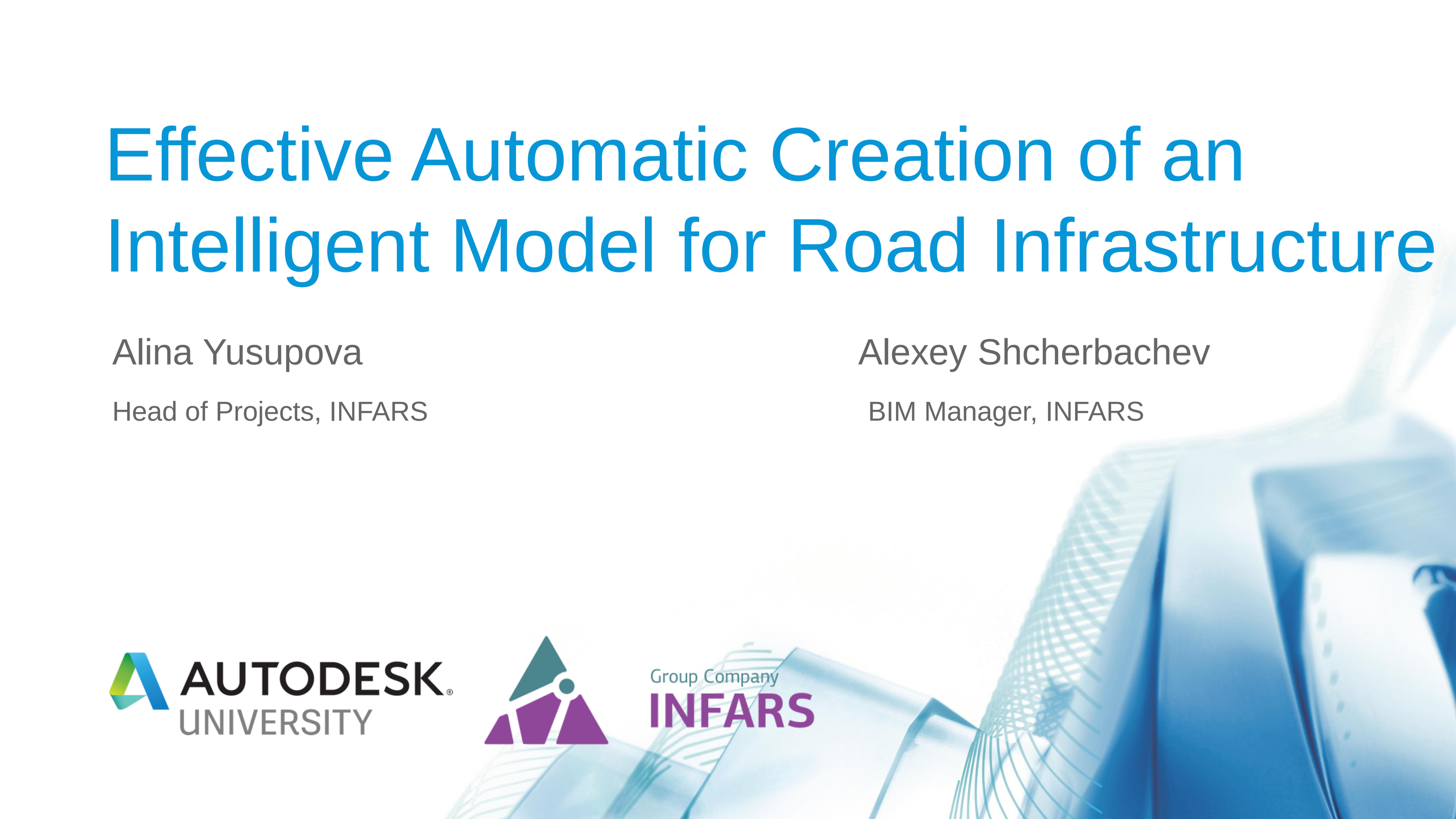
# Effective Automatic Creation of an Intelligent Model for Road Infrastructure

Alina Yusupova

Head of Projects, INFARS

Alexey Shcherbachev

BIM Manager, INFARS



# About the speaker

## Alina Yusupova

Head of projects and BIM specialist in INFARS

Master degree in Civil Engineering (MGTU)

Based in Moscow, Russian Federation

9+ years of AEC industry experience

Author and instructor of 10 courses in Civil 3D

Autodesk Certified Instructor

Autodesk Certified Professional

Best speaker of Autodesk University Russia in 2013 and 2014 years

First speaker from Russia at Autodesk University Las Vegas

LinkedIn: https://www.linkedin.com/in/alina-yusupova-82917677/

Group Company
INFARS

# About the speaker

## Alexey Shcherbachev

BIM manager in INFARS

Master degree in Design Engineering (MGSU)

Based in Moscow, Russian Federation

8+ years of AEC industry experience

8+ years in Structure engineering

2+ years in Autodesk VAR

Author and instructor of 5 courses in Autodesk Revit

Certified Instructor

Autodesk Certified Professional

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# INFARS

WE ARE INTERESTED IN JOINT IMPLEMENTATION OF INVESTMENT AND CONSTRUCTION PROJECTS IN COOPERATION WITH OUR CLIENTS AND PARTNERS

**1994** — INFARS WAS FOUNDED

**120** — SUCCESSFULLY REALIZED PROJECTS

**15 000** — SPECIALISTS GRADUATED FROM OUR TRAINING CENTER

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- ✓ SPECIAL **EDUCATIONAL MODEL** “BIM-BA” FOR EFFECTIVENESS AND PRACTICUM

# Agenda

- Creation of road signs with «universal» families in Revit
- Organization a GIS system of a traffic management plan in Civil 3D - InfraWorks
- Management of the connection between 2D plan in Civil 3D and Navisworks model
- Creation of 3D guardrail in Civil 3D
- Creation of parametric barriers in Inventor and applying them to roads in InfraWorks

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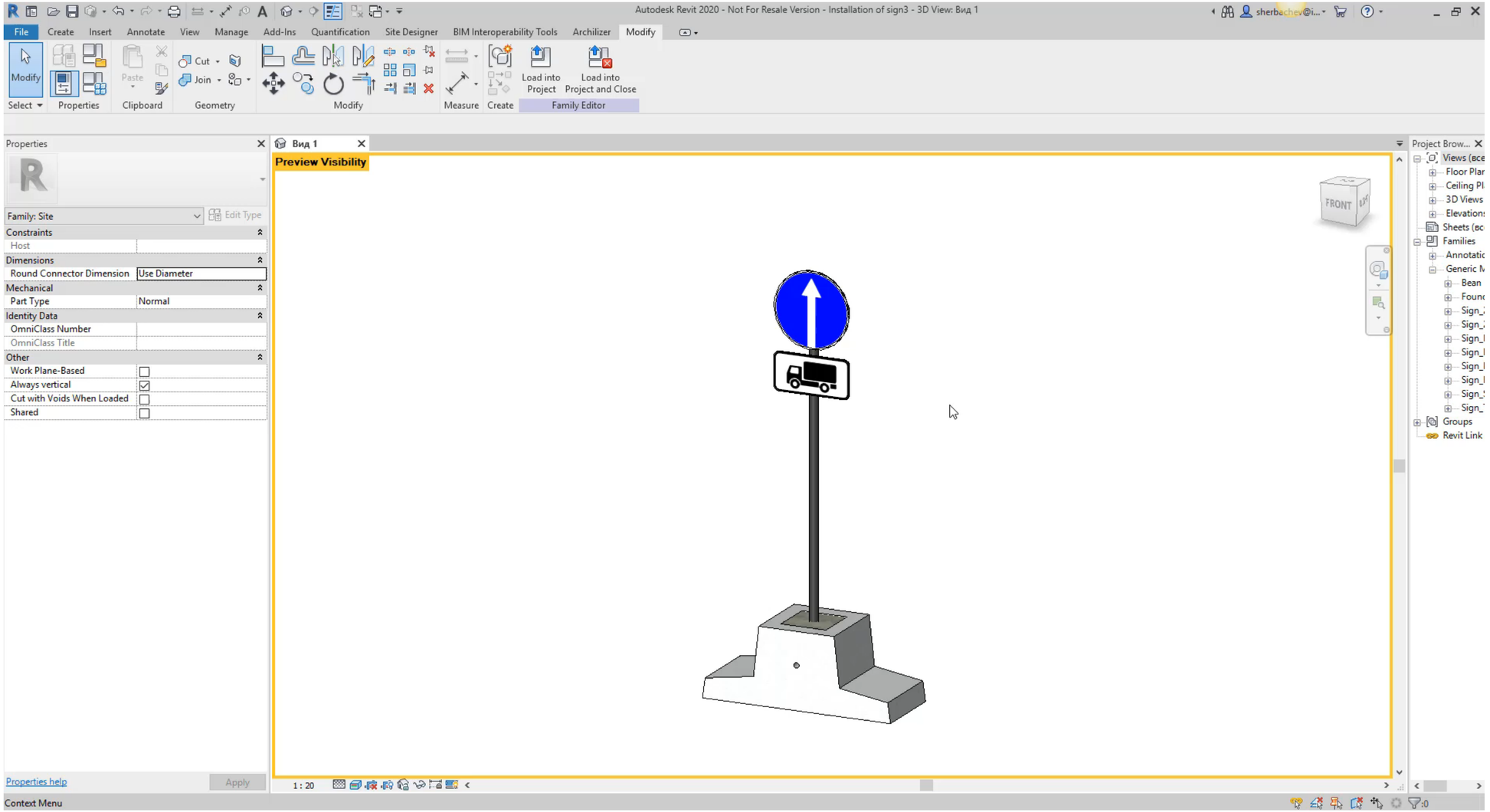
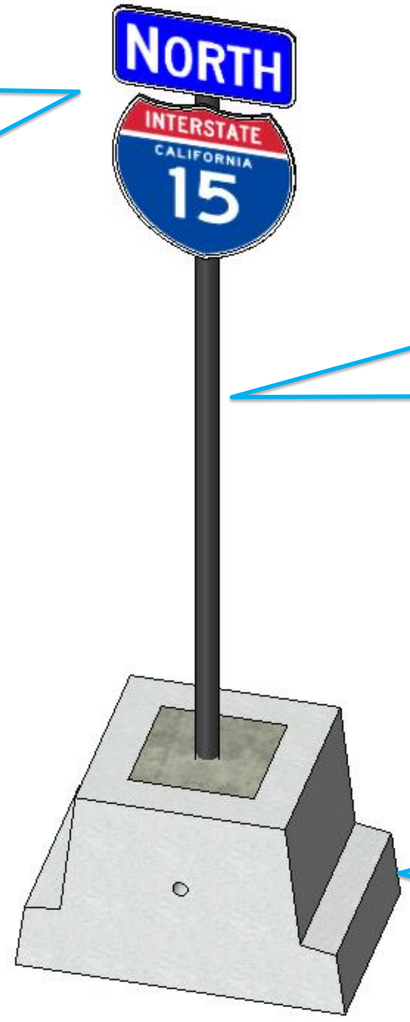
# Creation of road signs with «universal» families in Revit

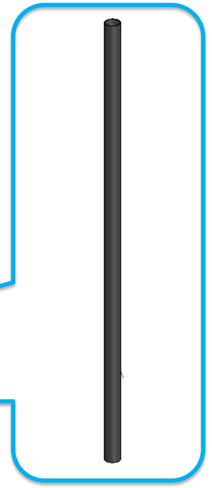
# «Universal» road sign family



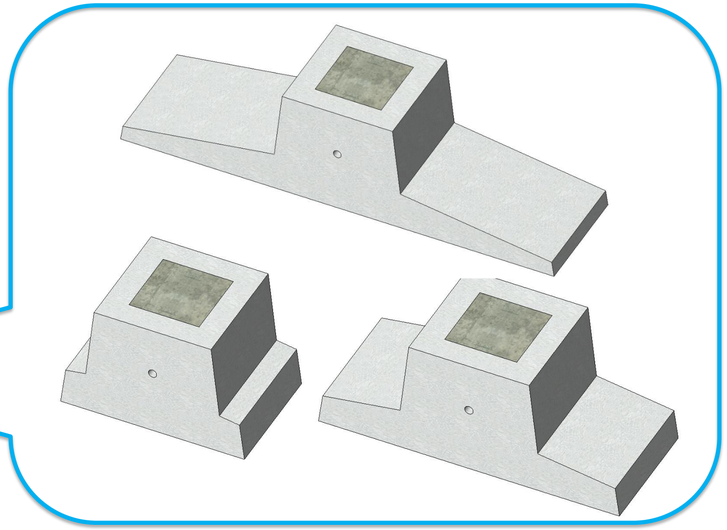
# How does «Universal» road sign family works

