Using AutoCAD Civil 3D in Railway Engineering: Vault as the Basis of Smooth Work and Quality

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Class summary

The session will focus on dynamic railway engineering using AutoCAD Civil 3D software. You will find out how you can use AutoCAD Civil 3D to complete a railway project from engineering solutions to detailed drawings. The session will reveal the possibilities of AutoCAD Civil 3D software in the creation of dynamic Building Information Modeling (BIM) infrastructure models, such as railways, roads, pipelines, and so on. We will show how Vault software facilitates the efforts of the entire Project Team, ensures smoother transfer of information, and increases the efficiency of AutoCAD Civil 3D software data shortcuts. We will provide practical examples on how Vault software helps to ensure higher quality for the project and avoid possible human error.

Key learning objectives

At the end of this class, you will be able to:

- Learn how to complete a railway project using AutoCAD Civil 3D, from concepts to detailed drawings
- Find out how to create a consistent, dynamic infrastructure BIM model using AutoCAD Civil 3D
- Find out how the Vault ensures smoother and more efficient collaboration between project team members
- Find out how Vault increases the quality of the project

Agenda

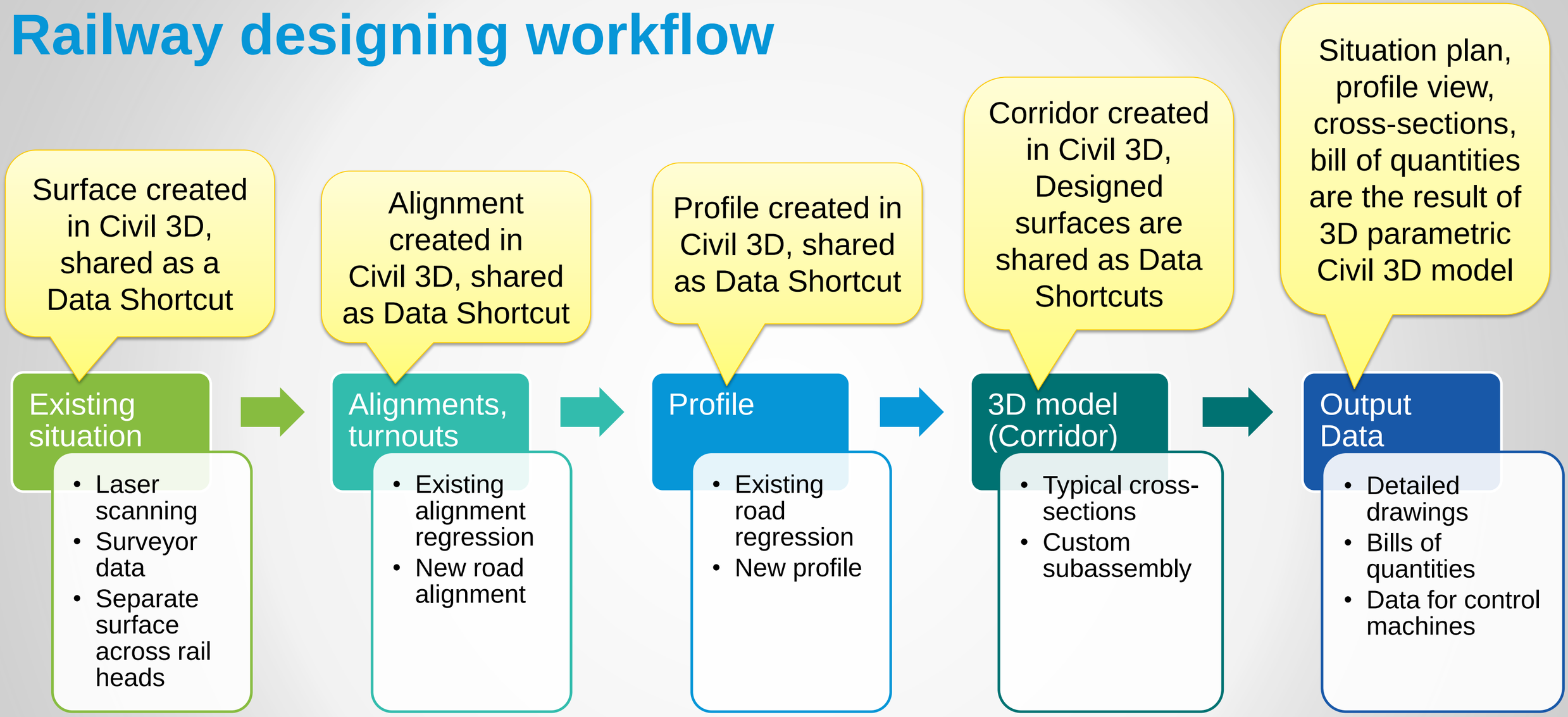
- Railway designing workflow
- Railroad project as the axis of dynamic BIM project
- Vault is the backbone of efficient project collaboration
- Vault helps achieve higher quality and avoid human error

Let’s look deeper!

A tool can be used beyond it’s primary purpose.

The possibilities of a program are not limited to the list of commands – we can always achieve more through SDK.

Railway designing workflow

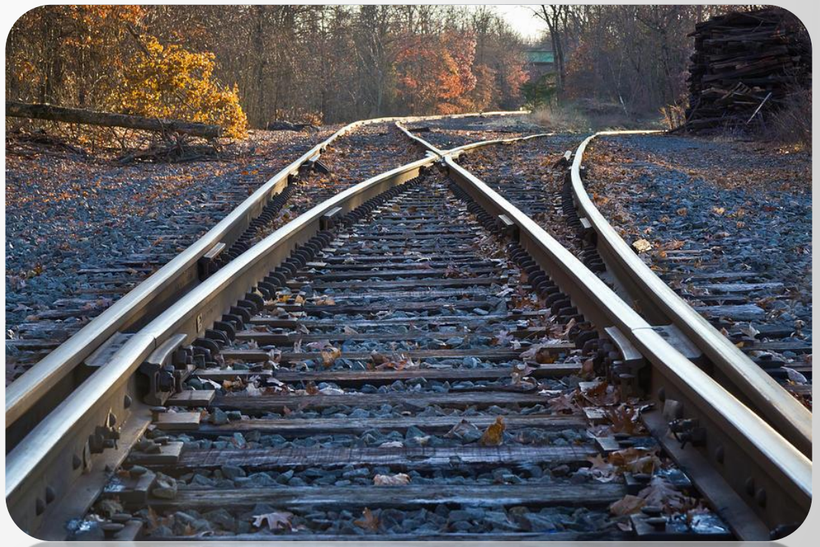


Designing turnouts using Civil 3D.

Looking for solutions.

