AUTODESK UNIVERSITY

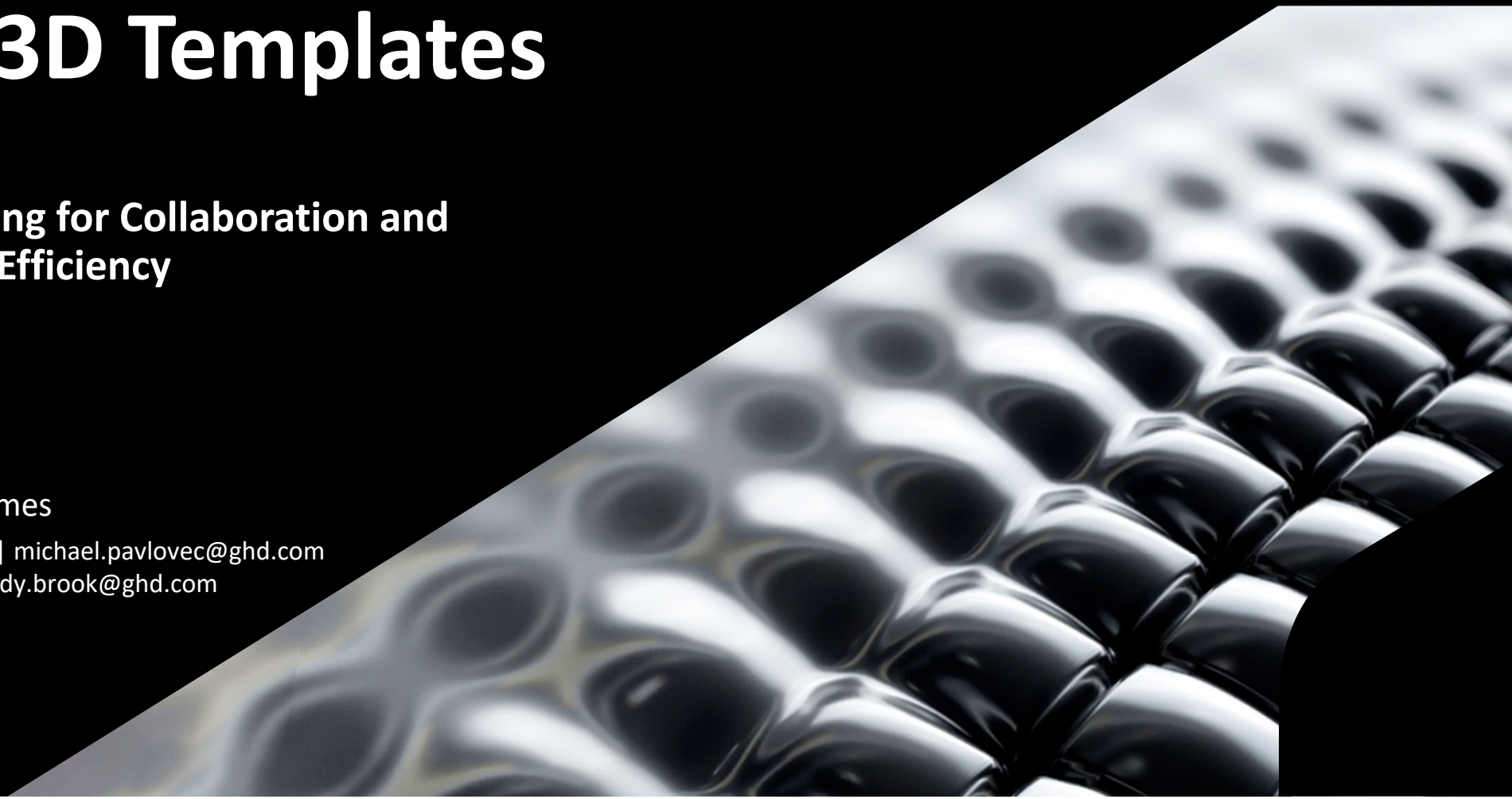
Civil 3D Templates

Restructuring for Collaboration and Maximum Efficiency

CES502192

Presenters Names

Michael Pavlovec | michael.pavlovec@ghd.com
Randy Brook | randy.brook@ghd.com



Your Presenters

Mike & Randy

About your Presenters

Michael Pavlovec, C.E.T.

30+ years in the Civil Engineering Industry, with the majority spent in the Transportation Sector. The last 6+ years here at GHD as a Project Manager working on large Transportation Expansion Projects, Infrastructure Improvement Projects, and an assortment of Urban Design Projects. Experienced with a variety of program delivery methods – including Design-Bid-Build and Design-Build.

Transportation works included projects involving the three R's - Roads, Rail, and Runways.

Dynamo & Python play a large part of my daily workflows and I'm always looking to automate by taking advantage of the Civil 3D API. As part of the first-generation CADD users, I became involved in the development of standards on day 1 – when none existed!
I also act as GHD's Application Manager for Civil 3D - empowering our global modeling community .

RAQS Registered Engineering Surveyor - Certified Highway Designer - Certified Data Processing Technician

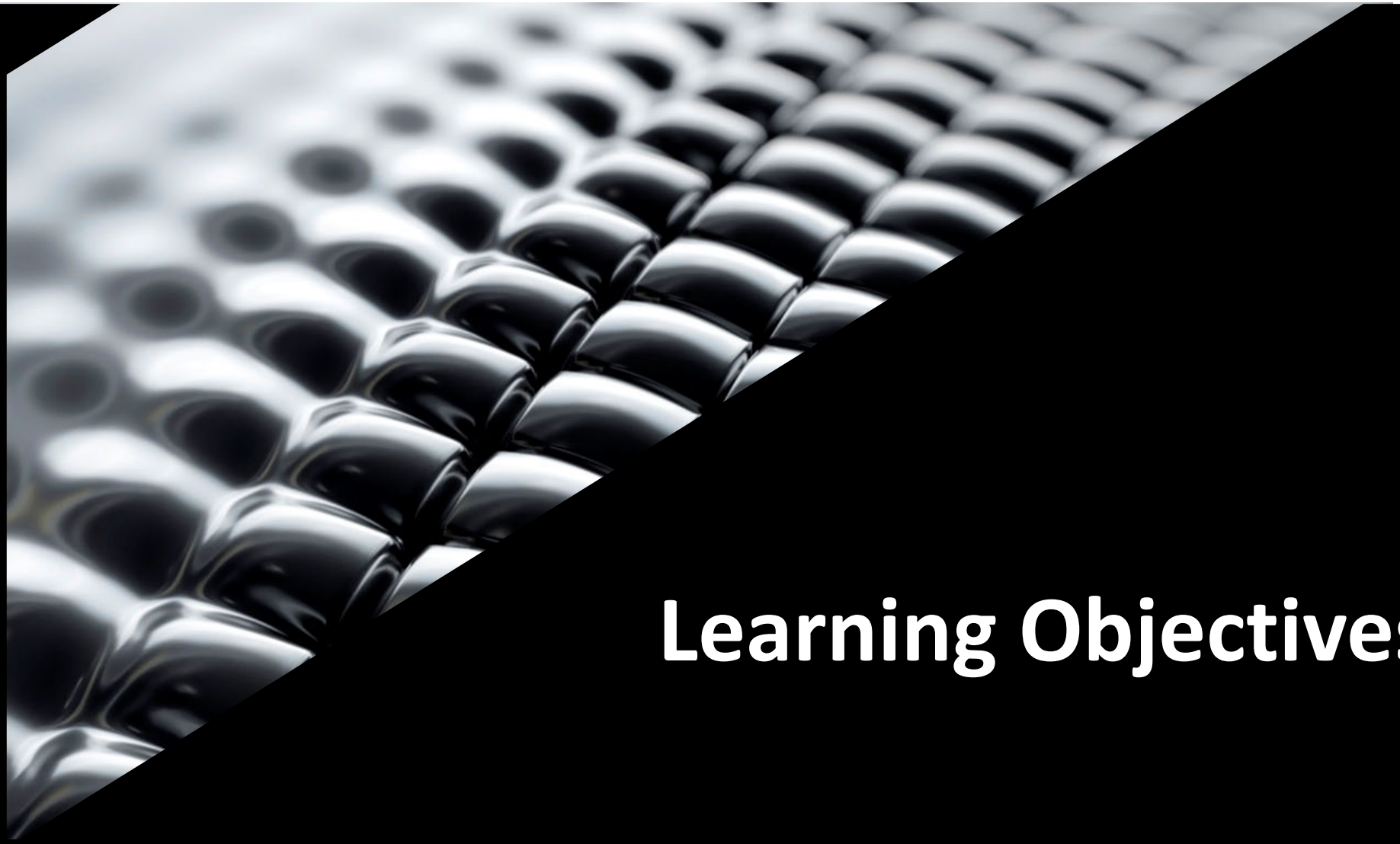
About your Presenters

Randy Brook

With over 35 years of experience in all forms of surveying, design, and inspection on a variety of projects including large subdivisions (300 lots), road reconstruction and expansion, an underground 1,000,000-gal storage tank and pumping station and a 50ft deep wet well and pumping station. After a brief time with a contractor, I came back to consulting and started my career as a designer.

My design career has included using AutoCAD, Land Development Desktop for design, and more recently (since 2007) Civil 3D. Within the Civil 3D era of my career, I have created many different templates and utilized them on many different types of projects, including, subdivisions, road reconstruction, stream restoration design and site plan designs. I am presently working at GHD in the Waterloo ON, CA. office.

I have been known as intense, or the ‘Grumpy Old Man’.



Learning Objectives

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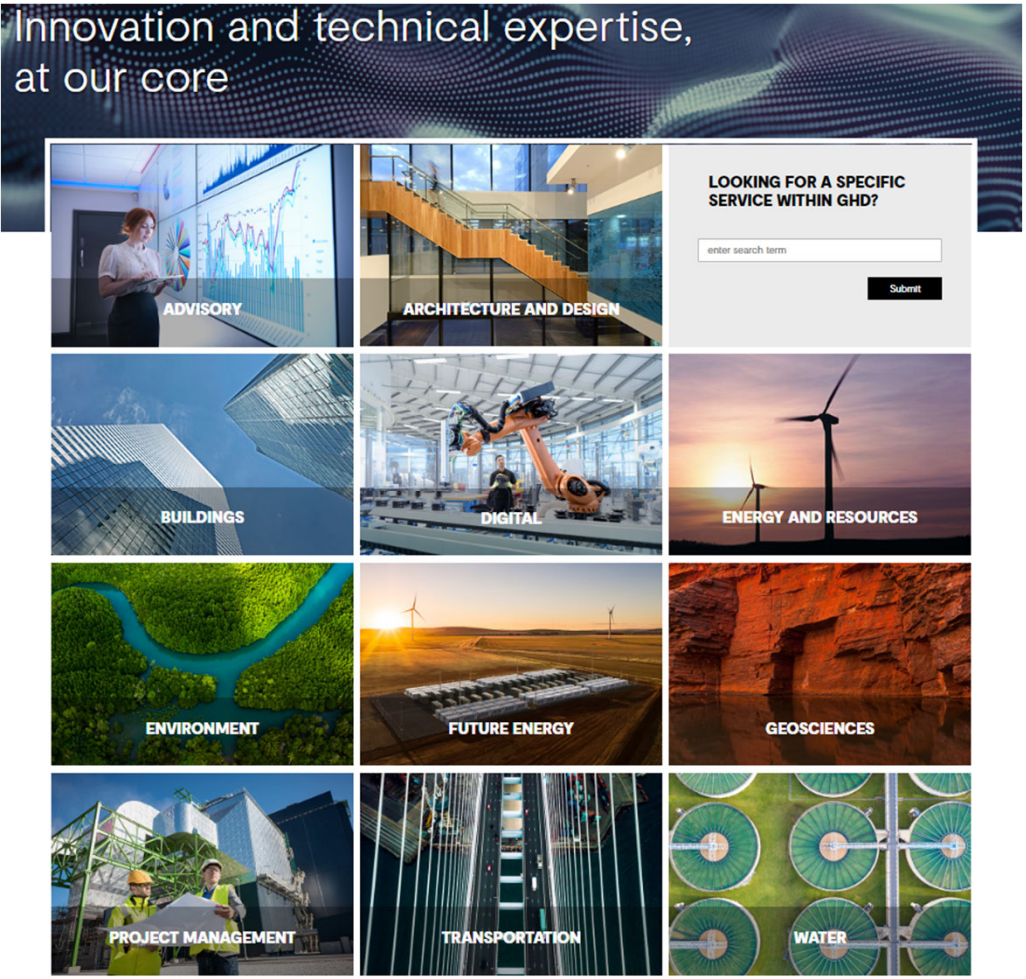
Learning Objectives

- Define template requirements, and leverage best practice workflows
- Restructure your templates to utilize new Civil 3D functionality with property sets and reference templates
- Implement procedures to manage, and develop template content
- Use Dynamo to automate the application of meta data, and generate IFC files

The Journey

Templates

GHD has over 10,000 employees in over 200 offices worldwide



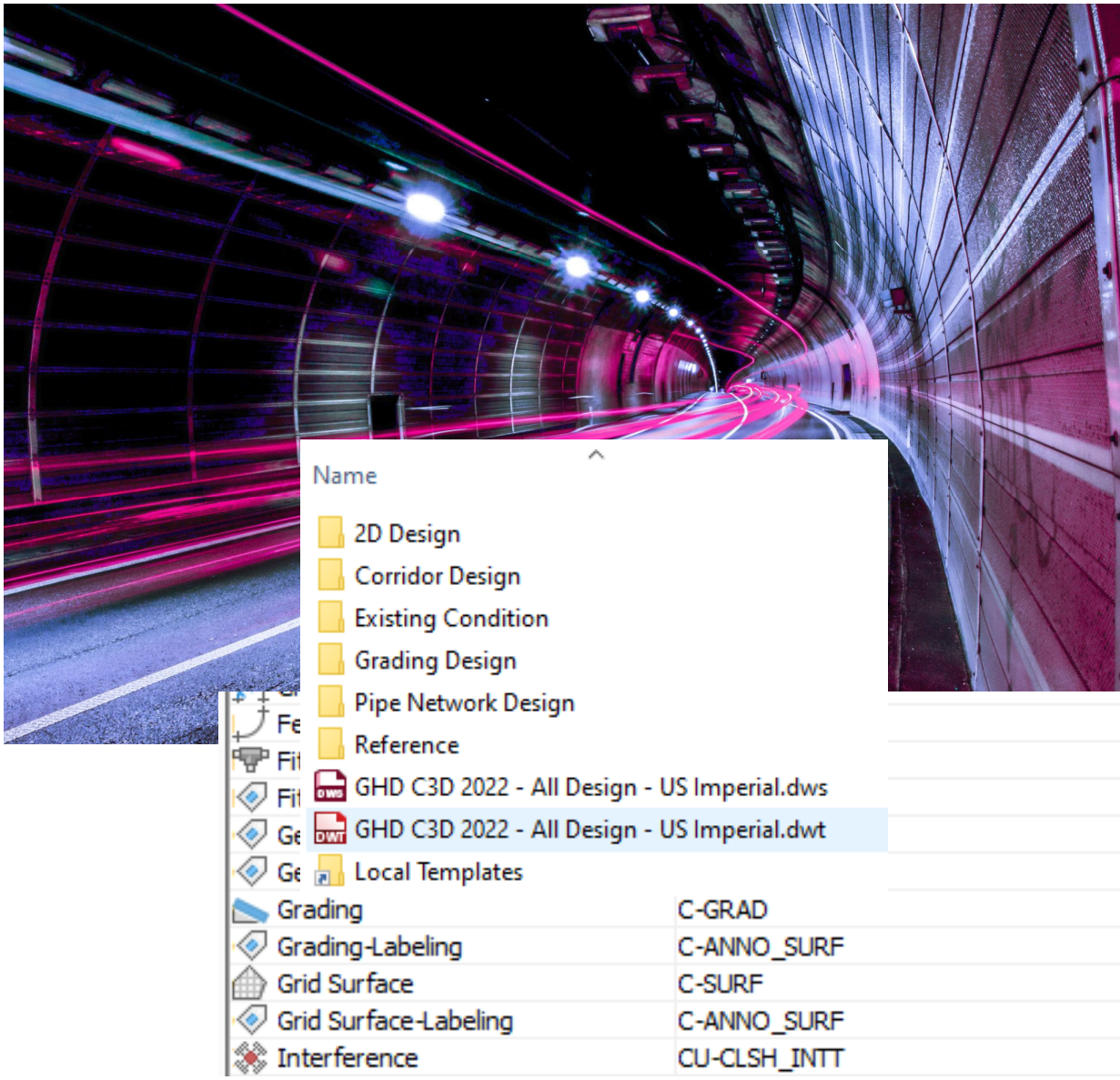
- English, French, and Spanish Template requirements
- Metric and Imperial
- Templates to cover all disciplines, and
- Service lines

