

CAD & SURVEY Tools

Tools guide

Version 2.5.0 · 2026-11-08

By Eng. Ali · CAD & SURVEY

CAD & SURVEY Tools

20 tools for AutoCAD and Civil 3D for surveyors and engineers: coordinates, checking and comparing, land subdivision, volumes and reports. All of them are on the **CAD & SURVEY** ribbon tab.

4 **Subscribe & activate in 4 steps**
Know the price · Pay · Request activation · Paste the code ›

✓ **Start here → Which tools fit your work?** Pick your kind of work (roads, pipelines, land subdivision, quantities...) and see the tools you need. **Tools by job ›**

i **You are part of the team.** These tools were built from real site work and grow with your ideas. Tell us about a problem, an improvement or an idea for a new tool. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

i 🤝 **A small request:** these tools took a lot of effort, long hours, many versions and money spent on software and tools to reach the version you are using now. So we kindly ask you: **do not share your copy, and get the tools only from the official source** (the CAD & SURVEY | Eng. Ali channel or our direct link). A copy from somewhere else, or a cracked or modified one, may have been changed in ways nobody knows, and can give **wrong calculations and results** without you noticing: a real risk for your work and for reports that carry your signature. The original copy is the one you can trust; it gets the updates and the support, and your subscription is what lets us keep going and build new tools for you.

✓ **Training exercises:** one exercise per tool, with ready files and a worked hand calculation. Open them with **Training** on the ribbon or type `CSTRAIN` . **Copy the Training folder to Documents before you start**: an update replaces the original folder and anything saved in it is lost.Exercises page › · PDF: Iraqi · MSA · English

POINTS & DRAWING

Import Points `CPOINTS`
Points from a file

Survey Select `CSEL` **PRO**
Select objects by kind and value

Point Table `PTX`
Point export

Coord Grid `CGRID`
Coordinate grid

Object Info `OINFO`
Object info

COORDINATES

Coord System CSCOORD
Coordinate system & sites

Dual Draw CSDRAW
Draw in two systems

Super Labels CLABEL
PRO
Coordinate labels, second system

Coord Transform
CTRANS PRO
Coordinate transformation

Quick Coord CLEAD
Quick coordinate leader

Geo ↔ UTM GEOUTM
PRO
Geographic ↔ UTM, KML

SURVEY QC

Survey Report SREPORT
PRO
Design vs field QC report

Benchmark Manager
CBM PRO
Benchmark / control point library per project

Object Notes CNOTE
PRO
Notes, photos and voice on the drawing, with reminders

DWG Compare CCOMP
Drawing compare, shifts

DESIGN & EARTHWORK

Volume Calc CVOL
PRO
Stockpiles, earthwork layers, quantity report

Profile Maker CPROF
PRO
Road and pipe profiles: L · CL · R, error checks, live drawing

Pipeline Survey CROUTE
PRO
Pipeline route

LAND

Land Subdivision CDIV
PRO
Land subdivision

Area Calc CAREA
Areas

Length Calc CLEN
PRO
Lengths and their total

123 Auto Number ANUM
Automatic numbering

CAD & SURVEY

My Profile CSPROFILE
Me, my instruments, my projects

Quick Bar CSBAR
A floating bar of your favourite tools

COMING SOON

Alignment Sheet `CSHEET` **PRO**
Plan and profile sheets of pipelines and roads

PDF to CAD `CPDF`
A PDF drawing back to AutoCAD at the right scale

Aerial Image `CIMAGE` **PRO**
An aerial picture in its place, with a grid

Building Elevation `CFACADE` **PRO**
Building facades from total station points

Foundations 3D `CFND` **PRO**
Foundations and anchor bolts in 3D at their levels, with sections and a bolt report

Voice Input `CVOICE` **PRO**
Read coordinates aloud (English) into AutoCAD prompts and tool boxes

Smart Edit `SEDIT` **PRO**
14 one-click smart edits: offsets, axes, distribute, dims, chainage, duplicates... on many objects at once

Smart Print `CPLOT` **PRO**
Professional PDFs with no plot setup: ready sheets, title block and key plan

They show grey on the ribbon with a SOON mark; click one to see what it will do. 🚀 All coming tools ›

