Autodesk® Civil 3D®
Country Kit Documentation

India

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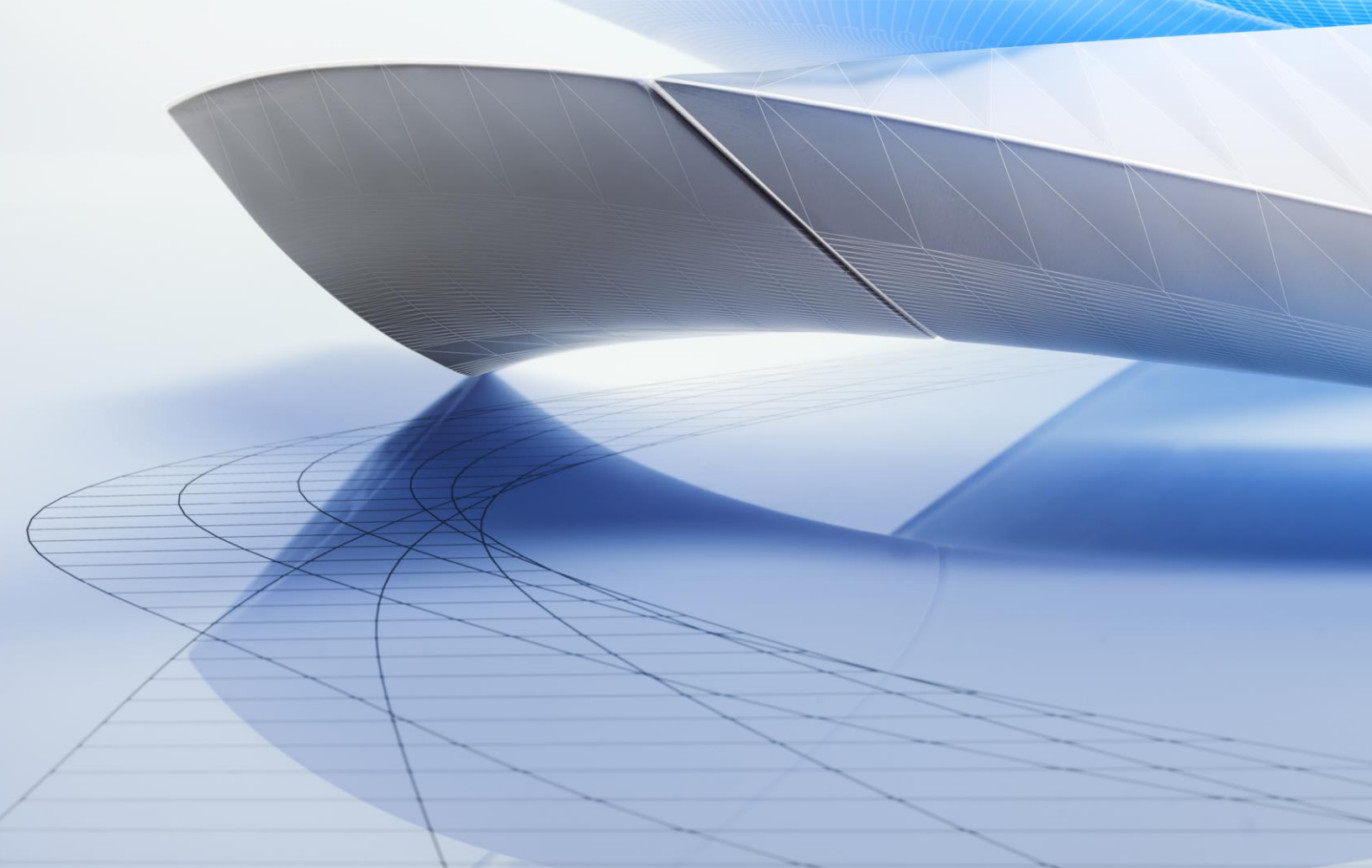

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1.0 Overview

1.1 Version History

Versions of this document:

Version	*Date*	*Update Description*
1.0	04/01/21	Updated for Autodesk® Civil 3D® 2022

1.2 Introduction

This document describes the overall content creation and new updates done on this country kit.

1.3 Standards used to create this Country Kit

This Country Kits is based on the following standards:

- IRC: 38 -1988
- IRC: 52-2019
- IRC: 65-2017
- IRC: 75-2015
- IRC: 86 -2018
- IRC: SP:20 -2002
- IRC: SP: 23 -1983
- IRC: SP: 73 -2018
- IRC: SP: 84 -2019
- IRC: SP: 99 -2013
- IRC: 35 -2015
- IRC: 67 -2012
- CPHEEO Manual (Central Public Health and Environmental Engineering Organization)
- Manual on Storm water drainage Systems
- Manual on Water supply and treatment
- Manual on Sewerage and Sewage Treatment Systems
- IS Codes (Indian Standard) for pipe Materials.

1.4 Installation

This Country Kit is installed using the appropriate msi-file.

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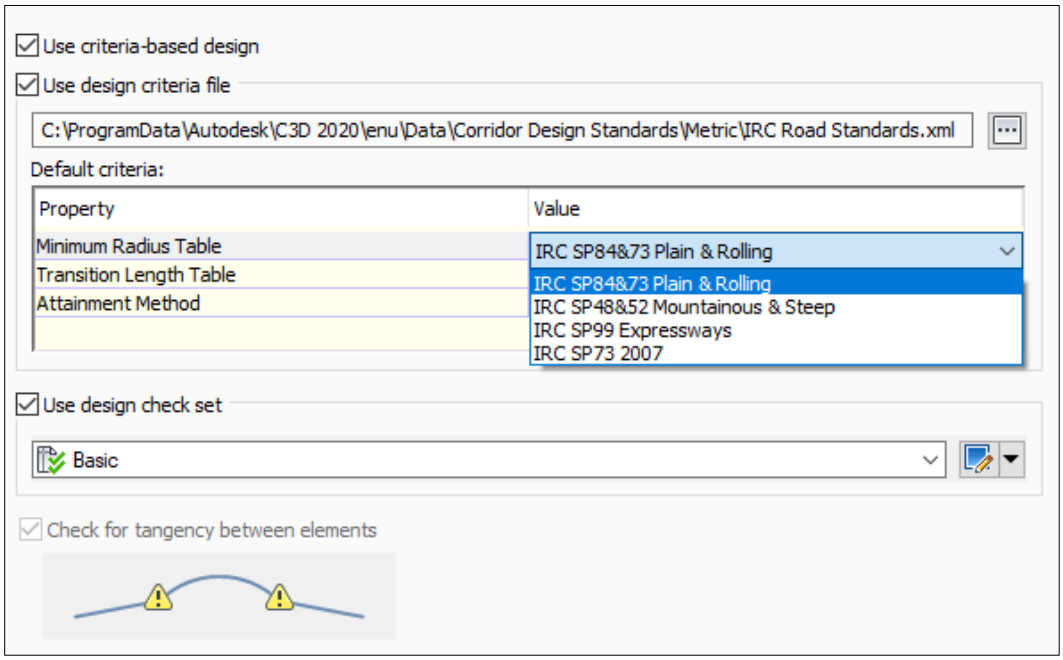
2.0 Country Kit Design Elements

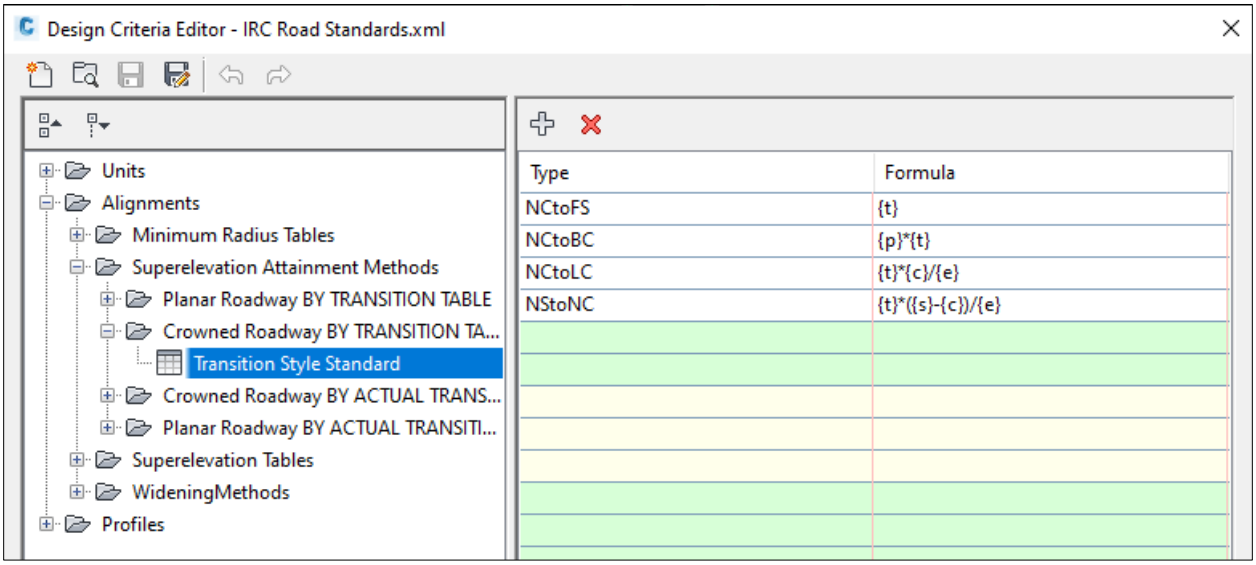
2.1 Road Design Criteria

Design formulas for Minimum Radius of Horizontal Curve, Transition lengths, Superelevation and Widening are explored and verified for all the latest IRC standards and amendments in this build. Design criteria that implement the IRC's are contained within of the file "IRC Road Standards.xml"



This build incorporates the following details:

- Superelevation attainment method related with application in Indian Projects.
- Sight Distances for design Speed of 120 kmph



