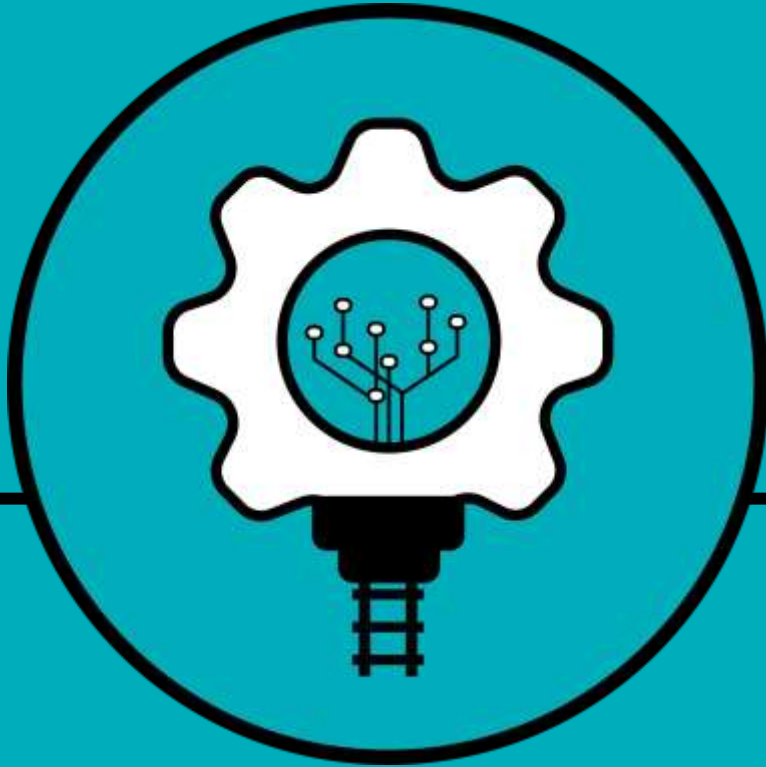




# Engineering Services

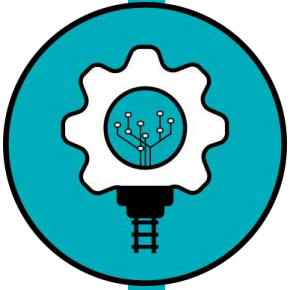
## OpenRail Designer 2024 Efficiencies

Bentley/PWI/Network Rail – Positive collaboration

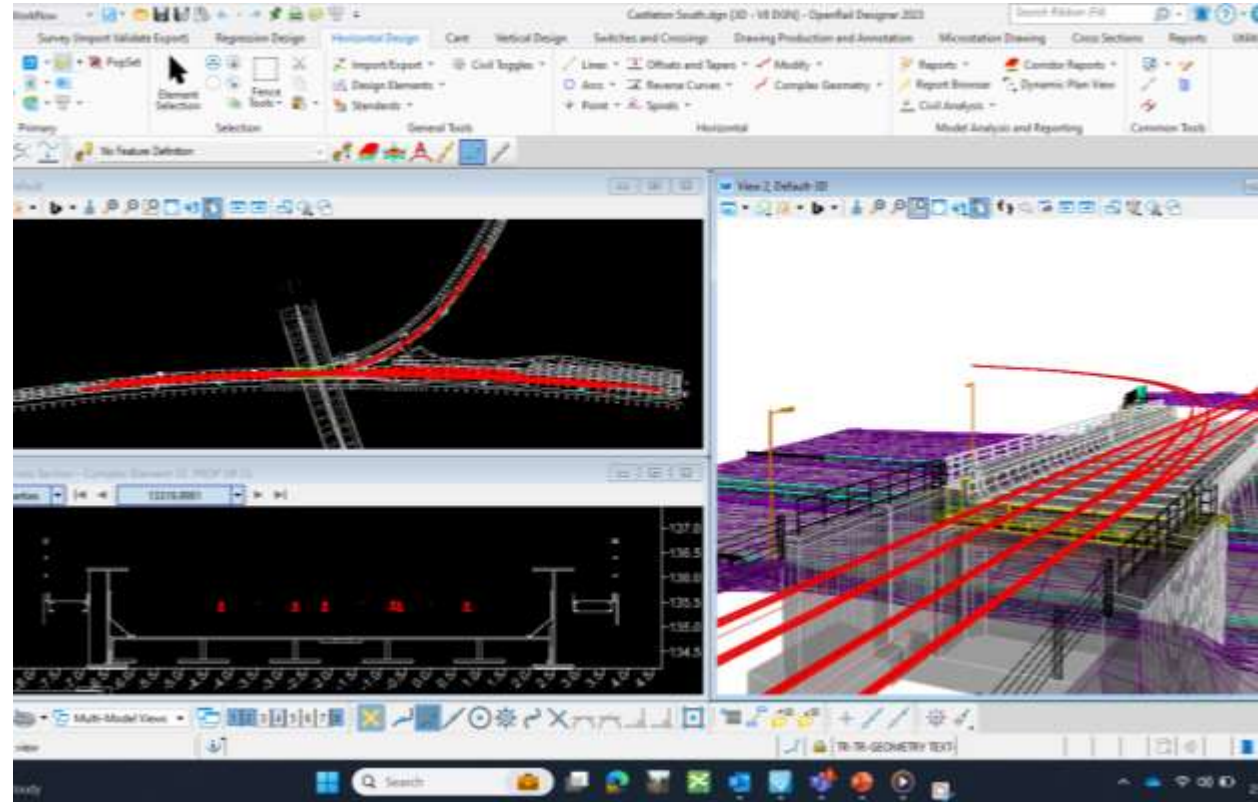
Phil Seymour CEng MPWI

ESDD Principal Design Engineer [Track]