Methods of turnout designing

- Using standard or dynamic blocks
- Using blocks in combination with Cogo points
- Using additional Civil 3D functionality – Rail Turnouts and Crossings
- Using Structures

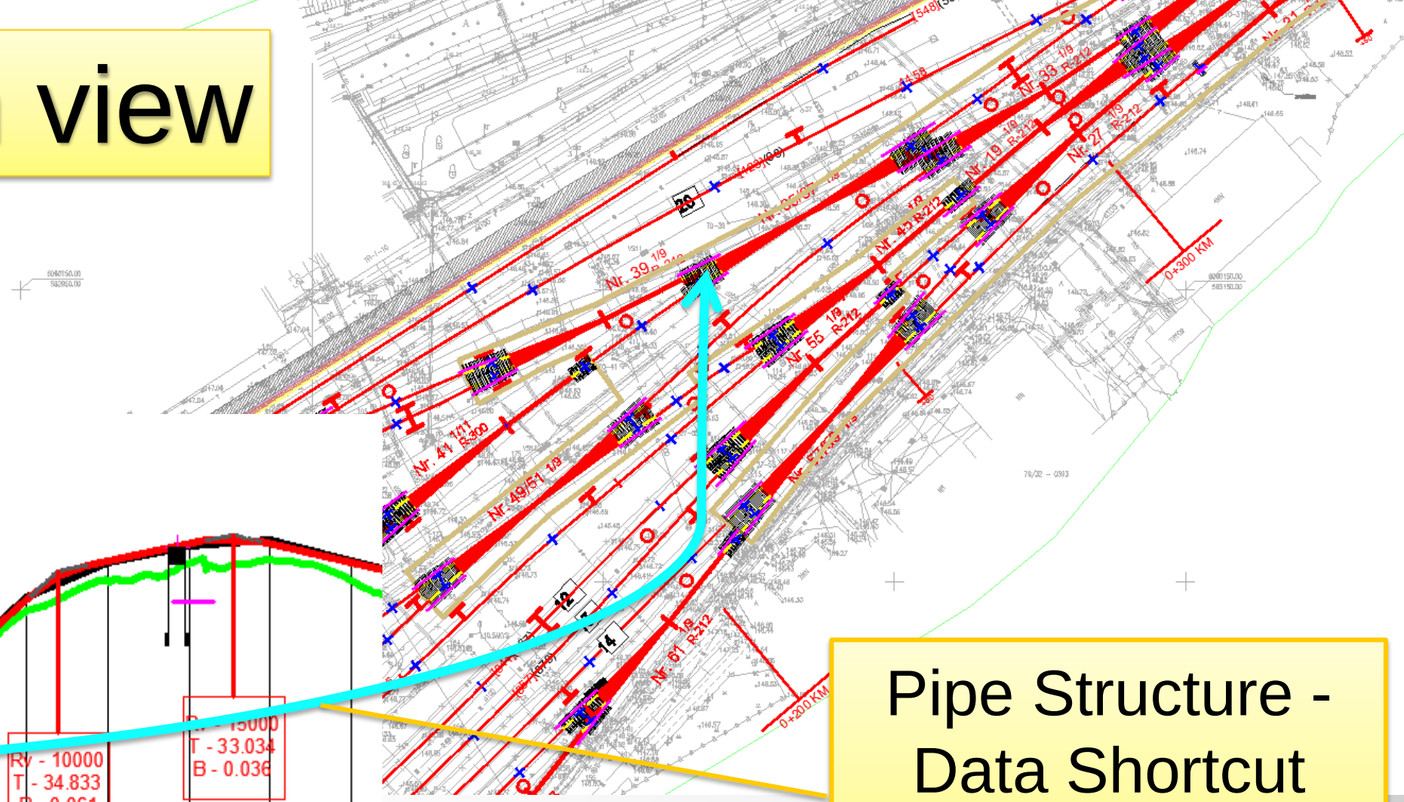


Can’t find the best solution to design turnouts?

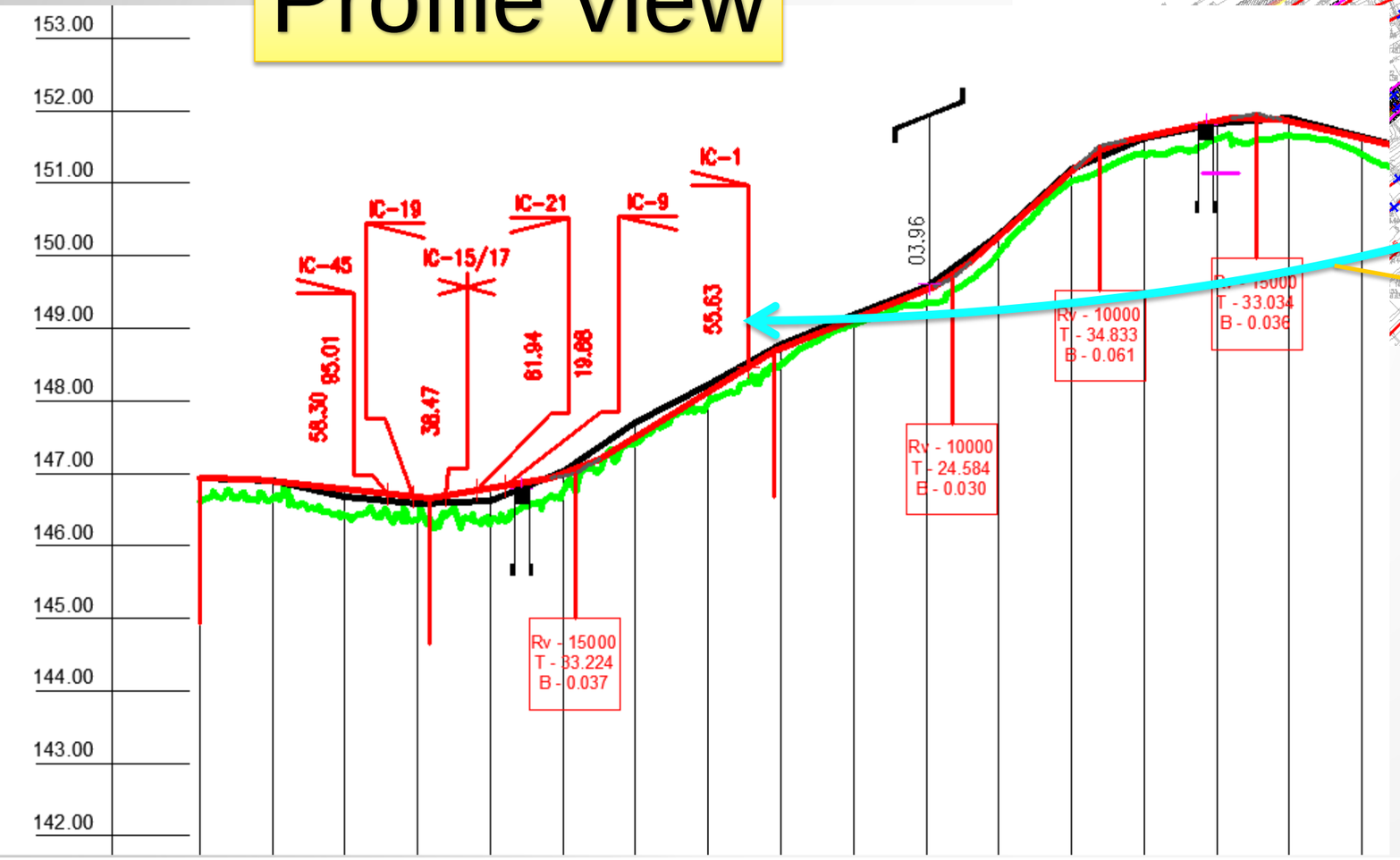
Use the pipe designing functionality for designing turnouts!

