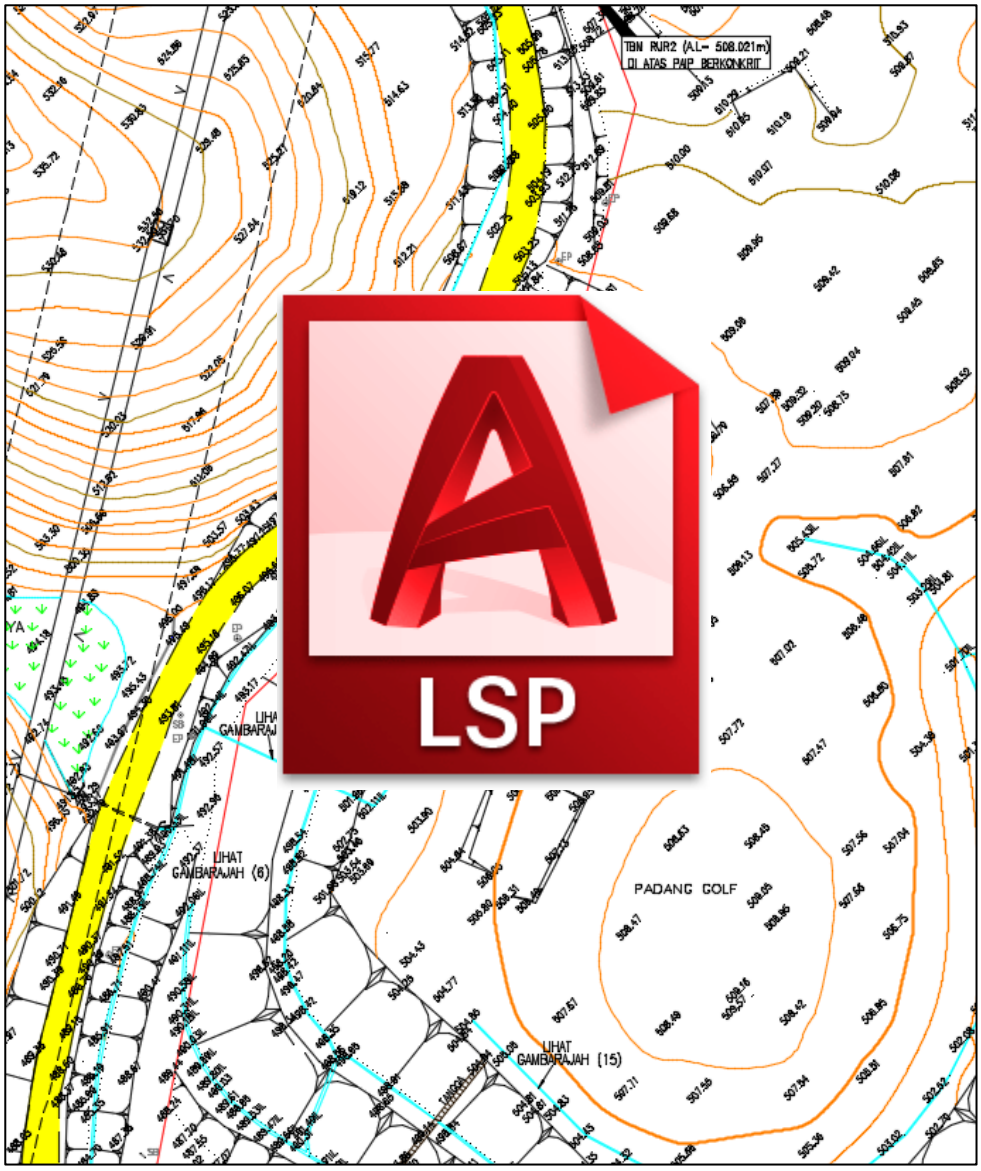
LISP APPLICATIONS IN SURVEYING PLAN DRAFTING



FIRHAN BIN SALIAN

SITI NURAZRIN BINTI SHEIKH ISMAIL

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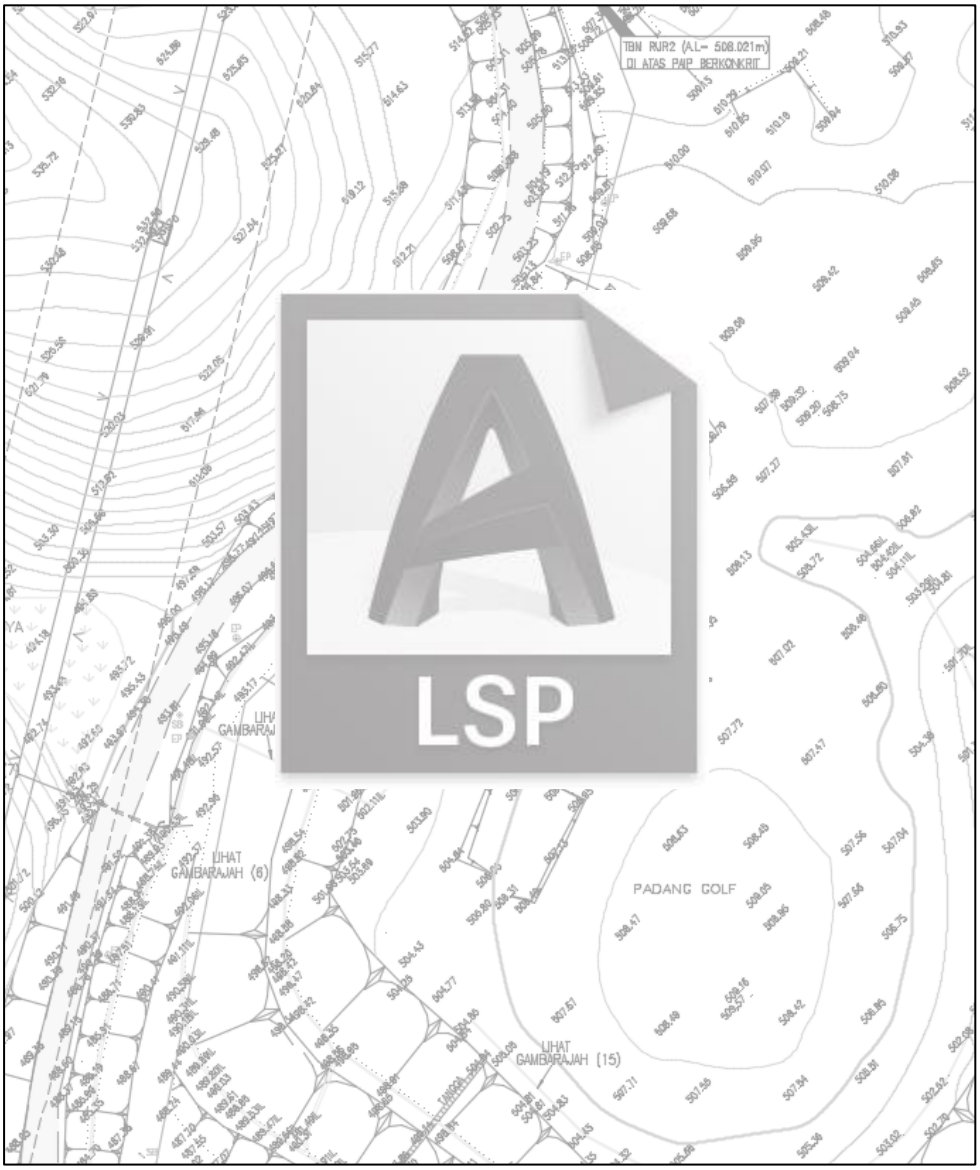

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PREFACE

The development of LISP Applications in Surveying Drafting eBook aims to provide general guidance on how to use the LISP function in facilitating the work of making Cadastral and Engineering Surveying plans. Using LISP programs will be able to help students in several courses to draft their plan especially for DCG20042 CADD for Surveyor, DCG30072 Cartography, DCG30083 Engineering Surveying 2, DCG40113 Cadastral Surveying 2 and DCG40123 Engineering Surveying 3. The LISP programs are freeware and it need to be used with the master software such as AutoCAD, BrisCAD and ZWCad where students are already proficient in using them. Indirectly the skills acquired by students will be an added value for them before venturing into industry. The LISP programs are also widely used by survey firms to handle bulk of survey data processing to generate plan as final output. We hope the eBook will help students to prepare their assignments successfully.

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INTRODUCTION

AutoLISP is an example of popular high-level language for programming in CAD packages such as AutoCAD, BricsCAD and ZWCAD. With AutoLISP, you can create custom CAD commands to perform actions that produce the output you want. AutoLISP comes with the full version of AutoCAD. However, AutoLISP is not supported by AutoCAD LT version.

LSP files or files with the .LSP extension are example of files written by using the LISP programming language. The LSP file contains the AutoLISP source code in the form of plain text program code that is executed using the LSP interpreter. These files can be read with any text editor. LSP files are used in common CAD programs such as AutoCAD, BricsCAD, and ZWCAD. You can create LISP programs in the VLISP window. To open the VLISP window, select Tools> AutoLISP from the AutoCAD menu window, then select VisualLISP-Editor. In the VLISP window that opens, LISP program language can be coded. You can also launch the VLISP text editor by selecting File> New. A text editor allows you to write and save a complete LISP program or routine.

The AutoLISP file must first be loaded before it can be run. To open an AutoLISP (LSP) file, make sure your text editor is active. In Visual LISP, click the Load button in the menu bar of the Tools menu. Alternatively, you may also click the Load Active Edit window on the Run toolbar. If the program loads successfully, you will see a message in the prompt window. To execute an AutoLISP function, at the AutoCAD command prompt, type the command name or function name in parentheses and press Enter. Alternatively, at the Visual LISP console window prompt, type the command or function name in parentheses and press Enter. One of the best high-level languages, LISP is the most suitable programming language for AUTOCAD due to the unstructured nature of AutoCAD drawings. Lisp functions are suitable for manipulating geometry, AutoCAD's internal DWG database, or working with AutoCAD graphic elements. The properties of these graphic elements are displayed in AutoLISP as an association list of AutoCAD group codes and values that indicate properties

such as definition points, colors, layers, and linetypes. AutoCAD loads the AutoLISP code from the .LSP file.

AutoLISP code also allows users to interact with users through AutoCAD's graphical editor using primitive functions that allow them to choose points, select objects on the screen, enter numbers and other data. AutoLISP also has an integrated graphical user interface (GUI) mini or domain-specific language (DSL) and dialog control language for creating model dialog boxes using automatic layout in AutoCAD. Enter your LISP programming code / routine into the Visual LISP Editor. Click the Load Active Edit Window button to execute the routine and then the desired command is created. You now can run this command in and obtain the results. You can also load LISP programs from an external LISP visual editor. This approach is typically used when you do not want to distribute the code for the rest of other LISP commands. To load LISP from other sources of LISP editor, go to the Administration menu and click Load Application. Select and load the LSP related file. By doing this, you are ready to use the LSP routines in your drawings. However, if you use LISP commands in multiple drawings, you must add them to your start-up suite so that the LISP routines are automatically loaded each time a new drawing is started and are available to run for the new drawing.

CADD IN ENGINEERING

CAD is an abbreviation for Computer Aided Design. Refers to the method of using computer software to create a virtual model of a proposed product. A wide variety of CAD software is available, each with specific features suitable for a particular application.

CAD has many advantages over manual drawings and this is a must in today's design market. Here are some advantages of using CAD in processing bulk of data compared to manual method.

a. Time Saving

In this era of product development advances, there is a lot of competition. The time it takes to bring a product to market is crucial to its success. In CAD, time is our lucrative reward. This saves surveyor a lot of work that can be used to complete the design of various projects and current projects. Easily visualize the ideas you gathered during the development of your product design concept. It takes a few seconds to create a simple shape or design. However, the biggest advantage is the more complex parts. For example, you can create flat patterns for complex bent sheet metal parts with the click of a mouse. You don't have to think about how to present it properly. At the same time, it's really easy to make changes. Or create a new model based on the previous model. You can easily reuse 3D models and add the functionality needed to create similar but unique parts in much less time and for different purposes.

b. Increased Productivity

Saved time directly leads to increased productivity. Spending the same amount of time can increase the number of completed projects. Design reproducibility is optional. By changing the same design, you can bring endless variations to the final output. On average, employee productivity is tripled. Over time, its productivity can approach tenfold. Much of this relies on the ability to create simulations in CAD rather than calculating them manually.

This improvement is such an evident in several aspects, including quality, time, and cost savings in manufacturing.

c. Improved accuracy

Manual sketches and drafting do not match the accuracy of CAD drawings. The accuracy of CAD design is unmatched and virtually perfect. This has a vast advantage over manually designing and drawing. Of course, the designer still needs to pay attention to the result. The Get Dimensions feature is not a substitute for an engineer. For example, it does not recognize the base plane of the measurement. It can be very important in wave-like parts. CAD makes it relatively easy to create complex surfaces and shapes. It is very difficult to sketch these surfaces manually, but you can use the tools of your CAD system to get perfect results.

OVERVIEW OF GEOMATICS

GENERAL

Surveying is generally considered as one of the oldest crafts in the world since the days when no profession was considered. In modern terminology, it can be considered one of the oldest professions. E. Dawson and V.L.O. Shepherd stated in their book on land registration: "The history of ancient Egypt gives us the earliest reference to land surveying and land ownership registration. The Nile was constantly flooded, flushing landmarks and causing controversy over taxes and property rights. This created a surveyor's deal."

Until recently, surveying basically meant land surveying, whether for property registration or other related purposes. However, with the recent introduction of other surveying departments such as area and volume surveying, building surveying, and general surveying, personnel who were formerly known as surveyors now need to be called as land surveyors. Other than surveying fields, in contrast to the other surveyors nominated in the previous paragraph, land surveyors are interested in the science and art of determining the nature, man-made and other features of the surface and surveying for real estate registration. He is responsible for planning and conducting all land and hydrographic surveys.

With the advent of new technologies related to the collection, processing, analysis and management of spatial information, land surveyors are becoming more and more interested in the science of Geographic Information Systems (GIS) and Land Information Systems (LIS) Traditional survey training has been extended to include new subjects such as GIS, LIS, remote sensing, and computer science to prepare surveyors for new challenges in geospatial and information technology.

PRACTICE OF THE LAND SURVEYORS

The work of a surveyor is very diverse and his or her work can be divided into one or more different categories, such as surveying. With the exception of geodetic and photogrammetric surveys, other categories of land surveying are essentially considered as a large-scale survey.

CADASTRAL SURVEYING

Cadastral Survey or Real Estate Survey is performed to establish and record real estate property boundaries and may constitute most of the work of a land surveyor. Cadastral investigations are governed by investigations within the meaning of law and Article 396 of State Law (Act 56 of 1965). It is on the one hand the employees of the surveying department under the supervision of the district surveying technicians who are empowered to carry out formal surveying work in the field, and on the other hand under their direct personal control and field supervision as stated under the 1958 Act on Licensed Land Surveyors.

The Land and Survey Department (JUPEM) has issue such a very strict regulations on official cadastral surveys. In the regulation states that only the authorized group of people whose allow by the Department to carry out these regulations and cadastral surveys reflects the importance of cadastral planning, including in preparing the end product of cadastral surveys. The plan must uniquely identify a particular land for real estate and registration purposes, and the survey must meet the technical standards required by land registration and handling legislation.

The above Land Law amends and integrates the "Law on Land and Property, Property Registration and Trade-in, and Collection of Income from Land" in the states of Semenanjung Malaysia. Similarly, the Land Ordinance (mackerel cap. 68) stipulates "regulating the expropriation and occupation of state-owned land", while the Land Law (Cap.81, Sarawak) is a "regulation to better regulate land law".

The Licensed Surveyor Act of 1958 provides for the establishment of a Surveying Commission to address "Approval and Management of Surveyors and Related Matters". To achieve the purpose of the regulation, the 1959 Licensed Surveyor Regulation was enacted. In this regard, it should be noted that the 1958 Licensed Surveyor Act is almost obsolete. It was declared to address a situation that existed nearly 40 years ago.

ENGINEERING SURVEYING

In order to eliminate the possible misconceptions, it is stated here that engineering surveys are still land surveys carried out specifically for engineering purposes. Engineering surveys are ultimately associated with cadastral surveys, as engineering surveys are rarely performed alone. It must be properly aligned and connected to the survey markings approved by the surveying department, such as boundary markings, triangulation points (primary, secondary, tertiary). Therefore, a licensed surveyor is legally entitled to carry out a cadastral survey and is a suitable person to carry out a technical survey. Large-scale engineering research is a very important part of the work of a licensed surveyor, as research is the basis of project planning. Therefore, approved engineering plan projects and various governments to carry out engineering surveys with the aim of providing large-scale plans and profiles that provide terrain details and additional information needed for planning which will be hired by the engineering department and regulators. In contrast to cadastral surveys, the performance of technical or topographical surveys cannot be legally controlled. However, it should be remembered that Malaysia's land management system makes it safe and easy to transfer property.

TOPOGRAPHIC SURVEY

Topographic surveys are performed to determine the location and shape of natural and man-made features in a particular area in order to create a topographic plan or map. The relative positions and altitudes of the control points that make up the network above sea level must be determined to provide horizontal and vertical controls for subsequent terrain surveys. The traditional baseline and triangulation networks for establishing horizontal control have been largely replaced by three-dimension surveys by using the electronic distance measuring device which can be used to quickly measure distances up to 100 km. Vertical control is usually established by the process of levelling or trigonometric elevation, called as mean sea level reference.

Land topography is the responsibility of the Survey Map Authority, but various government and legal agencies require detailed topographic planning for relatively small areas for project planning and design. Such terrain surveys are performed by a licensed surveyor. You may need to be careful here. Clients who rely on simple methods by blasting small maps that are useful for feasibility studies and large-scale research information can face challenges during the project design and planning stages.