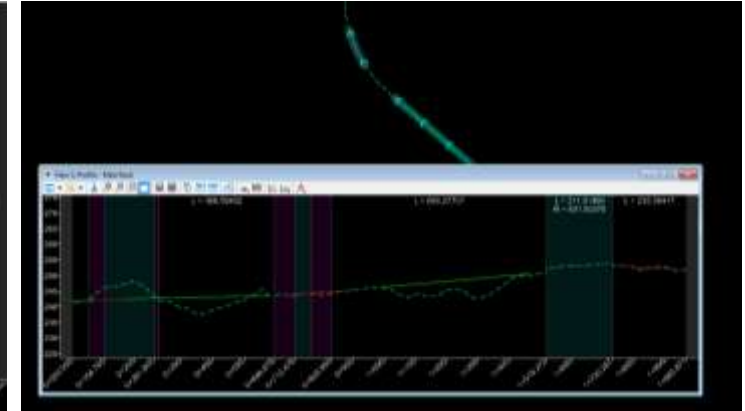
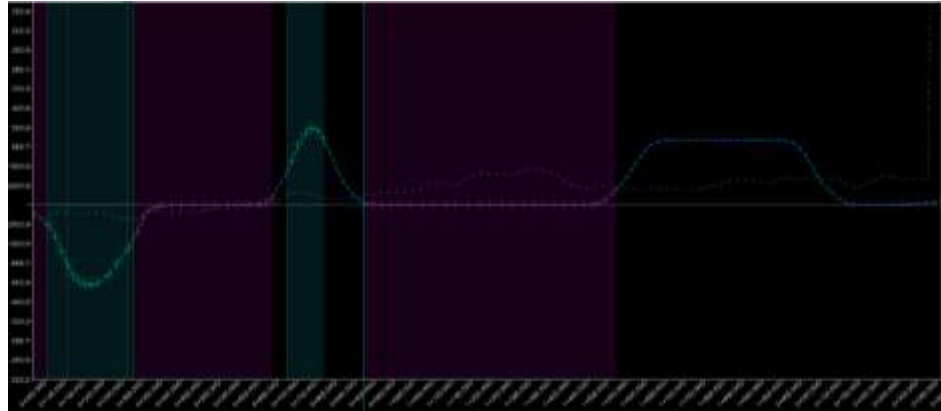
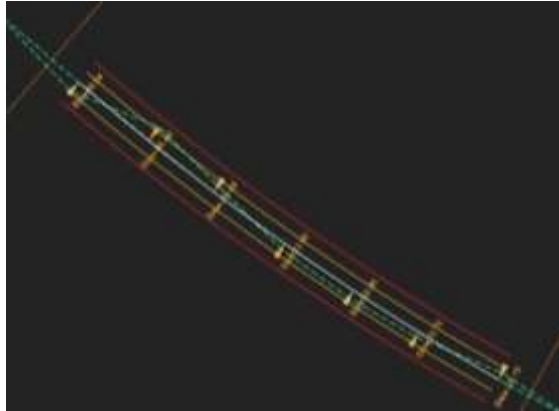
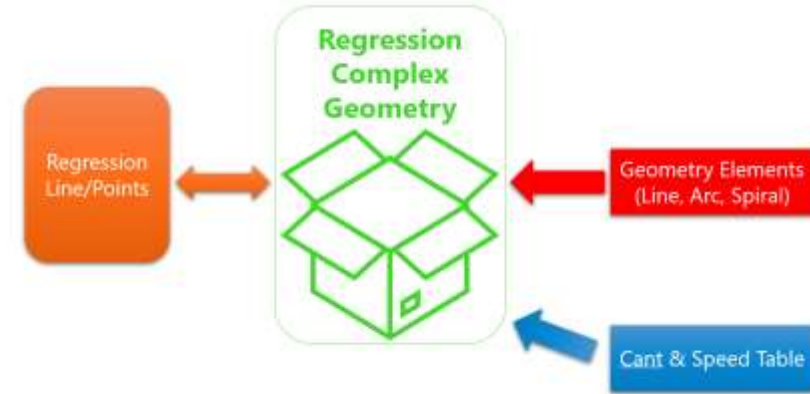
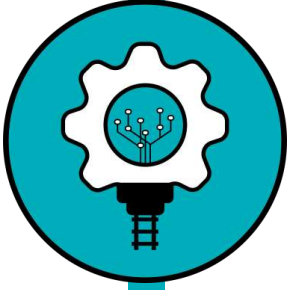
# Bentley OpenRail Designer 2024



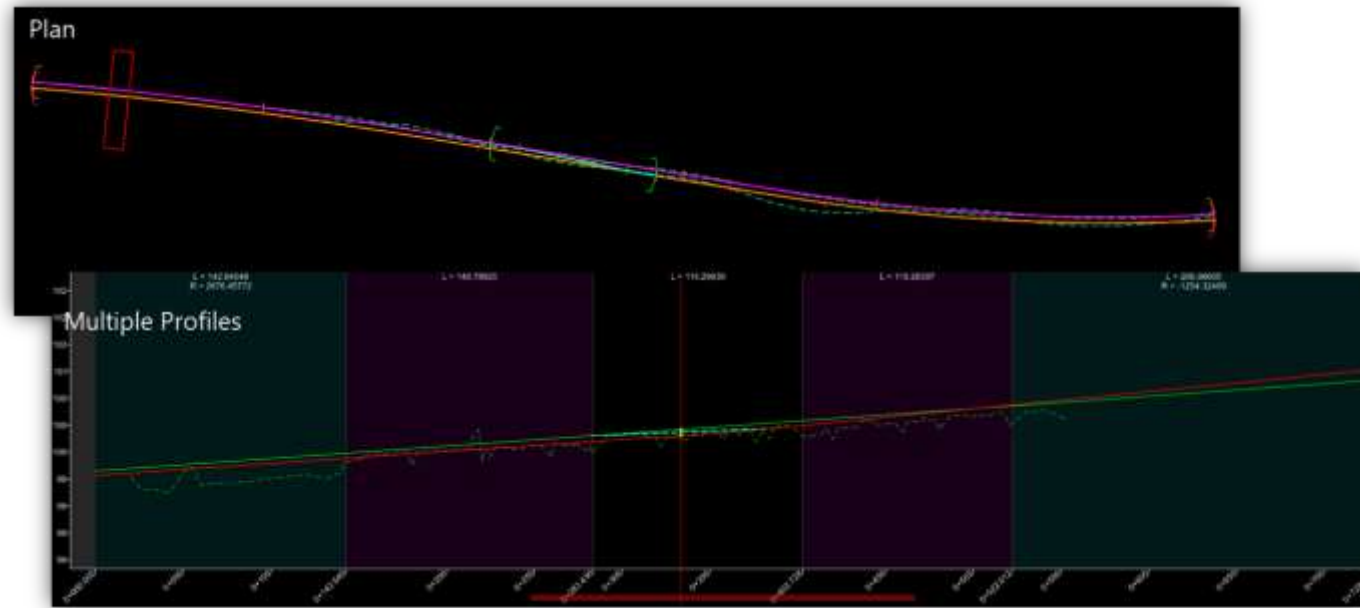
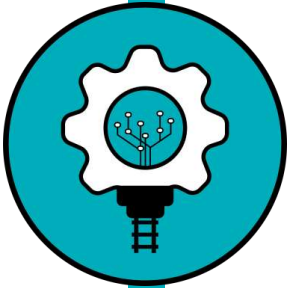
- A comprehensive and fully functional detailed 3D design application including:
- Survey
- Terrain Modelling
- Horizontal/Vertical Geometry Design
- Regression Design
- Cant Design
- S&C Design
- UK Rail Localisations
- Drawing Production
- Export to iTwin
- Drainage and Utilities
- Visualisations