Turnouts

Plan view



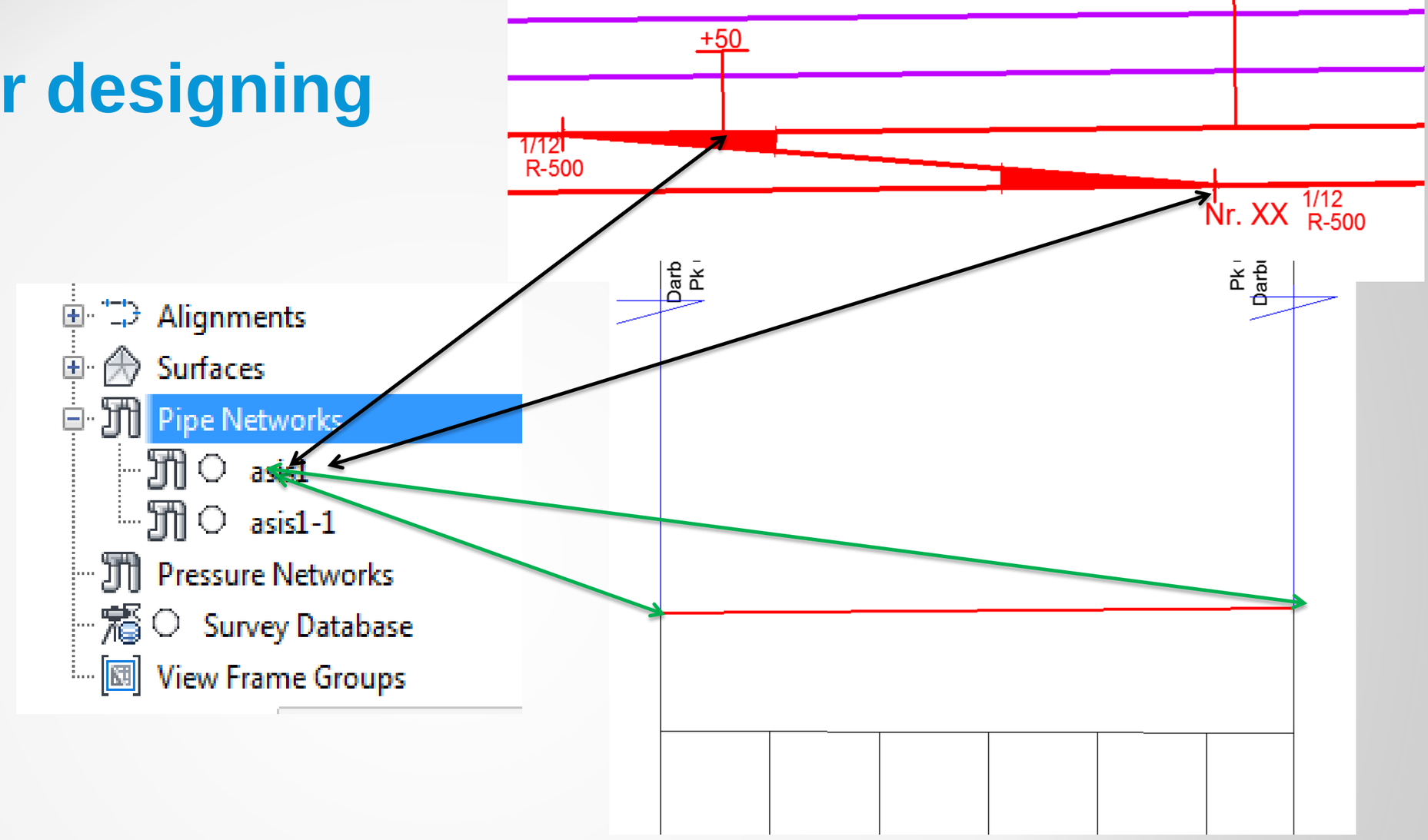
Profile view



Pipe Structure - Data Shortcut connection

- **Create Pipe Structure Data Shortcuts**
- **Draw parts in the profile view**
- **Set the right view style**
- **Update Data**

Rail crossover designing



The altitude of turnout insertion is the design altitude of your main tracks, which is dynamically linked to the planned position of the turnout and design altitudes of the main tracks.

Railway designing workflow – turnouts

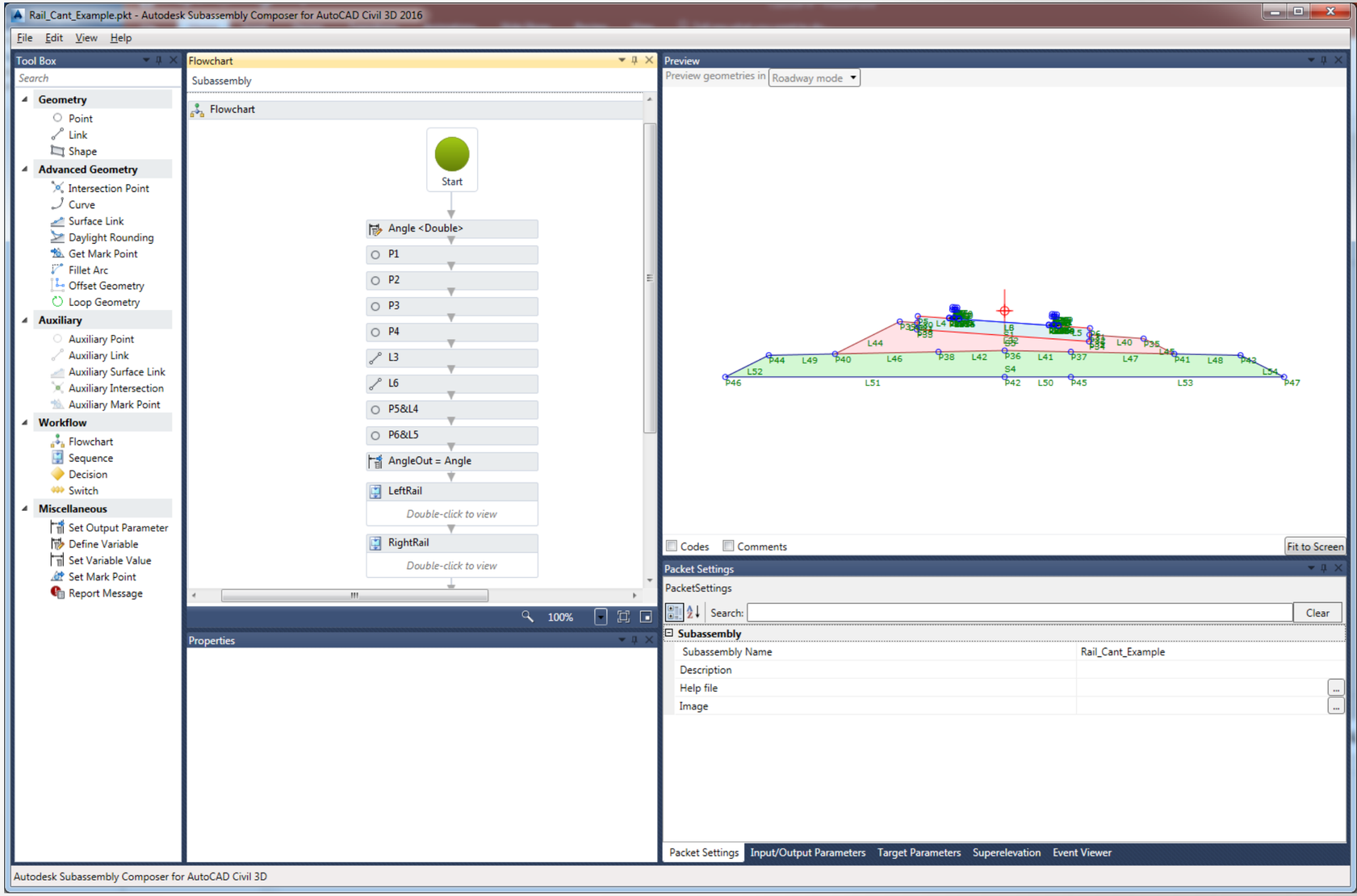
- How does your railway workflow look like?
- What do you use for turnout designing?
- What do you think of the use of pipelines?

