RQF LEVEL 5

LAND SURYEYING

MODULE CODE: LSVPC501

TEACHER'S GUIDE

Module name: Produce drawings and plans with Covadis software

Table of content

Acronyms

Introduction

LSVPC501: PRODUCE DRAWINGS AND PLANS WITH COVADIS SOFTWARE

Learning Unit 1. Apply Covadis <<Calculus>>

Learning Unit 2. Perform terrain modelling

Learning Unit 3. Produce Covadis Plans

Learning Unit 1: Apply Covadis <<Calculus>>

STRUCTURE OF LEARNING UNIT

Learning outcomes: **1.1** Use Covadis Calculs toolbar **1.2** Visualize data **1.3** Edit and Codify Geobase **1.4** Apply topometric calculation
Learning outcome 1.1 Use Covadis Calculs toolbar **Duration: 5hrs**

Learning outcome 1.1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify correctly lecture carnet

2. Identify correctly Exportation Carnet

3. Systematic Geobase editing

Resources

Equipment	Tools	Materials
- Computer - Printers - Projector - GPS	- Covadis Software - Field data - Storage device - Map source - Microsoft office	- Covadis Manual - Books - Marker pen - Piece of paper - Duster - Whiteboard - Flip chart

Advance preparation:

. he should have an introduction to GPS

. he should have an introduction to Map source software

. he should have an introduction to the Microsoft Office

Content 1.1.1 Identify lecture carnet

Data formats that are often used in Covadis to display data are following

- GPX
- DXF
- GSI
- IDX
- Tab Delimited
- Notepad

GPX is an XML schema designed as a common GPS data format for software application. It can be used to describe waypoints, tracks, and routes.

DXF is drawing Exchange Format for content of AutoCAD Drawing files (DWG)

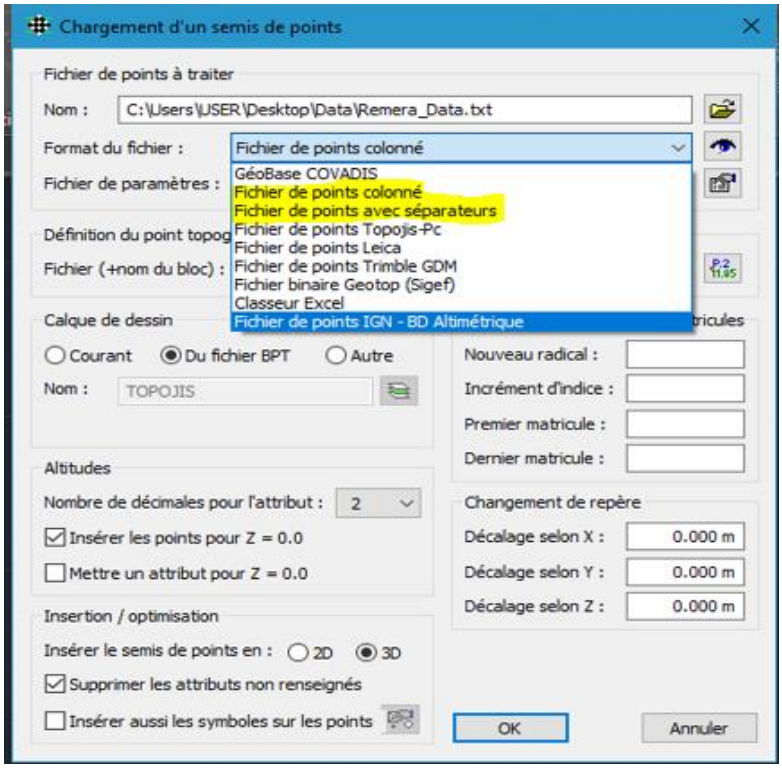
GSI

CSV is a comma-separated values file, which allows data to be saved in a tabular format.

IDX is an index file extension commonly used in Windows to speed up the search process in a database.

File Format

- ✓ Lecture séparateur
- ✓ Lecture colonné
- ✓ Spectra precision



Content 1.1.2 Identify Exportation Carnet

- ✓ Exportation geobase
- ✓ Format d'exportation
- ✓ Export points

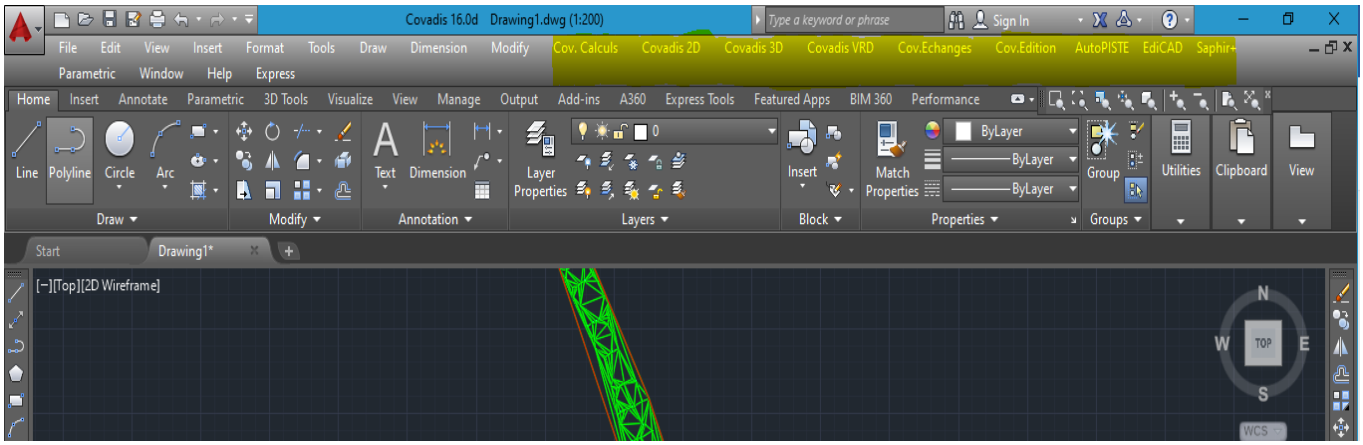
Content 1.1.3 Edition Geobase

- ✓ Edit reference station
- ✓ Edit point
- ✓ Edit Cheminement
- ✓ Edit mesure

- ✓ avant
- ✓ arrière

COVADIS TOPO is divided into 7 applications Menu

- Menu Cov. Calculs
- Menu Covadis 2D
- Menu Covadis 3D
- Menu Covadis VRD
- Menu Covadis échange
- Menu Covadis Edition
- AutoPISTE



Theoretical learning Activity

- ✓ Select any four (4) data formats that are often used to display data in Covadis software.

GSI, XML Data, GPX, SYLK, DIF, PDF, IDX, Tab Delimited.

Answer: the data formats

- ➢ GPX
- ➢ GSI
- ➢ IDX
- ➢ Tab Delimited

Points to Remember (Take home message)

- Data formats used to display data in Covadis
- File formats used to display data in Covadis
- Application Menu for Covadis software

Learning outcome 1 formative assessment

Written assessment

- Assessment tools
  - ✓ True or false questions
  - ✓ Multiple choice
  - ✓ Open ended questions
  - ✓ Case studies

Please mix different assessment tools for triangulation and relevancy of assessment

Practical assessment

- Assessment tools
  - ✓ Assay
  - ✓ Task to be performed
  - ✓ Observation checklist

References:

Learning outcome 1.2 Visualize data format

Duration: 5hrs

Learning outcome 1.2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify Visual symbols with respect to the data format
2. Identify Visual variables
3. Select suitable Visual styles

Resources

Equipment	Tools	Materials
- Computer - Printers - Projector - GPS	- Covadis Software - Field data - CAD software - Internet - Map source	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen - Marker pen - Piece of paper - Duster - Whiteboard - Flip chart

Advance preparation:

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Content 1.2.1 Visual symbols

Types of Visual symbols for data visualization of Covadis software used to display features in Covadis software

1. Linear/ Line feature,
2. Points features
3. Area features
4. Volume features

Content 1.2.2 Visuals variables

Visuals variables that consist of Data visualisation used in Covadis software

- Position
- Form
- Orientation
- Color
- Texture
- Value
- Size

Position is known as Location association takes into account the relationship between other recognizable objects or features in proximity to the target of interest.

Form known as Shape refers to the general form, structure, or outline of individual objects. Shape can be a very distinctive clue for interpretation. Straight edge shapes typically represent urban or agricultural (field) targets, while natural features, such as forest edges, are generally more irregular in shape, except where man has created a road or clear cuts. Farm or cropland irrigated by rotating sprinkler systems would appear as circular shapes.

Texture: Texture refers to the arrangement and frequency of tonal variation in particular areas of features.

Size: Size of objects is a function of scale. It is important to assess the size of features relative to other objects in the field, as well as the absolute size, to aid in the interpretation of that target. A quick approximation of target size can direct interpretation to an appropriate result more quickly.

Content 1.2.3 Visual styles

Types of Visual styles used in Covadis software

- ✓ 2D Wireframe options
- ✓ 2D Hide-Obscured lines
- ✓ 2D Hide-Intersection edges
- ✓ Display resolutions

Theoretical learning Activity

- ✓ Outline the types of Covadis software visual symbols
- ✓ Outline the types of Covadis software variables
- ✓ Outline the types of Covadis software visual styles

Answer

Covadis software Visual symbols are the following

1. Linear/ Line feature,
2. Points features
3. Area features
4. Volume features

Covadis software variables are

- ❖ Position
- ❖ Form
- ❖ Orientation
- ❖ Color
- ❖ Texture

- ❖ Value
- ❖ Size

Covadis software visual styles are

- ✓ 2D Wireframe options
- ✓ 2D Hide-Obscured lines
- ✓ 2D Hide-Intersection edges
- ✓ Display resolutions

Points to Remember (Take home message)

- Visual symbols
- Visual variables
- Visual styles

Learning outcome 1.3 Edit and Codify <<Geobase>>

Duration: 5hrs

Learning outcome 1.3 objectives:

By the end of the learning outcome, the trainees will be able to:

1. …….

2. …….

3. …….

.

n. ……

Resources

Equipment	Tools	Materials

- Computer - Printers - Projector - GPS	- Covadis Software - Field data - CAD software - Internet - AutoCAD/Covadis	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen - Marker pen - Piece of paper - Duster - Whiteboard
Advance preparation: . . .		

content 1.3.1: Edit and Codify <<Geobase>>

<<Calcul de station par intersection>>

<<Calcul de cheminement>>

<<Calcul du point>>

<<Editer une mesure>>.