Signs



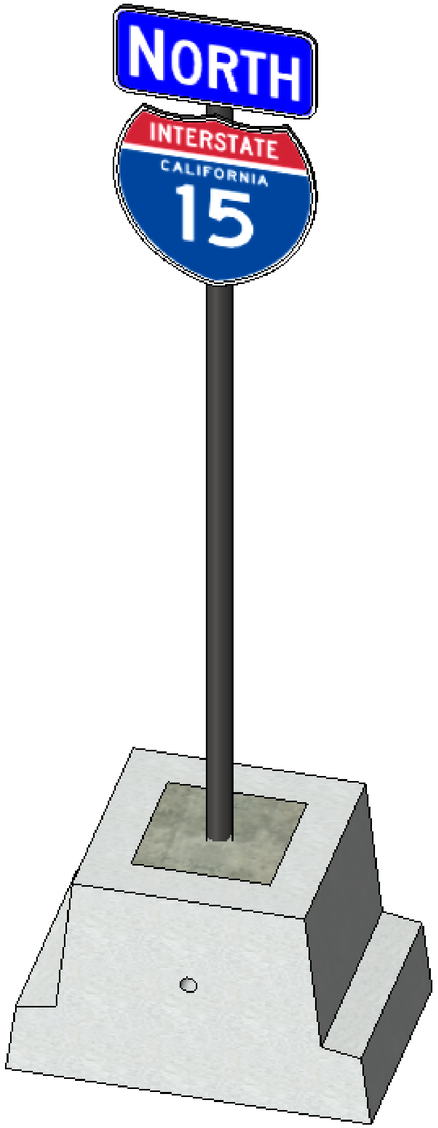



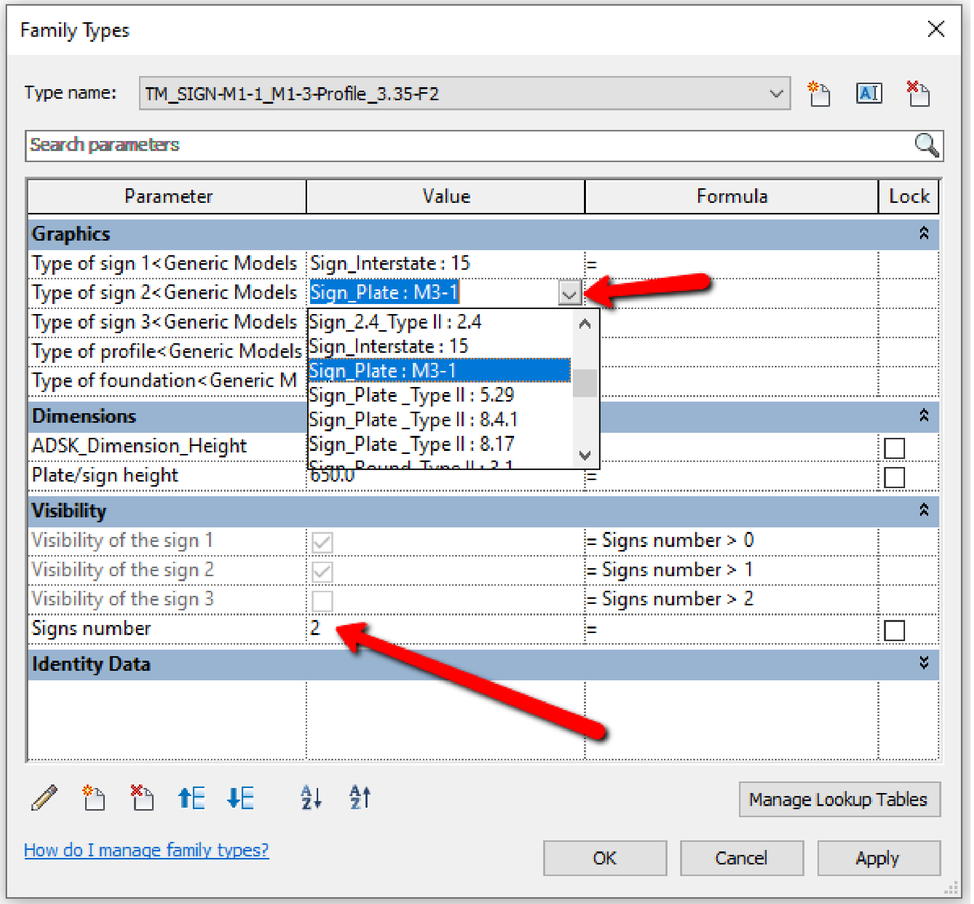
Stand



Foundation

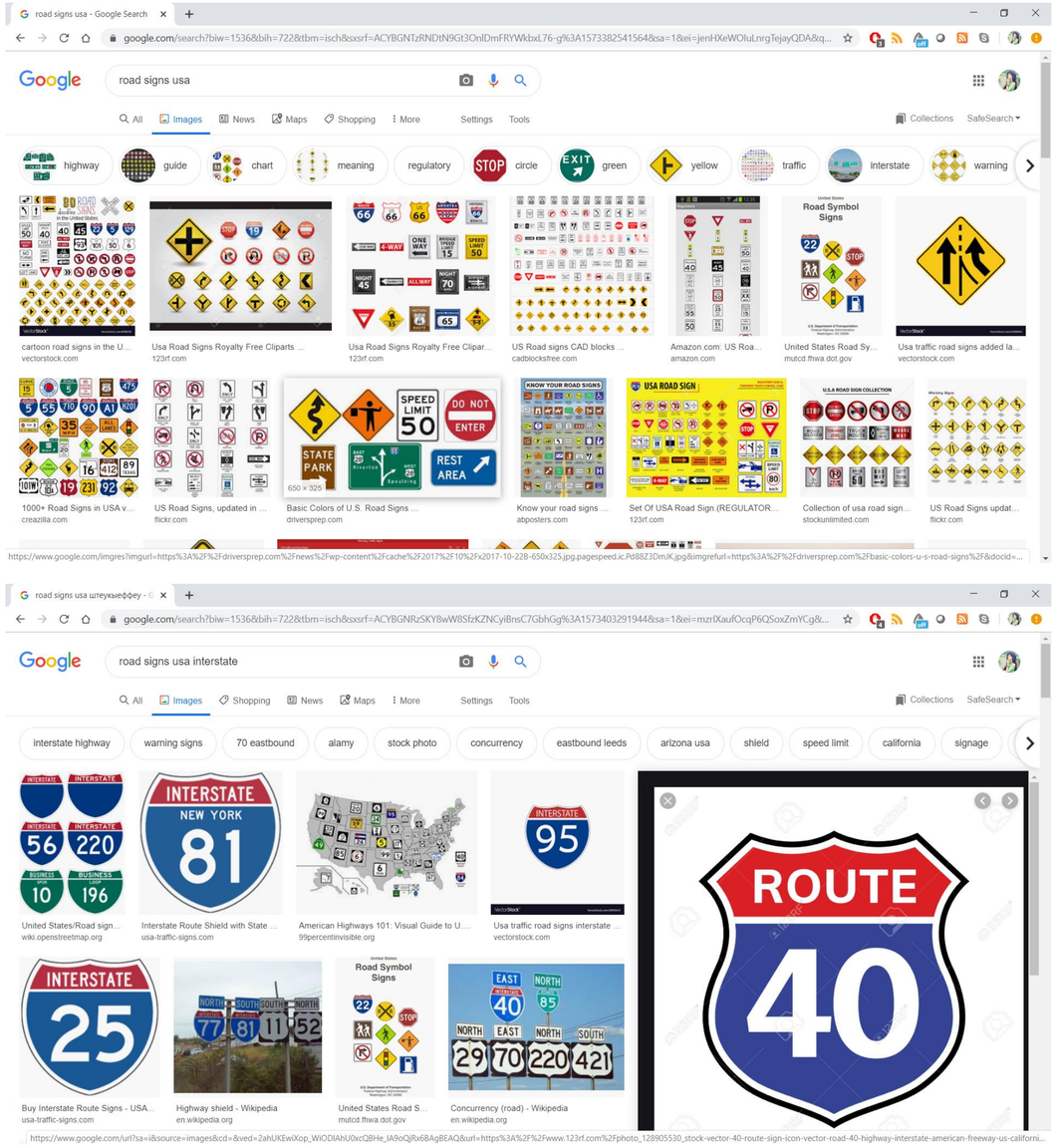
# How does «Universal» road sign family works



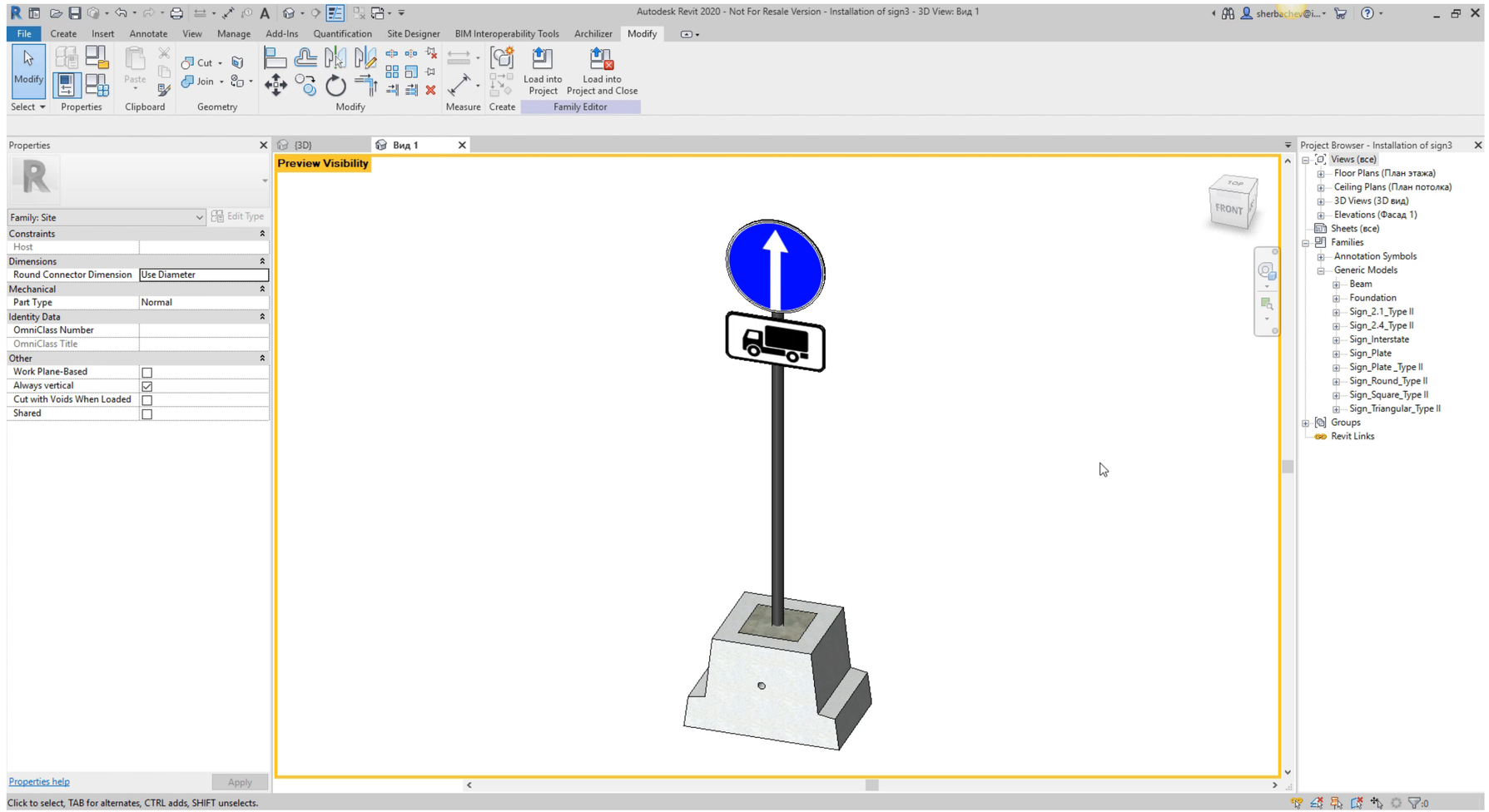



# Why «Universal» road sign family?

- Textures of any sign are available in free sources
- Creating any sign is very quick and easy.
- Revit models looks better in InfraWorks and Navisworks