# Intuitive and efficient design workflow



# Intuitive and efficient design workflow



Multiple Profile

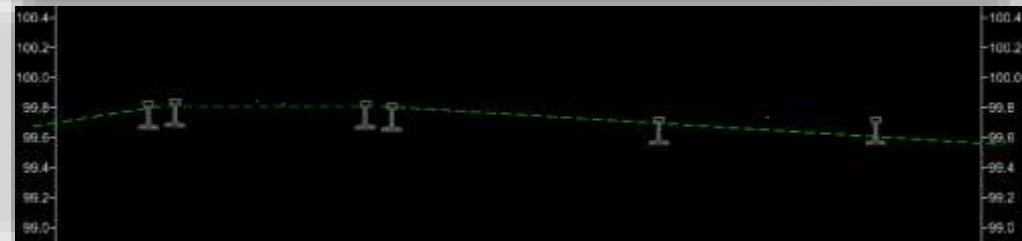
UP MAIN(4) Sync View Sync CrossSections View filter Snap Interval

| Name                    | Station   | Elevation | Terrain Offset | Offset (H) | Offset (V)   | Bearing      | Slope  | CrossSlope | Radius (H)  | Curve length (H) | Radius (V)    | Curve length (V) | Speed | Slew       | LR          | Cant       |
|-------------------------|-----------|-----------|----------------|------------|--------------|--------------|--------|------------|-------------|------------------|---------------|------------------|-------|------------|-------------|------------|
| UP MAIN (UP MN (V))     | 0+368.285 | 100.0052m | 0.07786m       | 0.00000m   | 0.00000mm    | -09°22'02.3" | +0.23% |            | 0.00000m    |                  | 0.00000m      |                  | 100   | -3.28472mm | 66.34427mm  | 0.00000mm  |
| DOWN MAIN (DOWN MN (V)) | 0+368.060 | 99.89410m | -0.03325m      | 3.43003m   | -111.10748mm | -09°21'22.2" | +0.24% | -3.27%     | 0.00000m    |                  | -25000.00000m | 23.51437m        | 100   | -3.48604mm | -83.25242mm | 0.00000mm  |
| CrsOvr (CrsOvr (V))     | 0+066.746 | 99.91877m | -0.00858m      | 3.17119m   | -86.44231mm  | -10°32'58.3" | +0.13% | -2.73%     | -644.40000m | 18.40908m        | 0.00000m      |                  | 30    |            |             | 30.00000mm |