IN EVERY TOOL

- **Name and command:** the ribbon shows the tool name (e.g. Survey Report); the short command (SREPORT) stays for typing, and the tip shows both.
- **Report options:** most PDF / Excel buttons open a window to choose what goes in the report, with a preview and zoom. Right-click the button to open it without saving a file. If you turned off *Show this window every time*, right-click the button → Report options... to get it back. The Excel button of OINFO, ANUM and CLEAD opens the list straight in Excel (a temporary CSV): keep it with Save As in Excel.
- **Branding in reports** (in `CSABOUT`): `Logo` a small logo at the bottom of the page, `Text` a small grey line, `None` only your client and contractor logos (PRO users).
- **Report style:** the colours of the reports (PDF, Excel, preview). Choose it once in the About window next to Branding in reports; each report can take its own style in the `STYLE` box of Report options (`Use global` = the global one). Paper: `CAD & SURVEY Light` (default, the same colours as before), `Print Mono` (black only), `Earth`, `Clear Contrast` (colour-blind safe). Panel: `CAD & SURVEY Dark`, `Soft Panel`, `Cream Panel`, `Blueprint` (plans and sketches get their own background, tables stay easy to read). Colours keep their meaning: Cut warm / Fill cool, Pass green / Fail red; Print Mono and Clear Contrast also write ✓ / × next to the result. The drawing in AutoCAD does not change.
- **Mouse wheel:** over a long list it moves the list only; over a short list it moves the palette; a closed drop-down never changes by the wheel.
- **The mark:** a faint CAD & SURVEY logo in the corner of every palette; clicks go through it.

Start here

1 · The tab

Open the **CAD & SURVEY** ribbon tab, or type the command (e.g. `CDIV`). If the tab is gone, type `CSRIBBON`.

2 · Hover help

Hold the mouse on any button: a short note with a green tip and a red warning. Switch the language with **Help: EN** next to the signature; the **Guide** link next to it opens the tool's page in this guide.

3 · Help

Help on the ribbon opens this guide; `CSHELP CDIV` opens one tool. Works offline.

Command	What it does
`CSHELP`	This guide (`CSHELP PTX` = one tool's page)
`CSTRAIN`	Training exercises
`CSVIDEOS`	Video lessons
`CSABOUT`	Version, updates, licence status, Auto-load, report style, and 💡 Suggest an idea to send us your idea
`CSPRO`	PRO activation and your Computer ID, Request activation and Price & plans
`CSSUPPORT`	🆘 Help & support: a question, problem or idea, with a support pack on your Desktop (`CSSUPPORT CDIV` = one tool). Also in `CSABOUT` and the Support link at the bottom of each tool
`CSBAR`	Quick Bar
`CSPROFILE`	My Profile
`CSRIBBON`	Brings the CAD & SURVEY tab back

PRO tools

PRO **CLABEL · CTRANS · GEOUTM · SREPORT · CBM · CNOTE · CSEL · CROUTE · CVOL · CPROF · CLEN · CDIV**: a full 30-day trial, then a yearly code for your computer. All the other tools stay free. Subscribe & activate in 4 steps › · Trial, activation and payment ›

Install or portable

Full step-by-step guide, with removing, updating and troubleshooting ›

Setup.exe

Personal laptop: run Setup (no admin needed) and open AutoCAD; the tab is there. Remove it from Windows apps.

Portable (.zip)

Company laptop: unzip anywhere, type `NETLOAD` in AutoCAD and open the DLL in the folder of your version (2020-2024, 2025-2026 or 2027). The first time it asks: every time or this session only. Removing = Auto-load off in `CSABOUT`, then delete the folder.



Eng. Ali

Civil engineer & surveyor

Working on oil field projects in Basra. Teaching survey instruments and software on CAD & SURVEY since 2018. These tools come from real problems on site.

25K+	10K+	20
YouTube	Facebook	tools

@Eng.alicadsurvey

CAD & SURVEY

cad.survey

eng.alicadsurvey@gmail.com

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Guide › START

Install and portable

Two ways: Setup.exe for your own laptop, and the portable version for a company laptop. Both need no admin and work in AutoCAD and Civil 3D 2020 – 2027.

⚠ **AutoCAD LT is not supported:** LT cannot load add-ons. You need full AutoCAD or Civil 3D. BricsCAD and GstarCAD are not supported either.

