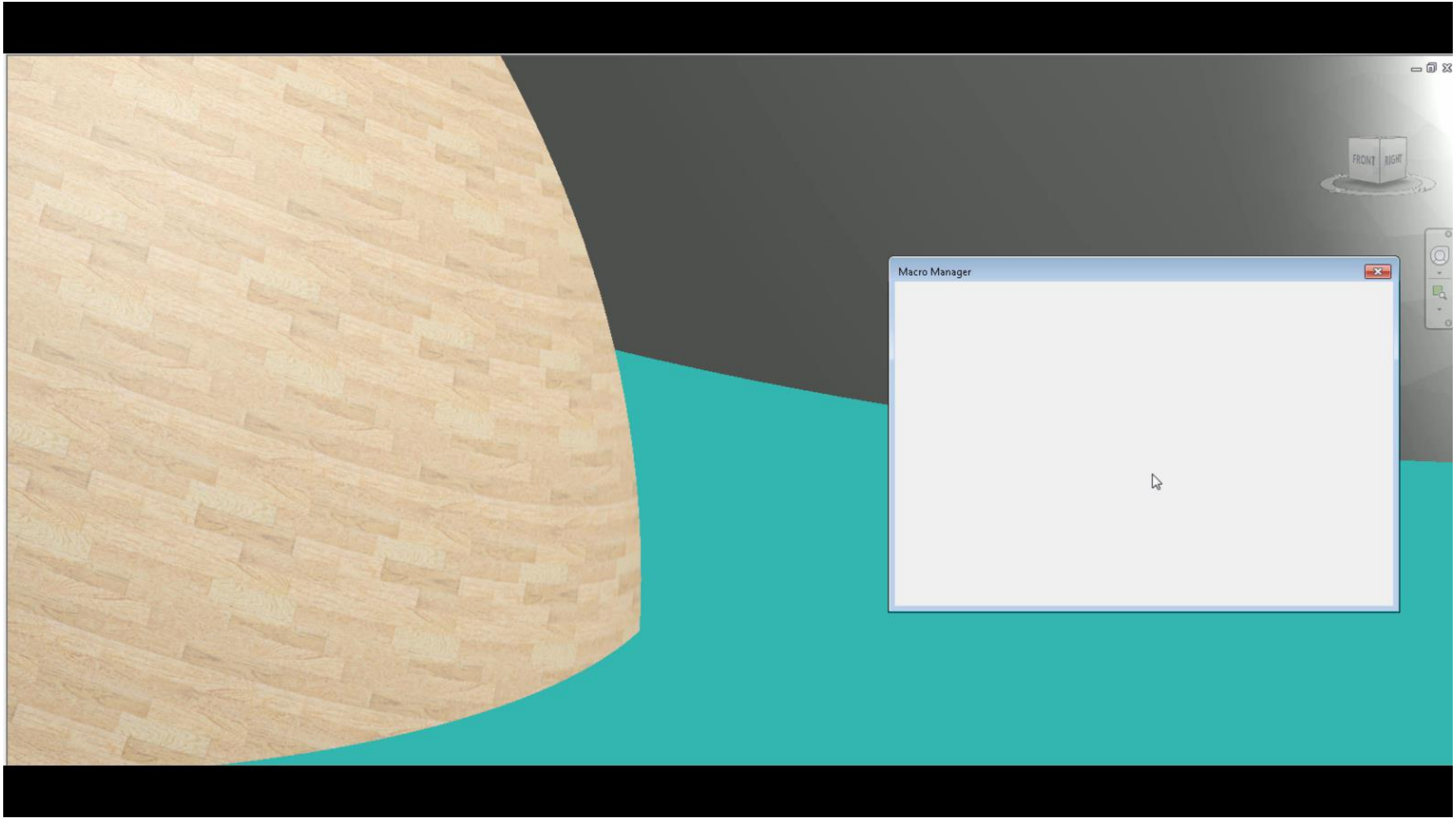
Connected Assets

- AssetProperty.GetSingleConnectedAsset()
- AssetProperty.RemoveConnectedAsset()
- AssetProperty.AddConnectedAsset (String schemaId)
- AssetProperty.AddCopyAsConnectedAsset(Asset renderingAsset)