- Pandemic working environment required a 'Re-think' in how we shared content

Existing Templates

Functional Set of 2D and 3D Templates

- Templates for all Civil design aspects
  - Roads
  - Land Development
  - Water Resources
- National Cad Standards (NCS) based
- Metric and Imperial Variants
- Regional Templates
  - AMER
  - EMEA
  - ANZ



Working at Home Needs

Collaboration Opportunities Changed Overnight

Shifted away from traditional design teams

Migrated into digital collaboration groups

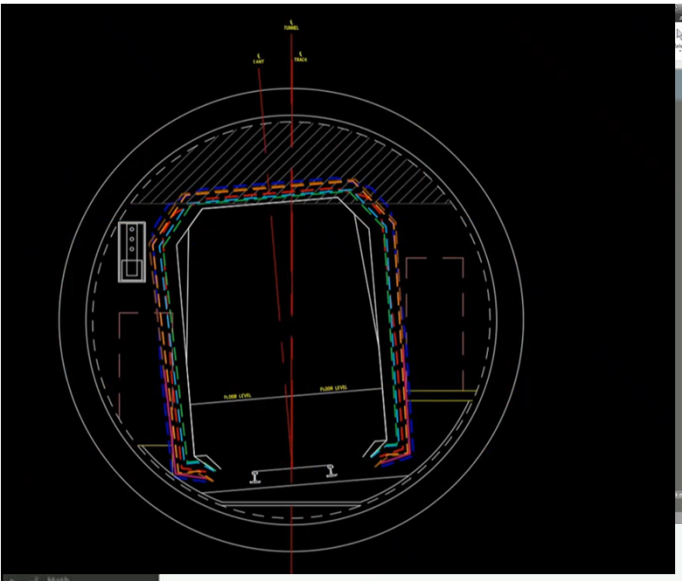
Changed to cloud-based data sharing

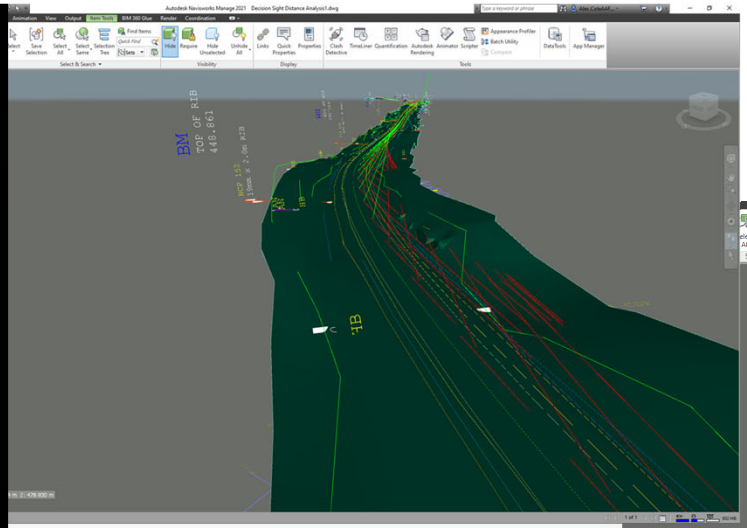
Drove the need for greater consistency and Flexibility in our Templates

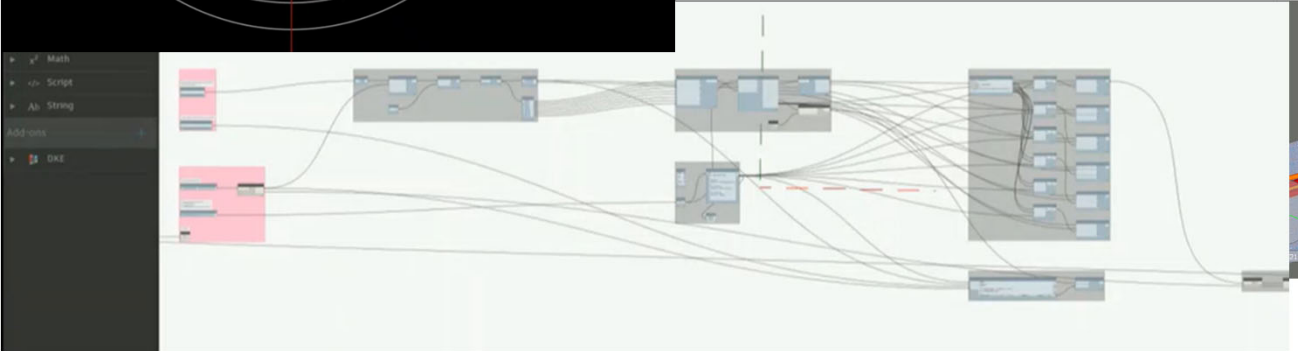
We started the process by engaging stakeholders

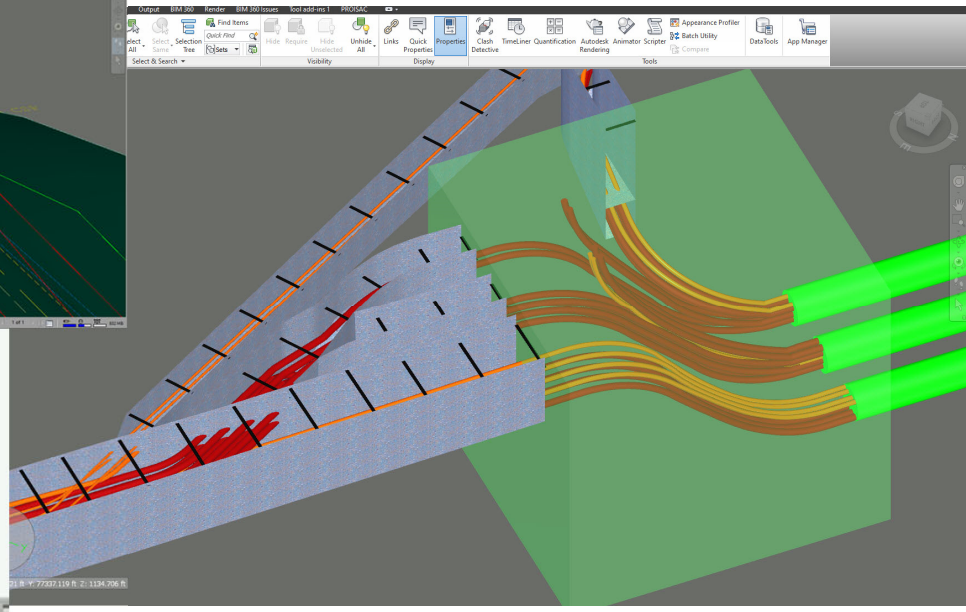
Template Requirements?

Our new workflow needed more flexibility and content for large BIM projects, yet clear and concise easy to consume templates for our day-to-day modeling activities.



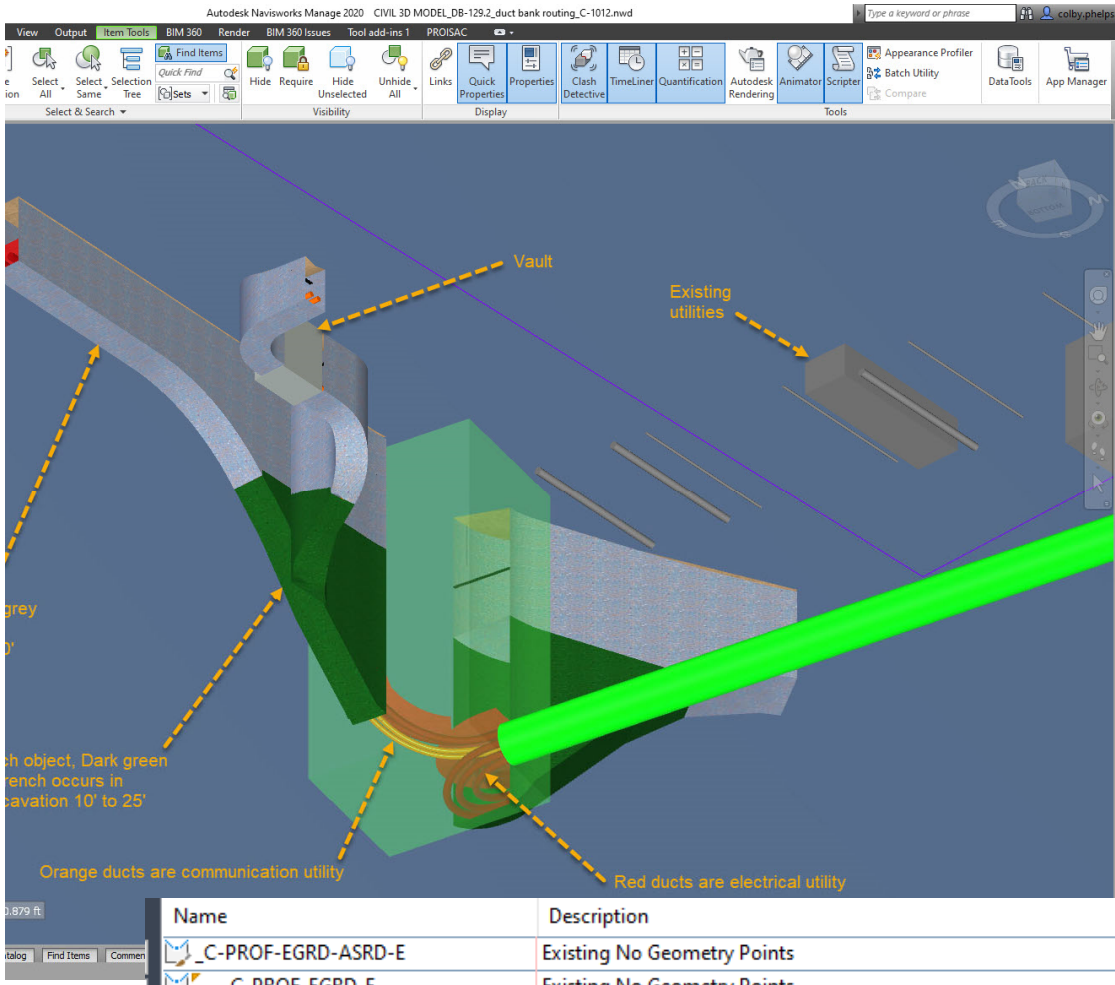






Template Requirements?

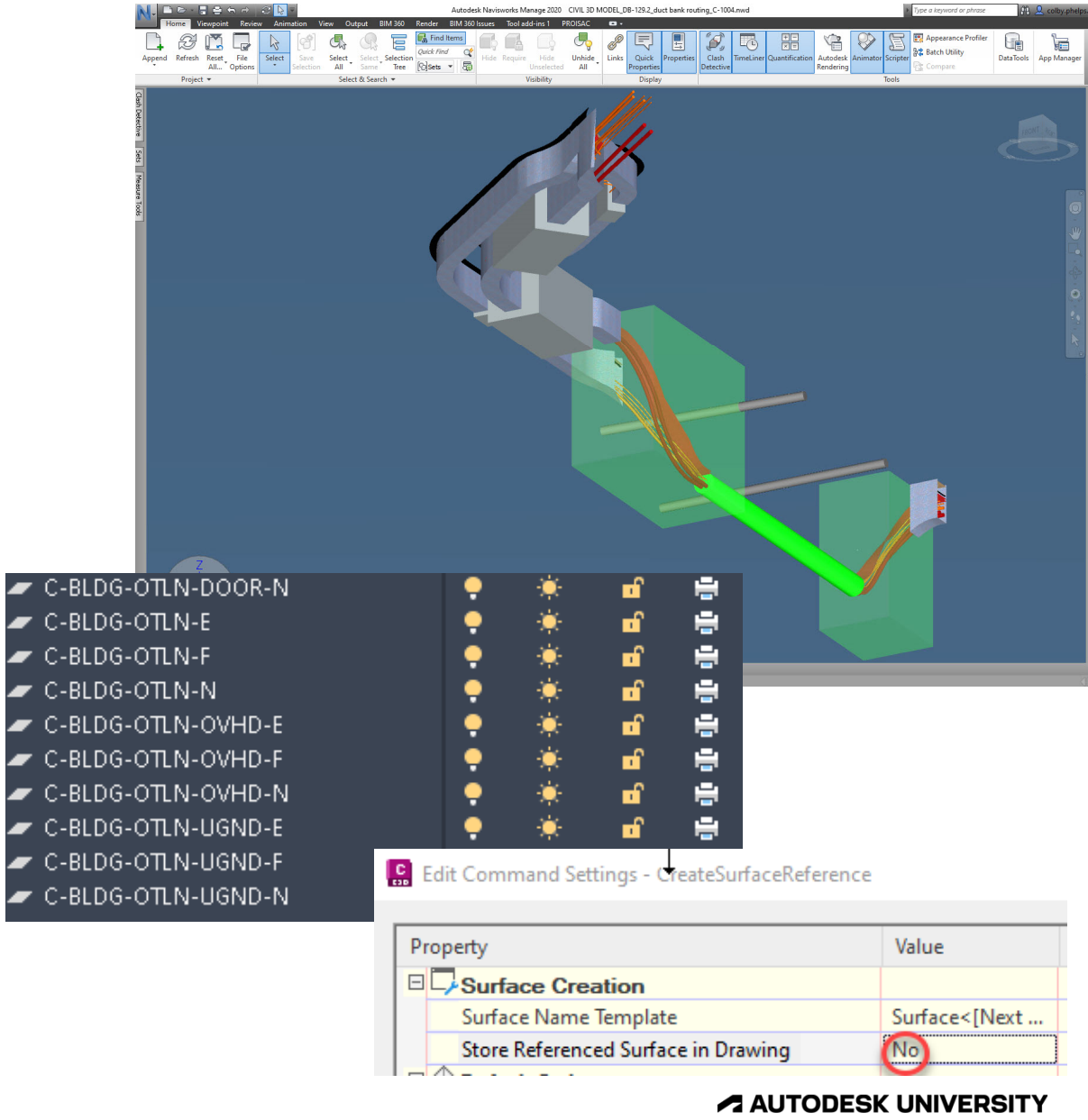
- Living templates and document - The ability to update and distribute
- Defined and consistent workflows – consistency equals efficiency!
- Concise templates - Working from home through Covid, VPN connections, and varying internet speeds
- Common Data Environment (CDE) - easy access to data for our stakeholders
- Flexibility in standards – we used the National Cad Standards (NCS)



Name	Description
_C-PROF-EGRD-ASRD-E	Existing No Geometry Points
_C-PROF-EGRD-E	Existing No Geometry Points
_C-PROF-FGRD-DTCH-N	New Finished Ditch Profile
_C-PROF-FGRD-N	New Finished Geometry Points Displayed
_C-PROF-FGRD-NOPI-N	New Finished No Geometry Points
_C-PROF-INTR-FGRD-NOPI-N	New No Markers, Interpolated Finished Ground Surface
_C-PROF-INTR-FGRD-NOPI-NPLT-N	New No Markers, Interpolated Finished Ground Surface, No Plot
_C-PROF-WATR-N	New Finished No Geometry Points