Theoretical learning Activity

- ✓ …… (example: ask trainees to brainstorm about……. within groups)
- ✓ ……
- ✓ ……

Practical learning Activity

- ✓ …… (Example: Trainees in pair perform ……)

Points to Remember (Take home message)

Learning outcome 1.4 Apply topometric calculation

Indicative content 1.4: Apply topometric calculation

<<Calcul d'intersections>>

<<Calcul de relevements>>

<<Calcul de recoupements>>

<<Calcul de stations décalées>>

<<Calculs de triangulations>>

<<Calcul de cheminements>>

<<Calcul de points rayonnés>>

<<Calcul en block>>

Theoretical learning Activity

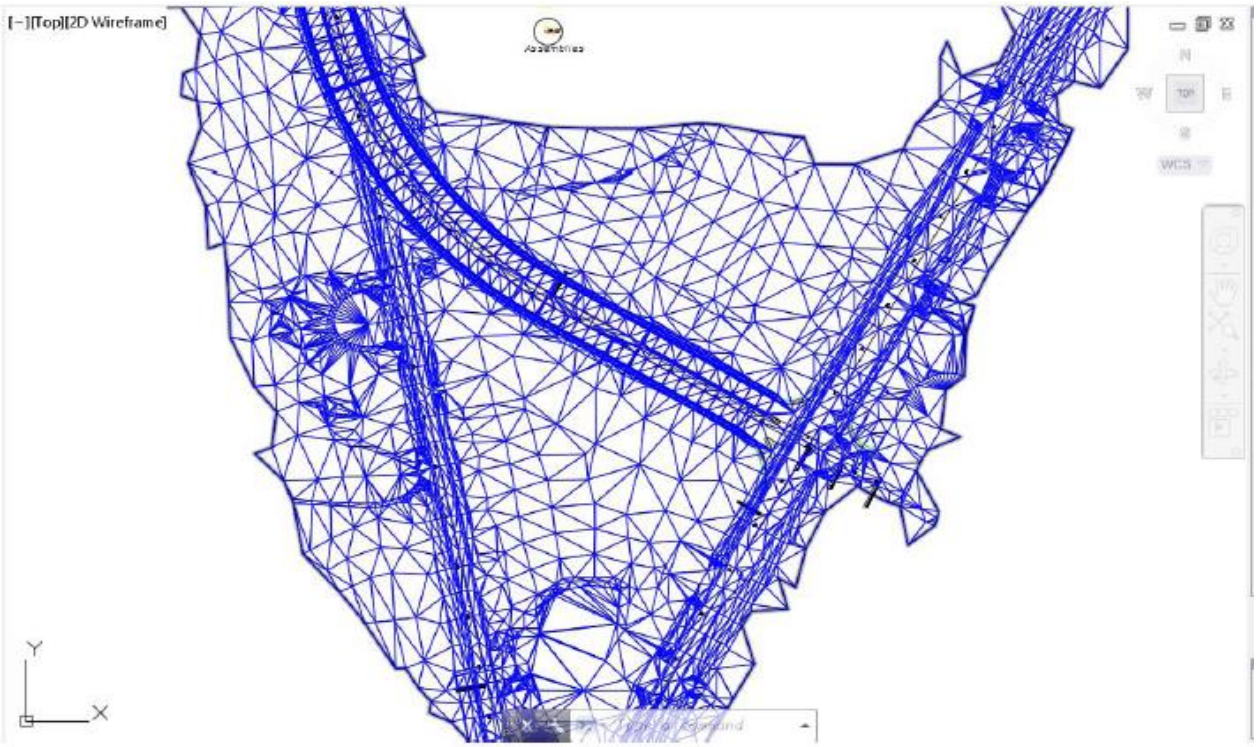
- ✓ …… (example: ask trainees to brainstorm about……. within groups)
- ✓ ……
- ✓ ……

Practical learning Activity

- ✓ …… (Example: Trainees in pair perform ……)

Points to Remember (Take home message)

Learning Unit 2: Perform terrain modelling



STRUCTURE OF LEARNING UNIT

Learning outcomes: **2.1** Proper creation of Triangular Irregular Network with respect to their use **2.2** Appropriate creation of Contours according to the nature of terrain **2.3** Efficient production of longitudinal profiles according to their use **2.4** Methodical production of cross-section profiles according to their use **2.5** Precise computation of volumes with respect to the work
Learning outcome 2.1 Create Triangular Irregular Network **Duration: 5hrs**

Learning outcome 2.1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Open correctly Covadis software
2. Display correctly Data in Covadis Software
3. Create clearly Triangular Irregular Network (TIN)
4. Create clearly the Plot Boundary.

Resources

Equipment	Tools	Materials
- Computer - Printers - Projector	- Covadis Software - Field data - CAD software - Internet - AutoCAD/Covadis	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen

Advance preparation:

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Content 2.1.1: Steps of Creating Triangular Irregular Network(TIN)

Perform Data Modelling

a) TIN stands for ''Triangulated Irregular Network''.

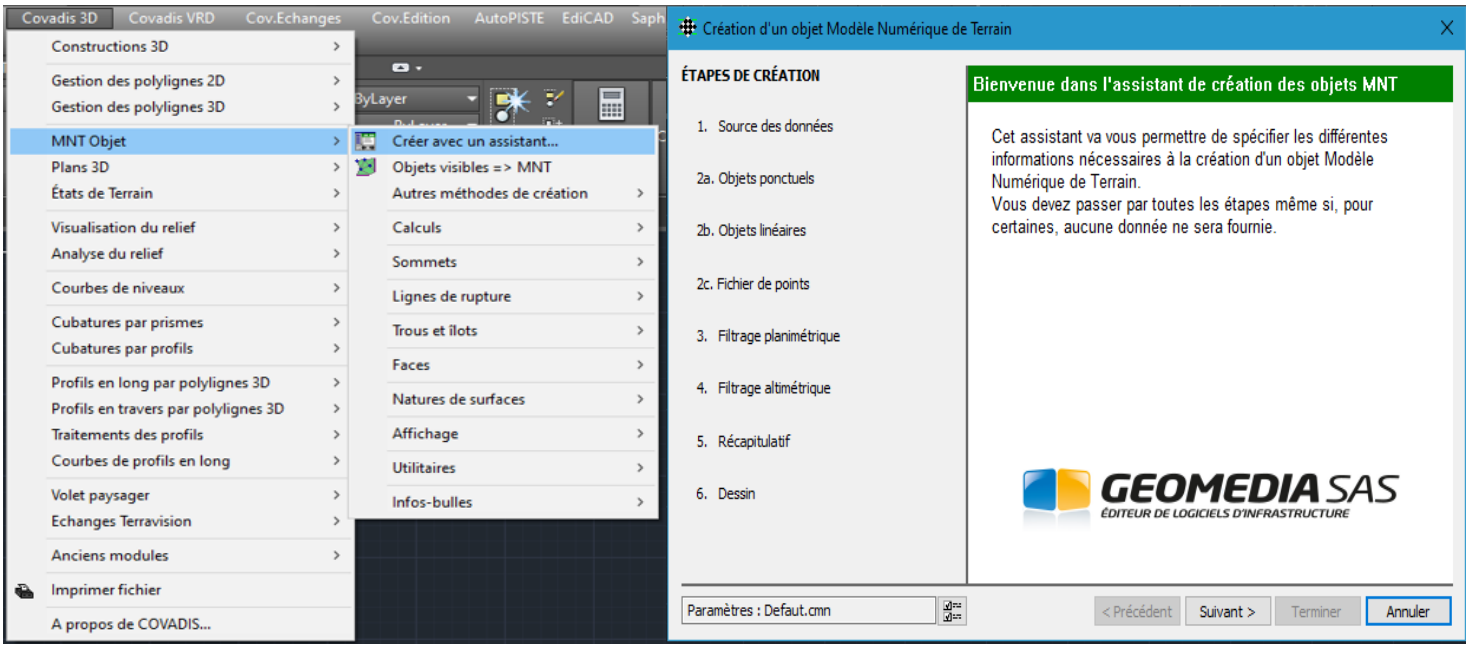
b) TINs are generated from points, polygons and lines.

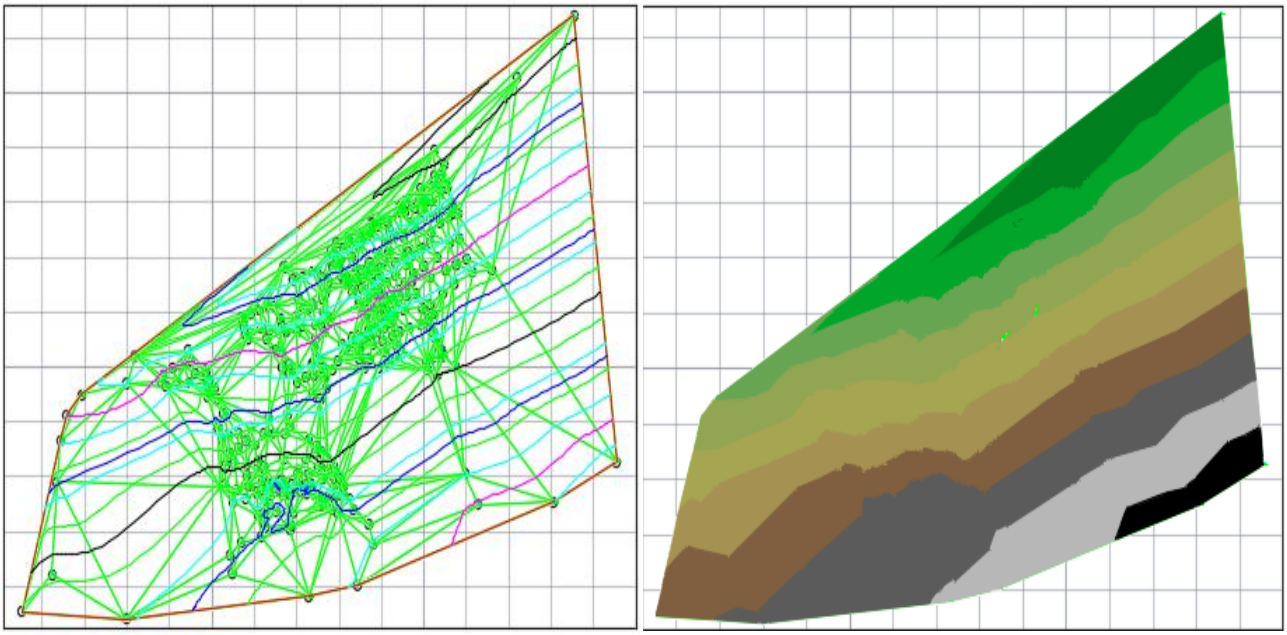
c) Points used in defining the tin are called mass points.

The Steps of creating TIN

1st Method

- Open Covadis 3D
- MNT Object
- Création avec d'un Object modèle Numérique de Terrain (MNT/TIN)
- Click sur suivant jusqu'à la Dessin or
- Open Covadis 3D ⟹ MNT Object ⟹ Object visible de MNT





2rd Method

- ✓ Open Covadis 3D
- ✓ Calcul de MNT
- ✓ Calcul et dessin de MNT
- ✓ Chargement de points et de lignes de rupture + configuration
- ✓ Interprétation du résultat du chargement de points et de lignes de rupture
- ✓ Statistiques du chargement et du calcul
- ✓ Modèle Numérique du Terrain (MNT) (TIN)

Theoretical learning Activity

- ✓ Enumerate the steps of TIN (triangular irregular network) creation in Covadis software.

Answer

The Steps of TIN creation are as follow

- Open Covadis 3D
- Onglet Calcul et dessin de MNT
- Chargement de points et de lignes de rupture + configuration

- Interprétation du résultat du chargement de points et de lignes de rupture.
- Statistiques du chargement et du calcul.
- Modèle Numérique du Terrain (TIN.

Practical learning Activity

✓ Create triangular irregular network

Points to Remember (Take home message)

- Steps of Displaying Data in Covadis Software
- Steps of Creating Triangular Irregular Network(TIN)

Learning outcome 2.2 Create contours

Duration: 5hrs

Learning outcome 2.2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Create clearly Topographic Map
2. laber properly Topographic Map

Resources

Equipment	Tools	Materials

- Computer - Printers - Projector - GPS	- Covadis Software - Field data - CAD software - Internet - Map source	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen
Advance preparation: . . .		

