myCivil Plus 2016 Intensive Training For Beginners



Road & Highway Module

Prepared and Conducted by:



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OVERVIEW

1.0 Introduction

AutoCAD Civil 3D software provides engineers and his design team with a comprehensive AutoCAD[®]-based package for importing and exporting data as well as wide range of site analysis tools. Using an industry-proven, dynamic engineering model, AutoCAD Civil 3D links design and production drafting, greatly reducing the time taken to implement design changes and evaluate multiple scenarios. A change made in one place instantly updates the entire project, helping you complete projects faster, smarter, and more accurately. All team members work from the same consistent, up-to-date model, so they stay synchronized throughout all project phases.

2.0 Objectives

This intensive training session is customized to meet the following objectives:-

- (a) To expose AutoCAD Civil 3D & myCivil Plus technology and solutions provided by it.
- (b) To synergize AutoCAD Civil 3D & myCivil Plus with current engineering workflow.
- (c) To ensure end-users are able to kick-start their preliminary design using AutoCAD Civil 3D & myCivil Plus.
- (d) To familiarize users on the workflow of simple road design in AutoCAD Civil 3D & myCivil Plus.

3.0 Training Content Preparation

This training should be accompanied by the following training materials:

- (a) Training Courseware (this book).
- (b) Training Datasets (one piece DVD) which includes various drawings and data for each exercise.

CHAPTER 1 : INTRODUCTION TO AutoCAD Civil 3D and myCivil Plus

1.1 AutoCAD Civil 3D Interface and Commands

The user interface of AutoCAD Civil 3D offers a window-based, easy to use and configurable environment. There are sets of ribbon menus, toolbars, and palettes that are grouped and organized so that users can create a custom, task-oriented design environment.

Coso Home Insert Annotate Civil 3D Import Survey Cost 2D Drafting & Annotation 2D Drafting & Annotation Import Import Survey Cost 3D Modeling Import Import Points * Planning and Analysis Import Surfaces * Save Current As	Use " Workspace " to quickly change the interface of AutoCAD Civil 3D (Figure 1.1). The application offers a set of pre-defined workspaces that break down the user interface into typical design tasks. We can quickly switch between these workspaces to have an
Palettes Create Ground Data Workspace Settings	environment that is tailored for a certain task or
Toolspace	workflow, such as planning & analysis, 2D drafting and
Figure 1.1 : Workspace menu dron-down	
	In the example on the left, you can switch the interface to "2D Drafting & Annotation" if you require to work in regular AutoCAD interface.
	"Toolspace" (Figure 1.2).
Active Drawing View	To activate, Home tab > Toolspace
Points Point Groups Point Clouds	The Toolspace has several tabs; <i>Prospector, Settings, Survey and Toolbox.</i>
···· ☆ Surfaces ···· ⇒ Alignments ···· ⇒ Sites	Prospector : to manage project and drawing objects.
Catchments Catchm	Settings : to manage styles for AutoCAD Civil 3D objects and to control settings for drawings and commands.
	Survey : to manage survey and system settings as well as survey data.
Alignments	Toolbox : to access the Reports Manager and to add custom tools.
Figure 1.2 : Toolspace panel	

Another important component of the AutoCAD Civil 3D user interface are ribbon tabs and toolbars (Figure 1.3). AutoCAD Civil 3D offers a ribbon menu for each object that can be created. It also offers consistent set of toolbars for the layout and editing objects.

A -			- {බුිCiv	il 3D					AutoCAD Civil 3	BD 2014	Drawin	ng1.dw	g
C3D	Home I	nsert Annotate	Modify	Analyze	View	Manage	Output	Survey	Autodesk 360	Help	Add-ins	Fea	itured
37	10 m	💭 Import Survey	Data 【	🛐 Parcel 🔹	×+-	Alignment	🔹 👯 In	tersections	🔹 📝 Profile '	view 🔹		<i>[</i> **	ఎ
Toolena	- 🕅 🖻	🍪 Points 🔹	4	ジ Feature Lin	ie + 📝	Profile 🔹	岱 A:	ssembly +	් Sample	Lines	%.*	•	ŗ
Tooispa		🦽 Surfaces 🔹	Ĺ	🗳 Grading 🔹	M	Corridor	St Pi	pe Network	. + 🕂 Section	Views *	D .	۰ •	1
Pal	ettes 🔻	Create Ground Da	ta 🔻		Cre	eate Design	*		Profile & Sec	tion Views	C)raw 👻	

Figure 1.3 : AutoCAD Civil 3D Ribbon Menus and Toolbars

1.2 myCivil Plus Template

When you first launch AutoCAD Civil 3D, it always define the new drawing by using the "_AutoCAD Civil 3D (Metric) NCS.dwt" template. There is not much stylization in the default "_AutoCAD Civil 3D (Metric) NCS.dwt" template.

In order to get more efficient analysis, design and stylization settings, based on local standard, please install myCivil Plus template included in this manual.

1.2.1 myCivil Plus Installation Guide

This section provides step-by-step procedures to install the myCivil Plus on top of AutoCAD Civil 3D Standalone license. This document is also applicable to the Clients/Workstations in a Network license environment.

The installation procedures are divided into four (4) stages:

- Stage 1 : Showing Windows Explorer hidden folders and file extensions.
- Stage 2 : Installing the C3D DWT file.
- Stage 3 : Installing the Design Criteria Standards.
- Stage 4 : Installing the Cassini Projection Coordinate Systems.

PRE-REQUISITES BEFORE INSTALLATION:

- Ensure you have login as the <u>Administrator</u> or login as Power Users privileges.
- The steps in this documentation are targeted for Windows 7 operating system and its variants. Windows XP and 8 operating systems may have different interfaces but the procedures are similar to the Windows 7.
- RC = "Right-Click" mouse.

STAGE 1 : SHOWING WINDOWS EXPLORER HIDDEN FOLDERS AND FILE EXTENSIONS.

No.	Descriptions	Commands/Remarks
1.1	Launch "Windows Explorer".	RC "Start" > Open Windows Explorer
1.2	Goto Folder Options.	Click Organize > Folder and search options Organize New library Cut Copy Paste Undo Redo Select all Folder and search options Note : For Windows XP, goto Tools > Folder Options

1.3	Activate the settings as highlighted.	Goto "View" tab and change the settings as highlighted
		below.
		Folder Options
		Genera View Search
		Folder views
		You can apply the view (such as Details or Icons) that you are using for this folder to all folders of this type.
		Apply to Folders Reset Folders
		Files and Folders
		Aways show icons, never thumbnails
		Always show menus
		Display file size information in folder tips
		Display the full path in the title bar (Classic theme only)
		Hidden files and folders
		 Show hidden files, folders, and drives
		Hide empty drives in the Computer folder
		 Hide extensions for known file types ✓ Hide protected operating system files (Recommended)
		Hestore Defaults
		Click "OK" to close the Folder Options dialog box.

STAGE 2 : INSTALLING THE C3D DWT FILE.

No.	Descriptions	Commands/Remarks
2.1	Copy the Malaysian Template from the CD directory.	While still in the Windows Explorer application, goto the CD directory at "/C3D Essentials 20xx/MALAYSIA Template/".
	Please note that the "_AutoCAD Civil 3D 20xx MALAYSIA yymmdd.dwt" template is developed as per intended. Any values presented in this template must be verified.	Copy the filename " _AutoCAD Civil 3D 20xx MALAYSIA <i>yymmdd</i> .dwt". Note : <i>xx</i> = the version of myCivil Plus release. <i>yymmdd</i> = the version of the Malaysian Template in year-month-day format.
2.2	Launch "AutoCAD Civil 3D 20xx Metric".	"Start" > All programs > Autodesk > AutoCAD Civil 3D 20xx Metric. Autodesk Autodesk Autodesk 3ds Max Design 2014 Autodesk AutoCAD Civil 3D 2014 Autodesk AutoCAD Civil 3D as AutoCy Autodesk AutoCAD Civil 3D as AutoCy Autodesk Content Browser Batch-Standards Checker Data Shortcuts Editor License Transfer Utility - AutoCAD 20 Note : Ensure to launch the " <u>Metric</u> " version as the units will be in "meter". The "Imperial" version will be having units in "feet" and "inches".

2.3	Launch "Options" dialog box.	RC on the drawing area > Options		
2.4	Change the QNEW file.	Goto "Files" tab > Template Settings > Default Template File Name for QNEW > highlight the file path > "Browse" button.		
		Options Conserved under the second		
2.5	Paste the template in the AutoCAD Civil 3D template directory.	RC anywhere in the list > Paste		
2.6	Assigning the template.	Highlight the pasted DWT file > Open		

2.7	Verifying the QNEW template	Ensure the QNEW directory is referring to "_Autocad Civil 3D 20xx
	has been successfully assigned.	malaysia yymmdd.dwt"
		Ten udde Settinus Ten udde Settinus Sheel Set Template File Location Default Template File Location Default Template File Name for LNEW
2.8	Close AutoCAD Civil 3D 20xx application.	
2.9	Re-launch AutoCAD Civil 3D	If required, click "Enable Macros" to accept macros running in
	20xx Metric .	the application.
		• In required, click OK to accept additional language dialog.
2.10	Double check the template has been applied appropriately.	Once the blank drawing is opened, goto "Settings" tab > Alignment > Alignment Styles
		You should be able to see "MALAYSIA Alignment" style as depicted above. If you do not see them, please repeat steps 2.1 previously.

STAGE 3 : INSTALLING THE DESIGN CRITERIA STANDARDS.

No.	Desc	riptions	Commands/Remarks
3.1	Copy the	Design Criteria	Launch back the Windows Explorer application, goto the CD
	Standards from	n the CD directory.	directory at "/C3D Essentials 20xx/MALAYSIA Template/Design
			Criteria Editor".
			<u>Copy</u> filenames " <u>Road Engineering Association of Malaysia</u> REAM_REVISED.xml" and "Arahan Teknik JKR 8_86_REVISED.xml" as depicted below.

		C3D Essentials 2012 C3D Essentials 2012 C3D Essentials 2012 C3D Essentials 2012 C3D Essentials 2012 C4D Essen
3.2	Pasting the XML files.	Still in the Windows Explorer, paste both XML files into the following directory:
		For Windows XP ,
		C:\ Documents and Settings \ All Users \ Application Data \ Autodesk \ C3D 20xx \ enu \ Data \ Corridor Design Standards \
		Metric
		For Windows 7/8 ,
		C:\ ProgramData \ Autodesk \ C3D 20xx \ enu \ Data \ Corridor
		Design Standards \ Metric

STAGE 4 : INSTALLING THE CASSINI PROJECTION COORDINATE SYSTEMS.

No.	Descriptions	Commands/Remarks	
4.1	Copy the coordinate system files from the CD directory.	Launch back the Windows Explorer application, goto the CD directory at "/C3D Essentials 20xx/MALAYSIA Template/Coordinate System".	
		Copy filenames "Category.CSD" and "Coordsys.CSD" as depicted below.	
4.2	Back-up the default Coordinate System files.	For Windows XP, browse to: C:\ Documents and Settings \ All Users \ Application Data \ Autodesk \ Geospatial Coordinate Systems For Windows 7/8, browse to C:\ ProgramData \ Autodesk \ Geospatial Coordinate Systems	

		Image: Second
4.3	Rename the default Coordinate System files to .BAK file.	Rename both file extensions from .CSD to .BAK as depicted below.
4.4	Pasting the new Coordinate System files.	Right-Click on the "Geospatial Coordinate Systems" folder > Paste
5	re-launch to begin your project.	

That's all. You have now configured myCivil Plus running on top of AutoCAD Civil 3D application. Enjoy the power of myCivil Plus.

CHAPTER 2 : CLEAN-UP THE SURVEY DRAWINGS

Everytime we receive any drawings from any parties, we have to clean-up these drawings before inserting them into myCivil Plus. This will ensure the drawings are free from malicious and erroneous data that can affect myCivil Plus performance.

No.	Descriptions	Commands/Remarks
1.	Open the survey / architect drawing.	Home Insert Annotate Modify Foolspace Points • Surfaces • Browse to filename "01 Proposed Highway 2013_START.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VUA - Not installed VUA - Not installed I his drawing contains content created with Microsoftig Visual Bask() for Application software (VBA). What do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what do you want to do? VB is a software (VBA) what is a NIT (This application of the NIT (This a
3.	Check the drawing unit and scale.	Randomly check the drawing values (e.g. bearing-distance; drainage width, road width, etc.) so that they are in the correct unit and scale. myCivil Plus ONLY works in metric unit (i.e. all drawing objects must be in "meters"). Use the AutoCAD "DISTANCE" (e.g. "DI") command to check the unit of the objects. If the drawing is not in "meters" unit, please consult your drafting department on how to convert the drawing appropriately.
4.	Refresh opened drawing.	"REA"
5.	Turn on/thaw/unlock all layers.	"LA". Ensure all layers are turn on, thaw and unlock.
6.	Zoom Extents.	"ZE". Remove any erroneous data.
7.	Remove unwanted AutoCAD entities.	"PU" > "Purge All" > "Purge All Items"



10.	Refresh drawing.	"REA"
11.	Saving the cleaned drawing.	"Save As". Filename = "02 Proposed Highway 2013_CLEANED.dwg"
		If you received pre-com/architect plan separately, please repeat step 1-8 above.
12.	Close myCivil Plus application.	

CHAPTER 3 : CREATING EXISTING/ORIGINAL GROUND SURFACE

There are three (3) methods to create Original Ground Level (OGL) surface, namely:

- i. OGL from AutoCAD TEXTS
- ii. OGL from AutoCAD POINTS
- iii. OGL from AutoCAD COUNTOUR LINES (Recommended)

Users have to choose one from the above. The most accurate surface is generated from COUNTOUR LINES, followed by AutoCAD POINTS and the least accurate will be from AutoCAD TEXTS. The selection between the three above is depending on what information is embedded into the Survey drawing and whether these data can be processed directly or indirectly.

Alternatively, the OGL Surface can be generated from ASCII text file. The text file contains Easting, Northing and Elevations of all the points. Refer to "*C3D10 - Generic Demo.avi*" video for more details.

myCivil Plus can also convert GIS (e.g. MapInfo tab file, etc.) and GPS (e.g. Garmin ASCII text file, etc.) data to create OGL surface. Refer to "GIS to DWG.avi" video for more details.

3.1 Creating OGL Surface from AutoCAD TEXTS (OPTION 1)

No.	Descriptions	Commands/Remarks
1.	Launch AutoCAD Civil 3D Metric and ensure the Malaysia Template is applied.	"Settings" tab > Alignment > Alignment Styles Toolspace Macter View Toolspace Macter View Toolspace Macter View Toolspace Provide Point Poi
2.	Insert the cleaned survey / architect drawings.	Type "Insert" in command line > browse to the CLEANED drawing. Insert Name: 1 Proposed Highway 2013 CLEANED Path: C:\Users\noor.azhar.PDSSB\>esktop\C30 · Customised Trainin Locate using Geographic Data Insertion point Scale Specify On-screen Specify On-screen X: 0000 Y: 1.000 Block Urit Unit: Unit: Unit: Unit: Unit: V: 0.000 Z: 0.000 V: 1.000 Block Urit Unit: Unit: Unit: Unit: Unit: V: Fashor 0:00 Cancol Hob

3.	"Zoom Extents" and refresh the inserted drawing.	"ZE" & "RE".
4.	Displaying only survey spot levels.	Select any spot level text > RC > "Select similar" > RC > "Isolate Objects" > "Isolate Selected Objects".
5.	Filtering only numerical text points (eg. Ground elevations, invert levels, manholes depth, etc.)	RC > "Quick Select" Apply to: Object type: Text Properties: Color Linetype Linetype scale Plot style Plot style Plot style Plot style
6.	Creating two new layers; ie. "HEIGHT" & "HEIGHT-IL". Note : This step is OPTIONAL. Assigning layer to elevations.	"LA" Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 3dr Bhd by Noor Adhar Image: Current laypr: 0: Copyright PDS (M) 4dr Continuous Image: Current laypr: 0: Copyright PDS (M) 4dr Continuous Image: Current laypr: 0: Copyright PDS (M) 4dr Continuous Image: Current laypr: 0: Current
	Note : This step is OPTIONAL	• Change layer name to "HEIGHT".
8.	Selecting miscellaneous elevations (eg. invert levels, manholes depth, etc.) Note : This step is OPTIONAL	• RC > "Quick Select".

		Quick Select Apply to: Current selecton Object type: Properties: Color Linetype scale Properties: Unetype scale Unetype scale
9.	Find and Replace "IL" with	RC > "Find"
	number "000".	A Find and Replace
	Note : This step is OPTIONAL	Find what: 1 Replace All Tind where: Selected objects Selected objects Selected objects Selected objects Click "Replace All". You may need to repeat these steps for "MH", "LP", etc. separately.
10.	Converting 2D text points to 3D text points.	"Modify" tab > "Surface" > "Surface Tools" > "Move Text to Elevation" > select all 3D text points > ENTER.
11.	Creating Original Ground Level (aka OGL) surface.	 Prospector > RC "Surfaces" > "Create Surface" Name = "OGL from TEXT" Leave other default values > OK
12.	Prospector tab > OGL from TEXT >	Definition > RC "Drawing Objects" > Add
	Toolspace Active Drawing view Active Drawing view Point S Point Srcups Point Clouds Point Clouds Point Sicups OSL iron TEXT Macks Watersheds Point Clouds Point Clouds Point Clouds Point Clouds Point Peaklines Point Peaklines Point Pies Point Pies Point Pies Point Pies	Select all 3D text points > ENTER

13.	Refresh drawing.	"REA"
14.	Viewing OGL surface in 3D mode.	Select the surface contours > RC > "Object Viewer"
15.	If in 3D viewing mode, the mode investigate the erroneous data and	el is completed without erroneous data, proceed to next step. Else, d rectify them.
16.	Ending the isolate object mode.	RC > "Isolate Objects" > "End Object Isolation"
17.	Zoom Extents & Refresh drawing.	• "ZE" • "REA"
18.	Saving drawing.	"Save As" filename "03 Proposed Highway 2013_OGL from TEXT.dwg"
19.	Improving the OGL surface to emphasize existing culverts, berms, monsoon drain, etc.	In the drawing area, select any culvert line > RC > Select similar
20.	Adding breaklines to the OGL surface.	Prospector tab > Surfaces > OGL from TEXT > Definition > RC Breaklines > Add
21.	Assigning Proximity Breaklines.	Change the Breaklines type to "Proximity" > OK. Add Breaklines Description: culvert Type: Proximity File link options: Break link to file
22.	Viewing OGL surface in 3D mode.	Select the surface contours > RC > "Object Viewer"
23.	If in 3D viewing mode, the model Else, investigate the erroneous dat	is completed without erroneous data, proceed to save the drawing. ta and rectify them.