PHOTOGRAMMETRY

Traditional ground surveys for recording terrain details have been significantly replaced by mappings from aerial photographs. The mapped area is covered with overlapping aerial strips showing control points already established on the ground. Using a photogrammetric plotter device, overlapping photo pairs provide the operator with a three-dimensional "model" of the ground for plotting terrain details. Cartography is the responsibility of the national cartography agency, and the sale of topographic maps in this country is very limited (for security reasons), so there should be no room for photogrammetry in the private sector. However, there are now emerging markets for photogrammetry in the private sector to

meet the increasing pace and demand for the development and progress of photogrammetry technology.

Geodetic Survey are being implemented to reduce the accumulation of errors, it is necessary to perform a wide range of surveys from the whole to the part by first creating a mesh of primary triangulation points. The primary triangulation is divided into the secondary triangulation and the secondary triangulation is divided into the cubic triangulation. These triangulation networks are complemented by accurate traverse until there are sufficiently dense control points throughout the country. After that, a comprehensive geodetic survey of the country will be available. Geodetic surveying is the responsibility of surveying and cartographic organizations nationwide. Geodetic surveys are carried out over a relatively large area using extremely accurate and accurate equipment and surveying techniques. Geodetic surveys are not only useful for national interests, but also for studying the size and shape of the earth.

HYDROGRAPHIC SURVEY

Hydrographic Survey is traditionally performed for nautical charting and port construction and maintenance. However, as offshore oil and gas production is under development, the need for hydrographic surveys is increasing accordingly. The principles of land and hydrographic surveys are basically is the same. However, the surveying techniques and equipment used are clearly different. The range of hydrographic surveys is wide, ranging from river and estuary surveys to offshore surveys for oil and natural gas production,sea and seabed surveys. A well-known example of the hydrographic survey is the joint hydrographic survey of the Straits of Malacca and Singapore conducted by Japan, Indonesia, Malaysia and Singapore from 1969 to 1974. The aim was to promote the safety of vessels in the phase of an increasing number of vessels navigating the straits and the obsolescence of old charts based on surveys up to the 1930s.

GEOGRAPHIC INFORMATION SYSTEM (GIS) AND LAND INFORMATION SYSTEM (LIS)

Land Information System (LIS) defined as a geographic information system for land use and cadastral mapping. The land information system is used for land records and cadastral in the most up-to-date format with accurate and reliable related attributes. In addition, the land information system contains data used for the legal boundaries of land ownership purposes.

Geographic Information System (GIS) consists of frameworks used to collect, manage and analyse geospatial data. Geographic information systems analyse locations and use maps and 3D scenes to organize layers of visualized information. Geographic information systems provide deep insights and information about data such as patterns, relationships, and help status. Geographic information systems are used by hundreds of organizations to create maps that provide solutions for communications, information sharing, analysis, and solutions to complex problems around us.

Importance of land information system

a. Land information system is a system that supports land access, land use management and decision making.

b. The land information system provides basic information about land suitable for the development of public programs. Public program.

c. The land information system creates paths for markets, land development, and other land activities.

d. The world map is updated with the help of the land information system.

e. The land information system helps to guarantee and protect the property of the land.

f. Land information system contributes to improvement of city planning and infrastructure development.

Importance of Geographic Information Systems

a. Geographic information is used to determine the geospatial information and its applications.

b. Geographic information helps to estimate flood damage.

c. Geographic information systems help to identify hazards.

d. Geographic information systems are used to manage natural resources.

e. Geographic Information Systems are useful for Environmental Impact Assessment (EIA).

f. Geographic information systems support successful disaster management and containment.

g. Geographic information systems helps to manage available natural resources.

h. Geographic information systems helps to assess and conduct landslide hazards zone.

Land and geographic information systems relate primarily to computerized systems used to manage and manipulate data. However, research shows that geographic and land information systems have similar meanings, but slightly different. Therefore, it is necessary to explain the fundamental difference between the land information system and the geographic information system. The Land Information System (LIS) creates a dynamic management system and a large medium with maximum integrity in the presentation of information. The land information system includes a new cadastral system to support and improve existing systems. Land information systems support government and non-governmental activities in land registration, property tax collection, land fragmentation, establishment of local governments, and maintenance of other land facilities for effective service. It is based on the administrative system. The Geographic Information System is a small and medium-sized non-dynamic management system that reduces the integrity and accuracy of data presentations common to environmental and natural resource systems. Geographic information systems are usually less consistent in displaying information on both environmental and natural resources. This is

in contrast to geographic information systems, which have a low supportive rating base but are highly rated in public services. Land information systems provide social and demographic data that share characteristics with geographic information systems. In some urban systems, land information systems have different meanings depending on the local government or state-owned enterprise. Most cities are driving the development of small to medium and large geographic information systems by encouraging and supporting them through strategic planning and activities.

TERMS IN SURVEYING

1. COORDINATES

Coordinates are linear or angular quantities that indicate the position of a point with respect to a particular reference system. In a two-dimensional plane, x and y are typically used to represent the coordinates of a point. Latitude and longitude are used together in to indicate the exact coordinates of their position on Earth. GIS and GPS are useful tools for finding latitude / longitude coordinates of locations on Earth. (Vernier Caliper, 2021)

2. BEARING AND DISTANCE

Bearings are represented as north (or south) west (or east) rotation angles in degrees, minutes, and seconds. Distances are always expressed in feet, regardless of map units. (USDA, 2021)

3. AREA

The area of all these triangles is added to measure the area of the field. • The base and height of each triangle are scaled, and their area is calculated by multiplying the base by half the height. (NIOS, 2012)

4. UNITS

The unit of the British system is a historical unit of measurement used in medieval England and derived from the Anglo-Saxon and Roman systems. The metric system is a decimal system of units developed in France at the end of the 18th century. Since the metric system is used almost universally, it is often called the International System of Units and is abbreviated as SI. (Wyoming Department of Transportation, 2021)

4. SUBDIVISION

The Subdivision Survey is a survey of the outer boundaries of the subdivisions. This is followed by a topographic survey, subdivision design, and division inside the wing. Each subdivision survey shows that your property is accurately subdivided into individual parcels. (SCALICE, 2021)

5. SLOPE

Slope refers to the angle of an incline. The slope can be upward or downward. Slope is usually expressed as a percentage and is the amount of rise or vertical distance divided by horizontal distance. Percentage means per 100. (National Wildfire Coordinating Group, 2021)

6. **PROFILE LEVELING**

Profile leveling is one of the most common uses for barrel levelling and vertical distance measurements for surveyors. The results are plotted in the form of a profile, which is a drawing

showing a vertical section. Profiles are required for the design and construction of roads, curbs, sidewalks, pipelines, etc. In short, profile levelling usually refers to the determination of the height of points on the floor, evenly spaced along a continuous line.

a. Vertical Levelling

Profile levelling basically corresponds to benchmark levelling, but there is one fundamental difference. At each instrument position, where an Height of Instrument (HI) is determined by a back sight rod reading on a benchmark or turning point, several additional foresight readings may be taken on as many points as desired. These additional readings are called rod shots, and the elevation of all those points is determined by subtracting the rod shot from the HI at that instrument location.

i. Plotting the Profile

The profile drawing is basically a graph of elevations, plotted on the vertical axis, as a function of stations, plotted on horizontal axis. A gridded sheet called profile paper is used to plot the profile data from the field book. All profile drawings must have the correct title block and both axes must be fully labelled with station and elevation. Height or height scales are usually exaggerated. In other words, it is in a "stretched" state compared to the horizontal scale. For example, the vertical scale can be 10 times larger. The horizon at the bottom of the profile does not necessarily have to start at zero elevation.

ii. Section Levelling

Section Levelling is another method of profile levelling. The term section generally refers to a relatively short profile view of the ground drawn perpendicular to the route centreline of a highway or other type of linear project. The section is especially important for estimating the amount of earthwork required to build a roadway. These show the height of the existing terrain,

the slope of the proposed side of the cut or infill, and the height of the slope at the base of the road.

In fact, except for the field note format, there is no difference in the procedure for adjusting the profile and cross section. Cross-section stick shots are typically recorded during course profiling from the same equipment position used for stick shots along the centerline. Section data is taken from the same location along the route used for the profile rod shot station . (ReadCivil, 2021)

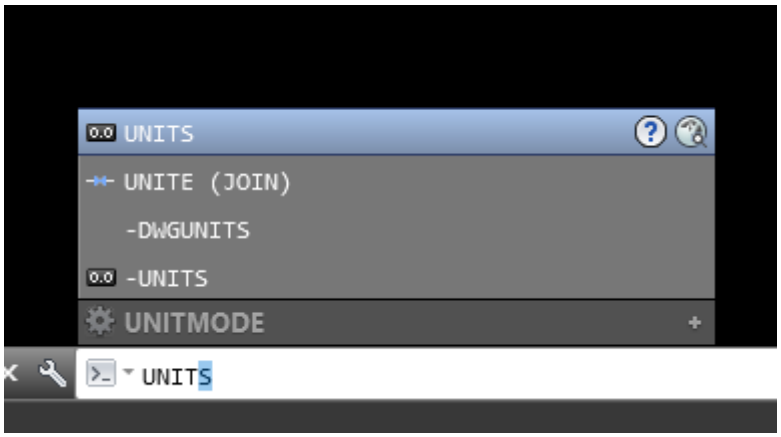
Download all LISP programmes from the following link:

https://drive.google.com/drive/folders/1k_QmiOC2ko1tUAotQTJQEqdwPZxBIlYH?usp=sharing

UNITS

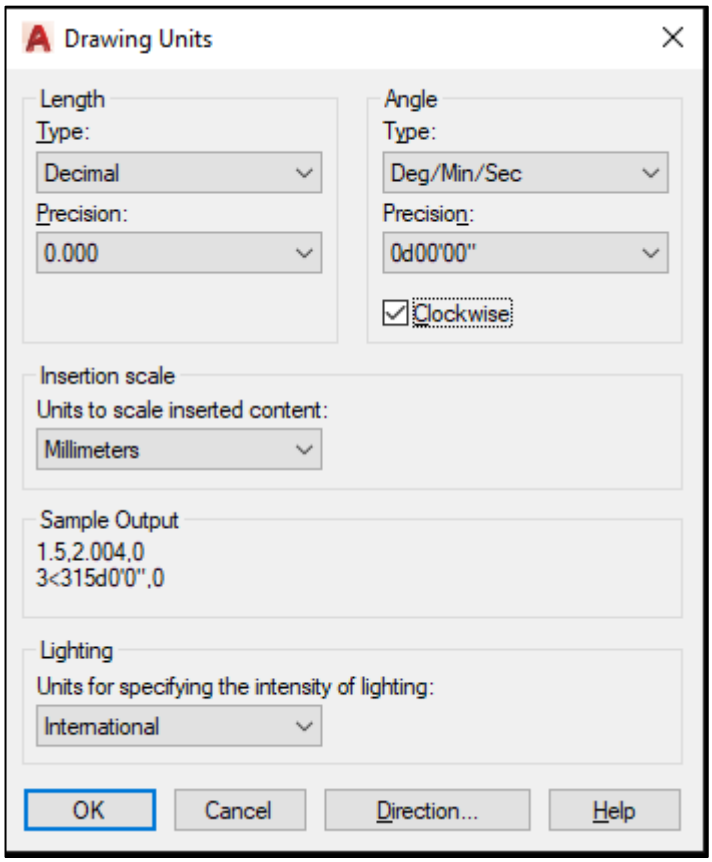
1) Setting the Units

a. Type UNITS in the command BAR to set the units.

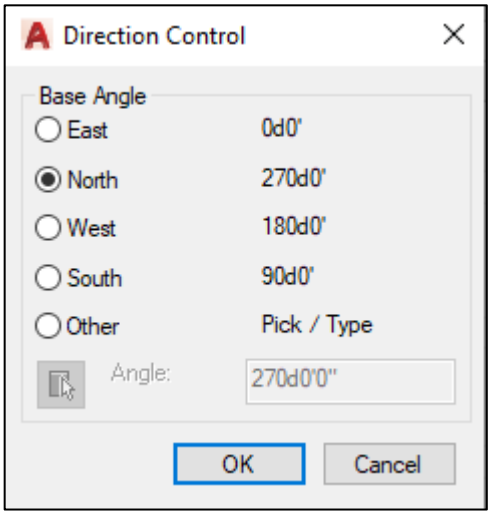


b. Set Type: Decimal, Precision: 0.000, Angle Type: Deg/Min/Sec, Precision: 0d00’00”.

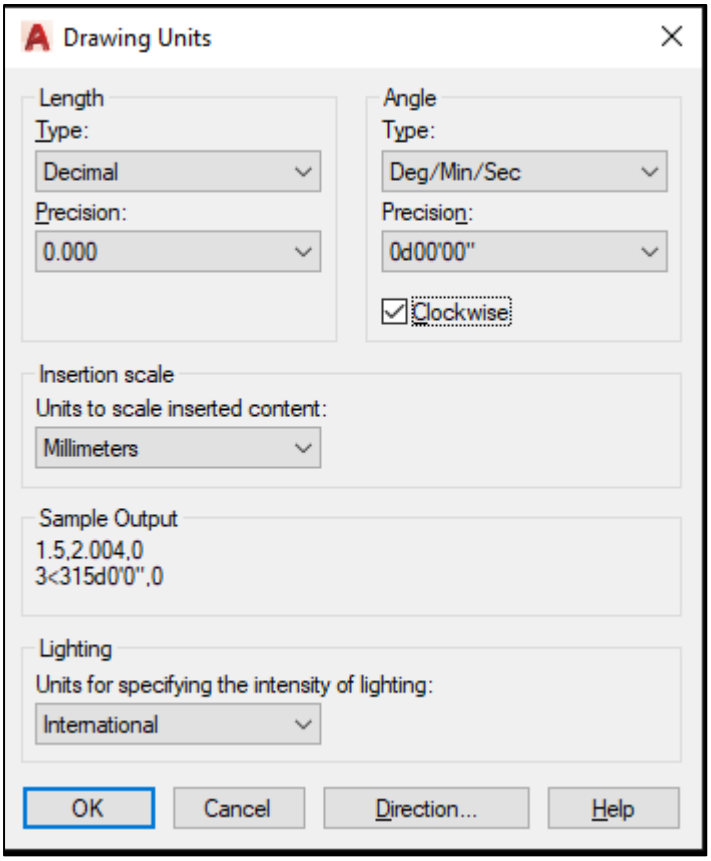
c. Tick Clockwise,



d. Choose North and clik OK.



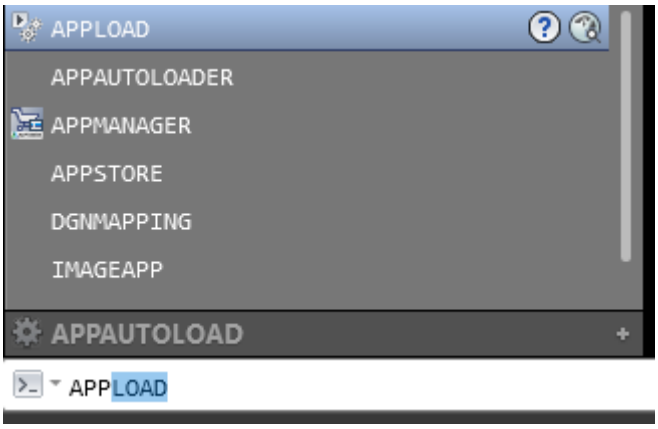
e. Click OK at Drawing Units window.



BEARING & DISTANCE

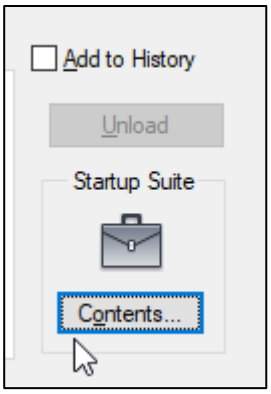
2) Draw line with Bearing and Distance text simultaneously

a. To activate the LISP, type APPLOAD at command BAR

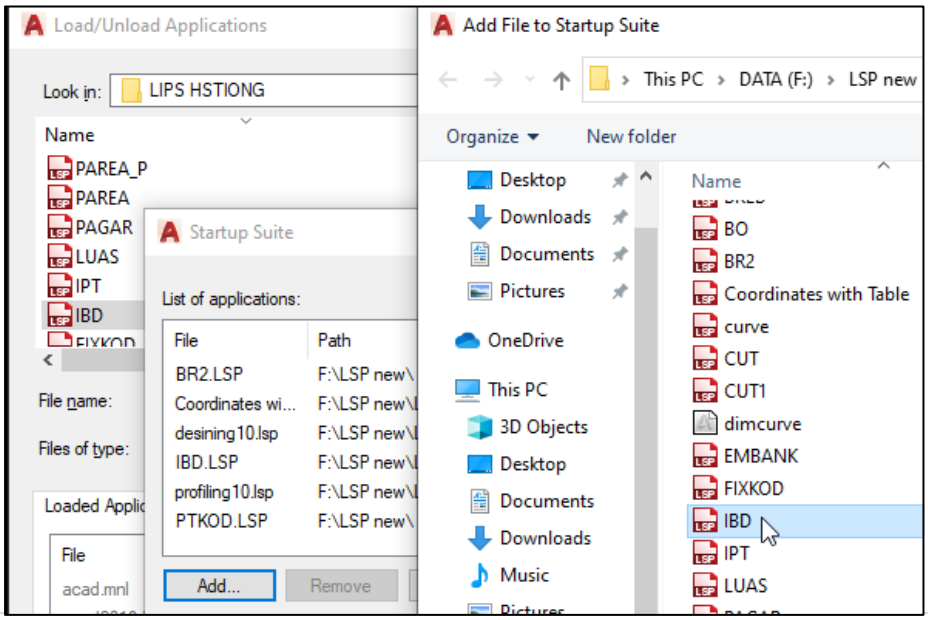


b. Choose the lisp file in your folder. For example IBD. Click twice.