3D parametric model.

You can achieve a lot using SDK

Creating railway structures using Subassembly Composer

- Easy to use
- No specific programing skills required
- Any structure of desired cofiguration can be created
- The code behind it as well!



Creating railway structures using Civil 3D custom subassemblies. VB.NET

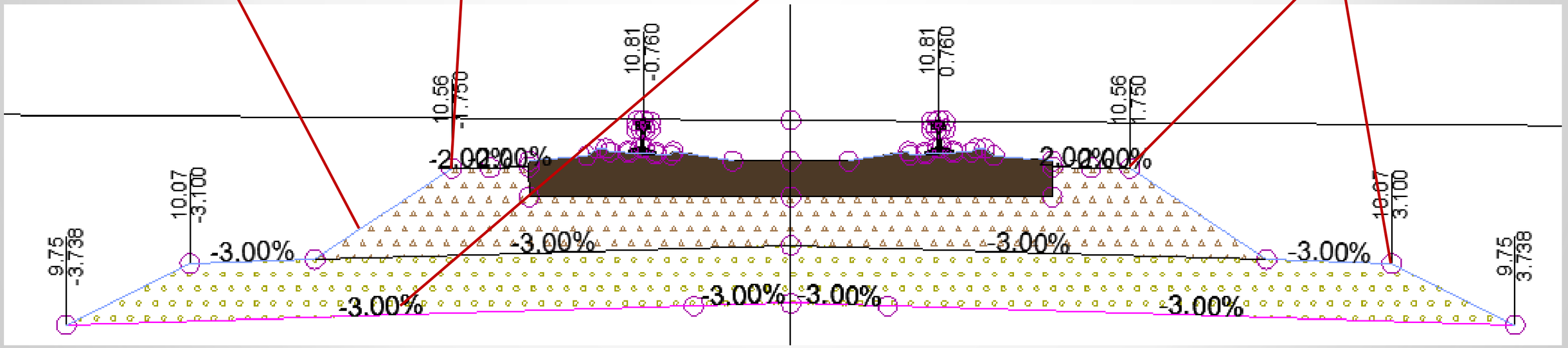
```
If nlsl1 = 0 Then
    P6 = New Point2d(P4.X, P13.Y + Math.Abs(P4.X) * vslope6)
    If dOutsideElevationS <> -1000 Then
        vslope6 = (oOrigin.Elevation + P13.Y - dOutsideElevationS) / Abs((dxS - P13.X))
        P6 = New Point2d(dxS * flip, (P13.Y - Abs(dxS) * vslope6))
        P5 = New Point2d(P6.X, P13.Y + Math.Abs(P6.X) * vSlope2)
    End If
Else
    P6 = New Point2d(dxS * flip, P5.Y + (Math.Abs(dxS) - Math.Abs(P5.X)) * vslope6)
End If
```

Set Point code manually

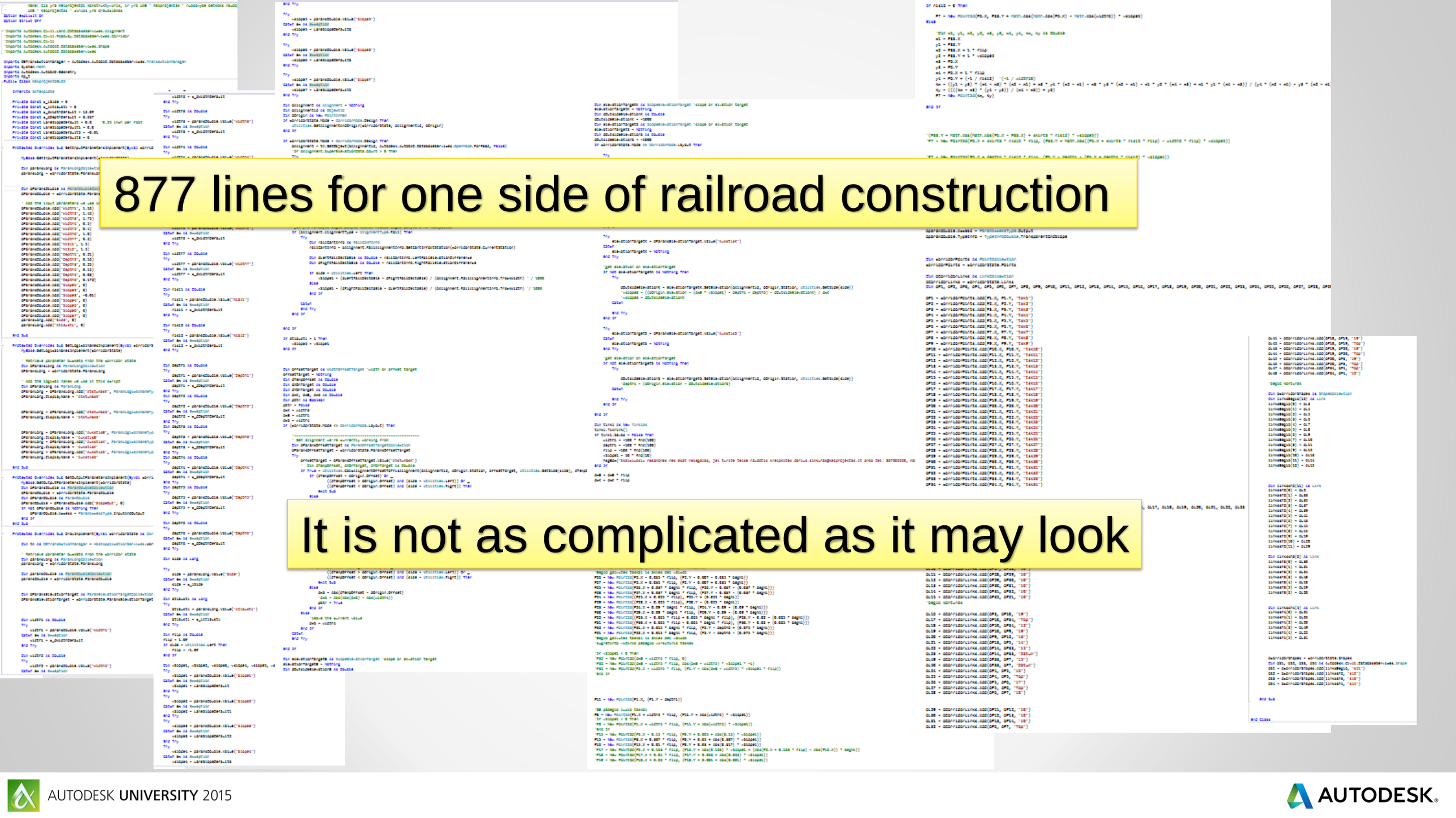
Set Link code manually

Grade can be calculated using a formula

Offset target
Height target
Set Point code manually



More info on AU 2014 - CV5762-R-P


877 lines for one side of railroad construction
It is not as complicated as it may look