No.	Descriptions	Commands/Remarks
1.	Launch AutoCAD Civil 3D Metric	"Settings" tab > Alignment > Alignment Styles
	and ensure the Malaysia	
	Template is applied.	Toolspace
		Master View
		E Wo General
		⊕ • Point
		E A Surface
		Parcel
		E Grading
		E De Alignment Styles
		MALAYSIA Alignment
		If the cattings above is not available, please refer to CHADTER 1
		Section 1 2 1 "myCivil Plus Installation Guide"
2.	Insert the cleaned survey /	Type "Insert" in command line > browse to the CLEANED drawing.
	architect drawings.	
		A Insert
		Name: 02 Proposed Highway 2010 CLEANED Bruwse
		Path: C:NUsers/noor.azhar.PDSSB\DesktopxC3D - Customised Trainin
		Insertion point Scale Rotation 2
		Specify On-screen
		Block Unit
		2. 10000
		J Unitom Scale
		V Explinite OK Cancel Hob
3.	"Zoom Extents" and refresh the	"ZE" & "RE".
	inserted drawing.	
4.	Selecting all AutoCAD points.	RC > "Quick Select".
		Quick Select
		Apply to: Entire drawing
		Object type Point 1
		Properties: Color
		Layer Linetupe
		Linetype scale. Plot style
		Lineweight Transparency
		Hyperlink Thickness
		Material Position X
		Position Y
		Operator: Select All
		2
		- How to applin

3.2 Creating OGL Surface from AutoCAD POINTS (OPTION 2)



13.	Zoom Extents & Refresh drawing.	• "ZE" • "REA"
14.	Saving drawing.	"Save As" filename "03 Proposed Highway 2013_OGL from POINT.dwg"
15.	Improving the OGL surface to emphasize existing culverts, berms, monsoon drain, etc.	In the drawing area, select any culvert line > RC > Select similar
16.	Adding breaklines to the OGL surface.	Prospector tab > Surfaces > OGL from TEXT > Definition > RC Breaklines > Add
17.	Assigning Proximity Breaklines.	Change the Breaklines type to "Proximity" > OK. Add Breaklines Description: culvert Type: Proximity File link options: Break link to file
18.	Clean the progress report.	Action > Clear All Events > Close
19.	Viewing OGL surface in 3D mode.	Select the surface contours > RC > "Object Viewer"
20.	If in 3D viewing mode, the model Else, investigate the erroneous dat	is completed without erroneous data, proceed to save the drawing. a and rectify them.



No.	Descriptions	Commands/Remarks
1.	Launch AutoCAD Civil 3D Metric and ensure the Malaysia Template is applied.	"Settings" tab > Alignment > Alignment Styles
		Master View Drawing2 Point
2.	Insert the cleaned survey / architect drawings.	Type "Insert" in command line > browse to the CLEANED drawing.
		Path: C:\Users\noor.achar.PDSSB\Desktop\C3D - Customised Trainin Locate using Geographic Data
		Insertion pont sicale Foreity Cn-screen Foreity Cn-screen Foreity Cn-screen Angle: OdC'0" Y: 0.000 Y: 1.000 Block Unit Unit: Unit: Unit: Factor 1.000 Z: 0.000 Z: 1.000 Elock Unit Unit: Unit: Unit: Elock Unit V: Factor 1.000 Elock Unit Unit: Unit: Unit: Unit: Elock Unit V: Factor 1.000 Elock Unit Elock Unit Unit: Unit: Unit: Unit: Unit: Elock Unit
3.	"Zoom Extents" & refresh the inserted drawing.	"ZE" & "RE".
4.	Select all contour lines.	Select any AutoCAD contours > RC > "Select similar" > RC > "Isolate Objects" > "Isolate Selected Objects".
		Bypeal AECSELECTSIVILAT tocnt input Lipbcard Dask Modify Tools
5.	Creating Original Ground Level	 Prospector > RC "Surfaces" > "Create Surface" Neme "OCL from CONTOLID"
	I LANA UULI SUITALE.	 Name = "OGL from CONTOUR" Leave other default values > OK
6.	Prospector tab > OGL from CONTO	UR > Definition > RC "Contours" > Add

3.3 Creating OGL Surface from COUNTOUR LINES (OPTION 3)

	: Toospace	🕹 Add Eontour Data 📉
		Description
		website
	E @ Puit Groups	Distance: Ande
	🕐 Pont Jouds	15.00 😴 4.000 (c)
	🖻 🗇 Suferes	T' una escentra ferra s
	自 舟 아님 Yon CONTOURS 술	Distance: Mid reditate detance:
	A constant a	100 000m 🕺 111 m
	interspects	
	Boundaries -	Filminiae Bet zeros bys
	··· 🚱 Breakines	
	Contours Add	V futin ports or altrangeoles
	DEM Fles	
	Eg Drawing Objects	> Select all contours > ENTER
7.	Clean the progress report.	Action > Clear All Events > Close
		Action View 🗇 🖓 🖅 🔳 🏝 😂 🕎
		Open Log File Event Viewer 34 event(s)
		Save Log File As
		Cear All Events (1) Informa 9/6/2012 3:17:38 PM Surface: OGL
		Refresh (j) Informa 9/6/2012 3:17:38 PM Surface: OGL
		Export List (i) Informa 9/6/2012 3:17:38 PM Surface: OGL
		Propercies 9/6/2012 3:17:38 PM Surface: OGL
		i loforma 0/6/2012 3:17:36 PM Surface: Oct
8.	Refresh drawing.	"REA"
٥	Viewing OGL surface in 3D	Select the surface contours $> PC > "Object Viewer"$
9.	viewing OGL surface in SD	Select the surface contours > NC > Object viewer
	mode.	
10	If in 3D viewing mode the mode	l is completed without erroneous data proceed to next step. Else
10.		is is completed without enoneous data, proceed to next step. Else,
	investigate the erroneous data and	d rectify them.
11	Ending the isolate object mode	RC > "Isolate Objects" > "End Object Isolation"
	Enang the isolate object mode.	
12.	Zoom Extents & Refresh	• "ZE"
	drawing.	• "RFA"
13.	Saving drawing.	"Save As" filename "03 Proposed Highway 2013_OGL from
	-	CONTOUR.dwa"
ļ		
14.	Close the drawing and	
	application.	
1		

All three surfaces have been created in separate drawings. We shall continue with filename "03 Proposed Highway 2013_OGL from POINT.dwg" because the provided contour lines are not covering the whole corridor properly.

CHAPTER 4 : myCIVIL PLUS ANALYSIS

Once we have created the OGL surface, we shall investigate the site for drainage planning and allocating proposed alignments.

myCivil Plus comes with pre-defined analysis functions. The analyses included are contours, directions, elevations, slopes, slope-arrows, user-defined contours, watersheds and water drops.

4.1 <u>Contour Labeling</u>

No.	Descriptions	Commands/Remarks
1.	Open the OGL Surface drawing.	Home Insert Annotate Modify Toolspace Points • Surfaces • Browse to filename "03 Proposed Highway 2013_OGL from POINT.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VMA Near Installact controls evalued with Microsoft § Visual Bacing for Application software (VRA), Wile do you want to 102 VMA Installacting controls evalued with Microsoft § Visual Bacing for Application software (VRA), Wile do you want to 102 VMA Installacting controls evalued with Microsoft § Visual Bacing Microsoftware (VRA), Wile do you want to 102 VMA Installacting controls and the visual Bacing Microsoftware (VRA) evaluation and the visual Bacing Microsoftware (VRA) evaluation and dig point on extension of Microsoftware (VRA). Image: Dependent Hold Hold Hold Hold Hold Hold Hold Hold
3.	Check the drawing unit and scale.	 Randomly check the drawing values (e.g. bearing-distance; drainage width, road width, etc.) so that they are in the correct unit and scale. myCivil Plus ONLY works in metric unit (i.e. all drawing objects must be in "meters"). Use the AutoCAD "DISTANCE" (e.g. "DI") command to check the unit of the objects. If the drawing is not in "meters" unit, please consult your drafting department on how to convert the drawing appropriately.
4.	Labeling the contour lines.	Annotate tab > Add Labels > Surface > Contour - Multiple
5.	Placing the label on the drawing.	Ensure OSNAP is off. Click any two points crossing the OGL surface contours.



4.2 <u>Elevation Analysis</u>

Usage : To determine the different height/elevation in the project area.

No.	Descriptions	Commands/Remarks					
1.	Goto OGL Surface Properties.	+Surfaces > RC "OGL from POINT" > Surface Properties					
		Image: Constraint of the second se					
2.	 Running and applying the Elevation analysis onto OGL surface. Note: Double-Click (DC) to change the values for Minimum Elevation and Maximum Elevation. DC to change the Color Scheme. 	Surface Properties OEL hom POINT Information Endyssigned Preview Preview Eventions Images Preview Images Regent Images Preview Images Pr					
		4нир					

3.	Applying the Elevation Banding (2D) styles	Surface Properties - OGL from POINT Information Definition Analyss Statistics Name: OCL from POINT Description: Description: Default styles Surface style: Perfault styles Perfault style: Perfault style:
4.	Generating the Legend of Elevation Analysis.	Add Add Multiline Check Fin text Add Add Multiline Check Fin text Labels Add Point Table Text Text Text 3 Figure Add Surface Add Surface 3 3
5.	Put the mouse cursor in the drawing & select "Elevations".	From Contracts SopeArrows Contracts Wratersliedb
6.	Select "Dynamic" behavior.	

7.	Click at any empty space in the drawing.	E.evations Table				
		Number	Minimum Elevation	Maximum Elevation	Area	Color
		1	0.10	3.86	4236746	
		2	3,86	4.15	39302.75	
		9	4 15	4 39	3517117	
		4	4.39	4.95	18594.95	
		5	4.95	7.86	75462.24	
		6	7.18	11.18	39721.73	
		7	10.18	27.79	36152,84	

4.3 Slope Arrows Analysis

Usage : To determine the natural/gravitational flow of surface runoff.

No.	Descriptions	Commands/Remarks
1.	Goto OGL Surface Properties.	+Surfaces > RC "OGL from POINT" > Surface Properties Toolspace Active Drawing View Points Points Point Groups Point Clouds Point Clouds Point Clouds Construction of the point Clouds Construction of
2.	 Running and applying the Slope Arrows analysis onto OGL surface. Note : Double-Click (DC) to change the values for Minimum Slope and Maximum Slope. DC to change the Color Scheme. 	Surface inoperiods ULL from IUINI Primation Lefinite Analysis Parallel Indexistype: Preview Indexistype: Image: Image



					174	
7.	Click at any empty space in the drawing.	Slope Arrows Table				
		Number	Minimum Slope	Maximum Slope	Color	
		1	0.00%	1.71%		
		2	1.71%	6.48%		
		3	6 48%	20.34%		
		4	20.34%	3530.42%		
8.	Regenerate the drawing.	"REA"				
9.	Perform Water Drop analysis. (Optional).	Survey Quck Frofis Groine	Insert Amotate Modif	Analyze sew Analyze sew District forence Chock Water Drop Craws the path that a		
10.	Select "OK".	Water Drop Property Building Path Cay Start Poir	Value rop Path er C-"OF sct Type 3D Pol rop Marker ker at Start Point No t Marker Style Basic OK Cancel	O-WDRP Vline Hep		
11.	Click continuously at any high points / peak of any hills/mountains. Note: If the Water Drop lines do not appear, run "REA" command.					
12.	The Water Drop Analysis explains Hence, we can estimate the poten	the potent tial water co	ial water/surface Ilection point fo	e run-off path fo r that surface/sit	or that pa e.	articular surface.
13.	Zoom Extents & Refresh drawing.	 "ZE" "REA" 				
14.	Saving drawing.	"Save As"	filename "04 Pro	posed Highway 2	2013_And	alysis.dwg".
15.	Close the drawing and application.	J				

CHAPTER 5 : ALIGNMENT DESIGN

This chapter will demonstrate step-by-step approach to :

- Creating Horizontal Alignment
- Editing Horizontal Alignment
- Labelling Alignment Control Plan

5.1 <u>Creating Horizontal Alignment</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Home Insert Annotate Modify Toolspace Points • Browse to filename "05 Proposed Highway 2013_Alignment.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VMA Mar Test held Image: Second sec
3.	Simplify the model space.	 Select the following objects in the drawing area: OGL Surface, ARS 5 text, leader line and circle indicator. Any spot level text.
4.	Isolate the objects.	RC > Select Similar > RC > Isolate Objects > Isolate Selected Objects
5.	Run "Alignment Creation Tools" command.	Home In ett Annotate Mooffy Analyze Yiew Manage Output Survey He Home In ett Annotate Mooffy Analyze Yiew Manage Output Survey He Image Image Image Minor AD Find rows Find rows He Image

6.	Give a dedicated name for the alignment, say "PROPOSED". Select "Design Criteria" tab.	Image: PROPOSED Yps: TD Centerline Description: Image: Starting station: Description: Image: Starting station: Doign Critoria Site: 2 Image: Alignmen: Alignmen: Alignmen: Alignmen: Alignmen:
7.	• Enter design speed (say	Alignmen: label set
	 70km/h). Activate "Use criteria-based design". Activate "Use design criteria file". Select the appropriate Attainment Method. <u>Un</u>check "Use design check set". 	General Design Criteria Starting design speed: 1 73 km/h Use criteria-based design C:/ProgramData/ALtocesk/C3D 2013/enu/Data/Corridor Default criteria: Property Value Minimum Radius Tabe REAM eMax 6% (Urban) Cranel Use design check set Cancel Help
8.	Ensure OSNAP is set to CENTER only.	
9.	Click the drop-down icon > run "Tangent-Tangent (With curves).	A I A A I A </td
10.	Zoom and OSNAP-click at ARS 5.	ARS 5 1000

11.	Zoom and OSNAP-click at ARS 9	A RS 9
12.	Zoom and OSNAP-click at ARS 13	4.22 4.62 4.62 4.62 4.62 4.63 4.64 4.65 4.7 3.77 4.65 4.7 3.77 4.75 4.
13.	Hit ENTER keyboard.Close the Alignment toolbar.	Alignment Layout Tools - FRCFOSED A ▼ △ △ △ △ △ △ ▼ → ▼ ✓ ▼ 8 ▼
14.	Close the drawing without saving.	

5.2 Editing Horizontal Alignment

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Home Insert Annotate Modify Toolspace Points * Browse to filename "06 Proposed Highway 2013_Alignment Editing.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	ViA - Noc Linst alled ViA - Noc Linst alled I his drawing contains content created with Microsofty Yisual Backgo for Application software (Vi6), What do you want to do' Wis produced to have a software (Vi6), Viab, do you want to do' Wis backgo backgo backgo backgo backgo backgo backgo Convert VIA coolent to NIT This application ry to ha content signed with earlier versions of Autorace with this current command All fi A breed rotater with the current e.
3.	Adding IP points.	Forme Inser: Annotate Modify Andyze View Manage Output Toolspace Fraction Tracks Provide Provide

		In the command line, enter the followings:
		IP 1 : N = 517 47 00; E = 219 33 77 IP 2 : N = 517 46 11; E = 219 36 44
4.	Terminate the command.	Hit ESCAPE keyboard twice. Close the "Create Point" toolbar.
		лап 192 192 192 192 192 192 192 192
5.	Select the alignment in the drawing.	Ensure OSNAP is set to "Node".
6.	Run "Geometry Editor" command.	Were Topposed Highway 2013 Alignment Editing.dwg Wire Topposed Highway 2013 Alignment Editing.dwg Wire Topposed Highway 2013 Alignment Editing.dwg Alignment Survey Highmant Editor Superlevation Superlevation Sight Distance Drive Tracker Probality
7.	Select "Insert PI" icon.	Alignment Lays ut Tools - PROPOSED A A Select a command from the layout tools Add Add Add Add Add Add Add Tags Labels & Tables General Tools
8.	Selecting desired IPs.	 Click at both nodes of IP 1 and IP 2. Hit ESCAPE keyboard twice to end the command.
9.	Adding circular curve at IP 1.	 Zoom to IP 1 area. Bun the "Free Curve Fillet" command
		- Run the free curve filler command.


11.	Return back to IP 1 in order to	Zoom to IP 1 area.
	rectify the alignment warning	Run the "Alignment Grid View" command
	symbol	
	Symbol.	A + 24 A 2 + + + + + + + + = 4 = 4 = 4 = 4 = 1 + + + + + + + + + + + + + + + + + +
		Soloct/Edit entity Spiral Type: Cothoid
		 Notice the warning symbol for violating "Minimum Badius" at
		70km/hr design speed Therefore Double Click the 170m radius
		Joking in design speed. Therefore, Double-Click the 170m radius
		value.
		👔 No. Type Targency Constraint Pa., Paraneter., Length Mirim, Radius Minimum Radius D
		1 Line Not Constrained (Fi 🗄 Two ponts 152.2
		A 2 Curve Constrained on B A Radius 49.58 A 170.000m 195.000m
		4.: Spira Constrained on Both 🛱 Spira-Racius 39.000m 39.000m
		4.25pira Constrained on Both 🔒 Spiin-Racius 15.617m 195.000m 195.000m
		4.dsptra Constrained on Both 5 June Not Constrained (Fi Two ponts 181.7
		6 Curve Constrained on Both 🛱 Radius 176.1 195.000m 195.000m
		7 Line Det Constrained El H Two parts 265.0
		• Change the value to "105" and the warning symbol will dismiss
		 Change the value to 195, and the warning symbol will distribut.
		📷 No. Type Tangency Constraint Pa Parameter Length Minim. Radius Minimum Radius
		1 Line Nct Constrained (Fi Torrest 148.5 2 Curve Constrained on Both A Radius 56.881m 195.000m 195.000m
		3 Line Nct Constrained (Fi A Two points 205.7
		1.1SpiraConstrained on Both P Spiin Radus 39.000m 37.000m 195.000m 195.000m 195.000m
		1.35piraConstrained on Both 🕘 Spilin Radus 39.000m 32.000m
		5 Line Net Constrained (Fi A Two points 101.7
ļ		
12.	Adjusting other values.	 Change the second circular radius to 500.
		No. Type Tangency Constraint Pa Parameter Length Minim Radius Minimum Radius
		1 Line Not Constrained (Fi 🔐 Two points 148 5
		2 Curve Constrained on Both The Radius Social 195,000m 195,000m 195,000m
		4.1 Spra Constrained on Both 🛱 Spiln-Radus 29.COOm 39.00 m
		4.25pra. Constrained on Both 🔓 Spiln-Radus 101 0 500.000m 195.000m
		5 Line Not Constrained (Fi 6 Two points 138 8
		6 Curve Constrained on Both 6 Radius 178 1, 195.000m 195.000m 7 Line Not Constrained (6) 6 Ture points 263 0
13.	Close all windows, Zoom Extents	"ZE" & "REA".
	and regenerate the drawing.	
	-0	
14	Close the drawing	Do not cavo
14.	Ciose the drawing.	DU HUL SAVE.