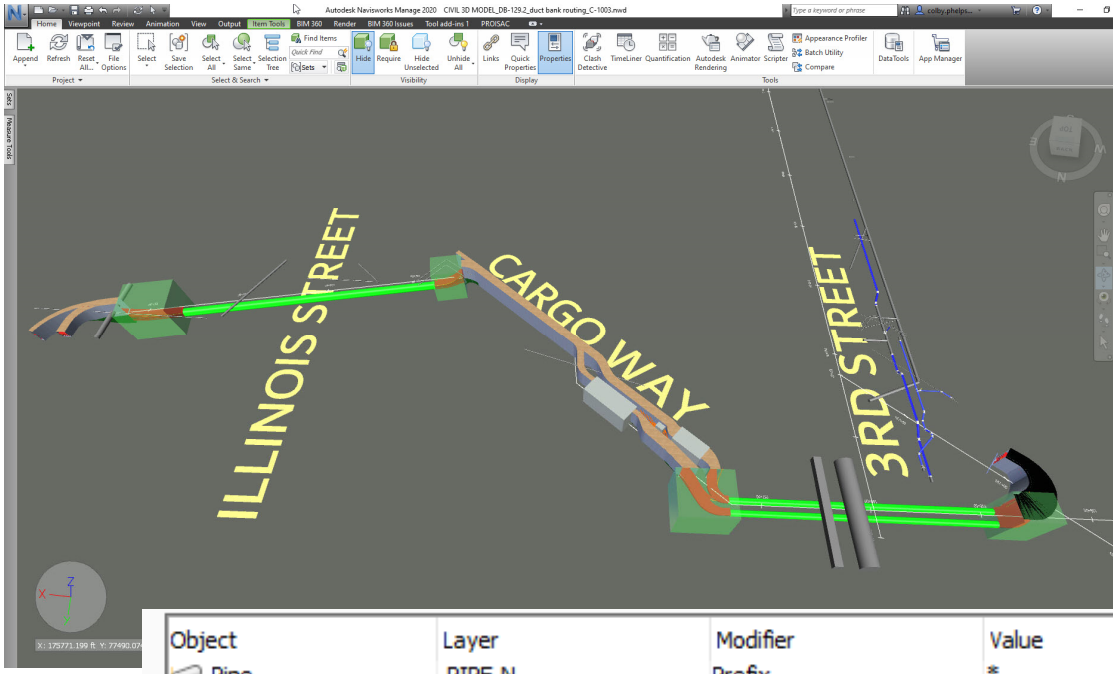
Template Requirements?

- ISO 19650 Compliant – you need control, checks, and records
- Cloud based - central CDE storage to maintain your 3D models
- Collaboration - Model coordination's between Civil 3D groups
- Automate – Leverage property sets for consistency
- Reference templates! – layers of standardization and functionality at your fingertips



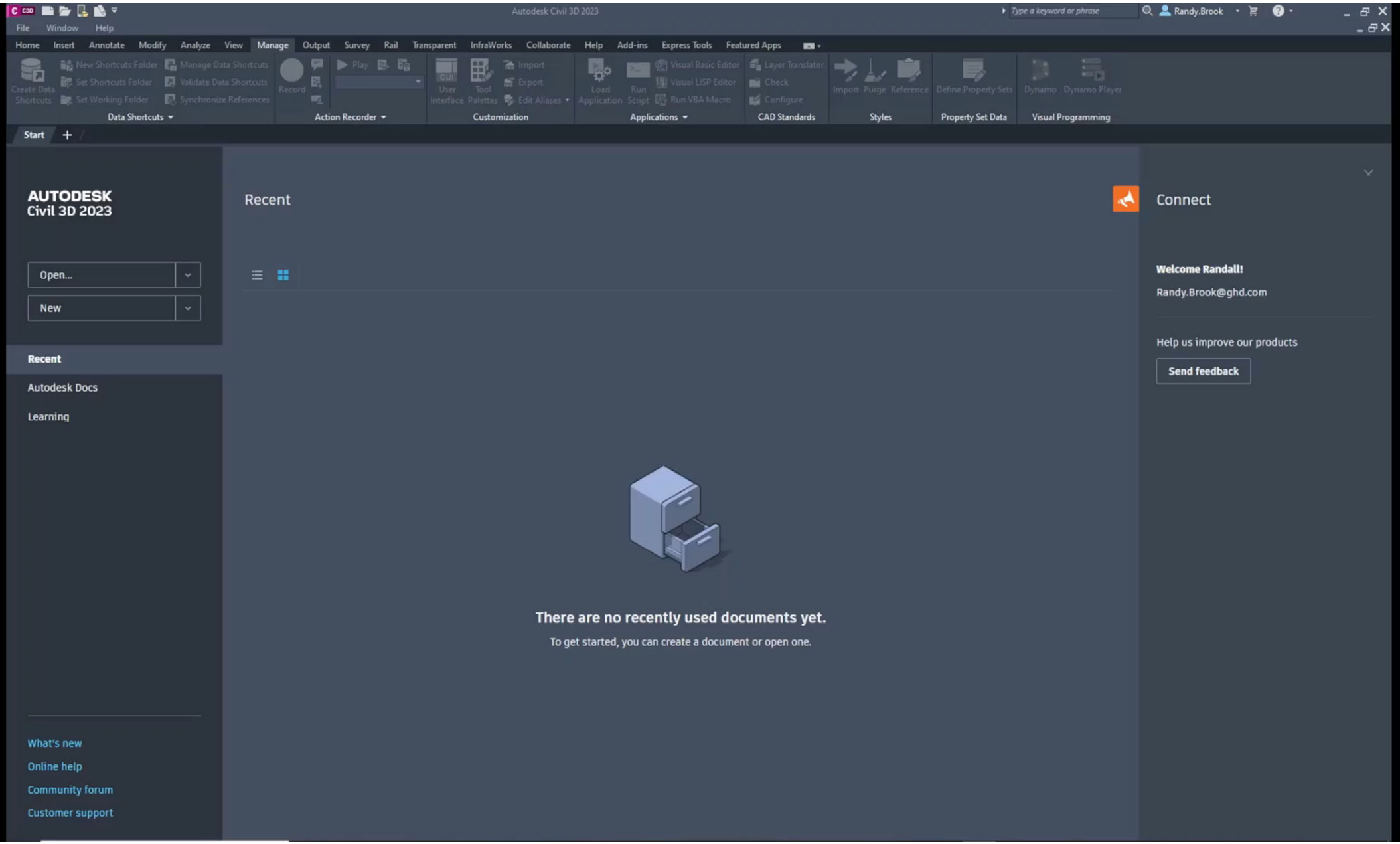
Template Requirements?

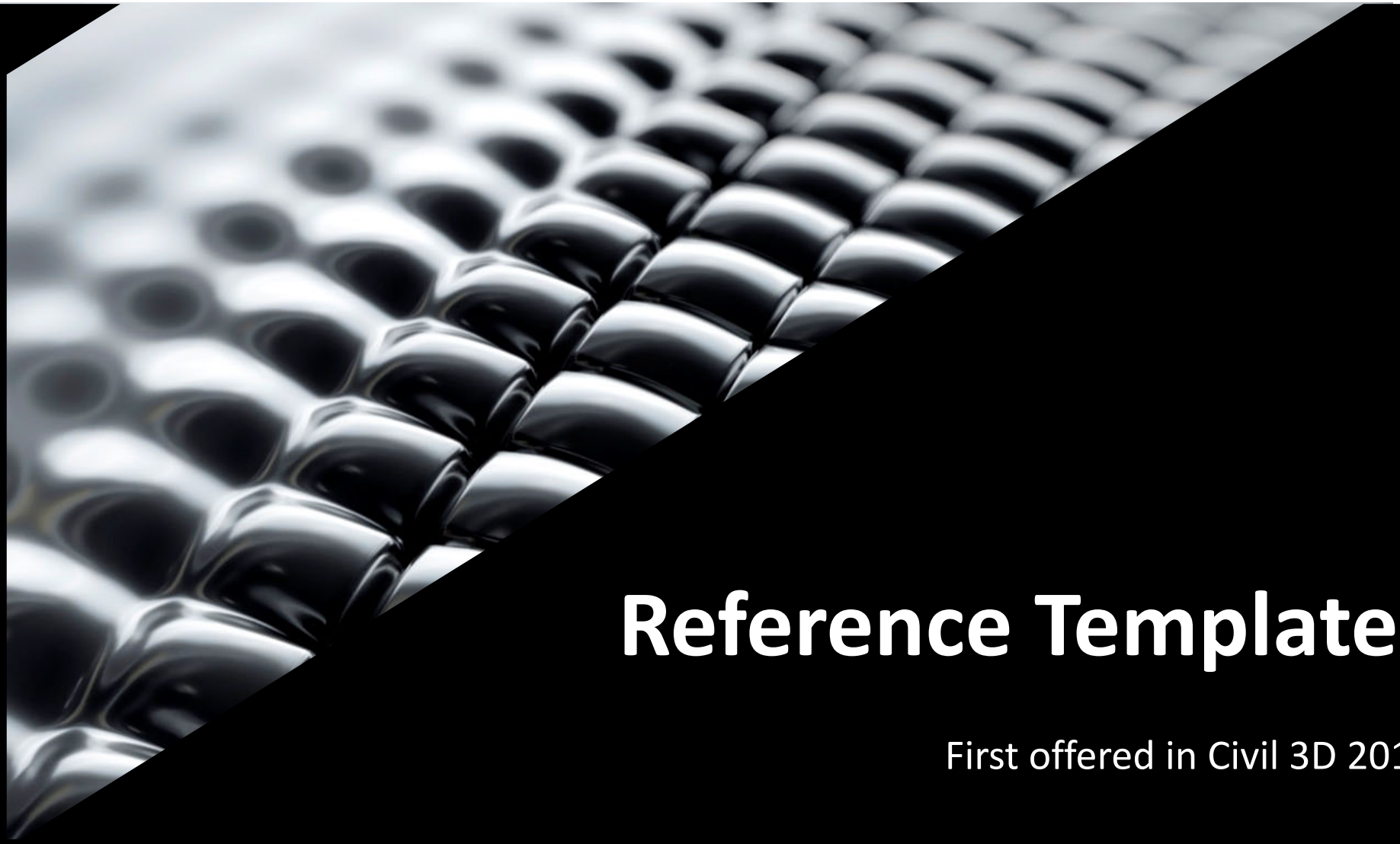
- Autodesk Best Practices! – why recreate the wheel
- Predefine objects so Object layer works with our NCS standards
- Check *all* the Commands
- Descriptions, descriptions, and more descriptions!



Object	Layer	Modifier	Value
Pipe	-PIPE-N	Prefix	*
Pipe-Labeling	-TEXT-N	Prefix	*
Pipe and Structure ...	-TEXT-N	Prefix	*
Pipe Network Section	-PROF-N	Prefix	*
Pipe or Structure Pr...	-PROF-N	Prefix	*
Point Table	C-SITE-TEXT-N	None	
Pressure Network S...	-SECT-N	Prefix	*
Pressure Part Profile	-PROF-N	Prefix	*
Pressure Part Table	-TEXT-N	Prefix	*
Pressure Pipe	-PIPE-N	Prefix	*
Pressure Pipe-Label...	-TEXT-N	Prefix	*

Name	Description	Network Parts List
C-SSWR	Design Sanitary Sewer	_C-SSWR-N
C-STRM	Design Storm Sewer	_C-STRM-N
C-STRM-FDCS	Design Foundation Drain Collection System	_C-STRM-FDCS-N
C-WATR	Design Watermain	_C-WATR-E


Autodesk Civil 3D 2023
Type a keyword or phrase
Randy.Brook
File
Window
Help
Home
Insert
Annotate
Modify
Analyze
View
Manage
Output
Survey
Rail
Transparent
InfraWorks
Collaborate
Help
Add-ins
Express Tools
Featured Apps
Create Data Shortcuts
New Shortcuts Folder
Set Shortcuts Folder
Set Working Folder
Manage Data Shortcuts
Validate Data Shortcuts
Synchronize References
Data Shortcuts
Record
Play
Action Recorder
User Interface
Tool Palettes
Import
Export
Edit Aliases
Customization
Load Application
Run Script
Visual Basic Editor
Visual LISP Editor
Run VBA Macro
Applications
Layer Translator
Check
Configure
CAD Standards
Import
Purge
Reference
Styles
Define Property Sets
Property Set Data
Dynamo
Dynamo Player
Visual Programming
Start
AUTODESK
Civil 3D 2023
Open...
New
Recent
Autodesk Docs
Learning
What's new
Online help
Community forum
Customer support
Recent
There are no recently used documents yet.
To get started, you can create a document or open one.
Connect
Welcome Randall!
Randy.Brook@ghd.com
Help us improve our products
Send feedback



Reference Templates

First offered in Civil 3D 2017

About reference templates

Template

- Primary Template
  - 2D Template
  - C3D Base Template – with Predefined Objects
  - Survey Template
  - Unit based – Metric/Imperial
  - Language variants

Reference Template

- Reference Template
  - Corridor Templates for Road, and Rail
  - Civil Design Template
  - Cad Template (layers, blocks, text styles and line styles)
  - Property Sets Templates
  - Client requirements

Workflow

- BIM Manager
  - Selects the Template and all Reference Templates based on the BIM Execution Plan requirements
- Add layers of functionality
  - that is project based
- Add flexibility
  - local, regional, or global standards