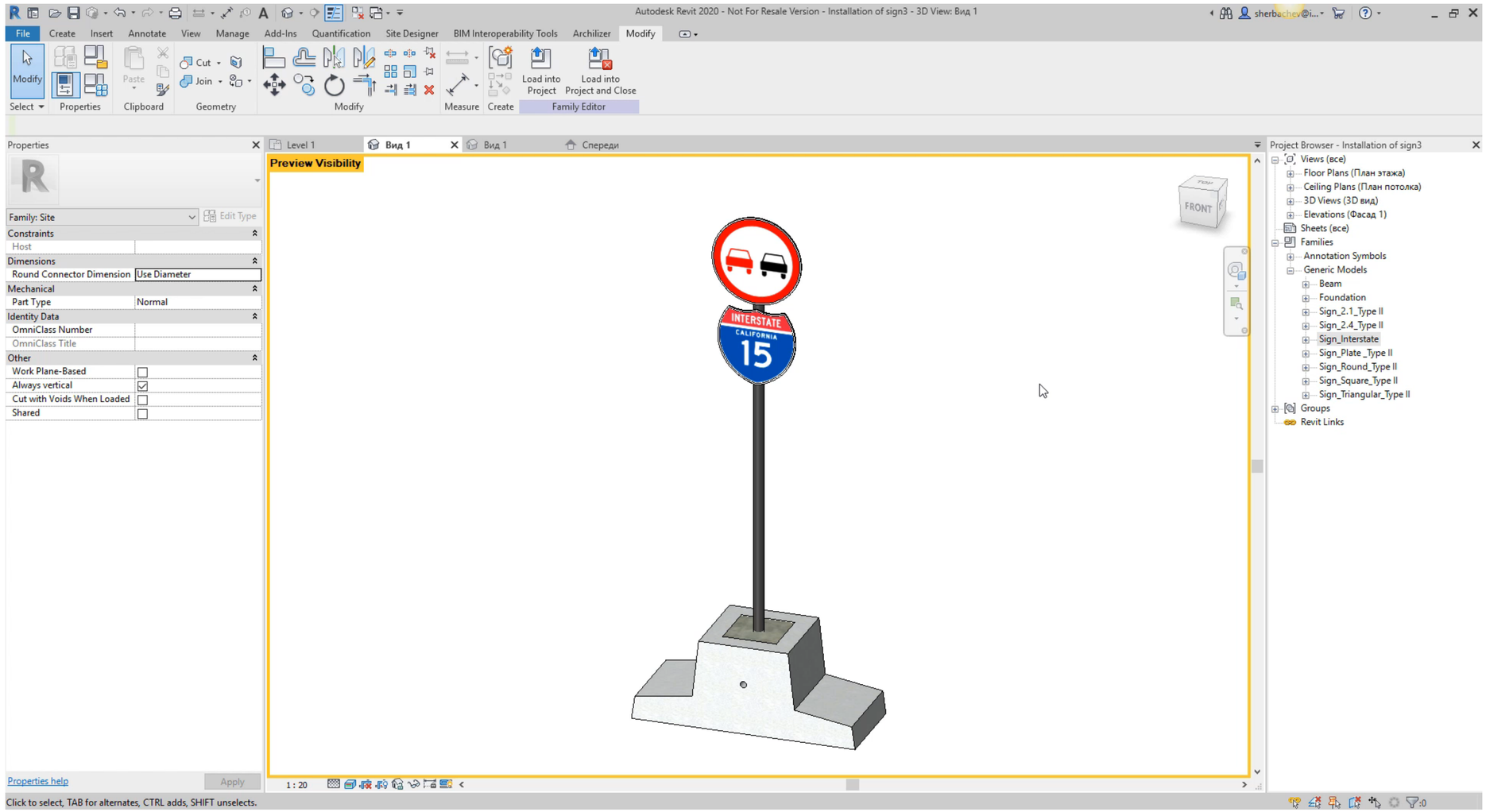


# Creation of a new assembly



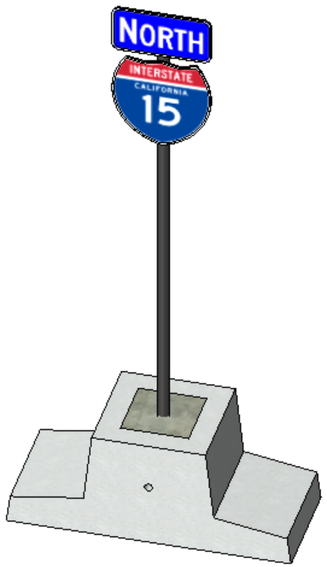

https://youtu.be/VAni0bzDXMQ

# Creating a new type of sign




https://youtu.be/06yS6WnQLh0

# «Universal» road sign family




Family Types

Type name: TM_SIGN-M1-1_M1-3-Profile_3.35-F2

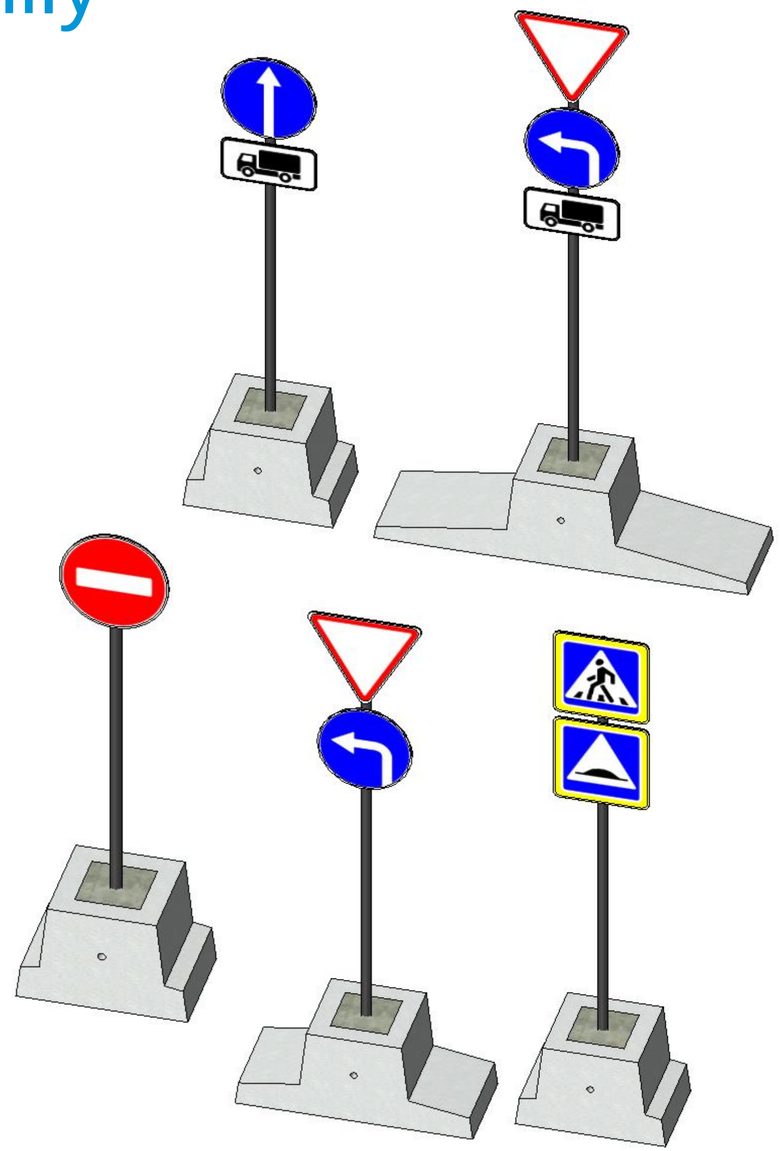
Search parameters

| Parameter | Value | Formula | Lo |
|---|---|---|---|
| **Graphics** | | | |
| Type of sign 1<Generic Models> | Sign_Interstate : 15 | = | |
| Type of sign 2<Generic Models> | Sign_Plate : M3-1 | = | |
| Type of sign 3<Generic Models> | Sign_2.4_Type II : 2.4 | = | |
| Type of profile<Generic Models> | Beam : Beam_3.35 | = | |
| Type of foundation<Generic Model | Foundation : F2 | = | |
| **Dimensions** | | | |
| ADSK_Dimension_Height | 2000.0 | = | ☐ |
| Plate/sign height | 650.0 | = | ☐ |
| **Visibility** | | | |
| Visibility of the sign 1 | ☑ | =Signs number > 0 | |
| Visibility of the sign 2 | ☑ | =Signs number > 1 | |
| Visibility of the sign 3 | ☐ | =Signs number > 2 | |
| Signs number | 2 | = | ☐ |
| **Identity Data** | | | |

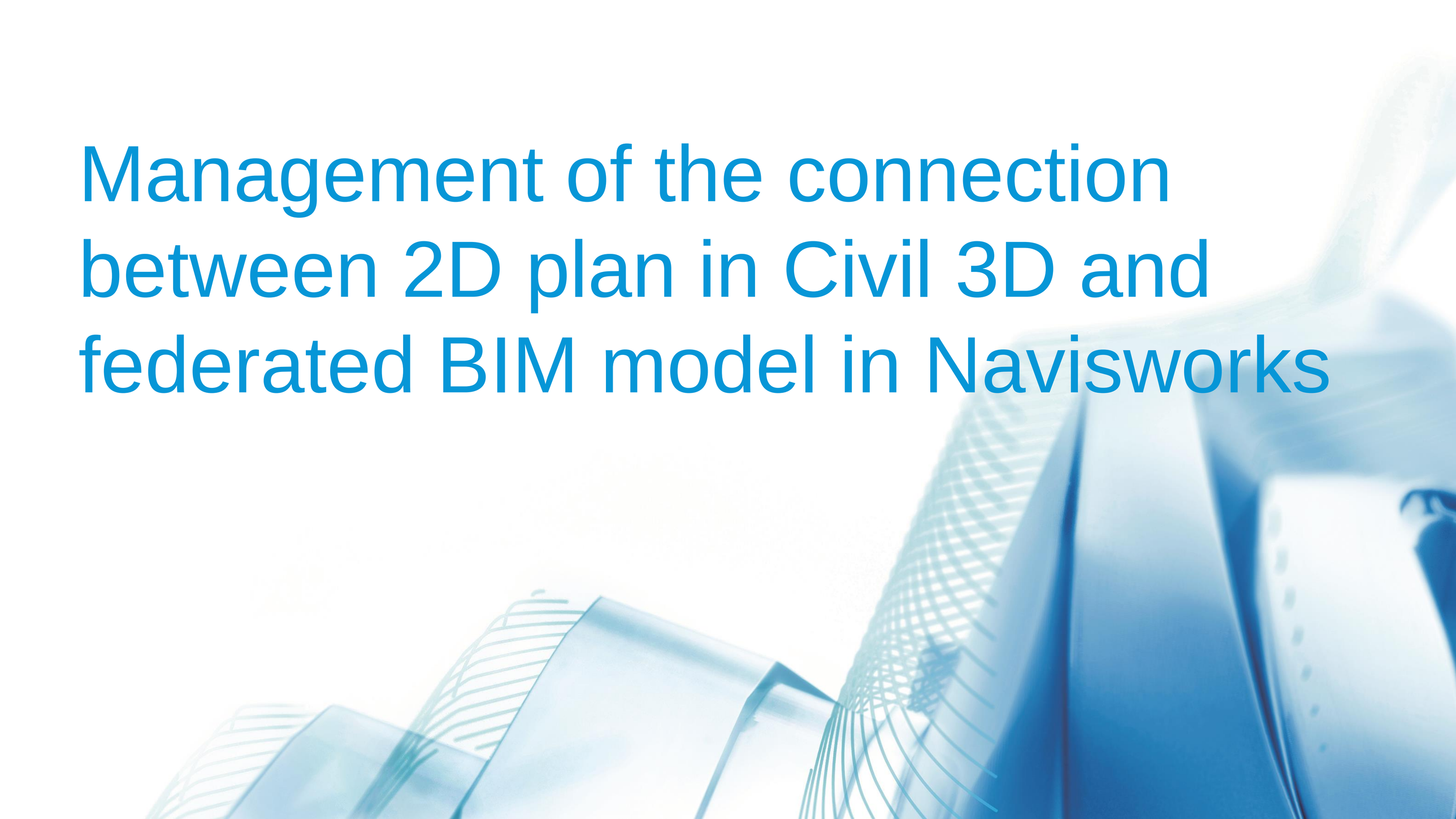
Manage Lookup Tables

How do I manage family types?