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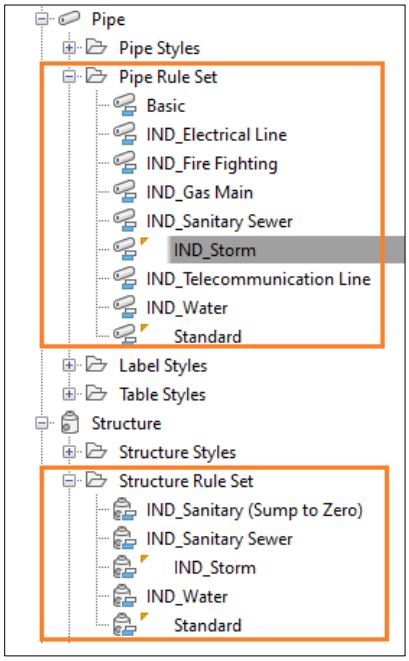
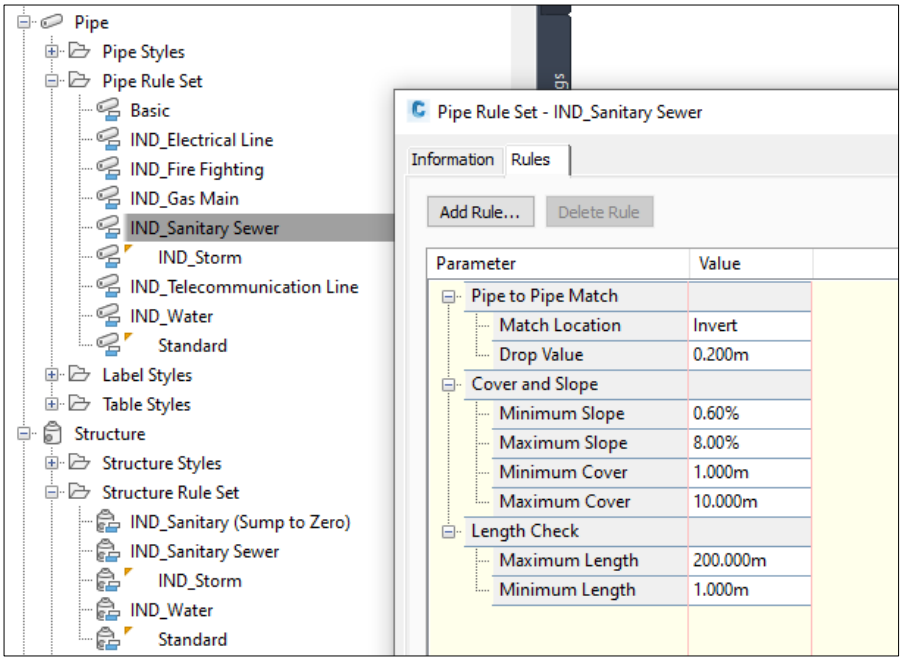
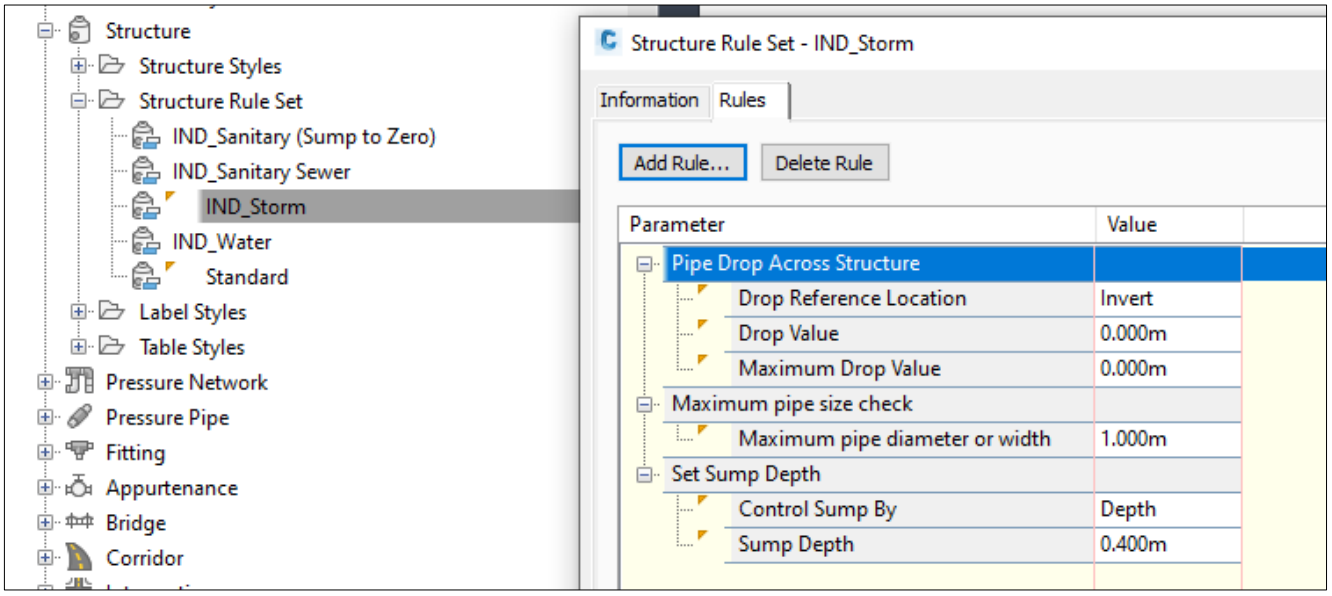
2.2 Rule Set Criteria

Rule set criteria as per CPHEEO Manuals for the following utilities have been added for the first time in this country kit.







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3.0 Country Kit Content

3.1 Drawing Template

The Country Kit contains a template file with settings based on the local market requirements:

__Autodesk Civil 3D 2022 India (Metric).dwt

This template has mostly covered all the element styles as per the Indian context and project scenarios. However, if at all any specific element or object exists in the project then Styles named as “Standard” should be used.

3.2 Assemblies

This build incorporates the readymade assemblies according to IRC Standards for 2/4/6 lane highways and Expressways. These also can be modified dynamically according to the user’s convenience.

Roads	IRC SP:73-2018 2 Lane Highways	With Paved Shoulder in Plain Terrain
		Without Paved Shoulder in Plain Terrain
		Built-up Area
		Mountainous Terrain with Retaining Wall
		Mountainous Terrain without Retaining Wall
		Bridge with Paved Shoulder and Protected Footpath
		ROB with Paved Shoulder and Protected Footpath
	IRC SP: 84-2019 4 Lane Highways	Divided with Depressed Median and without Service Roads
		Divided with Depressed Median and Service Roads
		Divided with Raised Median
		Divided with Raised Median & Service Roads in Built-up Area
		Divided on Different Contours
		Divided on Different Contours in Built-up Area
		Divided at same level with Raised Median
		Divided at same level with Raised Median in Built-up Section
	IRC Sp:99-2013 Multi Lane Highways	4-Lane Expressway in Plain Terrain with Depressed Median
		6-Lane Expressway in Plain Terrain with Depressed Median
		6-Lane Expressway in Plain Terrain with Flush Median
		8-Lane Expressway in Plain Terrain with Flush Median
	IRC:86-2018 Urban Roads/Highways	6-Lane with Raised Median
		6-Lane with Depressed Median
		4-Lane Divided Street
		2-Lane Undivided Collector Street

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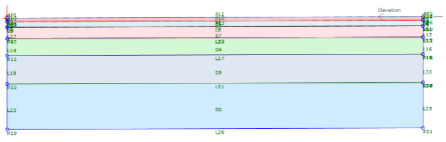
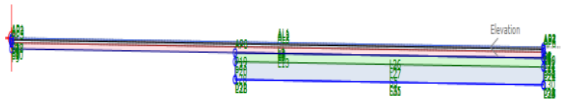
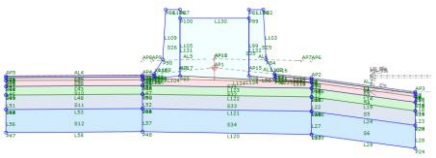
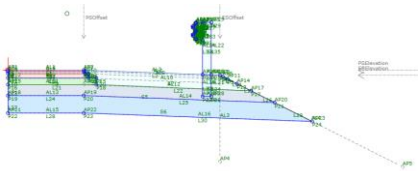
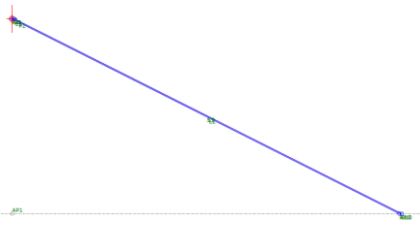
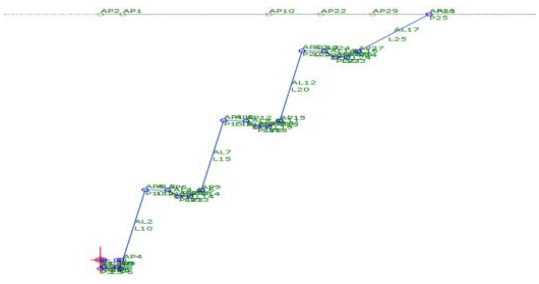
	Miscellaneous	Top link Corridor
Railways		IND_RailSingleTrack
		IND_RailDoubleTrack
		IND_Rail_LeftHandMultiTrack
		IND_Rail_RighttHandMultiTrack
Utilities		Trench_PipewithDia
		PipeTrench_ForDryUtilities
		Trench_ForWetUtilities

Additionally, this build includes the following subassemblies as well:

Roads	Carriageway	
	Carriageway with Widening Lane	
	Carriageway with Median	
	Shoulder with Crash Barrier	
	Daylight (Cut & Fill)	
	Daylight at Rock Cut above6.0m	

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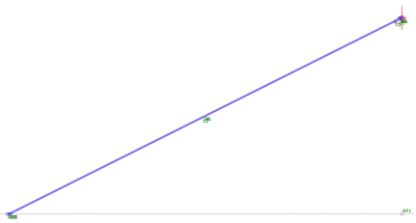
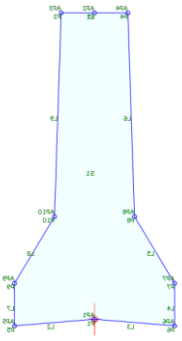
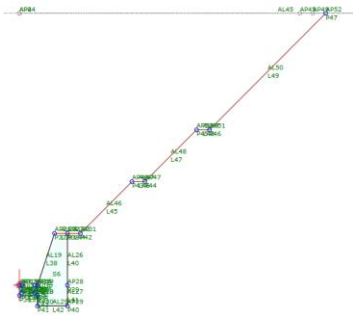
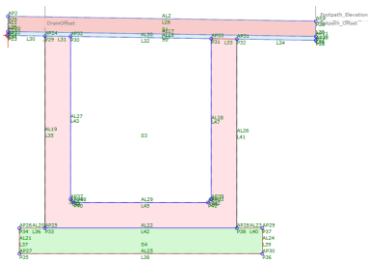
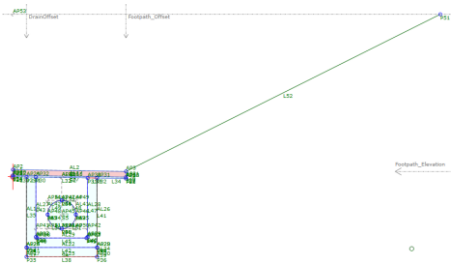
	Fill with Stone Pitching	
	Crash Barrier/Parapet Wall	
	Brest Wall	
	Footpath	
	Footpath with RCC Drain	

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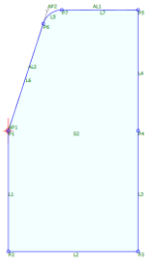
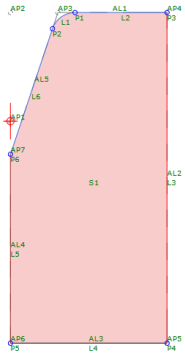
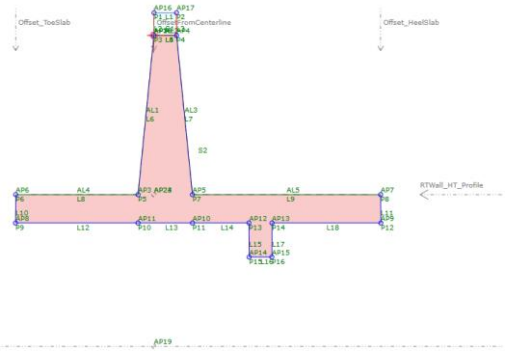
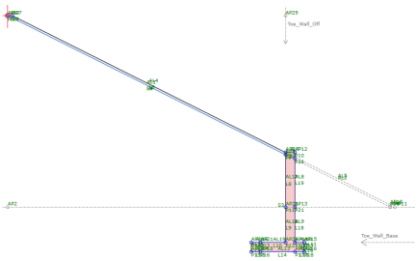
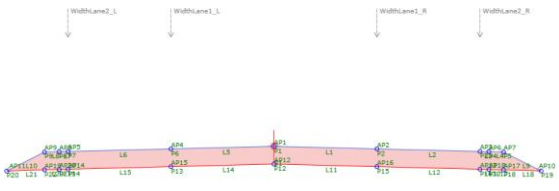
	Kerb	
	Kerb with Transition Feature	
	Retaining Wall	
	ToeWall	
	Top Link for Corridor	