Content 2.2.1: Methods of creation of contourlines

Methods of creation of contour lines using Covadis

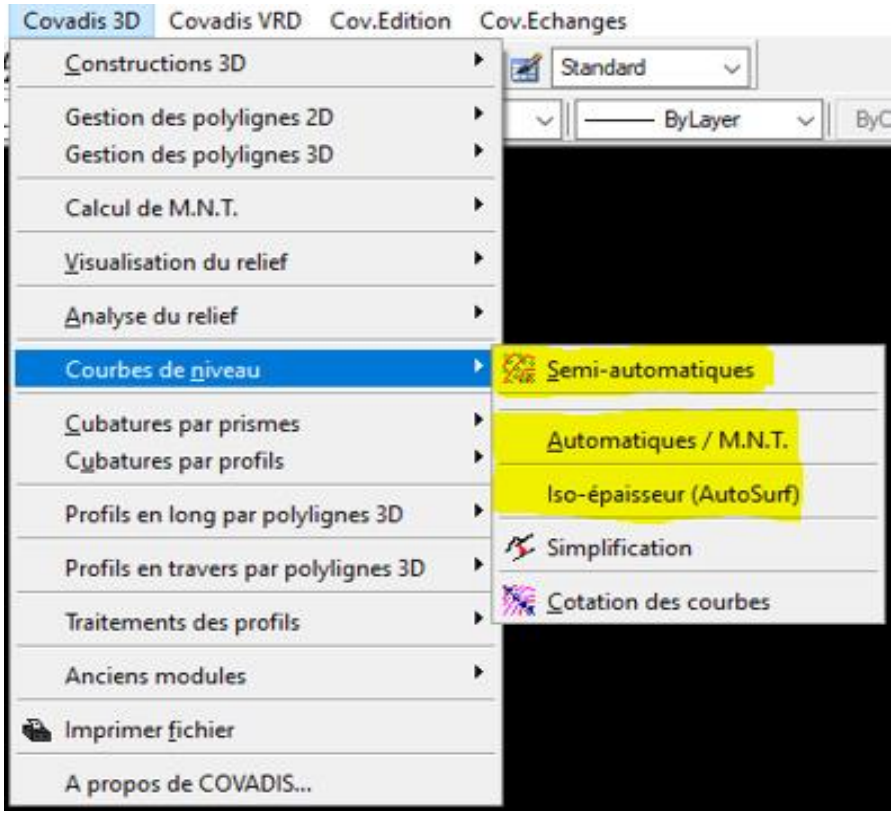
- Semi-automatic method
- Automatic method

Steps of Creating Contour lines

Single click on Covadis 3D on Menu Bar then

Courbes de niveau

- ✓ Semi-automatique
- ✓ Automatique/MNT
- ✓ Iso-épaisseur



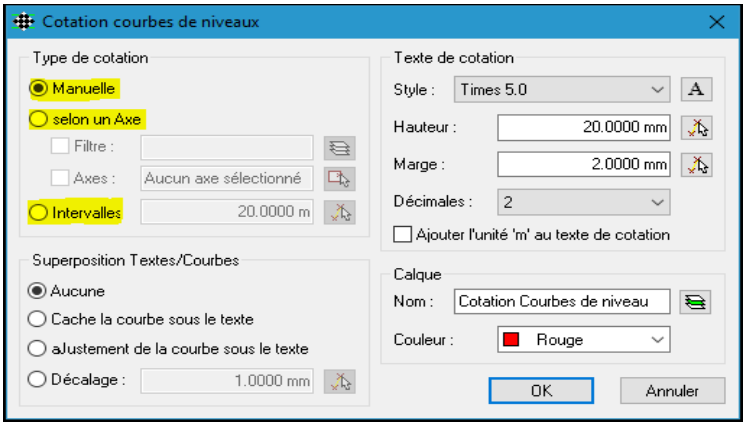
Content 2.2.2: Cotation de courbes de niveau