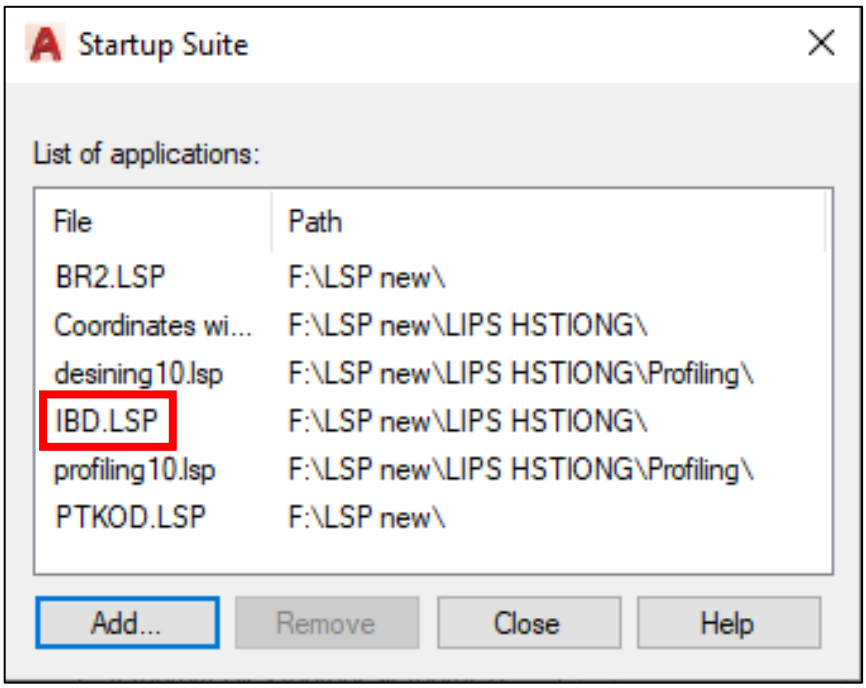
c. Click Contents to insert the LISP routine file.



d. For example, choose IBD LISP to make sure the file is one of the listing in the Startup Suite.

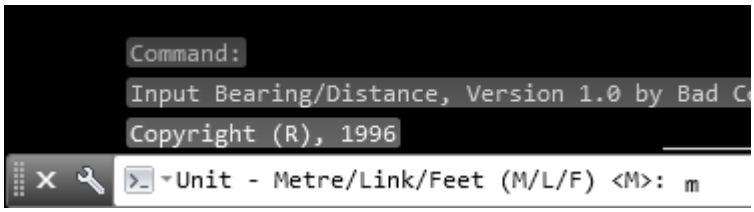


e. The IBD was listed in the Startup Suite.

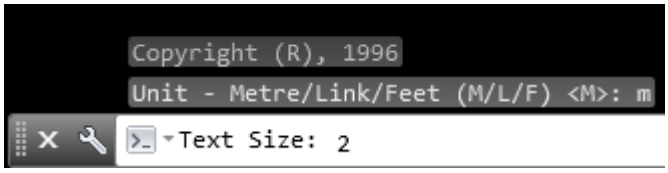


f. Type IBD at command BAR to activate the function.

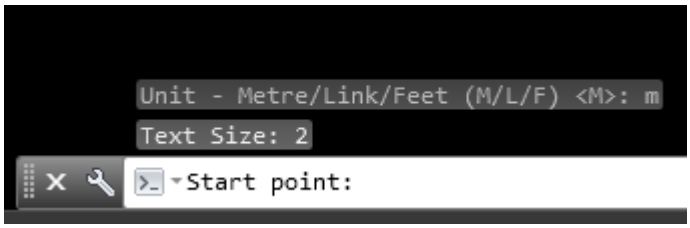
g. Choose Length Unit. Example: Type M for metre. Press ENTER



h. For Text Size, choose 2 (depend on what size you want). Press ENTER

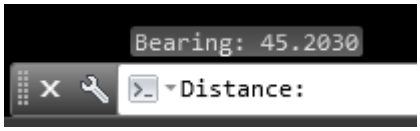


i. For start point, click the cursor where you want to start the traverse

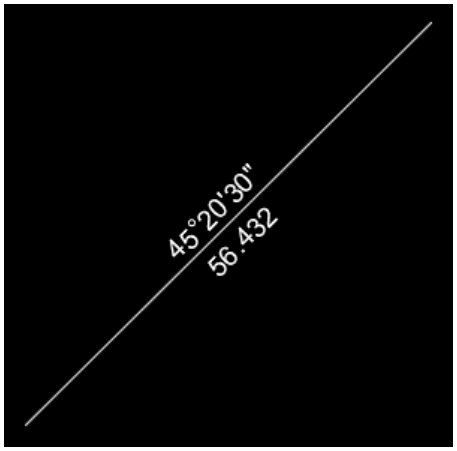


j. After you click at any point on the screen, insert bearing. For example: 45°20’30” (In command BAR the value is 45.2030). Press ENTER

k. Insert distance value. For example: 56.342 m (In command BAR the value is 56.342). Press ENTER

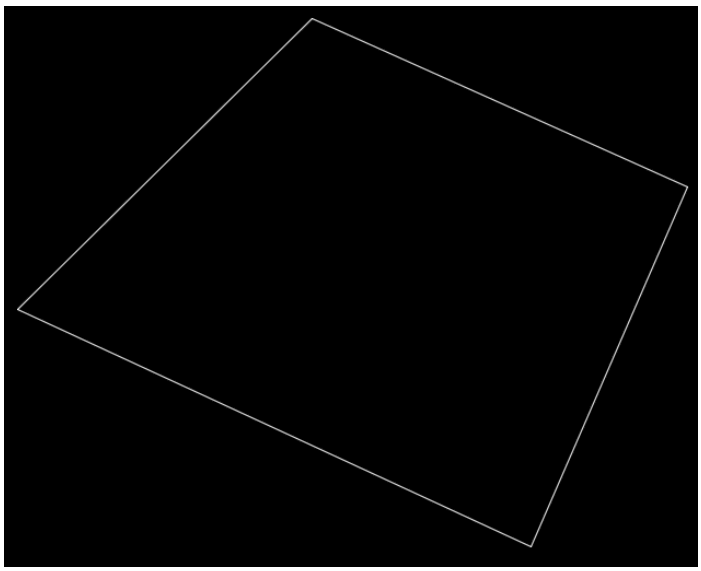


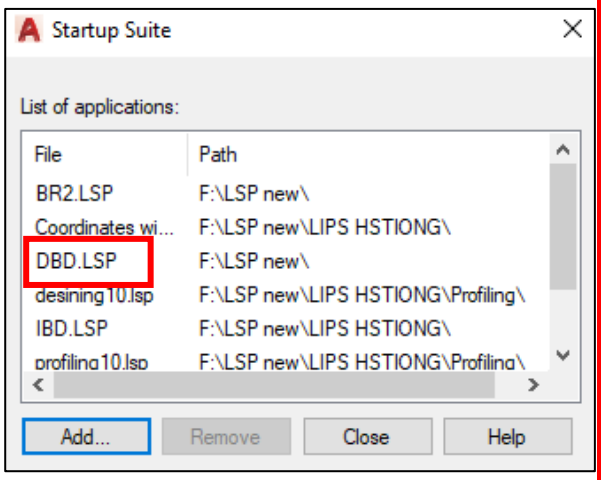
l. Now the line with bearing and distance text appear on screen. Repeat the same procedure (j and k) to insert the next line with bearing and distance text.



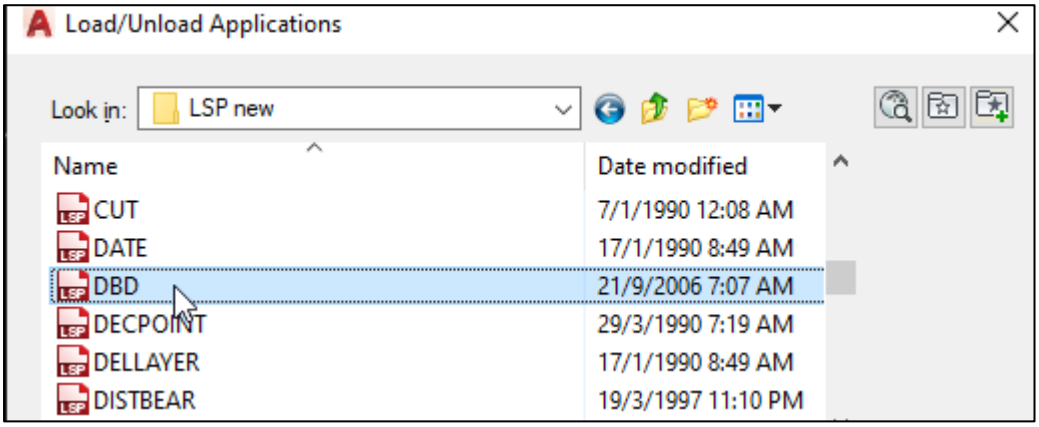
3) Draw Bearing and Distance text on the traverse line (round up to 10")

a. For example a traverse line was sketch on screen but do not have a bearing and distance text. Load DBD lisp.

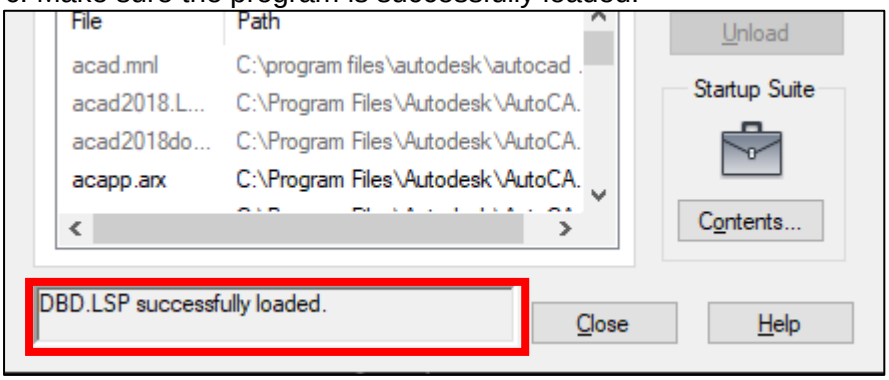




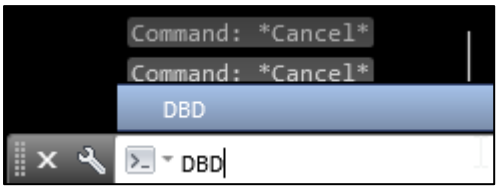
b. Double click at the file.



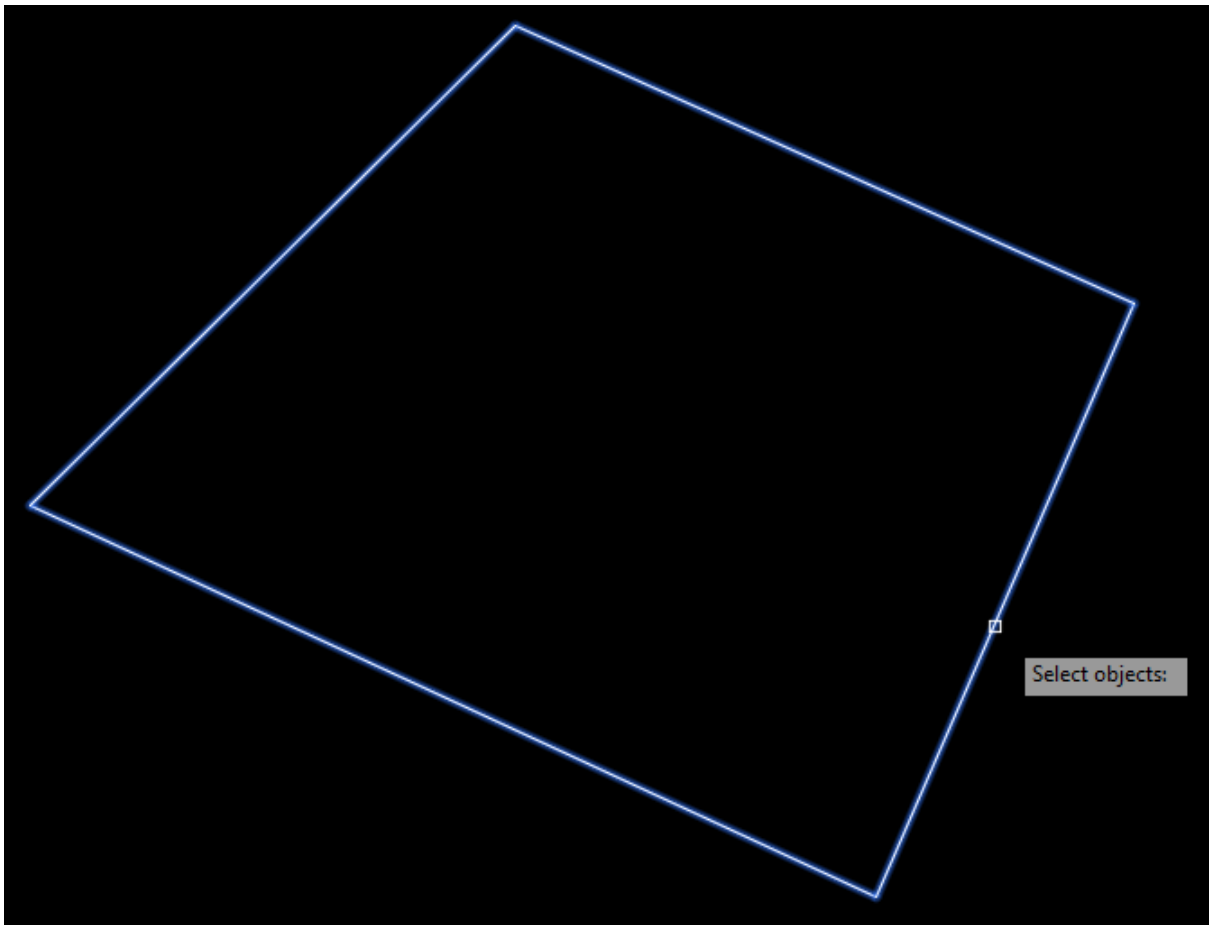
c. Make sure the program is successfully loaded.



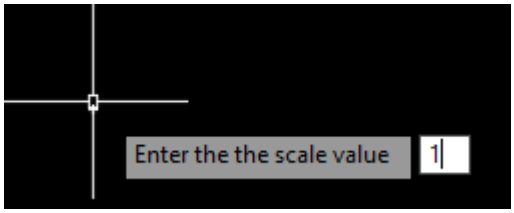
d. Type DBD in command BAR. Press ENTER.



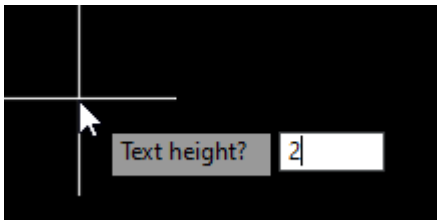
e. Use cursor to select whole object. Press ENTER.



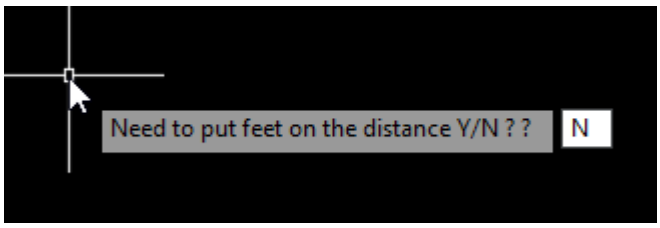
f. Enter the scale value: 1. Press ENTER.



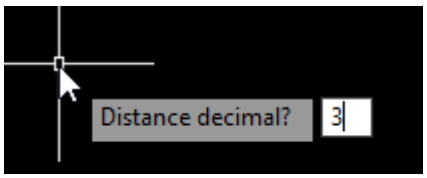
g. Enter Text height: 2 (depend on your size object). Press ENTER.



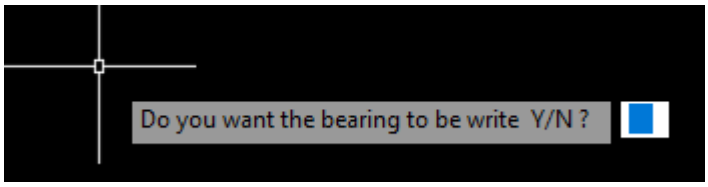
h. If you want to enter the length unit other than feet, insert N



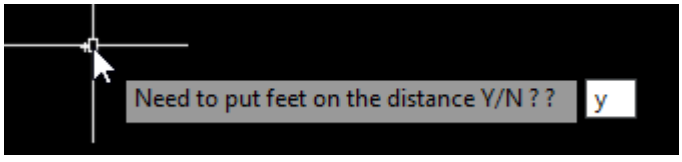
i. Insert 3 for 3 decimal places.