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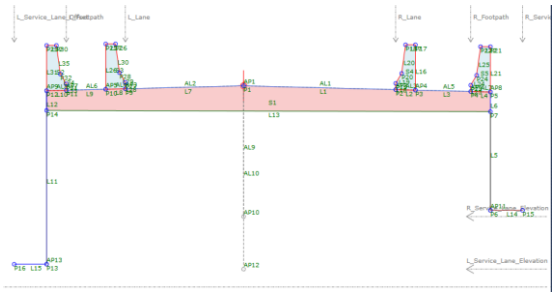
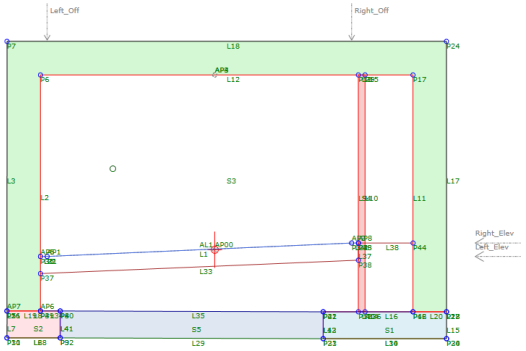
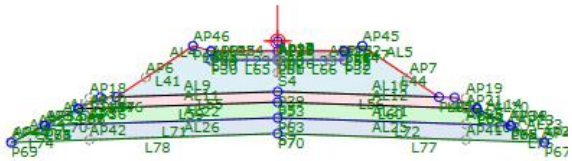
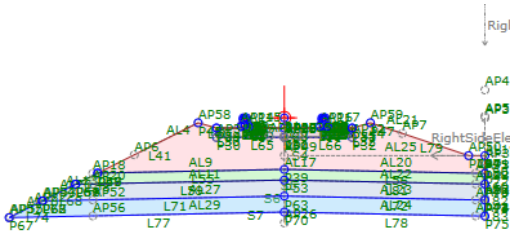
	ROB (Road Over Bridge)	
Tunnel	Concrete Tunnel	
Railways	Cut & Fill for Rail Embankments	
	Single Track CANT	
	Rail Left Hand Multi Track	

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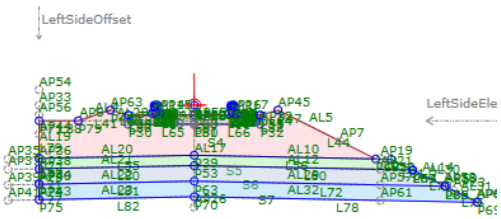
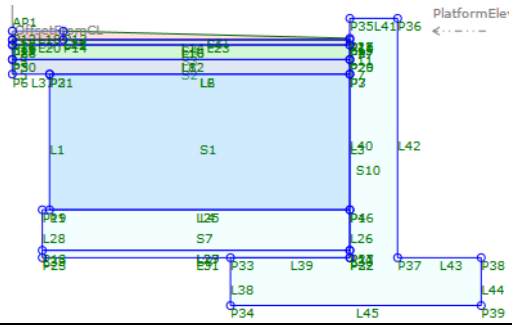
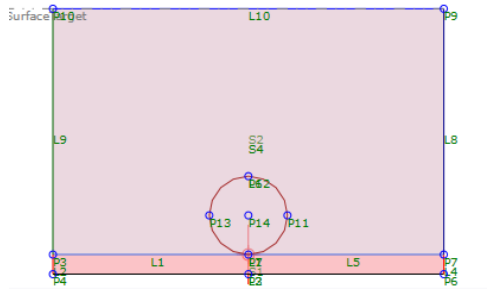
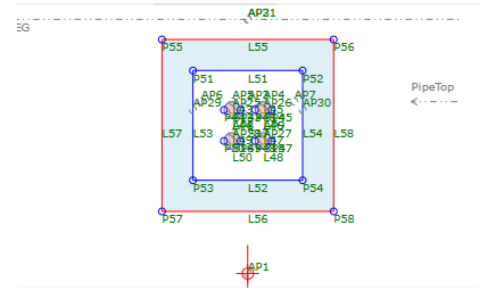
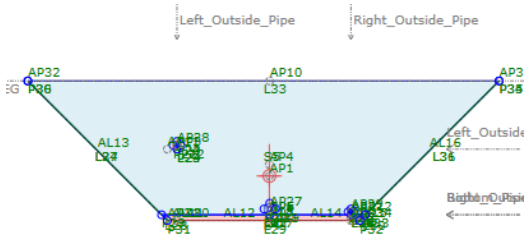
	Rail Right Hand Multi Track	
	Rail Platform with Retaining Wall	
Utilities	Pipe Trench with Adjustable Diameter	
	Trench for Dry Utility	
	Trench for Wet Utilities	

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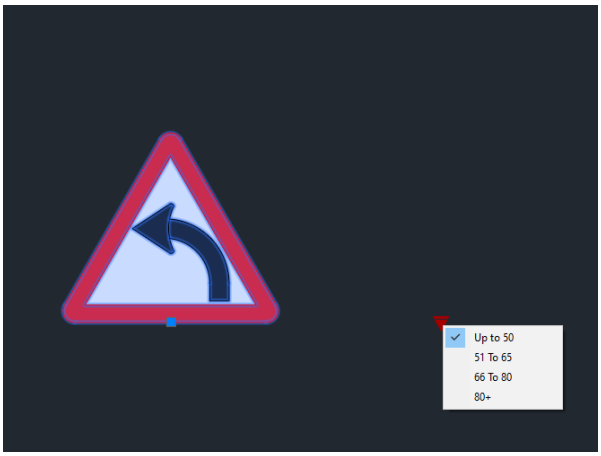
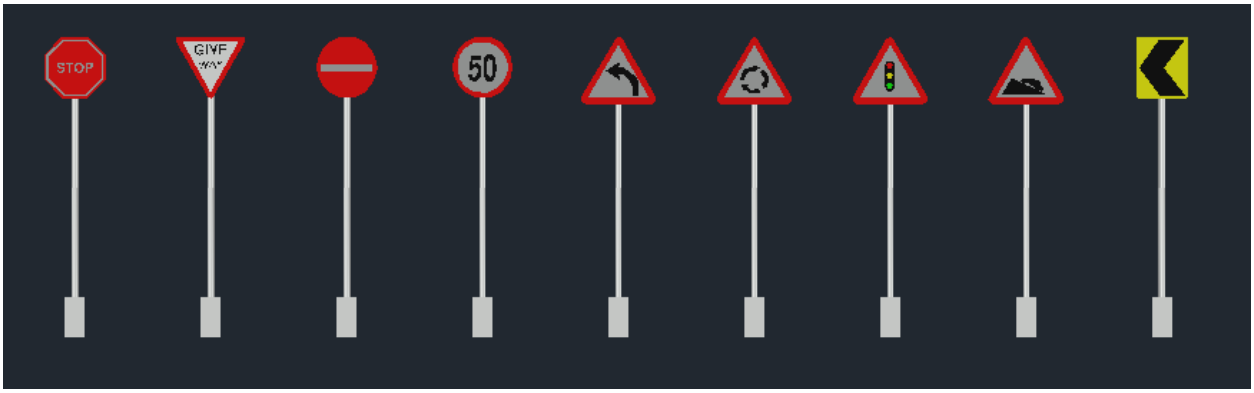
3.3 Road Signs and Markings

This build incorporated the 2D and Multi view 3D blocks of Road Signs created according to IRC 67-2012 standard. The user can choose 2D and Multiview blocks from Tool palettes and drag on drawing with ease. The 2D road sign blocks are created for various design speed ranges from 65 kmph to 80+ kmph based on the IRC 67:2012 standards for classified categories. These 2D blocks are resize according to design speed selected by user.





3.4 Tool Palettes

This Tool palettes is created according to Infrastructure design-based standards. The user can select various Highways/Roads Assemblies based on IRC standards for 2/4/Multi-lane Highways & Urban Roads, Railway Assemblies, Utilities Assemblies, Subassemblies, Roads Signs (2D & 3D), Road Furniture Blocks, Railway Signs & Blocks from the tool palette with ease. The Snaps of categorized tool pallet as below:

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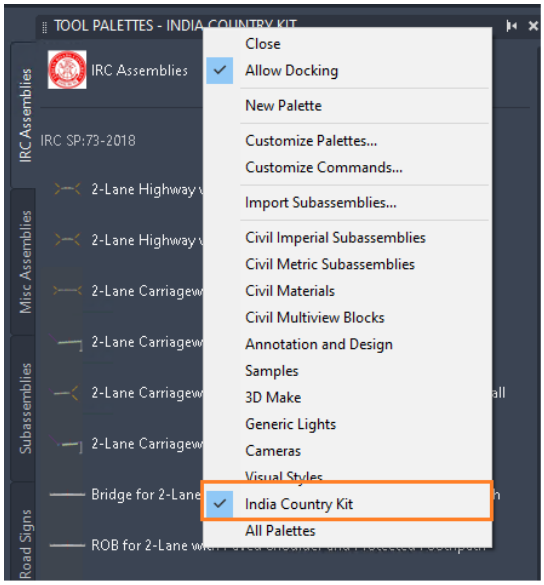

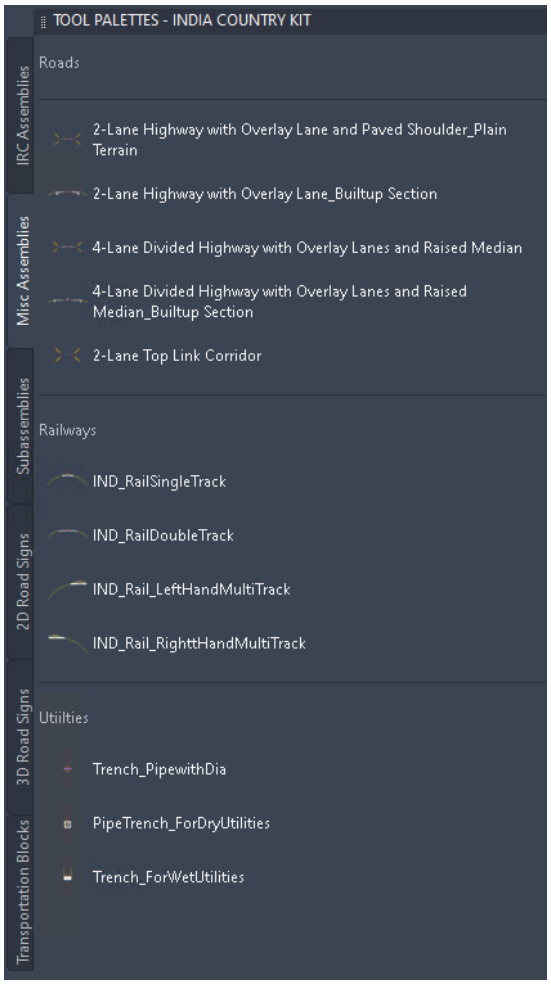

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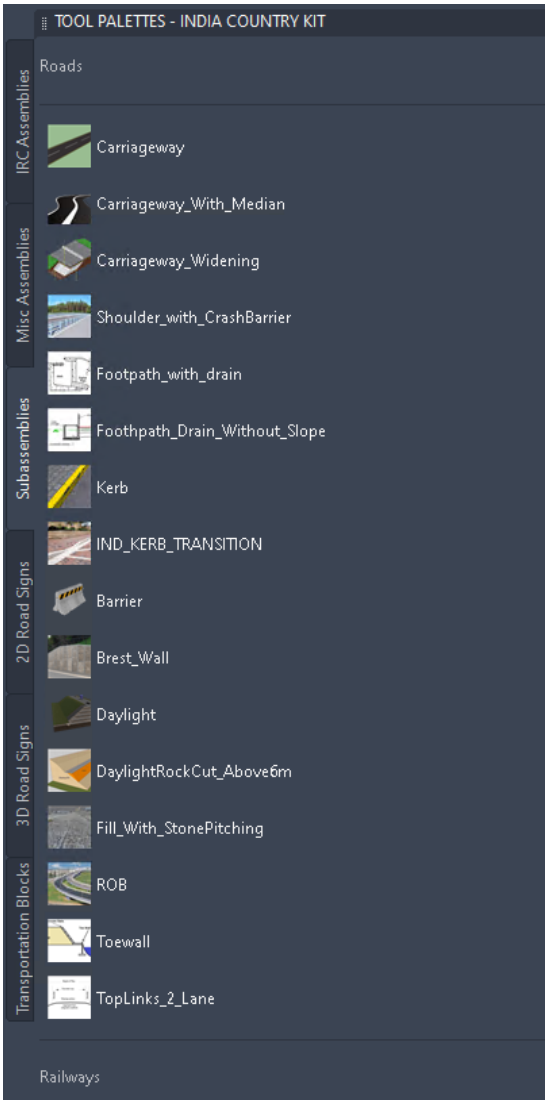