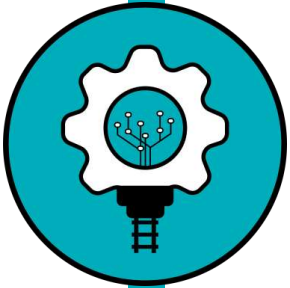
Multiple Profile

UP MAIN(4) Sync View Sync CrossSections View filter Snap Interval

| Name                    | Station   | Elevation  | Terrain Offset | Offset (H) |
|-------------------------|-----------|------------|----------------|------------|
| UP MAIN (UP MN (V))     | 0+658.279 | 100.67615m |                | 0.00000m   |
| DOWN MAIN (DOWN MN (V)) | 0+658.618 | 100.79556m |                | 3.52964m   |
| CrsOvr (CrsOvr (V))     |           |            |                |            |



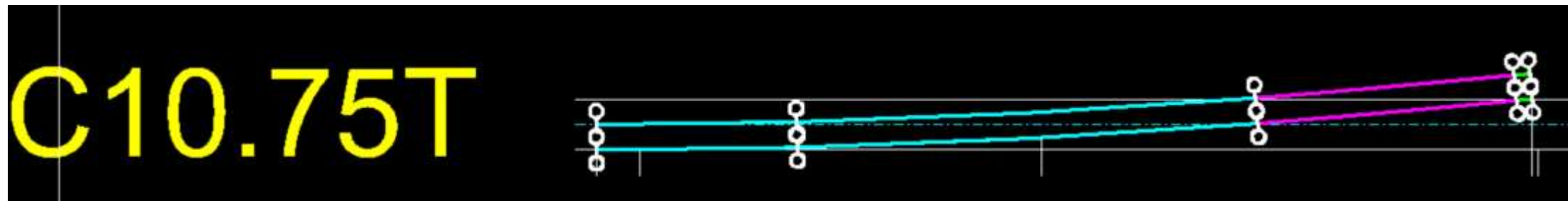
# RE/PW 1209, 1217 & 1223 Turnout Libraries



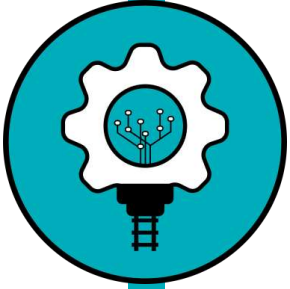
- ESDD created and maintain the 3 NR S&C Libraries on behalf of Technical Authority to ensure that they are controlled and correct for use by all design organisations supplying NR.
- RE/PW 1223 updated in November 2024 to include NR60 Mk 2 C Switches and new layouts:

| Document Verification                                                                                                            |            |              |                                                                                   |                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Revision:                                                                                                                        | Date       | Ref:         | NR60 Mk2 BRT Library Check Sheet V1.0 200318                                      |                                                                                   |
| A01                                                                                                                              | 13/03/2018 | Description: | FIRST ISSUE                                                                       |                                                                                   |
|                                                                                                                                  |            | Prepared by: | Checked by:                                                                       | Approved by:                                                                      |
|                                                                                                                                  |            | Name:        | Philip Seymour                                                                    | Mark Kidd                                                                         |
|                                                                                                                                  |            | Signature:   |  |  |
| A02                                                                                                                              | 07/11/2024 | Description: | Update to include NR60 Mk2 B5, C10 T5T, H02 383                                   |                                                                                   |
|                                                                                                                                  |            | Prepared by: | Checked by:                                                                       | Approved by:                                                                      |
|                                                                                                                                  |            | Name:        | Philip Seymour                                                                    | Mark Kidd                                                                         |
|                                                                                                                                  |            | Signature:   |  |  |
| 2. ESDD Track have presigned that the supplied Geometry is checked and approved with no outstanding design errors or alterations |            |              |                                                                                   |                                                                                   |
| 3. ESDD Track have not resolved any software constraints associated with the proposed geometries                                 |            |              |                                                                                   |                                                                                   |
| TA Supplied Geometry Tables are included from Tab "Cover Sheet"                                                                  |            |              |                                                                                   |                                                                                   |