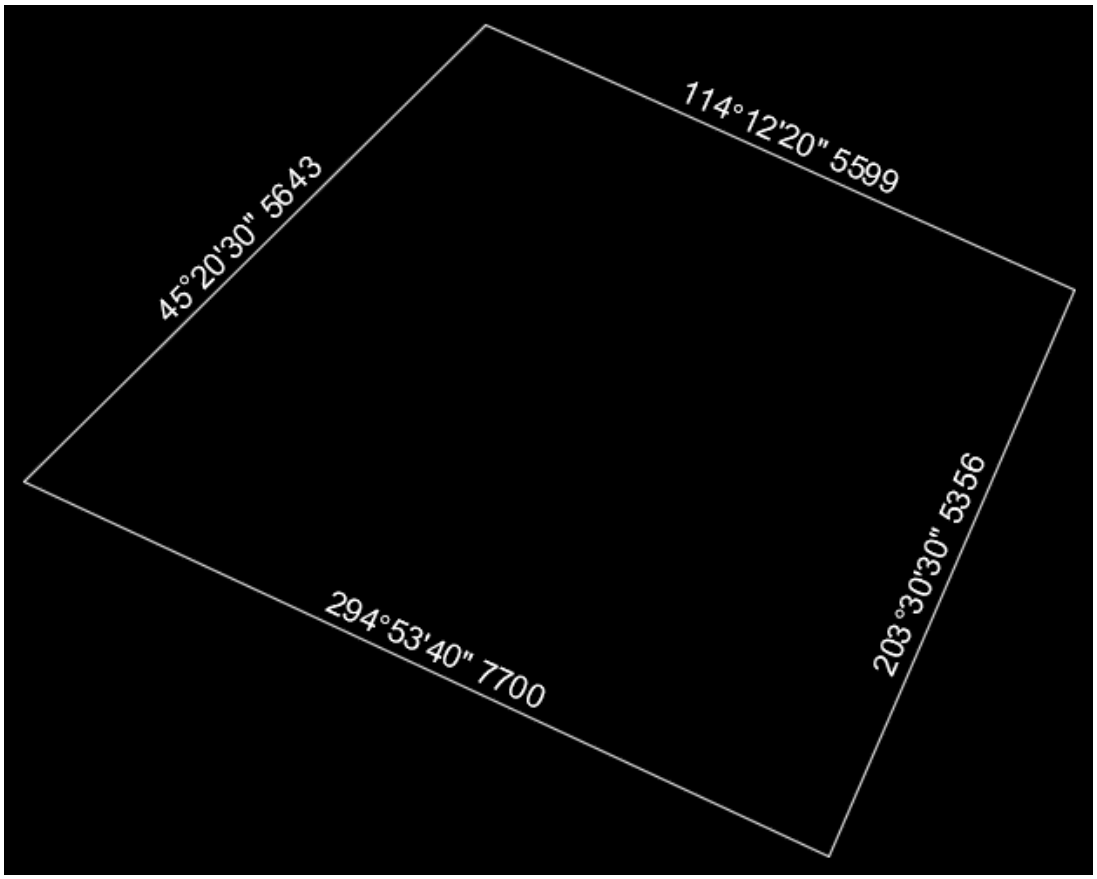
j. Before bearing to be write, make sure switch off OSNAP function (F3)



k. Insert y if everything ready. Press ENTER



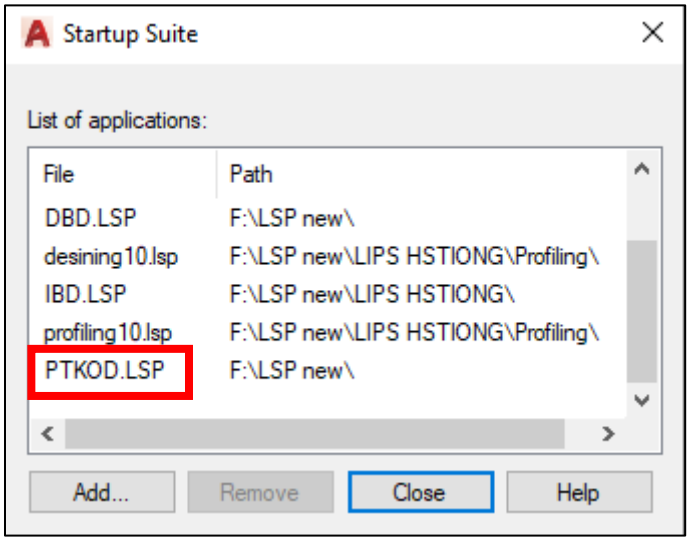
l. Bearing and distance are display for every line.



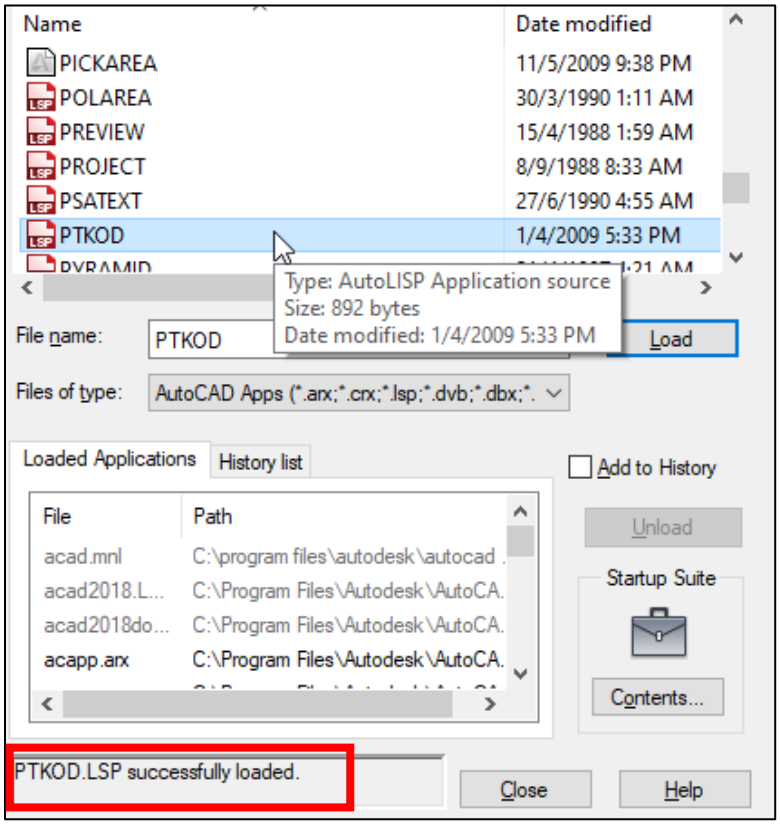
COORDINATE

To display a coordinate text

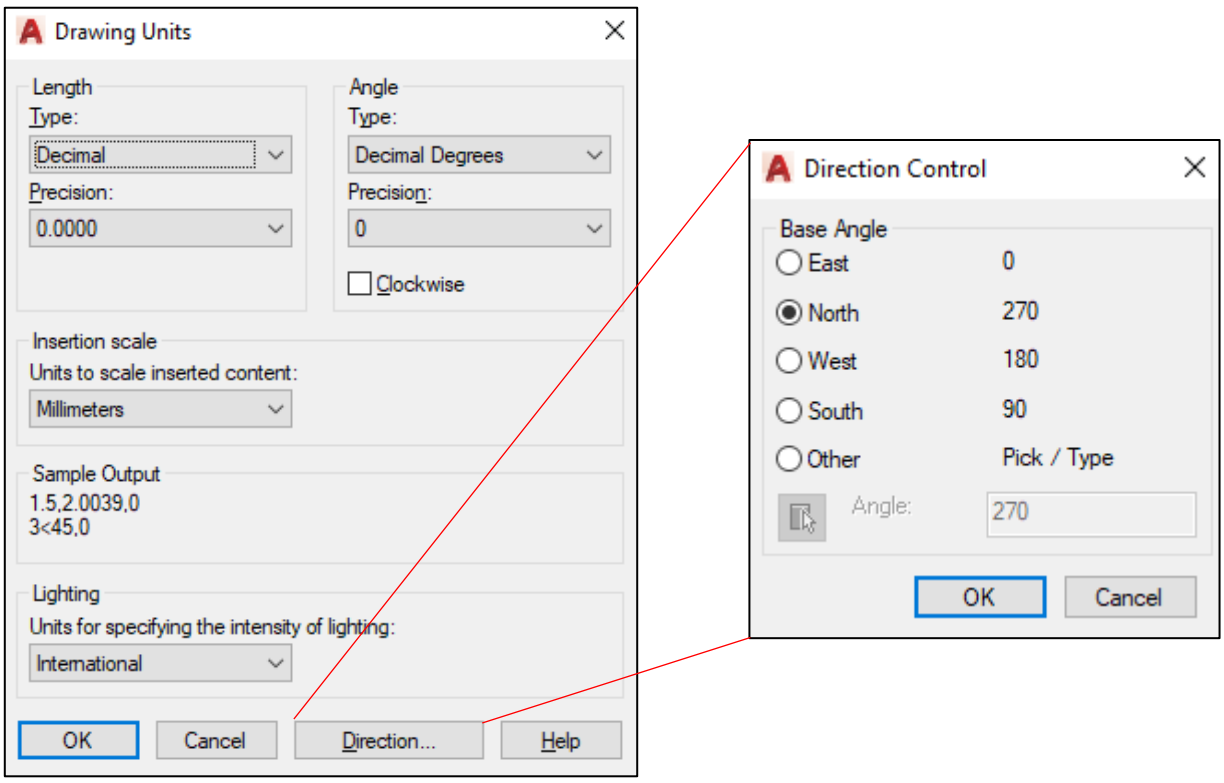
a. Load PTKOD at start-up Suite



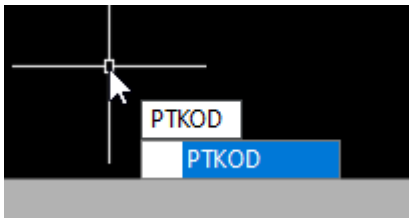
b. Double click the programme until successfully loaded



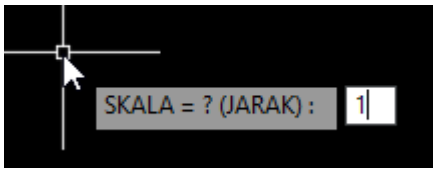
c. Before using this LISP, make sure tick Clockwise in Drawing Units and choose North in Direction. Click OK



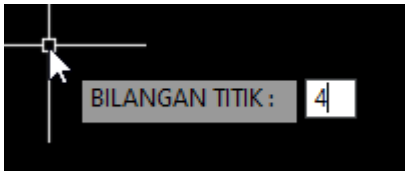
d. Type PTKOD in command BAR. Press ENTER



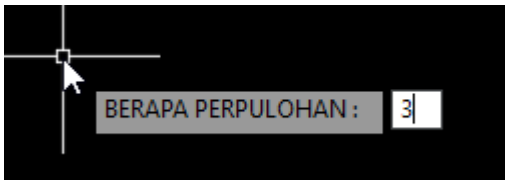
e. Insert Scale: 1. Press ENTER



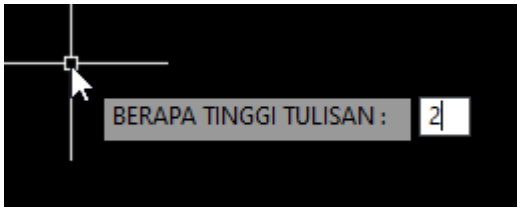
f. Let say we want to display 4 coordinates poin text. Insert 4. Press ENTER



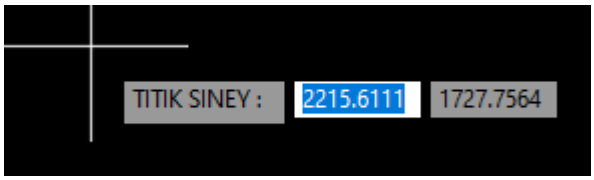
g. Insert decimal places: 3. Press ENTER



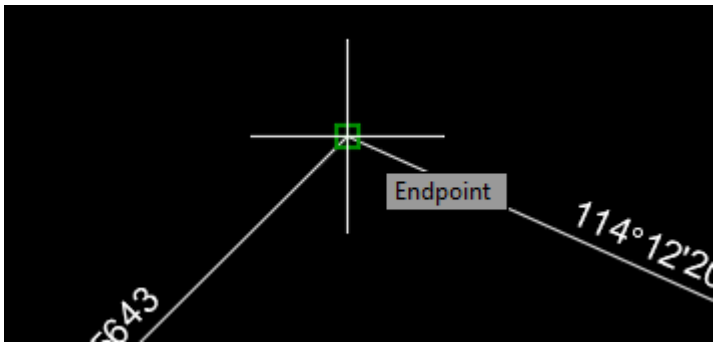
h. Insert Text Height: 2



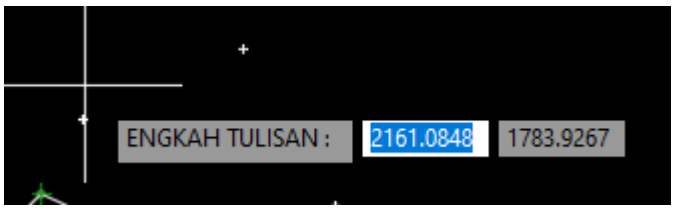
i. Click at the points to display a coordinate text



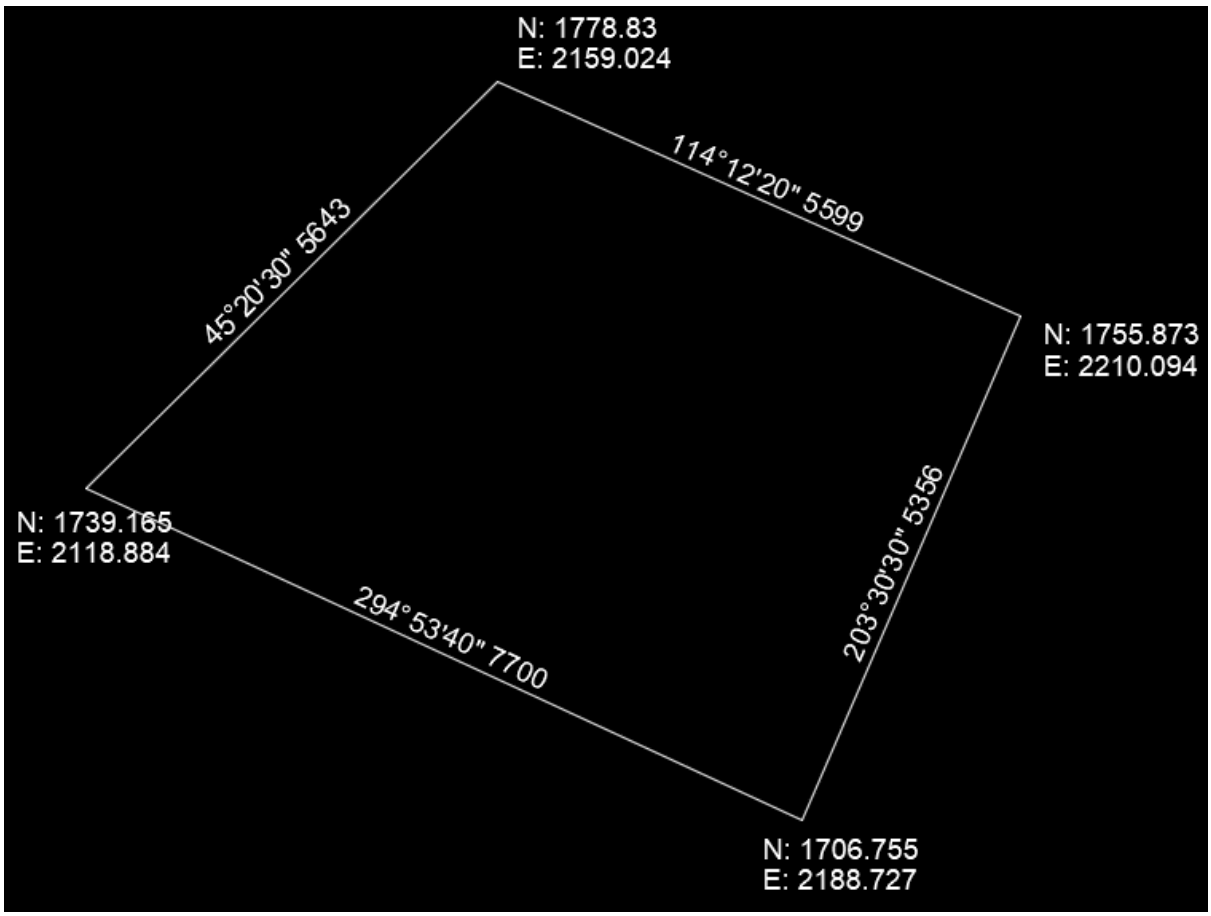
j. Make sure activate the endpoint OSNAP



k. Pointing the display text near the coordinates



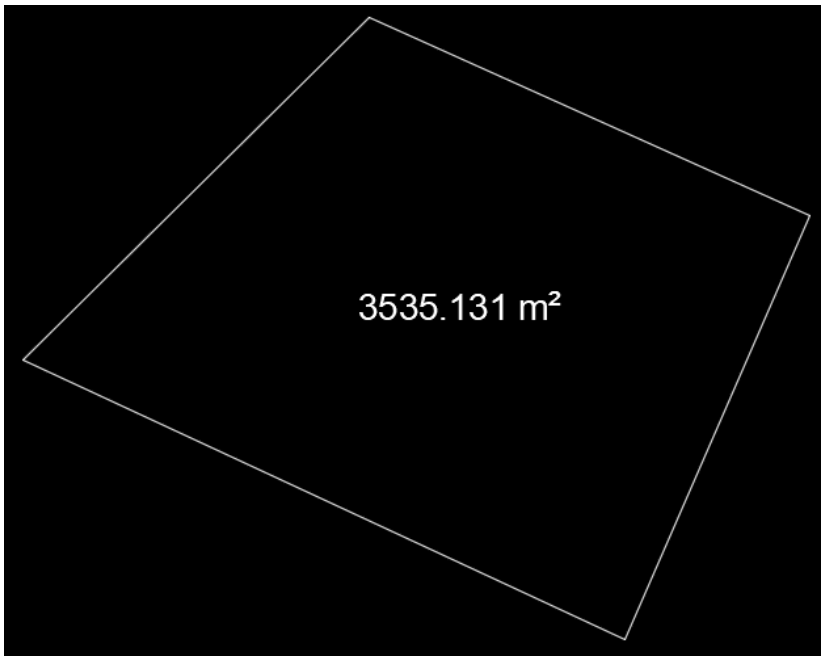
I. The result as below.