- ✓ Types de cotation
- ✓ Texte de cotation
- ✓ Types de Calque

Covadis 3D ⟹ Courbes de niveau ⟹ Automatique/MNT

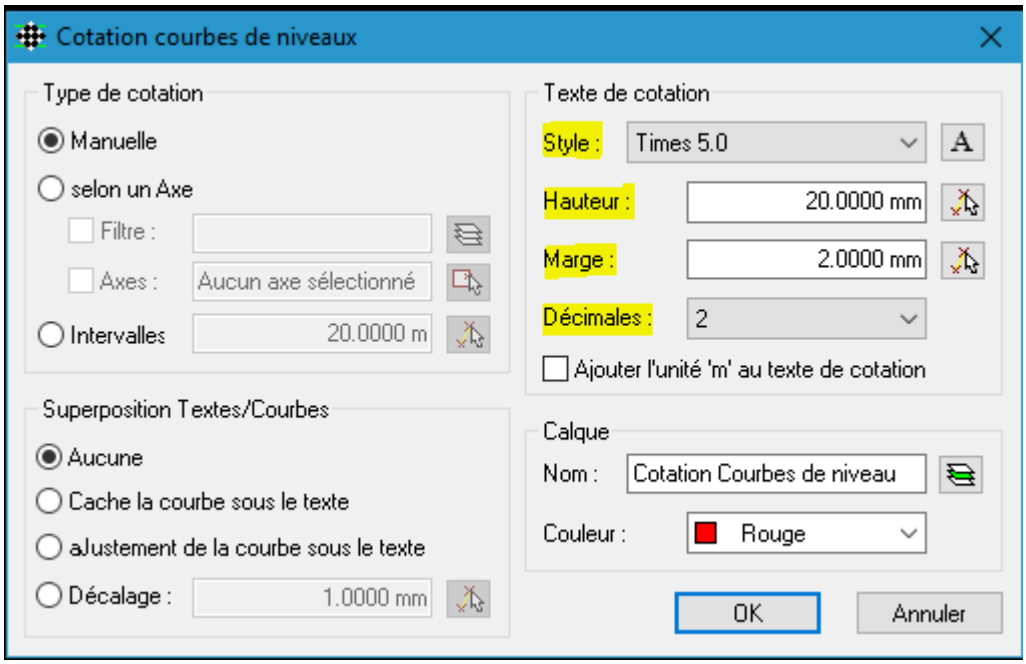
Types de cotation

- Manuel
- Selon un axe
- Intervalles



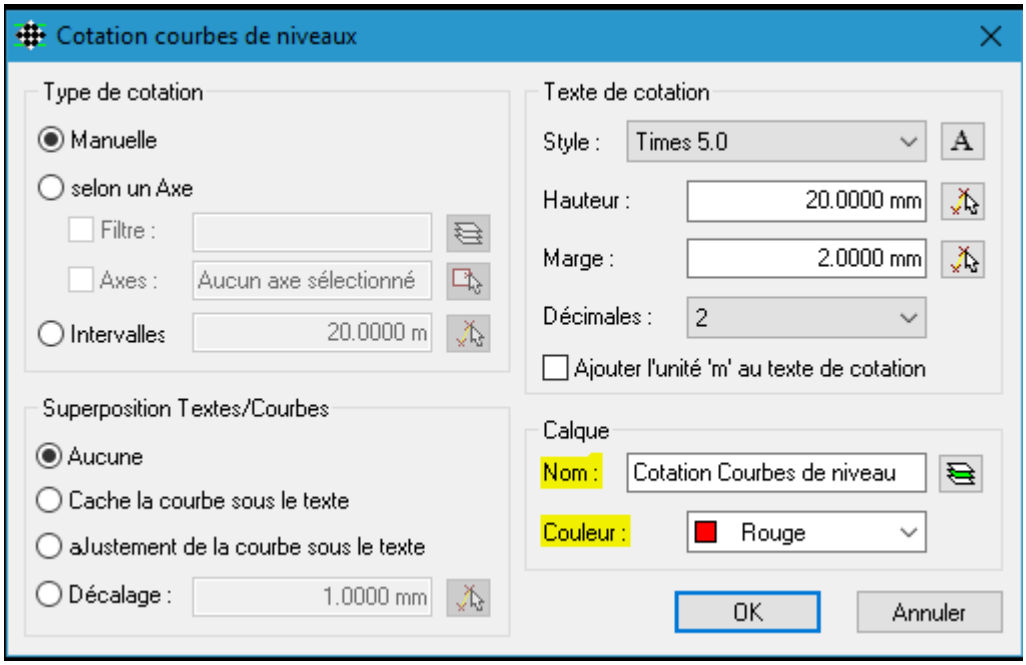
Texte de cotation

- Style
- Hauteur
- Marge
- Decimals

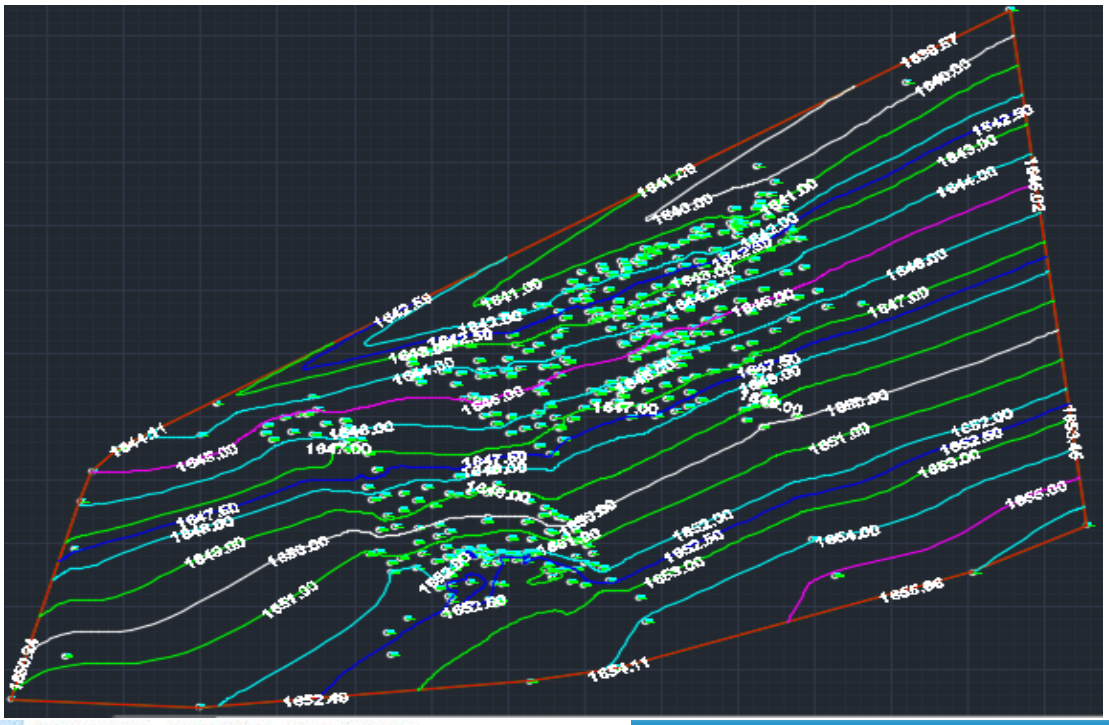


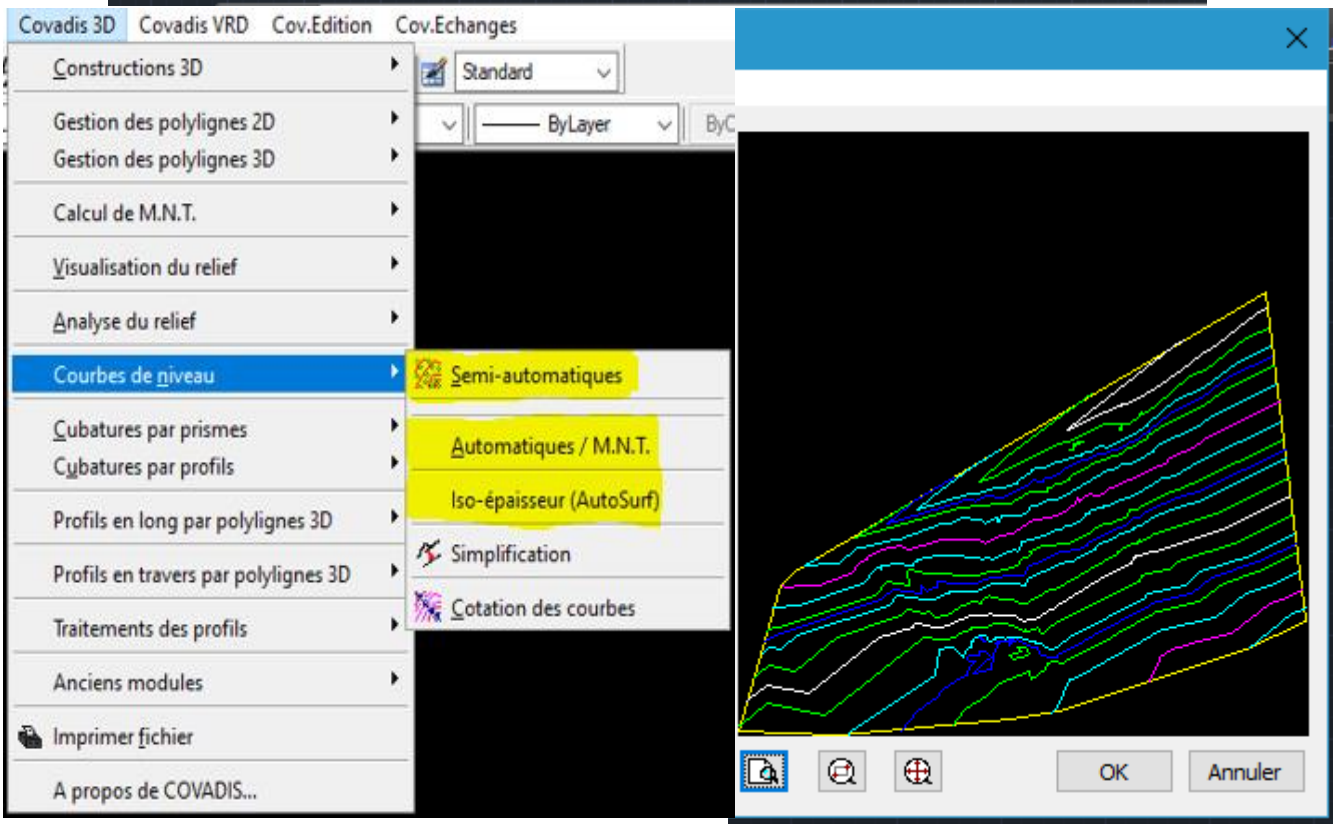
Types de Calque

- Nom
- Couleur



Cotation de courbes de niveau





Relevant production of contour lines according to the nature of terrain.

A map showing only the contour lines of an area is called contour map

Contour interval

- The constant vertical distance between two (2) consecutive contours is called the *"contour interval"*.

Horizontal equivalent

- The horizontal distance between any two (2) adjacent contours is called as *"horizontal equivalent".*
- The contour interval is constant between the consecutive contours while the horizontal equivalent is variable and depends upon the slope of the ground.

Components of the map

1. Distance scale
2. Direction (orientation indicators
3. Symbol
4. main body
5. Legend
6. Title

Data Frame is the portion of the map that displays the data layers. This section is the most important and central focus of the map document.

Creation of contour lines/ contour Map

A contour line is an imaginary line which connects points of equal elevation. After establishing reduced levels of several points in the area.

Contour interval is the distance between 2 contour line.

Characteristics of contours

The contours have the following characteristics:

2. Widely spaced contour indicates flat surface.

3. Closely spaced contour indicates steep ground.

4. Equally spaced contour indicates uniform slope.

5. Irregular contours indicate uneven surface.

6. Approximately concentric closed contours with decreasing values towards centre indicate a pond.

7. Approximately concentric closed contours with increasing values towards centre indicate hills.

8. Contour lines with U-shape with convexity towards lower ground indicate ridge

9. Contour lines with V-shaped with convexity towards higher ground indicate valley

10. Contour lines generally do not meet or intersect each other.

11. If contour lines are meeting in some portion, it shows existence of a vertical cliff

12. If contour lines cross each other, it shows existence of overhanging cliffs or a cave

USES OF CONTOUR MAPS

Contour maps are extremely useful for various engineering works:

- A civil engineer studies the contours and finds out the nature of the ground to identify **Suitable site for the project** works to be taken up.
- By **drawing the section** in the plan, it is possible to find out profile of the ground along that line. It helps in finding out depth of cutting and filling, if formation level of road, railway is decided.
- To mark the alignment of roads and railways so that the quantity of earthwork both in cutting and filling should be minimum.
- To locate the physical features of the ground such as a pond depression, hill, steep or small slopes.
- **Catchment area** and hence quantity of water flow at any point of river can be Found. This study is very important in locating bunds, dams and also to find out flood levels.

Settings of contour line are:

1. Interval,
2. Order
3. Altitude minimal/maximal and
4. Color

Theoretical learning Activity

1. Define contour

Answer

Contour: An imaginary line on the ground surface joining the points of equal elevation is known as "contour".

2. What is difference between a contour interval and horizontal equivalent?

Answer

The contour interval is constant between the consecutive contours while the horizontal equivalent is variable and depends upon the slope of the ground.

3. Show the methods used in creation of contour lines using Covadis software.

Answer

The methods used in creation of contour lines using Covadis software are:

- Semi-automatic method
- Automatic method

4. A map is drawn to a scale 1 cm=25 km. If the distance between two points **A** and **B** in the map is 12cm. calculate the actual distance between point **A** and point **B.**

Answer

- 1cm = 25km
  distance between A and B = 9cm
  1cm = 25km

12cm=12×25**=300km**
Distance between point **A** and point **B** = **300 km**

5. Show the methods used in creation of contour lines using Covadis software.

Answer

The methods used in creation of contour lines using Covadis software are:

- Semi-automatic method

- Automatic method

Points to Remember (Take home message)

- Methods of creation of contourlines
- Cotation de courbes de niveau

Learning outcome 2.3 Produce longitudinal profiles

Duration: 5hrs

Learning outcome 2.3 objectives:

By the end of the learning outcome, the trainees will be able to:

1. …….

2. …….

3. …….

.

n. ……

Resources

Equipment	Tools	Materials

- Computer - Printers - Projector - GPS	- Covadis Software - Field data - CAD software - Internet - Source map	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen
Advance preparation: . . .		

Content 2.3.1: the Steps of Longitudinal profiles production

1st Methods by using Covadis VRD

- Open Covadis VRD
- Project lineare par profil type
- Afficher la barre d'outils

Apres d'affichage de project lineaire par profil type.

- Axe en plan
- Creer un axe par P.I (Point of Intersection)

Sur parametrage de l' axe en plan

- Setting interval between 2 abscises
- Continouer

- Creer un axe par les points d'intersection
- Dessin

Gestion des projet

- Nouveau projet
- Selectioner axe en plan
- Creer

Tabulation et profils en travers

- Tabular l'axe
- Parameter des intervalles
- Largeur des nouvelles tabulation
- Ok

Profil en long du TN et courbe projet

- Nouveeau profile en long TN
- Dessiner

Profil en long et courbe projet

- Construction du projet
- Pentes/Rampes
- Dessiner la ligne

Road is a wide way leading from one place to another, especially one that vehicles can use.
Traffic" means the total volume of vehicles encountered in both directions on the road in the considered period.

Classification of road basing on region where the road is located,

A. Arterial roads/ Primary roads

B. Collector roads/ Secondary roads

C. Street roads/Rural roads

A. Arterial roads/ Primary roads: These are the main roads connecting national and international centers.
B. Collector roads/ Secondary roads: They have the function of linking traffic either to/from rural areas, direct to adjacent urban centers or to the arterial road.

C. Street roads/Rural roads: These are the lowest level in the road hierarchy. They are only sufficient to provide appropriate access to the rural agricultural, population and commercial small centers served.