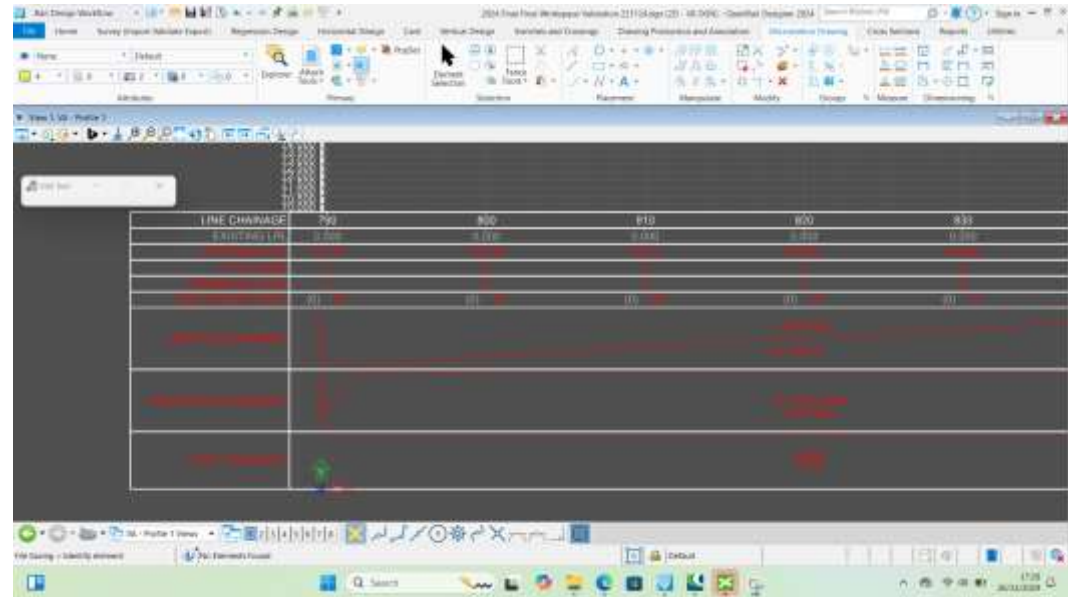
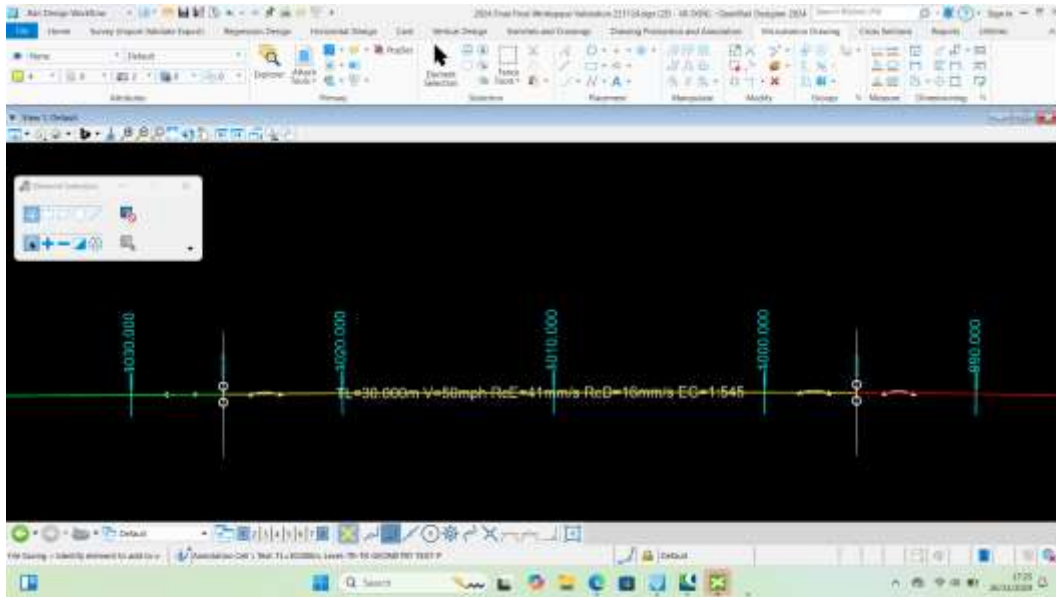
|                                                                                                       | B8         | C 9.25               | C 10                      | C STR 10    | D 10.75      | D 13         | E 15         |
|-------------------------------------------------------------------------------------------------------|------------|----------------------|---------------------------|-------------|--------------|--------------|--------------|
| Correctly Named in .xml file                                                                          | ✓          | ✓                    | ✓                         | ✓           | ✓            | ✓            | ✓            |
| All Geometry Tangential                                                                               | ✓          | ✓                    | ✓                         | ✓           | N/A          | ✓            | N/A          |
| Crossing Angle (+/-)                                                                                  | -0.00002°  | -0.00000002°         | ✓                         | ✓           | +0.00000009° | +0.00000008° | +0.00000008° |
| Switch Radius (+/-)                                                                                   | ✓          | ✓                    | ✓                         | ✓           | -0.000006m   | ✓            | -0.000014m   |
| Turnout Radius (+/-)                                                                                  | ✓          | N/A                  | ✓                         | N/A         | N/A          | ✓            | N/A          |
| Switch Radius drawn to Switch Heel                                                                    | N/A        | N/A                  | ✓                         | ✓           | N/A          | ✓            | N/A          |