Coding Workflow to Edit a Connected Asset

```
using(AppearanceAssetEditScope editScope
                            = new AppearanceAssetEditScope(document))
{
    Asset editableAsset = editScope.Start(assetElem.Id);
    AssetProperty bumpMapProperty = editableAsset["generic_bump_map"];
    Asset connectedAsset = bumpMapProperty.GetSingleConnectedAsset();
    if (connectedAsset != null)
    {
        AssetPropertyString bumpmapBitmapProperty
            = connectedAsset["unifiedbitmap_Bitmap"] as AssetPropertyString;
         if (bumpmapBitmapProperty.IsValidValue(bumpmapImageFilepath))
            bumpmapBitmapProperty.Value = bumpmapImageFilepath;
    }
    editScope.Commit(true);
}
```

Demo


Macro Manager
FRONT
RIGHT

Schemas and Property Names

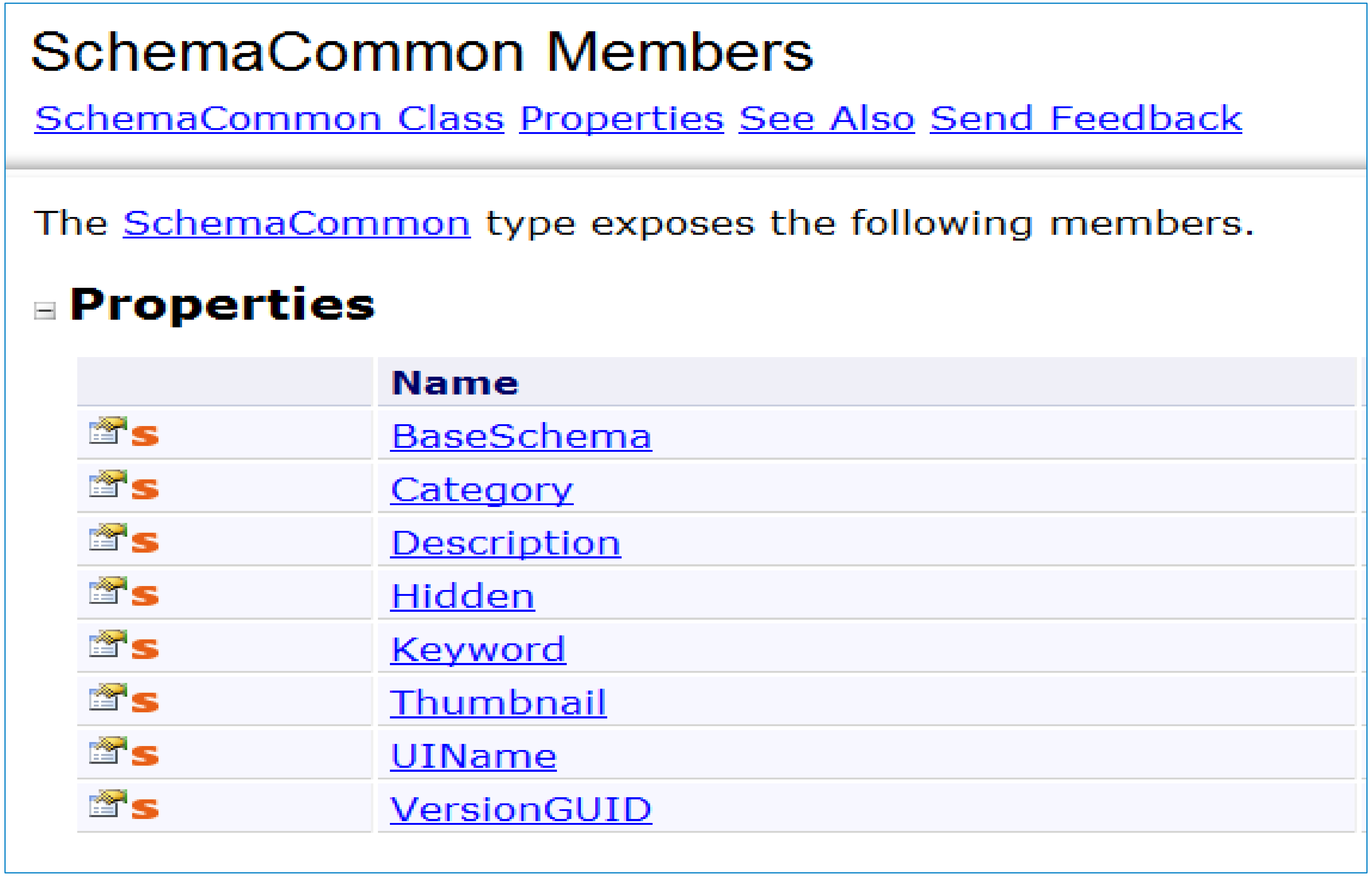
Standard Material Schemas

- Ceramic
- Concrete
- Generic
- Glazing
- Hardwood
- MasonryCMU
- Metal
- MetallicPaint
- Mirror
- PlasticVinyl
- SolidGlass
- Stone
- WallPaint
- Water

Advanced Material Schemas

- AdvancedLayered
- AdvancedMetal
- AdvancedOpaque
- AdvancedTransparent
- AdvancedWood

Common Schema



SchemaCommon Members

SchemaCommon Class Properties See Also Send Feedback

The SchemaCommon type exposes the following members.