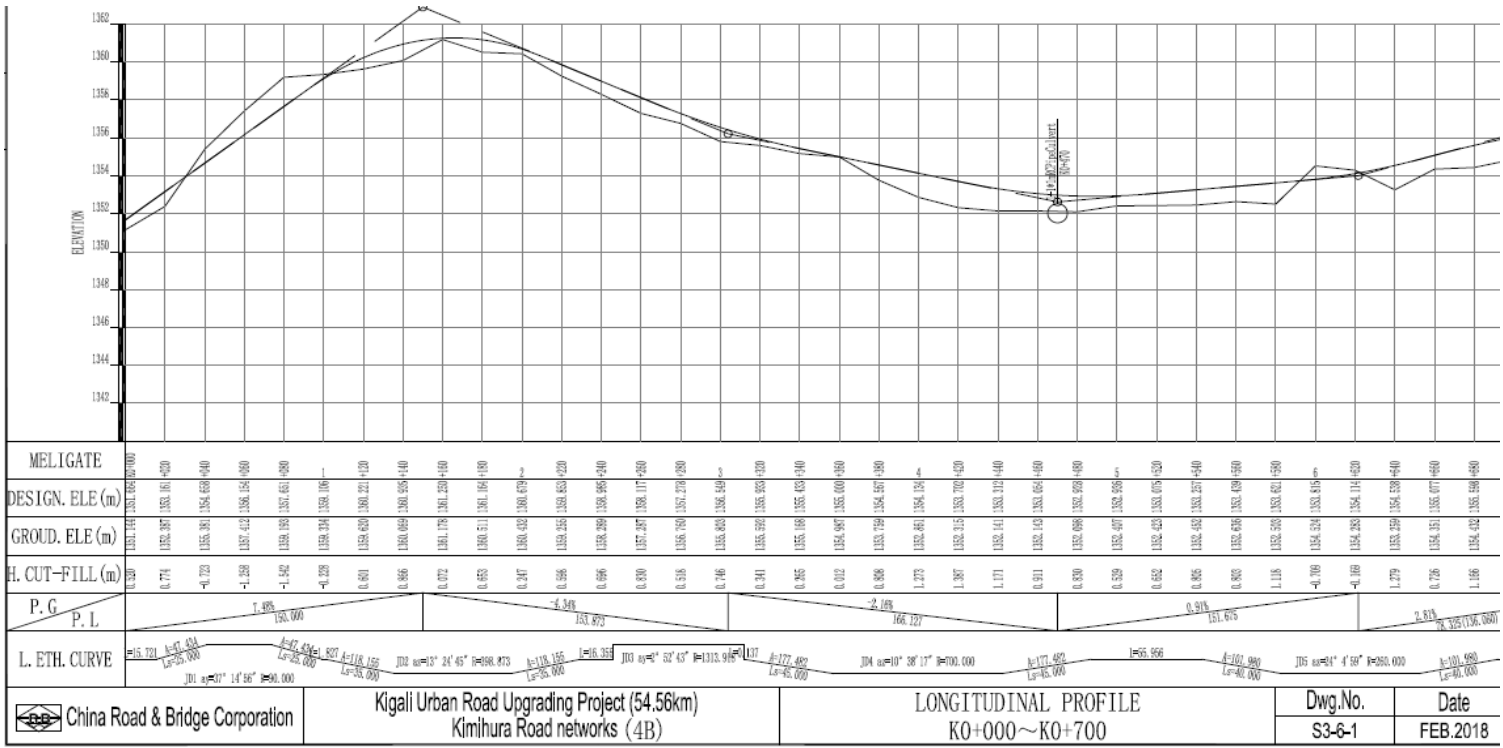
Road has 2 Types of Profile

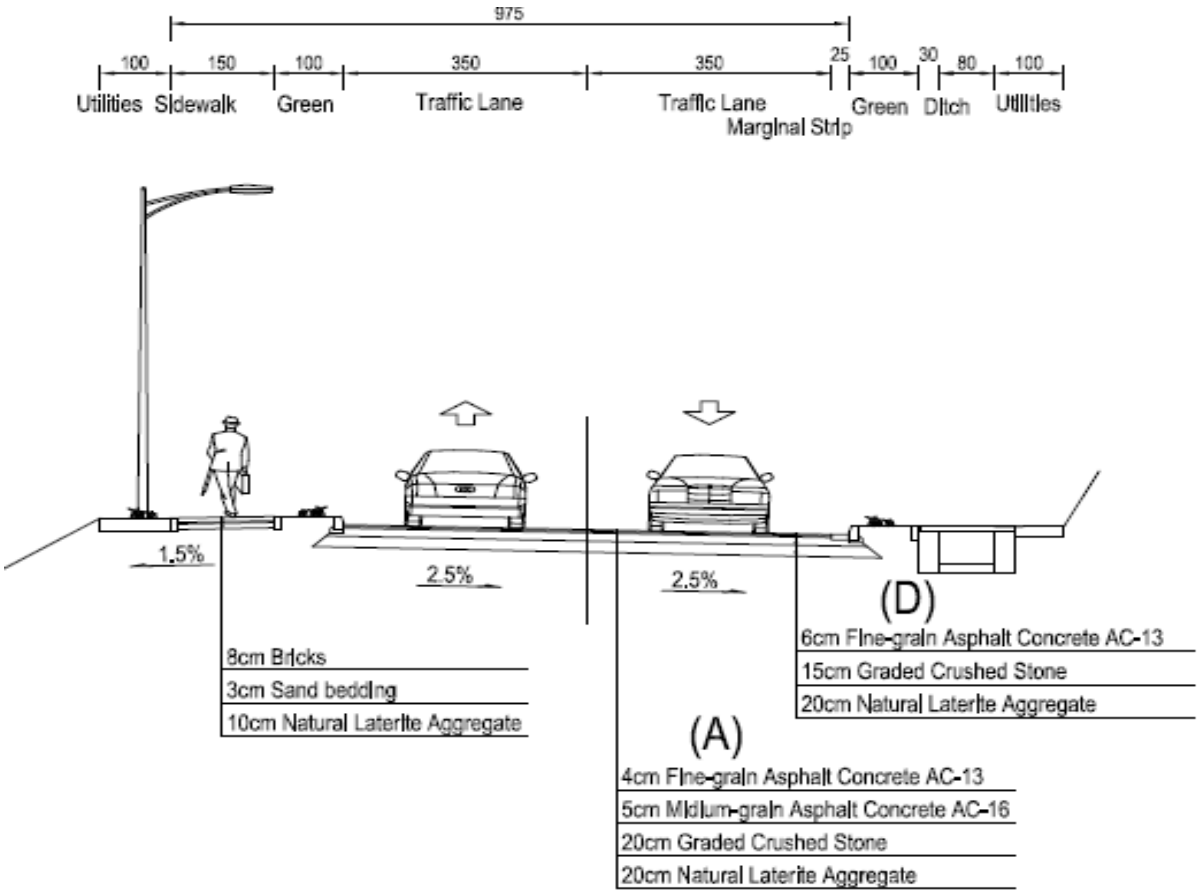
- ✓ Longitudinal profiles
- ✓ Cross-section profiles

Longitudinal profiles of the road is defined as the vertical section cut the road along its centre line/ along its length.

Cross-section profiles of the road is defined as the vertical section cut the road along its width.