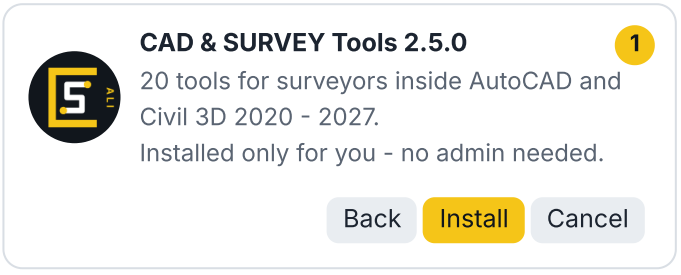
1 Which way fits you?

	Setup.exe	Portable (.zip)
Computer	Your own laptop	Company laptop
Admin rights	Not needed	Not needed
Loads by itself	Always	If you choose Every time
AutoCAD	2020 – 2026	2020 – 2026
Removing	Windows apps	Delete the folder

i Both give the same tools and settings. If Setup works on the company laptop use it; if it is blocked, use portable.

2 Installing with Setup.exe

1. Close AutoCAD.
2. Run `CadSurveyTools_2.5.0_Setup.exe` and press Install. No admin is asked.
3. Open AutoCAD: the **CAD & SURVEY** tab is on the ribbon, in every AutoCAD / Civil 3D you have (2020 – 2027).
4. On the last page keep “Open the guide” ticked. Later the guide is in the Start menu → **CAD & SURVEY Tools → CAD & SURVEY Guide**, even without AutoCAD.



5 If AutoCAD shows a security message the first time, choose **Always load**.

✓ AutoCAD picks the right build by itself: 2020 – 2024, 2025 – 2026 or 2027.

i **Where does it go?** `%AppData%\Autodesk\ApplicationPlugins\CadSurvey.bundle` ; the guide and the training are inside it, under `Contents` .

⚠ If Windows shows "Windows protected your PC": press More info → Run anyway. It appears because the file is new and not company-signed.

3 Portable (company laptop)

1 Before unzipping: right-click the zip → Properties → **Unblock** → OK. (If it is not there, fine.)

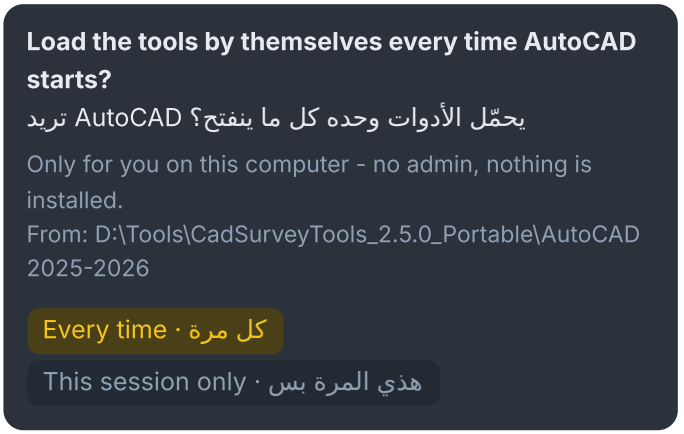
2 Unzip anywhere: D:\Tools, Documents or a USB stick.

3 In AutoCAD type `NETLOAD` and open the DLL in the folder of your version.

4 If a security message appears choose **Always load**.

5 The first time it asks: **Every time** so AutoCAD loads it by itself, or **This session only**.

```
CadSurveyTools_2.5.0_Portable\
├─ AutoCAD 2020-2024\   CadSurvey.Tools.dll
├─ AutoCAD 2025-2026\   CadSurvey.Tools.dll
├─ AutoCAD 2027\        CadSurvey.Tools.dll
├─ Help\                (this guide)
├─ Training\            (exercises)
├─ links.txt
├─ pay_zaincash.png
└─ READ ME.txt
```



i "Every time" is written only for you in AutoCAD's settings, no admin, nothing installed. Change it in `CSABOUT` → Auto-load.

⚠ Pick the right folder: the 2025 – 2026 DLL does not load in 2024 or 2027; each version has its own folder.

Your version	Folder

AutoCAD / Civil 3D 2020 – 2024	`AutoCAD 2020-2024`
AutoCAD / Civil 3D 2025 – 2026	`AutoCAD 2025-2026`
AutoCAD / Civil 3D 2027	`AutoCAD 2027`

The Civil 3D year is the AutoCAD year (Civil 3D 2024 = AutoCAD 2024).

4 Updating to a new version

Setup	Run the new Setup over the old one. Settings stay.
Portable	Close AutoCAD and replace the folder at the same place. A new place needs one NETLOAD.
CSABOUT	Tells you when a newer version exists; Download takes you to it.