Creating railway 3D models

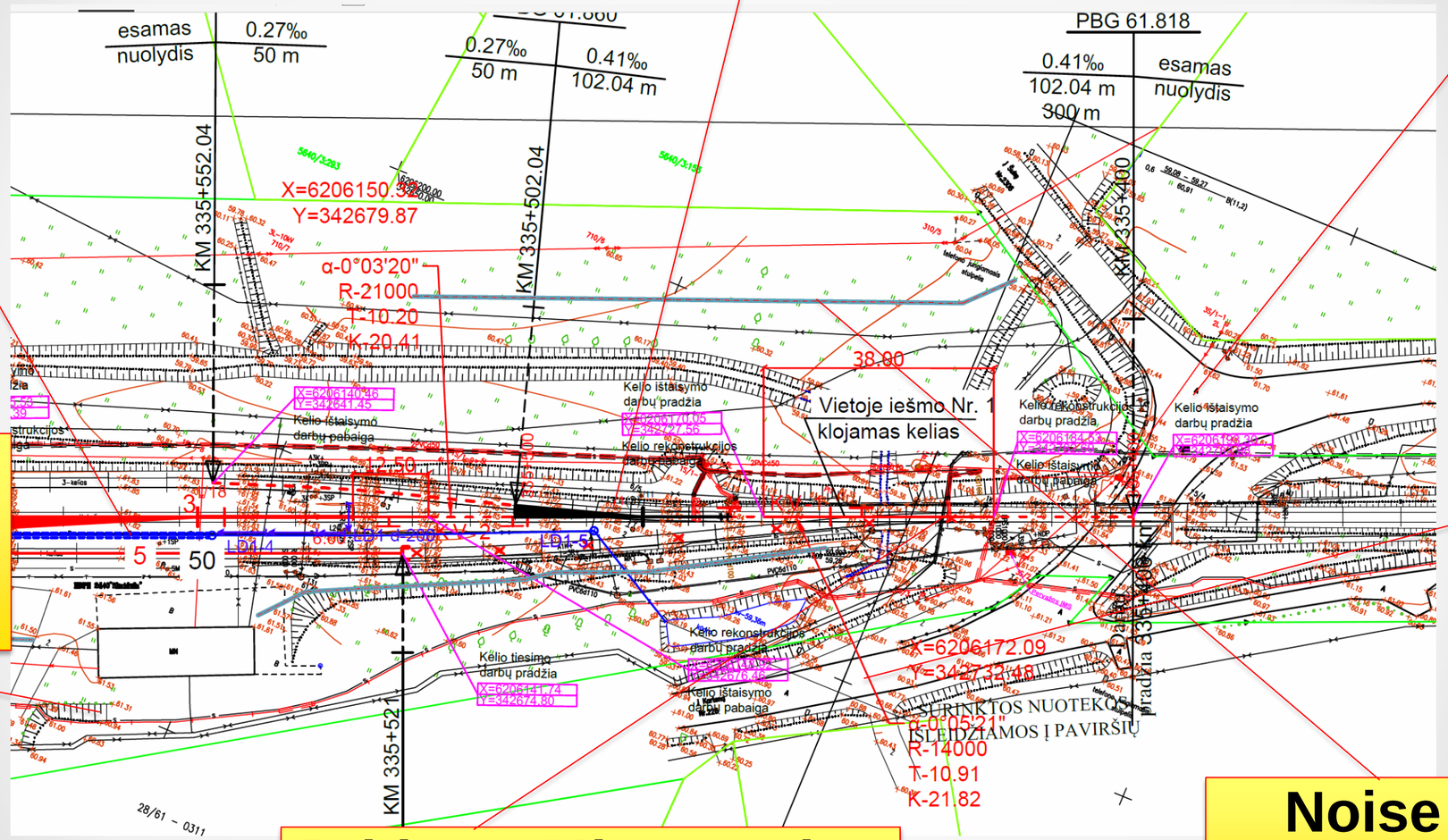
- What are your biggest challenges when creating Civil 3D corridors?
- What does your company use to create railway structures?
- Do you have a single library of elements in your company? How many elements does it contain?