5.3 Alignment Labelling : Control Plan

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	L C C C C C C C C C C C C C C C C C C C
		Browse to filename "07 Proposed Highway 2013_Alignment Control
		Plan.dwg"

2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	Y3A - the tractalled X It is drawner contains content created with Microsofts Visual Backty for Application software (VBR). What do you want to do? Y85 - too force rasted with Accelo Durl S3, Y23 should other convert the Y87 backd existentiate, pape and structure rules to J21 or convolad the V87 modules. Image: Convert VIA content to JXT Tricls applicable or j2 oth accelor to applied with earlier version of Autora Carlini S0 Image: Described of the VBA Modules Image: Described of the VBA Modules Image: Described of content with the current command AUTA bread overlam with the current with the runsed to.
3.	Labelling Circular Curve Control Plan	Aud Add Add Add Add Add Add Add Add Add
4.	 Label type = Point of Intersection Label style = MALAYSIA – IP Curve 	Add Labels Image: Ima
5.	Select the desired IP that has Circular Curves ONLY.	Click at blue-colour Circular Curves at IP 1 and IP 3.

6.	Label style = MALAYSIA – IP T-S-C	Add Labels Focture: Alignment Label type: Point of Intersection label style: Point of Intersection label style: Total MALAYSIA - IP T-S-C Reference text object prompt method: Compare Line Add Close Help
7.	Select the desired IP that has Transition Curves ONLY.	Click at blue-colour Transition Curve at IP 2.
8.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
9.	Close the drawing.	Do not save.

5.4 Alignment Labelling : Fixed Interval Coordinates

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Foolspace Field Surfaces + C Browse to filename "07 Proposed Highway 2013_Alignment Control Plan.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VMA - Not installed x Image: Second and the second and the second sec

3.	Goto "Home" tab > Points > Create Points – Alignments > Measure Alignment.	Home Insert Annotate Modify Analyze View Manage Output Import Survey Data Import Survey Data<
4.	Command line prompts "Select Alignment". Just click the alignment in the model space.	Command: Command: Command: Command: Command: _AeccCreatePointMeasureAlign
5.	Command line prompts "Starting station <0.000>". Just ENTER keyboard.	Command: Command: Command: _AeccCreatePointNeasureAlign Select alignment: SNAP GRID ORTHO POLAR OSNAP 3DOSNAP OTRACK DUCS DYN LWT TPY
6.	Command line prompts "Ending station <1227.286>". Key in the round- <u>down</u> value of the end chainage. In this example, we will round-down to 1220. So, type in "1220" and hit ENTER.	Command: _AeccCreatePointMeasureAlign Select alignment: Starting station <0.000>: CREATEPOINTMEASUREALIG Ending station <1227.286>: SNAP GRID ORTHO POLAR OSNAP 3DOSNAP OTRACK DUCS DYN LWT TPY
7.	Command line prompts "Specify an offset <0.000>". Just hit ENTER keyboard.	Select alignment: Starting station <0.000>: Ending station <1227.286>: 1220 CREATEPOINTMEASUREALIG Specify an offset <0.000>: SNAP GRID ORTHO POLAR OSNAP 3DOSNAP OTRACK DUCS DYN LWT TPY
8.	Command line prompts "Enter an interval <10.000>". Type in your desired value. In this example, we will type in "20" and hit ENTER.	 Model / Layout1 / Starting station <0.000>: Ending station <1227.286>: 1220 Specify an offset <0.000>: CREATEPOINTMEASUREALIG Enter an interval <10.000>: SNAP GRID ORTHO POLAR OSNAP 3DOSNAP OTRACK DUCS DYN LWT TPY
9.	Command line prompts "Select Alignment". Just hit ESCAPE keyboard to end the command.	 Model / Layout1 / Ending station <1227.286>: 1220 Specify an offset <0.000>: Enter an interval <10.000>: 20 CREATEPOINTMEASUREALIG Select alignment: SNAP GRID ORTHO POLAR OSNAP 3DOSNAP OTRACK DUCS DYN LWT TPY

10.	You may close the "Create Points" dialog box. The points are now shown along the alignment. Next is to resize the points and label them accordingly.	Create Points # 3 × - + + + + + + + + + + + + + + + + + + +
11.	"Prospector" tab > Points Groups > RC "_All Points" > Properties	Toolspace Active Drawing View O7 Proposed Highway 2013 O8 Proposed Highway 2013
12.	Information tab > Edit Current Selection.	Point Group PropertiesAll Points Information F bint Groups Raw Desc Matching Include Exclude Query Builder Name:
13.	 Goto "Marker" tab. Verify the highlighted value. Click OK. 	All Point Style - Basic Information Refer C Use AuroCAD PCINT for marker C Use AuroCAD PLCIC syncol for marker D orbit d: D orbit d: Status C Use AuroCAD PLCIC syncol for marker D orbit d: D orbit d: Status D orbit d: D orbit d: <td< td=""></td<>

14.	Back to "Information" tab, change the Point label style to "Northing and Easting", and click OK.	Point Group PropertiesAll Points Information Point Groups Raw Desc Matching Include Exclu Name: _All Points Description: Default styles Point style: Point style: Point label style
15.	The alignment now is labelled with fixed interval CoGo points having Northing and Easting coordinates.	Image: Construction of the second o
16.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
17.	Close the drawing.	Do not save.

CHAPTER 6 : SUPERELEVATION DESIGN

This chapter will demonstrate step-by-step approach to design superelevation for circular curves and transition curves.

6.1 <u>Creating Superelevation</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Toolspace Points • Browse to filename "08 Proposed Highway 2013_Superelevation.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VBA - Not startalled X It is drawne costans context created with Microsofty Yisual Blacky for Application software (VR), What & you want to de? Yes VBA - Not Encort Asside with ARCLED unl SJ, You should other convert the VBA - back costance solution where to she i or comout the VB? models. Yes is not costance to ANT This is applicable only so the context supped with earlier versions of Adultation of the VBA Models Deemical the VBA Models Yes in context on a bit intervel.
3.	Select the desired alignment.	Click the alignment.
4.	Run the "Calculate/Edit Superelevation" command.	Autor AD (Tvil 3D 2013) BB Proposed Highway 2013_Supereleva Ourpu: Survey Help Express Tools Plug-ins Alignment: PR Pug-ins Criteria Editor Prodrive Editor Modify View Tabular Editor 2 Set
5.	Run the "Calculate superelevation now".	Edit Superelevation - No Data Exists X The alignment does not contain superelevation data. What would you like to do? X Calculate superelevation now This option will guide you through the superelevator wizard Open the superelevation curve manager This provides details on superelevation curves for the alignment



9.	 Setup the desired attainment parameters. Click "Finish". 	Evenue Design curve e Ner: Supersitevation = Altheimened CuPtocramDateVuiloced/CDD 2013/smit/DateVcor Supersitevation rate table: Supersitevation rate table: Stockdar Curve FEANI strike S2 (J-ban) Accomment Accomment rate/or longth table: Accomment Accomment rate/or longth table: Accomment Transition formula for outpersitevation outoff X multiplication Transition formula for outpersitevation Dure mouthing Transition formula for outpersite Image: structure outpersite The outpersite origin to the amits alignment K Back Lost 2 Ended Hep
10.	Scroll up-down and left-right to see all calculated Superelevation values. You may change the values by Double-Click the cells.	Image: Second
11.	The Superelevation wedges are printed along the alignment.	1.38 4.6 6.77 4.6 6.46
12.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
13.	Close the drawing.	Do not save.

CHAPTER 7 : PROFILE DESIGN

Profile is also known as Longitudinal Section. This chapter will demonstrate step-by-step approach to :

- Creating OGL profile.
- Generating PROPOSED profile.
- Editing PROPOSED profile.

7.1 <u>Creating Profile</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Toolspace Points • Browse to filename "09 Proposed Highway 2013 Profile.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	YMA - Noc Links alled X Inc. do source, contains content created with Microsofth Yisual Easkip for Application software (YMR). What do you want to do? YMS YMS - East cubersoftware (YMR). What do you want to do? YMS - back cubersoftware (YMR). What do you want to do? YMS - East cubersoftware (YMR). What do you want to do? YMS - back cubersoftware (YMR). YMS to control to the YMS - back cubersoftware (YMR). Yms do Lot there convort the modules. Image: Control to the Cuber of the Cuber of the SMS - control to the YMS - back cuber of the SMS - control to the Cuber of the SMS - cuber of the Cuber of the Cuber of the SMS - cuber of the Cuber of t
3.	Select the alignment.	Run the "Surface Profile" command. Highway 2013_Profile.dwg Type a keyword or phra Plug-ins Aigment: PROPOSED Image: Station Image: Station Ince Drive Station Image: Station Trocker Image: Station Image: Station Image: Station
4.	 Surfaces = OGL Click "Add>>" button Click "Draw in profile view" button. 	Alignment: Solect surfaces: Station range OGL Alignment: Solect surfaces: Station range OGL Alignment: Fnr: J.0000m J.227.286m To samplo Sample offsets: 0.000m J.227.286m Profile list Sample offsets: Name Descript: Type Data Sc CHse: Update Layer Style S.ar. End Mare Descript: OGL 0.300m Dynamic CROAD= Exempte Draw rsprofile view 3 VX (Annel

5.	In General parameters, just hit "Next>".	
		Profile Display. 2010ns Description: Pipe Network Display. Image: Comparison of the state
		CEach Next > Greate Protie View
6.	In Station Range parameters, just hit "Next>".	Sealera Station Range Profile View Hords: Profile View Hords: Profil
7.	In Profile View Height parameters, just hit "Next>".	Create Profile View - Profile View Heidlit Station Rance Profile View Heidht Profile View Heidht Profile View Heidht Profile Display Coolons The Network Disclos Eata Bancs Profile Haten Optime Mel AYS A Profile View Style:

8.	In Profile Display Options parameters, just hit "Next>".	Senaral Specify profile display options Subur Range Specify profile display options Profile view Height Specify profile display options Casta Bands Specify profile display options Profile -isten Options Specify profile display options Image: Specify profile display options Specify profile display options Casta Bands Specify profile display options Image: Specify profile display options Specify profile display options Image: Specify profile display options Specify profile display options Image: Specify profile display options Specify profile display options Image: Specify profile display options Specify profile display options Image: Specify profile display options Specify profile display options Image: Specify profile display options Specify profile display options
9.	 In Data Bands parameters: Band set = MALAYSIA Profile Band Set. "Next>". Note: If the MALAYSIA Profile Band Set is not available, please refer to CHAPTER 1, Section 1.2.1 of this Manual. 	Secure Secure Satur Farue Profile View - Dota Dands Satur Farue Profile View - bicht Data Bancs Profile Hatch Coptions Et usand uncuentles: Eard Trove Style Profile Data D/2 - Sufface - V/2 - Sufface - PROP Vorteo Licomour, PROPOSED Trag, O.2 - Sufface - V/2 - Sufface - PROP Vorteo Licomour, PROPOSED Trag, O.2 - Sufface - V/2 - Sufface - PROP Superelevation UND/VIDED - Vag, O.2 - Sufface - PROP Superelevation UND/VIDED - Vag, O.2 - Sufface - PROP Superelevation UND/VIDED - Vag, O.2 - Sufface - PROP Superelevation UND/VIDED - Vag, O.3 - Sufface - PROP
10.	In Profile Hatch Options parameters, hit "Create Profile View" button.	Create Profile View - Profile IIstch Options General Staton Fanae Profile View i cicht Import

11.	 Ensure OSNAP is set to "Center" ONLY. Click at the "Profile 0,0 Coordinate" marker. Note : You can place the Profile anywhere in the drawing. 	Center
12.	A Profile View is drawn accordingly.	
13.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
14.	Close the drawing.	Do not save.

7.2 Generating PROPOSED Profile

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Browse to filename "10 Proposed Highway 2013_PROPOSED Profile.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VAA - Not installed VAA - Not installed I the desame contains content created with Microsoftie Yesial Blackie for Application software (VBA). What do you use to do? Visit and observables and the Application content of the open and the VeA Produce. Convert VIA content to APT Prist application of software supped with earlier versions of AutorApplication for VIAA to be open and structures and the earlier versions of AutorApplication for VIAA to be open and structures and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication for VIAA to be open and structures to apped with earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the UNAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the VIAA to be open and the earlier versions of AutorApplication of the earlier version of the ear
3.	Goto Home tab > Profile > Profile Creation Tools.	Image Image <td< td=""></td<>

4.	Click the Title of the Profile View.	Click here
5.	 Give a unique name for the PROPOSED profile. Click "Design Criteria" tab. 	Alignment: PROPOSED Narre: PROPOSED Description: General Design Criteria Profile style: C.RCAD-PROF Profile label Style MALAYSIA Profile Label Style V RALAYSIA Profile Label Style
6.	 Activate "Use criteria-based design" Activate "Use design criteria file" Un-check "Use design check set" Hit "OK". 	Alignment Image: PROPOSED Name: PROPOSED Description: Seneral Design Criteria Image: Property Use design criteria file Property Velue Minimum K Table REAM Stendard Image: OK
7.	Run the "Curve Settings…" command.	Profile Layout Tools - PROPOSED Image: Second Sec

8.	 Enter the required parameters. Hit "OK". 	Yertical Curve Settings ★ Select curves type Parabolic ▼ Crest curves ▼ ■ Crest curves ▼ ■ Crest curves ● Length ■ Iso.000m © Length ■ K value © Prefaril/R address ■ So.000 © Length ■ So.000m © Length1: ■ So.000m © Length1: ■ So.000m © Dom ■ K value © Default Radius □ So.000m © ■ ■ DK Cancel Hep ■
9.	Run the "Draw Tangents With Curves" command.	Profile Layout Tools - PROPOSED Image: Sector Sec
10.	 Zoom to the Profile View. Ensure OSNAP is set to "CENTER". Click at VIP 1, then, VIP 2, and finally VIP 3. 	OSNAP at VIP 1 OSNAP at VIP 2 OSNAP at VIP 2 OSNAP at VIP 3
11.	ESCAPE keyboard to end the command.	
12.	Select the title of the Profile View.	Click here
13.	Run the "Profile View Properties" command.	10 Proposed Highway 2013 PROPOSED Profile.dwg 7 ut Survey Help Express Tools Plug-ins Profile View: PROPOSED1 C viteria Frrfile View Station Frrfile Image: Station Tracker Project Objects Tc Profile View Properties Frrfile Creation Tools Superimposed Profile Superimposed Profile Modary View Analyze Launch Fad Launch Fad

14.	Change the settings as shown below:	:	
	₽ Profile View Properties - PROPOSED		
	Information Stations Eevations Profiles Bands Hetch		
	Band type:	Select band style:	
	Frofile Data	I DISTANCE	
	ist of bands		
	Lotation: Bottom of profile view	2	
	Id Type Style L G., S.,	M. M. G., Label., Label., Alignment Profile1 Profile2	
	ile Data OGL III 0 V	1 25	
	ie Data FRL 0 V ical Geometry PROPOSED PROFILE 0 V	1 25 ··· · · · · · · · · · · · · · · · ·	
	zontal Geometry PR.OPOSED ALIGNMENT		
		PROPOSED	
	Match major/minor increments to vertical grd intervals	Import hand set Save as hand set	
15.	The Profile View is updated.	Hit ESCAPE keyboard to end the command.	
16.	Close all windows, Zoom Extents " and regenerate the drawing.	'ZE" & "REA".	
17.	Close the drawing.	Do not save.	

7.3 Editing PROPOSED Profile

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Toolspace Points • Surfaces • Browse to filename "11 Proposed Highway 2013_Profile Editing.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	WAL ther installed X Image: A state of the state of

3.	 Zoom to VIP 3. Click the PROPOSED profile line. 	VIP No. 3
4.	• Click the square-cyan-grip.	Click this cyan-grip VIP No. 3
5.	 Ensure OSNAP is set to "ENDPOINT" ONLY. OSNAP at the end of OGL Profile line. Hit ESCAPE to end the command. 	OSNAP here
6.	 Select the PROPOSED Profile line. Run the "Geometry Editor" command. 	Autor AD Fivil 3D 2013 11 P nalvze View Manage Outpu: Survey Help Exp Profile Secretry Design Criteria Profile View Profile View Sigh Modity Profile Modity View Modity View Nodity View Nodity View
7.	Select the "Profile Grid View" icon.	Profile Layout Tools - PROPOSED W ・ ☆ 笑 や / ・ ホ ・ ノ ダ ヤ 空 ケ ・ 茶 ズ ロ 日日 Seect a command Forr the layout tools PVI based
8.	Double-Click the K-value that is violated.	X Frif Fr
9.	 Change K-value to "200". The warning symbol is dismissed. 	No.
10.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
11.	Close the drawing.	Do not save.

CHAPTER 8 : ASSEMBLY DESIGN

Assembly is also known as Typical section/detailing of the road. This chapter will demonstrate step-by-step approach to :

• Creating Assembly from various sub-assembly objects.