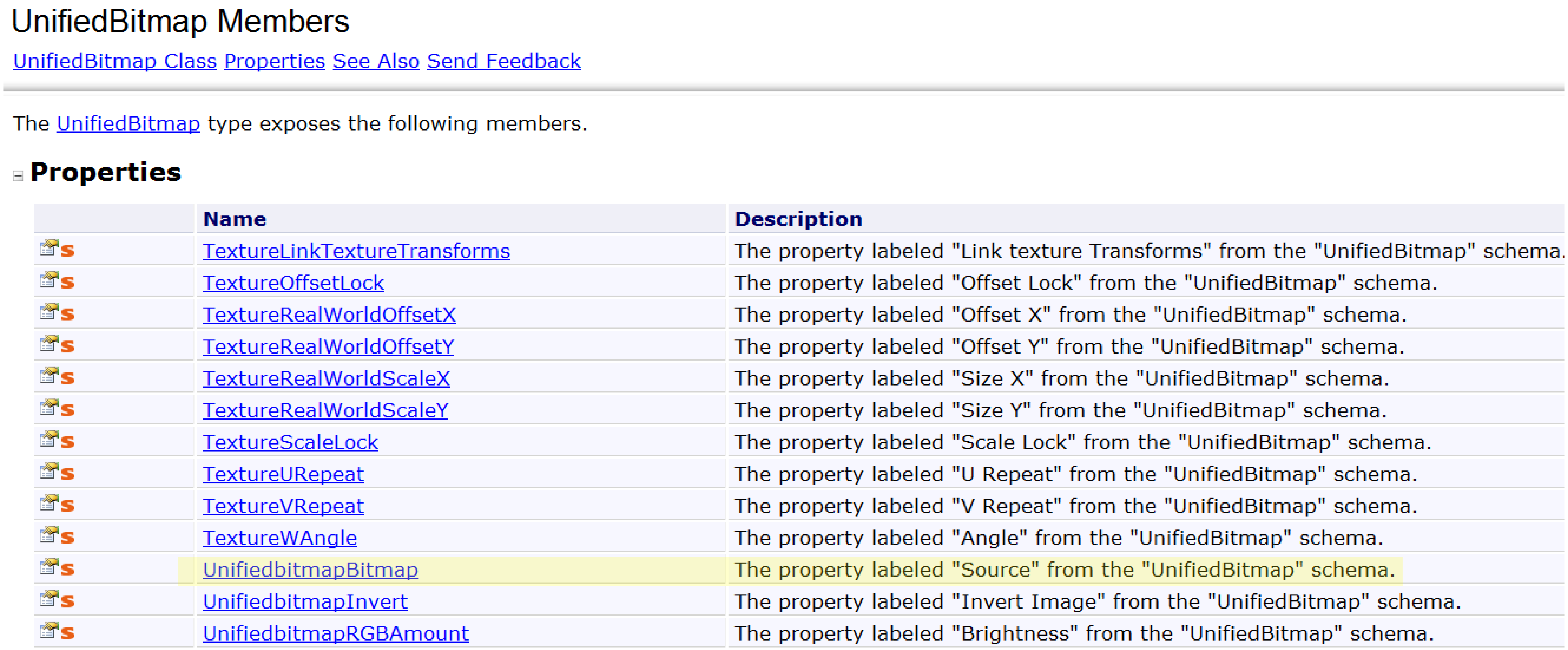
⊟ Properties

	Name
S	BaseSchema
S	Category
S	Description
S	Hidden
S	Keyword
S	Thumbnail
S	UIName
S	VersionGUID

Schemas for Connected Assets

- BumpMap
- Checker
- Gradient
- Marble
- Noise
- Speckle
- Tile
- UnifiedBitmap
- Wave
- Wood

UnifiedBitmap



UnifiedBitmap Members

UnifiedBitmap Class Properties See Also Send Feedback

The UnifiedBitmap type exposes the following members.

Properties

	Name	Description
S	TextureLinkTextureTransforms	The property labeled "Link texture Transforms" from the "UnifiedBitmap" schema.
S	TextureOffsetLock	The property labeled "Offset Lock" from the "UnifiedBitmap" schema.
S	TextureRealWorldOffsetX	The property labeled "Offset X" from the "UnifiedBitmap" schema.
S	TextureRealWorldOffsetY	The property labeled "Offset Y" from the "UnifiedBitmap" schema.
S	TextureRealWorldScaleX	The property labeled "Size X" from the "UnifiedBitmap" schema.
S	TextureRealWorldScaleY	The property labeled "Size Y" from the "UnifiedBitmap" schema.
S	TextureScaleLock	The property labeled "Scale Lock" from the "UnifiedBitmap" schema.
S	TextureURepeat	The property labeled "U Repeat" from the "UnifiedBitmap" schema.