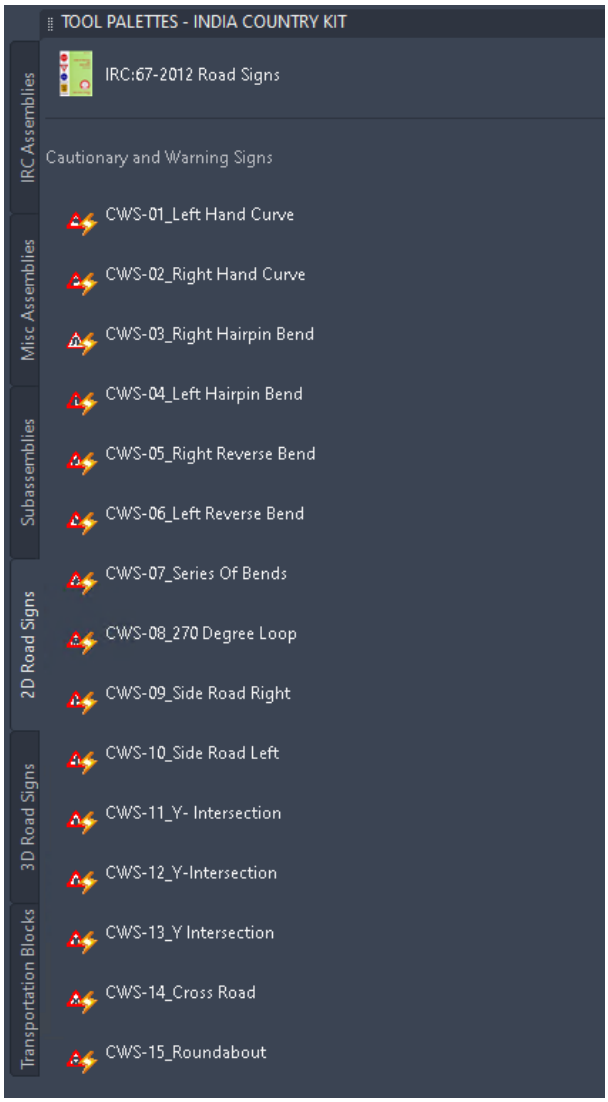

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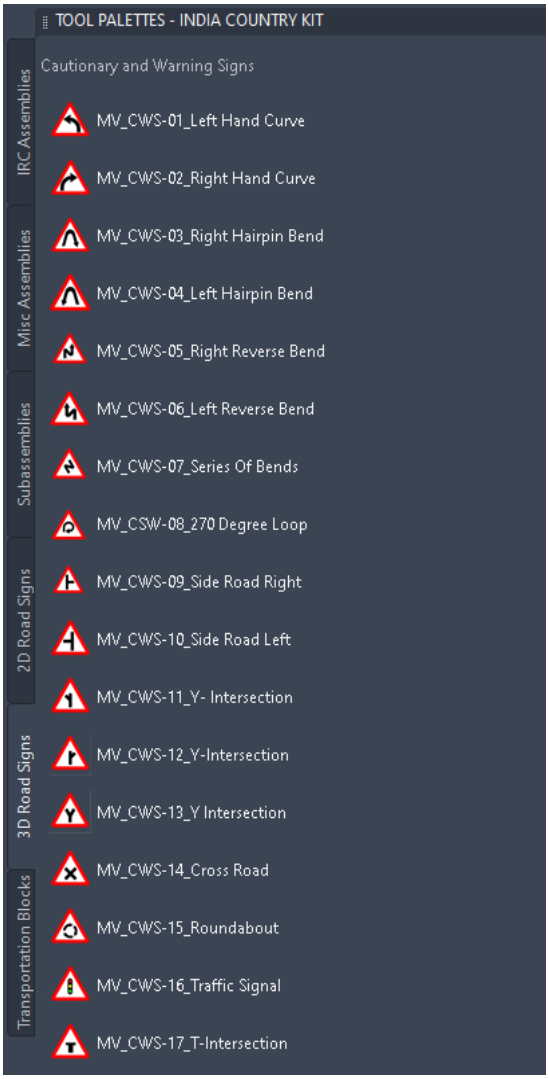

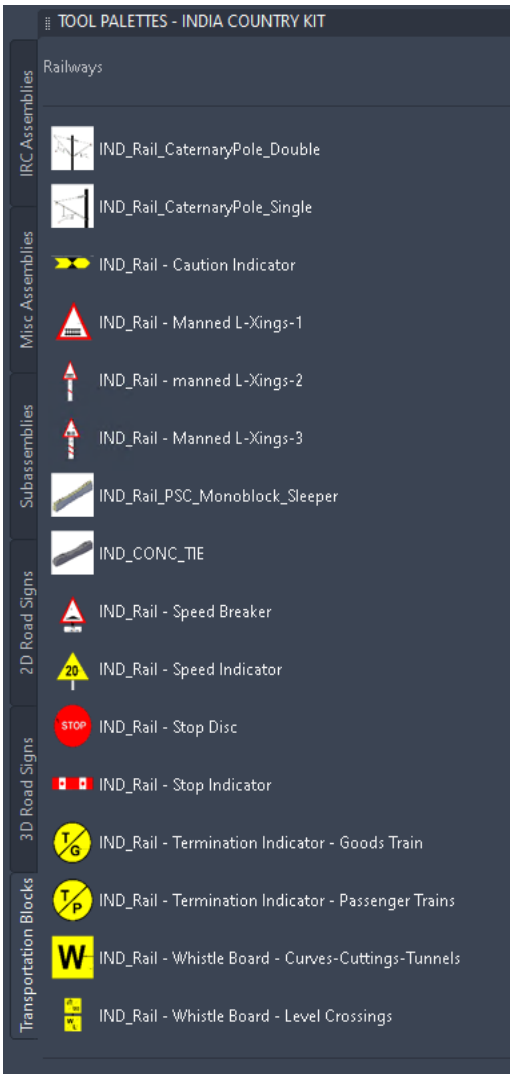

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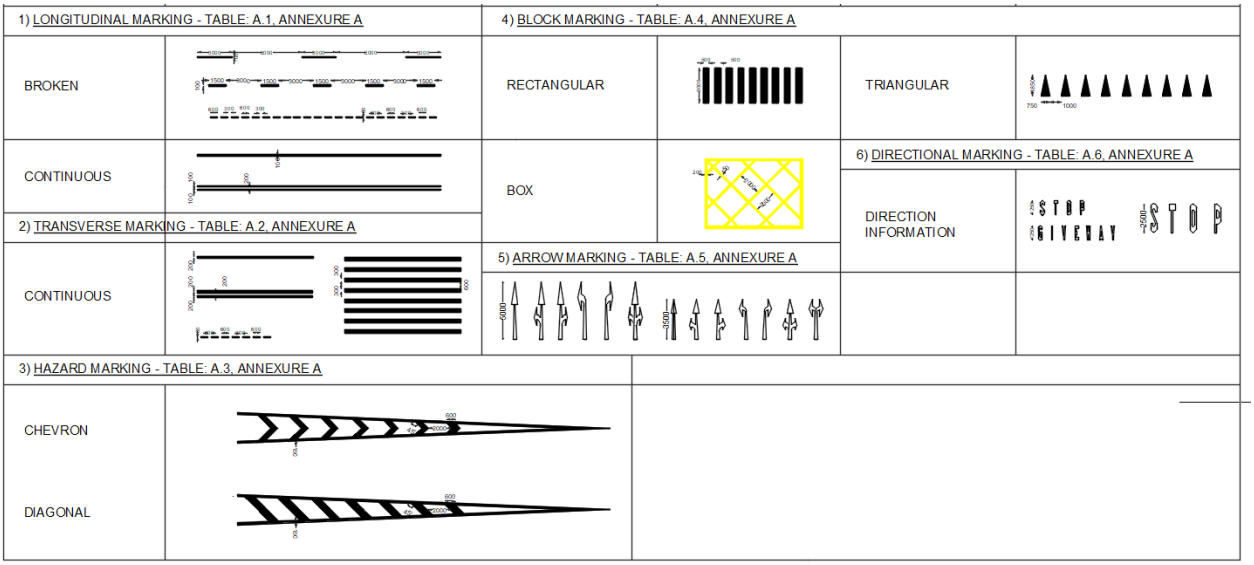
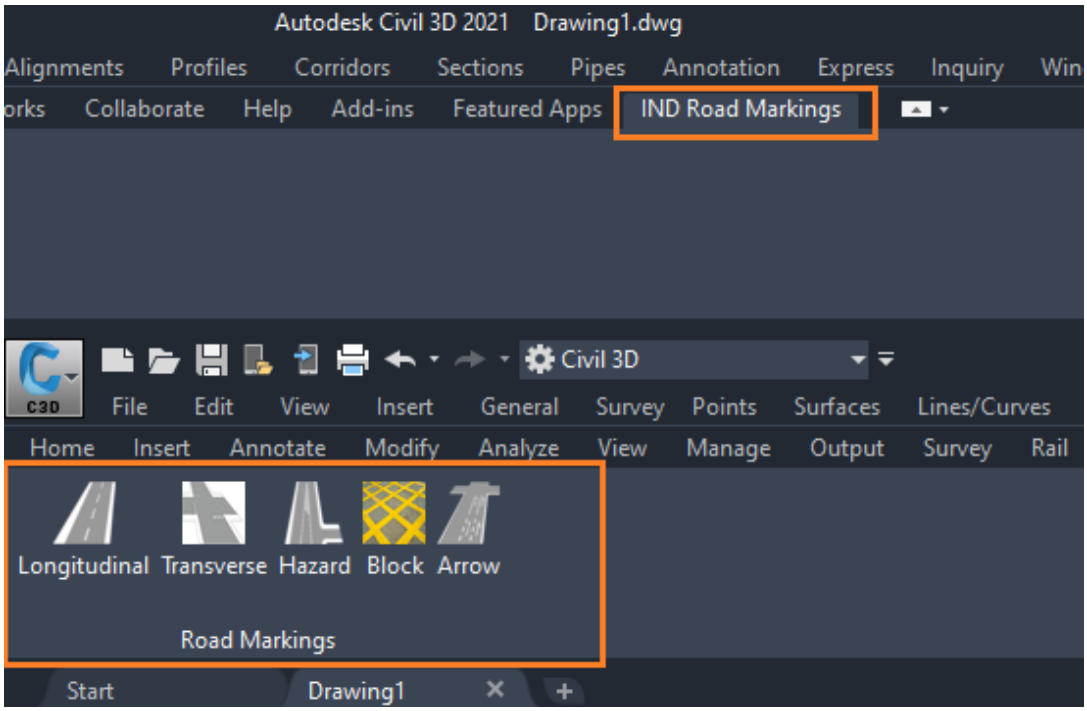
3.5 Civil3D ToolKit for Road Markings

This build incorporates the readymade .NET tool for common types of road marking according to IRC:35-2015 Standards. The user can prepare road marking drawings with ease by using this tool.





This Civil3D Toolkit for road markings will look like above. User must select the Marking styles from the categorized tab as 2D blocks and can prepare road marking drawing for selected Polylines with ease.