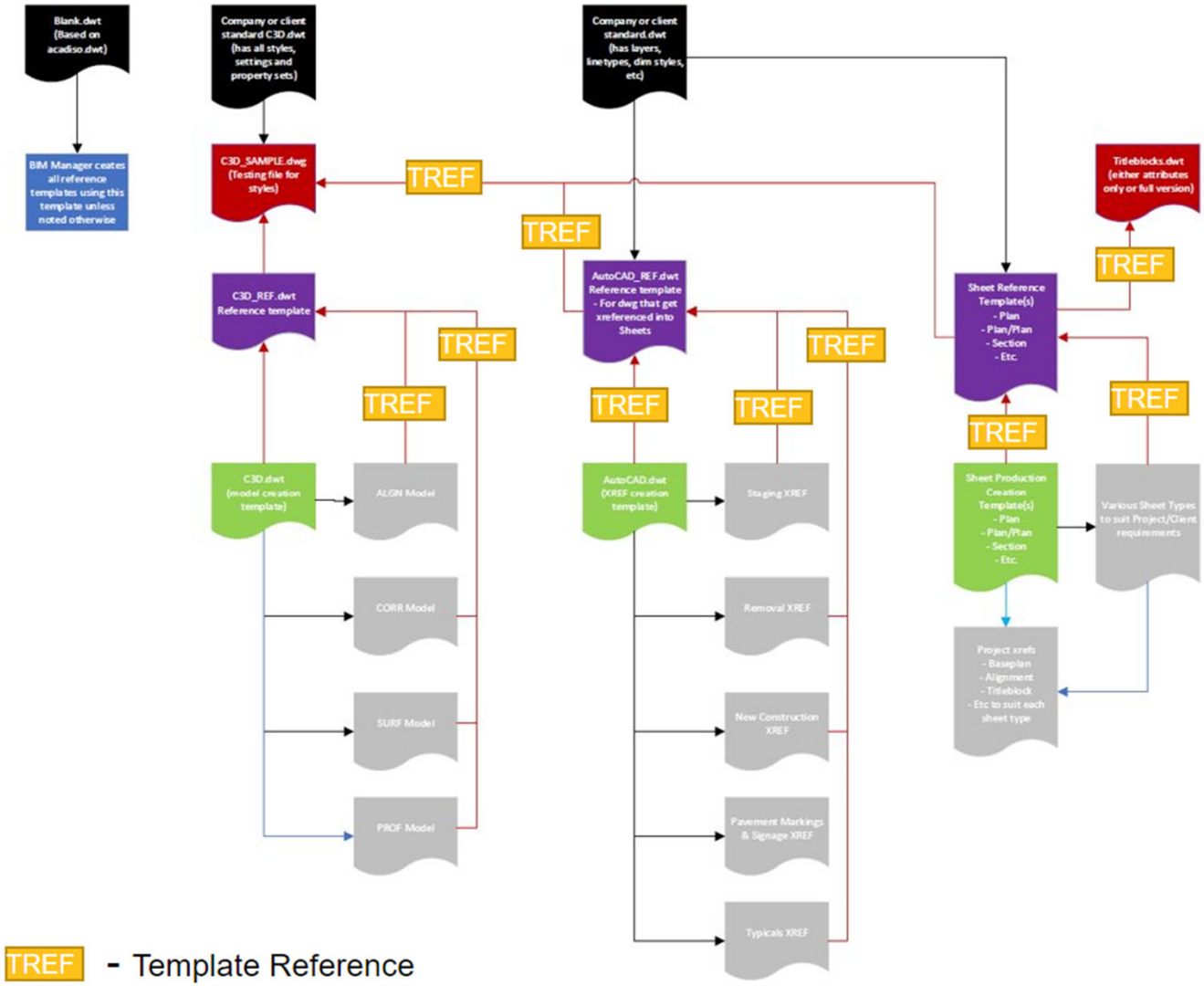
Template Structure

Create reference templates to suit your projects design requirements

Name	Contains
2D2022_Prime_2DBlank_CA_M 2D2022_Prime_2DBlank_US_I	Blank templates, they have references to the C3D2022_Ref_CAD_CA_M (Metric) or Imperial as a reference template.
C3D2022_Prime_Base_CA_M C3D2022_Prime_Base_US_I	These templates contain the base information to start a C3D drawing, there is predefined point groups, Design Surface, Sites and Description Keys. These items are not transferred with a reference template. They reference C3D2022_Ref_CAD_CA_M and I, C3D2022_Ref_CAD_CA_M and I, and C3D2022_Ref_Property_Set_CA_M and I
C3D2022_Prime_Survey_CA_M C3D2022_Prime_Survey_US_I	These are standalone templates, there are predefined point groups, surfaces and sites, for surveying
C3D2022_Ref_CAD_CA_M C3D2022_Ref_CAD_US_I	When referenced into other drawings, these templates bring all the basic AutoCAD goodies such as Civil Layers, Blocks, Line Types, Dimension Styles, and Text Styles.
C3D2022_Ref_Design_CA_M C3D2022_Ref_Design_US_I	When reference into other drawings, these templates will add all the C3D settings and styles for objects.
C3D2022_Ref_Property_Set_CA_M C3D2022_Ref_Property_Set_US_I	When referenced, these templates will add the Property Set Data and Style functionality to your models

Template Structure

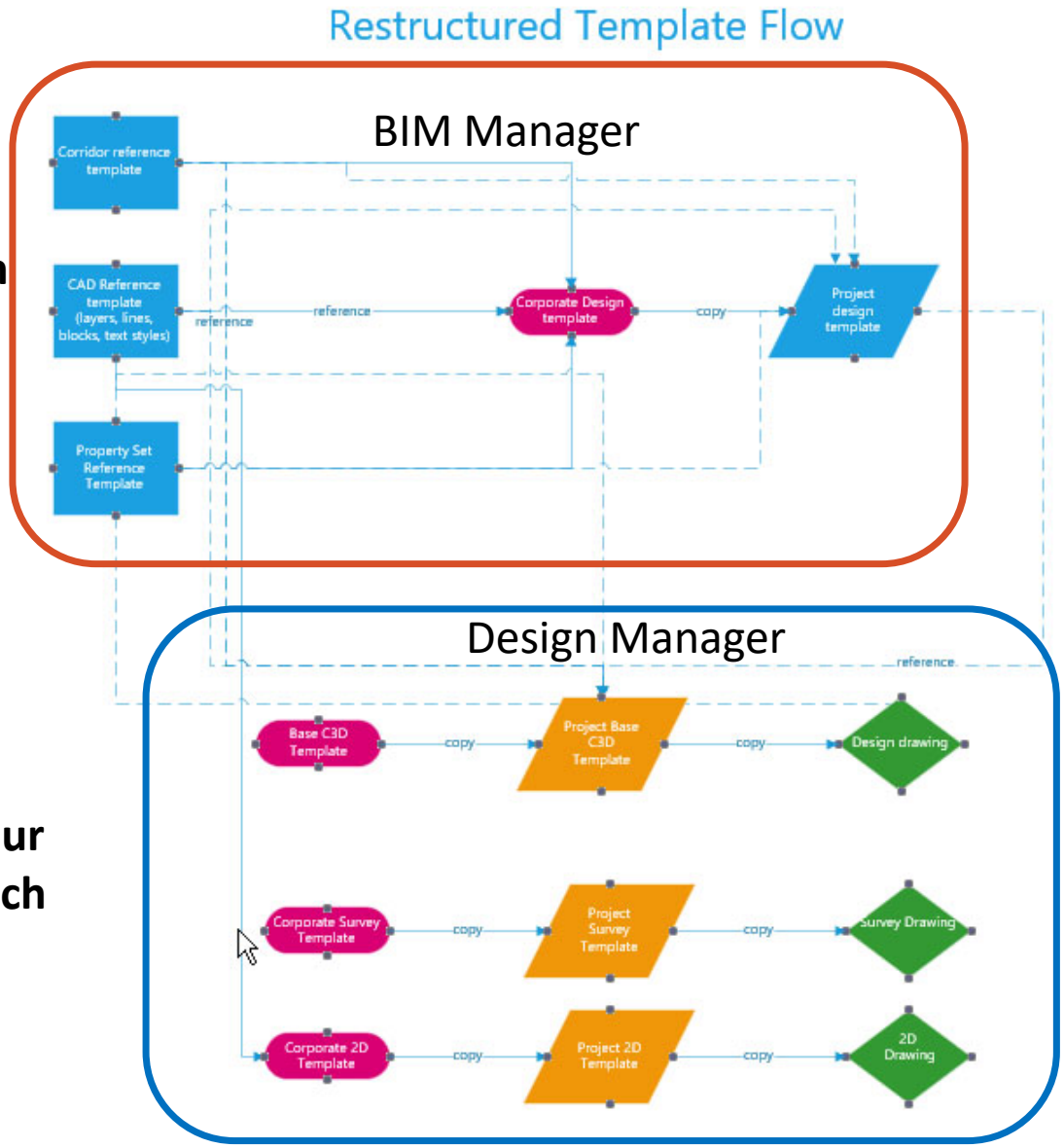
Create reference templates to suit your projects design requirements



Best Practice

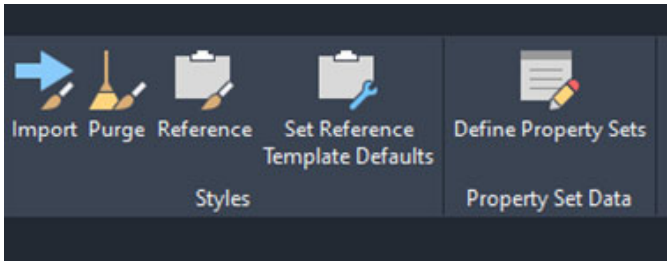
BIM Manager creates each project design template using your projects BIM Execution Plan

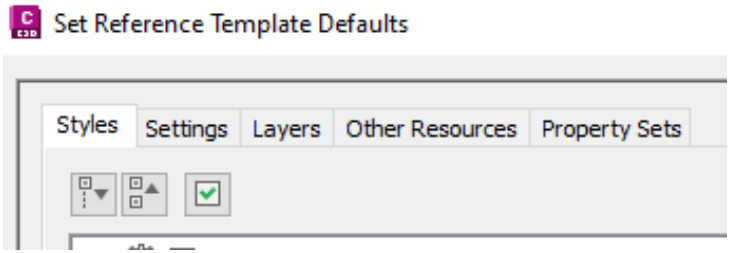
Design Manager guides your design team in creating each DWG file

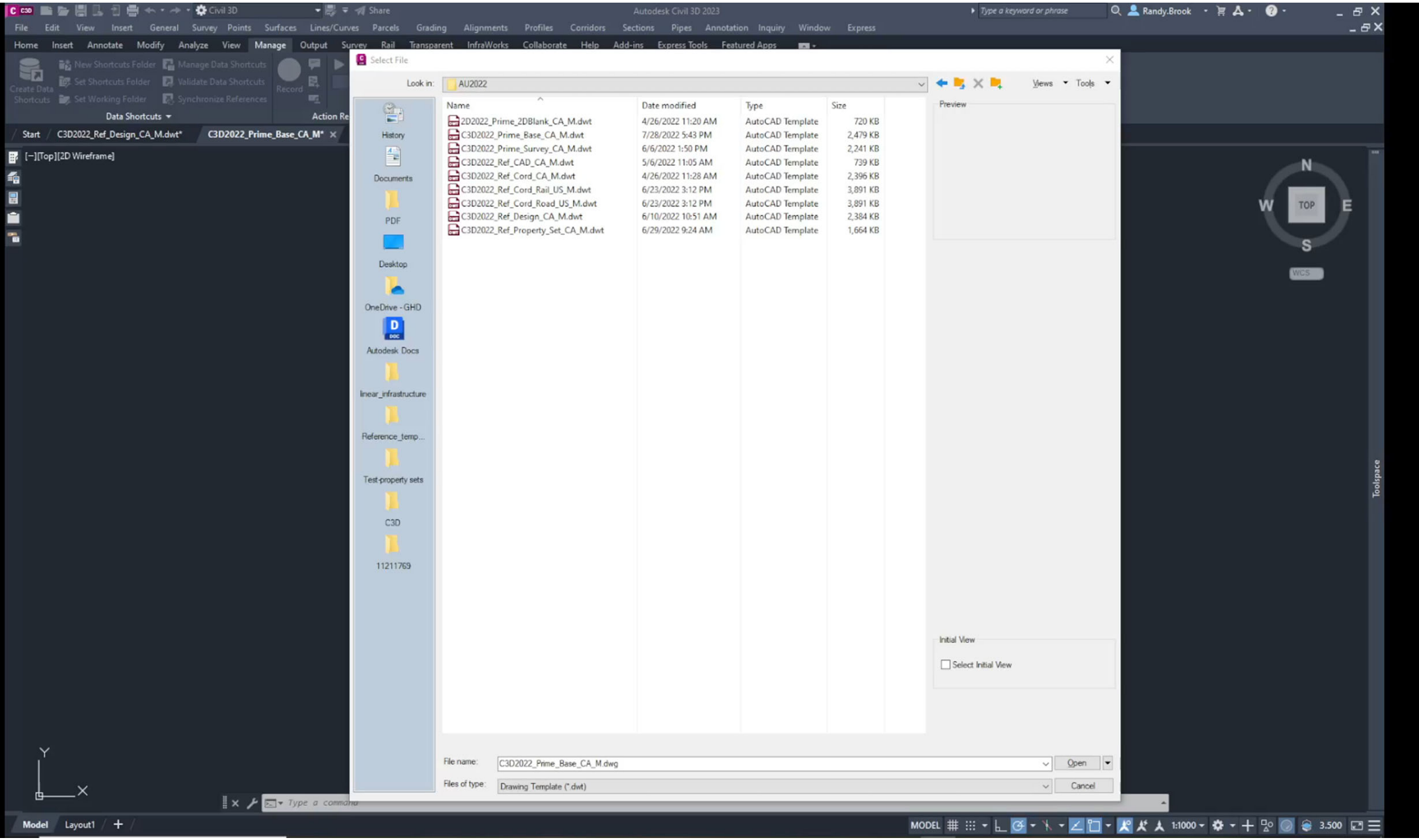


Restructuring Templates…

- Look for the Best Practices
- Look for ways to create a single source of truth
- Project Templates vs Global Templates?
  - There’s a reference for that!
- Always use DWT’s for your reference templates
- "AECCREFTEMPLATEAUTOUPDATE" Set to 0 or 1?