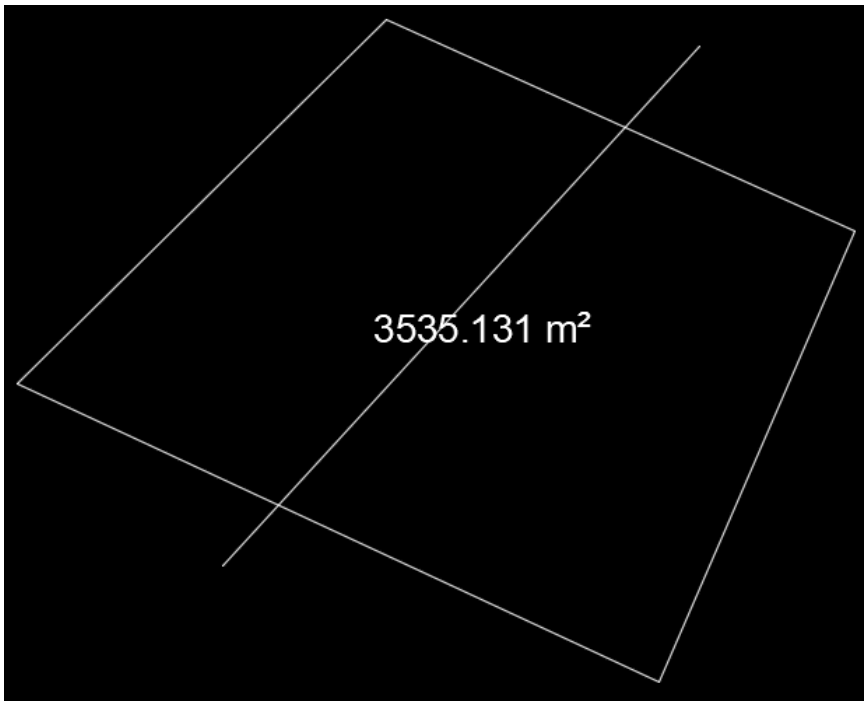
SUBDIVISION

To divide lot into sub plot

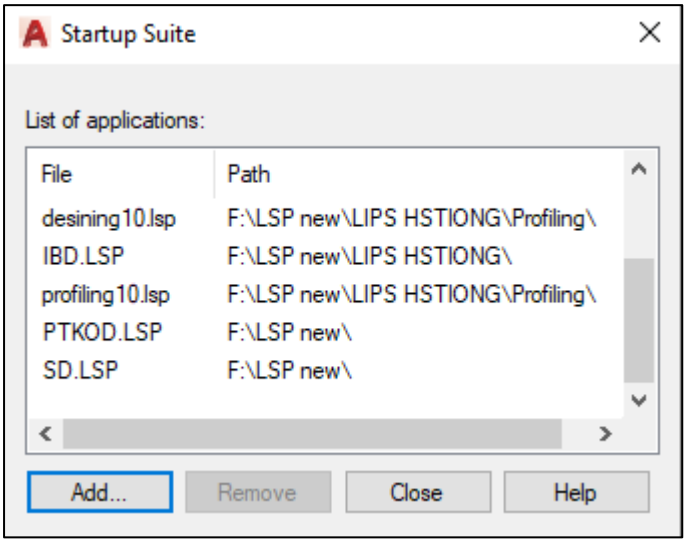
a. For example an area of the traverse is 3535.131 m² will divide into 2 sections.



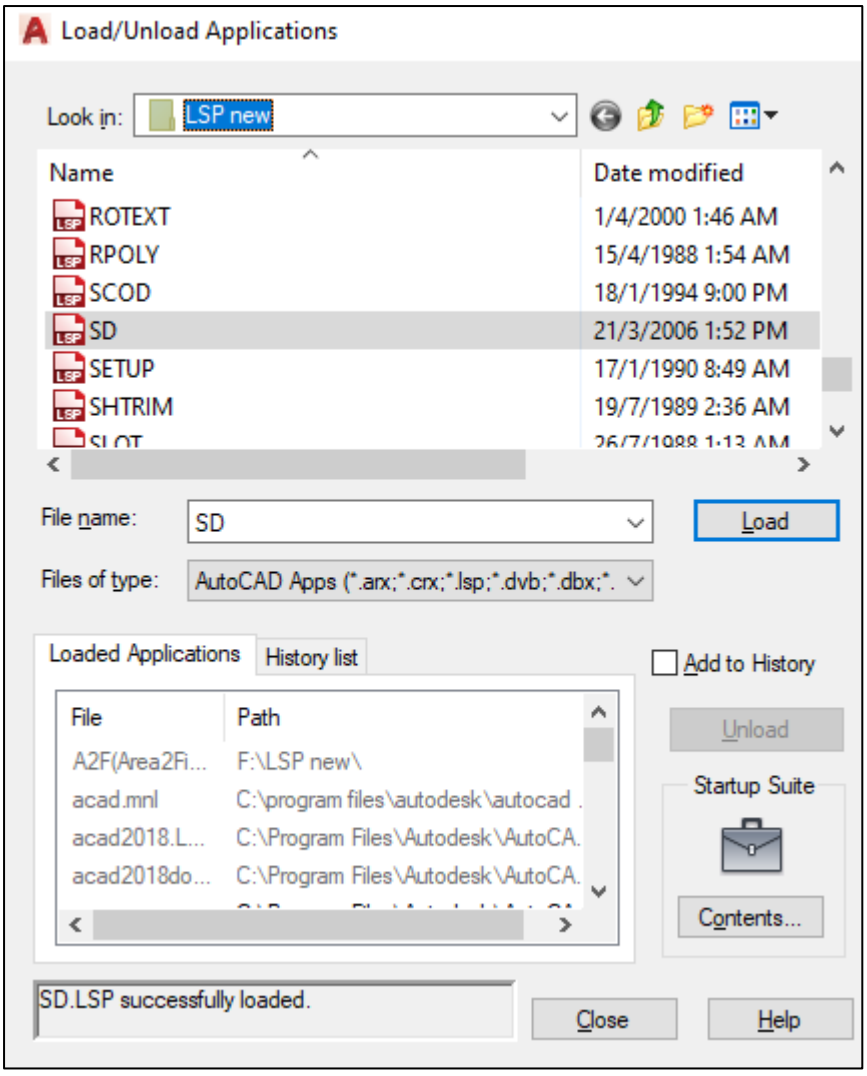
b. Draw a line as below



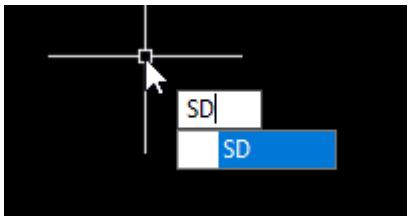
c. Load SD in start-up Suite



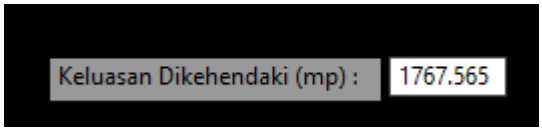
d. Make sure the programme successfully loaded

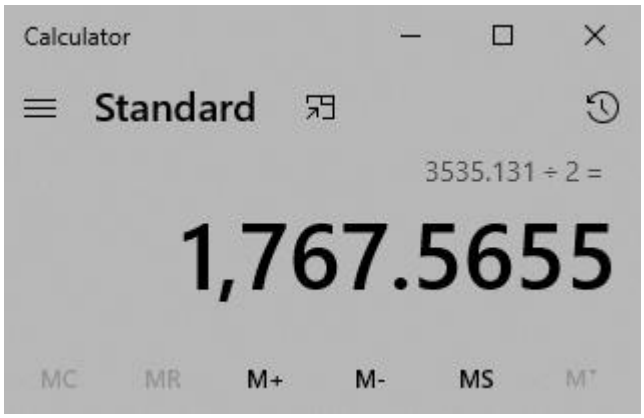


e. Type SD in command BAR. Press ENTER

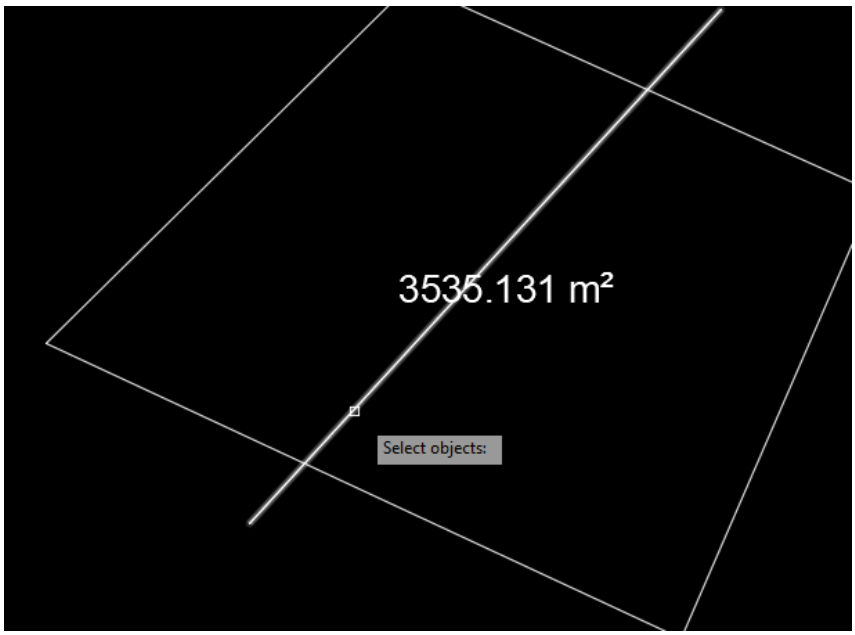


f. Insert an area for each subplot. (3535.131 / 2 = 1767.565). Press ENTER

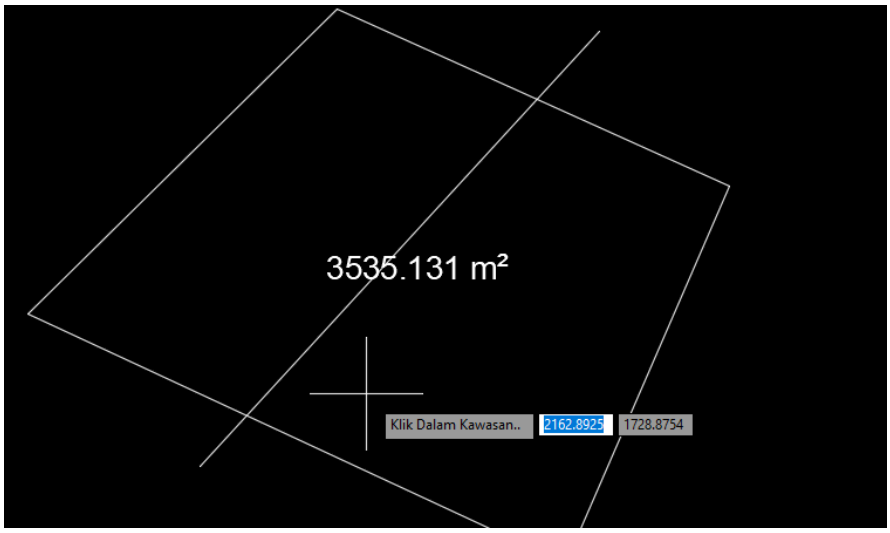




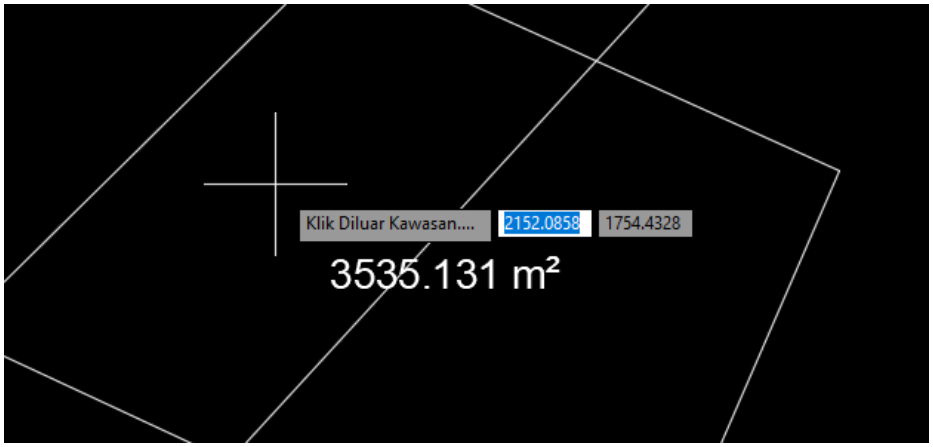
g. Select the line



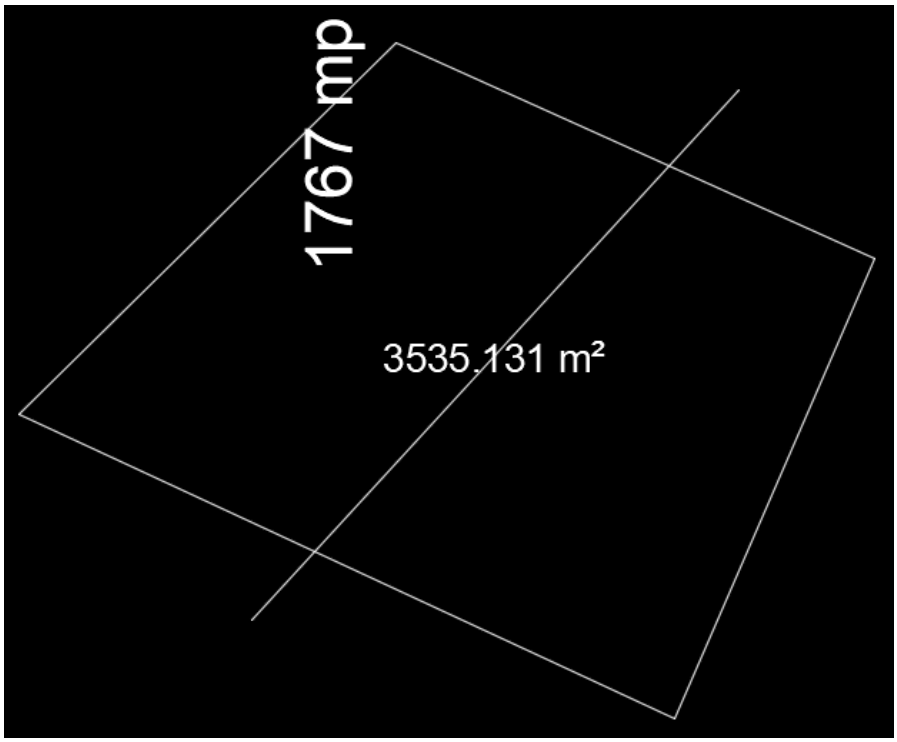
h. For example, we want to set the left sub plot area 1767.565 m²



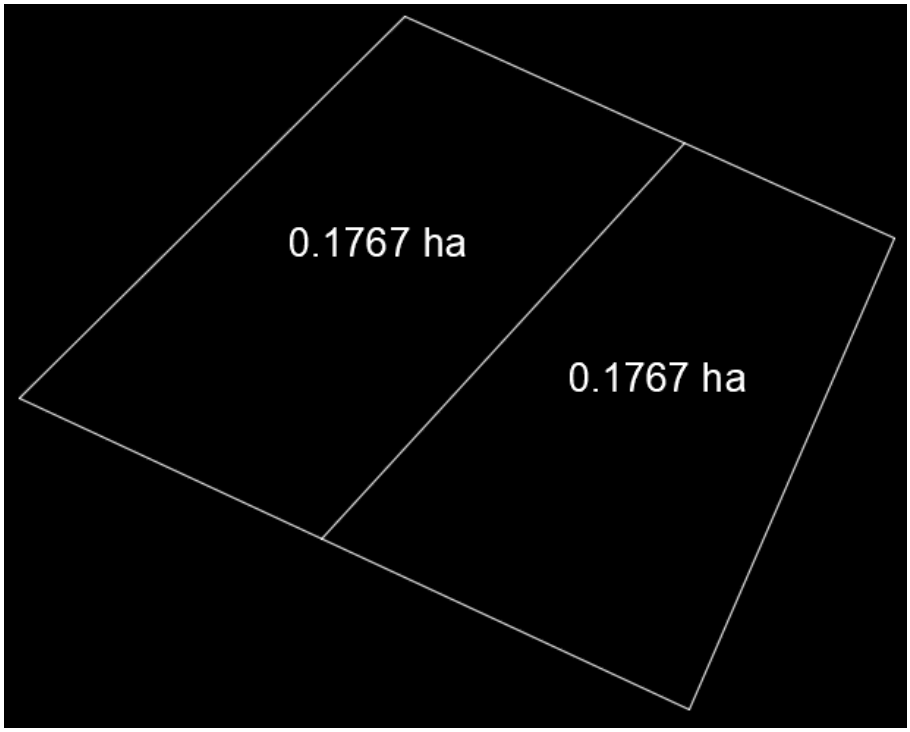
i. Click the cursor in the left sub lot and then click the cursor at the right sub lot



j. Let the line auto move until the area sub lot display. Check area manually at the right sub lot.