5 Removing

Setup	Windows → Settings → Apps → **CAD & SURVEY Tools** → Uninstall.
Portable	`CSABOUT` → Auto-load off, then delete the folder.

✓ **What stays after removing?** Your settings (`HKCU\Software\CADSURVEY`), My Profile (`%AppData%\CADSURVEY`) and your PRO licence (`%LocalAppData%\CADSURVEY\lic.dat`). A reinstall keeps your licence.

6 Troubleshooting

▼ **The tab is not on the ribbon?**

Type `CSRIBBON`. If the ribbon itself is closed, type `RIBBON` first.

▼ **NETLOAD error (Could not load file / not supported)?**

Usually Windows blocked the file: close AutoCAD, right-click the DLL → Properties → Unblock, or unzip again after unblocking the zip. Also check the version folder.

▼ **Which version do I have?**

`CSABOUT` shows the version, AutoCAD and .NET, and where it is installed.

▼ **AutoCAD 2027?**

Supported from 2.5: it has its own DLL (.NET 10) in the `AutoCAD 2027` folder; Setup installs it for you.

▼ **Portable: the tools do not load after restarting?**

You chose This session only. NETLOAD again and turn on Auto-load in `CSABOUT`.

▼ **AutoCAD was open during Setup?**

Setup asks you to close it. Close AutoCAD, finish the install, then open it again.

▼ **The antivirus removed or quarantined the file?**

The file is not company-signed, so some antivirus programs distrust it. Restore it from quarantine and add the folder as an exception, or use the portable version.

▼ **Installed, but the tools never load?**

In AutoCAD type `APPAUTOLOAD`, set it to `14`, then close and reopen AutoCAD.

▼ **Another Windows user on the same computer?**

Setup installs only for the user who ran it. The other user runs Setup from his own account (and pastes the PRO code again).

▼ **Still stuck?**

Send a support request: `CSABOUT` › 🆘 **Help & support** (or `CSSUPPORT`). It makes a zip on your Desktop and opens WhatsApp or e-mail; attach the zip and send.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

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Which tools fit your work?

Pick the card that looks like your day, and see how much time the tools give back.



1 Site supervision & QC

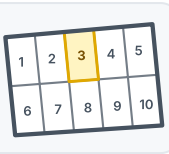
"The contractor cast 40 anchor bolts and wants sign-off today."

Design vs field, pass / fail, a signed QC report. A revised drawing? CCOMP shows what moved.

- SREPORT Survey Report PRO
- CCOMP DWG Compare
- CNOTE Object Notes PRO
- CBM Benchmark Manager PRO

AutoCAD alone — about 3 h (≈)

With the tool — about 20 min (≈)



2 Land subdivision & plots

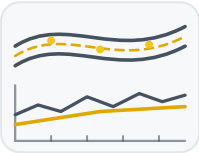
"Morning: the contractor brings a 5-dunam parcel to split into 20 equal plots."

Split, leave out the road, number them: the table and A4 report are ready.

- CDIV Land Subdivision PRO
- CAREA Area Calc
- CLEN Length Calc PRO
- CGRID Coord Grid
- ANUM Auto Number

AutoCAD alone — about 2 h (≈)

With the tool — about 10 min (≈)



3 Roads & pipelines

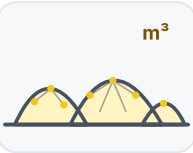
"The contractor sends a 4 km pipeline route table, as a photo or a PDF."

Read it, check the bends and missing points, get the stakeout list and the profile.

- CROUTE Pipeline Survey PRO
- CPROF Profile Maker PRO
- CLABEL Super Labels PRO

AutoCAD alone — about 1 day (≈)

With the tool — about 1 h (≈)



4 Earthworks & volumes

"You surveyed 3 stockpiles of sand and gravel; the office wants the quantity today."

Volume, weight, truck count, and a PDF report per pile.

- CVOL Volume Calc PRO
- CPROF Profile Maker PRO
- CPOINTS Import Points

AutoCAD alone — about 2 h (≈)

With the tool — about 15 min (≈)



5 Coordinates & instrument data

"The plant drawing is in local coordinates; the consultant wants it on UTM 38N."

Transform from two known points, verify, and move points to and from the instrument.