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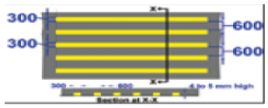
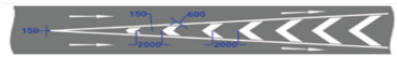
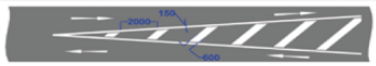
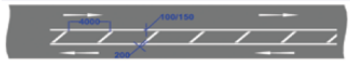
Sr. no.	Marking Category	Marking Type	Marking Abbrevation	Pattern
1	Longitudinal Marking	Broken	LM-01	
			LM-02	
			LM-03	
		Continuos	LM-04	
			LM-05	
2	Transverse Marking	Continuos	TM-01	
			TM-02	
		Broken	TM-03	
		Bar Marking	TM-04	
3	Hazard Marking	Chevron	HM-01	
		Diagonal	HM-02	
		Ladder Hatching	HM-03	
4	Block Marking	Rectangular	BM-01	
		Triangular	BM-02	
		Box	BM-03	

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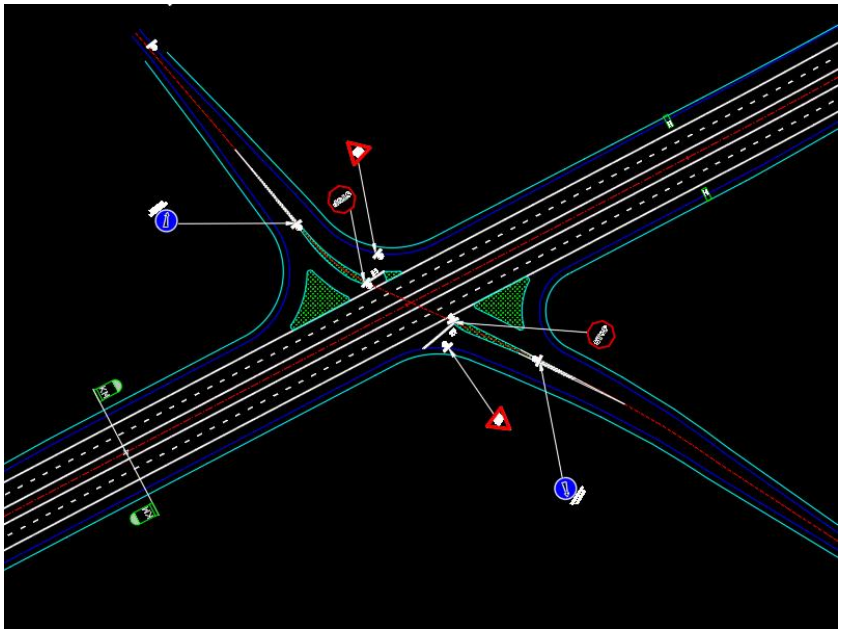
5	Arrow Marking	Straight arrow	AM01	
		Left Arrow	AM02	
		Right Arrow	AM03	
		Straight & Left Arrow	AM04	
		Straight & Right Arrow	AM05	
		Right and Left arrow	AM06	
		Straight, Right & Left Arrow	AM07	
		Straight arrow	AM08	
		Left Arrow	AM09	
		Right Arrow	AM10	
		Straight & Left Arrow	AM11	
		Straight & Right Arrow	AM12	

6	Direction Marking	Direction Information "STOP"	DM-01	
		Direction Information "Giveway"	DM-02	



These created 2D blocks of road marking can drape to the 3D surface by user manually. Reference Link of Video Tutorial to use this tool Kit is provided below.

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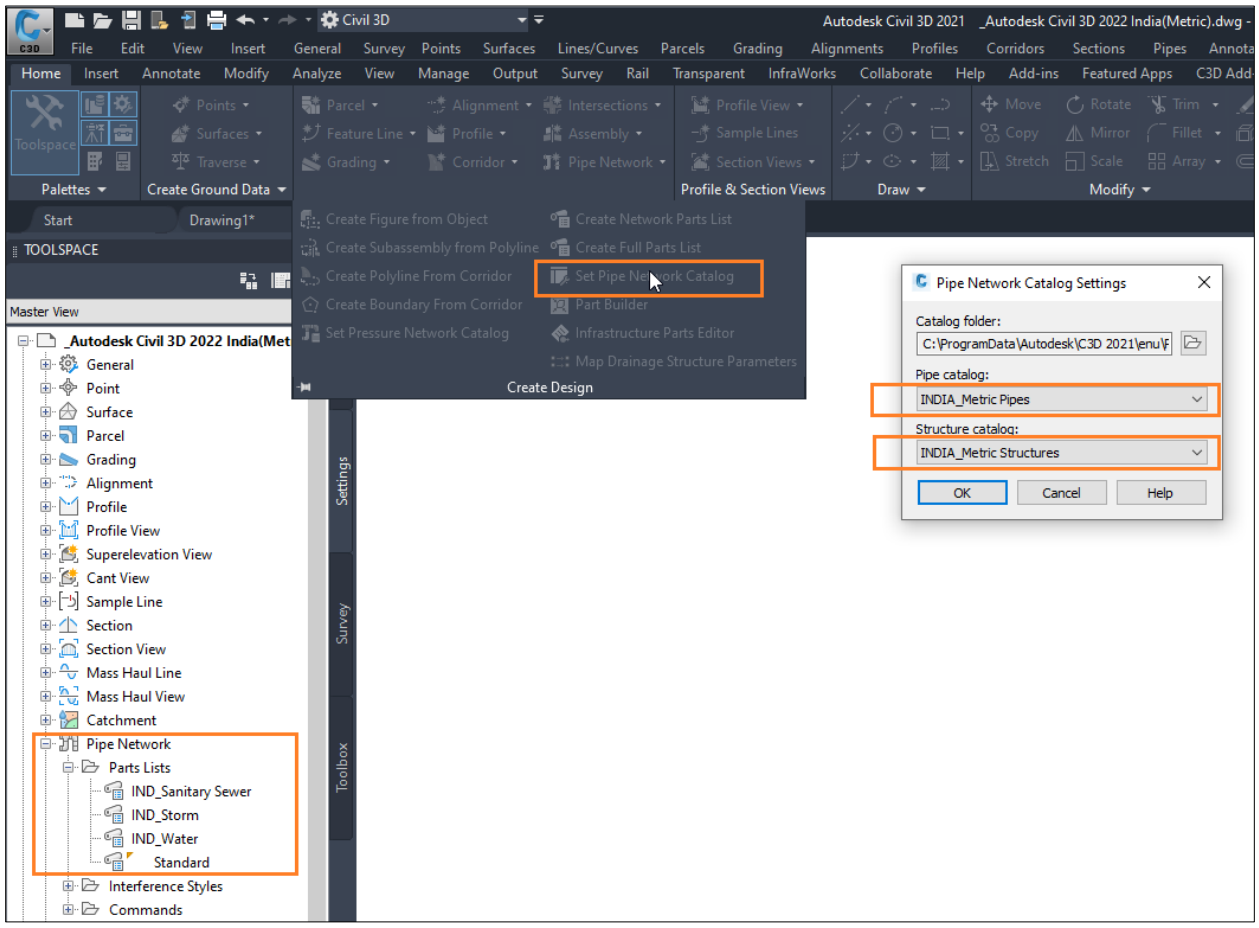
3.6 Pipe Catalog and Parts Lists

India Pipe catalogue is prepared based on referring to the material Codes and specifications from respective Indian Standards (IS codes).

Pipe Catalog and corresponding part lists are available at the location below. User needs to use command "**SetNetworkCatalog**" to set correct local catalog.



Part Lists are created for each individual wet utility considering the use of the materials as per local market.

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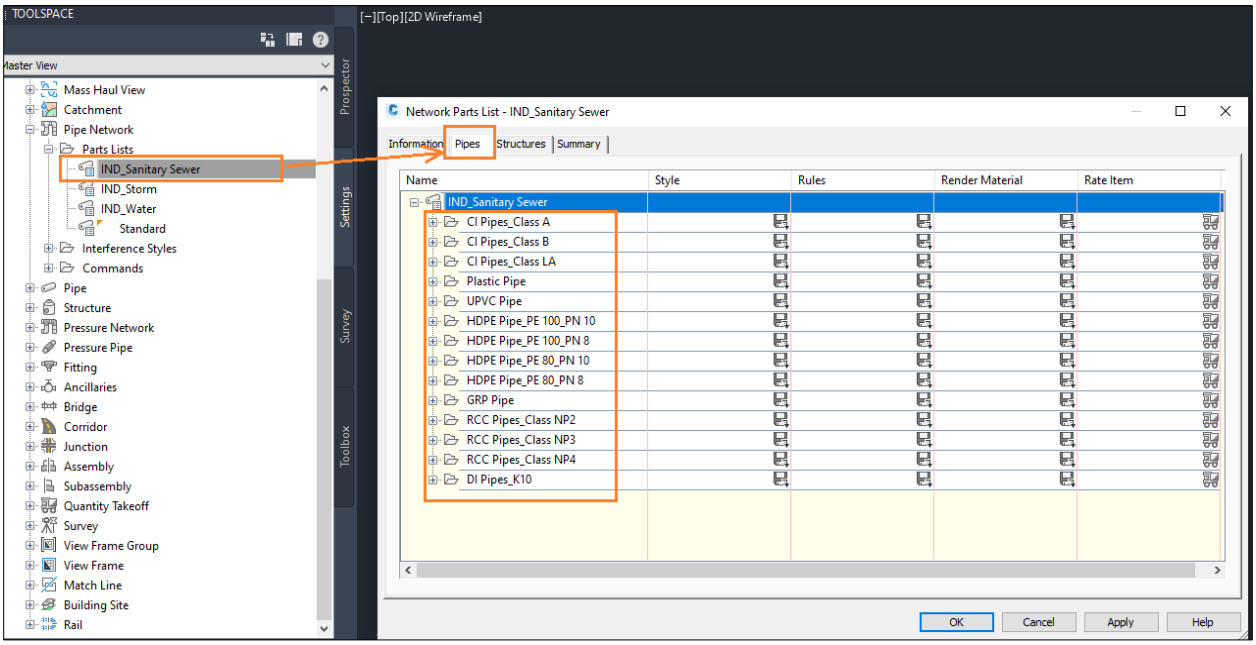

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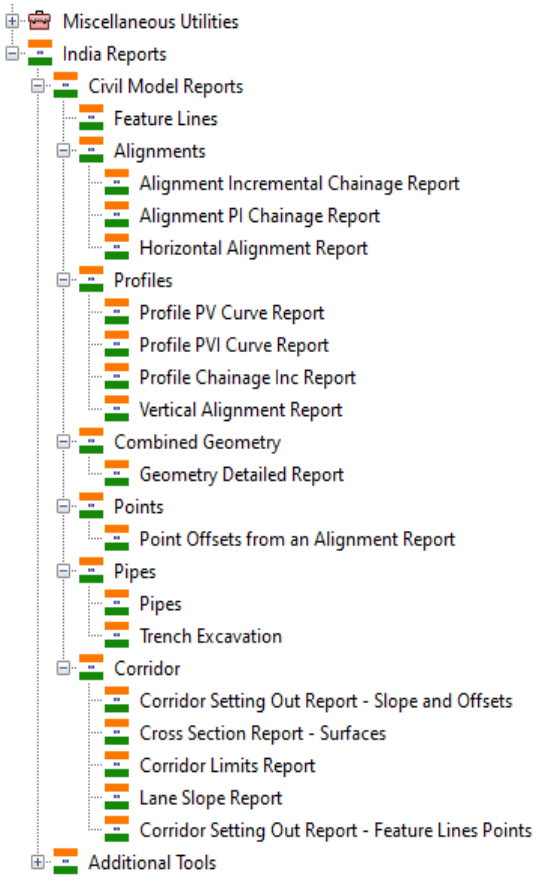
4.0 Reports

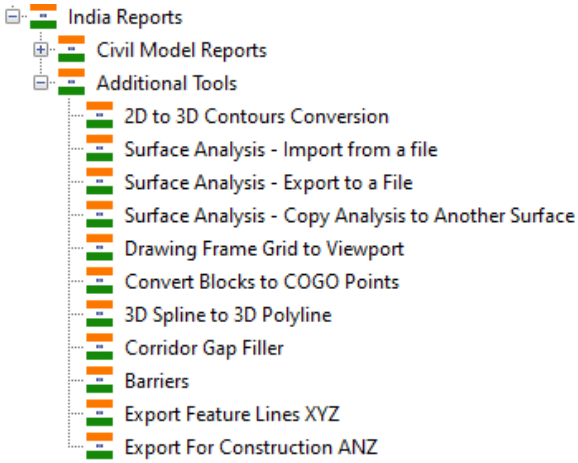
4.1 Information on Reports

This build incorporates the customized reports as per Indian standards in the country kit. The reports are made available in toolbox for outputs and documentation.