S	TextureVRepeat	The property labeled "V Repeat" from the "UnifiedBitmap" schema.
S	TextureWAngle	The property labeled "Angle" from the "UnifiedBitmap" schema.
S	UnifiedbitmapBitmap	The property labeled "Source" from the "UnifiedBitmap" schema.
S	UnifiedbitmapInvert	The property labeled "Invert Image" from the "UnifiedBitmap" schema.
S	UnifiedbitmapRGBAmount	The property labeled "Brightness" from the "UnifiedBitmap" schema.

Property Names

```
AssetPropertyDoubleArray4d genericDiffuseProperty
                    = editableAsset["generic_diffuse"]
                            as AssetPropertyDoubleArray4d;
```

equivalent

```
AssetPropertyDoubleArray4d genericDiffuseProperty
                    = editableAsset[Generic.GenericDiffuse]
                            as AssetPropertyDoubleArray4d;
```

Special Cases

- AssetPropertyString path = asset[UnifiedBitmap.UnifiedbitmapBitmap] as AssetPropertyString;

Path is relative if inside default Material Library or

in Options/Rendering/Additional Render Appearance Paths;

Path is absolute otherwise.

Special Cases (continued)

- AssetPropertyDoubleArray4d color = asset[Generic.DiffuseColor]
  as AssetPropertyDoubleArray4d;

The Value of this AssetProperty is **ignored** if there is a connected Asset.