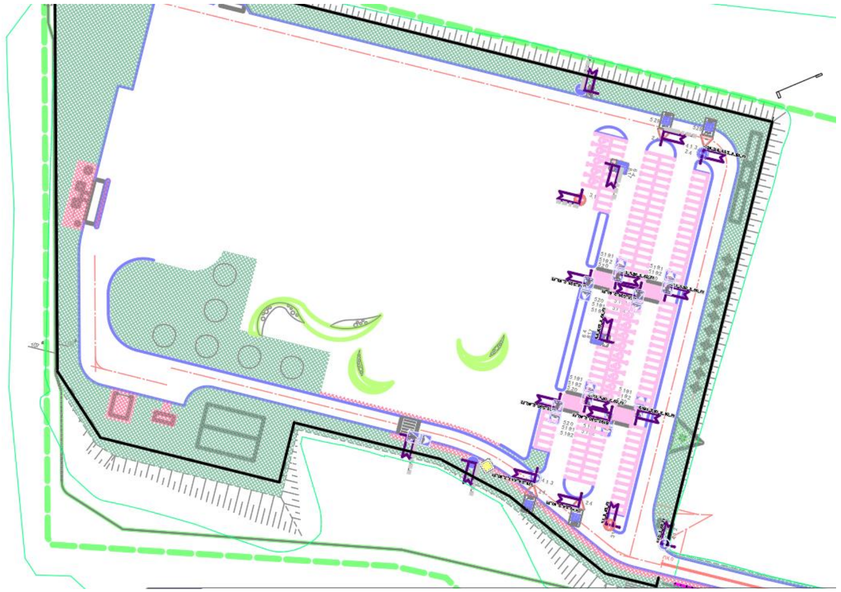
OK Cancel Apply



# Management of the connection between 2D plan in Civil 3D and federated BIM model in Navisworks



# Preparation of data in Civil 3D plan

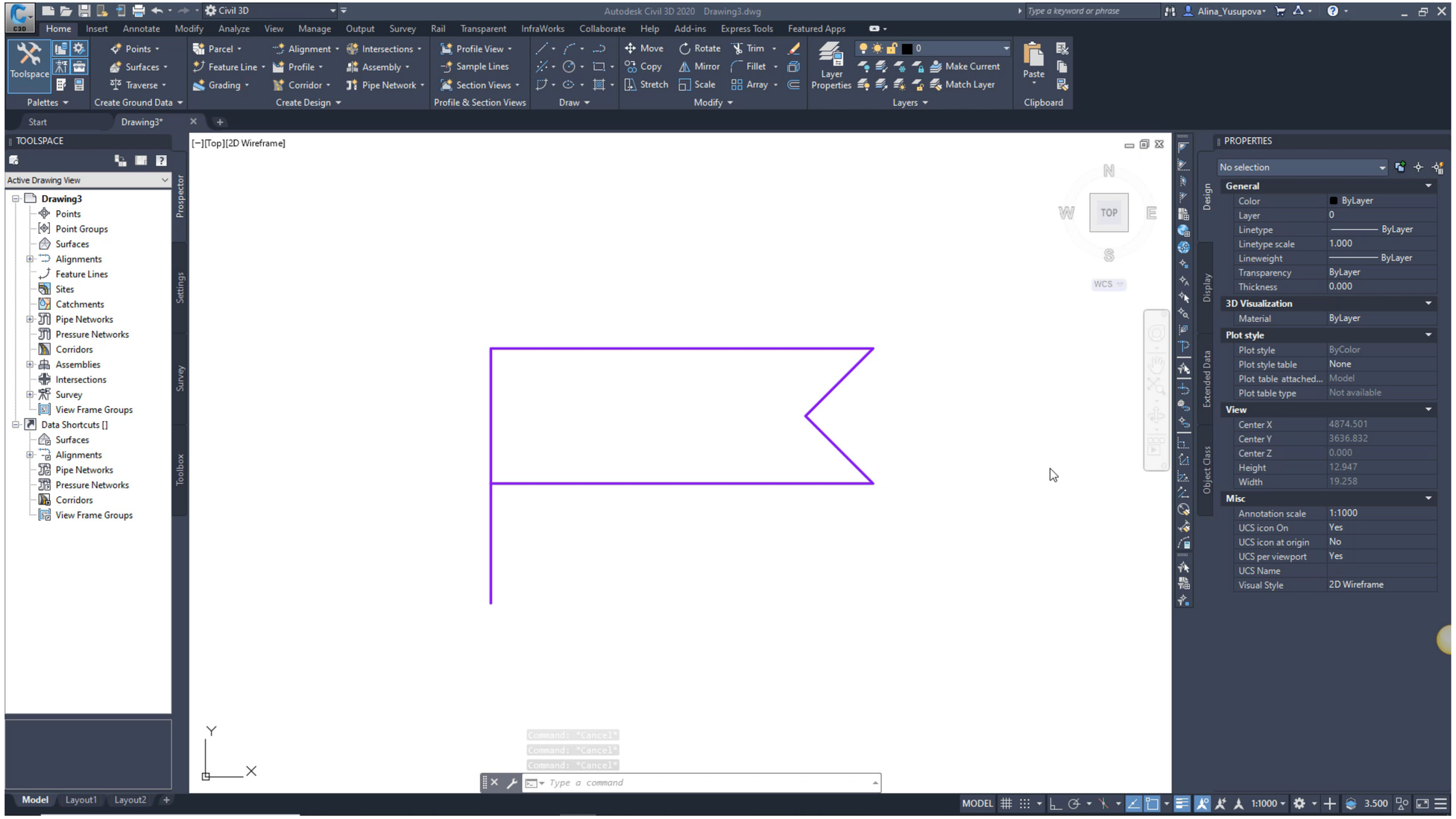


Civil 3D plan

InfraWorks model

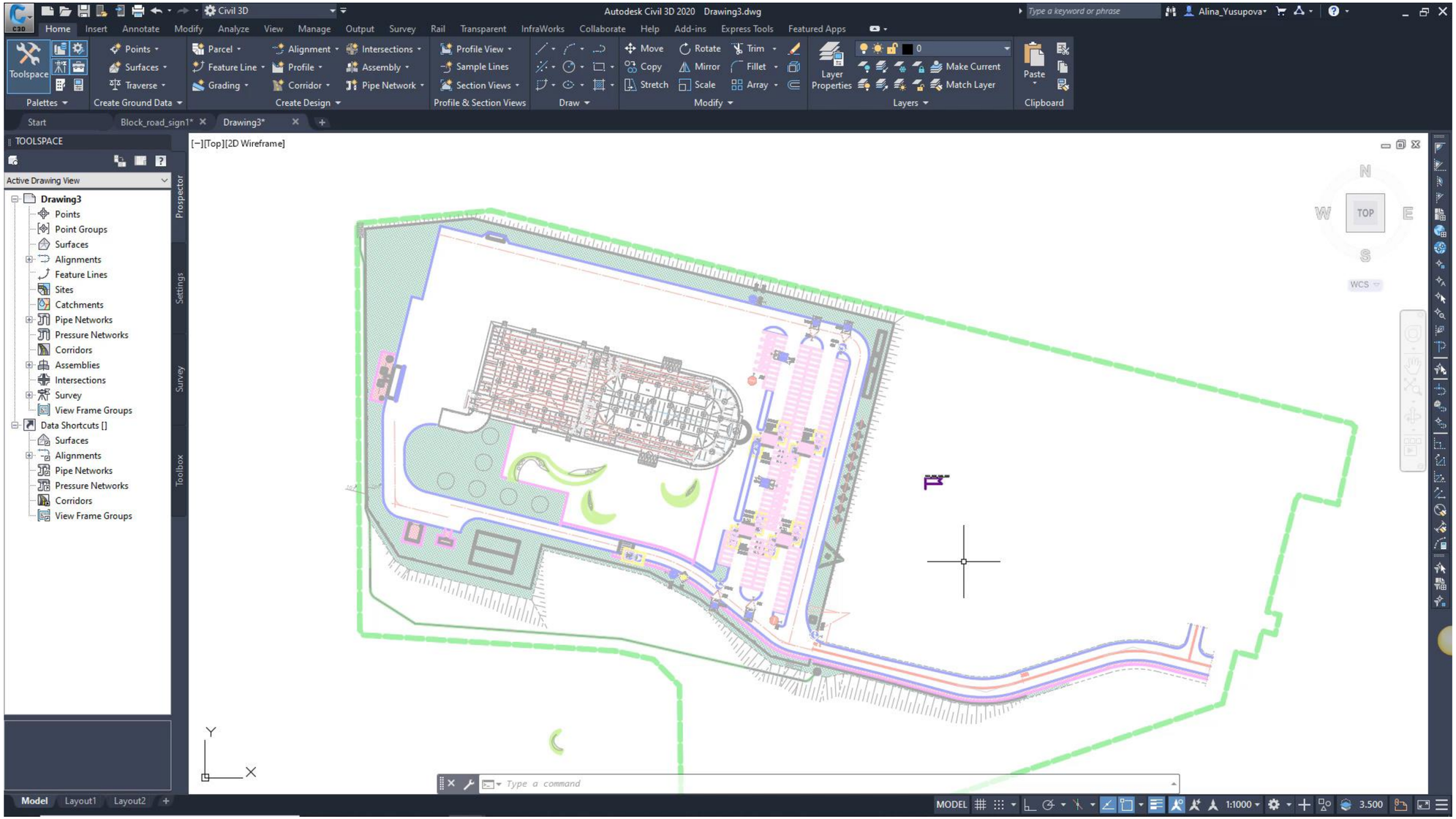
Navisworks model

# Create dynamic block of road sign

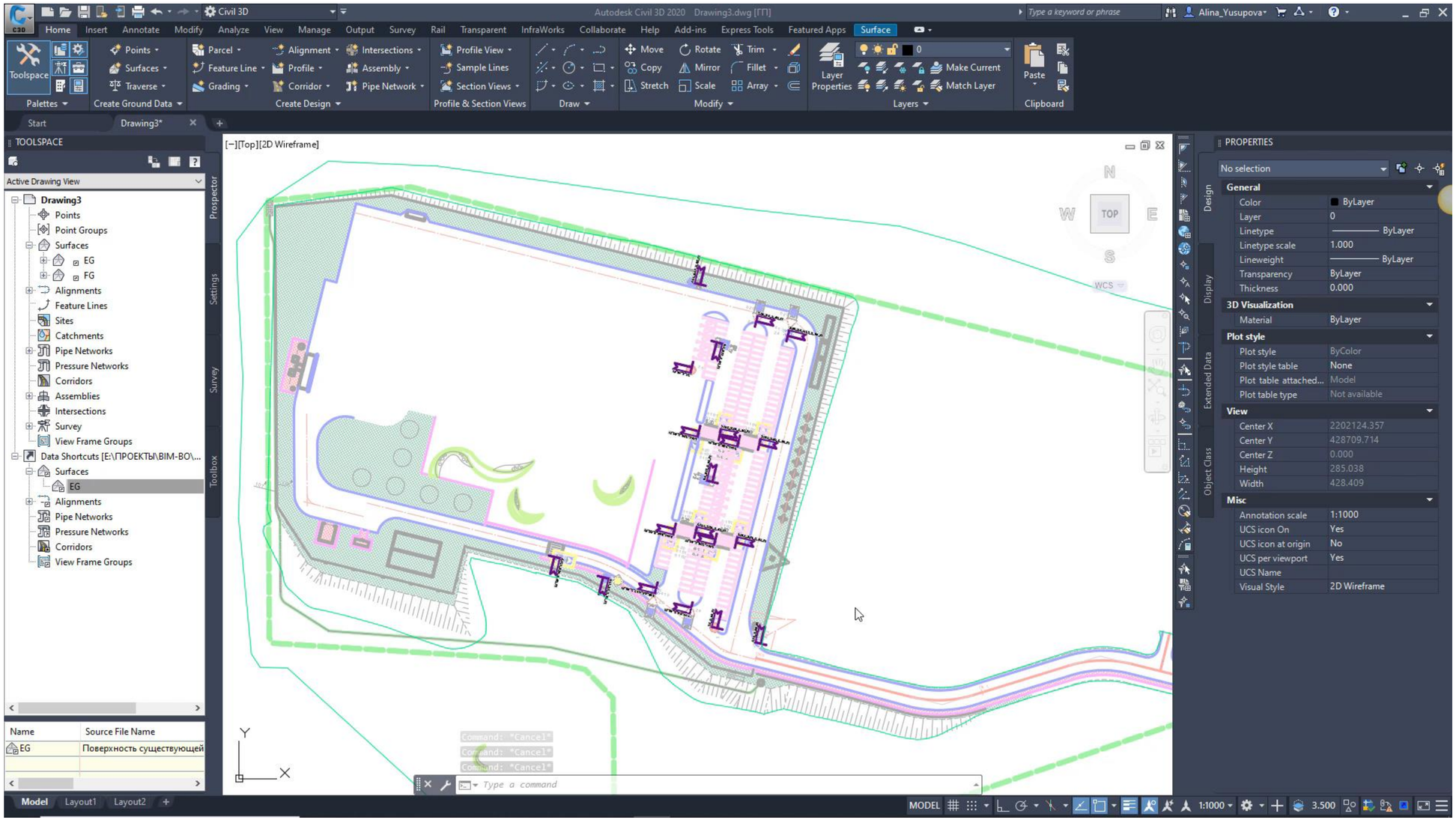



https://youtu.be/XXjwsGPMx8I

# Place blocks on the Plan



# Export data


Civil 3D
Autodesk Civil 3D 2020 Drawing3.dwg [ГП]
Home Insert Annotate Modify Analyze View Manage Output Survey Rail Transparent InfraWorks Collaborate Help Add-ins Express Tools Featured Apps Surface
Toolspace
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
Trim
Fillet
Array
Layer Properties
Make Current
Match Layer
Paste
Palettes
Create Ground Data
Create Design
Profile & Section Views
Draw
Modify
Layers
Clipboard
Start
Drawing3*
TOOLSPACE
Active Drawing View
Drawing3
Points
Point Groups
Surfaces
EG
FG
Alignments
Feature Lines
Sites
Catchments
Pipe Networks
Pressure Networks
Corridors
Assemblies
Intersections
Survey
View Frame Groups
Data Shortcuts [E:\ПРОЕКТЫ\BIM-ВО\...
Surfaces
EG
Alignments
Pipe Networks
Pressure Networks
Corridors
View Frame Groups
Prospector
Settings
Survey
Toolbox
Name
Source File Name
EG
Поверхность существующей
[−][Top][2D Wireframe]
N
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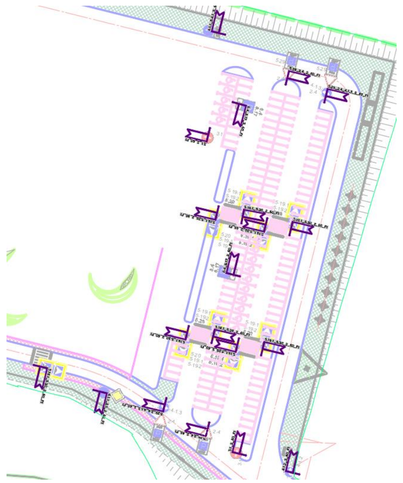
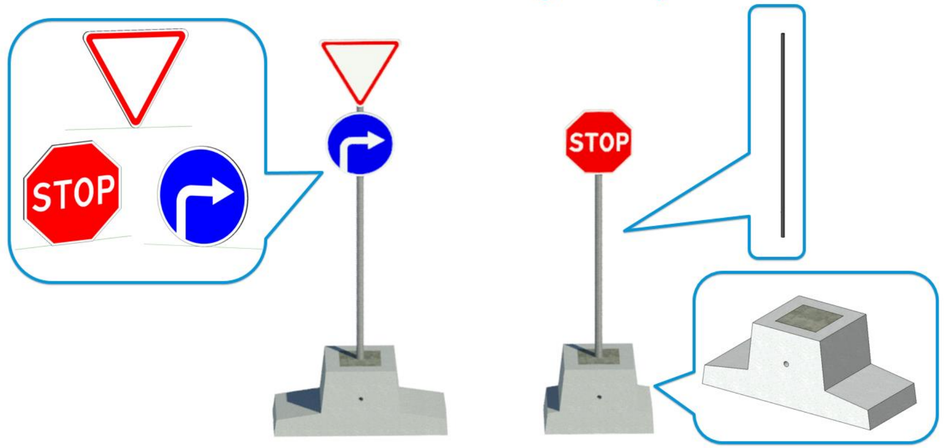
E
S
WCS
Command: *Cancel*
Command: *Cancel*
Command: *Cancel*
Type a command
Model
Layout1
Layout2
MODEL
1:1000
3.500
PROPERTIES
No selection
General
Color ByLayer
Layer 0
Linetype ByLayer
Linetype scale 1.000
Lineweight ByLayer
Transparency ByLayer
Thickness 0.000
3D Visualization
Material ByLayer
Plot style
Plot style ByColor
Plot style table None
Plot table attached... Model
Plot table type Not available
View
Center X 2202124.357
Center Y 428709.714
Center Z 0.000
Height 285.038
Width 428.409
Misc
Annotation scale 1:1000
UCS icon On Yes
UCS icon at origin No
UCS per viewport Yes
UCS Name
Visual Style 2D Wireframe