| Toe to IP Dimension                                                                                   | ✓          | ✓                    | ✓                         | ✓           | ✓            | ✓            | ✓            |
| IP annotation correct                                                                                 | ✓          | ✓                    | ✓                         | ✓           | ✓            | ✓            | ✓            |
| IP to Nose BRT annotation error (+/-)                                                                 | -0.0005m   | -0.000432m           | -0.0004m                  | -0.0004m    | -0.000372m   | +0.000308m   | -0.000267m   |
| Switch Origin (T) Dimension (+/-)                                                                     | +0.000004m | -0.589273m*          | -0.589272m*               | -0.589279m* | ✓            | ✓            | ✓            |
| Switch Radius split correctly at switch heel (+/-)                                                    | N/A        | +0.000002m           | +0.000002m                | +0.000002m  | ✓            | +0.000002m   | +0.000001m   |
| Verifies correctly in Turnout Library Editor                                                          | ✓          | ✓                    | ✓                         | ✓           | ✓            | ✓            | ✓            |
| 72mm rail offset correct (C switches only)                                                            | N/A        | ✓                    | ✓                         | ✓           | N/A          | N/A          | N/A          |
| Fillet radius tangential both ends (C switches only)                                                  | N/A        | 0.00000012° @ origin | 0.00000001° @ Switch R TP | ✓           | N/A          | N/A          | N/A          |
| Note * C Switches are incorrect referring to the supplied Geometry Tables due to software limitations |            |                      |                           |             |              |              |              |