Civil Model Reports



Additional Tools



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Horizontal Alignment Report

The user needs to execute the Horizontal Alignment Report option mentioned in the toolbox and select the appropriate alignment whose report needs to be exported. The user can save the report as file '.doc', '.xls', '.txt', '.pdf', and '.html' format.

Horizontal Alignment Report

HIP/Curve No.	HIP		Deflection	Element	Start			End			Length	Chord Length	Bearing	Radius	Hand Of Arc
	Easting	Northing			Chainage	Easting	Northing	Chainage	Easting	Northing					
				Straight	0+00.000	175418.052	6412094.518	0+38.772	175438.225	6412127.629	38.772		N 31° 21' 09.4483" E		
1	175469.261	6412178.727	04° 33' 53.2129"	Arc	0+38.772	175438.225	6412127.629	1+58.278	175496.131	6412232.132	119.506	-		1500	LEFT
				Straight	1+58.278	175496.131	6412232.132	2+39.264	175532.836	6412304.323	80.986		N 26° 57' 03.2191" E		
2	175575.49	6412385.767	17° 25' 23.6880"	Arc	2+39.264	175532.836	6412304.323	4+21.720	175640.573	6412450.703	182.456	-		600	RIGHT
				Straight	4+21.720	175640.573	6412450.703	5+47.528	175729.002	6412540.19	125.808		N 44° 39' 33.7769" E		
3	175813.439	6412625.116	11° 23' 53.9702"	Arc	5+47.528	175729.002	6412540.19	7+86.254	175879.427	6412725.054	238.726	-		1200	LEFT
				Straight	7+86.254	175879.427	6412725.054	10+61.433	176030.099	6412955.319	275.18		N 38° 11' 54.1755" E		
4	176110.337	6413077.991	27° 27' 27.0009"	Arc	10+61.433	176030.099	6412955.319	13+48.968	176238.1	6413149.847	287.534	-		600	RIGHT
				Straight	13+48.968	176238.1	6413149.847	14+50.538	176327.115	6413198.764	101.57		N 61° 12' 33.9273" E		
5	176388.557	6413231.105	19° 41' 42.8713"	Arc	14+50.538	176327.115	6413198.764	15+88.036	176435.506	6413282.262	137.499	-		400	LEFT

Vertical Alignment report

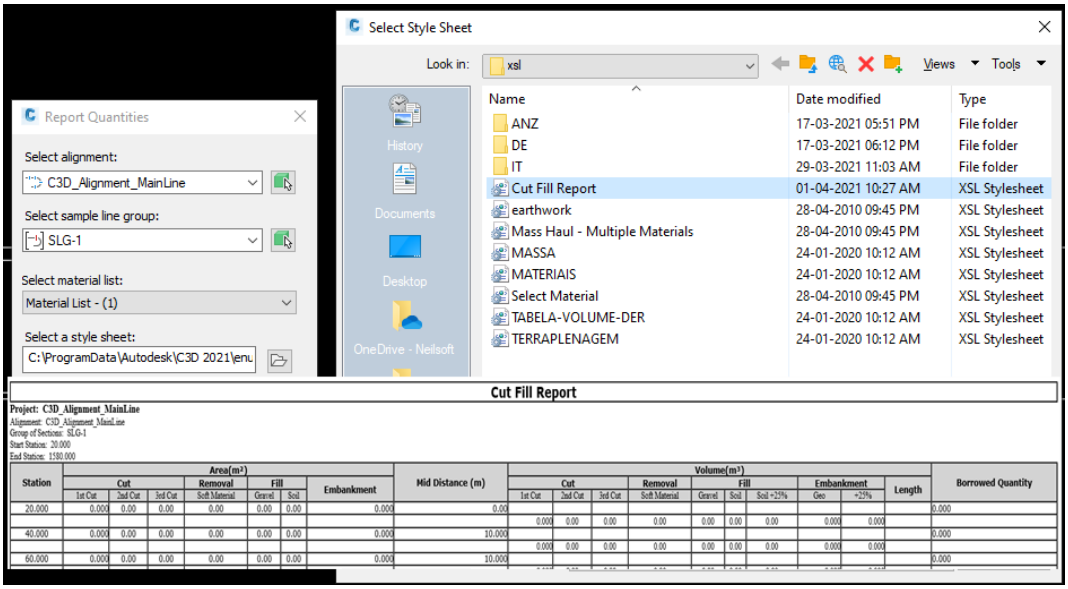
The user needs to execute the Vertical Alignment Report option mentioned in the toolbox and select the appropriate alignment whose profile report needs to be exported. The user can save the report as file '.doc', '.xls', '.txt', '.pdf', and '.html' format.

Vertical Alignment: DesignProfile_Mainline

PVI No.	PVI		Element	Start		End		Length	Grade In	Type
	Chainage	RL		Chainage	RL	Chainage	RL			
				4+94.129	70.853					
1	10+83.252	91.472	Curve	8+75.387	84.197	12+91.118	89.394	415.732		Summit
			Grade	12+91.118	89.394	15+20.000	87.105	228.882	-1.00%	
				15+20.000	87.105					

Cut Fill Report (Earthwork)

The user needs to execute the Cut-Fill Report option mentioned in the Generate Volume Report from the Section Tab and select the report format as highlighted whose material takeoff report needs to be exported.



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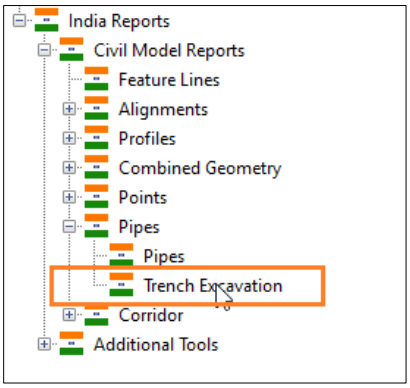
New Reports are added in toolbox for exporting the Pipe Schedule and Pipe Trench excavation.

Trench Excavation report is applicable only single pipe network condition with surface assigned to the network.



STORM WATER
PIPE EARTHWORK VOLUME

PIPE NAME	PIPE DIA (OD)	LENGTH (M)	SLOPE (%)	PIPE AREA (SQ.M)	PIPE EXCAVATION VOLUME (CU.M)	PIPE BEDDING DEPTH (M)	PIPE BEDDING VOLUME (CU.M)	TRENCH WIDTH (M)	AVG. DEPTH (M)	TRENCH EXCAVATION VOLUME (CU.M)	TRENCH BACKFILL VOLUME (CU.M)
Pipe - (1)	500	36.3	3.09%	0.33	12.03	0.20	9.07	1.25	3.19	144.49	123.39
Pipe - (2)	500	43.4	0.50%	0.33	14.40	0.20	10.85	1.25	2.98	161.66	136.40
Pipe - (3)	500	12.6	0.50%	0.33	4.18	0.20	3.15	1.25	3.10	48.79	41.46
Pipe - (4)	500	159.6	0.50%	0.33	52.96	0.20	39.90	1.25	2.94	587.09	494.23
Pipe - (5)	500	29.5	0.50%	0.33	9.77	0.20	7.36	1.25	2.74	101.00	83.86
Pipe - (6)	500	16.9	0.50%	0.33	5.62	0.20	4.24	1.25	2.55	54.00	44.14
Pipe - (7)	500	10.8	0.50%	0.33	3.57	0.20	2.69	1.25	2.15	28.86	22.61

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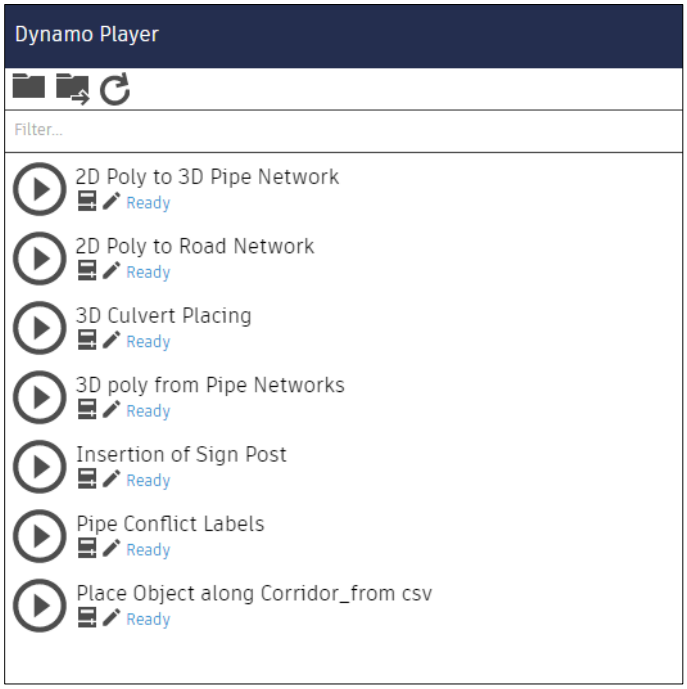
5.0 Dynamo Scripts

Following dynamo scripts have been incorporated in the Country Kit 2022. Reference link for Demonstration of all these Scripts is provided in **6.0**

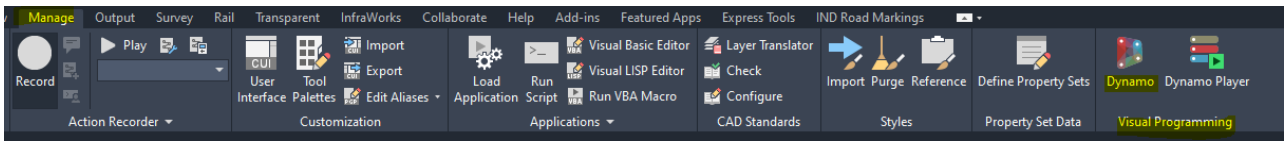
All these dynamo scripts are placed at below path.

“C:\Program Files\Autodesk\AutoCAD 2022\C3D\Sample\Dynamo”



5.1 Prerequisites

- Microsoft .Net Framework 4.8 or later is installed.
- Iron Python 2.7.11 (https://ironpython.net/)
- Civil3DToolkit v 1.1.16 is installed, if not installed follow the below steps.
    - Go to Manage >> Go Visual Programming
    - Click on Dynamo



    - Below window will get appear

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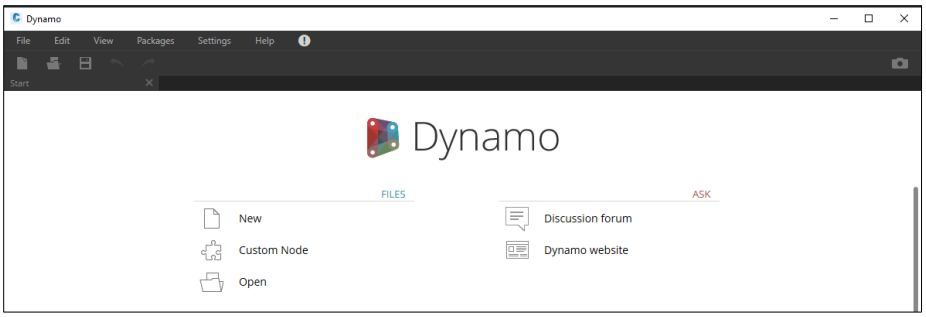
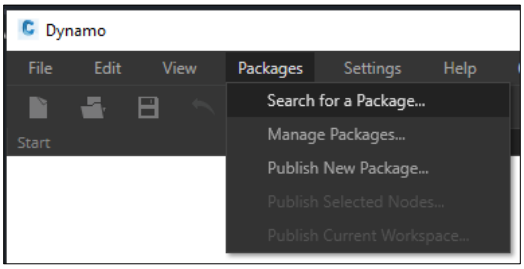
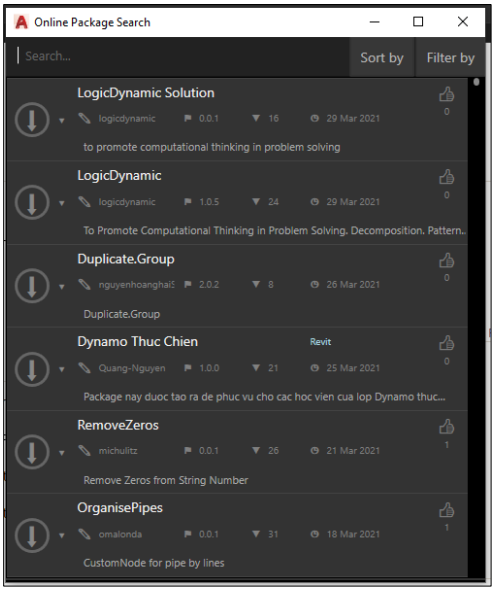


- Go to Packages >> Select “**Search for a Package...**”



- Below window will appears



- Search for “**Civil3DToolkit**” and select the “Civil3DToolkit” from result and install the version **1.1.16** from list.