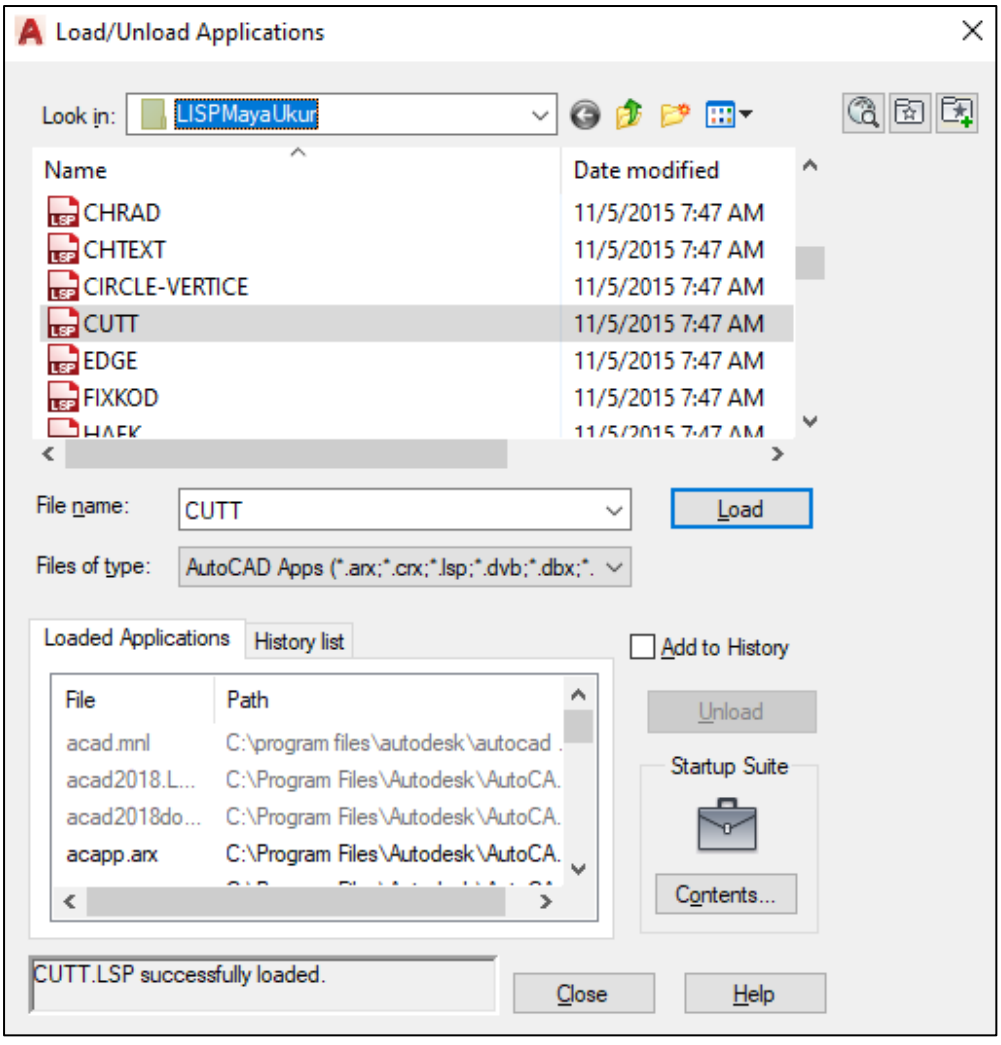
k. Trim the line and plot the area text properly



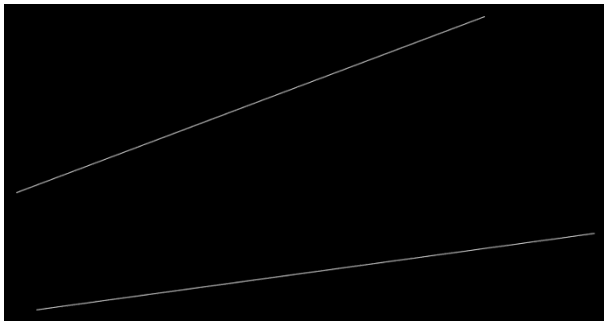
CUTTING

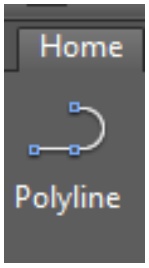
To draw cutting symbol at slope line

a. Load CUTT programme until successfully loaded

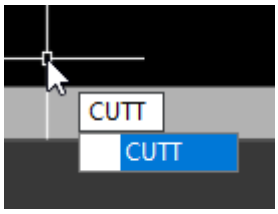


b. Draw two polylines approximately 100m for each line.

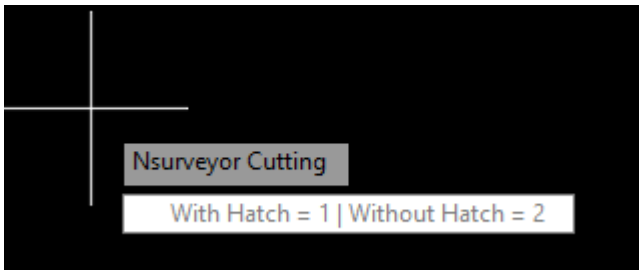




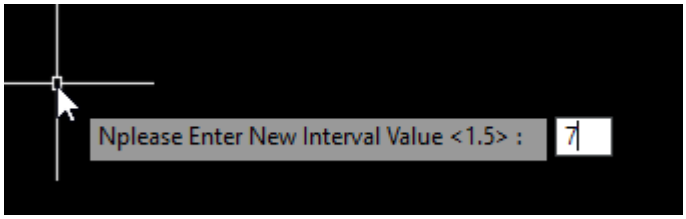
c. Type CUTT in command BAR. Press ENTER



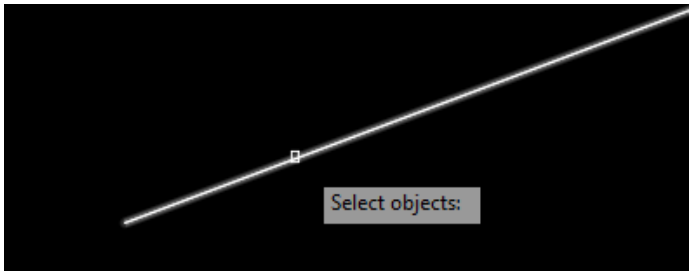
d. For hatch drawing, type 1. If without hatch, type 2. Insert 1 for example.



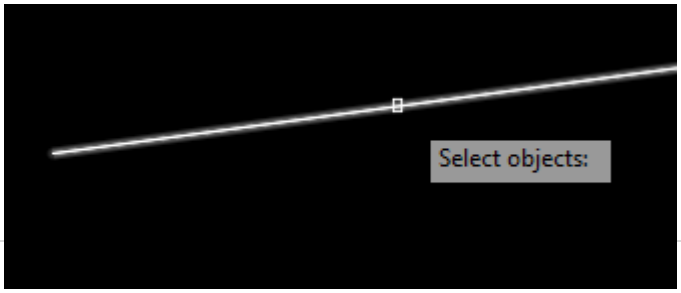
e. Insert drawing interval value. For example insert 7. Press ENTER



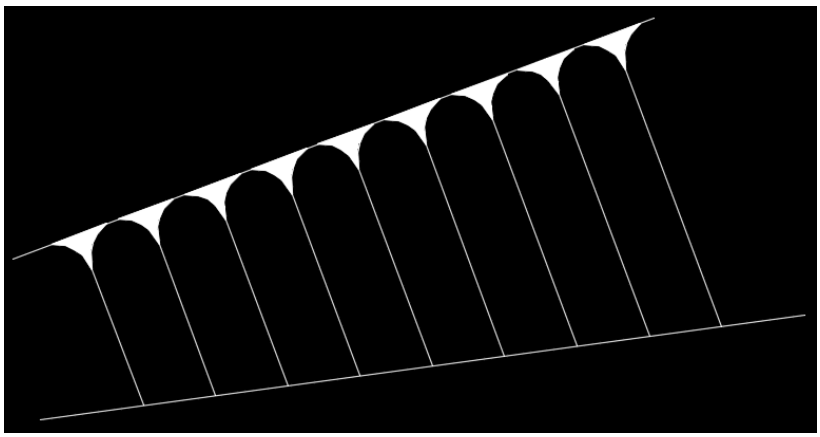
f. Let say the upper line is top cutting. Left click and then right click mouse button on the line.



g. For bottom line, do the same procedure as procedure f.



h. The cutting drawing will appear as below.

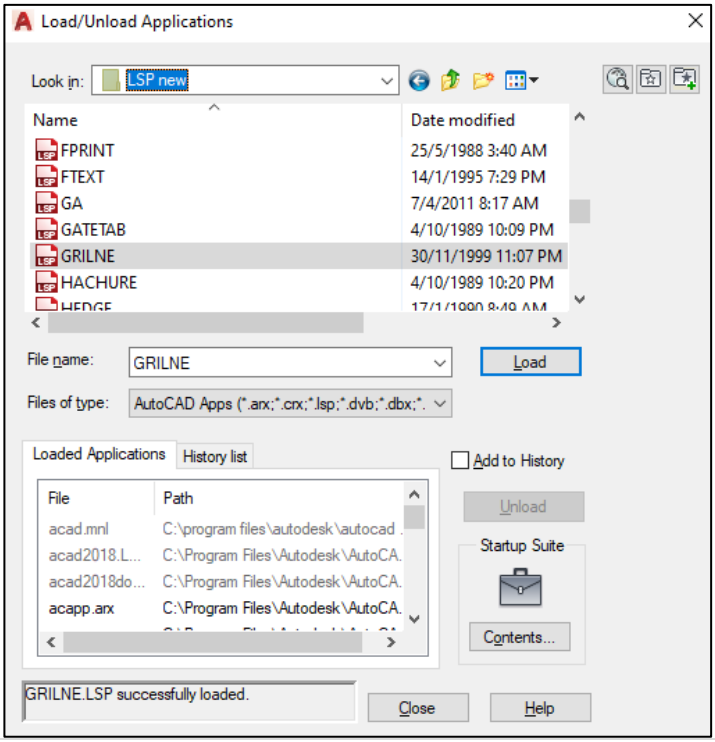


GRIDLINE

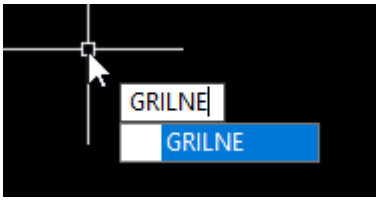
To draw a gridline in frame

a. Draw a rectangle with length 100 and width 70

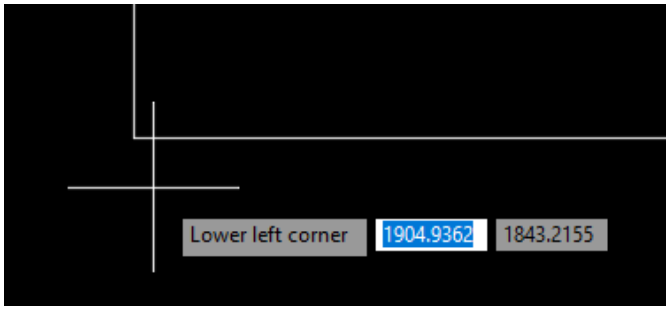
b. Activate **GRILNE** until its successfully loaded



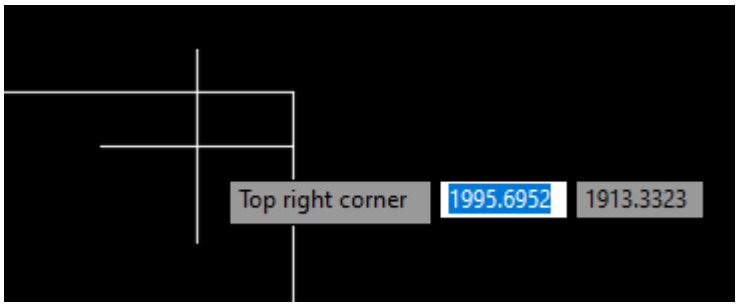
c. Type GRILNE in command BAR. Press ENTER.



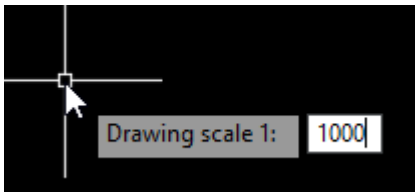
d. Click cursor to lower left corner



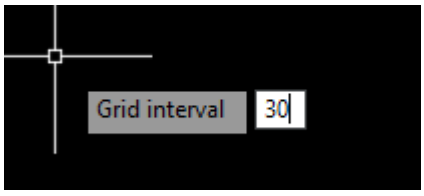
e. Click cursor to the top right corner



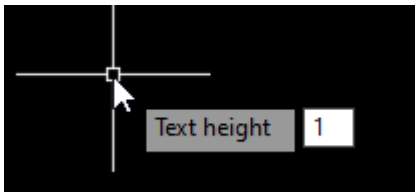
f. Insert 1000 for drawing scale. Press ENTER



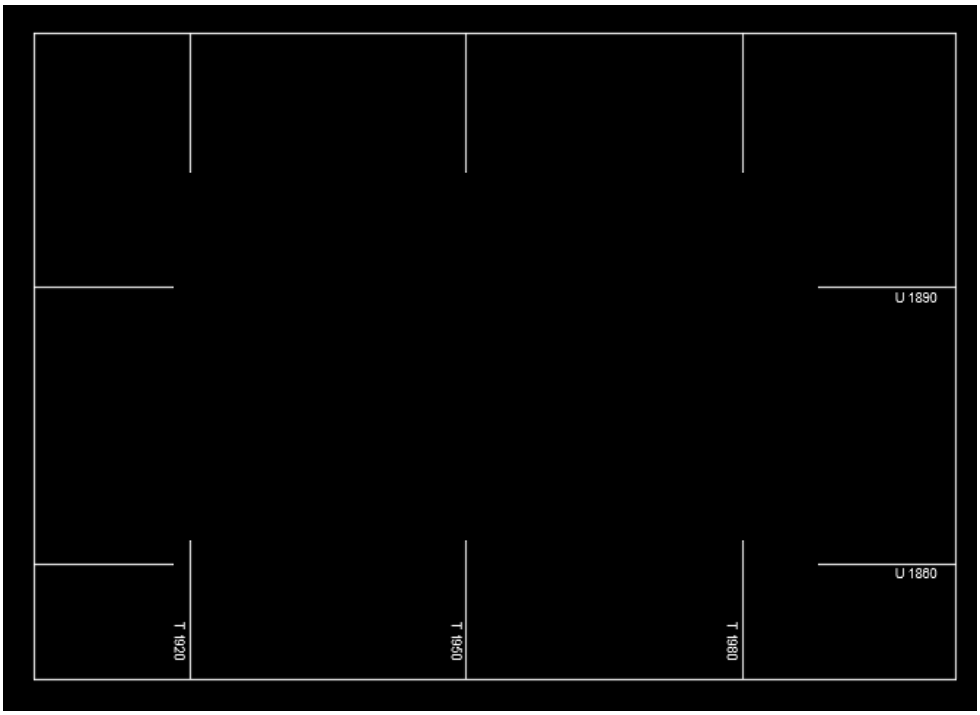
g. Insert 30 for grid interval (depend on the length of the line). Press ENTER.



h. Insert 1 for text height.



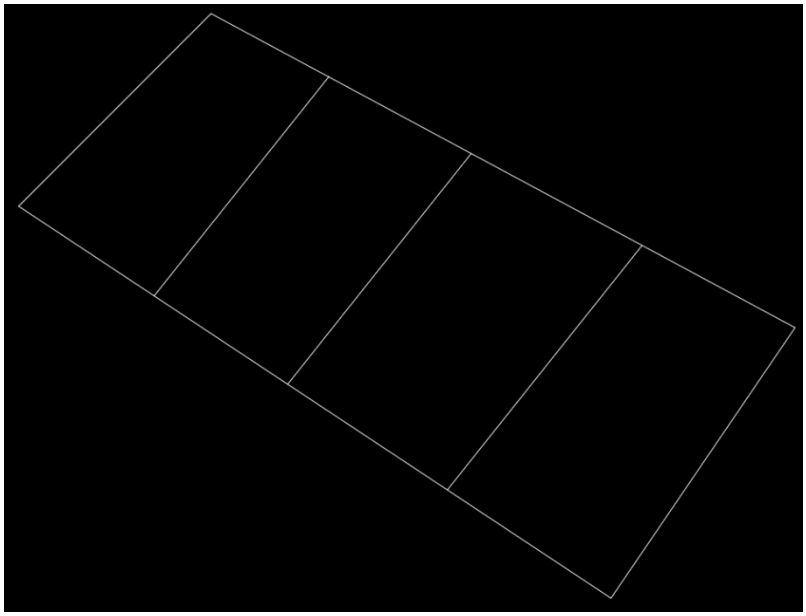
i. Make sure switch off OSNAP (F3). Press ENTER. The result as shown below. Edit the gridline later.