Civil 3D
Autodesk Civil 3D 2023
Randy.Brook
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C3D2022_Prime_Base_CA_M.dwt 7/28/2022 5:43 PM AutoCAD Template 2,479 KB
C3D2022_Prime_Survey_CA_M.dwt 6/6/2022 1:50 PM AutoCAD Template 2,241 KB
C3D2022_Ref_CAD_CA_M.dwt 5/6/2022 11:05 AM AutoCAD Template 739 KB
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History
Documents
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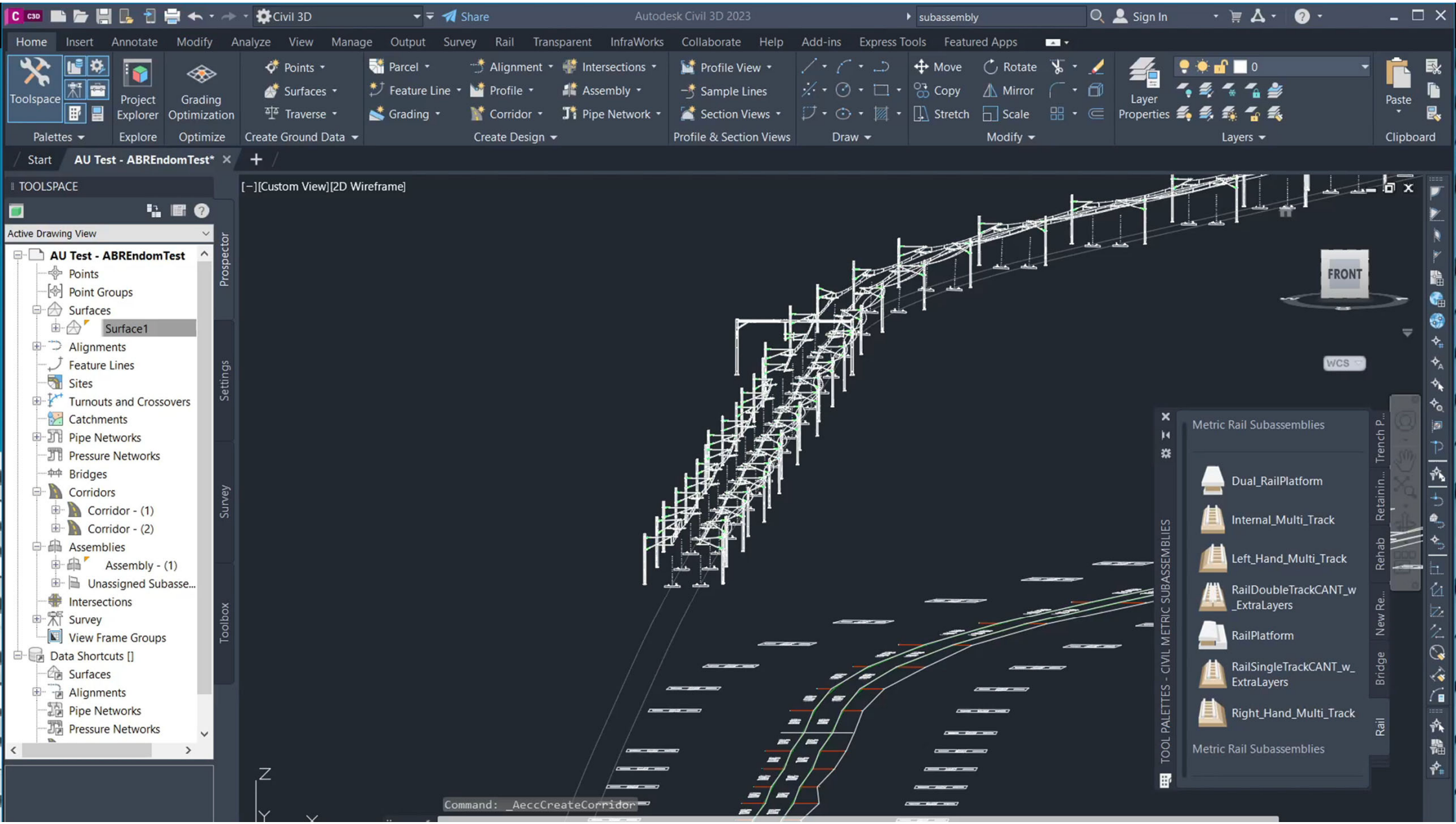
Civil 3D
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Survey
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Transparent
InfraWorks
Collaborate
Help
Add-ins
Express Tools
Featured Apps
Toolspace
Project Explorer
Grading Optimization
Points
Surfaces
Traverse
Parcel
Feature Line
Grading
Alignment
Profile
Corridor
Intersections
Assembly
Pipe Network
Profile View
Sample Lines
Section Views
Move
Copy
Stretch
Rotate
Mirror
Scale
Layer Properties
Paste
Palettes
Explore
Optimize
Create Ground Data
Create Design
Profile & Section Views
Draw
Modify
Layers
Clipboard
Start
AU Test - ABREndomTest*
TOOLSPACE
Active Drawing View
AU Test - ABREndomTest
Points
Point Groups
Surfaces
Surface1
Alignments
Feature Lines
Sites
Turnouts and Crossovers
Catchments
Pipe Networks
Pressure Networks
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Assemblies
Assembly - (1)
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FRONT
WCS
Metric Rail Subassemblies
Dual_RailPlatform
Internal_Multi_Track
Left_Hand_Multi_Track
RailDoubleTrackCANT_w_ExtraLayers
RailPlatform
RailSingleTrackCANT_w_ExtraLayers
Right_Hand_Multi_Track
Metric Rail Subassemblies
TOOL PALETTES - CIVIL METRIC SUBASSEMBLIES
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Retainin...
Rehab
New Re...
Bridge
Rail
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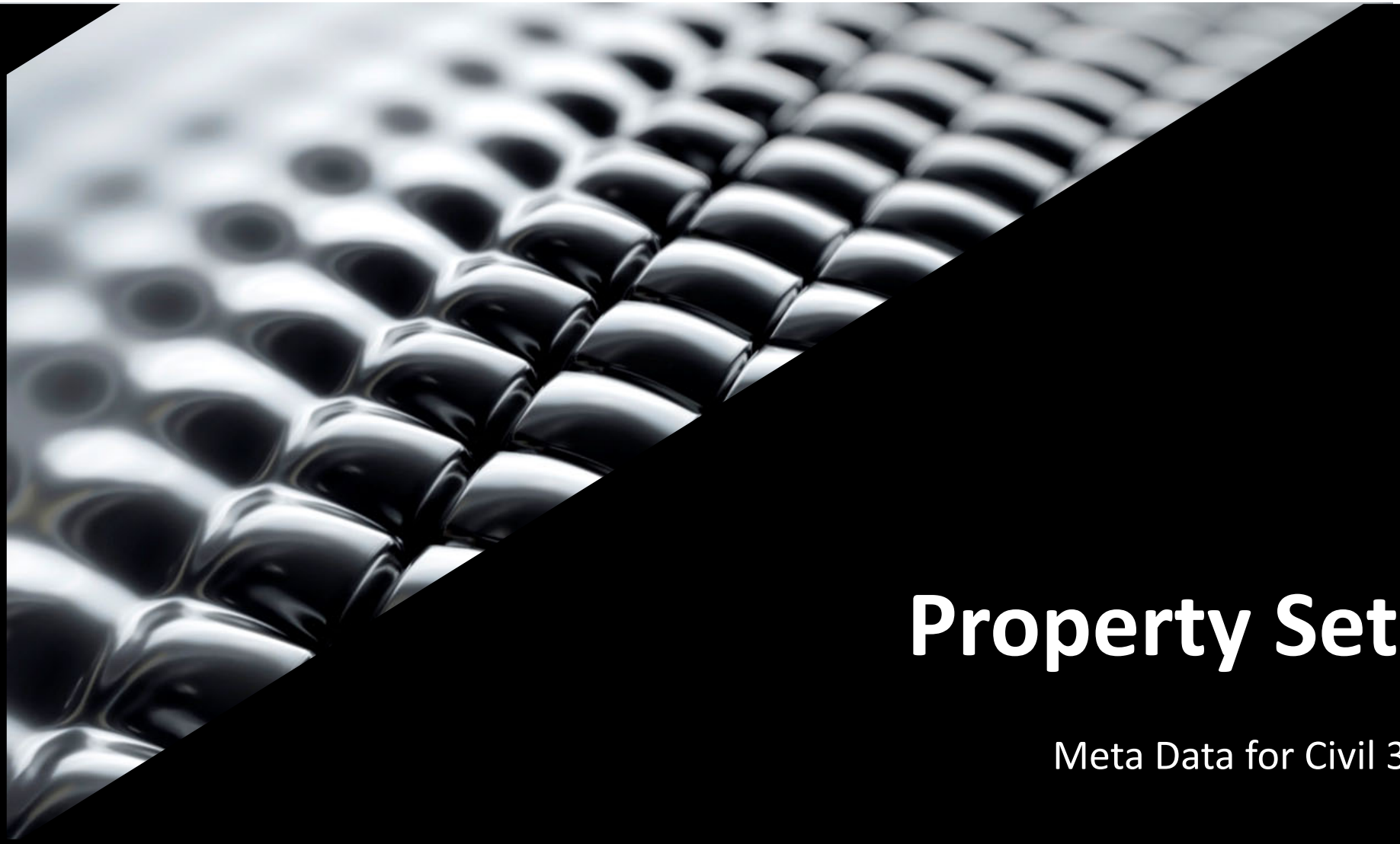
Command: _AeccCreateCorridor



Property Sets

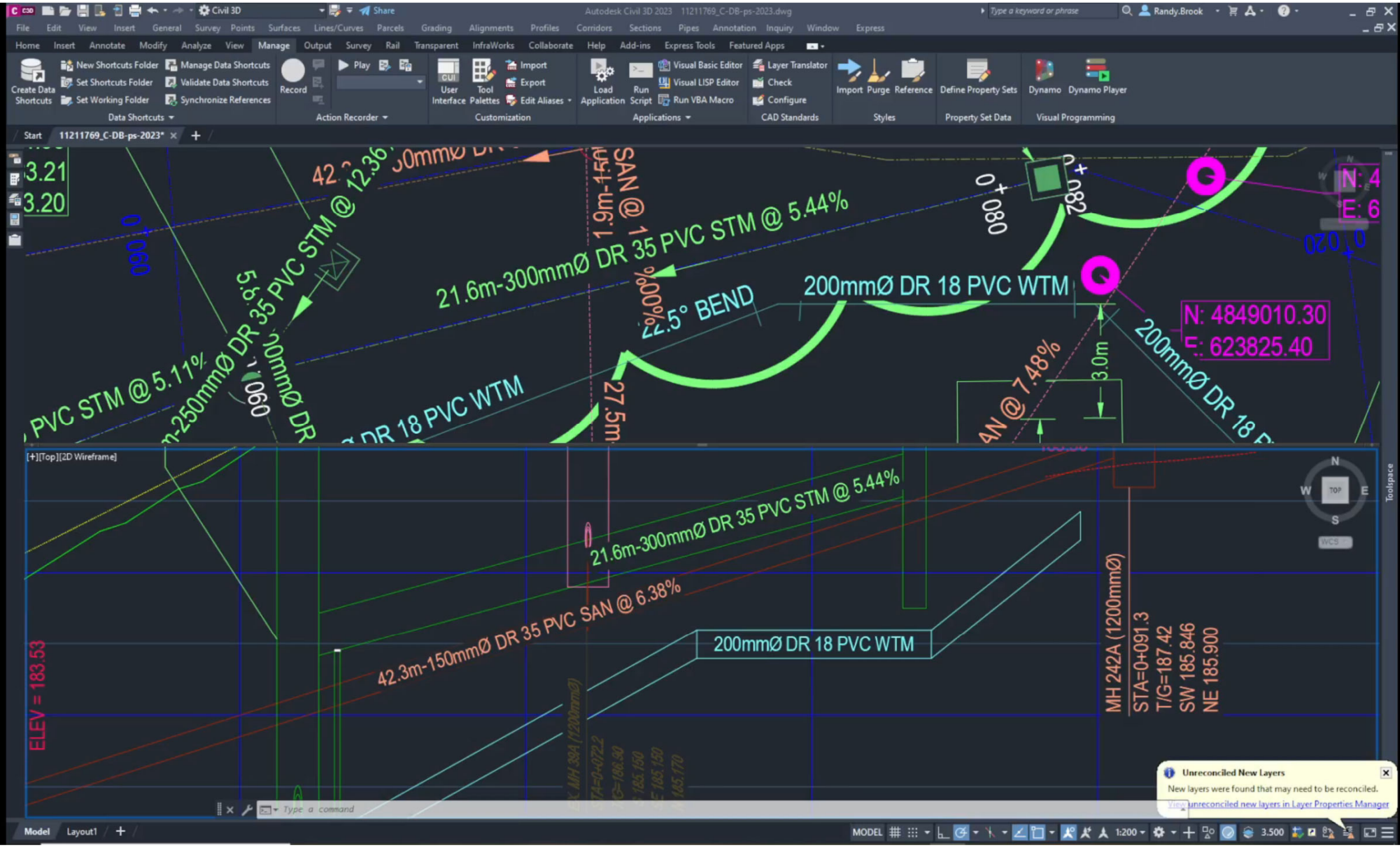
Meta Data for Civil 3D

Property Sets

How will meta data change your workflows?

How can it enrich your models?

- Think of buying a new vehicle
  - Window sticker represents the cars meta data!
  - Does it have what you need?
- Do you need more options
- Consider its use
- Look at its cost!!


Civil 3D
Autodesk Civil 3D 2023 11211769_C-DB-ps-2023.dwg
Randy.Brook
Create Data Shortcuts
New Shortcuts Folder
Set Shortcuts Folder
Set Working Folder
Manage Data Shortcuts
Validate Data Shortcuts
Synchronize References
Record
Play
User Interface
Tool Palettes
Import
Export
Edit Aliases
Load Application
Run Script
Visual Basic Editor
Visual LISP Editor
Run VBA Macro
Layer Translator
Check
Configure
Import
Purge
Reference
Define Property Sets
Dynamo
Dynamo Player
Data Shortcuts
Action Recorder
Customization
Applications
CAD Standards
Styles
Property Set Data
Visual Programming
Start
11211769_C-DB-ps-2023*
21.6m-300mmØ DR 35 PVC STM @ 5.44%
200mmØ DR 18 PVC WTM
22.5° BEND
N: 4849010.30
E: 623825.40
3.0m
[+][Top][2D Wireframe]
21.6m-300mmØ DR 35 PVC STM @ 5.44%
42.3m-150mmØ DR 35 PVC SAN @ 6.38%
200mmØ DR 18 PVC WTM
ELEV = 183.53
MH 242A (1200mmØ)
STA=0+091.3
T/G=187.42
SW 185.846
NE 185.900
Unreconciled New Layers
New layers were found that may need to be reconciled.
View unreconciled new layers in Layer Properties Manager
Type a command
Model
Layout1
MODEL
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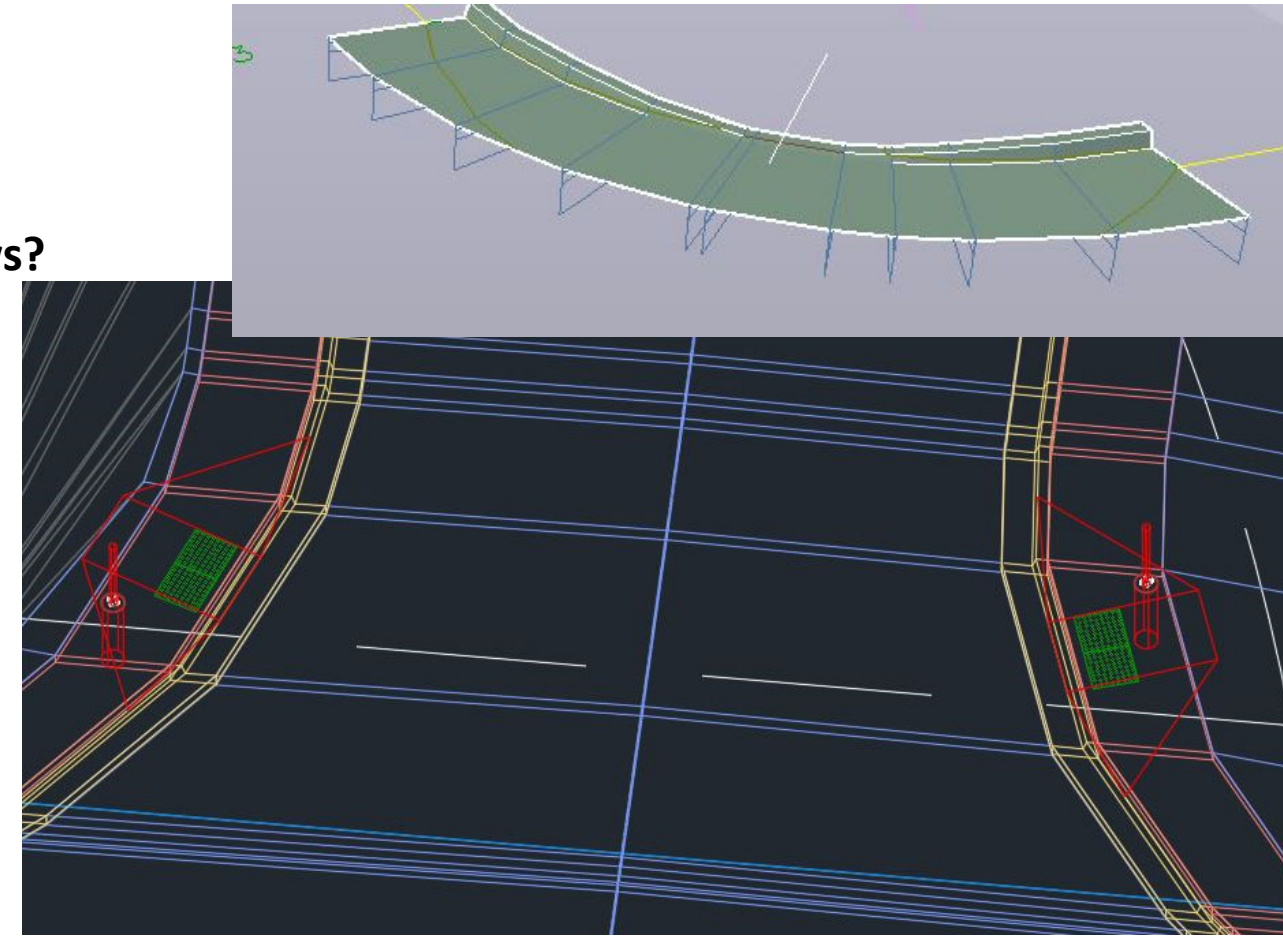
3.500

Property Sets

How will meta data change your workflows?