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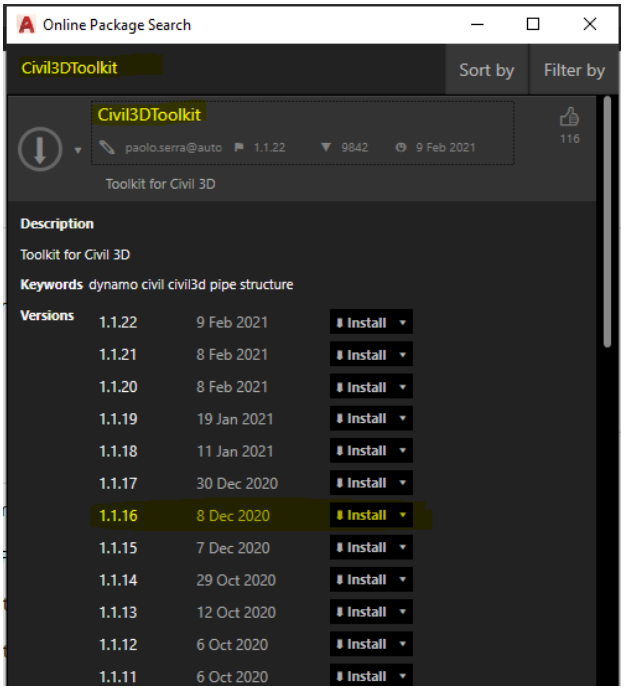

- Restart the Civil 3D 2022 Application.

5.2 Converting 2D Polylines to 3D Pipe Networks

Script Name: 2D Poly to 3D Pipe Network.dyn

Objective:

This script is basically developed to create quick 3D pipe networks from 2D lines without doing it for individual 2D polylines every time. It will create Pipe Network using defined pipe Catalogue. Pipes and Structures will be selected based on the default part lists. First objects of pipes and structures from that Part list will be chosen by default to create the network. Later it can be swapped as per user requirement.

When the project has multiple polylines in the form of Existing pipeline data or planned pipelines, then to create basic Civi3D pipe network model from it with conventional Command of “Create pipe network from Object” will be repetitive task. This script can help avoid that process somehow to minimize the efforts on developing pipe networks with certain default part sizes.

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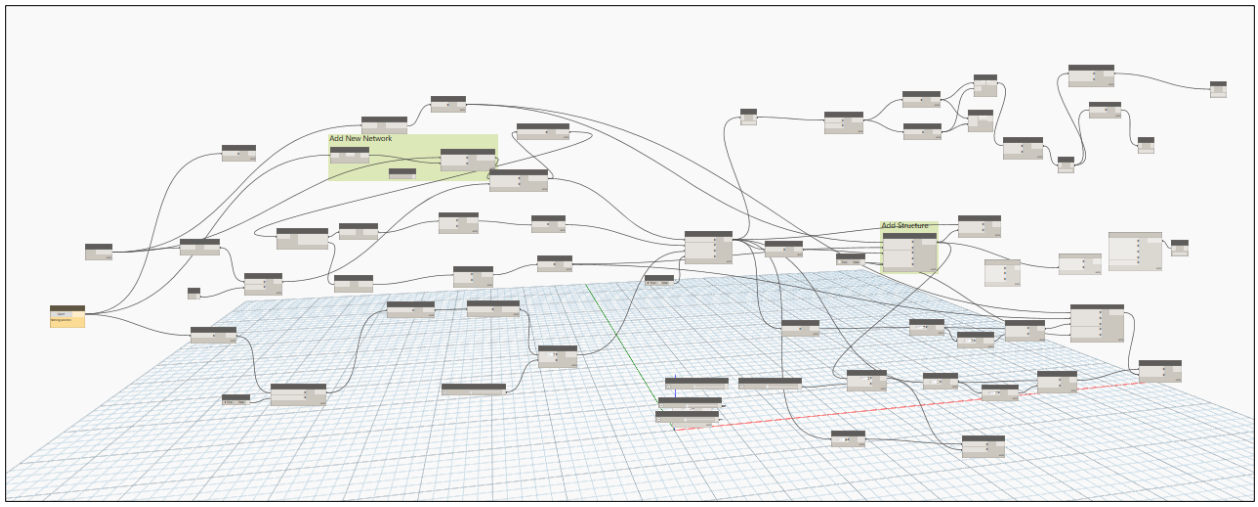


5.3 Converting 2D Polyline to Road Network

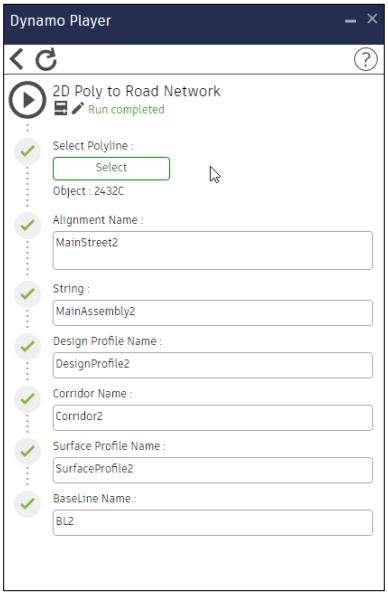
Script Name: 2D Poly to Road Network

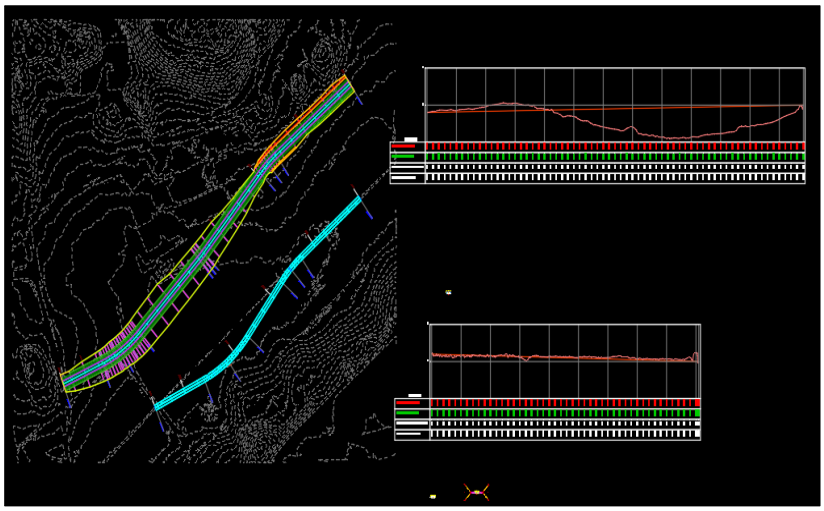
This script is basically developed to create quick Road corridor from 2D polyline. It will create Alignment, profile and corridor using default design set and styles. This created road corridor can be modified later as per user requirement.

To use this scripts user should have minimum one ground surface in the drawing file where he wants create road network from selected polylines.

Same Scripts can be run multiple time to create road networks from each polyline.

Basic design profile is considered while executing this script. User can modify the design profile as per requirements after that to make it more accurate.





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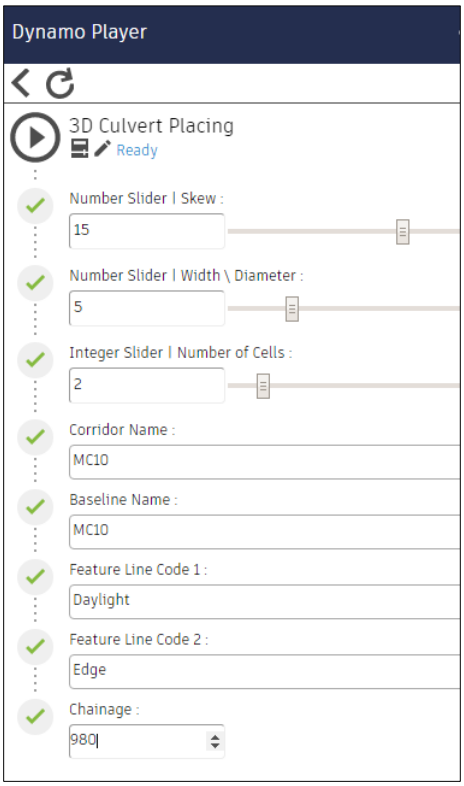
5.4 Placing of 3D solid Culvert along the corridor alignment

Script Name: 3D Culvert Placing.dyn

Objective: It is basically developed to place the 3D solid culvert with user defined number of Cells and pipe Diameters at identified chainages along the road Corridor.



Number Slider Width\Diameter	Culvert Pipe Sizes	Wall Thickness
No.s	m	m
1	0.225	0.05
2	0.300	0.062
3	0.375	0.07
4	0.450	0.084
5	0.525	0.088
6	0.600	0.096
7	0.750	0.102
8	0.825	0.108
9	0.900	0.114
10	1.050	0.128
11	1.200	0.14
12	1.350	0.152
13	1.500	0.152
14	1.650	0.166
15	1.800	0.178
16	1.950	0.204
17	2.100	0.228
18	2.250	0.28
19	2.400	0.28
20	2.700	0.33
21	3.000	0.35
22	3.300	0.6
23	3.600	0.64

Number Slider I Skew: it is basically angle of orientation of culvert with road alignment.

Number Slider I Width\Diameter : User has to select one number and it will full the Culvert pipe diameter and associated wall thickness with that. Currently Following table is with Pipe sizes and wall thickness is configure in the dynamo. User can change the list as per requirements.

Integer Slider I Number of cells: It is no. of pipes that user want to use.

Corridor Name: User need to select the required Corridor name from the document.

Baseline Name: User need to select the Associated base line name from the corridor.

Feature Line Code 1: These codes shall be selected based on the requirement of position and the assemblies that one has used.

Feature Line Code 2: These codes shall be selected based on the requirement of position and the assemblies that one has used.

Chainage: Need to select the chainage from the associated alignment.

See the demo of script for more details from Reference chapter.

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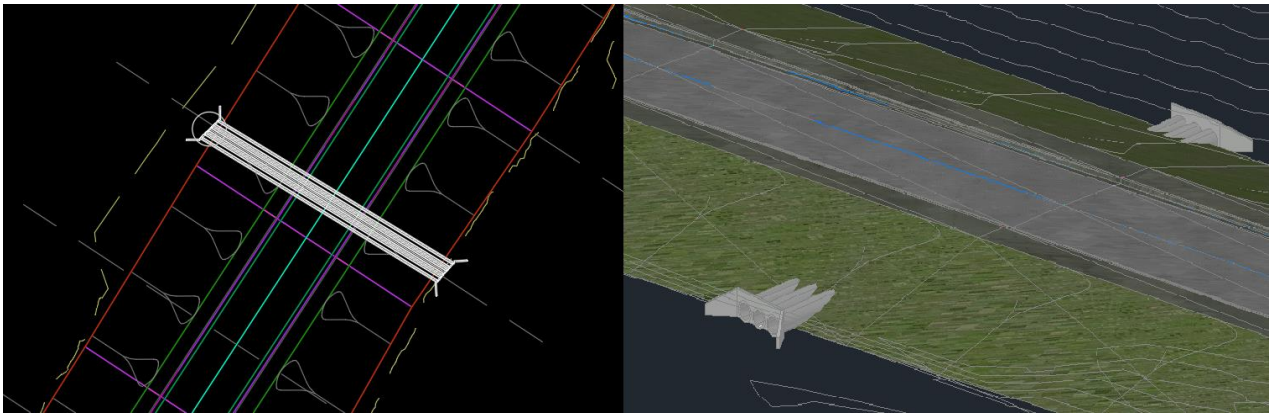

5.5 Creating 3D Polylines from Pipe Networks

Script Name: 3D poly from Pipe Networks.dyn

Objective: The objective of this script is to extract 3D polylines from the invert elevation of pipes. It extracts from all pipe networks at a once from document.