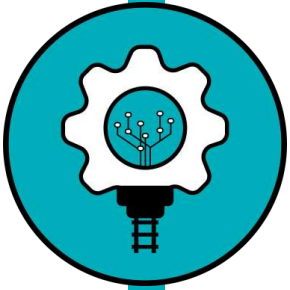
# UK Rail Workspace 2024



- Collaboration to create a consistent and correct UK Rail Workspace to enable all suppliers to NR to annotate designs and present drawings and models effectively with minimal CAD work and set up time.



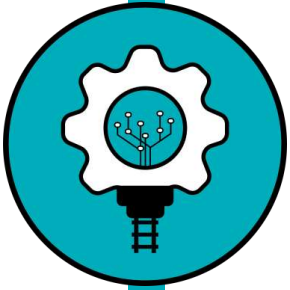
# Using the right tools drives efficiencies....



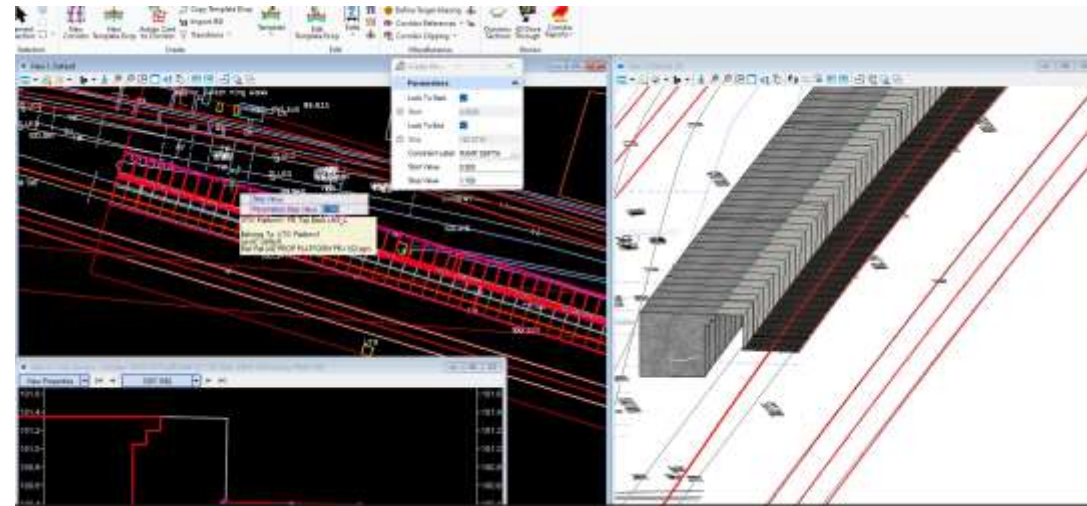
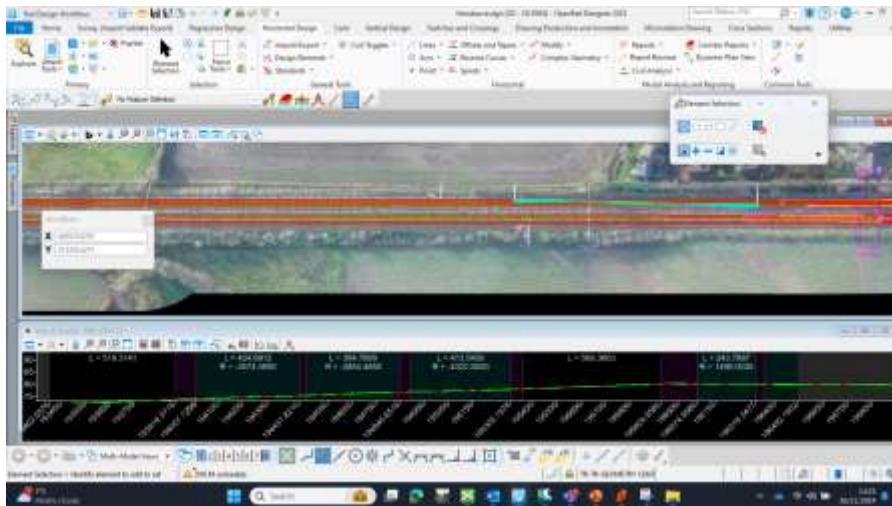
- As part of funding challenges and challenging ourselves, we must work smarter and more effectively, and digital technology is key to our success.
- Railway design workflows need to be efficient and capable of addressing complex design requirements with the ability for real time updates and rule-based design intentions.
- Transitioning to new design software takes time, training and mindset changes but the efficiencies and opportunities are clearly there.



# Could this be quantified in 12 months?



- As an early adopter of ORD 2024, I have experienced the following positive efficiencies:
  - Reduction in design duration and design iterations
  - Robust and correct design intentions reducing checking time and rework
  - Increased integration with designs from other disciplines/companies
  - Consistent workflow and drawing/model output
  - Standardisation and consistency potential across all suppliers to NR



Network Rail – Engineering Services  
part of Route Services