Special Cases (continued)

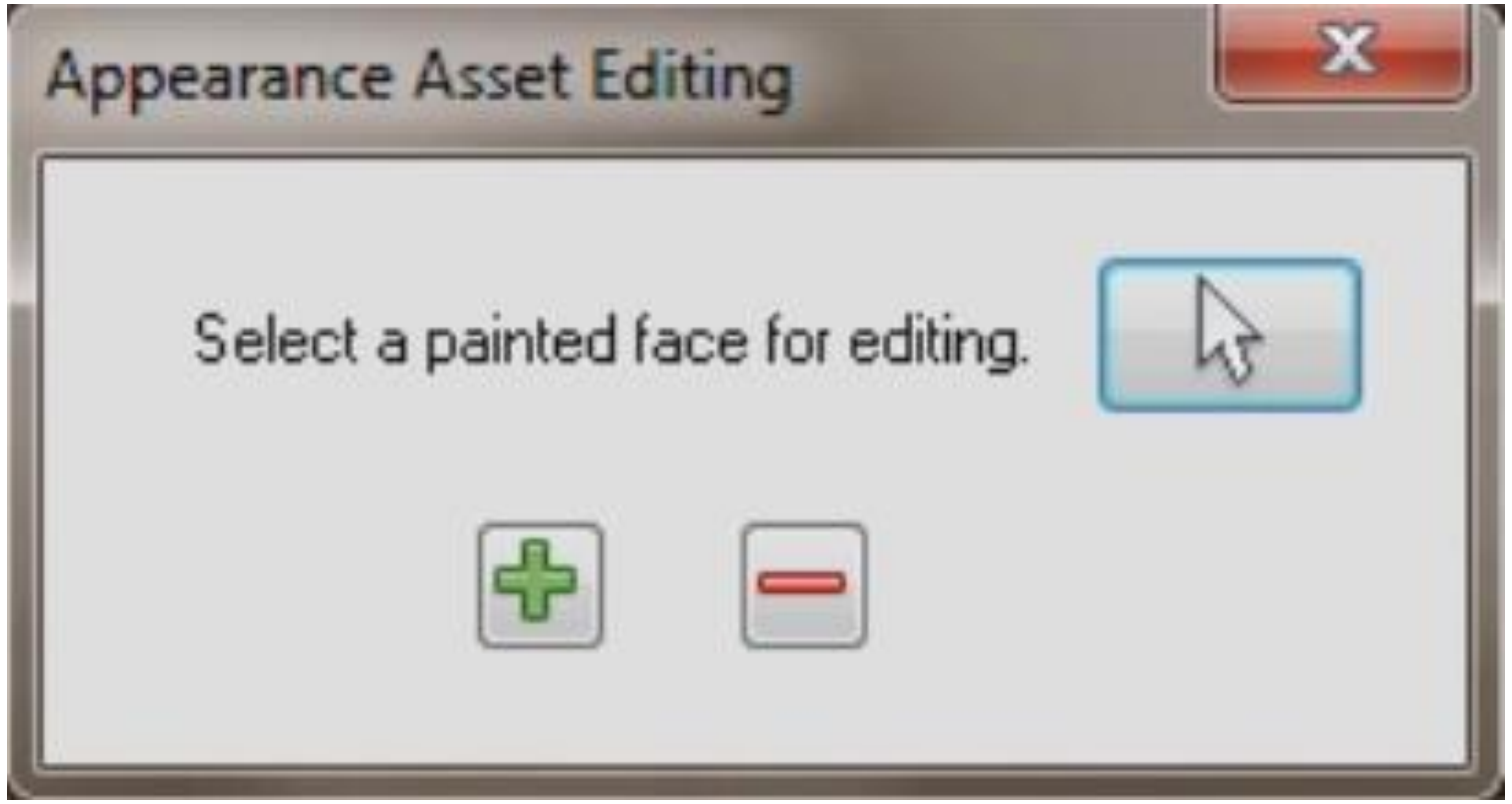
- AssetPropertyReference reference;

Does not have a Value. Used only to have a connected Asset.