5.6 Crash Barriers_Steel

Script Name: CrashBarrier-Steel.dyn

Objective: This script is developed to place 3D crash barriers along road corridor following 2D polylines.

However, User Need to give csv file prepared with default values to create shape of crash barriers as below.

	A	B	C
1	0	0.4	
2	-0.1	0.5	
3	0	0.56	
4	-0.1	0.65	
5	0	0.71	
6			
7			

5.7 Pipe Conflicts Labels

Script Name: Pipe Conflicts Label.dyn

Objective: This script developed to place a marker and callout on the crossing of pipes (both gravity and pressure) for a Civil3D drawing.

This script will color code the created markers based on the user input value for 'minimum clearance'. If the crossing pipes are closer than the 'minimum clearance' a red marker will be

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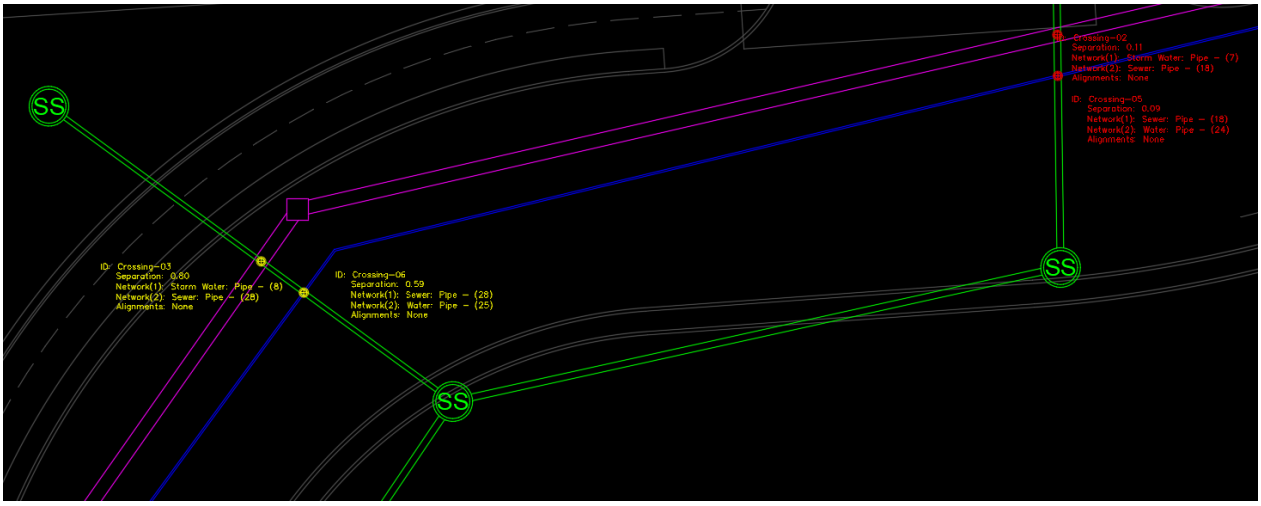
placed. Otherwise, a green marker is placed. If the pipes are on alignments, the alignment name and crossing station is provided in the crossing label's text.



5.8 Insertion of Poles, Light Post and Signals (Entities) along the defined alignment of Road using .csv file

Script Name: Place Object along Corridor_from csv.dyn

Objective: This script developed to place user defined 3D objects in the form of Blocks at defined offset along Road corridor.

The csv file shall have Chainage, Offset value from Alignment and Block names.

	A	B	C
1	540	-4.5	MV_MRS-33_No Parking
2	580	5	MV_FIS-8_Public Telephone
3	600	-4.5	MV_MRS-33_No Parking
4	620	5	MV_MRS-33_No Parking
5	640	4	MV_FIS-8_Public Telephone
6			

Drawing shall have all these blocks within document/drawing before running the script.

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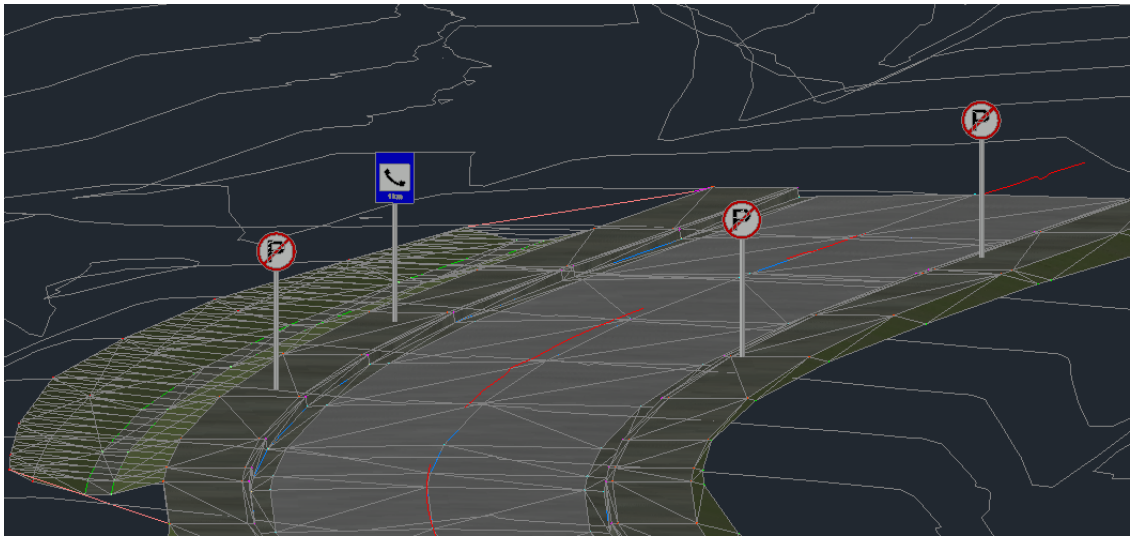


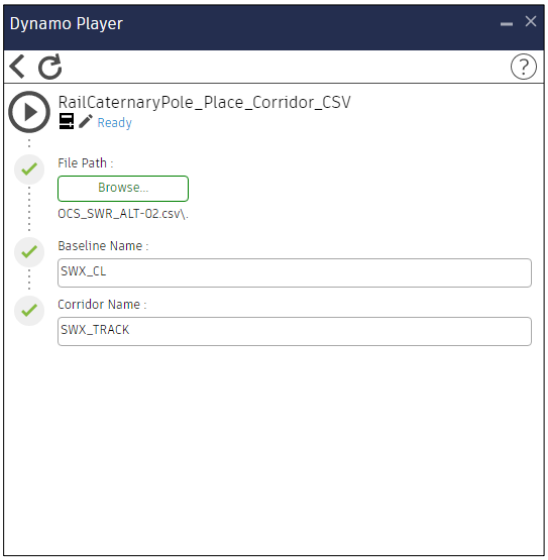
5.9 Placing of 3D OCS (Overhead Catenary System) Poles along the corridor using .csv file

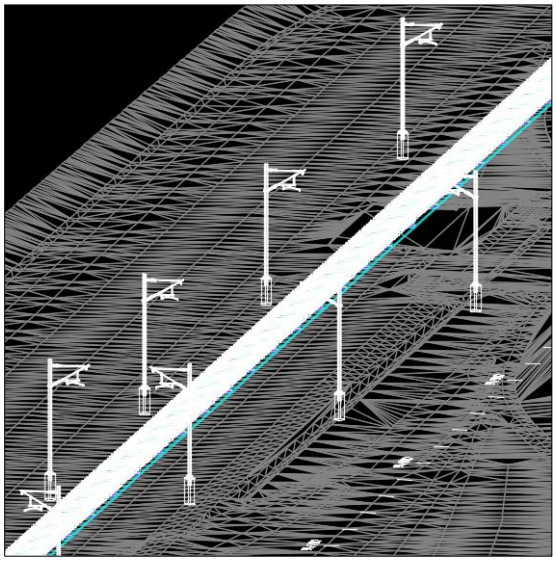
Script Name: RailCaternaryPole_Place_Corridor_CSV.dyn

Objective: This script is basically developed to place 3D OCS poles along Rail corridor using .csv file.

To use this scripts user should have OCS CAD Blocks in the drawing file where he wants to place OCS Poles.

Input requires to run this script is .csv file containing station number, offsets of poles from baselines & block names, Corridor name and Baseline name.





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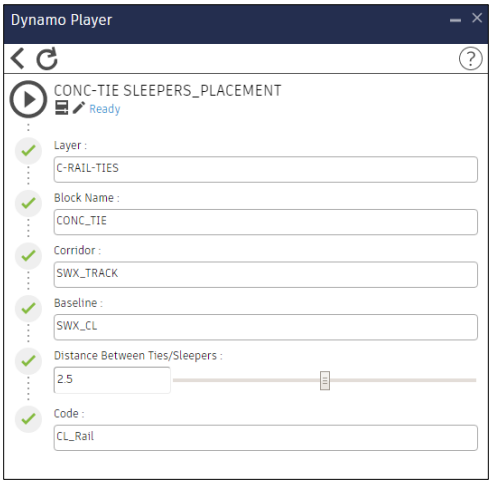
5.10 Placing of 3D Concrete Sleepers along the Rail corridor

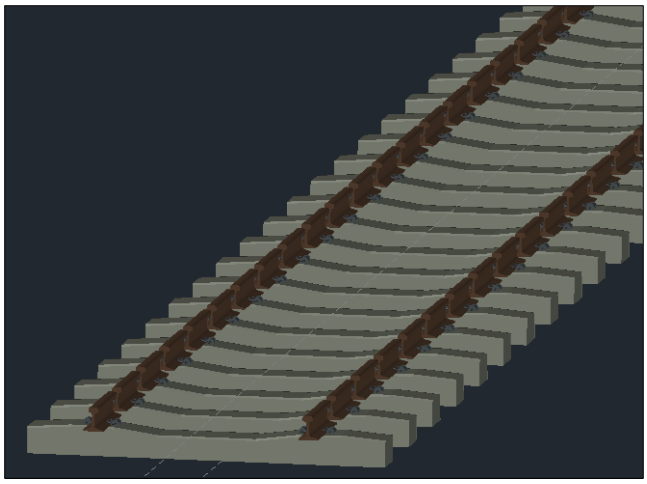
Script Name: Placement of Concrete Sleepers.dyn

Objective: This script is basically developed to place 3D Concrete Sleepers along Rail corridor.

To use this scripts user should have Sleeper CAD Blocks in the drawing.

Input requires to run this script is Corridor name and Baseline name, Distance between Sleepers.





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6.0 References

Refer the following links for various new provisions made in India Country kit 2022. Click on the hyperlink to view.

Sr No	Content Categories	Title Name
1	Content	India Road Marking Tool
2		India Pipe Network Catalog and Part Lists
3	Reports	Trench Excavation volume
4	Dynamo Scripts	Converting 2D Polylines to 3D Pipe Networks
5		Converting 2D Polyline to Road Network
6		Placing of 3D solid Culvert along the corridor alignment
7		Creating 3D Polylines from Pipe Networks
8		Pipe Conflicts Labels
9		Crash Barriers Steel
10		Insertion of Poles, Light Post and Signals (Entities) along the defined alignment of Road using .csv file
11		Placing of 3D OCS (Overhead Catenary System) Poles along the corridor using .csv file
12		Placing of 3D Concrete Sleepers along the Rail corridor

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