- **CTRANS** Coord Transform **PRO**
- **GEOUTM** Geo ↔ UTM **PRO**
- **PTX** Point Table
- **CPOINTS** Import Points

AutoCAD alone — **about 1 h** (≈)

With the tool — **about 5 min** (≈)



6 Drawing finishing & handover

"The drawing is done, but 150 points need coordinates and a table before handover."

Every click places a coordinate leader, and the table comes out by itself.

- **CLEAD** Quick Coord
- **CLABEL** Super Labels **PRO**
- **CSEL** Survey Select **PRO**
- **OINFO** Object Info

AutoCAD alone — **about 1 h** (≈)

With the tool — **about 5 min** (≈)

(≈) Times are rough estimates; they change with the job and the drawing.

Not sure? Start with **CLEAD** Quick Coord and **CAREA** Area Calc : free and quick.

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Guide › PRO

CSPRO PRO Trial and activation

8 tools are free forever. The 12 PRO tools share one 30-day trial, then need an activation code for your computer. When a code ends only the PRO tools stop; the free tools and your drawings are untouched.

Code	How long
Yearly	One year from the day the code is issued (not the activation day). In the last 30 days the command line shows the days left; renew with a new code.
Temporary 7 days	Sent while your payment is on its way; stops after 7 days, with a reminder every session.
Gift	A gift from us (a contest or a partnership); CSPRO shows how long it runs.

CSPRO shows it like `until 14-03-2027` (the last day it works).

1 Free and PRO

Free forever	PRO PRO
OINFO · CLEAD · CAREA · ANUM · CGRID · PTX · CPOINTS · CCOMP	CLABEL · CTRANS · GEOUTM · SREPORT · CBM · CROUTE · CVOL · CPROF · CLEN · CSEL · CNOTE · CDIV

i 🤝 **A small request:** these tools took a lot of effort, long hours, many versions and money spent on software and tools to reach the version you are using now. So we kindly ask you: **do not share your copy, and get the tools only from the official source** (the CAD & SURVEY | Eng. Ali channel or our direct link). A copy from somewhere else, or a cracked or modified one, may have been changed in ways nobody knows, and can give **wrong calculations and results** without you noticing: a real risk for your work and for reports that carry your signature. The original copy is the one you can trust; it gets the updates and the support, and your subscription is what lets us keep going and build new tools for you.

2 The 30-day trial

1. One 30-day trial for all PRO tools, from the first time you use any of them, not from the install day.
2. Everything works in the trial, no watermark. The command line shows the days left.

3 After 30 days the tool opens the activation window instead. Your drawings and files are not touched.

⚠ Do not set the computer clock back (more than 2 days): the tools notice it, end the trial and stop a yearly or temporary code. Fix: correct the date, then close and reopen AutoCAD.

3 Buy and activate

4 Subscribe & activate in 4 steps (with pictures)
Know the price · Pay · Request activation · Paste the code ›

1. **Know the price:** type `CSPRO` or press **Pro** on the CAD & SURVEY tab, then **Price & plans**: it opens the plans page and sends us a short request; we answer with the price.
2. **Pay** (next part).
3. **Request activation:** press **Request activation ▸**: a small form filled from My Profile (name, e-mail, phone, payment method, ref or MTCN). **Send** opens WhatsApp or an e-mail with the request and your Computer ID ready. Attach the payment photo and send.
4. **Paste the code:** you get a code that starts with `CSPRO-` . Copy all of it, open `CSPRO` , press **Paste** then **Activate**.

i **Receipt:** when you give your e-mail, an activation receipt (PDF) comes with the code. **Renew:** in the last 30 days a **Renew** button shows in `CSPRO` ; the new year starts where the old one ends.

✓ Activation works offline and stays through updates: install new versions with no new code.

i The licence is per Windows user: another user on the same computer pastes the same code once more from his own account.

4 Payment

Zain Cash

Scan the code with the Zain Cash app. The same code is in the `CSPRO` window.

Qi Card

The details are sent to you on WhatsApp.

Outside Iraq

Western Union: receiver name exactly **Ali Dakhil**, country Iraq, the sender pays the fee. Send the **MTCN** in the request. Details ›

The price: **Price & plans** in `CSPRO`. Contact: eng.alicadsurvey@gmail.com

5 Questions

▼ **I changed or reset my computer**

The code is tied to the computer. If the Computer ID changes after a reset or a new computer, send the new ID with your old code and we sort it out.

▼ **The portable version?**

The same: activation is for your computer, Setup or portable, AutoCAD 2020 – 2027.