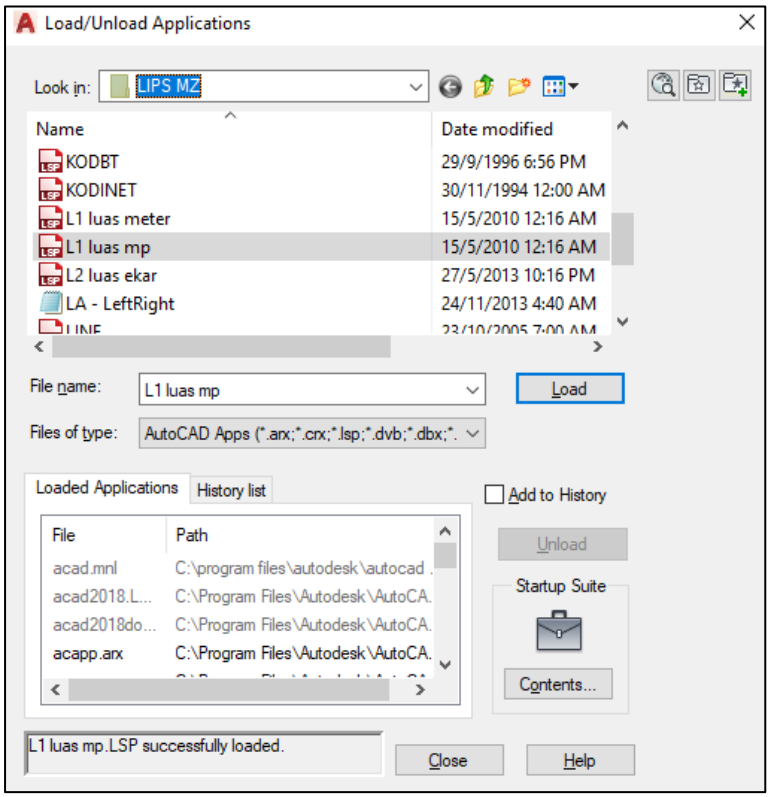
AREA TEXT

To display an area text in the polygon

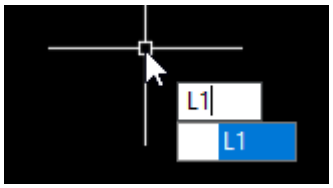
a. Draw a multiple sub lot using line/polyline



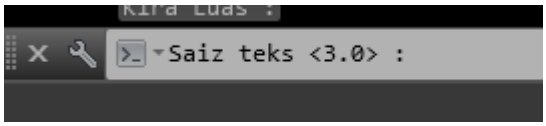
b. Generate L1 until its successfully loaded



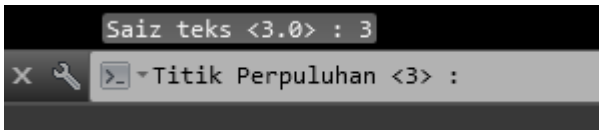
c. Type L1 in the command BAR. Press ENTER



d. Insert 3 for text size. Press ENTER

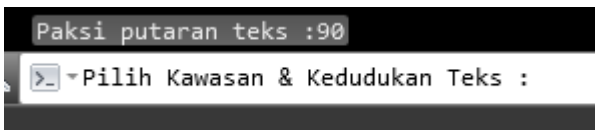


e. Insert 3 for decimal places. Press ENTER

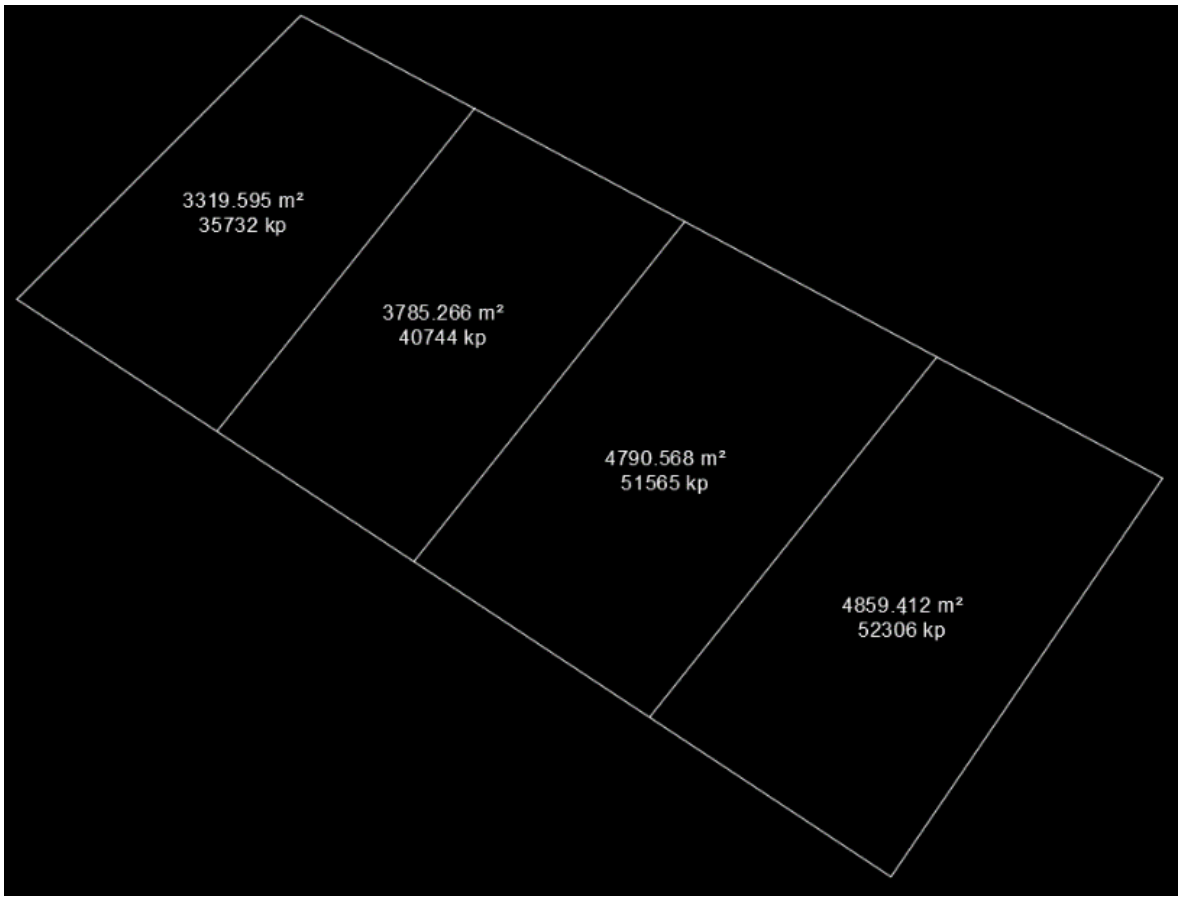


f. Insert 90 for text rotation. Make sure the units are sets Clockwise and North direction. Press ENTER

g. Choose an area and text position by click inside the sub lot



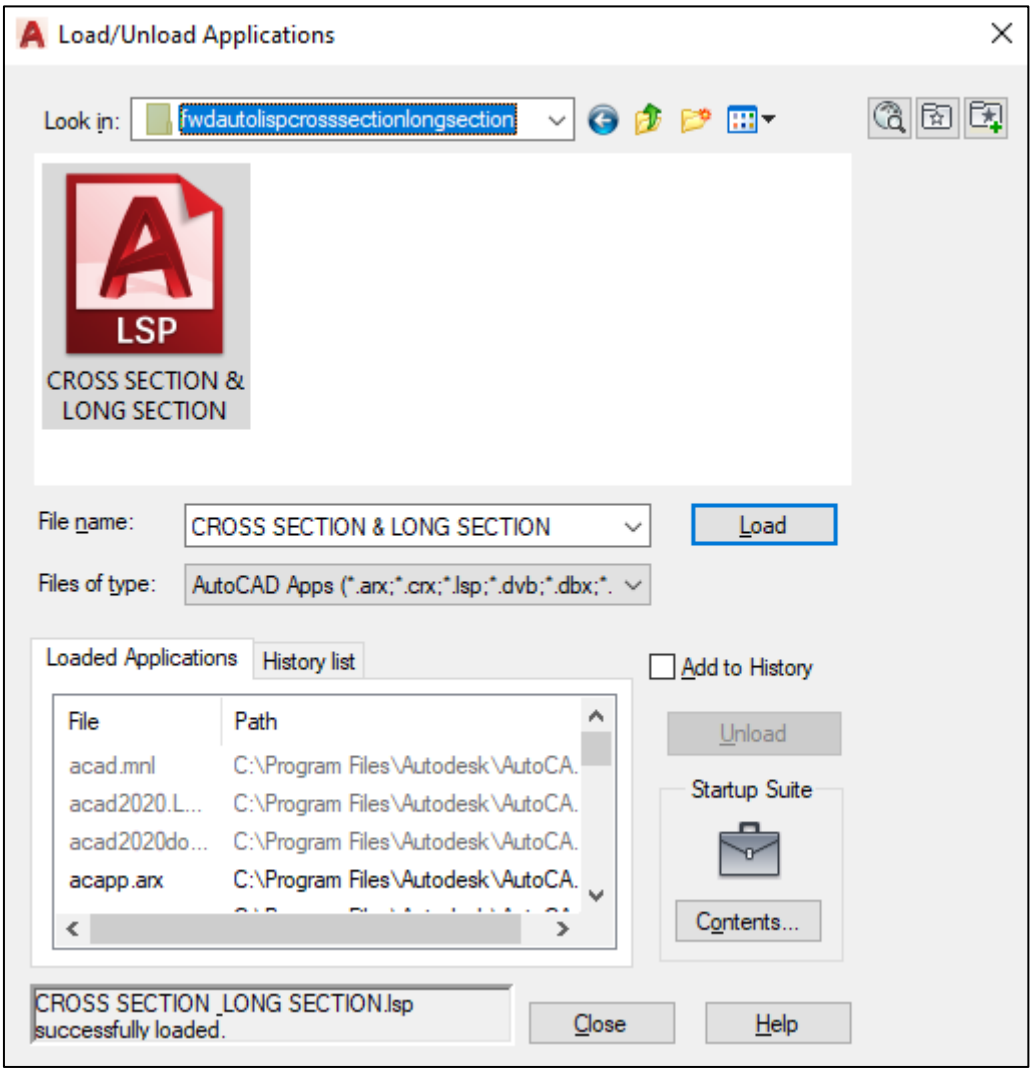
h. The result as shown as below



PROFILE

To draw a long section and cross section from excel data

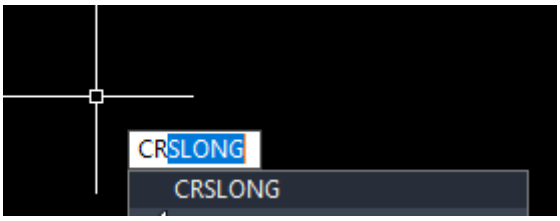
a. Load **CROSS SECTION & LONG SECTION** until its successfully loaded



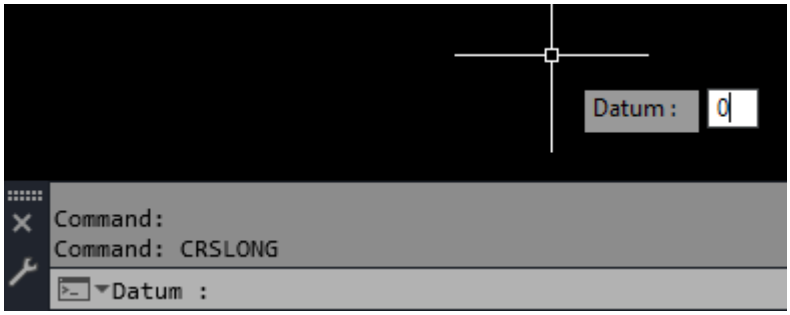
b. Prepare a data based on the format given. For cross section it starts from Chainage & no point, offset, Original Ground Level (OGL) and design. For example, points 1-4 (depend on project) represents for left OGL, point 5 represent a middle point and points 6-9 represent for right OGL. Let the yellow row blanks.

CHA + NO POINT	OFFSET	OGL	DESIGN		
0+000					
1	-39.602	14.260	10.000		LEFT (-)
2	-29.582	14.262	10.000		LEFT (-)
3	-18.860	14.019	10.000		LEFT (-)
4	-13.279	14.110	10.000		LEFT (-)
5	0.000	13.954	10.000		MIDDLE (0)
6	7.759	13.746	10.000		RIGHT (+)
7	25.217	13.526	10.000		RIGHT (+)
8	38.806	13.258	10.000		RIGHT (+)
9	50.000	12.971	10.000		RIGHT (+)
0+025					
1	-40.390	13.952	10.000		
2	-36.407	14.416	10.000		
3	-32.754	14.455	10.000		
4	-28.734	14.372	10.000		
5	-24.971	14.290	10.000		
6	-19.269	13.775	10.000		
7	-14.855	12.430	10.000		
8	-11.036	12.047	10.000		
9	-7.151	11.839	10.000		
10	0.000	11.480	10.000		
11	6.833	11.074	10.000		
12	10.947	10.379	10.000		
13	18.174	10.097	10.000		
14	26.471	9.455	10.000		
15	32.148	9.665	10.000		
16	37.666	10.129	10.000		
17	46.141	10.732	10.000		
18	50.000	10.965	10.000		

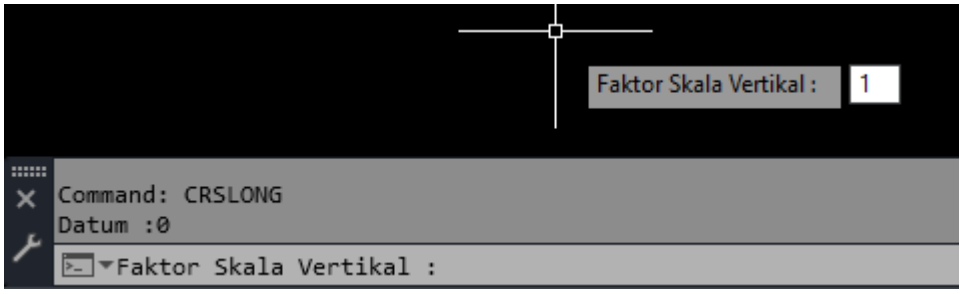
c. Type **CRSLONG** in command BAR. Press ENTER.



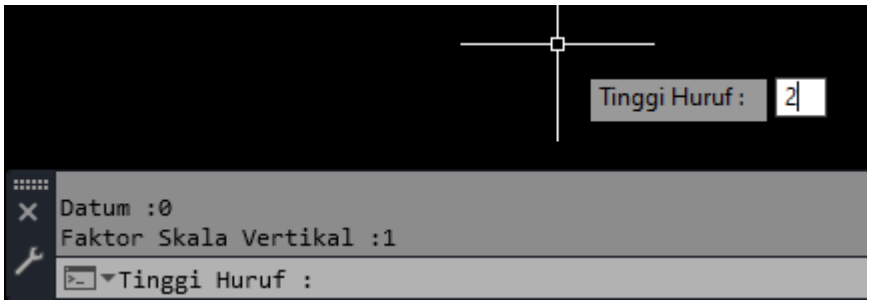
d. For datum, insert 0 (depend on operator). Press ENTER



e. For Vertical scale factor, insert 1. Press ENTER.

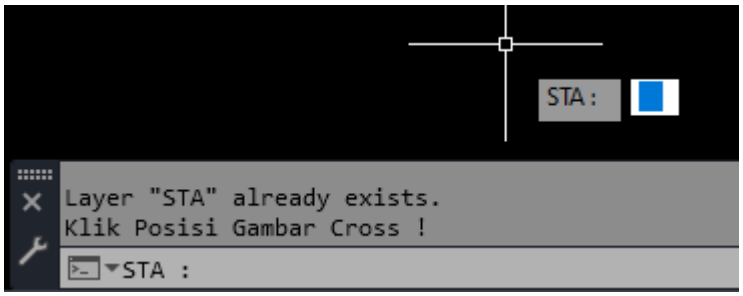


f. Insert 2 (depend on operator) for text size. Press ENTER.

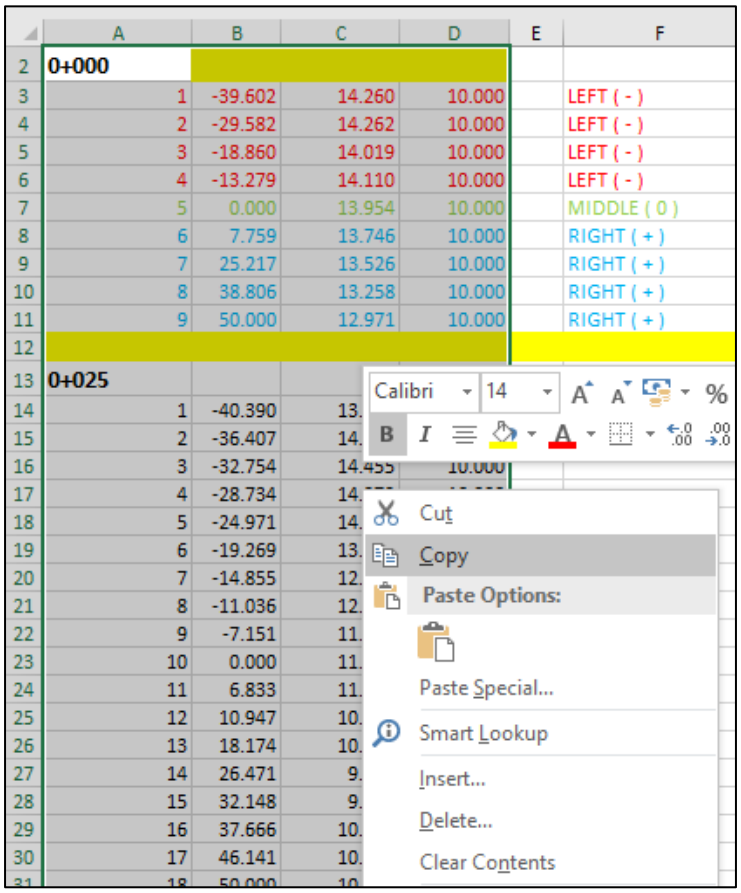


g. Click anywhere in the screen to position the long and cross section drawing

h. STA means the data must insert directly (paste) in the command BAR.

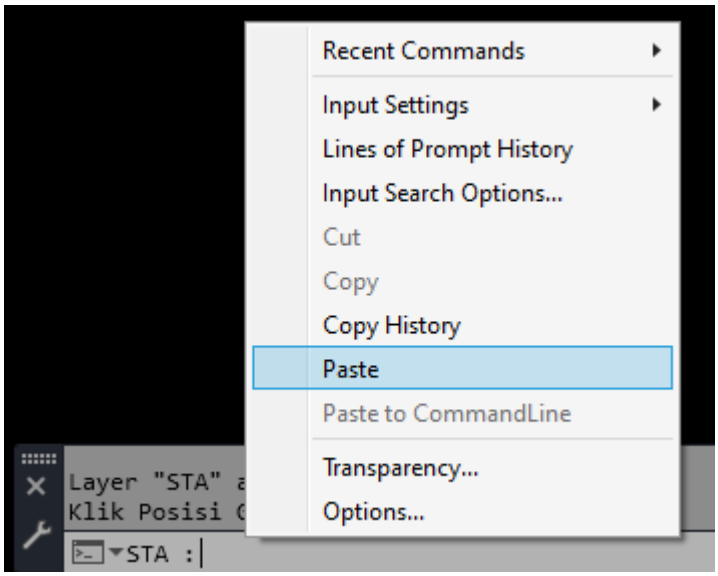


i. Copy all the numerical data in excel.