Railroad project as the axis of a dynamic BIM project

Piping – C3D data shortcut

Railroad – C3D data shortcut

Road – C3D data shortcut



Existing ground – C3D data shortcut

Electricity – AutoCAD reference

Bridge – Microstation reference

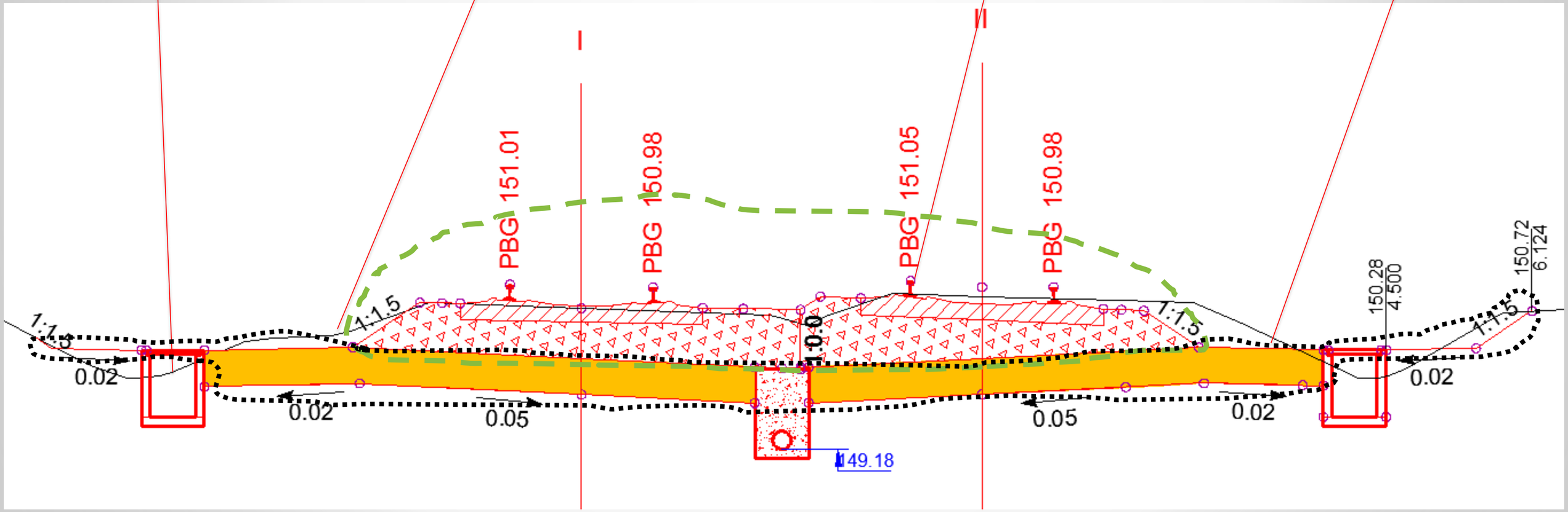
Noise barrier – AutoCAD reference

Piping – C3D data shortcut

Existing ground – C3D data shortcut

Railroad – C3D data shortcut

Road – C3D data shortcut

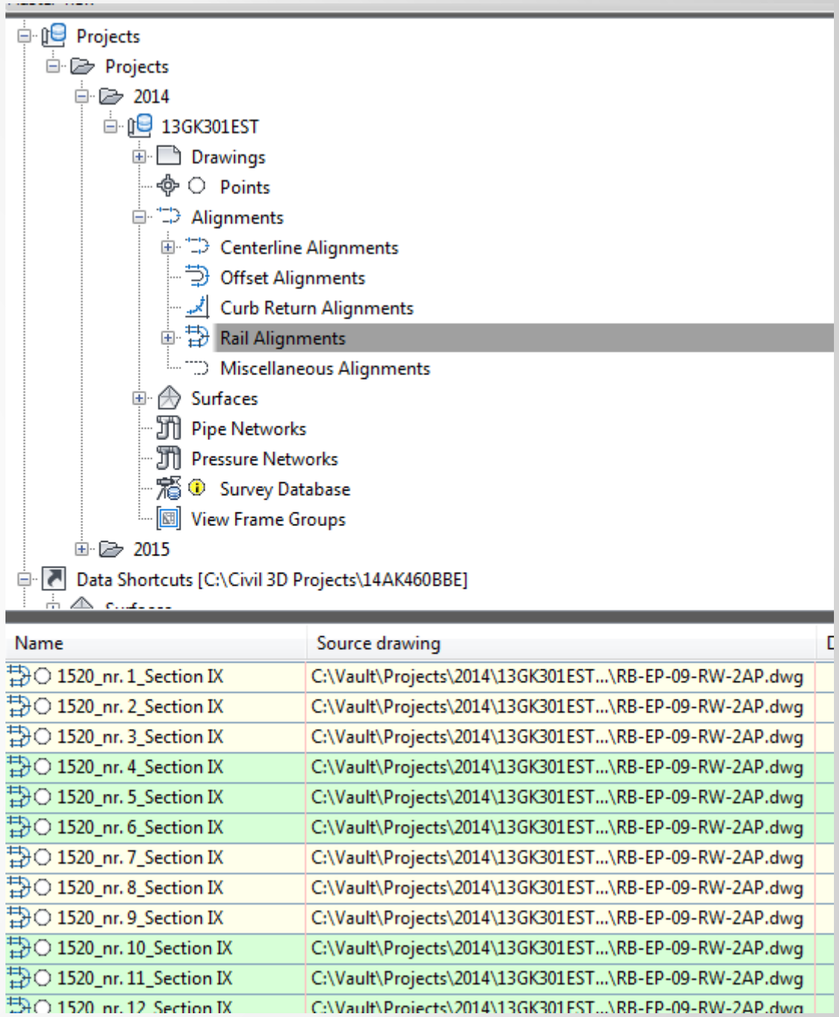


Communication levels

2D
- CAD (DWG, DXF, DGN)
- GIS

3D
- CAD (DWG, DXF, DGN,IFC)

Civil 3D object
- Data Shortcuts, teamwork

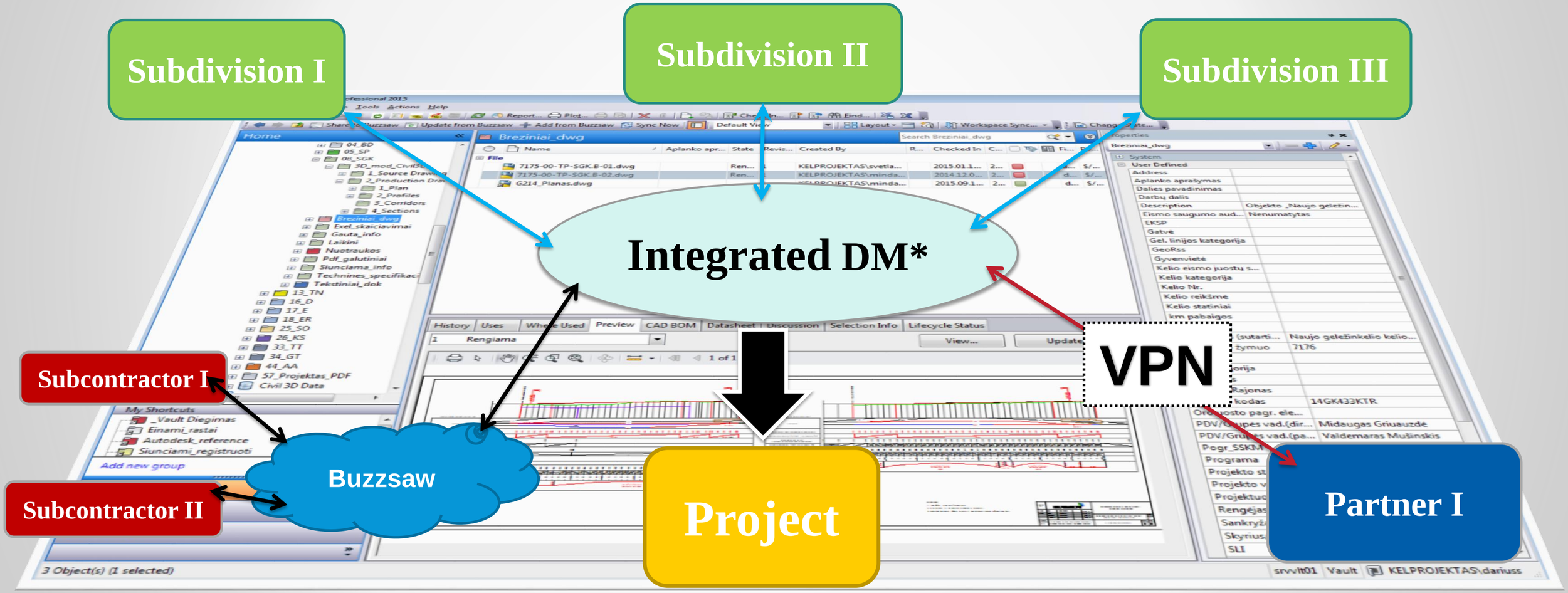


Civil 3D – the foundation of a dynamic model

- What is your experience in exchanging information and what are the levels of data exchange?
- What fields are involved in the single integrated parametric 3D model?
- What is the connecting element of your integrated 3D model?

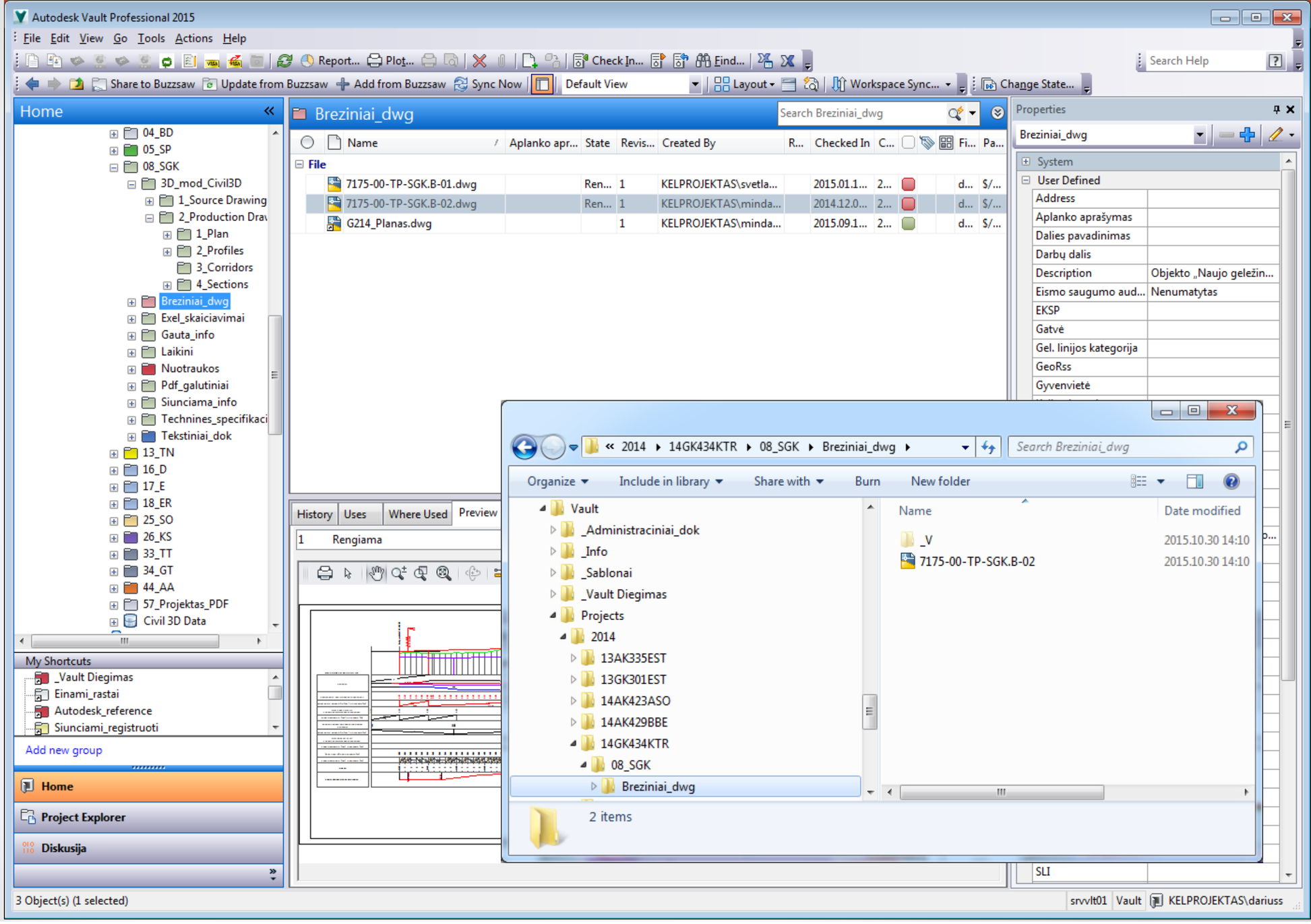
Vault is the backbone of efficient project collaboration