Design
Display
Extended Data
Object Class

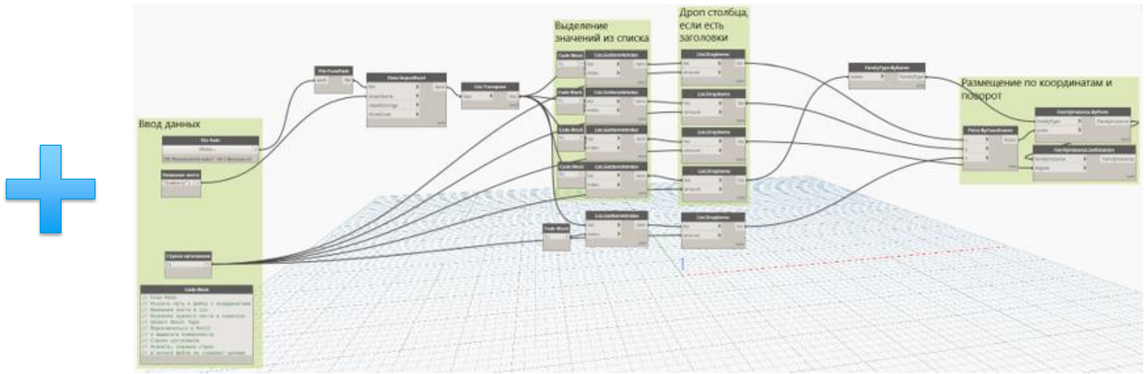
# Workflow

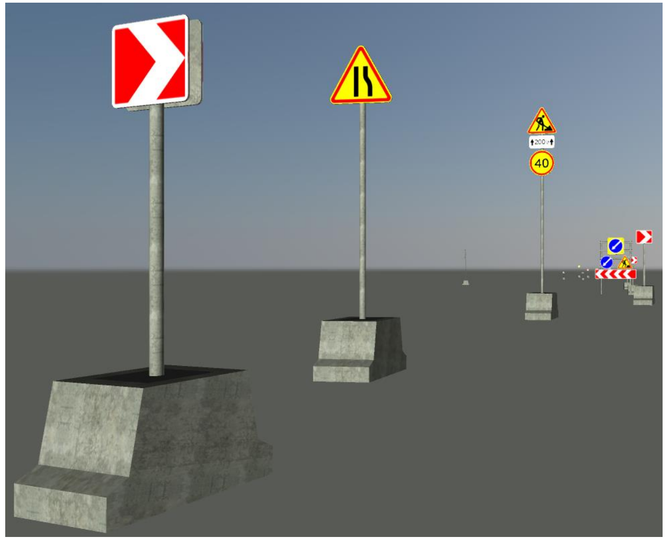


| | A | B | C | D | E | F | G | H | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | FULL_NAI | HEIG | Position X | Position Y | Position Z | PROF | ROTATIO | SIGNS | TY |
| 2 | 3.1_2_60_I | 2 | 2202122.5 | 428754.12 | 54.522 | 60 | 166.3308 | 3.1 | F1 |
| 3 | 3.1_2_60_I | 2 | 2202135.2 | 428638.66 | 53.528 | 60 | 76.0000 | 3.1 | F1 |
| 4 | 4.1.1_2.1_2 | 2 | 2202081.4 | 428661.76 | 53.955 | 60 | 256.0000 | 4.1.1_2.1 | F1 |
| 5 | 4.1.1_8.4.1 | 2 | 2202127.9 | 428787.01 | 53.841 | 60 | 76.0089 | 4.1.1_8.4.1 | F1 |
| 6 | 4.1.2_2_60 | 2 | 2202154.1 | 428631.97 | 0.000 | 60 | 76.0000 | 4.1.2 | F1 |
| 7 | 5.19.1_5.2( | 2 | 2202133.6 | 428720.48 | 54.399 | 60 | 349.0432 | 5.19.1_5.2( | F1 |
| 8 | 5.19.1_5.2( | 2 | 2202150.5 | 428716.26 | 54.133 | 60 | 346.3373 | 5.19.1_5.2( | F1 |
| 9 | 5.19.1_5.2( | 2 | 2202060.4 | 428670.55 | 54.157 | 60 | 256.3373 | 5.19.1_5.2( | F1 |
| 10 | 5.19.1_5.2( | 2 | 2202125.6 | 428726.52 | 54.670 | 60 | 166.3373 | 5.19.1_5.2( | F1 |
| 11 | 5.19.1_5.2( | 2 | 2202142.7 | 428722.32 | 54.282 | 60 | 166.3373 | 5.19.1_5.2( | F1 |
| 12 | 5.19.1_5.2( | 2 | 2202140.6 | 428673.92 | 53.977 | 60 | 346.3373 | 5.19.1_5.2( | F1 |
| 13 | 5.19.1_5.2( | 2 | 2202132.8 | 428679.98 | 54.110 | 60 | 166.3373 | 5.19.1_5.2( | F1 |
| 14 | 5.19.1_5.2( | 2 | 2202115.1 | 428684.31 | 54.233 | 60 | 166.3373 | 5.19.1_5.2( | F1 |
| 15 | 5.19.1_5.2( | 2 | 2202123.1 | 428678.27 | 54.116 | 60 | 346.3373 | 5.19.1_5.2( | F1 |
| 16 | 5.29_2.4_2 | 2 | 2202149.2 | 428769.40 | 54.030 | 60 | 346.0000 | 5.29_2.4 | F1 |
| 17 | 5.29_2.4_2 | 2 | 2202122.3 | 428650.32 | 53.714 | 60 | 166.0000 | 5.29_2.4 | F1 |
| 18 | 5.29_2.4_4 | 2 | 2202162.8 | 428763.11 | 53.981 | 60 | 346.0000 | 5.29_2.4_4 | F1 |
| 19 | 5.29_2.4_4 | 2 | 2202107.2 | 428658.92 | 53.882 | 60 | 166.0000 | 5.29_2.4_4 | F1 |
| 20 | 6.4_8.17_2 | 2 | 2202130.5 | 428763.24 | 54.282 | 60 | 254.5497 | 6.4_8.17 | F1 |
| 21 | 6.4_8.17_2 | 2 | 2202133.1 | 428701.79 | 54.418 | 60 | 75.9997 | 6.4_8.17 | F1 |