8.1 <u>Creating Assembly</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	Second S
3.	Goto Home tab > "Properties" icon.	Home In sert Home In sert A modate Nodfy Points Points Points Points Points Points Points Points Points Points Points Points Points Points Points Points Points
4.	Click the "black-cabinet" icon.	Color ByLayer Color ByLayer Color ByLayer Click here ByLayer Interness 0.000 3D Yisualization Material Material ByLayer Chick here ByLayer Click here ByLayer Distribution ByLayer Battrian ByLayer Distribution ByLayer
5.	Select "Anchor Right >" command. The "Properties" panel will be placed at the right-side of the screen. Just touch the "Properties" bar and it will auto-slide.	No selection No selection ByLayer Close O-FOOTPATH Alow Decking ByLayer Auto-hice Dy-ayer Auto-hice Dy-ayer ByLayer Auto-hice Dy-ayer ByLayer Auto-hice Dy-ayer ByLayer Auto-hice Dy-ayer ByLayer

6.	Goto Home tab > "Tool Palettes" icon.	Image: Second Data Image: Second Data Palettees Create Ground Data
7.	Click the "black-cabinet" icon.	Palette Palette Palette Click here Divided Highway Pimary Poad Full Section Secondary Road Full Section Secondary Road Full Section
8.	Select "Anchor Right >" command. The "Tool Palettes" panel will be placed at the right-side of the screen. Just touch the "Tool Palettes" bar and it will auto-slide.	Allow Decking ByLayer Allow Decking ByLayer Allow Decking ByLayer Allow Decking ByLayer Auto-hice Dy.ayer JU Yisualization Size
9.	Zoom to the "Place Assembly here" area. Note: You can place the assembly anywhere in the drawing.	To be a construction of the construction of th
10.	Home tab > Assembly > Create Assembly	Image: Survey Data Image: Survey Data Image: Survey

11.	Set the "Name" and "Assembly Type".	Vame: TYPICAL Description: Assembly Type: Assembly Style: Code set stye: Code set stye:
12.	Click anywhere in the provided box. Note: You can place the assembly anywhere in the drawing.	Place Assembly here
13.	Tool Palettes > Lanes tab > "LaneSuperelevationAOR".	Metric Lanes Subassemblies Metric Lanes Subassemblies LaneSuperelevation AOR Counself are Counself are Counself are Counself are LaneBrokenBack LaneFromTaperedM edian1 LaneFromTaperedM edian2 LaneInsideSuperLay
14.	In the Properties slider-panel, change the required parameters.	ADVANCED • Paralleters • Lane Slope •2.00% Lane Width 3.600 Version R2013 Creating the Autor 6D Supported Side Right Will(I) 3./50m Default Slope •2.50% Pave1 Depth 0.025m Pave2 Depth 0.025m Base Depth 0.100m Sub-base Death 0.300m Use Superivation Right Lane Outside Slope Silection Away from Crown Potential Sive Office Code Crown Use Sub-base Death 0.300m Use Sub-base Death 0.300m Use Sub-base Death 0.300m Use Sub-chase Death 0.300m Use Sub-chase Death 0.300m Use Sub-chase Death 0.300m Use Sub-chase Death 0.300m Default Sive Silect Hollit Code Crown

15.	Click the "Assembly" object and the first lane on the right-side will be generated.	-2.50%
16.	In the Properties slider-panel, change the required parameters as highlighted.	ADVANCED Parameters Lane Slope Anie Sf Free Supported Side Left Default Slope Cefault Slo
17.	Click the "Assembly" object and the opposite lane on the left- side will be generated	2.50% -2.50%
18.	Tool Palettes > Shoulders tab > "ShoulderExtendSubbase".	Metric Shoulders Subassemblies Subassemblies ShoulderExterdAl ShoulderExterdSub Ease ShoulderMultiSurfac e ShoulderMultiSurfac e ShoulderMultiSurfac e ShoulderMultiSurfac e

19.	In the Properties slider-panel, change the required parameters as highlighted.	Side Right Shoulcer Width 2.400m Use Superelevation Slope Right Octside Shoulder Shoulcer Slope Direction Anny free Score Default Shoulder Slope -6.00% Subbase Davlight Type Hald slope, adj ist width Davlight width 1.800m Subbase Dav Superelevation Outside slouder 0.000m Pavel Extension 0.000m Pavel Extension 0.000m Pavel Desth 0.025m Pavel Desth 0.005m
20.	Click at the RED circle on the right-side lane.	Click at the RED circle -2.50%
21.	The right-side shoulder will be generated.	-2.50% -0.00%
22.	Immediately, in the Properties slider-panel, change the required parameters as highlighted.	State Coperativation Axia of Pill Supported Side Left Shoulder Width 2.400m Use Superatovation Stops Left Outside Shoulder Shoulder Shoulder Shoulder Shoulder Shoulder Shoulder Shoulder Shoulder Shoul
23.	Click at the RED circle on the left-side lane.	Click the RED circle

24.	The left-side shoulder will be generated.	-5.0C% -2.50% -6.00%
25.	Tool Palettes > Trenches tab > "Ditch".	CharneParabolicBot bom Dtch 2 SideDitcn SideDitcn SideDitcn TrenchRipe1 TrenchRipe2 TrenchRipe3 Metric Trench Pines Metric Trench Pines
26.	Immediately, in the Properties slider-panel, change the required parameters as highlighted.	ADVANTED Parameters Version R20.3 Side Right: Induce Ditch Cut Ditch Witch 1.000m Ditch Jopth 1.000m ForeStope Slope 11:1.00 Forescope Buffer Width 1.000m Parameters 11:1.00 Backsope Slope 11:1.00 Backsope Buffer Vidth 1.000m Parameters 11:0.00 Backsope Buffer Slope 11:0.00 Material : Thickness 0.3mm Material : Name Rip Rap
27.	Click at the ORANGE circle on the right-side shoulder.	Click this circle
28.	The right-side ditch will be generated.	-250% -6.30%

29.	Immediately, in the Properties slider-panel, change the required parameters as highlighted.	ADVANCED Parameters Parameters Side Left Include Dtch Out Ditch Width 1.000m Porestipe Suffer Width Forestipe Suffer Width 1.000m Forestipe Suffer Width Packispe Suffer Width 1.000m Proveslupe Buffer Slope 1:1.00 Backslope Suffer Width Place Lined Materia None Slope imt 1 11.00 Material 1 Thickness 0.300m
30.	Click at the ORANGE circle on the left-side shoulder.	Click this circle
31.	The left-side ditch will be generated.	-6.00% -2.50% -2.53% -6.70%
32.	Tool Palettes > Daylight tab > "DaylightBench".	Wetric Daylight Subassemblies Daylight:Basin Daylight:Basin2 Daylight:Basin2
33.	Immediately, in the Properties slider-panel, change the required parameters as highlighted.	ADVANCED ADVANCED Parameters ADVANCED Variano D20.42 Side Kght Cut Slope 1 1.50 Max Cut Height 5 000m Fill Slope 1 2.00 Max Ril Height 5 000m Bench Width 1 500m Dench Slope 2 00% Rounding Option Nane Rounding Parameter 0 500m Planet Inerd Material None Slope Limit: 1 1.00

34.	Click at the GREY circle on the right-side ditch.	Click this circle
35.	The right-side daylight will be generated.	
36.	Immediately, in the Properties slider-panel, change the required parameters as highlighted.	ADVAYED * Parameters * Side Left Cut Slope 1 1.50 Max Cut Height 5 000m Fill Slope 1 2.00 Max Fill Height 5 000m Bench Width 1 500m Bench Width 1 500m Rounding Parameter 0 500m Rounding Parameter 0 500m Rounding Tesselation 6 Place Lined Material None Slope Lim: 1 1 1.00
37.	Click at the GREY circle on the left-side ditch	Click this circle
38.	The left-side daylight will be generated.	
39.	Hit ESCAPE keyboard to end the command.	
40.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
41.	Close the drawing.	Do not save.

CHAPTER 9 : CORRIDOR DESIGN

Corridor will combine alignment, proposed profile and assembly to generate 3D road model. This chapter will demonstrate step-by-step approach to :

• Creating Corridor from alignment, proposed profile and typical assembly.

9.1 <u>Creating Corridor</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Foolspace File Foints • Surfaces • Browse to filename "13 Proposed Highway 2013_Corridor.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	V2A - Not Installed VA - Not Installed I his drawing contains content created with Microsofty Yesual Back(0) for Application asferrare (V6A), Walk do you want to do? We have braces assold and the ACROUVUR, 71, 724 hold dotter convolution We have braces assold and ACROUVUR, 71, 724 hold dotter convolution We have braces assold and ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 71, 724 hold dotter convolution Microsoft VIA content to ACROUVUR, 724, 724 Microsoft VIA content to ACROUVUR, 724,
3.	Goto Home tab > Corridor	Home Inser: Annotata Modify Analyze View Manage Output Home Inser: Annotata Modify Analyze View Manage Output Import Import Survey Data Import Parcel - Analyze Analyze View Manage Output Import Import Survey Data Import Parcel - Analyze Analyze Import Import </td

4.	Undata the highlighted	N Create Corridor
	parameters	Name: 1
	parameters.	PROPOSED
		Description:
		Corrider style:
		🕅 MALAYSIA Corridor Style 💌 🔯 🔽 🔯
		Corridor layer:
		C-ROAD-CORR
		Alignment: 2
		T> PFOFOSED
		Frofile: 3
		PROPOSED
		Assembly 4
		A TYPICAL
		×
		Target Surface: 5
		Set baseline and region parameters
		OK Cancel Help
	Varify the perspectare > OK	Minseline and Region Privatetes - PKIBITA D
5.	verify the parameters > OK .	AcdDese ine Set al Frequences Set al Tanges
		Name Gigment Profile Assembly LiterLiteron Linc Station Trequency arget Unerrices
<u> </u>	Colort the "Dobyild the counidor"	Corridor Properties - Rebuild
6.	Select the "Rebuild the corridor"	Corridor Properties - Rebuild
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X The corridor definition has been modified and needs to be rebuilt. What do you want to do?
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X The corridor definition has been modified and needs to be rebuilt. What do you want to do?
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: A state of the corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: A state of the corridor of the corridor of the corridor will be rebuilt to apply the modifications.
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: A second constraints Image: A second constraints
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: Second control of the corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor modifications. Image: Mark the corridor as out-of-date modifications will not reflect them until a rebuild is done at a later time.
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: Second constraints The corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor definition has been modifications. Rebuild the corridor will be rebuilt to apply the modifications. Image: Mark the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them until a rebuild is done at a later time. Image: Repuire the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them until a rebuild is done at a later time.
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Corridor definition has been modified and needs to be rebuilt. What do you want to d
6.	Select the "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: Second control of the corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor many the corridor multiple rebuilt to apply the modifications. Image: Mark the corridor as out-of-date many the modification will not reflect them unit a rebuild is done at a later time. Image: Always perform my current choice
6.7.	Select the "Rebuild the corridor" command. Note:	Corridor Properties - Rebuild X Image: Second corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor The corridor Will be rebuilt to apply the modifications. Image: Mark the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them unit a rebuild is done at a later time. Image: Always perform my current choice Cancel
6.7.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient	Corridor Properties - Rebuild X Image: The corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor Image: Rebuild the corridor The corridor will be rebuilt to apply the modifications. Mark the corridor as out-of-date The modificators will be saved, but the corridor will not reflect them until a rebuild is done at a lefter time. Cancel Always perform my current choice Cancel ease check that the corridor is NOT generated beyond the OGL surface. OGL surface to generate the slopes/daylight along the corridor. To
6. 7.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need	Corridor Properties - Rebuild X The corridor definition has been modified and needs to be rebuilt. What do you want Rebuild the corridor The corridor will be rebuilt to apply the modifications. Mark the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them unit a rebuild is done at a letter time. Cancel ease check that the corridor is NOT generated beyond the OGL surface. to OGL surface to generate the slopes/daylight along the corridor. To to:
6.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need • Enlarge the OGL surface by ad	Corridor Properties - Rebuild X Image: The corridor definition has been modified and needs to be rebuilt. What do you want to do? Image: Rebuild the corridor The corridor The corridor will be rebuilt to apply the modifications. Image: Mark the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them until a rebuild is done at a later time. Image: Always perform my current choice Cancel ease check that the corridor is NOT generated beyond the OGL surface. to OGL surface to generate the slopes/daylight along the corridor. To to: Iding more survey data (RECOMMENDED), or
6.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need Enlarge the OGL surface by ad Adjust the alignment.	Corridor Properties - Rebuild X Image: The corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor Image: Rebuild the corridor The corridor will be rebuilt to apply the modifications. Mark the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them until a rebuild is done at a latter time. Cancel Cancel Cancel ease check that the corridor is NOT generated beyond the OGL surface. to OGL surface to generate the slopes/daylight along the corridor. To to: Iding more survey data (RECOMMENDED), or
6. 7.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need Enlarge the OGL surface by ad Adjust the alignment.	Corridor Properties - Rebuild X Image: The corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor Image: Rebuild the corridor The corridor will be rebuilt to apply the modifications. Image: Rebuild the corridor as out-of-date Image: Rebuild the corridor will be saved, but the corridor will not reflect them unit a rebuild is done of a lefter time. Image: Cancel Image: Rebuild the corridor is NOT generated beyond the OGL surface. Cancel Ease check that the corridor is NOT generated beyond the OGL surface. To OGL surface to generate the slopes/daylight along the corridor. To to: Iding more survey data (RECOMMENDED), or The corridor will a construct the corridor.
6.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need Enlarge the OGL surface by ad Adjust the alignment. <u>If the alignment is adjusted</u> , pleas	Corridor Properties - Rebuild The corridor definition has been modified and needs to be rebuilt. What do you want Rebuild the corridor The corridor will be rebuilt to apply the modifications. Mark the corridor as out-of-date The modificators will be saved, but the corridor will not reflect them until a rebuild is done at a lefer time. Always perform my nument choice cancel ease check that the corridor is NOT generated beyond the OGL surface. to OGL surface to generate the slopes/daylight along the corridor. To to: Iding more survey data (RECOMMENDED), or e ensure to re-design/update the followings:
6.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need Enlarge the OGL surface by ad Adjust the alignment. <u>If the alignment is adjusted</u> , pleas Superelevation	Corridor Properties - Rebuild X Image: The corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor Image: Rebuild the corridor The corridor will be rebuilt to apply the modifications. Mark the corridor as out-of-date The modificators will be saved, but the corridor will not reflect them until a rebuild is done at a later time. Cancel ease check that the corridor is NOT generated beyond the OGL surface. Cancel to OGL surface to generate the slopes/daylight along the corridor. To to: Image: Concel Iding more survey data (RECOMMENDED), or eensure to re-design/update the followings:
6.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need Enlarge the OGL surface by ad Adjust the alignment. <u>If the alignment is adjusted</u> , pleas Superelevation Proposed profile	Corridor Properties - Rebuild X Image: The corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor Image: Rebuild the corridor The corridor will be rebuilt to apply the modifications. Image: Rebuild the corridor as out-of-date Image: Rebuild the corridor as out-of-date Image: Rebuild the corridor will not reflect them unit a rebuild is done of a lefter time. Image: Rebuild the corridor is NOT generated beyond the OGL surface. CoCl. surface to generate the slopes/daylight along the corridor. To to: Iding more survey data (RECOMMENDED), or e ensure to re-design/update the followings:
6.	Select the "Rebuild the corridor" command. Note: If you received warning report, ple The warning is due to insufficient solve this problem, you may need Enlarge the OGL surface by ad Adjust the alignment. <u>If the alignment is adjusted</u> , pleas Superelevation Proposed profile Corridor Parameters (in Corridor	Cerridor Properties - Rebuild The corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor The corridor will be rebuilt to apply the modifications. Mark the corridor as out-of-date The modifications will be saved, but the corridor will not reflect them unit a rebuild is done of a letter time. Cencel ease check that the corridor is NOT generated beyond the OGL surface. to OGL surface to generate the slopes/daylight along the corridor. To to: Hding more survey data (RECOMMENDED), or e ensure to re-design/update the followings: dor Properties command).

8.	The complete corridor is generated.	
9.	Prospector tab > Corridors > RC "PROPOSED" > Properties	Innispace Active Drawing View I 3Proposed Highway 20. Points Point Groups Point Clouds Point Clouds Point Stress Point Point Stress Properties Properties Properties Properties Point Stress Properties
10.	Surfaces tab > Create a corridor surface	Curridur Properties - PROPOSED If in telin Parameters (Cirles Pedirection Strates But obtains Stope Pathems) Add_add Add_add Data type: Specify code Kan e Surfa_s Byle Rander Maker al Sudd as Breedine Overlang Cur. Descript on
11.	Change the "Overhang Correction" to "Bottom Links".	Information Parameters Codes Feature Lines Surfaces Boundarias Sbpe Patterns Adc data Data type: Specify code: Top Top Image: Surface Surface Style Render Mate Add as Break. Overhang Correction Desc Name Surface Style Render Mate Add as Break. Overhang Correction Desc Image: Surface Style Render Mate Add as Break. Overhang Correction Desc
12.	 Specify code = Datum. Hit the PLUS symbol icon. 	Information Parameters Codes Feature Lines Surfaces Support Su
13.	The "Datum" links code will be placed under PROPOSED – (1) corridor surface data.	Add da:a Jala type: Spec fy code: Link: Datum Name Surface Style Render Mate Add as Dreak Overnang Correction Des PROPOSED - (1) _No Jisplay ByLayer Botton Links

14.	Goto "Boundaries" tab. Right-click "PROPOSED – (1)" > Corridor extents as outer boundary".	Information Parameters Codes Feature Lines Surfaces Boundaries Stype Patterns Name Description Render Material Definitions Information Parameters Codes Feature Lines Surfaces Boundaries Slope Pattern Information Parameters Codes Feature Lines Surfaces Boundaries Slope Pattern Name Description Render Material Definitions Corridor extents as outer boundary Add Automatically Add Interactively
16.	The corridor surface boundary is generated.	Information Parameters Coules Feature Lines Suifaces Econidaries Supe Patterns Name Description Render Meterial Definitions Jse Type Image: State of the
17.	Goto "Slope Patterns" tab > Add slope pattern	Corridor Properties - PROPOSED Information Parameters Codes Feature Lines Surfaces Boundarie Sope Patterns Add slope pattern >> 2 Index Feature Line1 Feature Line2 Slope Pattern Stye Baseline Statio
18.	Click at the YELLOW ditch line.	1972 1972 19.90 19.90 22.91 22.91 23.95 Click the VELLOW dited line 24.85 5.31 20.0
19.	Click at the PEACH-colour berm line.	14.7 15.224 19.4 19.4 19.30 16.46 19.30 18.80 27.91 16.46 19.30 18.80 18.80 18.80 18.80 18.80 15.55 15.55 20.19 15.55 15.

20.	 The first Index will be generated. Click OK. 	Note: You may need to adjust the "Station Start" and "Station End" column values for all other Indexes depending on the location of cut and fill areas along the corridor.
21.	Select "Rebuild the corridor" command.	Corridor Properties - Rebuild X Image: Corridor definition has been modified and needs to be rebuilt. What do you want to do? Rebuild the corridor The corridor The corridor will be rebuilt to apply the modifications. Image: Mark the corridor as out-of-date the modifications will be saved, but the corridor will not reflect them until a rebuild is done at a later time.
22.	The "tadpoles" slope pattern is generated along the benching.	14.05 15.24 15.25 16.15 16
23.	Finally, verify the corridor surface [ie. PROPOSED – (1)] has been generated as highlighted.	Toolspace Image: Constraining View Active Drawing View Image: Constraining View
24.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
25.	Close the drawing.	Do not save.

CHAPTER 10 : SAMPLE LINES

Sample Lines is used to generate volume calculation (based on Average End Area method) as well as preparation for Cross-Section drawings. This chapter will demonstrate step-by-step approach to :

• Creating Sample Lines along the proposed corridor.