1. Longitudinal profiles

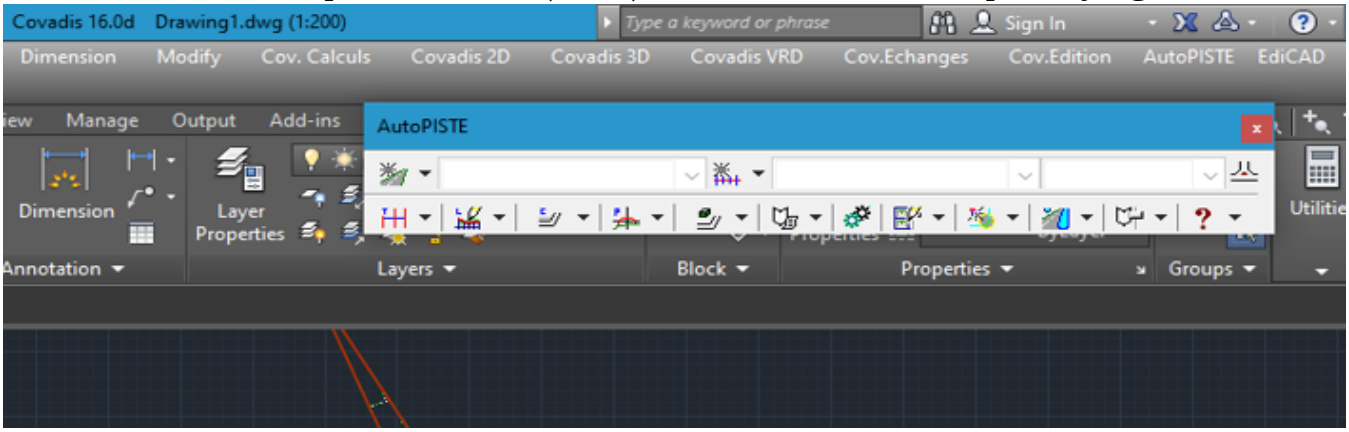


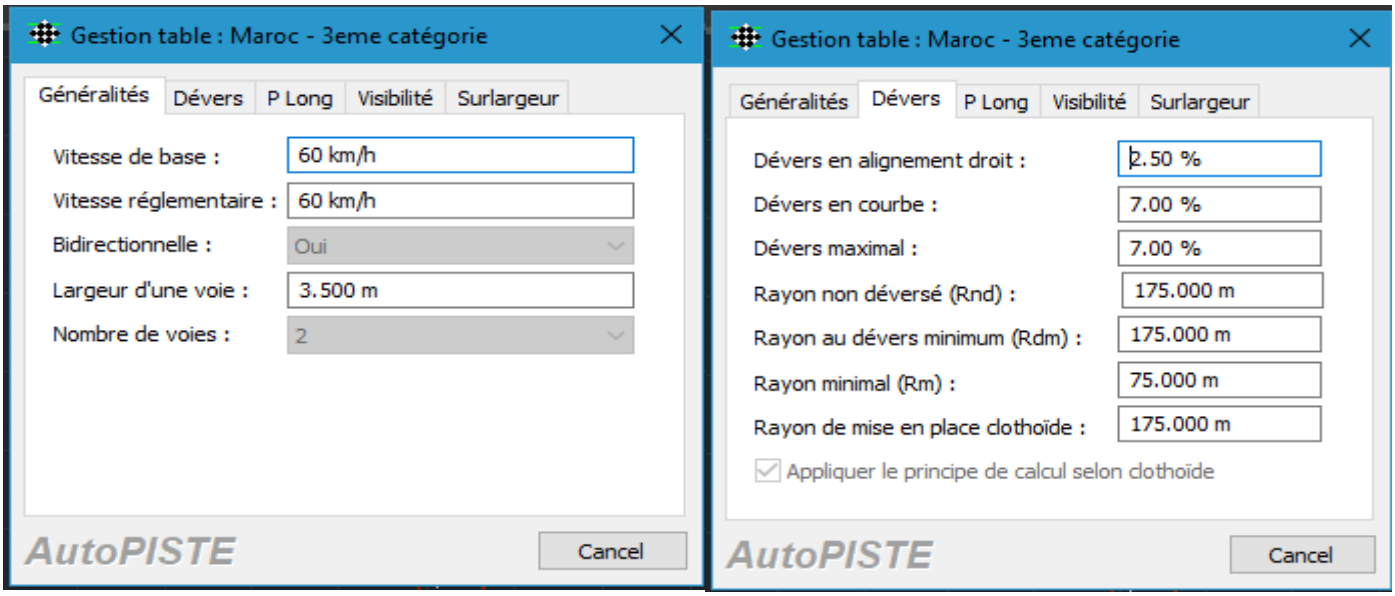


2. Cross-section profiles

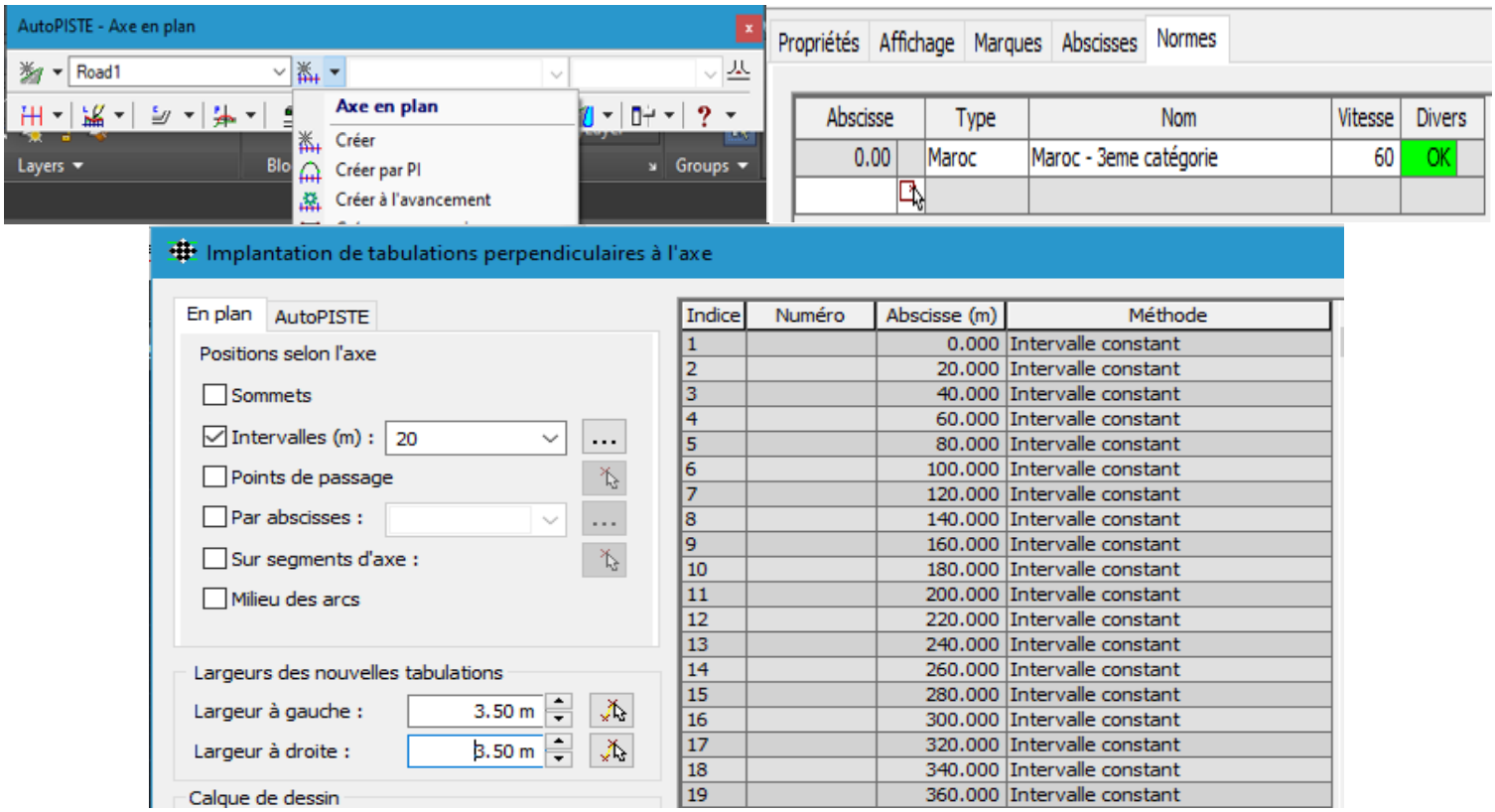
2rd Methods by using AutoPISTE

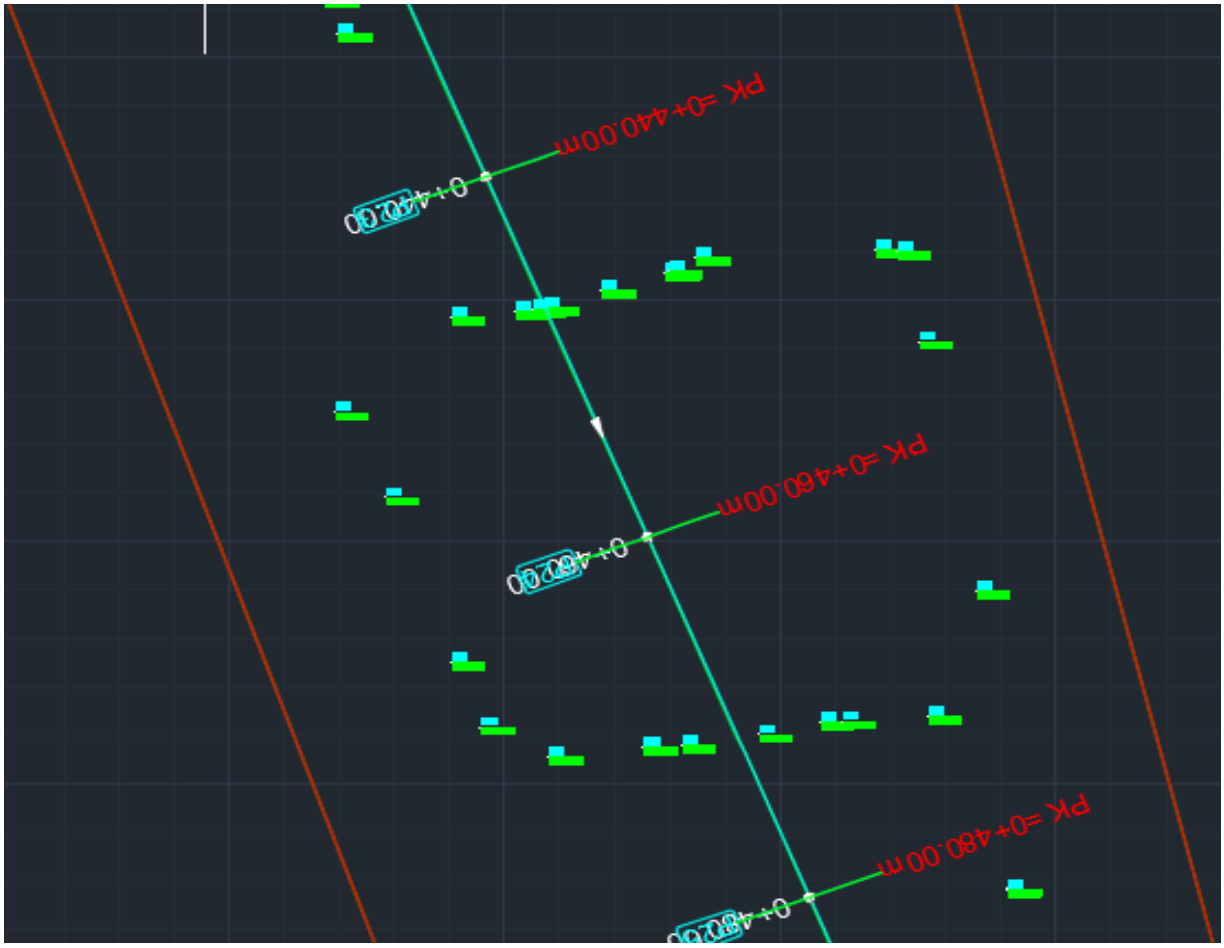
1. Display AutoPISTE Toolbar by single click on AutoPISTE Menu
2. Create new Road project
3. Choose design speed according to the country design speed (60km/h)
4. Choose lane superelevation= (2.5%) and vertical curve slope varying 0-7%





3. Creation of center line of the road ⟹ Créer par PI

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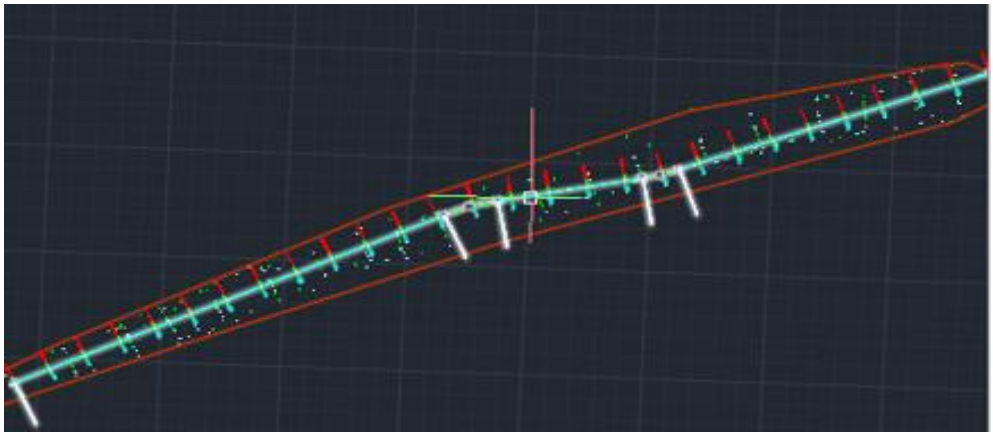
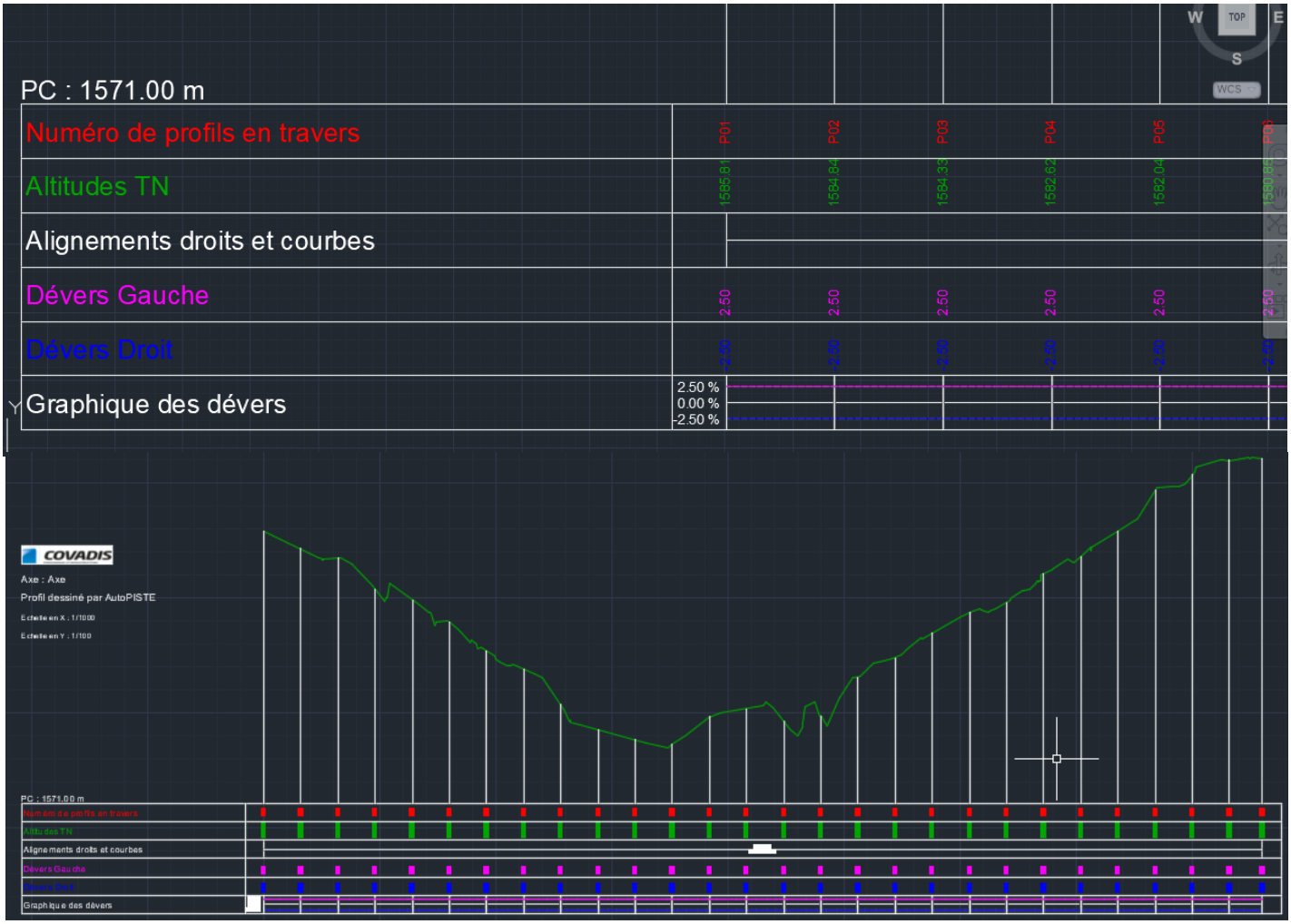
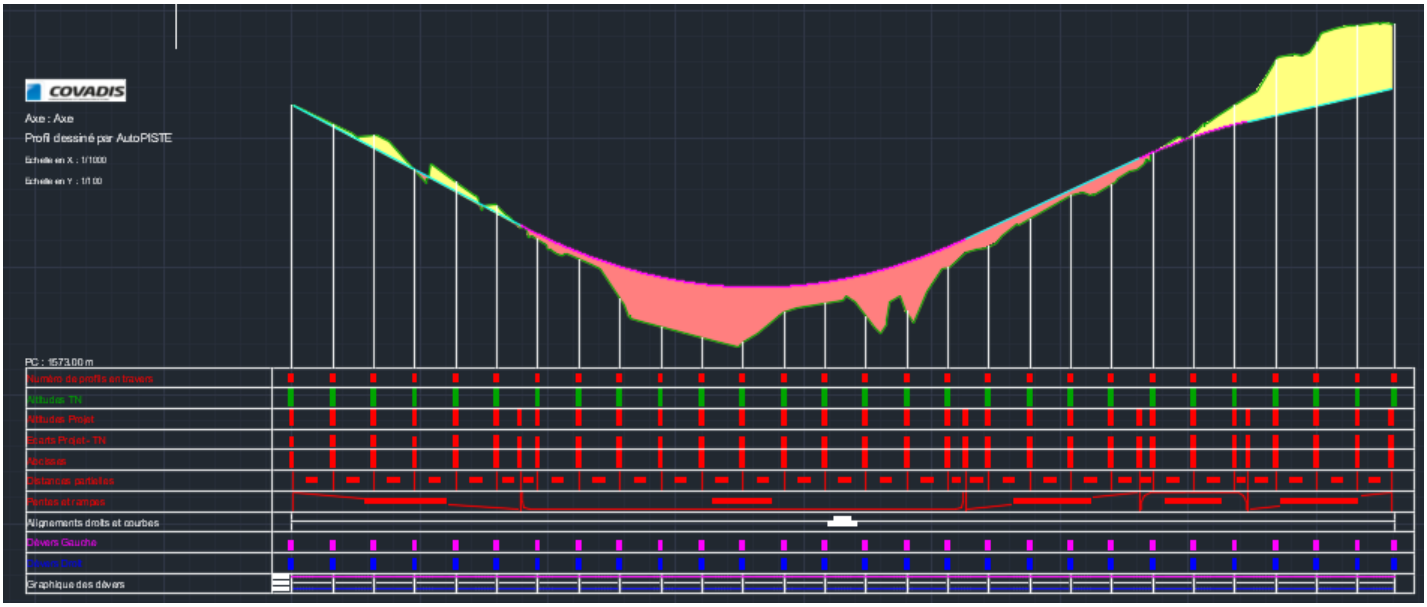