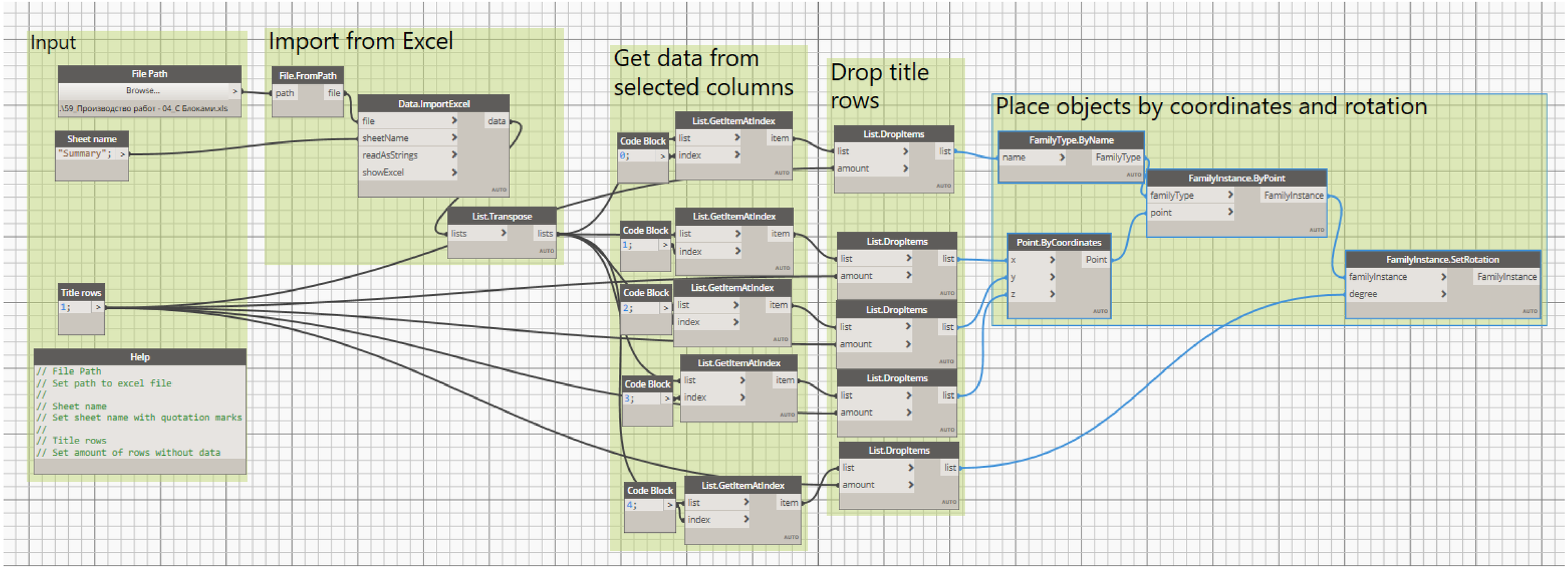
«Universal» road sign family



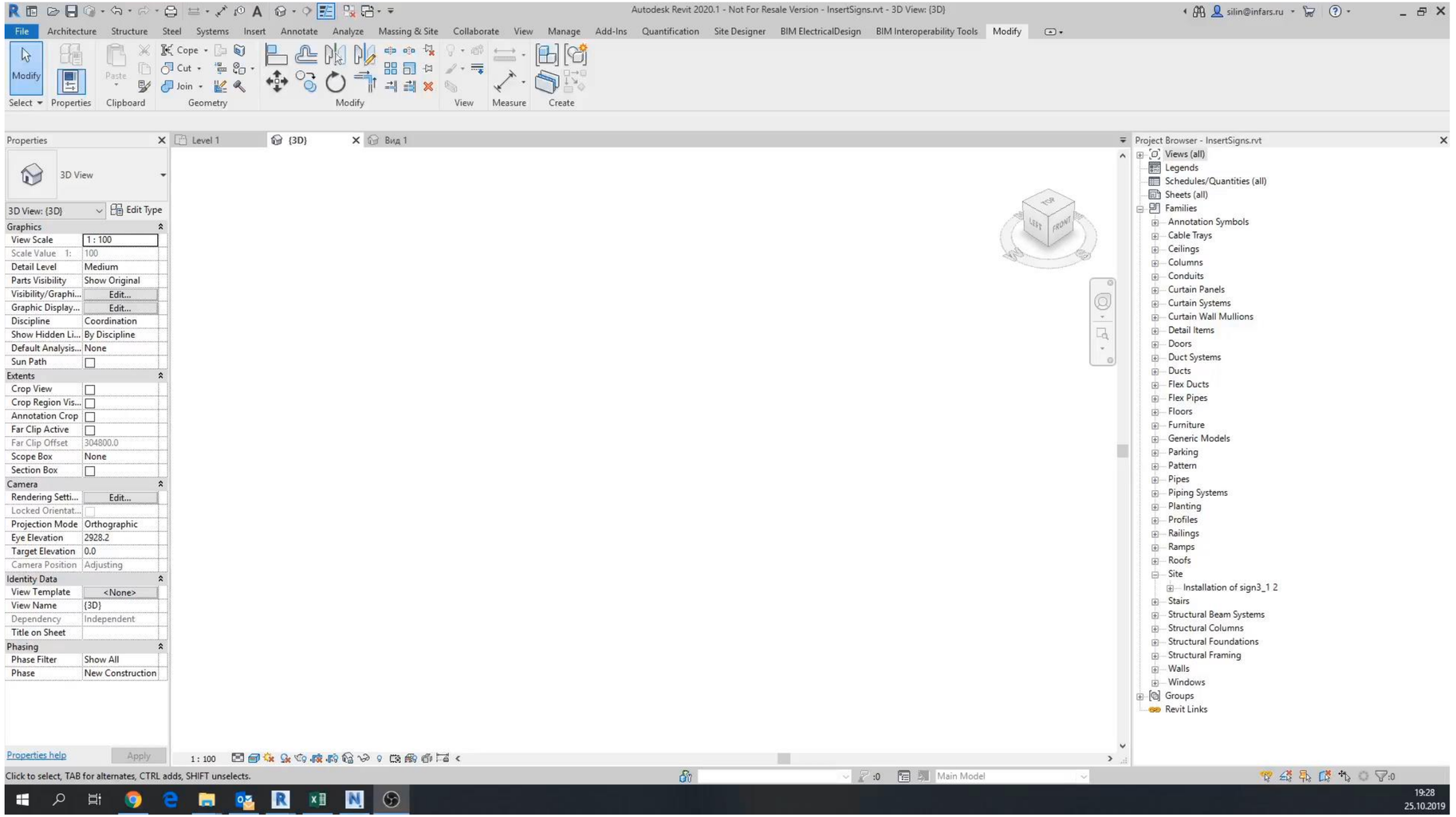



# Dynamo script



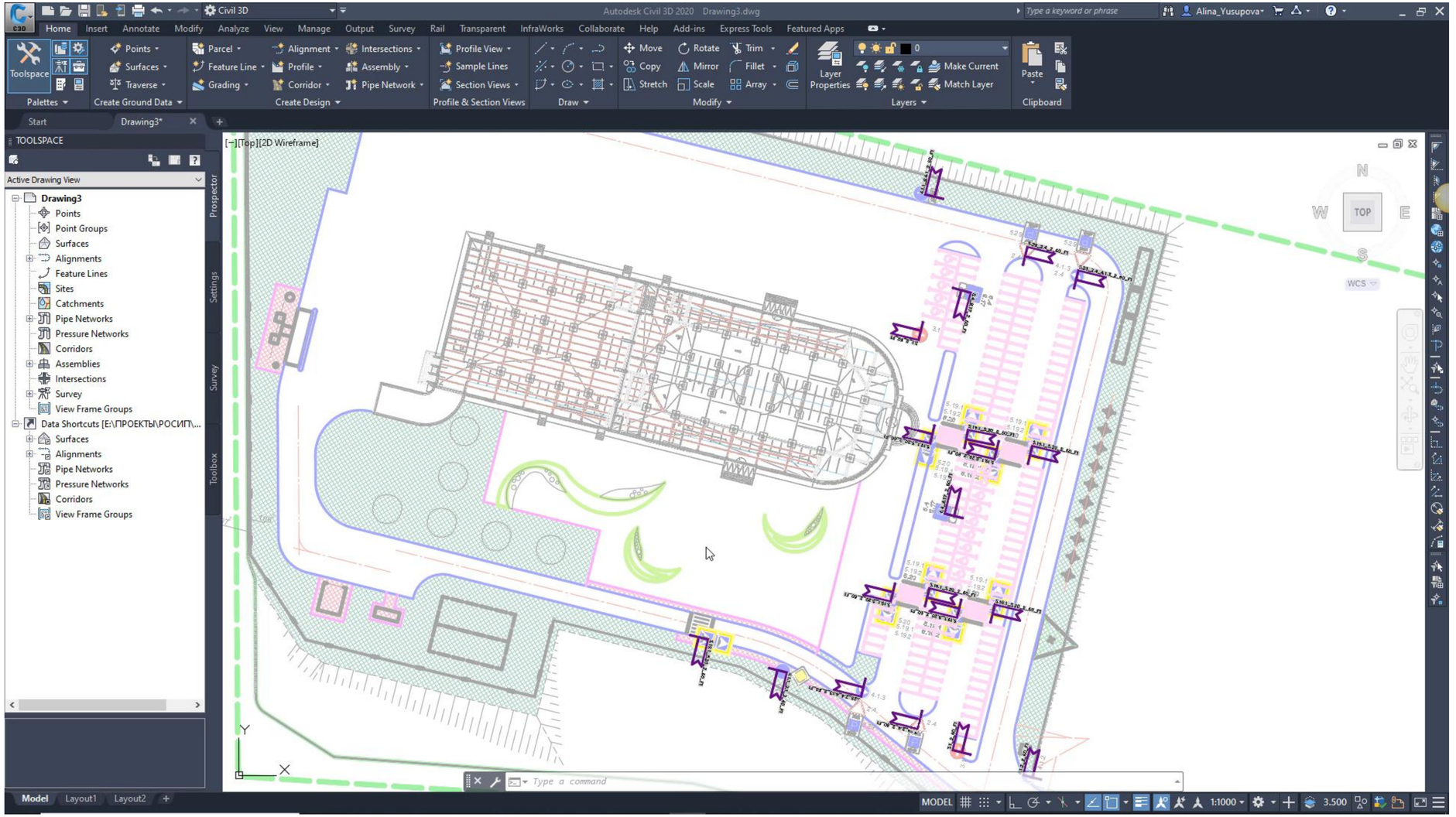
# Dynamo script




https://youtu.be/C746Zb6fwcg

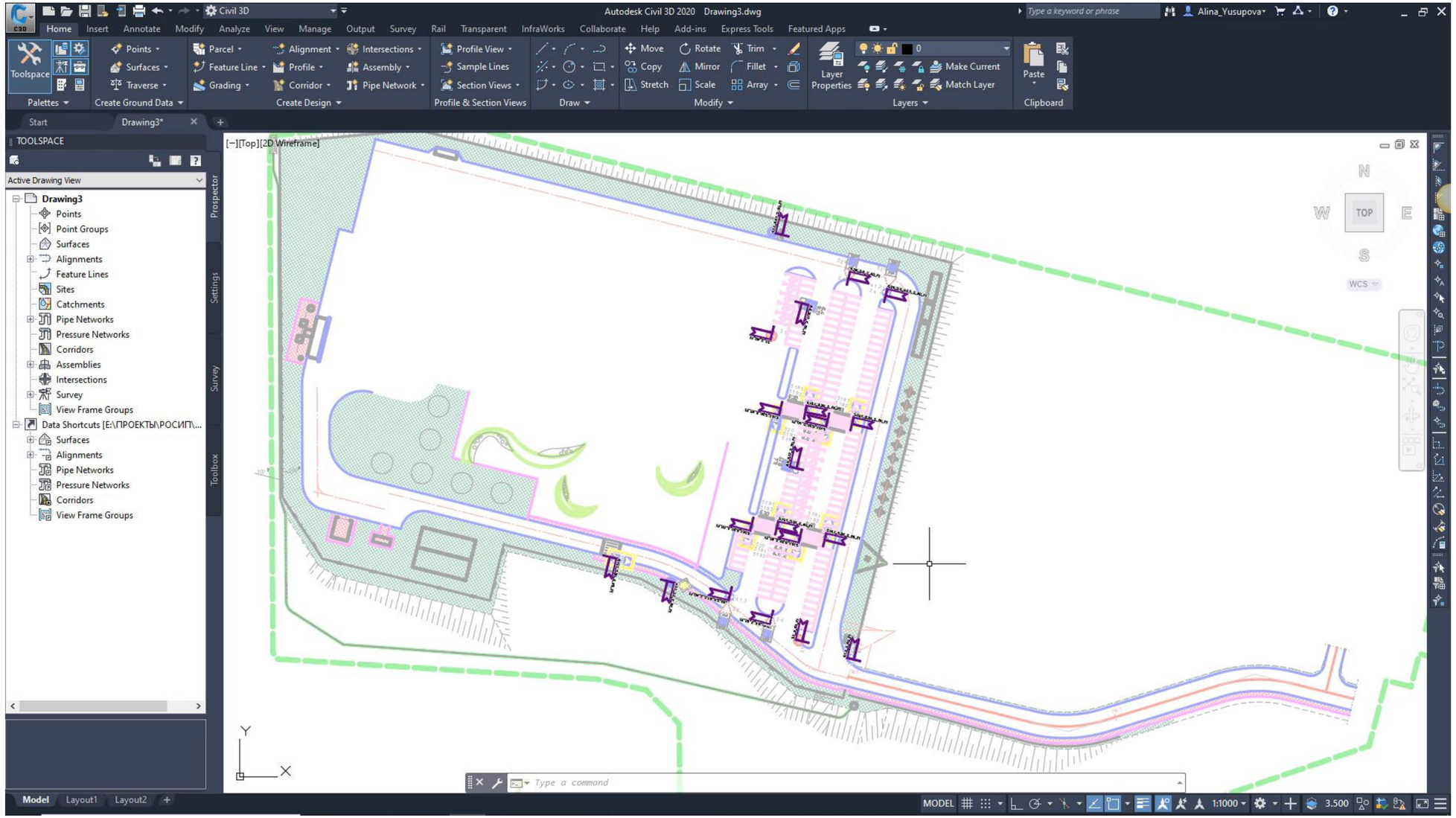
# Organization a GIS system of a traffic management plan in Civil 3D and its effective transfer to InfraWorks model

# Organization a GIS system in Civil 3D and import to InfraWorks




https://youtu.be/pwv8Kr_V1Yc

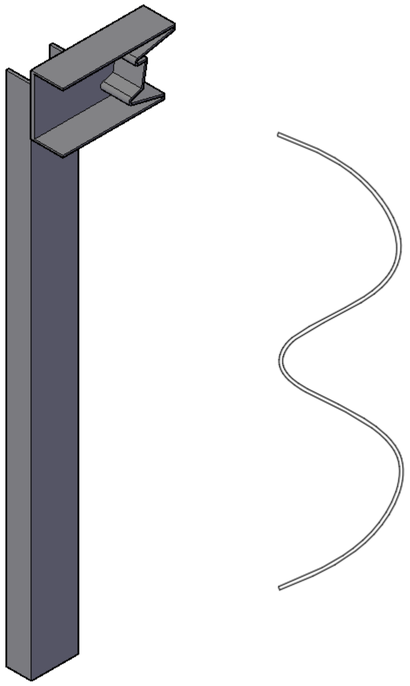
# Making changes



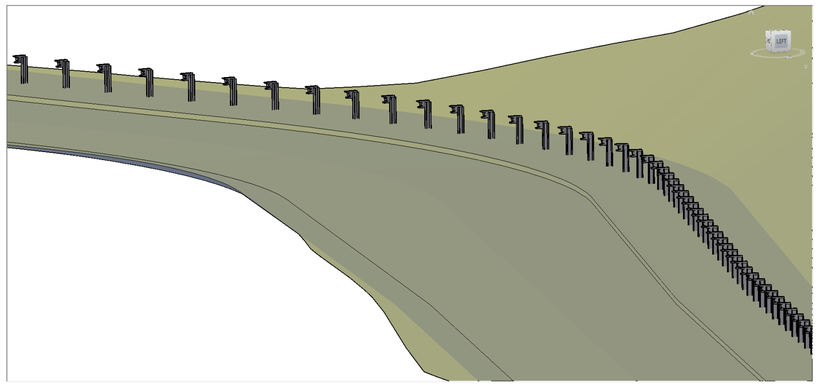
# Creation of 3D guardrail in Civil 3D

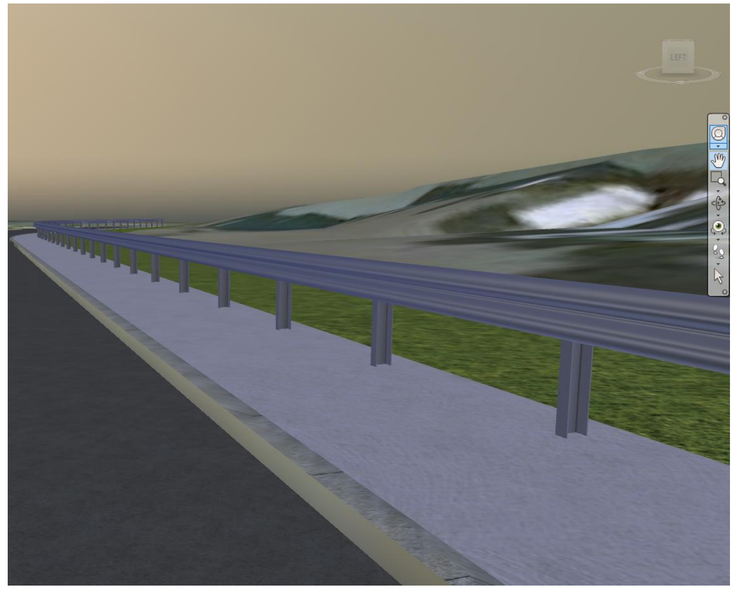
# Creation of 3D guardrail in Civil 3D

1. Create 3D model of post and closed polyline of rail profile
2. ARRAY or MEASURE for placing 3D models of posts along the line
3. SWEEP closed polyline of rail profile for creating a rail