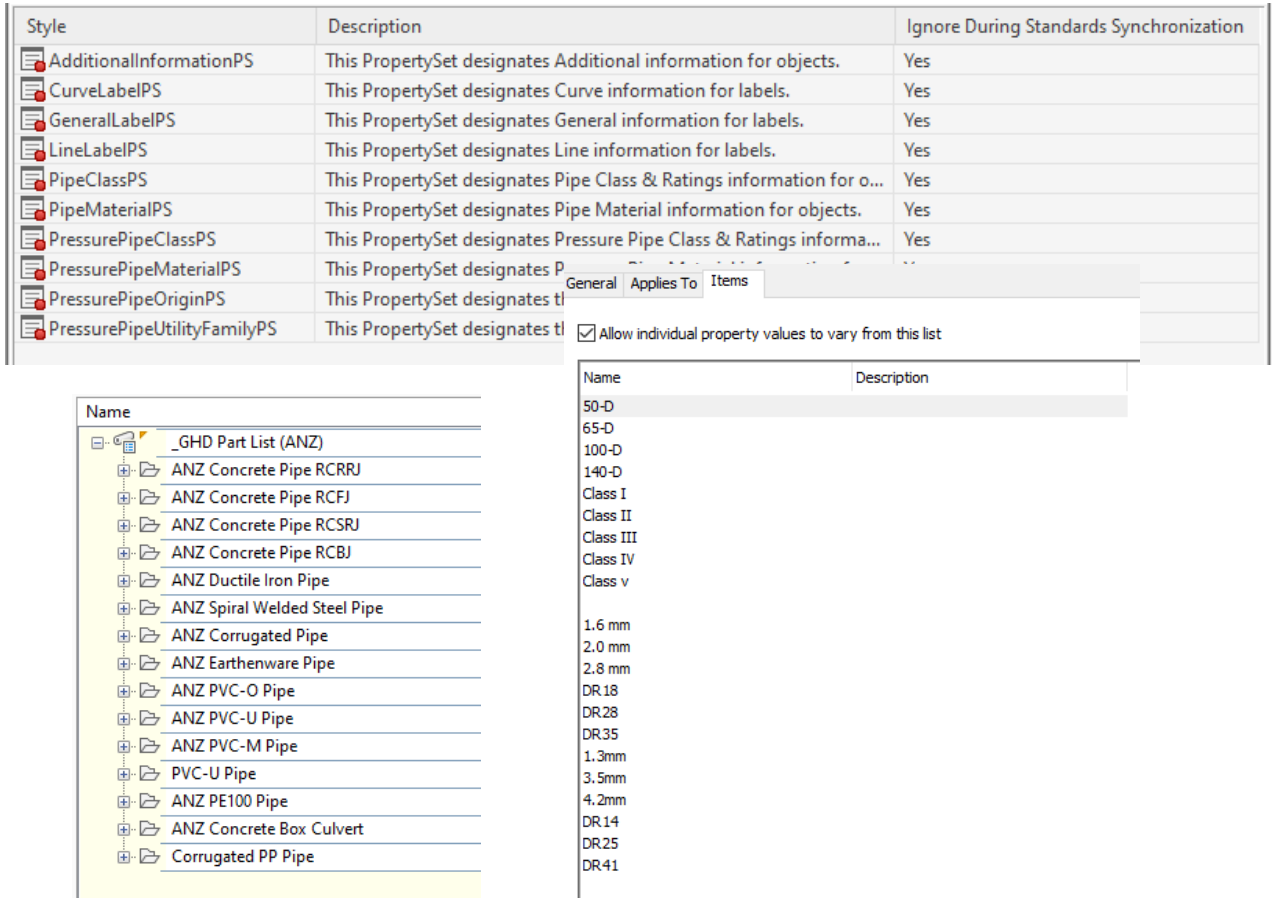


- Let’s take a common roadway element like Curb & Gutter
  - What meta data would you add?
- Barrier vs Mountable vs Dropped
- Straight vs Circular
- Wide Gutter vs Standard vs No Gutter
- Accessibility standards
- Client standards

Property Sets

How will meta data change your workflows?

- How about Pipe Networks
  - What meta data would you add?
- Material
- Class
- Coatings
- Durability Requirements
- Client standards

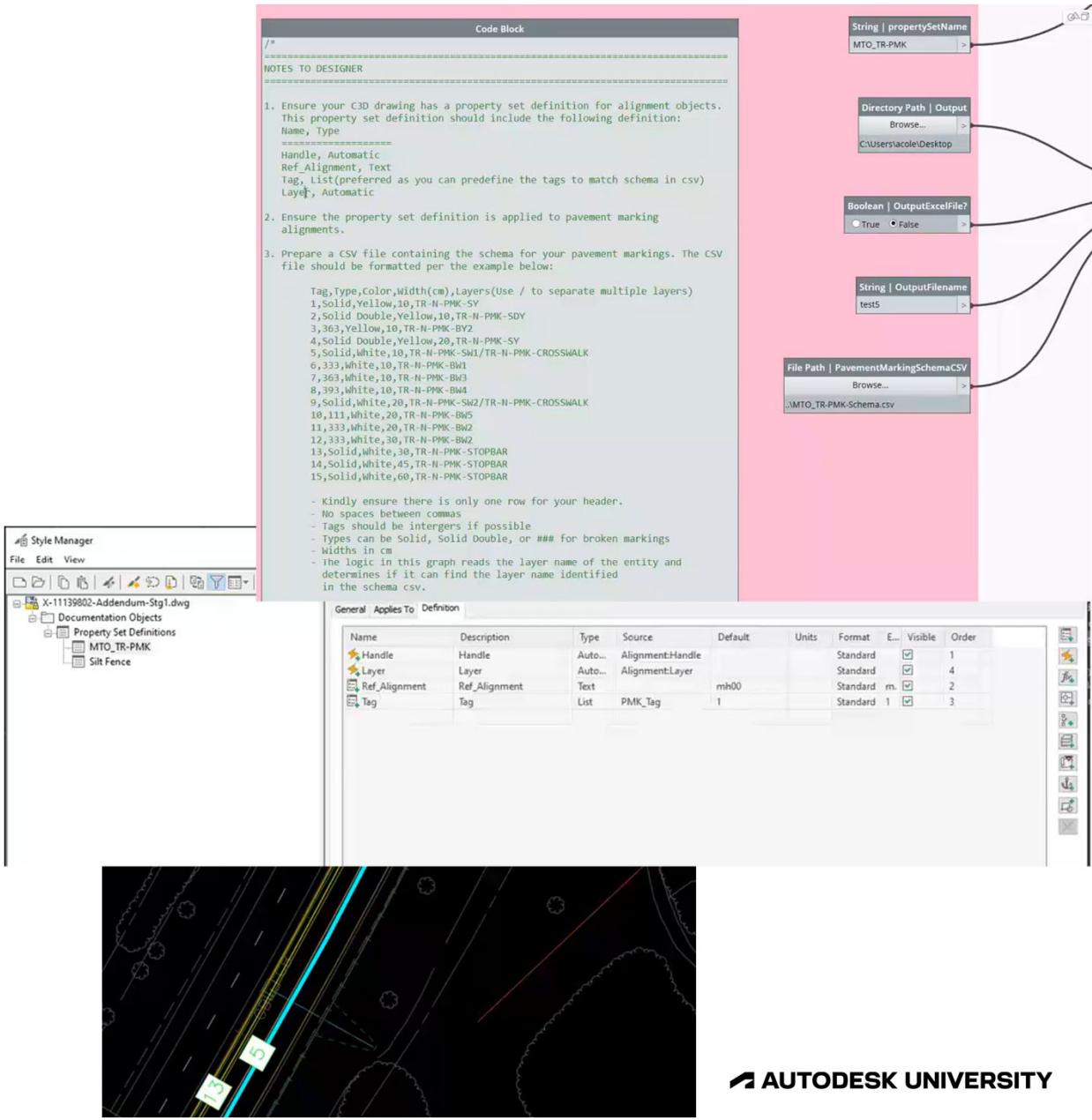


Property Sets

How will meta data change your workflows?

Now that we have our meta data added

- Use Dynamo to generate quantities
- Or to update your meta data
- Export your critical path schedule
  - Add a property set for your curbs production rate
    - 200m/day for straight – 80m/day for circular
    - 5 Day cure time required?
- Export your Contract Estimates
  - Add a property set for your pay items
    - $75.00/m for Wide gutter barrier curb
    - $35.00/m for Standard dropped curb

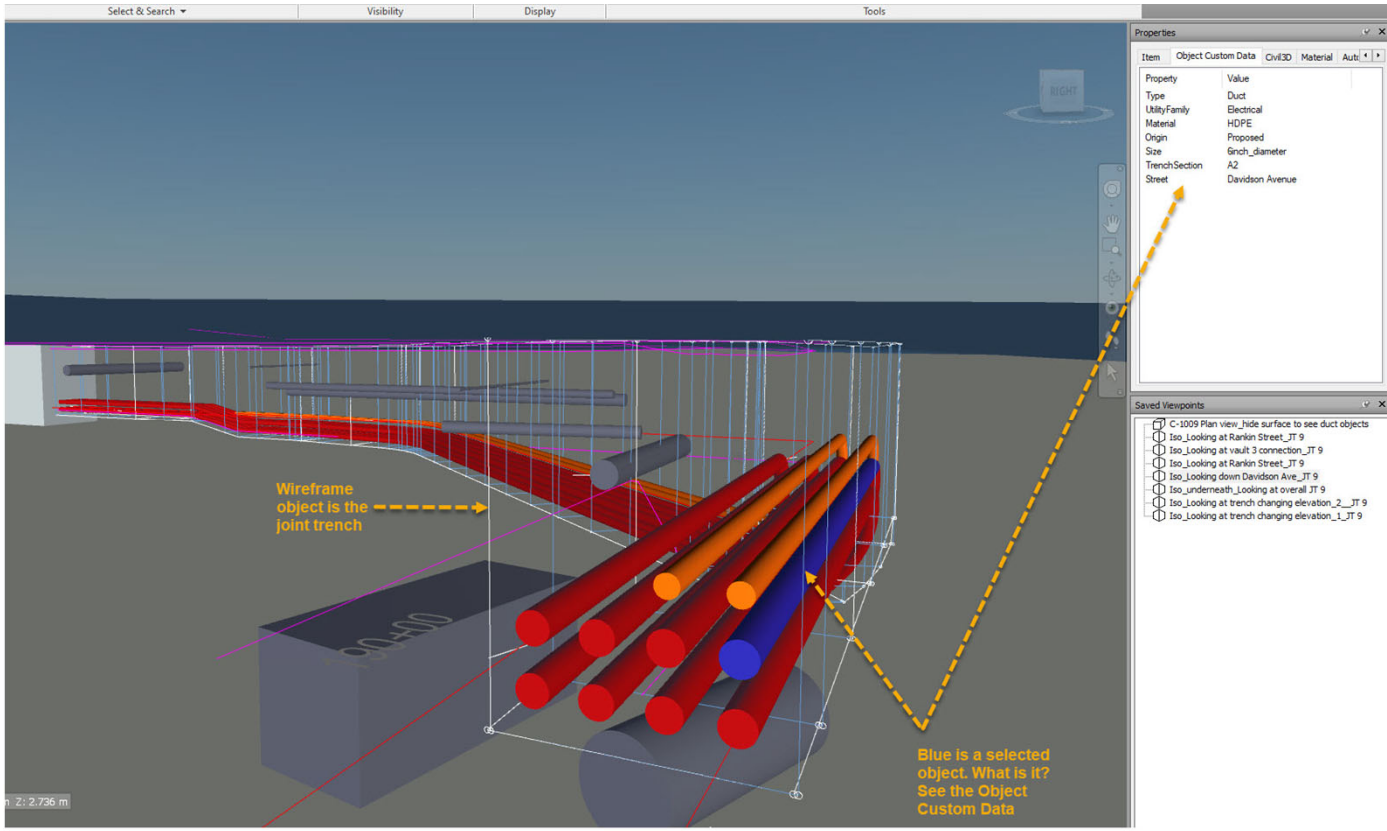


Property Sets

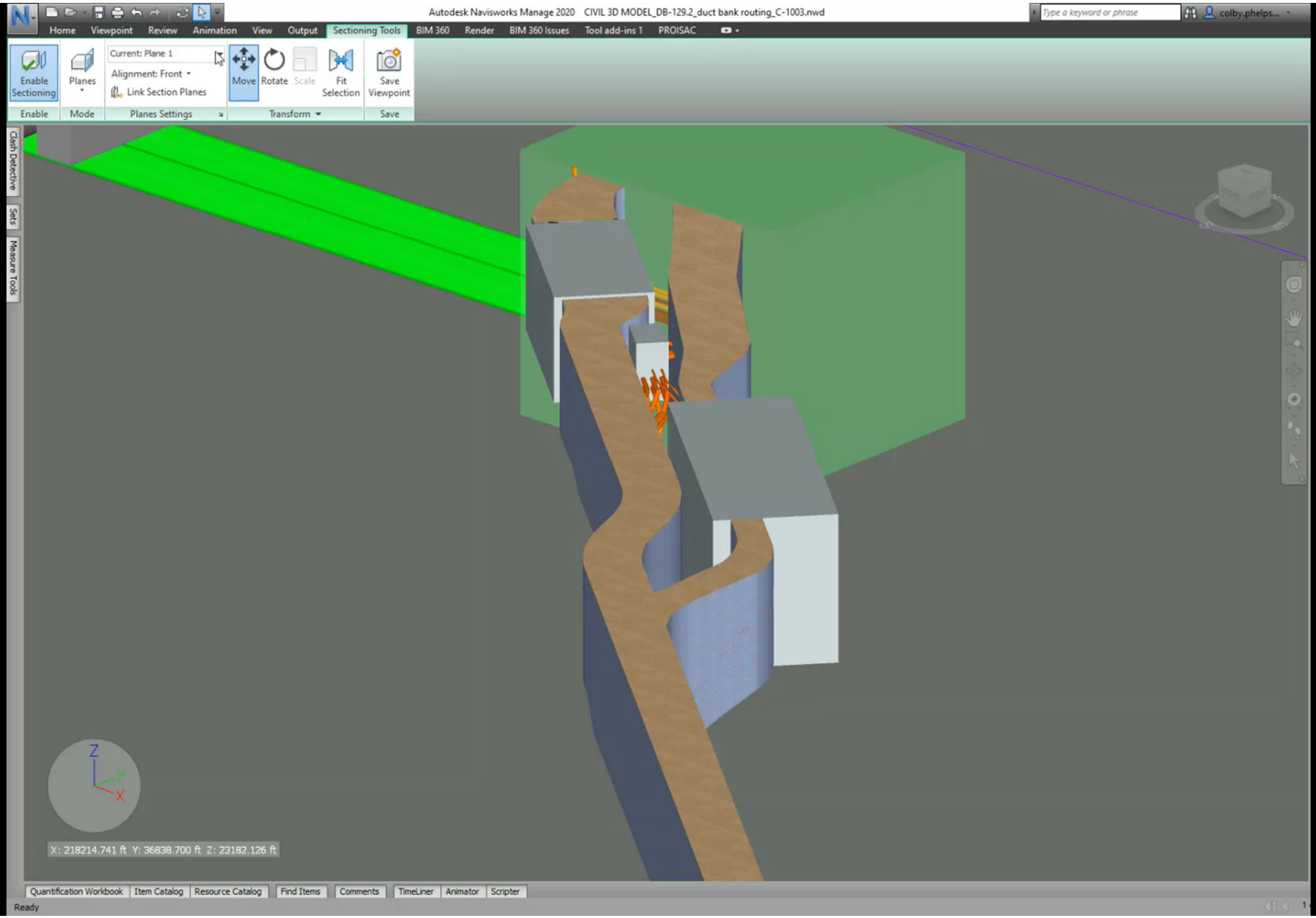
How can it enrich your models?

Federated Models in Navisworks!