JSC Kelprojektas digital project scheme



*DM – digital model

- **The entire project in a single place**
- You always know which file version is the latest, when it was created and by whom
- Ability to see where the file is used and by whom
- Ability to work effectively in a team with remote subdivisions



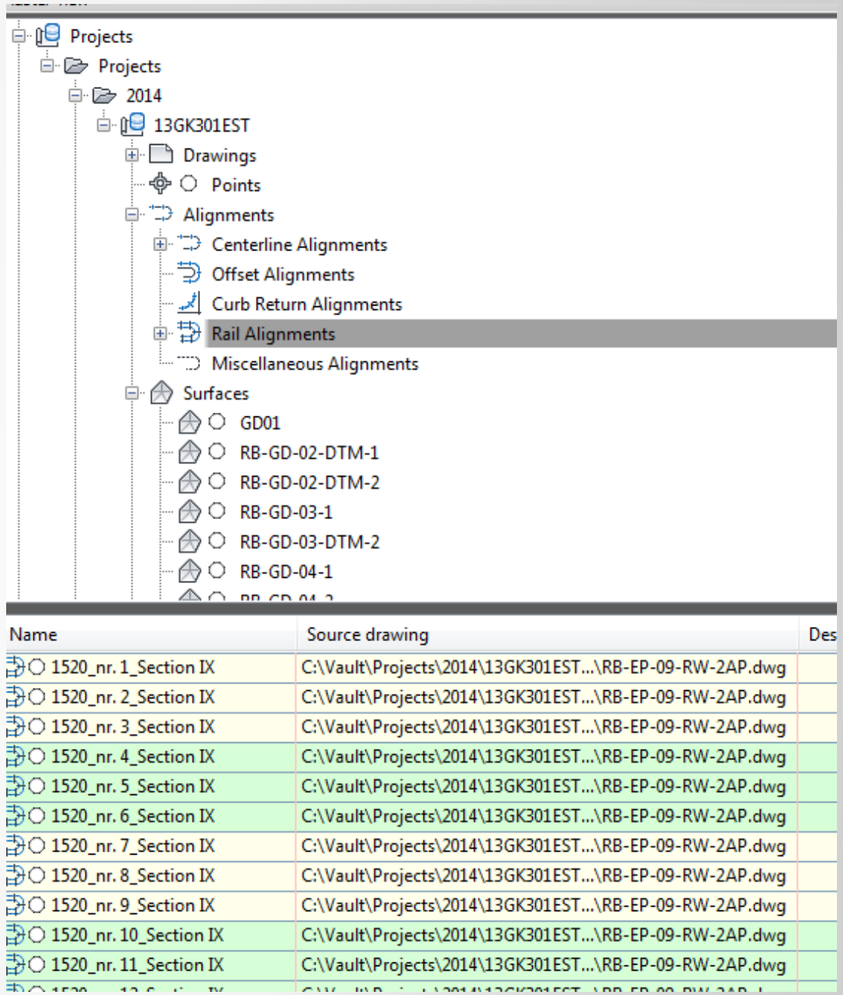
Vault is backbone of the efficient project collaboration

- How is the teamwork between project members organised?
- What challenges do you encounter most often and how do you meet them?
- Do you believe that Vault would facilitate cooperation in your team?

Vault helps us achieve higher quality and avoid human errors

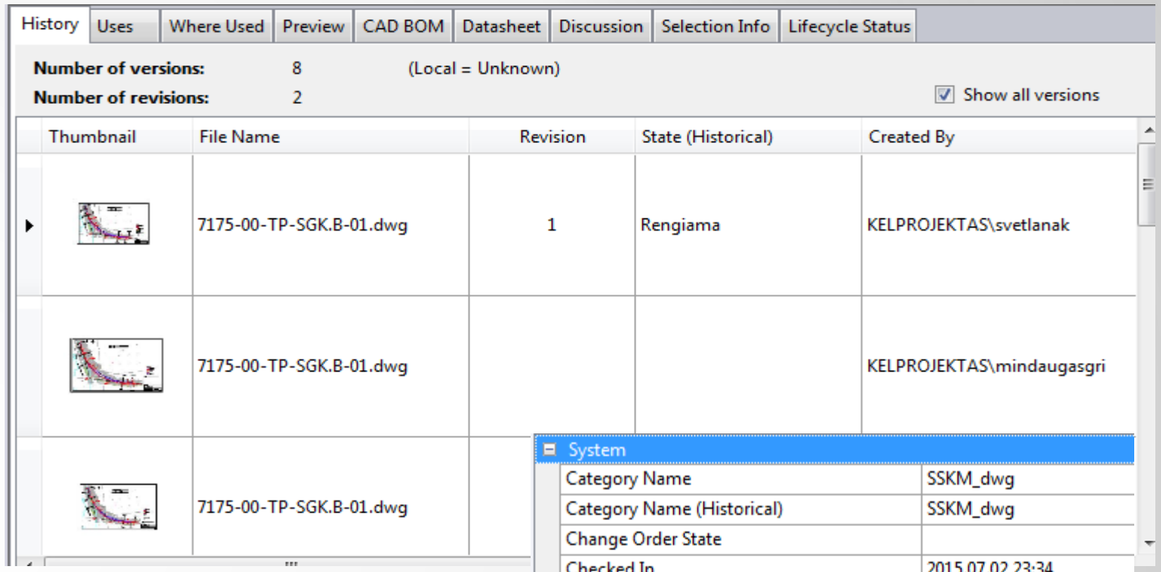
Clear, standardized, managed project structure

- **The entire project in a single place**
- Clear and standardized project structure
- Clear and standardized structure of file names
- Searching and filtering system enables easy and fast checking if all the standards have been applied