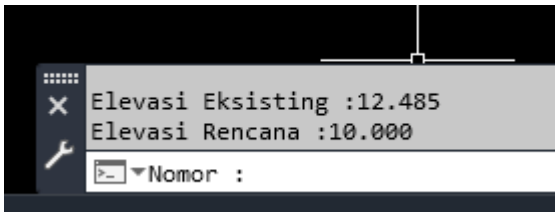
	A	B	C	D	E	F
2	0+000					
3	1	-39.602	14.260	10.000		LEFT (-)
4	2	-29.582	14.262	10.000		LEFT (-)
5	3	-18.860	14.019	10.000		LEFT (-)
6	4	-13.279	14.110	10.000		LEFT (-)
7	5	0.000	13.954	10.000		MIDDLE (0)
8	6	7.759	13.746	10.000		RIGHT (+)
9	7	25.217	13.526	10.000		RIGHT (+)
10	8	38.806	13.258	10.000		RIGHT (+)
11	9	50.000	12.971	10.000		RIGHT (+)
12						
13	0+025					
14	1	-40.390	13.			
15	2	-36.407	14.			
16	3	-32.754	14.455	10.000		
17	4	-28.734	14.			
18	5	-24.971	14.			
19	6	-19.269	13.			
20	7	-14.855	12.			
21	8	-11.036	12.			
22	9	-7.151	11.			
23	10	0.000	11.			
24	11	6.833	11.			
25	12	10.947	10.			
26	13	18.174	10.			
27	14	26.471	9.			
28	15	32.148	9.			
29	16	37.666	10.			
30	17	46.141	10.			

j. Paste the data directly in command BAR

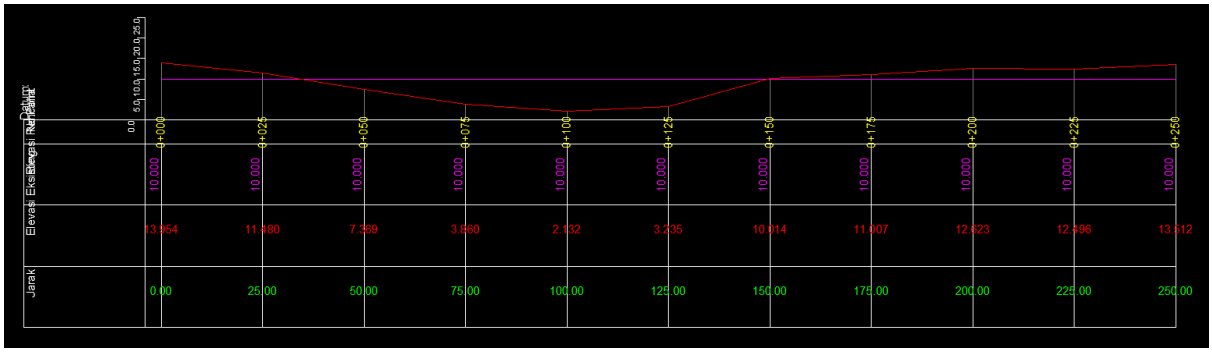


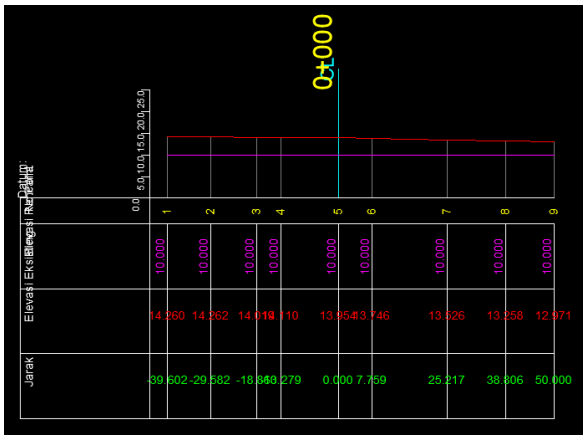
k. Let the LISP generate the long and cross section drawing.

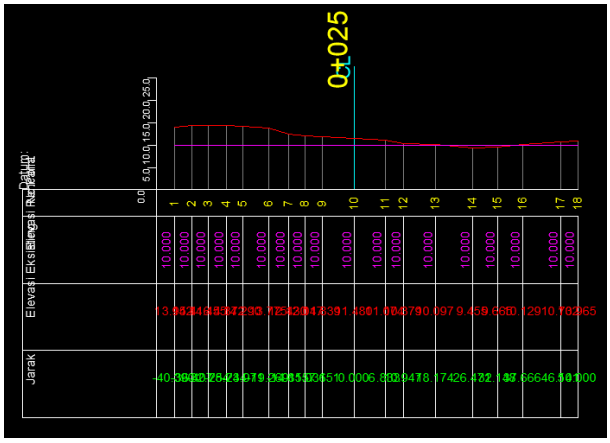
l. After the drawing stop, press ENTER twice and ESC.

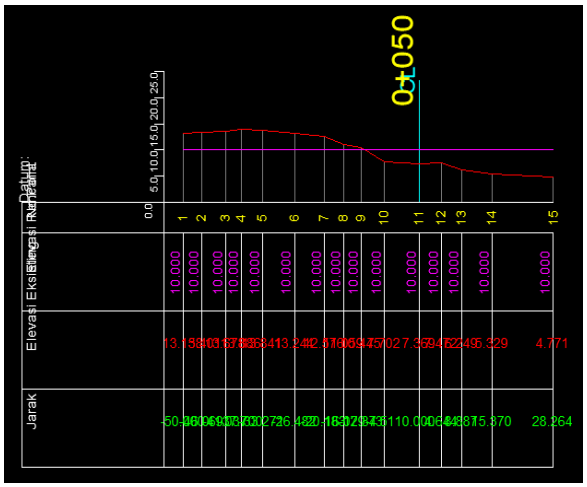


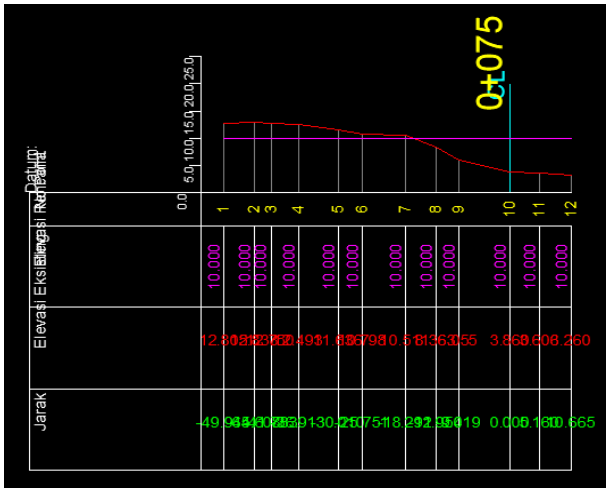
m. The result for long and cross section as below. The drawing can be edited based on requirement.

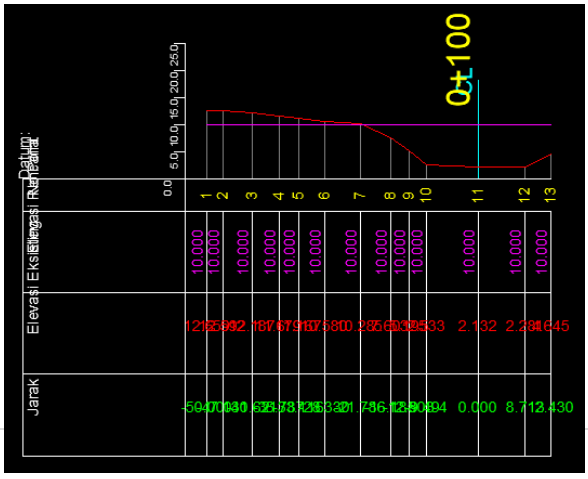


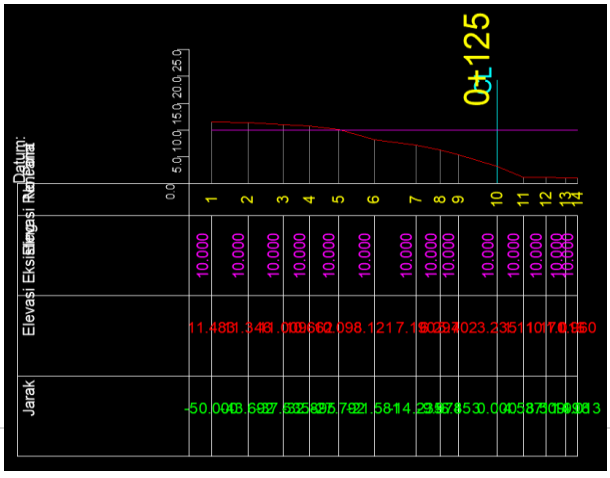






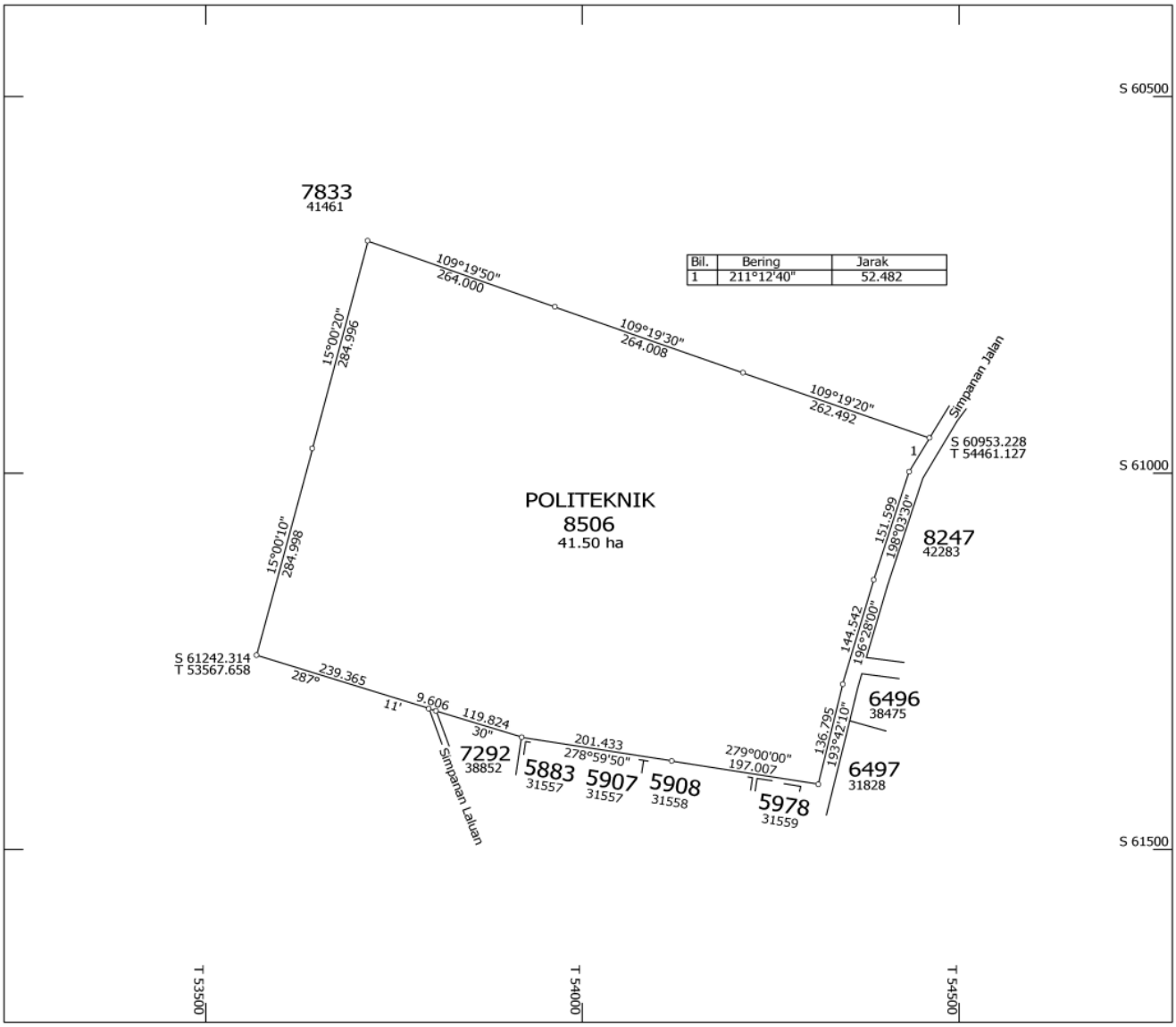


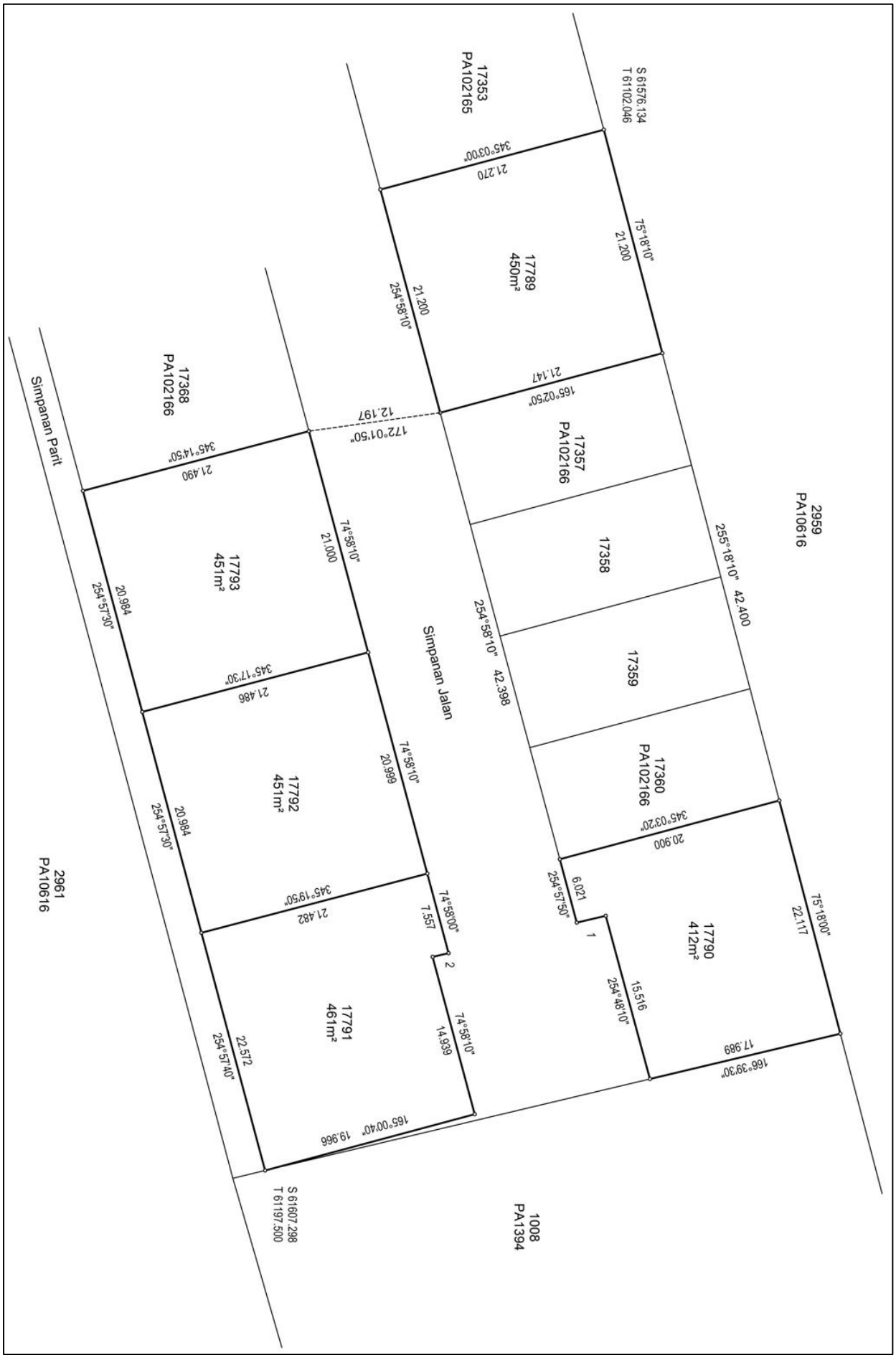




EXERCISES

Draw the Certified Plan (CP) in page 49-50 using the LISP programmes




S 61576.134
T 61102.046
17353
PA102165
345°03'00"
21.270
75°18'10"
21.200
17789
450m²
254°58'10"
21.200
21.147
165°02'50"
17357
PA102166
17358
17359
17360
PA102166
2959
PA10616
255°18'10" 42.400
254°58'10" 42.398
345°03'20"
20.900
6.021
254°57'50"
1
15.516
254°48'10"
17790
412m²
75°18'00"
22.117
166°39'30"
17.989
17368
PA102166
12.197
172°01'50"
345°14'50"
21.490
74°58'10"
21.000
17793
451m²
20.984
254°57'30"
345°17'30"
21.486
74°58'10"
20.999
17792
451m²
20.984
254°57'30"
345°19'50"
21.482
74°58'00"
7.557
2
74°58'10"
14.939
17791
461m²
22.572
254°57'40"
165°00'40"
19.966
Simpanan Pant
Simpanan Jalan
2961
PA10616
S 61607.298
T 61197.500
1008
PA1394

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