10.1 Creating Sample Lines

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Toolspace Points • Surfaces • Browse to filename "14 Proposed Highway 2013_Sample Lines.dwg"
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	Y3A - Not Links alled x Interding contains content coasted with Microsofts Yisual Eacking for Application software (very, White do you want to do? Y84 - Not Engine stability with ALCCO UV VI2, Y valshould when convert the Y84 bits Engine stability of the ALCCO VI2, Y12, Y valshould when convert the reduces. Image: Convert Y1A content to ANT This is applicable only so the content subject with earlier version of Autocal Cole 30 Deembad the YBA Modules Image: Convert Y1A hered content with the convent content All Y1A hered content with the content of the instante.
3.	Goto Home tab > Sample Lines Hit ENTER keyboard.	Pure finet A modes Mulfy Analyse Yes, Marege Colput. Survey Help Express Tools Pro Pure finet A modes Mulfy Analyse Yes, Marege Colput. Survey Help Express Tools Pro Pure finet Pront Survey Data Toolspace To
5.	 Select the desired alignment. Hit "OK". 	Select Alignment X Name Description PROPOSED <description> OK Cancel</description>

6.	 Change the "Style" column values as highlighted. Hit "OK". 	Nanc: Sample line sky e: St. Collector - <[Next: Counter(CP)]> Image: Collector - <[Next: Counter(CP)]> Desermine: Sample line lane lane lane lane lane lane lane la
7.	Click the drop-down icon and run "By range of stations…" command.	Sample Line Tools Image: Station Vclue]> Image:
8.	 For LEFT Swath Width, Click the "50.000m" value. Click the GREEN-colour cube. Note: Pay attention on the direction of the alignment. The LEFT and RIGHT swath width is depending on the direction of alignment. 	Property Value General PROPOSED Station Range PROPOSED Station Range Promally ment stat From ally ment stat True State statoor U UUUm To alignment end True Eleft Swath Width False Alignmen: PROPOSED Width Station PROPOSED False Alignmen: PROPOSED Width Station Sonp to an elignment False Alignmen: PROPOSED Width Station Sonp to an elignment False Alignmen: PROPOSED Width Station Sampling Increments Sullum
9.	Turn OFF OSNAP setting.	Command: _AeccCreateSampleLines Select an alignment <or enter="" fro<br="" key="" press="" select="" to="">Specify station along alignment: -<u>3</u>* - CREATESAMPLELING Specify distance: SNAP GRID ORTHO POLAR OSNAP ODOSNAP OTRACK DUCS DYN</or>
10.	Zoom at the WIDEST corridor area.	2,01 14,17 4,00

11.	Click near the alignment.	2,98 11,20 15,224 16,43 13,60 21,99 20 21,99 22,99 24,07	14.70 14.70 14.77 14	
12.	Click near the daylight area.	3.98 11.52 10 15.48 18,80 21.87 21.87 21.87 21.87	1430 1430 1430 1430 1443 14,77 2,91 14,77 2,91 4,33 14,77 2,91 4,33 14,77 2,91 4,3 14,77 2,91 4,3 14,77 2,91 4,3 1,42 14,77 2,91 4,3 10,42 10,4	
12	Round up the Width value For	Create Sample Lines - By Station I	Range	
13.	this case, the rounded value is	Property	Value	
	this case, the rounded value is	General		
	"30".	Alignment	PROPOSED	
		E Station Range	True	
		Start Station	0.000m	
		Tc alignment end	True	
		Erd Station	1227.286m	
		E Left Swath Width		
		Shap to an alignment		
		Wdth	30 10	
		🖃 Right Swath Width		
14	Repeat steps " 8 " to " 13 " for	End Station	1227.286m	
±.4.		Space of an alignment	Falce	
	KIGHT Swath width value.	Alignment	PRCPOSEC	
		Width	30.000m	
		E Right Swath Width		
		Spanitic an alignment	Faise	
		Width	53	
		Sompling Increments		
		Use Sampling Increments	True	
		Increment Along Langerts	25.000m	
		Increment Along Curves	25.000m	
		Increment Along Spirals	25.00UM	

15.	 Change the Sampling Increments value to desired intervals. Note : This value will be used for volume calculation (based on Average End Area Method) and generating cross-section detailing. Hit "OK". Place the mouse cursor in the drawing area. Hit ENTER keyboard. The Sample Lines is generated. 	Left Swath Width Snap to an alignment Alignment Width Right Swath Width Snap to an alignment Width Snap to an alignment Width Snap to an alignment Width Sampling Increments Use Sampling Increments Ircrement Along Curves Ircrement Along Spirals Additional Sample Controls At Range Start At Range Start At Range End At Horizontal Genmetry Points At Superelevation Critical Stations CK Cancel	Fake PROPOSED 30 000m Folds PROPOSED 50 000m 25 000m 25 000m 25 000m 1 True Fake Fake Fake Fake		
17.	Close all windows, Zoom Extents	"ZE" & "REA".		~~~~	
	and regenerate the drawing.				
18.	Close the drawing.	Do not save.			

CHAPTER 11 : VOLUME CALCULATION

This chapter will demonstrate step-by-step approach to Generate Volume Calculation based on:

- Cross-section Method (a.k.a. Average End Area Method).
- TIN Volume Surface Method.

11.1 Cross-Section Method

No.	Descriptions	Commands/Remarks	
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Toolspace Points • Surfaces • Browse to filename "15 Proposed Highway 2013_Volume.dwg"	
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VSA = Not Lists alled It is drawing contains content created with Microsofty Visual Elancia for Application software (VBA), What do you want to do? VSB is no longen assault with ALCLOD VIST 37, You should there convert the VSD based observations, page and structure rules to JET or convolad the VEX modules. Image: Convert VIIA content to JNT This is applicable only so this content subject with earlier versions of Auto-All Contents. Image: Description of the VBA Modules Image: Convert VIIA content to UNE subject with earlier versions of All TA hered orderer with the current command All TA hered orderer with the subsects.	
3.	Goto Analyze tab > Compute Materials.	AutoCAD Civil 3D 2013 1S Proprie ad Healinway 2013_Volumeadwo Tope a Augment of phrase Massive Yeange Cutput Sale Massive Yeange Massive Massive Massive Yeange Massive Massive Massive Yeange Massive Massive Massive Yeange Massive Massive Massive Yeange Yeange Yeange Massive Yeange Yeange Yeange Massive Yeange Yeange Yeange Massive Yeange Yeange Yeange Massive Yeange Yeange Yeange	
4.	 Select the desired Alignment and Sample Line Group. Hit "OK". 	Select a Sample Line Group Select alignment: Select sample line group: Select sample line group: Select sample line group: CK Cancel Help	
5	Change the Object Name	🖉 Compute Materials - SL Collection - 1 🔀	
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5.	values as per highlighted	Quantity tokooff criteria Volume can ilening method:	
	values as per highlighted.	💀 Lul and hil 🗾 📑 🗸 Average End Area	
	• Hit "OK"	Curve conoction tolerance 1.0000 (d) Map objects with same name	
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		Contidor Shapes 1	
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		Carcel Hep	
6.	Goto Analyze tab > Volume	FxpressTank Plug-ins 🛤 🗸	
	Report.	L Kolume Report 💀 Compute Materials	
		Volumes Dashboard Grading Volume Total Volume Table	
		Tools 🔠 Materia Volume Table	
		Voumes and Materials	
7	lust hit "OV"	A Report Quantities	
7.	Just Int. OK .	Select alignment:	
		Select sample ine group:	
		[] SL Colection - 1	
		Select material list:	
		Material List - (1)	
		Select a style sheet:	
		C:\ProgramData\AutodesK/C3D 2213\enu	
		Cisplay KML report	
		OK Cancel Help	
8.	Hit "Yes".	Internet Explorer	
		CO Scripts are usually safe. Do you want to allow scripts to	
		run?	
		Yes No	

9.	The Volume Report will be generated in Internet Explorer application. You may need to copy-paste into Microsoft Word or Excel to	Volume Keport Project: C:\Users\uoor.azhar.PDSSB\Desktop\C3D - Customised Training\15 Proposed Highway 2013_Volume.dwg Algamment. PROPOSED Sample Line Group: SL Collection - 1 Start Sta: 0+000.000 End Star 11227.286									
	produce proper volume report format.	Station	<u>Cut</u> Area (Sq.m.)	<u>Cut</u> Volume (<u>Cu.m.</u>)	<u>Reusable</u> Volume (Cu.m.)	<u>[ill</u> Arca (<u>Sq.m.)</u>	<u>Fill</u> Volume <u>(Cu.m.)</u>	<u>Cum.</u> Cut Vol. <u>(Cu.m.)</u>	<u>Cum.</u> Reusable <u>Vol.</u> (Cu.m.)	<u>Cum.</u> Fill Vol. <u>(Cu.m.)</u>	<u>Cum.</u> Net Vol. <u>(Cu.m.)</u>
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		0+050.000	0.00	0.00	0.00	185.47	4012.68	265.17	266.17	5706.99	- 5440.81
		0+075.000	0.00	0.02	0.02	167.13	1407.51	265.19	266.19	10111.50	-0818.30
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		0+125.000	0.00	0.00	0.00	108.98	3284.69	265.21	266.21	1/410.74	17144.52

11.2 <u>TIN Volume Surface Method</u>

No.	Descriptions	Commands/Remarks
1.	Goto Analyze tab > Volumes Dashboard	Image: Superson of the second seco
2.	Run the "Create new volume surface" command.	Image: Second
3.	 Change the values as highlighted. Hit "OK". 	Image: Surface

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CHAPTER 12 : CROSS-SECTION DETAILING

This chapter will demonstrate step-by-step approach to :

• Auto-generate cross-section detailing at certain intervals.

12.1 <u>Creating Multiple Cross-Sections</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing or continue from previous drawing.	Home Insert Annotate Modify Fore Points • • • • • • • • • • • • • • • • • • •
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VIA - Not installed I have drawing contains content created with Microsoftly Visual Blancib for Application software (VIA), What do you want to do VIA - Not installed VIA - Not installed VIA - Not installed VIA - Not installed Development Development
3.	Goto Home tab > Section Views > Goto Home tab > Section Views > Goto Home Insert Annotate Modify Arr For Palettes + Create Ground Data + Toolspace	Create Multiple Views I6 Proposed Highway 2013_Cross Section.dwg nalyze View Manage Output Survey Help Image arcel • Intersections • Intersections • Image Profile View • Image
4.	Click "Next".	Schoold Face: Algoment Scarple line group were: Schoold Image: Algoment Starple line group were: Schoold Image: Algoment Starple line group were: Starple line group were: Image: Algoment Image: Algoment Officel Same Image: Algoment Image: Algoment Officel Same Image: Algoment Image: Algoment Starple line group were: Image: Algoment Image: Algoment Section Name



8.	Ensure the section names and styles as displayed. Click "Next".	Energid Section Piscenerk Officient Section View Tables Drank di m R-must Section Display Options Section Display Options Drank di m R-must Section Display Options Section Display Options Drank di m R-must Section Display Options Section Display Options Drank di m R-must Section Display Options Display Options Option di menunt Section Display Options
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9.	Ensure the "Surface1" and "Surface2" columns as displayed. Click "Next". Note: If you do not see "PROPOSED" data, please delete the sample lines and re-create sample lines again.	Microsite Multiple Section Views - Data Bands Grunda Sector Marken wa. Glisel Bance Becalan Banas Sector Name Decalan Banas Sector Name Decalan Banas Sector Name Decalan Banas Sector Name Decalan Banas Sector Name
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	Goto "Section Views" tab >	Section View Group Properties - Section View	4 Group - 1
	under "Change Band Set"	Section Views	
	column, click the ellipse button.	Sample line group name:	Alignment name:
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CHAPTER 13 : PLAN PRODUCTION

This chapter will demonstrate step-by-step approach to :

• Create construction plans.

13.1 Creating Multiple View Frames and Sheets

No.	Descriptions	Commands/Remarks				
1.	Open the drawing.	Home Insert Annotate Modify Toolspace Points - C Browse to filename "18 Proposed Highway 2013_Plotting.dwg"				
2.	Ignore "VBA – Not Installed"	VEA - Not installed				
	message. Select "Continue with the current command".	for Application software (VBA), what do you want to do? VBA to kince mission with AppCoV purils2, "you should other convert the VBA to add observatives, poins and instructing values to Add to convert the VBA to add observatives, poins and instructing values to Add to convert the VBA to add observatives, poins and instructing values to Add to add the VBA.				
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		Devenless the VBA Modules				
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3.	Goto Output tab > Create View Fran	nes				
	Image: Create View Create Create Frames Create Create Create Plot Image: Create Create Create Plot Image: Create Create Creat					
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5.	Cick the ellipsis button.	Akrment Choose the sheet type and make settings for the view itames. To use a templete, the DW ⁻ file must convergence specified using Extended Data Properties, according to your deviced abact type. Sheets Choose the sheet type and make settings for the view itames. To use a templete, the DW ⁻ file must convergence according to your deviced abact type. Week France Group Choose the sheet type you want to generate: Match Lines © Plan and Finfle Profile Views © Plan and Finfle Profile Views © Plufte univ Template for Flan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile over Flan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for the template to the plan and Profile I to UTI for
6.	Click the "ellipsis" button, again.	Select Layout as Sheet Template ? × Drawing template file name: [C:(Users(noor.azbar.PDSSB)Desktop)C3D - Customised Training)Civil 3D (Metric) Plan and Profile Select a layout to create new sheets [Den and Profile 1 to 500] Plan and Profile 1 to 500 [DK] OK Cancel
7.	Browse to the "\C3D Essentials 20xx \ 03 INTENSIVE COURSEWARE \ ROAD WATER WASTEWATER" folder, and select the "Civil 3D 20xx JKR Plan and Profile.dwt" template. Then, hit the "Open" button.	Select Layout as Sheet Template
8.	Ensure to select "Plan and Profile 1 to 1000" setting. Then, hit "OK".	Select Layout as Sheet Template ? × Drawing template file name: C:\Users\noor.azhar.PD55B\Desktop\C3D Essentials 2013\Customised Training Dataset\HIGHW Select a layout to create new sheets Plan and Profile 1 to 500 Plan and Profile 1 to 500 OK Cancel
9.	Click "Next".	PC Create View Prames - Sheets Alarrent Cheats Cheats View Prame Group Sheet Set is a seried of the set is up for the view for and the baset are in up in the view for and the baset are in up in the view for and the baset are in up in the view for and the baset are in up in the view for and the baset are in the baset are in up in the view for and the baset are in up in the view for and the baset is the set of the baset. Prove State Prove State Prove

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11.	 Set the "Allow additional distance for repositioning" to 3.000m Left label location = Middle Right label location = Middle Hit "Next" button. 	Create View Frames Match Lines Charts Charts Miss Frame Frame Miss Frame Frame Miss I time Frofte Views CANNO-WT Eylo Sign ctal CANNO-WT Eylo Sign ctal control contro control control contro contro contro contr	c: o next maloh ines submets silv and deme how they are placed hiffree to value sown to the nearest 3000m 1 N-net
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23.	Click "Create Sheets".	All Create Sheets - Profile Views Work France Group and Layouts Sheet Sch Profile Views outlings Profile Views out to be used! Bandle Markets Date Partice Views with the two stude: Bandle Views out to be used! Her MALLYTEK Profile Band Set Dher profile View out one: C All on the steings if numericaling in the views Mign Views: C Algor stells and plan view steed Mign Views: C Algor stells and plan view steed
		< Badk Glent > Create Sheets Cancel
24.	Hit "OK".	AutoCAD Civil 3D 2013
25.	The command line will prompt, "Select profile view origin:".	Command: Command: Command: Command: Command: _Accecr cuteSheets Command: _Accecr cuteS
26.	Just select anywhere in the model space (find an empty spot).	
27.	Two floating windows will appear. Just close the Event Viewer report.	X Autor Marco Image: Section of the sect
28.	Near the command line, there will be a row of Sheet sets. Click any of the tab to reveal the Plan and Profile layout ready to be plotted.	Kodel (Layout) (Sheet (1) (Sheet (2) (Sheet (3) / Model (Layout) (Sheet (1) (Sheet (2) (Sheet (3) / Automatic save to C:\Users\noor.azhar.PDSSB\appdata\local\temp\1 Command: S - Type a command NFER SNAP GRID ORTHO POLAR OSNAP 3DOSNAP OTRACK DUCS DYN LWT TPY (



CHAPTER 14 : PRINT-OUT REPORTS

This chapter will demonstrate step-by-step approach to :

• Prepare print-out reports for proposed alignment and profile.

14.1 <u>Generating Built-in Technical Report</u>

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Home Insert Annotate Modify Points * Coolspace Points * Coolspace Surfaces * Coolspace Coolspace * Co
2.	Ignore "VBA – Not Installed" message. Select "Continue with the current command".	VAX-Not installed VAX-Not installed I his drawing contains content created with Microsofty You Black (% VaX-is no knop: install of VitA Act (40 un) (32; 72 ushould other convert the VaX-is no knop: install of VitA Act (40 un) (32; 72 ushould other convert the vaX-is not black (%) Convert VIA modernit in AFT Prist application only to the content striped with earlier versions of Download the VIAA Modules Download the VIAA Modules Lontinue with the correct command All VIA benef content with be unrectle.
3.	Activate the "Toolbox" tab.	Tudspace Image: State Sta
4.	Right-click "Alignment_Curve" > "Execute"	Ionispare Image: Second Logal Decimant Image: Alignment Curve

5.	Hit "OK".	Kport to XMI Report
		The sty objects to be supported Image: Sty objects to be supported to
6		
0.	 Assign a name for the report. Hit "Save" 	File name: Alignment_Curve.html
		Files of type: HTML files (*.html)
7.	The default web browser will	Your Company Name
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	report.	City, State 01234
		Alignment Carre Report Client Chest
		Project Name: CrUber inson anhar FDSSB Deilarp (200 - Cuntenised Project 1 am 2019 Property Software Policy, 2013 Second readory, Beaconfision
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		− Suàn Cuus Dan Cuus
0	Pight click "DVI Station and Curre	
о.	Report" > "Execute"	En Incremental Station Elevation Differenc
	•	Incremental Stationing Report
		-E PVI_Station
		Execute Execute
		€ Surface Refresh
		E I Breakline

9.	 Select the alignment. Hit the "Create Report" button. 	Freate Reports - PVI Station and Furve Report The PVI station and curve report The PVI station and curve report lists the station, elevation and grade out for each PVI in a revisiting ground profile and smilarly for each PVI in a finished ground profile as well as detailed linish ground vertica curve information. List of profiles Include Name Description Station Static Static End Alignine PHUPUSED U+UUU.UUU 1+227:285 PRUPU Include Name Description Station Stat Station Shat station: Save report to: 1-227:286 Create Repor: Done Ilep
10.	The default web browser will present the Alignment Curve report.	Profile PVI Station & Curve Report Clent: Drpard by: Clent Company Year Company Name Addres 1 123 Man Stated Date S402012 22:00 920 123 Man Stated Vertical Augment 7B020 SED 123 Man Stated Decement 129 Man Stated Station Grade Out (%) Vertical Curve Leavelh 129 Man Stated Vote Same 129 Man Stated Vertical Curve Leavelh 000 1 00 2000 1 129 Man 1129 Man Vertical Curve Information(ong corre) 1129 Man Vertical Curve Information(ong corre) 1120 Man Vertical Curve Information(ong corre) 714m PVI State 600.000 Dentate 4187m PVI State 701 23 Theoretion 4187m PVI State 720 00000000000000000000000000000000000
11.	You may proceed with other reports listed in the Toolbox tab.	I lookspace C S subcraption Parager Miscelenzous Löllies S subcraption Parager S subcrapt
12.	Close all windows, Zoom Extents and regenerate the drawing.	"ZE" & "REA".
13.	Close the drawing.	Do not save.