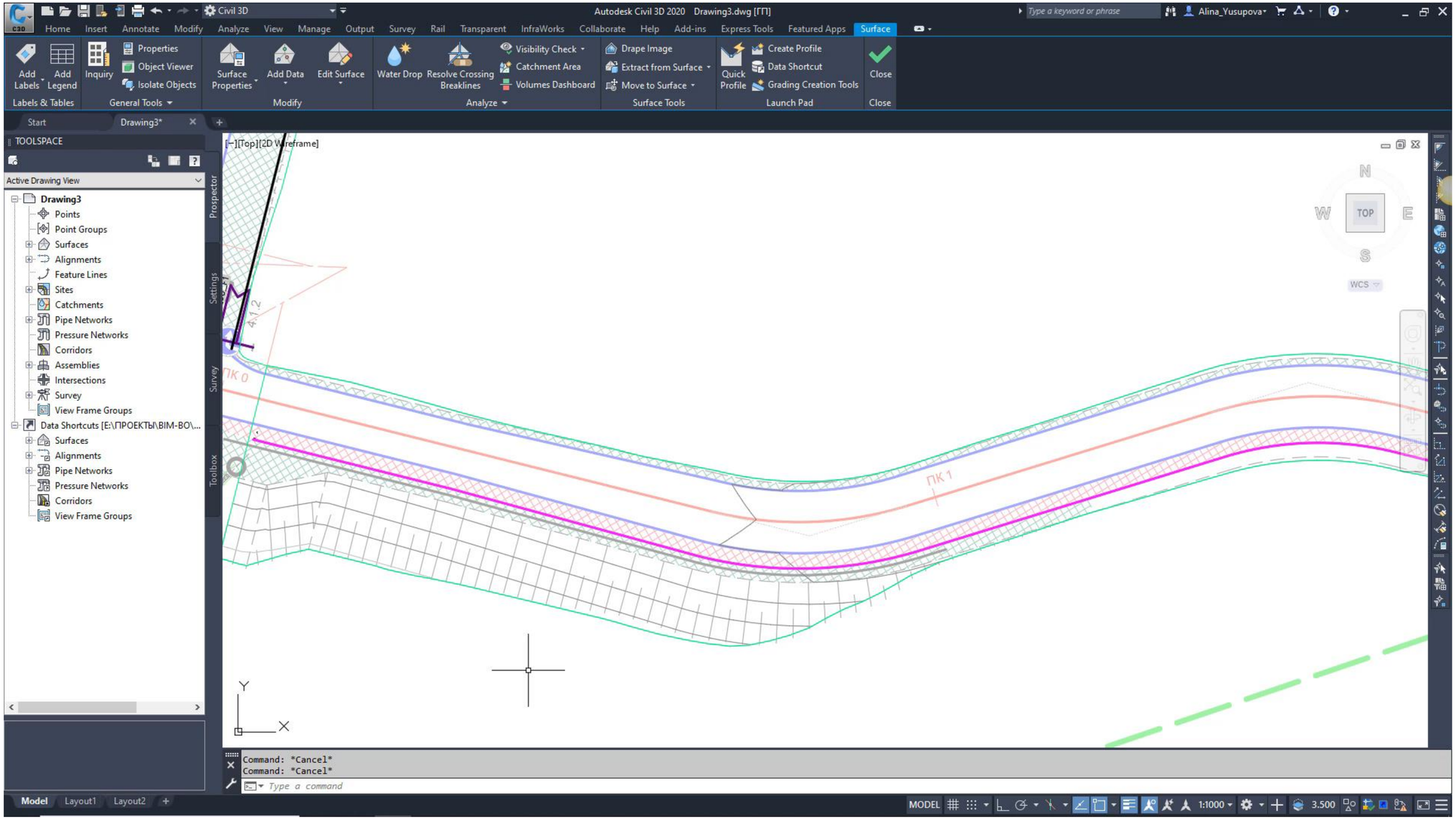




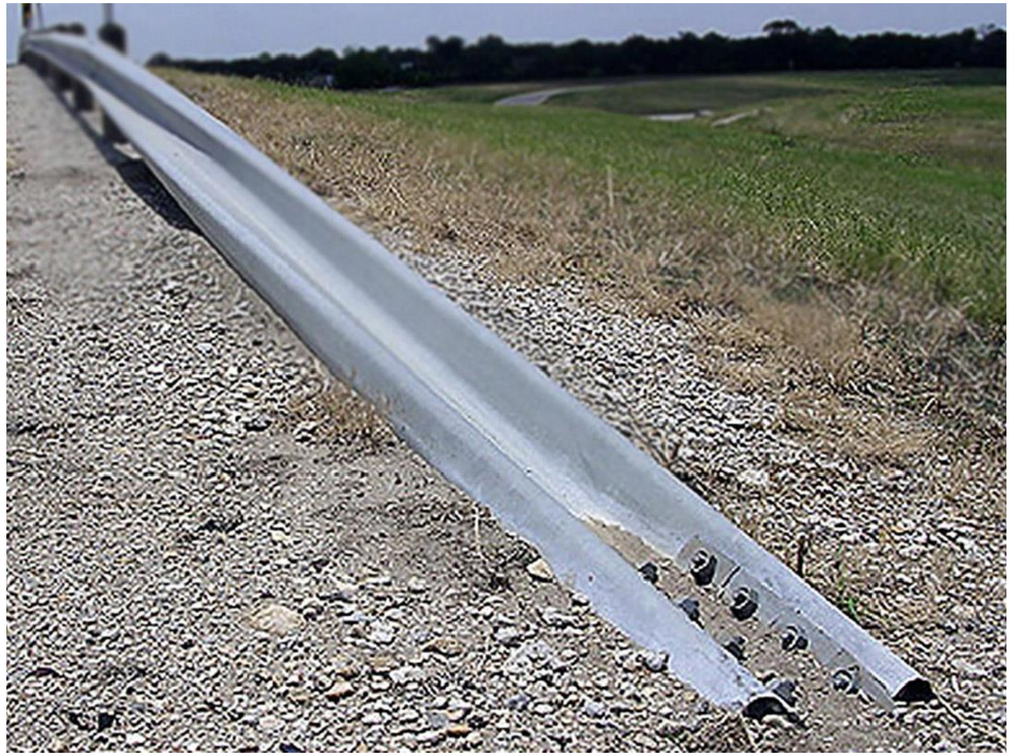




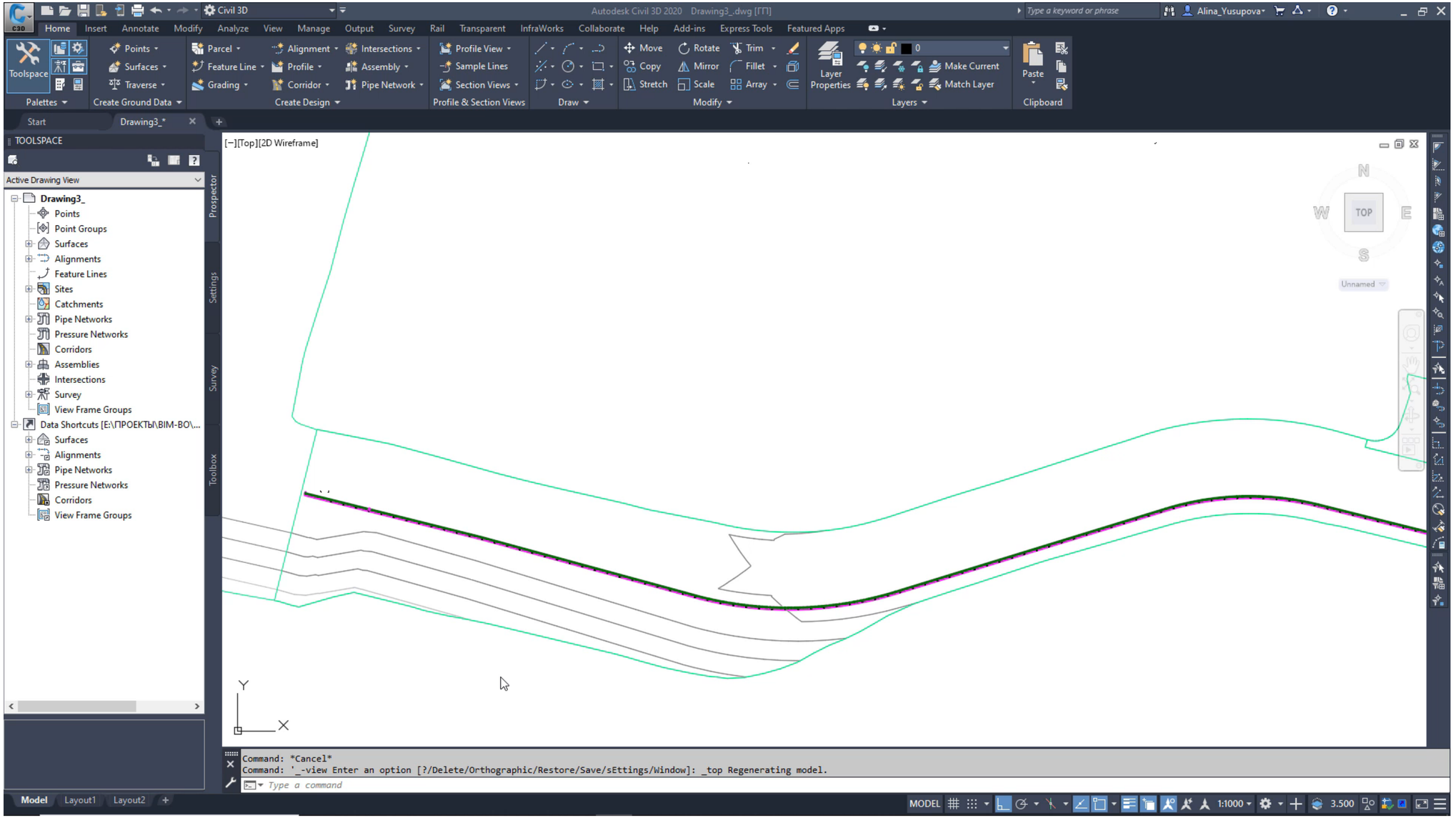
# Creation of 3D guardrail in Civil 3D



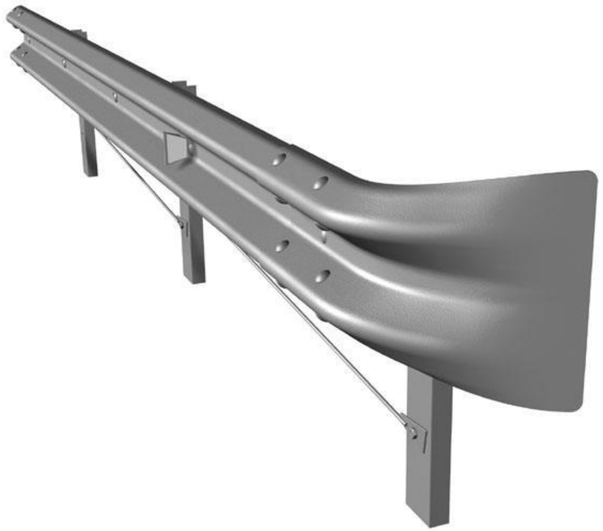
# Creation of terminal anchor section guardrail

# Creation of terminal anchor section guardrail

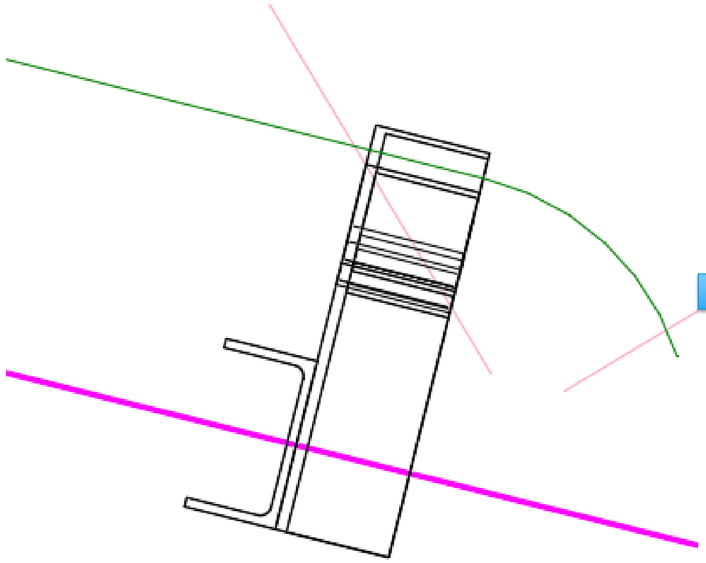


# Creation of guardrail terminal end wing



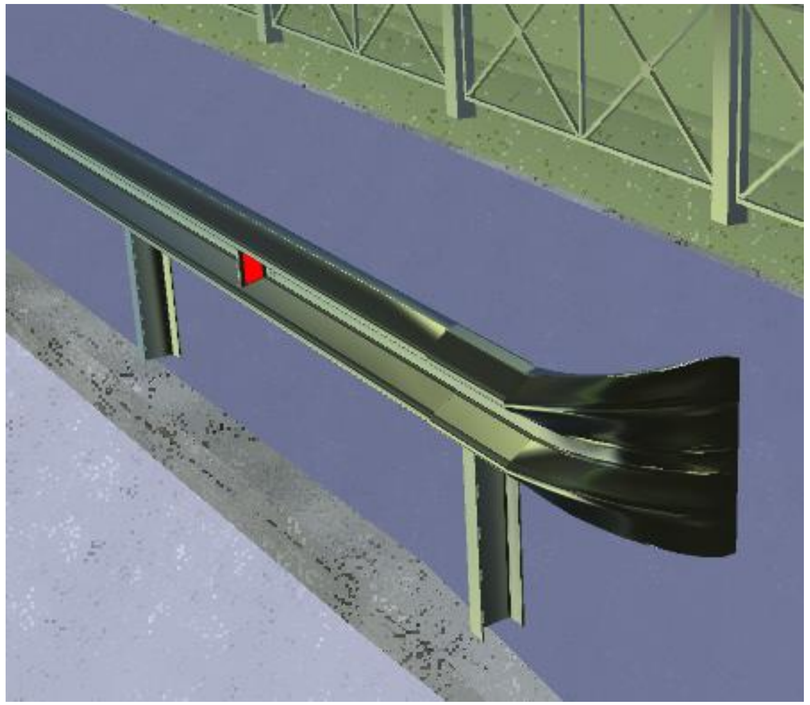
Flared end wing

(photo)



Feature line with an arc