- Adding property sets to your 3d Solids
- Import into Navisworks
- View your meta data



Property Sets = Meta Data = Model Intelligence


Autodesk Navisworks Manage 2020 CIVIL 3D MODEL_DB-129.2_duct bank routing_C-1003.nwd
Type a keyword or phrase
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Home Viewpoint Review Animation View Output Sectioning Tools BIM 360 Render BIM 360 Issues Tool add-ins 1 PROISAC
Enable Sectioning
Planes
Current: Plane 1
Alignment: Front
Link Section Planes
Move
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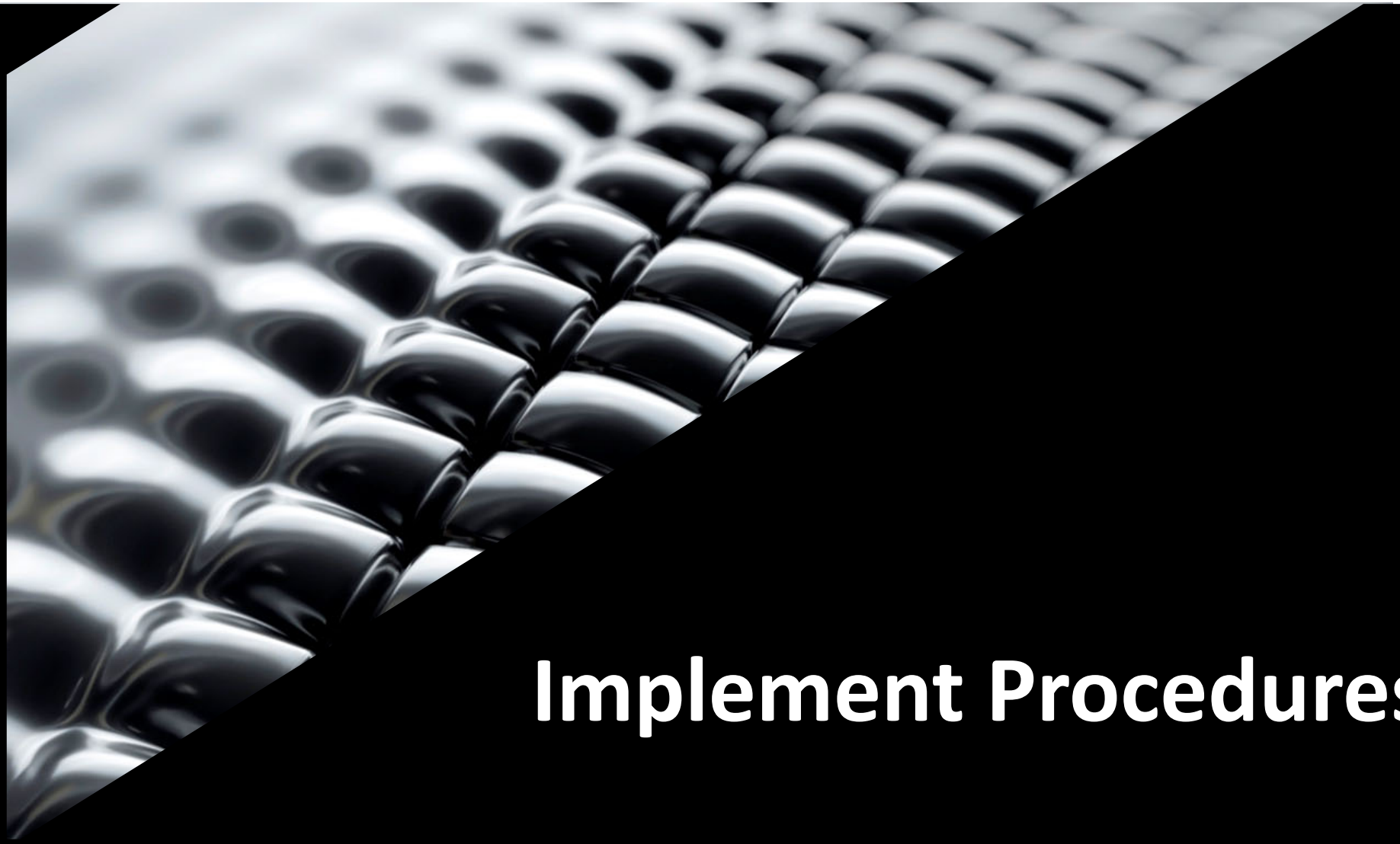
Scale
Fit Selection
Save Viewpoint
Enable
Mode
Planes Settings
Transform
Save
Clash Detective
Sets
Measure Tools
Z
Y
X
X: 218214.741 ft Y: 36838.700 ft Z: 23182.126 ft
Quantification Workbook
Item Catalog
Resource Catalog
Find Items
Comments
TimeLiner
Animator
Scripter
Ready



Implement Procedures

Managing your New Templates

CAD Manager

- Responsible for your primary Templates
  - Annual migration to new versions of C3D
  - Addition of content for new C3D features
- Recruit Champions to assist with the development
- Monthly workshops with your Template Development Group

BIM Manager

- Responsible for your Property Set Reference Templates
  - Develop meta data standards
  - ISO 19650 Compliance
  - LOD Requirements
  - Code Set Styles
- Assemble the BIM projects template structure

Design Managers

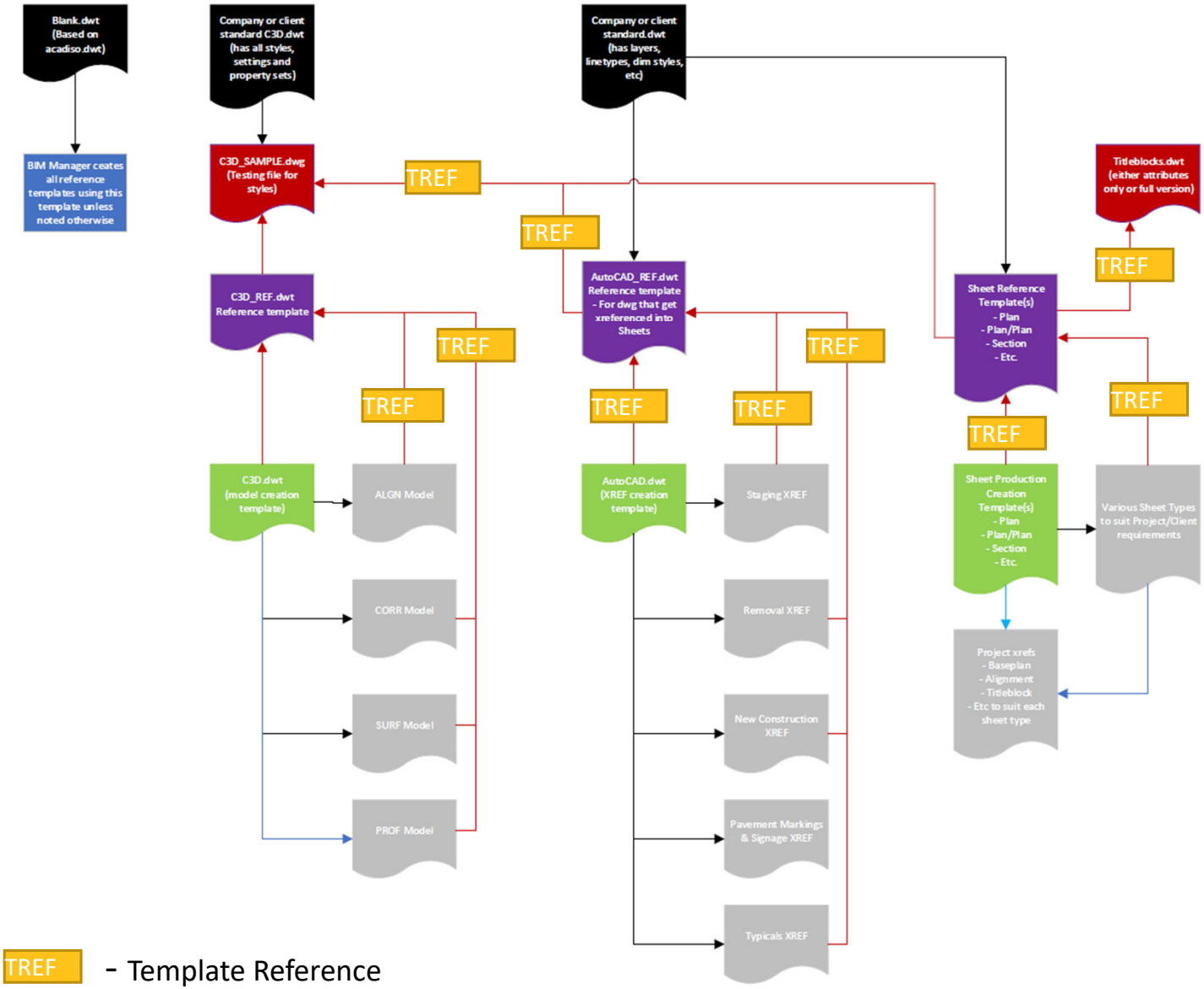
- Responsible for the Discipline Reference Template Content
  - Assign templates to your service lines
  - Manage functionality for their project components
  - Add additional reference templates to accommodate project or client needs
- Distribution to your users

Delegate Owners

Assign Responsibility

Document and Share

Mentor

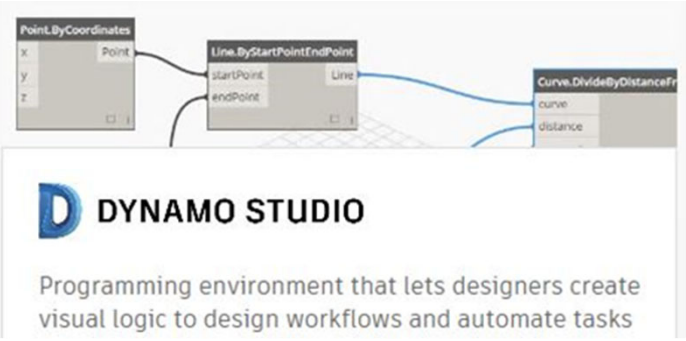


Dynamo and Python

First offered in Civil 3D 2020

Leverage the power of the API

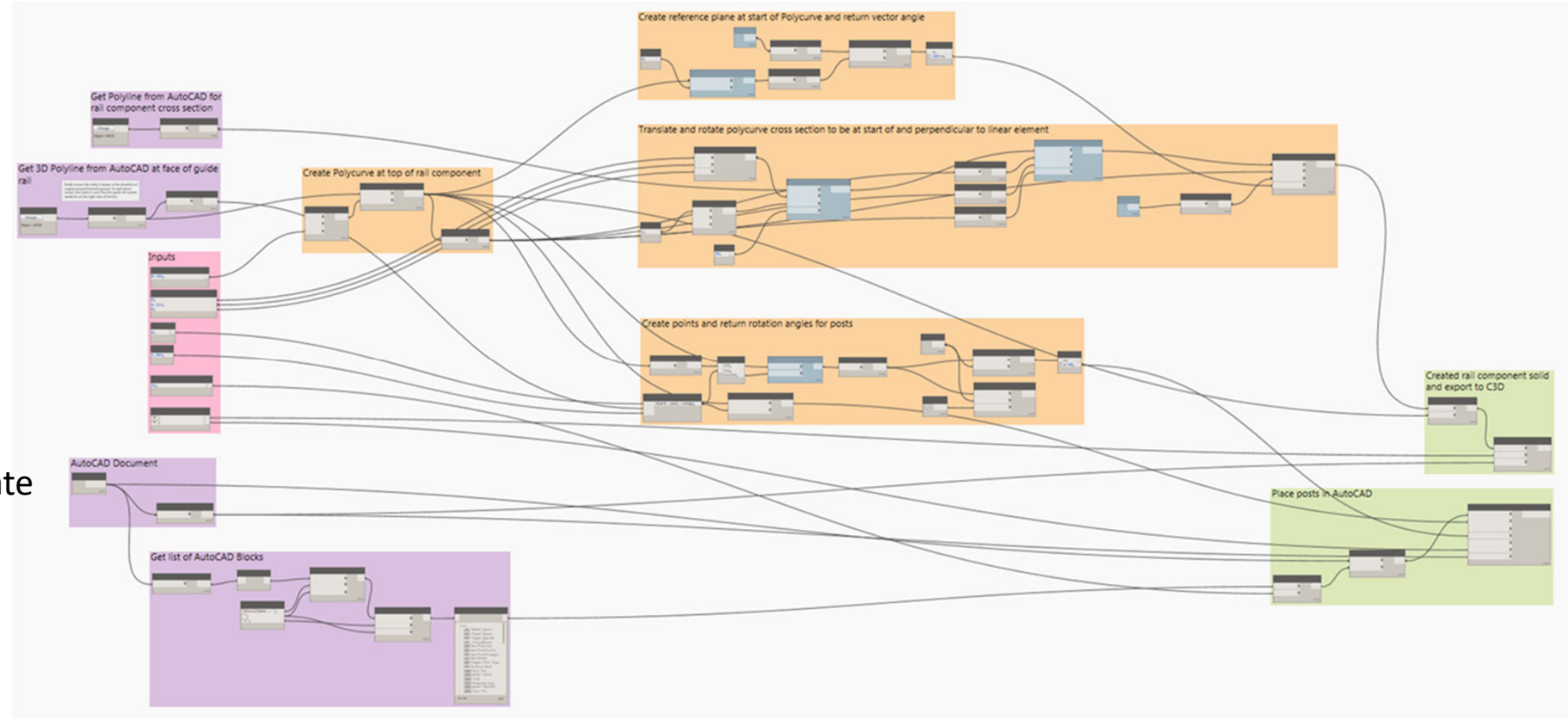
Dynamo - Programming for us non-programmers!