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CHAPTER 7 : GRAVITY PIPE NETWORKS

In this chapter, we will look at modelling only. Model what? Model the pipe network for gravity-based systems. This kind of system is suitable for underground stormwater and sanitary sewer/sewerage layout.

There are two components which define a complete gravity-based pipe network, i.e. Structures and Pipes.

Structures = manholes, catch basins, inlets, joints and outlets. You may create your own Structures by using the Part Builder tool in Civil 3D.

Pipes = any type of conduit such as culverts, gas lines, or utility cables. They can be straight or curved. They can be adapted for water reticulation system too.

First, we will look at the workflow needed to model effective gravitational pipe networks. They are:

- Part Rules.
- Part Lists.
- Creating an underground Storm Drainage/Sanitary Sewer Network.
- Creating a Pipe Network.
- Editing the Pipe Network layout.
- Creating an Alignment from Network Parts.
- Drawing Parts in Profile View.
- Adding Pipe Network Labels
- Running the Interference/Clash Check.

7.1 Part Rules and Part Lists

Every project will have local authority standard/requirements to control the limit/allowance of the proposed gravitational pipe design – things like minimum slope, sump depths, and pipe-invert drop across structure.

Depending on the type of network (stormwater or sewerage) and the complexity of the design, there are many different constraints on your design. Civil 3D allows you to establish structure and pipe rules that will assist in respecting these constraints during initial layout and edits.

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Home Insert Annotate Modify Notice Points - Toolspace Surfaces - Browse to filename " 31 Civil 3D Template_Rules_METRIC.dwg "
2.	Activate "Settings" tab > Structure > RC Structure Rule Set > New	Mass Haul View Catchment Drevente Styles Structure Styles Structure Rule Set Description The Pressure Network Description

3.	Name = Sanitary Structure Rules.	Structure Rule Set - New Structure Rules Information Rules Name: Sanitary Structure Rules Description:
4.	Goto "Rules" tab > Add Rule	Structure Rule Set - Sanitary Structure Information Rules Add Rule Delete Rule Parameter
5.	Rule name = Pipe Drop Across Structure. Click "OK".	Add Rule Category: Mac Storm Sewer C:1 Rule name: Mac Pipe Drop Across Structure Pip Rule parameters: Pip
6.	Set the limit as highlighted. These parameters establish a rule that will match your hypothetical municipality's standard (eg. Jabatan Perparitan & Pembetungan).	Parameter Value Pipe Drop Across Structure Invert Drop Reference Location Invert Drop Value 0.030m Maximum Drop Value 1.000m
7.	Goto "Rules" tab > Add Rule	Structure Rule Set - Sanitary Structure Information Rules Add Rule Delete Rule Parameter
8.	Rule name = Set Sump Depth. Click "OK".	Category: Storm Sewer Rule name: Set Sump Depth Rule parameters:
9.	Set the limit as highlighted. These parameters establish a rule that will match your hypothetical municipality's standard (eg. Jabatan Perparitan & Pembetungan). Click "OK".	Add Rule Delete Rule Parameter Value Image: Pipe Drop Across Structure Image: Pipe Drop Across Structure Image: Set Sump Depth 0.500m
10.	Activate "Settings" tab > Pipe > RC Pipe Rule Set > New	Mass Haul View Catchment Dip Rule Set New Pipe Rule Set New Refresh

11.	Let's name it as "200mm Sanitary Pipe Rule". Goto "Rules" tab > Add Rule	Information Rules Name: 200mm Sanitary Pipe Rule Description: Pipe Rule Set - 200mm Sanitar
		Information Rules Add Rule Delete Rule Parameter
13.	Select "Cover and Slope" > OK	Add Rule Category: Storm Sewer Rule name: Cover and Slope
14.	Set the limit as highlighted. These parameters establish a rule that will match your hypothetical municipality's standard (eg. Jabatan Perparitan & Pembetungan).	Parameter Value Cover and Slope
15.	Right-click the newly created rule set > Copy	Pipe Network Pipe Pipe Styles Pipe Rule Set Pipe Rule Se
16.	Rename as shown.	Pipe Rule Set - 200mm Sanitary Pipe Information Rules Name: 250mm Sanitary Pipe Rule Description:
17.	Update the values as shown > OK.	Parameter Value Image: Cover and Slope Image: Cover and Slope Image: Maximum Cover 3.000m Image: Maximum Slope 10.00% Image: Minimum Cover 1.500m Image: Minimum Slope 0.28%
18.	Repeat steps 15 to 17 to generate another pipe rule 300mm as shown. Click "OK" when done.	Parameter Value Cover and Slope

19.	You should now have 1 rule for Structure and 3 rules for pipe as shown.	Pipe Pipe Pipe Styles Pipe Rule Set Pipe Rule Set Pipe Rule Set Pipe Rule Set Pipe Rule Styles Pipe Rule Styles Pipe Rule Set Pipe Rule Rule Rule Rule Rule Rule Rule Rul
20.	The next step is to define the Part There is quite a bit of setup involve only once.	t Lists. The Part Lists should reside in the Civil 3D template (.DWT). ed, and having this information in your .DWT file will ensure you do it
21.	Settings tab > Pipe Network > RC Parts Lists > Create Parts List	Pipe Network Parts Lists St Create Parts List St Refresh Interference scyles Commands Pipe Structure
22.	Name it as shown.	Network Parts List - New Parts List Information Pipes Structures Summary Name: Example Country Sanitary Description:
23.	Pipes tab > RC New Parts List > Add part family The Part Catalog dialog will appear.	Network Parts List - Example Country Sanitary Information Pipes Structures Summary Name Style Add part family Copy value to clipboa Copy to clipboard
24.	Let's assign "PVC Pipe SI" material for our Sanitary Sewerage Network. Click "OK".	Part Catalog Circular Pipes Concrete Pipe SI Concrete Pipe SI PVC Pipe SI Corrugated Metal Pipe SI Corrugated HDPE Pipe SI HDPE Pipe SI
25.	RC "PVC Pipe SI" > Add part size".	Information Pipes Structures Summary Name Style Rules Example Country Sanitary PVC Pipe SI Country Sanitary Add part size Delete

26.	Update the highlighted values > OK.	Part Size Creator Property Value Units
	For "Material", you may type in your own material name. But the engineering properties is not available in Civil 3D. E.g. "Fibre- glass"; no engineering properties of fibre-glass is available in calculations later.	Wall Thickness 7.000000 mm Inner Pipe Diameter 200.000000 mm Cross Sectional Shape SweptShape_Circular Minimum Curve Radius 0.000000 inch Manning Coefficient 0.000000 inch Hazen Williams Coeffic 0.000000 Inch Material PVC: Inch
27.	Repeat Steps 25 and 26 to generate for 250mm and 300mm pipes as shown.	Name Sty Image: Contry Sanitary Image: Contry Sanitary
28.	Click the "disk" icon in the Style column.	Name Style Rules Example Country Sanitary PVC Pipe SI Rules 200 mm PVC Pipe Double Line (St The Basic 250 mm PVC Pipe Double Line (St The Basic 300 mm PVC Pipe Double Line (St The Basic
29.	Let's assign "Single Line (Sanitary)" style. Click "OK".	Pipe Style X Single Line (Sanitary) Image: Comparison of the pipe style OK Cancel
30.	Now, all three diameters will use the same style in the drawing later.	Name Style Rules Example Country Sanitary PVC Pipe SI 200 mm PVC Pipe Single Line (Sanitary) 250 mm PVC Pipe Single Line (Sanitary) 300 mm PVC Pipe Single Line (Sanitary)
31.	Assign each diameter following their respective Rules as shown.	Name Style Rules Re Example Country Sanitary PVC Pipe SI Image: Country Sanitary Image: Country S
32.	Activate the "Structures" tab. Note: Null structures are needed when two pipes are joined together without a structure.	Network Parts List Example Country Sanitary Information Pipes Structures Name Style Rules Image: Structure Rules Image: Rules Rules

33.	Change the style to "Null".	Information Pipes Struc	tures Summary	
		Name	Stule	Buler
		New Parts List	Julie	Ruies
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		🛄 🎧 Null Stru	ucture Null	💼 Besic
34	RC "New Parts Lists" > Add part	Information Pipes Struct	ures Summary I	
0	family			- Weiner
		Name	Style	Rules
		Rew Parts List	Add part famil	ly
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25	Latio accimentation		ctangular Winged Headwa	sil cr
35.	Let s assign the sewerage	E B Junction Structures	with Frames	1
	mannoles as shown.	Concentric C	vlindrical Structure Rectar	ngular Frame SI
	Click "OK".	Concentric C	ylindrical Structure SI	
			ructure Slab Top Circular r	ular Frame SI
		Eccentric Cy	indrical Structure Rectang	jular Frame SI
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36.	RC "Concentric Cylindrical	Name		Style
	Structure SI" > Add part size	Example Country S	ianitary	
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		Concentric Cyli	ndrical Structure SI	Add part size
		Cylindrical Stru	cture Siab Top Circular F	Delete
27	Verify the values $> OK$	Part Size Creator		
57.	verify the values > OK.	i are size creator		
57.	verify the values > 0k.	Property	Value	Units
57.		Property Wall Thickness	Value 125.000000	Units
57.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height	Value 125.000000 150.000000	Units mm mm
57.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter	Value 125.000000 150.000000 1550.000000 1450.000000	Units mm mm mm
57.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000	Minits mm mm mm mm
37.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000	Units mm mm mm mm mm mm
37.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Examp Diameter	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 100.000000 100.000000	Units mm mm mm mm mm mm
57.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance	Value 125,000000 150,000000 1550,000000 1450,000000 1400,000000 1200,000000 100,000000 450,000000 1200,000000	Units mm mm mm mm mm mm mm
57.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 1200.000000 1200.000000 500.000000	Units mm mm mm mm mm mm mm mm
57.	Verify the values > OK.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 1200.000000 500.000000 600.000000	Units mm
57.	Verify the values > OK.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 1200.000000 500.000000 500.000000 600.000000 BoundingShape_Cylinde	Units mm
57.	verify the values > ok.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame	Value 125,000000 150,000000 1550,000000 1450,000000 1400,000000 1200,000000 1200,000000 1200,000000 500,000000 500,000000 600,000000 BoundingShape_Cylinde Reinforced Concrete Standard	Units mm
57.	Verify the values > OK.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate	Value 125.00000 150.00000 1550.00000 1450.00000 1450.00000 1400.000000 1200.000000 100.000000 450.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard	Units mm
57.	Verify the values > OK.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard	Units mm
57.	Verify the values > OK.	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125,000000 150,000000 1550,000000 1450,000000 1400,000000 1200,000000 1200,000000 1200,000000 500,000000 600,000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard	Units mm mm <
37.	Repeat Steps 36 and 37 to generate	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.00000 150.00000 1550.00000 1450.00000 1450.00000 1400.000000 1200.000000 100.000000 450.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard nhole shown be	Units mm mm mm mm mm mm mm mm mm mm mm mm mm
37.	Repeat Steps 36 and 37 to generate	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard nhole shown be	Units mm mm mm mm mm mm mm mm mm mm mm mm mm
38.	Repeat Steps 36 and 37 to generate	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125,000000 150,000000 1550,000000 1450,000000 1400,000000 1200,000000 1200,000000 1200,000000 1200,000000 500,000000 600,000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard Standard Standard Standard	Units mm
37.	Repeat Steps 36 and 37 to generate	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 500.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard Style	Units mm
38.	Repeat Steps 36 and 37 to generate	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard Standard Nhole shown be Style Null	Units mm
38.	Repeat Steps 36 and 37 to generate Name Example Country Sanitary Null Structure Null Structure Null Structure Concentric Cylindrical Structure SI	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125,000000 150,000000 1550,000000 1450,000000 1400,000000 1200,000000 1200,000000 1200,000000 1200,000000 500,000000 600,000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard Standard Standard Nhole shown be Style Null	Units mm
38.	Repeat Steps 36 and 37 to generate Name Reference Country Sanitary Null Structure Null Structure Null Structure Concentric Cylindrical Structure SI Concentric Cylindrical Structure SI Concentric Structure 1,200 dia 450 fram	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125,000000 150,000000 1550,000000 1450,000000 1400,000000 1200,000000 1200,000000 500,000000 500,000000 600,000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard Style Style Style Storm Sewer Manhole	Units mm
37.	Repeat Steps 36 and 37 to generate	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 450.000000 500.000000 600.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard Standard Standard Standard Standard Storm Sewer Manhole Storm Sewer Manhole	Units mm mm mm mm mm mm mm mm mm m
38.	Repeat Steps 36 and 37 to generate Name P C Example Country Sanitary Null Structure Null Structure Null Structure Size Concentric Structure 1,200 dia 450 frante Concentric Structure 1,500 dia 450 frante Cylindrical Structure Size Concentric Structure 1,500 dia 450 frante Cylindrical Structure Size Concentric Structure Size Concentric Structure 1,500 dia 450 frante Cylindrical Structure Size Concentric Structure Size Conce	Property Wall Thickness Floor Thickness Structure Height Structure Diameter Rim to Sump Height Inner Structure Diameter Frame Height Frame Diameter Vertical Pipe Clearance Barrel Pipe Clearance Cone Height Structure Shape Material Frame Grate Cover	Value 125.000000 150.000000 1550.000000 1450.000000 1400.000000 1200.000000 1200.000000 1200.000000 500.000000 600.000000 BoundingShape_Cylinde Reinforced Concrete Standard Standard	Units mm mm </td

39.	Assign the style to be "Sanitary Sew	er Manhole" as	shown.		
			Ch. In	2.1-	
	Name		Style	Rules	
	E Country Sanitary				
	Concentric Cylindrical Structure 51 Concentric Structure 1 200 dia 450 frame 600 case 125 well 150 flame				
	Concentric Structure 1,200 dia 450 frame 600 cone 125 wali 150 floor		Sanitary Sewer Manhole	C Basic	
	Concentric Structure 1,500 dia 450 frame 60	UU CONE 125 Wall 150 NOOP	Sanitary Sewer Manhole		
	Cylindrical Structure Slab Top Circular Frame SI				
40.	RC "Cylindrical Structure Slab Top Ci	rcular Frame SI'	' > Add part size		
	Name		Style		
	Example Country Sanitary				
	H R Null Structure				
	- Concentric Cylindrical Structure SI				
	Concentric Structure 1,200 dia 450 frame 60	00 cone 125 wall 150 floor	Sanita		
	Concentric Structure 1,500 dia 450 frame 60	00 cone 125 wall 150 floor	Sanita		
		Add part size	(
		Delete			
4.1	Cat the "langer Chrystere	Part Size Creator			
41.	Set the "Inner Structure				
	Diameter" to "450mm".	Property	Value	Unit	
		Wall Thickness	65.000000	mm	
	Click "OK".	Floor Thickness	150.000000	mm	
		Structure Height	1550.000000	mm	
		Structure Diameter	430.000000	mm	
		Rim to Sump Height	1400.000000	mm	
		Inner Structure Diame	450.000000	mm	
		Frame Reight	400.000000		
		Traine Diameter	400.000000	11011	
42.	Change the style to "Cleanout".				
	Name	1	Style		
	Rumo		Jeyic		
	Example Country Santary				
	Concentric Cylindrical Structure SI				
	Concentric Structure 1.200 dia 450 frame 60	0 cone 125 wall 150 floor	Sanitary Sewer Manhole		
	Concentric Structure 1,500 dia 450 frame 60	00 cone 125 wall 150 floor	Sanitary Sewer Manhole		
	Cylindrical Structure Slab Top Circular Frame SI				
	Slab Top Cylindrical Structure 450 dia 400 dia Frm 100 FrHt 150 slab Cleanout				
	lesses!				
43.	Finally, set the rules as shown.				
	Name		Style	Rules	
	Example Country Sanitary		50,10	, Adds	
	Example country bandary				
	Concentric Cylindrical Structure SI				
	Concentric Structure 1,200 dia 450 frame 6	00 cone 125 wall 150 floor	Sanitary Sewer Manhole		
	Concentric Structure 1.500 dia 450 frame 6	00 cone 125 wall 150 floor	Sanitary Sewer Manhole	Sanitary Structure Rules 🔗 I	
	Cylindrical Structure Slab Top Circular Frame SI				
	Slab Top Cylindrical Structure 450 dia 400 d	ia Frm 100 Fr <u>Ht 150 slab</u>	Cleanout 👘	Sanitary Structure Rules 🕰	
44.	Click "OK" to complete the Par	rts List dialog	and save the	drawing to filename "32 Pipes-	
	Exercise1_METRIC.dwg"	0			

7.2 <u>Creating a Sanitary Sewer/Sewerage/Drainage/Stormwater Gravity Network</u>

Once we have determine the Part Lists and Pipe Rules for a project, we are now ready to design, edit, and annotate a complete gravitational pipe network system.

There are several ways to create gravitational pipe networks. You can do so by using the Civil 3D pipe Network Layout Tools. You can also create gravitational pipe networks from AutoCAD objects such as lines and polylines. Or, use any existing Civil 3D objects such as alignments and feature lines.

This exercise will give you hands-on experience using the Civil 3D Network Layout Tools method.