SDK Sample

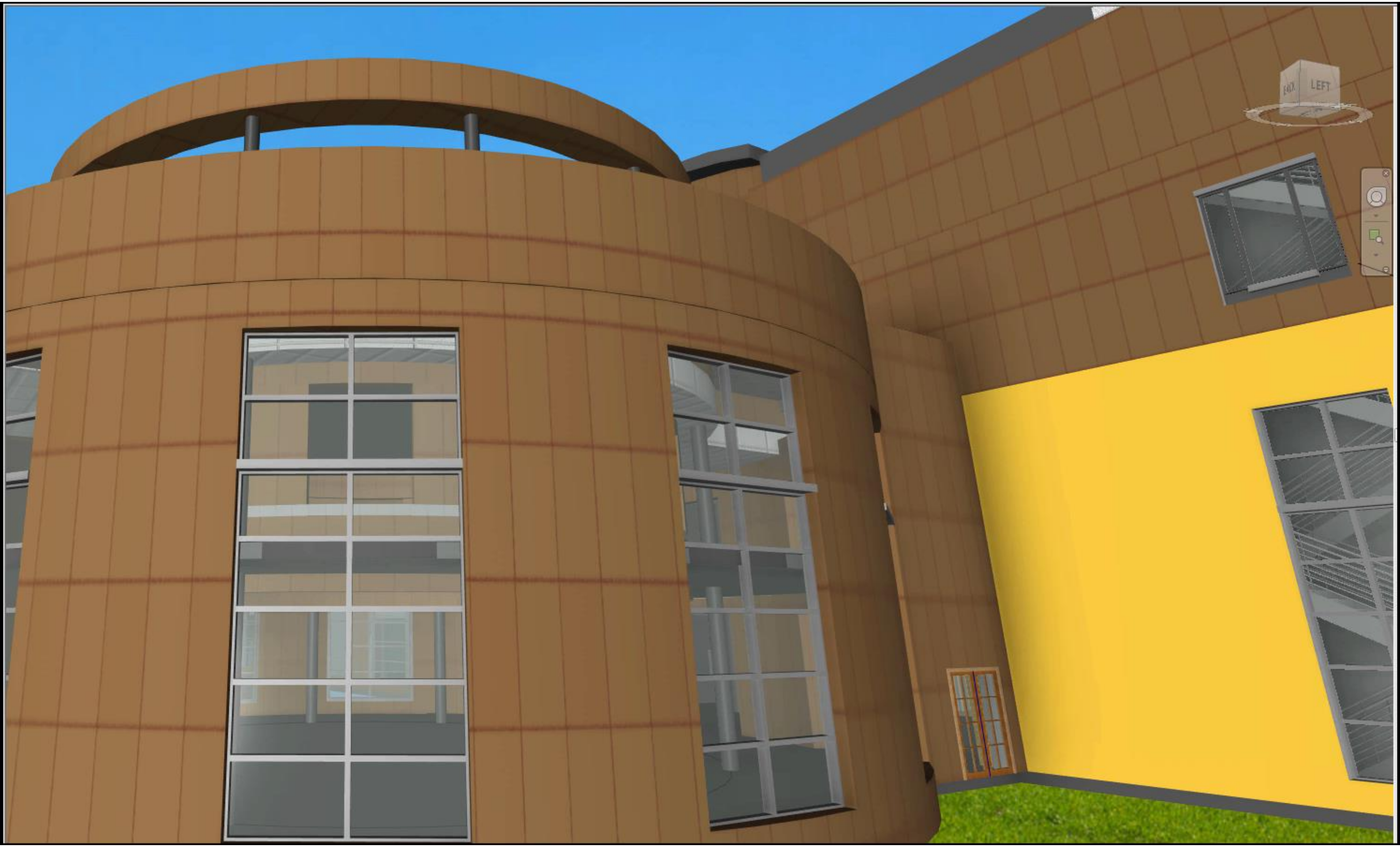
AppearanceAssetEditing

- Bring up a modeless dialog
- Select a Painted Face
- Get Appearance Asset
- Get Tint Color AssetProperty
- Increment red/green/blue



Select a painted face for editing.

Demo


BACK
LEFT

Q & A

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Make anything.