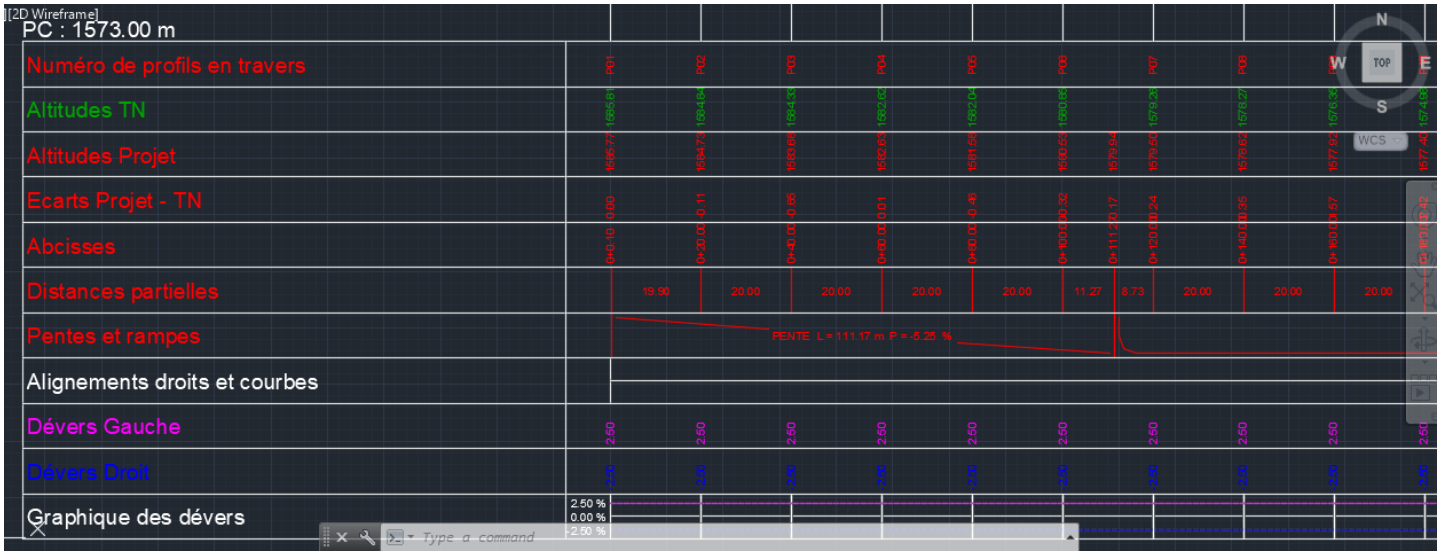
Produce longitudinal profiles for Ground level



Procedure longitudinal profiles of Design Level for new Road Project according to the existing Ground Level

- Click on Profil en Long
- Pente/Rampe
- Créer





Theoretical learning Activity

- ✓ …… (example: ask trainees to brainstorm about……. within groups)
- ✓ ……
- ✓ ……

Practical learning Activity

- ✓ …… (Example: Trainees in pair perform ……)

Points to Remember (Take home message)

Learning outcome 2.4 Produce cross-section profiles **Duration: 10hrs**		
Learning outcome 2.4 objectives: By the end of the learning outcome, the trainees will be able to: 1. ……. 2. ……. 3. ……. . n. ……		
Resources		
Equipment	**Tools**	**Materials**

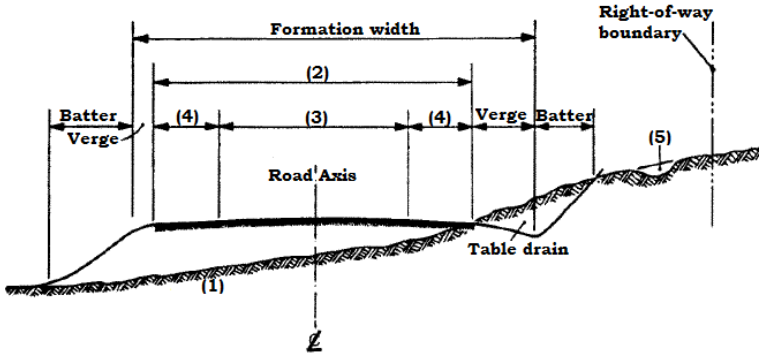
- Computer - Printers - Projector -	- Covadis Software - Field data - CAD software - Internet -	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen
Advance preparation: . . .		

Content 2.4.1: Steps of cross-section profiles Production

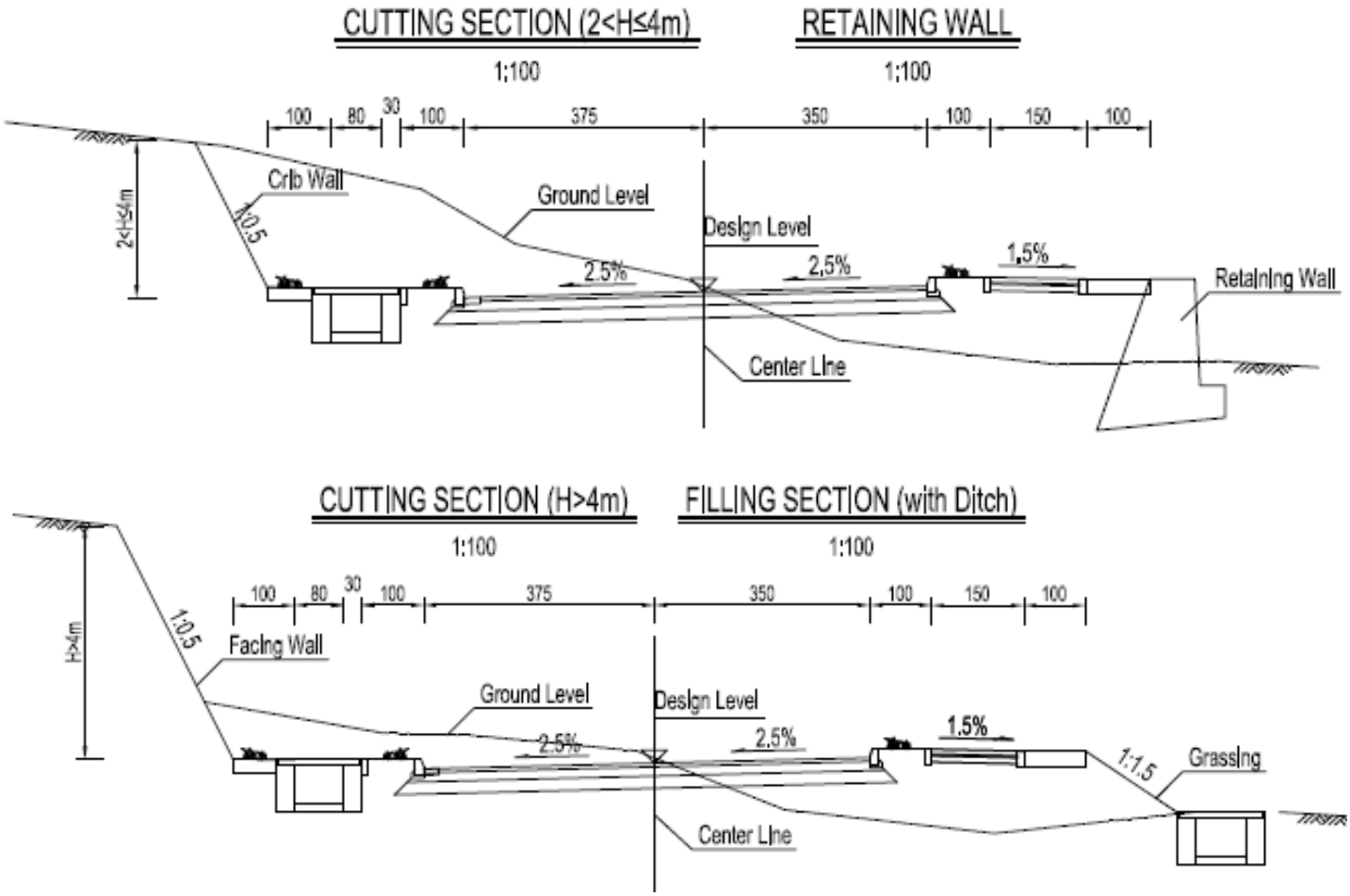
Cross-section profiles of the road is defined as the vertical section cut the road along its width.