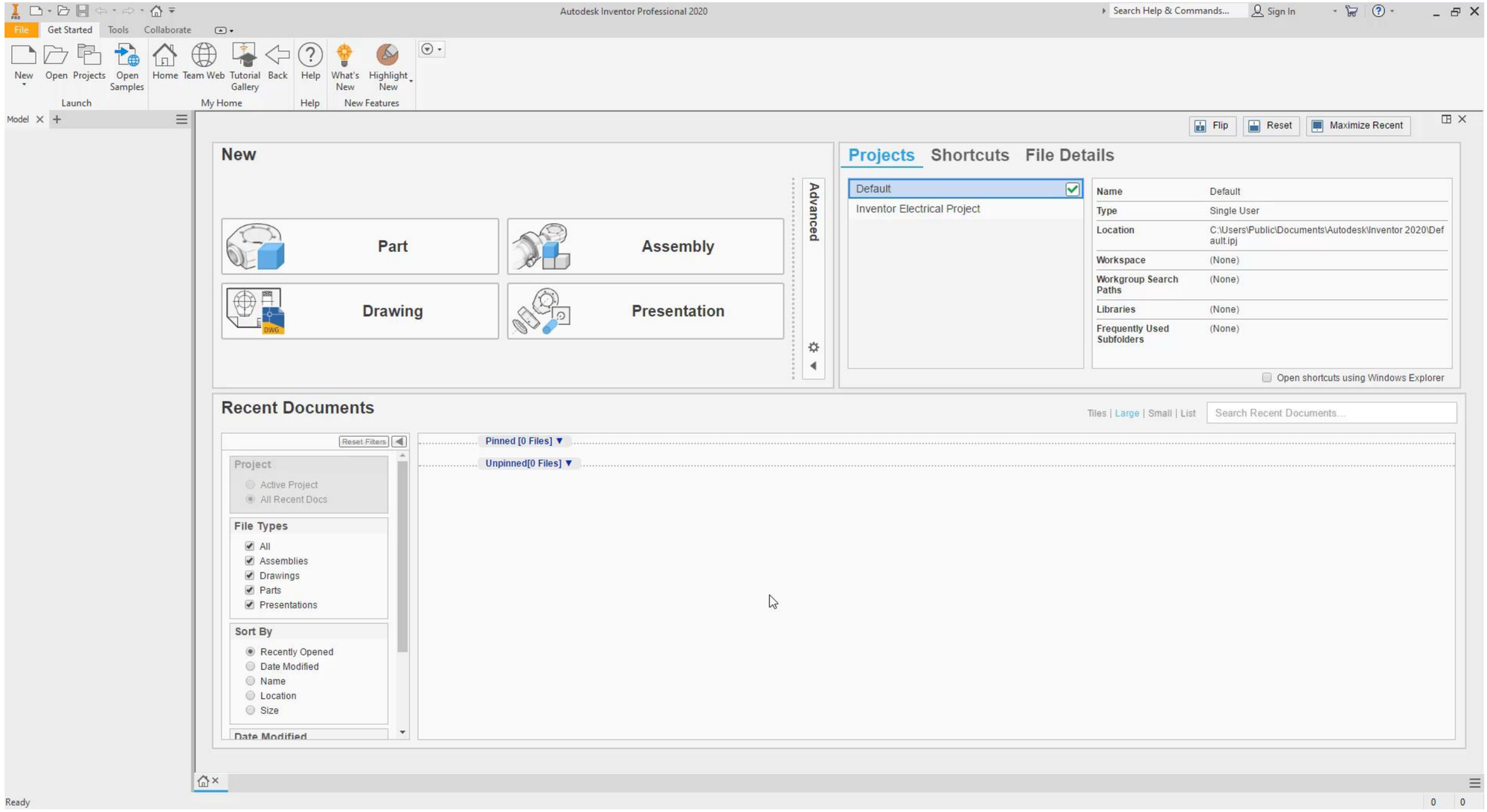
at the end



3D model of flared end wing in Navisworks

# Creation of parametric barriers in Inventor and applying them to component roads in InfraWorks

# Create parametric barriers in Inventor



# Import to InfraWorks


https://youtu.be/9H4ubZc-jI0

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INFARS

# THANK YOU!


## Alina Yusupova

yusupova@infars.ru

alin.yusupova


www.infars.ru

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