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Home Insert Arnotate Modify Noticolspace Real Points - Browse to filename "32 Pipes-Exercise1_METRIC.dwg".
2.	Expand the Surfaces branch in Prospector. This drawing has several surfaces which have a "_No Display" style applied to simplify the drawing. The surface you will be working off is a composite of the existing conditions, corridor surfaces, and grading surfaces.	Image: Solution Clouds Image: Style Image: Sty
3.	Notice that there are several road alignments too.	Image: Syrah_Way Syrah_Way
4.	Home tab > Pipe Network > Pipe Netwo	etwork Creation Tools.
	Image: Second	View Manage Dutput Survey Actodess 360 Help ************************************

5.	 Complete the dialog as below: Network name = Sanitary Sewer Network Part list = Sanitary Sewer Surface = Composite Alignment = Cabernet_Court Structure label style = Data with Connected Pipes (Sanitary) Pipe label style = Length Description and Slope. Click "OK". 	Create Pipe Network X Network name: Sanitary Sewer Network Sanitary Sewer Network X Network description: X Metwork parts list: X Sanitary Sewer X Layers X Surface name: X Composie X Alignment name: X Caterre_Dun. X Structure abel style: X Ye label style: X Ye label style: X Ye langth Description and Slope X
6.	Select the Structure and Pipe as sho Network Layout Tools - Sanitary Sewer Networ The Concentric Structure 1,2 Parts List: Sanitary Sewer	DWN. k 200 mm PVC Pipe 200 mm PVC Pipe Surface: Composite Alignment: Cabernet_Court
7.	Activate "Node" OSNAP.	Snap and Grid Polar Tracking Object Snap 3D Object Snap Dynamic Input Quid Image: Constraint of the second secon
8.	Run the "Pipes and Structures" command as highlighted.	200 mm PVC Pipe site Alight Alight Alight → Pipes and Structures ure Line - Profile - Pipes Only Structures Only DD - Structures Only Pipes Only Structures Only Pipes Only Structures Only Pipes Only Structures Only Pipes
9.	Click the "X" at point 1 and "X" at point 2 as shown.	2 SYRAHWAY
10.	Change the pipe to "250mm".	k 250 mm PVC Pipe Alignment: Cabe





7.3 Editing Gravity Pipe Network

This exercise will give you hands-on experience in making a variety of edits to a gravitational flow of Sanitary Sewer and gravitational flow of Stormwater Drainage systems.

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Browse to filename "33 EditingPipesPlan_METRIC.dwg ".

2.	Select the structure STM STR 3 icon in the drawing.	STM STR 3 STA:0+115.00 OFF:4.42 RIM:248.94 SUMP:245.09 INV IN:247.09 375mm R INV OUT:247.09 375mm
3.	Run the "Swap Part" command.	View Manage Output Survey Autodesk 360 Image: Properties Image: Properis Properis Image: Properties
4.	Let's change the catch basin to "1,000x750mm" size. Click "OK".	Swap Part Size Image: Structure Si Structure Si Structure Si Structure Si Structure Si Structure Si
5.	A new icon is placed to represent catch basin.	
6.	Use AutoCAD Erase command to de	elete structure SAN STR 7.
	SAN STR 7 STA:0+296/45 OFF-0.04L RIM:239.87 SUMP:236.43 375mm Reinforced Concrete 375mm Reinforced Concrete BEFORE	biects:
7.	Select the sanitary sewer pipe at the north of the drawing.	39.01m of 8 inch PVC @ 1,00%
		107 SFRONTENAC DRIVE

8.	 Click the cyan-colour triangular grip. Hit the TAB keyboard. ENTER "60.96" to change the length of the pipe. Note: The length is the effective 3D length which include the slope/gradient of the pipe. 	ERONTENAC DRIVE FRONTENAC DRIVE 147 148 149
9.	Select any pipe in the drawing > Edit Pipe Network	View Manage Output Survey Autodesk 360 Image: Properties Image: Properties Image: Properties Image: Properties Image: Properties Image: Properties Structure Properties Image: Properties Image: Properties Image: Properties Image: Properties Modify Image: Properties Image: Properties Image: Properties
10.	 Assign "SMH" structure list. Run the "Structure Only" command. 	ut Tools - Sanitary Network
11.	Click at the end of the pipe line that we have lengthened previously. Note: There is a special peach-colour grip telling you that a structure will be attached to the end of this pipe/line.	NE NE
12.	A brand new manhole has been added to the end of the pipe.	ch PVC @ 1.00% - 105 106 FRONTENAC DRIVE
13.	Select the STM STR 3 catch basin in the model.	INV OUT:247.09 31
14.	Run the "Structure Properties" command.	View Manage Output Survey Image Image Image Image Pipe Image Image Image Properties Structure Edit Pipe Image Image Image Image Modify Image Image Image

15.	• Goto "Part Properties" tab.	Structure Properties - STM STR 3		
	Change the Sume Dopth to Information Part Properties Connected Pipes Rules			
	"0.000″.	Structure Properties	Vaue	
	 Click "OK" 	General		_
	Chek OK :	Surface Elevation At Insertion Point	243.939m	
		Reference Surrace	Composite Composite	
			by an_way	
		Structure Rotation Angle	10.6758(d)	
		Structure Offset	4.420m	
		Structure Station	01115.00m	
		Structure Nort ing	59539.5435m	
		Structure Easting	/U2578.7842m	
		Connected Pipes	2	
		🗉 Insertion Rim Behavior		
		Insertion Rim Elevation	243.989m	
		Surface Adjustment Value	0.000m	
			True	
		Sume Elevation	247.091m	
		Sume Depth	0.000	
		Control Sump By:	Dept	
		🗄 Hydraulic Properties		
16.	Goto Prospector tab, and browse	Toolspace		
	to the Structures list as shown			
	to the structures list as shown.	ltà ≌≞ L	1 ?	
		Active Drawing View	e e	
	You may rename the each		- i i i i i i i i i i i i i i i i i i i	
	i du indy rename and eden	Catchments		
	structure located in the preview	🖃 🎢 Pipe Networks	۰.	
	pane as highlighted.	🗄 🎢 Networks		
	P	H T Network - (1)		
		⊞ Network - (2)	8	
		🖹 🗐 Sanitary Network	£	
		🖻 🥔 Pipes	8	
		E 2 Storm Network		
		Interference Checks		
		Status Name Description	n Sty 5	
		✓0 MH1 SMH	Sani 🖌	
			Sani	
		V Structure - (19) SMH	Sani	
		V MH3 SMH	Sani ğ	
		√0 MH4 SMH	Sani 8	
			Coni	
17	Close the drawing without caving			
1/.	close the drawing without saving.			

7.4 Creating an Alignment from Network Parts

On some occasions, certain legs of the pipe network require their own stationing/chainage. Perhaps most of your pipes are shown on a road profile but the legs that run offsite or through open space require their own profiles. Whatever the reason, it's often necessary to create an alignment from network parts. The next exercise will demonstrate this mission.

No.	Descriptions	Commands/Remarks			
1.	Open the drawing.	Image: Superstand Supers			
		Browse to filename "34 AlignmentFromNetworkParts_METRIC.dwg".			
2.	Select the CB1 structure.	75 STA:04:025,08 OFF: 2.81R RM: 250.61 SUMP:248.84 INV OUT: 249.02 876mm Reinforced Concrete 76			
3.	Select "Alignment from Network" ribbon command.	Edit in Storm and Sanitary Analysis Launch Pad			
4.	Select the STM STR 7 structure > ENTER keyboard.	STM STR 7 STA:0+211.47 OFF:68.92R RIM:238.74 SUMP:237.42 INV-IN:237.47 375mm Reinfe			
5.	Name your alignment "Storm CL".	Create Alignment - From Pipe Network			
	Notice the "Create Profile and Profile View" is activated.	Storm CL			
	Click "OK".	Description:			
		Alignment style: Proposed Alignment layer: C-ROAD Alignment label set: Major Minor H+V Gecmetr Kereate profile and profile viewi Kereate profile and profile viewi Kereate profile and profile viewi			
6.	 Select "Composite" surface. Click "Add". Click "Draw In Profile View". 				
	👗 Create Profile from Surface	×			
----	---	---	--	--	--
	Alignment:				
	Te Storm CL				
	Station range				
	Alignment:				
	Start: End: Pond Surface				
	0+000.00m	0+245.90m			
	To sample:	Sample offsets: 2			
	0+000.00m	0+245.90m -12 Add>>			
	Profile list:	Profile list:			
	Name Descrip Type Data Source Offset Update Layer Style Station				
	Composite - Surface (2)	🥍 Composite 0.000m Dynamic C-ROAD Existing Ground P 0+000.00m			
	Remove	Draw in profile view 3 OK Cancel Help			
7	lump to "Bipo/Brossuro	General Select alignment:			
7.	Notwork" link	TD Storm CL			
	Network link.	Station Range			
		Profile View Height // CFParent Alignment/CF			
		Profile Display Options Description:			
		Pipe/Pressure Network			
		Data Bande Profile view style:			
		Profile Hatch Options Profile view layer:			
8.	Ensure "Storm Network" list is	General Relationstration			
	activated.				
		Station Range Select networks to draw in profile view:			
		Profile View Height			
		Profile Display Ontions			
		Pipe/Pressure Network			
		Data Bands			
9	Ensure "Show only parts sol	ected to draw in profile view" is actiauted			
5.	Click "Create Profile View"	בכובע נס ערמיש ווי אוסוווב אוביש ווז מכוומעובע.			
	- CIER Create Profile view .				
	For Show only parts selected to d	raw in profile view			
	< Bac	K IVEXC > Create Profile View			

10.	Zoom out and click any empty space in the model.	
11.	Close the drawing without saving.	

7.5 Labelling Pipe Network Profile including Crossings

This exercise will meet the following objectives:

- Creating an alignment from a pipe network.
- Labelling the pipe networks in Profile View.
- Showing crossing pipe in the Profile View.

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Browse to filename "35 Pipes-Excercise3_METRIC.dwg".
2.	Select the Sanitary Structure 16.	55 55 56 78 12 57 0 57 11
3.	Select "Alignment from Network" ribbon command.	Edit in Storm and Sanitary Analysis Edit In Storm and From Network Express Launch Pad
4.	Select Sanitary Structure 18 > ENTER keyboard.	

5.	Verify the highlighted values > OK	Site: Site: Name: SMH16 to SMH18 Alignment Type: "
		Alignment style: None Alignment layer: C-ROAD Alignment label set: C_ROAD OK Cancel Help
6.	 Sample the "EG" and "Corridor Change the Style for "Corridor I Click "Draw in profile view" but Profile list: 	FG" surfaces. FG – Surface (2)" to " Design Profile ". ton.
	Name De Type [Data Source Offset Undate Laver Style
	The second	Start E
	EG - Surface (2) (1)	G 0.000m Dynamic C-ROADExisting Ground P 0+000.00m 0+1 orridor EG 0.000m Dynamic C-ROAD- Design Profile 0+000.00m 0+1
	<u> </u>	•
	Remove Draw	in profile view OK Cancel Help
7.	Jump to "Pipe/Pressure Network' link.	General Select alignment: Station Range "> SMH16 to SMH Profile View Height Profile view name: Profile Display Options Description: Pipe/Pressure Network

8.	Ensure "Yes" is selected for each pipe and structure under Sanitary Network.	Station Range Select networks to draw in profile view: Profile Display Options Name Select Profile Display Options Image: Select network Image: Select network Pipe/Pressure Network Image: Select network Image: Select network Data Bands Image: Select network Image: Select network Profile Hatch Options Image: Select network Image: Select network Profile Hatch Options Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Pipe/Pressure Network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network Image: Select network
9.	Click "Create Profile View" button and	d place the Profile View to the right of the site plan.
10.	Select EITHER one pipe or one structure inside the profile view.	SMH16 to SMH18 Alignment PROFILE 242 240 240 240 240 240 240 240
11.	Run the "Entire Network Profile" ribbon command.	Add Reset Add Reset Tables Colject Viewer Tables Isolate Objects Add Pipe Network Labels reral Tools • Entire Network Plan Pro Entire Network Profile Pro Entire Network Sectif Intire Network Profile Single Part Plan Creates labels for pipe ne
12.	The "STA:" and "OFF:" is missing because the alignment was created AFTER the pipe network.	SMH16 to SMH18 Alignment PROFILE 242 16 17 STA:??? OFF:?????? STA:??? OFF:?????? RIM:240.85 SUMP:239.60 SUMP:239.71 SUMP:239.16 MV:N:239.71 Sta:??? PM:N:239.71 Sta:??? NV:N:239.71 Sta:??? PM:N:239.71 Sta:??? NV:N:239.71 Sta:?? NV:N:239.72 Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:?? Sta:??? Sta:?? Sta:???? Sta:?? Sta:???? Sta:?? Sta:???? Sta:?? Sta:?? Sta:??

14. Select Structure 16, 17 and 18. 14. Select Structure 16, 17 and 18. 15. Scroll to the right until you see the "Reference Alignment" header. 15. Scroll to the right nutil you see the "Reference Alignment" header. 16. Bight-click "Reference Alignment" > Edit 16. Right-click "Reference Alignment" > Edit 17. Choose "SMH16 To SMH18"	13.	Prospector > Pipe Networks > Networks > Sanitary Network > Structures.	Active Drawing View
15. Scroll to the right until you see the "Reference Alignment" header. 15. Scroll to the right until you see the "Reference Alignment" header. 16. Right-click "Reference Alignment" > Edit 16. Right-click "Reference Alignment" > Edit 17. Choose "SMH16 To SMH18" 17. Choose "SMH16 To SMH18"	14.	Select Structure 16, 17 and 18.	✓ 0 14 SMH S ✓ 0 15 SMH S ✓ 0 16 SMH S ✓ 0 17 SMH S ✓ 0 18 SMH S ✓ 0 19 SMH S ✓ 0 20 SMH S
16. Right-click "Reference Alignment" > Edit Edit Reference Alignment 0.0000 (d) Hide column 0.0000 (d) Show all colu 0.0000 (d) Show all colu 0.0000 (d) Show all colu 0.0000 (d) Reset colume 17. Choose "SMH16 To SMH18" Alignment > OK. Select Alignment Octobernet_Court Cabernet_Court Cabernet-Syrah Left Cabernet-Syrah Left OCDS L OCDS L OCDS_L OCDS_L SMH16 to SMH18 Alignment	15.	Scroll to the right until you see the "Reference Alignment" header.	Inner Hei Rotatiot Reference Alignment Station Offset 0.0000 (d) 0.0000 (d) 0.000 0.000 0.000 0.0000 (d) 0.0000 (d) 0.000 0.000 0.000 0.0000 (d) 0.0000 (d) 0.0000 0.0000 0.0000 0.0000 (d) 0.0000 (d) 0.0000 0.0000 0.0000 0.0000 (d) 0.0000 (d) 0.0000 0.0000 0.0000 0.00000 (d) 0.0000 (d) 0.0000 0.0000 0.0000
17. Choose "SMH16 To SMH18" alignment > OK. Name □ Cabernet_Court □ Cabernet_Syrah Left □ Cabernet-Syrah Right □ CDS Left □ CDS Left □ CDS L □ CDS L □ CDS L □ CDS L □ CDS L □ CDS L □ CDS L	16.	Right-click "Reference Alignment" > Edit	Rotatio Reference Alignment Edit 0.0000 (d) Edit 0.0000 (d) Show all column 0.0000 (d) Reset column
	17.	Choose "SMH16 To SMH18" alignment > OK.	Select Alignment Name Cabernet_Court Cabernet-Syrah Left Cabernet-Syrah Right CDS Left CDS Right CDS_R Frentenac_Drive Swrah-Erontenac1-CB Left OK



24.	 Hit ESC keyboard. Select the Syrah W View. Run the "Profi Properties" ribbon co 	a y Profile le View ommand.	yutput Su yn Ciiteria Edtor	Pmfle View Poperties Modry View Analyze		
25.	 Goto "Pipe Networks Activate "Show o drawn in profile view 	" tab. nly part: ".	S Profile	View Properties - Sy/ Image: Stations Elevation Santary Network Pips - (109) Pips - (111) Pips - (112) Pips - (113) Pips - (119) Pips - (119) Pips - (126) Pips - (126) w only pasts drawn in pr w only crossing pipes	rah_Way2 Draw Draw V Yes O'I Yes V Yes O'I Ye	Pascription Binch PVC Binch PVC Binch PVC Binch PVC Binch PVC Binch PVC SMH SMH SMH SMH SMH SMH SMH SMH
26.	Change the Crossing Pipe	s style as s ions Profile	shown belo es Bands	ow: Hatch Pipe Ne	stworks	
	Name	Draw	Description	Layer	Style	Style Override
	Sanitary Network Storm Network Pipe - (119) Pipe - (124) Pipe - (125) Pipe - (126)	V Yes 1 V Yes 1 V Yes 1 V Yes 1 V Yes 1	18inch RCP 18inch RCP 18inch RCP 18inch RCP	C-STRM-PROF C-STRM-PROF C-STRM-PROF C-STRM-PROF	Double Line (Storm Double Line (Storm) Double Line (Storm) Double Line (Storm)	 Pipe Crossing Pipe (Storm) Pipe Crossing Pipe (Storm) Pipe Crossing Pipe (Storm) Pipe Crossing Pipe (Storm)
27.	Click OK. Now you can see	e clearly w	hether the	e crossing pip Syrah We	oes require elevat ay PROFILE	tion adjustment or not.
					1	

28.	Adjust the levations of the crossing pipes as needed.
	Close the drawing WITHOUT saving.

7.6 <u>Pipe Network Interference Check</u>

In Building Information Modeling (BIM), one of the main reason of adopting the BIM technology is to detect any clashes of components within the project boundary. This feature is popularly known as Clash Detection.

In design, you must ensure pipes and structures have appropriate separation. The following exercise will lead you through creating a pipe network and using Interference Check to scan your design for potential pipe network conflicts.

No.	Descriptions	Commands/Remarks
1.	Open the drawing. This drawing includes a sanitary sewer pipe network and a storm drainage network.	Image: Solution of the solution
		Browse to filename "36 Interference_METRIC.dwg".
2.	In the drawing, select ANY part from either network. In this example, we select one of the crossing pipe (Storm drainage).	66 66 7 66 7 68 66 7 68 66 7 68 66 7 68 68 7 68 68 7 68 7 68 7 68 7 68 7 68 7 68 7 7 68 7 7 68 7 7 7 7 7 7 7 7 7 7 7 7 7
3.	Run the "Create Interference Check" ribbon command.	s Express Tools Raster Tools Geotechnics F Draw Parts in Profile Check Storm Edit in Storm ar Storm Sanitary Analys Tools Create Interference Check

4.	Select the OTHER pipe network.	1]20 Wiretrame] 66
	In this example, we will click at one of the Sanitary Sewer structure.	35 36 36 36 36 36
5.	 Verify the highlighted values. Click "3D proximity check criteria" button. 	Create Interference Check Name: Exercise Description: Description: Network 1: Image: Sanitary Network Network 2: Image: C-STRM Interference style: Interference style: Basic Interference style: Image: Im
6.	You're interested in finding all network parts that are within a certain tolerance of one another. In this exercise, we allow 0.5m distance. This setting creates a buffer to help find parts in all directions that might interfere. If you forget to activate "Apply 3D Proximity Check" option, you would only get "direct" physical collisions among pipe networks. Click "OK" twice to run the Intereference Check.	Criteria Apply 3D Proximity Check Use distance: 0.500m Use scale factor: 2.000 OK Cancel Help

7.	A report is presented telling you that there are three clashes have been detected. Just hit OK.	AutoCAD Civil 3D 2014
8.	Goto Prospector and right-click "Exercise" > Zoom to.	Toolspace I - II Active Drawing View I - II Pipe Networks I - II Image: Pressure Networks Interference Checks Image: Pressure Networks Interference Checks Image: Pressure Networks Rerun Interfere Interference Checks Interference Checks Image: Pressure Networks Rerun Interfere Intersections Delete Intersections Select Image: Pressure Group Pan to Image: Pressure Select Pan to Image: Pressure Select Pan to Intersections Surfaces
9.	A small marker denotes where the interference occurs.	
10.	Select any one of the interference ma	arker, the pipes that intersect, and the nearby inlets.