Clear, standardized, managed project structure

- You can see when the changes are made and by whom
- File versions and revisions with comments enable fast decision making
- Additional file attributes provide all the necessary information
- Everyone knows what needs to be done

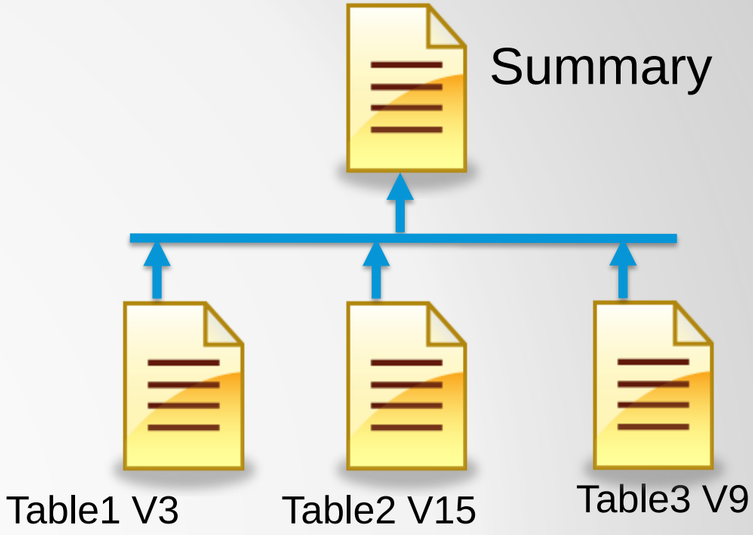


Objekto kodas	14AK431ICU
Oro uosto pagr. elementai	
PDV/Grupės vad.(dirba)	Viačeslavas Zbrujevas
PDV/Grupės vad.(pasirašo)	Viačeslavas Zbrujevas
Pogr_SSKM	
Programa	
Projekto stadija	
Projekto vykdymo priežiūra	
Projektuojamas greitis	
Rengėjas (dirba)	
Sankryža	
Skyrius/padalinys	
SLI	
Statinio/darbo pavadinimas	Valstybinės reikšmės kra...
Statinio/darbo vadovas (PV)	
Statinių rūšys	Susisiekimo komunikacij...
Sutarties būklė	Veikianti
Sutarties koordinatorius/PV	Inesa Čubarova

System	
Category Name	SSKM_dwg
Category Name (Historical)	SSKM_dwg
Change Order State	
Checked In	2015.07.02 23:34
Checked Out	2015.07.01 14:57
Checked Out By	
Checked Out Local Spec	
Checked Out Machine	
Classification	None
Comment	
Controlled By Change Order	False
Created By	KELPROJEKTAS\jurater
Current Owner	SRVSQL01\AUTODESKV...
Date Modified	2015.07.02 23:32
Date Version Created	2015.07.02 23:34
File Extension	dwg
File Name	Skersiniai.dwg
File Name (Historical)	Skersiniai.dwg
File Replicated	True
File Size	838807
Hidden	False

Life cycle – Clearly defined, controlled responsibilities

- Security level based on **Life cycle** state;
- Lifecycle allows to see the stage of the file and make proper decisions;
- Automated process (e-mail notifications, PDF, DWF generation, etc.).



Can be edited by everyone

Can be edited exclusively by the responsible employee

DWF

Work in Progress → For Review → Released → Obsolete

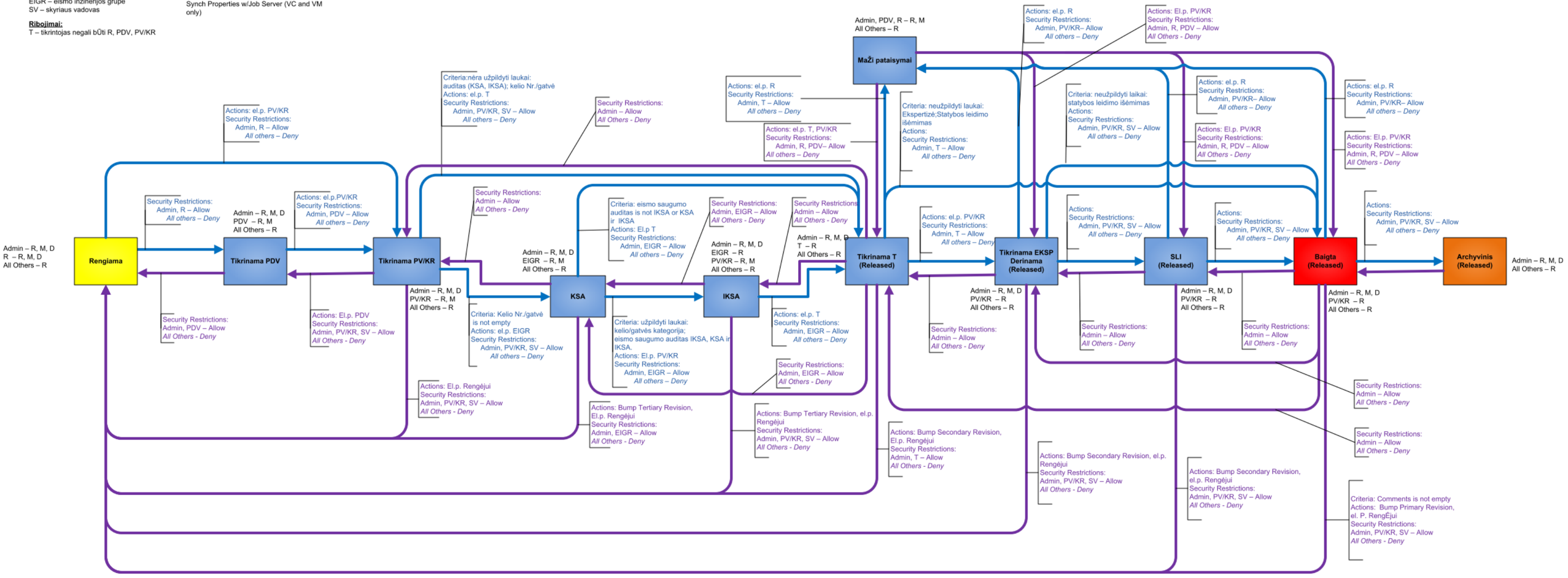
Available Groups::
R - Rengėjas
PDV – Projekto dalies vadovas
PV – Projekto vadovas
KR – koordinatorius
T – tikrintojas
EKSP - ekspertizė
SLI – statybos leidimo išėmimas
KSA - kelių eismo saugumo auditas
IKSA - išorinis eismo saugumo auditas
EIGR – eismo inžinerijos grupė
SV – skyriaus vadovas

Ribojimai:
T – tikrintojas negali bŪti R, PDV, PV/KR

Lifecycle State Permissions (Allow/Deny):
R = Read
M = Modify
D = Delete

Lifecycle State Transition Actions:
Bump Primary Revision
Bump Secondary Revision
Bump Tertiary Revision
Synch Properties w/Job Server (VC and VM only)

Kategorija: Susisiekimo mokunikacijos SSKM
Dalis: Susisiekimo 03_S
Gyvavimo ciklas failams su dgn/dwg galūne



Life Cycle is the key element for the project management. It is crucial for different teams to be aware of the status of the file and be sure that it is not edited without a proper notice.

Vault helps us achieve higher quality and avoid human errors

- How do you ensure and control the application of standards in your company?

- What advantages of the Vault seem most relevant to you?

Thank you!

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- AU 2016 passes awarded daily!
- Give your feedback after each session.
- Give instructors feedback in real-time.