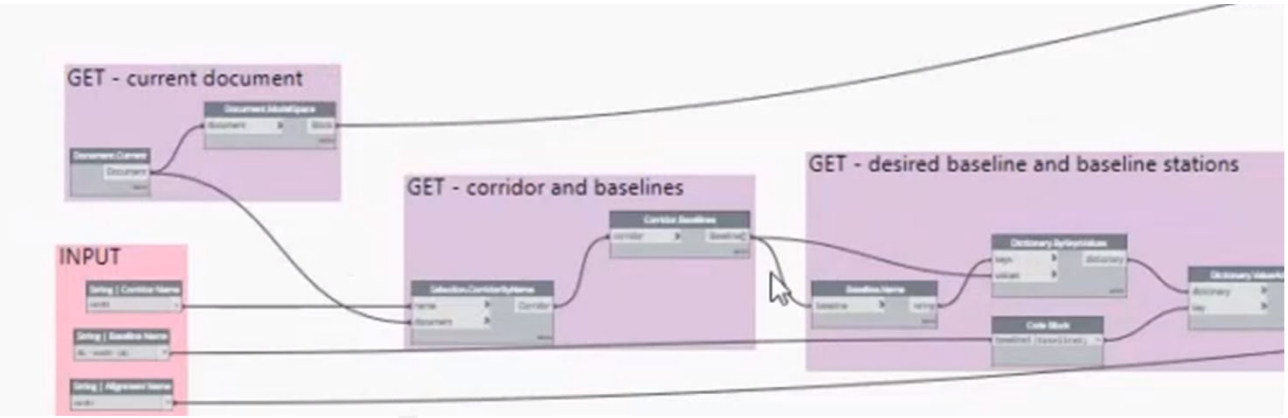


Build graphs by selecting standard nodes

Join nodes to automate your workflow

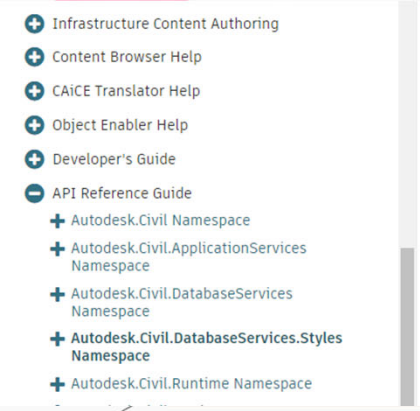
Use Python to create custom nodes



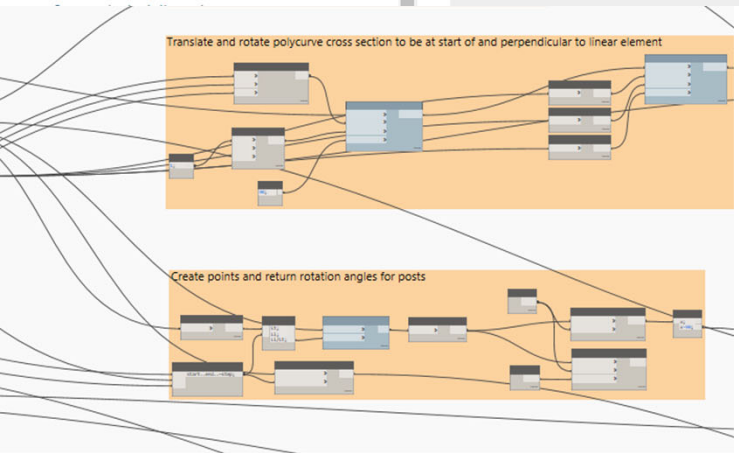


Leverage the power of the API

- Apply rule-based design coding to automate processes

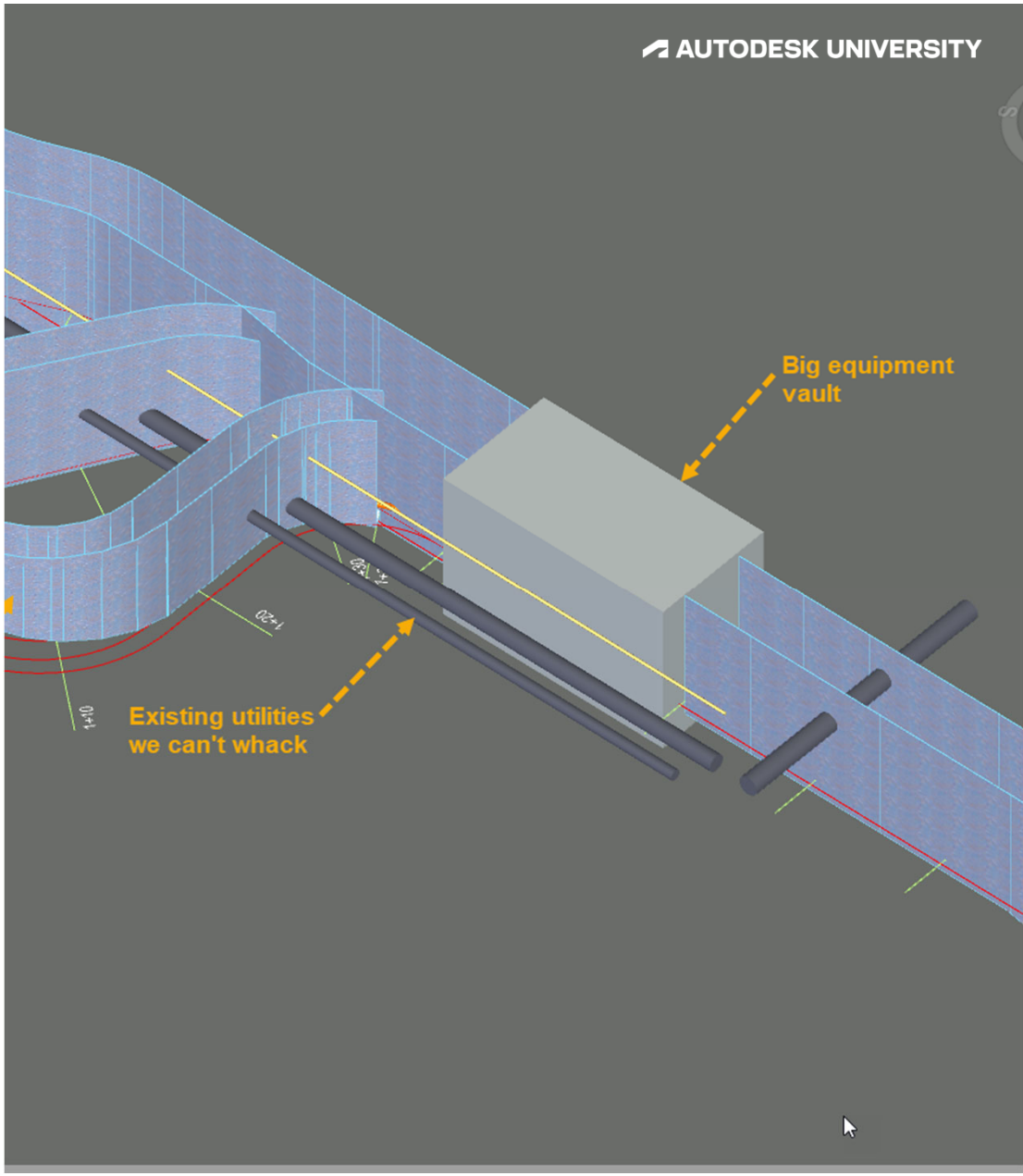


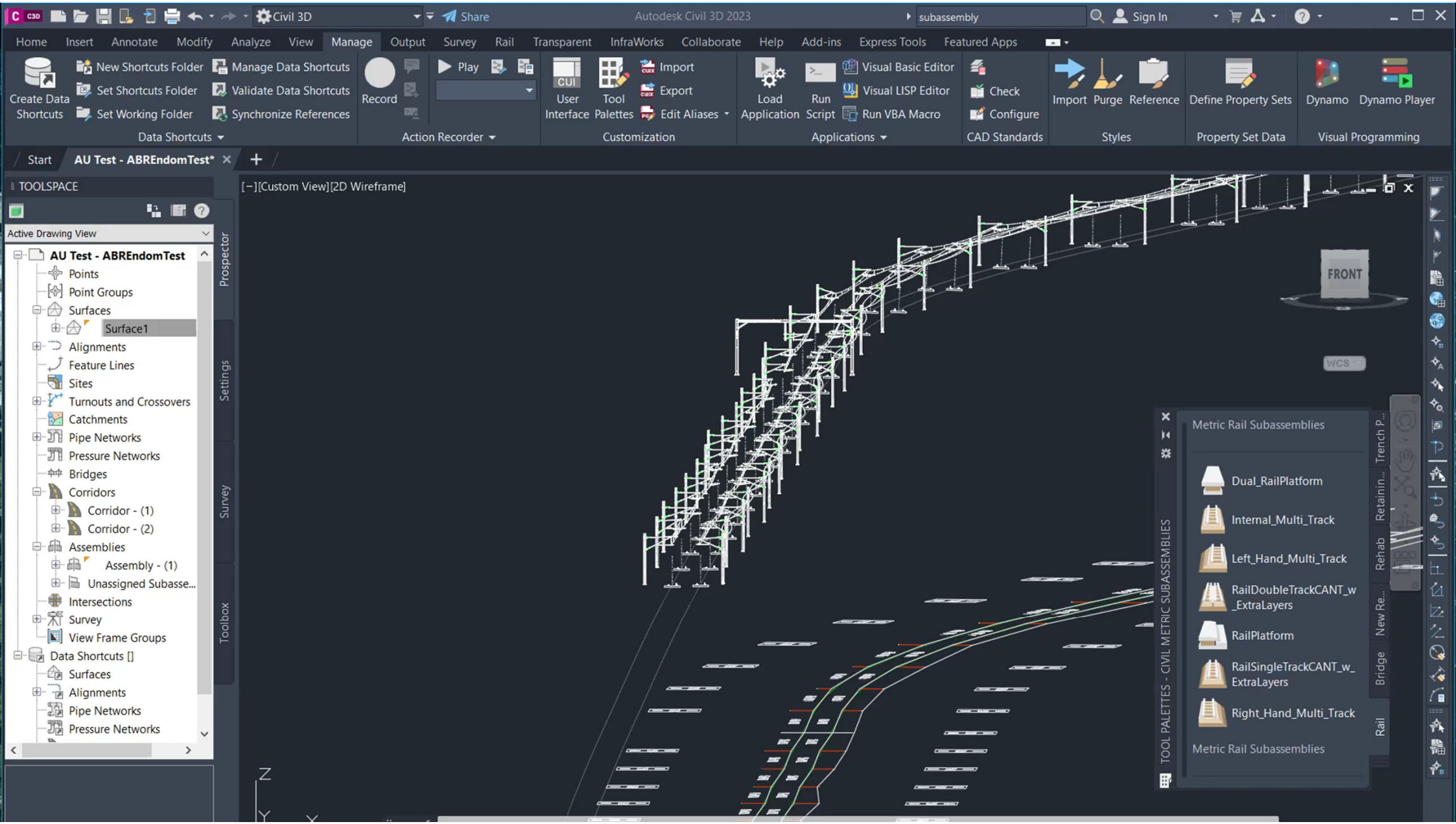
	Class	Description
	AlignmentDesignCheckSet	A collection of alignment design checks, which can be applied to an alignment.
	AlignmentDesignCheckSetCollection	The AlignmentDesignCheckSetCollection class.
	AlignmentLabelSetItem	The predefined label properties for alignments.
	AlignmentLabelSetStyle	The predefined label properties for stations, lines, and curves.
	AlignmentLabelSetStyleCollection	The AlignmentLabelStyleCollection class.
	AlignmentStyle	Specifies properties for the various alignment components.
	AlignmentStyleCollection	A collection of AlignmentStyle objects.
	ArrowHeadOption	Display options for arrows in AlignmentStyle and ProfileStyle.
	AssemblyStyle	Used to control the visual style of an Assembly object.
	AssemblyStyleCollection	A collection of AssemblyStyle objects.



- Export structures or pipes to solids; Read property set values and apply to solids; Export to IFC; Import IFC to Navisworks to validate

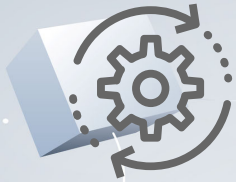

GHD


AUTODESK UNIVERSITY
Big equipment vault
Existing utilities we can't whack


Civil 3D
Share
Autodesk Civil 3D 2023
subassembly
Sign In
Home
Insert
Annotate
Modify
Analyze
View
Manage
Output
Survey
Rail
Transparent
InfraWorks
Collaborate
Help
Add-ins
Express Tools
Featured Apps
Create Data Shortcuts
New Shortcuts Folder
Set Shortcuts Folder
Set Working Folder
Manage Data Shortcuts
Validate Data Shortcuts
Synchronize References
Data Shortcuts
Record
Play
Action Recorder
User Interface
Tool Palettes
Import
Export
Edit Aliases
Customization
Load Application
Run Script
Visual Basic Editor
Visual LISP Editor
Run VBA Macro
Applications
Check
Configure
CAD Standards
Import
Purge
Reference
Styles
Define Property Sets
Property Set Data
Dynamo
Dynamo Player
Visual Programming
Start
AU Test - ABREndomTest*
TOOLSPACE
Active Drawing View
AU Test - ABREndomTest
Points
Point Groups
Surfaces
Surface1
Alignments
Feature Lines
Sites
Turnouts and Crossovers
Catchments
Pipe Networks
Pressure Networks
Bridges
Corridors
Corridor - (1)
Corridor - (2)
Assemblies
Assembly - (1)
Unassigned Subasse...
Intersections
Survey
View Frame Groups
Data Shortcuts []
Surfaces
Alignments
Pipe Networks
Pressure Networks
Prospector
Settings
Survey
Toolbox
[−][Custom View][2D Wireframe]
FRONT
WCS
Metric Rail Subassemblies
Dual_RailPlatform
Internal_Multi_Track
Left_Hand_Multi_Track
RailDoubleTrackCANT_w_ExtraLayers
RailPlatform
RailSingleTrackCANT_w_ExtraLayers
Right_Hand_Multi_Track
Metric Rail Subassemblies
TOOL PALETTES - CIVIL METRIC SUBASSEMBLIES
Trench P...
Retainin...
Rehab
New Re...
Bridge
Rail
Z

Automation – Utilize your new standards

Leverage consistency



Understand your Workflows

Automate Select Components

Deploy the Automation Tools Enterprise wide


Efficiency

Realized Efficiency

2007 → 2017 → 2020 → 2020+

Adopted Civil 3D

Implement

First is the foundational level training and the implementation of parametric modeling software.

Civil 3D

Revit

Navisworks

Introduced Ref Templates

Restructure

Changing the way you provide consistency through a restructured Template Structure provides the information your design team need.

Corporate/Client Templates

Reference Templates

Custom Requirement

Leveraged Dynamo

Automate

Eliminate the randomness in your projects from team to team. Develop standardized workflows to drive consistency. Leverage Dynamo to run off standard drawing elements.

Project Setup and Documentation

Standardization

Developed Property Sets

Unparalleled Efficiency

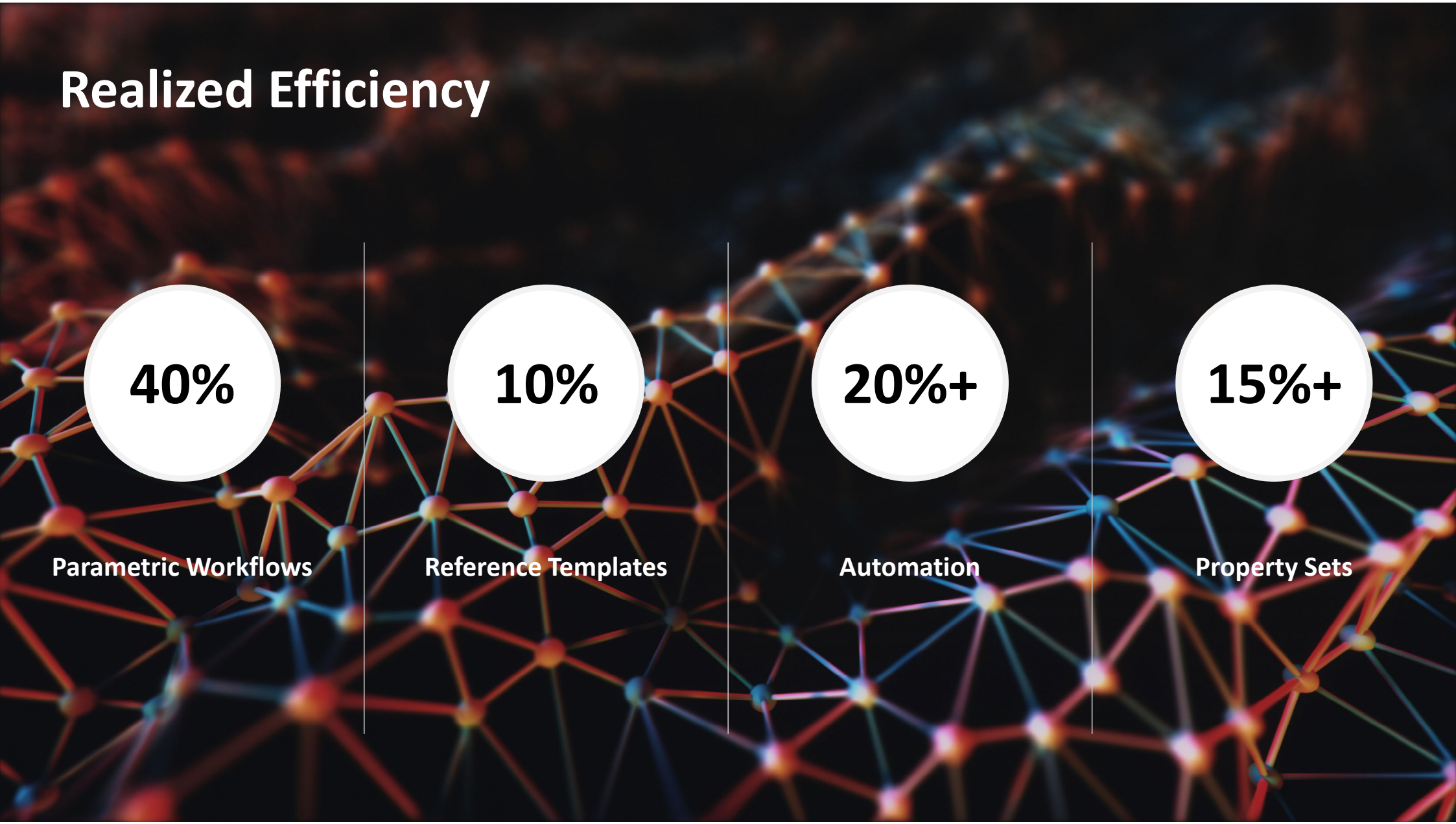
Develop property sets to enhance consistency and leverage automation in your projects.

Drawing Documentation

Quantities

Estimates and Scheduling

Realized Efficiency



Summary

Define your template requirements to attain consistency in your workflows

Utilize new functionality in Civil 3D with Reference and Corridor Templates, using Property Sets

Manage your templates, and content through cloud-based workflows

Automate with Dynamo and Custom Programming