7.7 <u>Creating Pipe Tables</u>

Preparing a clean construction drawing is a big challenge for infrastructure project. Would it be better to replace those engineering parameters in a tabulation format? Let's explore how to simplify the drawings using Pipe Network Table feature.

No.	Descriptions	Commands/Remarks
1.	Open the drawing. This drawing includes a sanitary sewer pipe network and a storm drainage network.	Fore to filename "35 Pipes-Excercise3_METRIC.dwg".

3.	Just hit "OK values.	" to accepi	t default	Toolspa Parcel Active Drev Pipe Network Active Drev Pressure Network Volume Line and Curve Structure Table Creation Table style: Structure with Pipes Table laver C-STRP-TABL ® pretwork Soloct network: Soloct network:	Image: Contract of the second sec
4.	Click any emp	ty space in th	e drawing.	The sample Structure table	is shown below:
				STRUCTURE TABLE	
	12	1200 mm RM = 261.64 SUMP = 250.49 INV OUT = 250.518		PIPESIN:	Pipe- (111), 225 mm REINFORCED CONCRETE INV OUT=250.52
	2	1200 mm RIM = 261.31 SUMP = 249.23 INV IN = 249.259 INV OUT = 249.259	Pipe- (101), 225	MM REINFORCED CONCRETE INV IN =249.26	- Unit Pipe- (182), 225 mm REINFORCED CONCRETE INV OUT=249.26
			1/ T		

CHAPTER 8 : PRESSEURISED PIPE NETWORKS

Since version 2013, AutoCAD Civil 3D has been enhanced with a brand new feature called pressure networks. Pressure pipes work differently than gravity flow pipe systems within Civil 3D. Much of the need for custom parts like valves or hydrants is eliminated with these systems.

8.1 Creating Pressure Network Parts List

In the following exercise, you will create a pressure network parts list for water supply system.

No.	Descriptions	Commands/Remarks
1.	Open the drawing. This file is set up with a layer state that makes other objects grey. This will help you focus on the placement of pressure pipe networks objects.	Home Insert Annotate Modify Toolspace Pipe Points + Browse to filename
		"37 Pressure_METRIC.dwg".
2.	Goto Home tab > Create Design > Set Pressure Network Catalog.	iv Analyze View Manage Output Survey Autodesk 3d Image: Parcel * **** Alignment * **** Intersections * ***** Prof Image: Parcel * ******** Profile * ********** ************************************
3.	Verify that the Catalog Database File is set to "Metric_AWWA_PushOn.sqlite". Flanged join type and Mechanical join type are not supported in Civil 3D. However, the most commonly used join type in modern water supply construction is the push-on type.	Set Pressure Network Catalog Catalog folder: C:\ProgramData\Autodesk\C3D 2014\enu\Pr\ssure Pipes Cata Catalog database file: Metric_AWWA_PushOn.sqlite OK Cancel Help

4.	Goto Settings tab > Pressure Network > RC Parts Lists > New	Toolspace I Active Drawing Settings View I Mass Haul Line I Mass Haul View I Image: Catchment Image: Catchment Image: Pipe Image: Catchment Image: Pipe
5.	Rename the Pressure Network Parts List to " Watermain ".	Pressure Network Parts List - New Parts List Information Pressure Pipes Fittings Appurtenances Name:
6.	Pressure Pipes tab > RC New Parts List > Add material	Pressure Network Parts List - Watermain Information Pressure Pipes Name Style New Parts List Add material Copy value to clipboard
7.	Activate "ductile iron" > OK.	Pressure Network Catalog Material
8.	Right-click "ductile iron" > Add size	Pressure Network Parts List - Watermain Information Pressure Pipes Fittings Appurtenances Summary Name Style Render Material Pay Item Image: Style Render Material Pay Item Image: Style Render Material Pay Item Image: Style Add size Delete Delete
9.	Verify the highlighted values > OK.	Add Pressure Pipe Sizes Property Value Unit Add all sizes Nominal Diameter 250.000000 mm Inner Diameter Inner Diameter 250.000000 mm Inner Diameter Outer Diameter 274.000000 mm Inner Diameter Vall Thickness 12.000000 mm Inner Diameter Cut Length 6 m Inner Diameter Allowable Deflection 5.000000 deg Inner Diameter

10.	Switch to "Fittings" tab > RC New Parts List > Add type Activate all types of fittings > OK.	Pressure Network Parts List - Watermain Information Pressure Piper Fittings Abpurtenances Summary Name Style Name Style New Parts List Add type Copy value to clipboard Pressure Network Catalog Copy Catalog Cop
12.	RC "ductile iron Elbow" > Add size	Pressure Network Parts List - Watermain Information Pressure Pipes Fittings Appurtenances Name Style Render Material Image: Style Gender Material </td
13.	Set the values as highlighted > OK.	Add Fitting Sizes Property Value Unit Add all sizes Bend Angle 11.250000 deg Nominal Diameter 250.000000 mm Allowable Deflection Allowable Deflection 5.000000 deg
14.	Repeat steps 12 and 13 for 22.5° and 45° bend angles elbow with the same 250mm nominal diameter and Allowable defection of 5°.	Pressure Network Parts List - Watermain Information Pressure Pipes Fittings Appurtenances Summary Name Style Image: Style Image: Style Imag
15.	RC "ductile iron Tee" > Add size	Pressure Network Parts List - Watermain Information Pressure Pipes Fittings Appurtenances Name Image: State S

16.	Set the nominal diameter to 250mm > OK.	Add Fitting Sizes
		Property Value Unit Add all sizes
		Nominal Diameter 250.000000 mm
		Allowable Deflection 5.000000 deg
17.	Switch to the Appurtenances tab >	Pressure Network Parts List - Watermain
	RC New Parts List > Add type	Information Pressure Pipes Fittings Appurtenances Sum
		Name Style
		🔏 New Parts List
		Add type
		Copy value to clipboard
18.	Activate the "gate valve-push on-	Pressure Network Catalog
	ductile iron-16 bar" > OK.	
		Valve
		SE V gate valve-position-odditie ilioneto bai
19.	RC "gate valve-push on-ductile	Information Pressure Pipes Fittings Appurtenances Summar
		Name Style Rende
		Unitermain
		gate valve-push on-ductile ir 🖳
		Add size
		Delete
20.	Set the Nominal Diameter to	Pressure Network Parts List - Watermain
	250mm > 0K.	Information Pressure Pipes Fittings Appurtenances Summary
		Name Style Render M
		Add Appurtenance Sizes
		Property Value Unit Add all sizes
21.	Click OK again to complete the creation	on of the Watermain pressure network parts list.
	Close the drawing WITHOUT saving.	
	· · · · · · · · · · · · · · · · · · ·	

8.2 Modelling the Watermain Pressure Network

In this exercise, you will create a water supply pressurised network. Use the red-colour "X" markers in the drawing as a guide for placement, but don't worry if your pipe network is slightly off from the guides.

No.	Descriptions	Commands/Remarks
1.	Open the drawing. This file is set up with a layer state that makes other objects grey. This will help you focus on the placement of pressure pipe networks objects.	Browse to filename "38 Watermain_METRIC.dwg".
2.	Home tab > Pipe Network > Pressure Network Creation Tools.	View Manage Output Survey Autodesk 360 Help •
3.	Set all values as shown > OK.	Create Pressure Pipe Network Network name: Watermain North Parts List Image: Surface name: Image: Surface name: Surface nam
4.	Set the default cover to 1.500m.	Network Composite Cover: Syrah Way 1.500m Watermain Network Settings
5.	Set the OSNAP to "Insertion" only.	Snap and Grid Polar Tracking Object Snap 3D Object Snap I Image: Object Snap On (F3) Image: Object Snap Tracking Object Snap Tracking Object Snap Tracking Object Snap modes Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap On (F3) Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap On (F3) Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap On (F3) Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap On (F3) Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking Image: Object Snap Tracking

6.	OSNAP at the first red-marker label 1 and click.	21 x Insert
7.	Place the first bend by clicking (or OSNAP) near red-marker label 2.	21 X Insert
8.	At the bend, you are restricted to the ALLOWABLE bending angles listed in your part network. The yellow-colour compass glyph that appears represents the elbow angles to the left and right of your pipe. If you had not included multiple elbow angles, only the default elbow angle of 11.25° would be available.	X 22.2m
9.	Turn off the OSNAP (i.e. press F3 keyboard).	
10.	Click the red-marker labelled 3 until labelled number 8.	x 66 65 64 x 22.4m x 20.0m 20.0m 20.0m 20.0m
11.	Hit ESC keyboard to terminate the command.	
12.	Select pipe between label 7 & 8.	22.4m

13.	Touch the cyan-colour diamond glyph until you see the "Defection" notation. Click this diamond glyph.	0.0000° Deflection
14.	Use the defection angles (yellow- projected lines) to aim at the green circle.	22.4m Specify stretch point or ■
15.	The pipe has been deflected to target to the green circle.	X 22.4m ELBON
16.	Click the "+" cyan-colour glyph to continue the layout.	Continue layout 22.4m
17.	Continue placing the elbow at X lael 9 and 10.	
	not be placed exactly on the X- marker anymore.	X 15.7m XELBOW 6.7m ELBOW 22.4m ELBOW
	You can always use the glyphs to re-position the pipe location after the fact.	

18.	Hit ESC to end the command.	ELBOWI6.7m ELBOW 22.3m ELBOW 2
19.	Change the fitting to "Tee- 250mmx250mm". Then, click "Add Fitting" button.	o Express Tools Plug-ins Plug-ins Featured Apps Image: Add Fitting tee-250 mm × 250 mm - push or , Image: Add Appurtenance gate valve-250 mm - push on -dt [
20.	As you hover the cursor near the end of the pipe, you will see the "Add Fitting" glyph as shown. Just click to add the Tee connection.	Pressure Pipe Name Pressure Pipe - (21) Style DIP-WATER
21.	Hit ESC keyboard to end the command.	
22.	Click the Tee > right-click > "Disconnect from pressure part".	Display Order Image: Display Order <t< td=""></t<>
23.	The command line says "Select conner	ected pressure part:". Click the pipe before this Tee.
1	now that the part is disconnected, yo	ou are free to rotate it into place.

24.	Select the Tee > click at the "Rotation" cyan-colour glyph.	Rotation
25.	Enter "- 90 " at the Dynamic Input.	-90 Specify stretch point or
26.	The Tee is now rotated to the correct position, but it must be reconnected back to the pipe.	
27.	Click the Tee > click the "Location" glyph > move the Tee until you see the connection glyph > click.	Pressure Pipe Name Style DIP-WAT
28.	Select the Tee to reveal the grips > click the "+" glyph (North) to continue the layout.	



8.3 <u>Pressure Pipe Networks in Profile View</u>

Pressure pipe networks can do things in profile view that gravity pipes cannot. With pressure pipes, the profile view can be used to add on to the pipe layout, change straight pipes to curves, and delete parts from the project altogether.

In the following exercise, you will draw the pressure pipe network in profile view and modify the layout using the "Follow Surface" command.

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Image: Construction of the second
		"39 PressureProfile_METRIC.dwg".
2.	Modify tab > Design > Pressure Pipe Network	Annotate Modify Aralyze View Manage Parcel Parcel Alignment Intersection Image Feature Line Profile Assembly Grading Corridor Pipe Network Convert 2D to 3D Polylines Convert 2D to 3D Polylines Convert 2D to 3D Polylines Convert 2D to 3D Polylines Convert 2D to 3D Polylines Convert VDA Subassemblies to .NET Convert VDA Subassemblies to .NET Convert VBA Pipe and Structure Rules to .NET Pressure Fipe Network Design
3.	Run "Alignment from Network" ribbon command.	Featured Apps Express Tools Radio Design Depth Alignment Close Analyze Launch Pad Close
4.	Click the icon of Gate Valve at the far right of the drawing.	76 LEBOW 28.9M
5.	Click the southern part of the project.	ELBOW6.3m ELBOW 22.6m ELBOW 20 ELBOW6.3m ELBOW 22.6m ELBOW 20 GATE VALVE 51

0.	Hit ENTER keyboard.	Create Alignment - From Pressure Net	
		Site:	
	verify the highlighted values > OK.	Name:	
		Syrah Water	
		Туре:	
		Till Miscellaneous	
		Description:	
		× .	
		Starting station: 0+000.00m	
		Alignment style:	
		Proposed	
		Alignment layer:	
		Alignment label set:	
		Kajor Minor H+V Geometr 💌 📝 🗾 🔣	
		Create profile and profile view	
		OK Cancel Help	
7.	• Add the "Composite" surface.	Profile list:	
	Click Draw in profile view.	Name De Type Data Source Offset Update .	
		Composite - Surface (2) 🛛 💆 Composite 0.000m Dynamic	
		•	
		Remove Draw in profile view	
		i	
8.	Verify the Pipe/Pressure Network	Station Range Sevent networks to draw in profile view	
	lists as per highlighted > Create	Profile View Height Senicary Network	
	Profile View.	Prufile Display Options	
	Profile View.	Prufile Disulary Options Image: Committee work Pice/Pressure Network Image: Committee work Pice/Pressure Network Image: Committee work	
	Profile View.	Prufile Display Options Image: Comm Network Plice/Pressure Network Image: Comm Network Data Bands Image: Comm Network Pressure Pipe - (12) Image: Yes Image: Comm Network Image: Comm Network Image: Comm Network Image: Comm Network	
	Profile View.	Prufile Disulary Options Image: Constraint of the work Pice/Pressure Network Image: Constraint of the work Data Bands Image: Constraint of the work Drofile Hatch Options Image: Constraint of the work	
	Profile View.	Profile Display Options Comm Network Pice/Pressure Network Watermain North Data Bands Pressure Pipe - (12) V Yes Drofile Hatch Options Pressure Pipe - (13) V Yes Profile Hatch Options Pressure Pipe - (16) V Yes Pressure Pipe - (16) V Yes Pressure Pipe - (17) V Yes	
	Profile View.	Profile Disulary Options Pipe/Pressure Network Data Bands Drofile Hatch Options Profile Hatch Options Profile Hatch Options Pressure Pipe - (12) Pressure Pipe - (13) Pressure Pipe - (14) Pressure Pipe - (15) Pressure Pipe - (16) Pressure Pipe - (17) Pressure Pipe - (18) Pressure Pipe - (19)	
	Profile View.	Profile Disulary Outloans Pipe/Pressure Network Data Bands Drofile Hatch Options Profile Hatch Options Profil	
	Profile View.	Price/Pressure Network Data Bands Drofile Hatch Options Profile Hatch Options Profile Hatch Options	
	Profile View.	Profile Disulary Options Data Bands Profile Hatch Options	
	Profile View.	Prudike Disulary Outlands Pipe/Pressure Network Data Bands Drofile Hatch Cablons Profile Hatch Cablons Profile Hatch Cablons Pressure Pipe - (13) Pressure Pipe - (14) Pressure Pipe - (15) Pressure Pipe - (16) Pressure Pipe - (17) Pressure Pipe - (18) Pressure Pipe - (19) Pressure Pipe - (10)	
	Profile View.	Profile Disulary Outlands Pipe/Pressure Network Data Bands Profile Hatch Options Profil	
	Profile View.	Profile Dealey Options Data Bands Profile Haten Options Profile Haten Option Profile Ha	
	Profile View.	Profile Disulary Options Data Bands Profile Haten Options Profile	
	Profile View.	Profile Disulary Qualuus Pipe/Pressure Network Data Bands Drofile Hatch Cablons Profile	
	Profile View.	Profile Databasy Qualuus Data Bands Profile Hatch Options Profile Hatch Options Profile Hatch Options Profile Hatch Options	
	Profile View.	Principressure Network Data Bands Drofile Hatch Cotions Profile Hatch Cotions Profile Hatch Cotions Profile Hatch Cotions Profile Hatch Cotions	
9.	Profile View.	Profile Deadlay Qualuus Pice/Pressure Network Data Bands Profile Hatch Options Profile	





8.4 Design Checks

Pressure pipe networks differ from the gravitational pipe network when it comes to design check. Since the fluid in a pressure network can go uphill, the rules you saw in gravity systems no longer apply. The main concerns for a pressure system are pressure loss and depth of cover.

Bear in mind that Civil 3D is for modelling tool NOT analysis software. So, Civil 3D will NOT compute the pressure loss at each junction, but you can set an acceptable range of values for pipe bends and radius of curvature for curved pipes.

Design Check will check for improperly terminating pipes, mismatched pipe and fitting diameters, any curved pipe whose radius has exceeded acceptable values, and pipes that have exceeded the maximum deflection you set up in the parts list.

In the following exercise, you will modify command settings and run a depth check on the pressure pipe network.

No.	Descriptions	Commands/Remarks
1.	Open the drawing.	Image: Supersonal Content of Conten
		Browse to filename "40 PressureDesignCheck_METRIC.dwg".

2.	Goto Settings tab > Pressure Network > Commands > RC RunDepthCheck > Edit Command Settings	Image: Second
3.	Verify the highlighted values > OK.	∃ <mark>ﷺ</mark> Run Depth Check
		Use Min Depth of Cover Validation Yes
		Minimum Depth of Cover 2,000m
		Maximum Depth of Cover 10.000m
4.	Select the far left pipe in the Profile	Systh Water PROFILE
	View.	
5.	Run the "Depth Check" ribbon command.	Add-ins Featured Apps Express To Image: Draw Parts in Profile Image: Design Depth Check Check Image: Design Depth from Network rk Tools Analyze Launch Pad
6.	Click the far left pipe, then far right valve > ENTER keyboard.	

7.	Verify the value > OK.	Run Depth Check
		Select parameters to check: Minimum depth of cover 2.000m Maximum depth of cover 10.000m
8.	In both plan view and profile view, warning will appear if any Depth	Bysels Water PROFILE
	Check violations are found.	
9.	Hover over any of the warning, a yellow tooltip box will elaborate the details of the warning.	
		From 0+053.90m to 0+083.05m along Syrah Way. Current minimum depth of Cover is 1,492m. Minimum Depth of Cover Required is 2.000m.
10.	Close the drawing WITHOUT saving.	·

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