2.4.1 Cross sectional setting out of a typical road

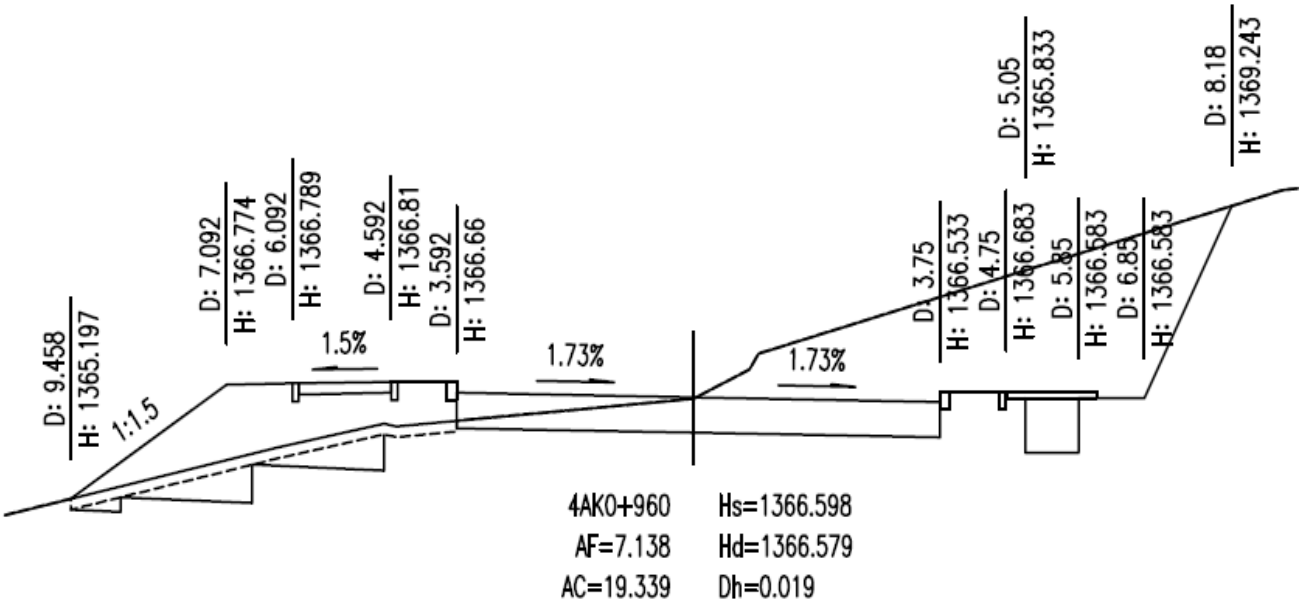
(1)Natural surface;
(2)Carriageway;
(3)Traffic lanes;
(4)Shoulder;
(5)Catch drain.

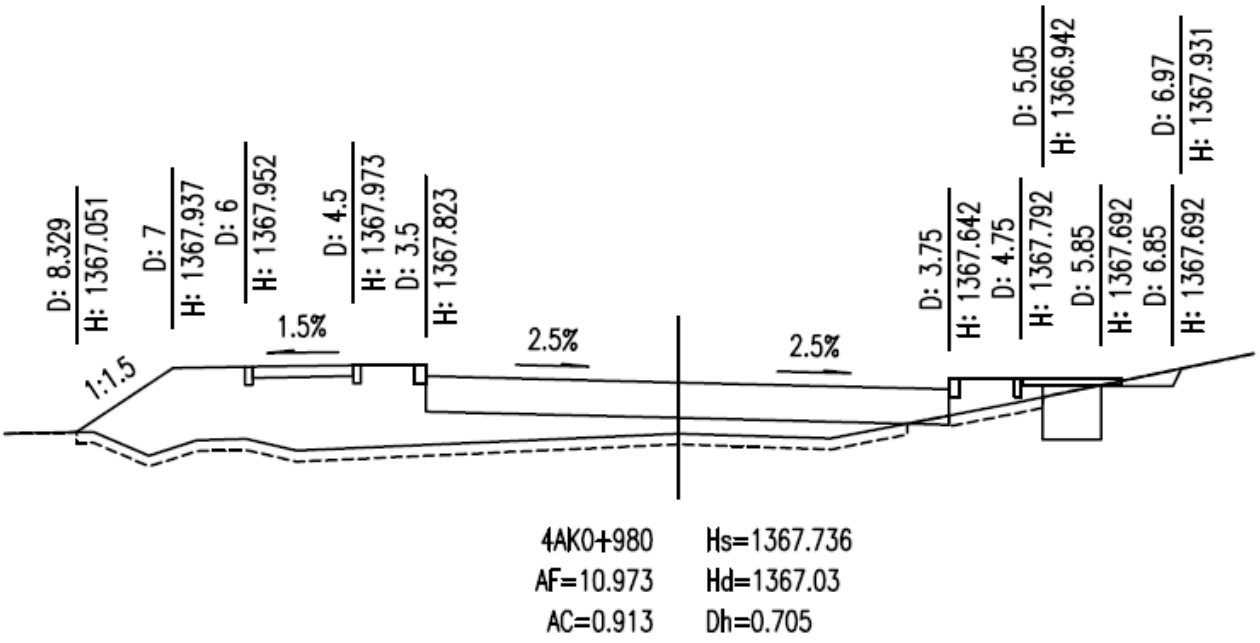


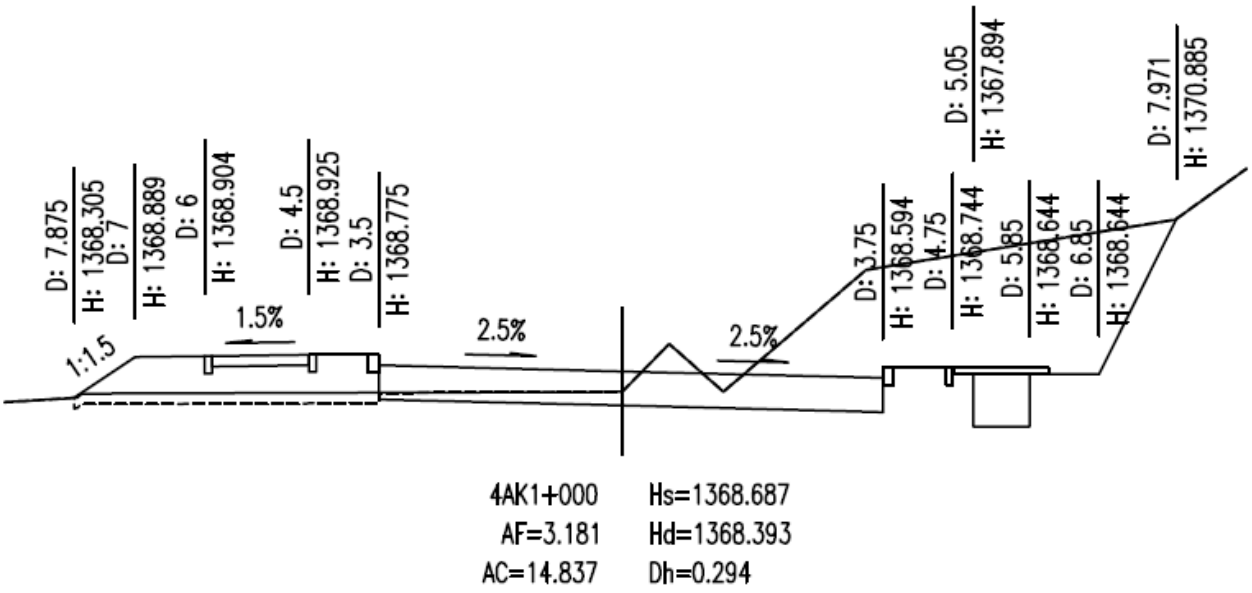
2.4.2 Cut and fill on cross-section profiles



2.4.3 Cross-section profiles with elevation and its calculation







Steps of longitudinal profile production

Mise en place des donnees

Parametrage du profil

Definition et tabulation de l'axe

Manipulation et modification des profils en travers

Dessin des profils en travers

Manipulation and modification of cross-section profiles

- ✓ Affecter les profils types
- ✓ Longueurs d'aplication
- ✓ Gérer les types des points
- ✓ Calculer le projet
- ✓ Dessiner les profils en travers du projet (draw the cross-section profiles of project).

Affecter les profils types

- ✓ Point d'axe
- ✓ Profile type
- ✓ Tout sélectionner
- ✓ Affecter la profils a gauche
- ✓ Affecter la la profils a droite
- ✓ Affecter la profile décapage
- ✓ Masquer les axes

- ✓ Echelle de vue en z (scale view in z)

Gérer (manage) les types des points

- ✓ Gestion des types des points du projet
- ✓ Types des points utilizes
- ✓ Dévers
- ✓ Editer le tableau des variation
- ✓ Dévers
- ✓ Calcul des dévers de données (data)
- ✓ Selectionnez début de point du PK (Starting point)
- ✓ Selectionnez fin de point du PK (final or last point)
- ✓ Select dévers gauche (left slope of road from the center)
- ✓ Select dévers droite (right slope of road from the center)
- ✓ Cote interier select cote droite
- ✓ Calcule then ok

Calculer le projet

- ✓ Controle des type des profils en Travers (control the type of cross-section profiles)
- ✓ Calculer les profils (from the first to the last point)
- ✓ Calculer d'un profils en travers
- ✓ Echelle de vue en z (scale view in z)
- ✓ Dessiner (draw)
- ✓ Listing general et exports du projet complet
- ✓ Select file format (word) then
- ✓ Ok

Dessiner les profils en travers du projet (draw the cross-section profiles of project).

Theoretical learning Activity

- ✓ **……** (example: ask trainees to brainstorm about……. within groups)
- ✓ **……**
- ✓ **……**

Practical learning Activity

- ✓ …… (Example: Trainees in pair perform ……)

Points to Remember (Take home message)

Learning outcome 2.5 Compute Volumes **Duration: 5hrs**
Learning outcome 2 objectives: By the end of the learning outcome, the trainees will be able to: 1. ……. 2. ……. 3. ……. . n. ……
Resources

Equipment	Tools	Materials

- Computer - Printers - Projector - GPS	- Covadis Software - Field data - CAD software - Internet - Map source	- Covadis Manual - Books - Tutorials - Notebooks - Pens - Whiteboard/ Black board - Marker pen
Advance preparation: . . .		

Content 2.5.1: Methods of volume computation

Methods of volume computation in Covadis software

- ✓ Cubature par prisms
- ✓ Cubature par Profils

Content 2.5.2: Cubature entre un MNT et un plan horizontal

Content 2.5.2: Cubature entre un MNT et un plan horizontal

Theoretical learning Activity

- ✓ **……** (example: ask trainees to brainstorm about……. within groups)
- ✓ **……**
- ✓ **……**

Practical learning Activity

- ✓ **……** (Example: Trainees in pair perform ……)

Points to Remember (Take home message)

Learning Unit 3: Produce Covadis Plans

STRUCTURE OF LEARNING UNIT

Learning outcomes:

3.1 Identify the types of plans
3.2 Produce horizontal plans
3.3 Produce inclined plans
3.4 Determine the formation levels
3.5 Design the roundabout
3.6 Edit the title block

Learning outcome 1.1 Use Covadis Calculs toolbar

Duration: 5hrs

Learning outcome 1.1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify correctly lecture carnet

2. Identify correctly Exportation Carnet

3. Systematic Geobase editing

Resources		
Equipment	**Tools**	**Materials**
- Computer - Printers - Projector - GPS	- Covadis Software - Field data - Storage device - Map source - Microsoft office	- Covadis Manual - Books - Marker pen - Piece of paper - Duster - Whiteboard - Flip chart
Advance preparation: . he should have an introduction to GPS . he should have an introduction to Map source software . he should have an introduction to the Microsoft Office		

Content 1.1.1 Identify lecture carnet

Theoretical learning Activity

- ✓ **……** (example: ask trainees to brainstorm about……. within groups)

- ✓ **……**
- ✓ **……**

Practical learning Activity

- ✓ **……** (Example: Trainees in pair perform ……)

Points to Remember (Take home message)