▼ **Where do I see the status?**

In `CSABOUT`, the Licence row, or in the `CSPRO` window.

Activation messages → fix

Message	Fix
`not a CAD & SURVEY Pro code` · `not valid`	WhatsApp split the code. Copy all of it again and press **Paste** (do not type it).
`made for another computer`	Send the Computer ID of the computer that runs AutoCAD.
`needs a newer version`	Update the tools first, then enter the code.
`code ended on …`	The yearly or temporary code has ended: ask for a new one.
`date of this computer is wrong`	Correct the computer date, restart AutoCAD, enter the code again.

★ New in 2.5

1. **AutoCAD and Civil 3D 2027** are supported (their own .NET 10 DLL; Setup installs it).
2. **CPOINTS · File in:** inserting a file that is in the second system is a new PRO part (like CGRID+ and CAREA Draw); everything that uses two systems is PRO.

6 New in 2.4.1

1. **A days-left ring** in the Pro and About windows: gold, orange at 7 days or less, red pulsing at 2 days or less. A licence with no end = a gold ring with ✓.
2. **Trial-end reminder:** at 7, 3, 2 and 1 day left, a quiet card once a day with "Subscribe...".
3. After the trial: CLEN Path and CAREA Draw have 5 free saves each; the preview always stays free.

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CSPRO Subscribe & activate in 4 steps

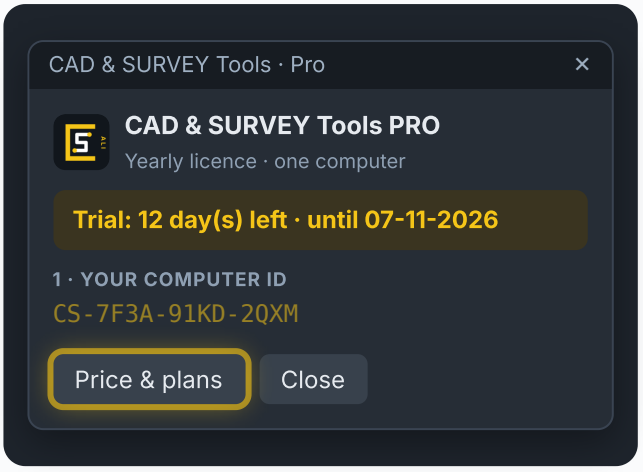
Everything happens in the `CSPRO` window in AutoCAD. The pictures below are the same buttons you will see.

1 — 2 — 3 — 4 ✓

1 Know the price

Type **CSPRO** (or **Pro** on the CAD & SURVEY tab) and press **Price & plans**. The plans page opens and a short request reaches us; we answer with the price and the offers.

> Try before you pay: a full 30-day trial of all PRO tools.

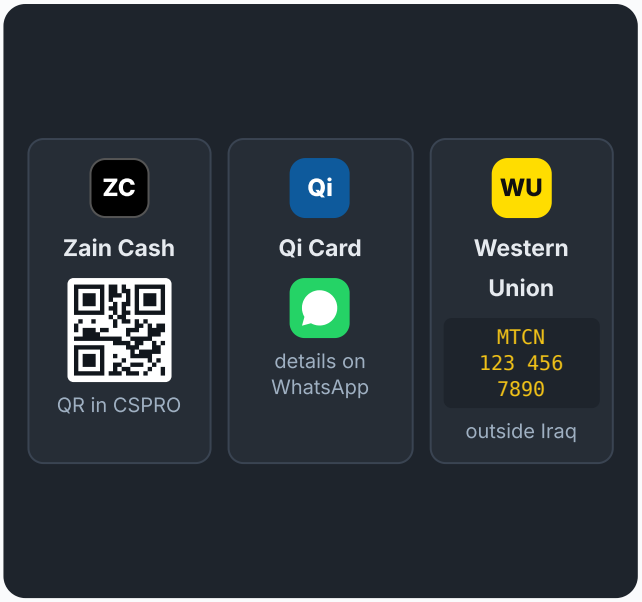


CAD & SURVEY ENG. ALI

2 Pay

- **Zain Cash** · scan the QR in the `CSPRO` window with the Zain Cash app.
- **Qi Card** · the details are sent to you on WhatsApp.
- **Western Union** · outside Iraq: read the yellow box before you pay.

Take a photo of the payment (receipt or screenshot): you need it in step 3.



WU Western Union (outside Iraq): read before you pay

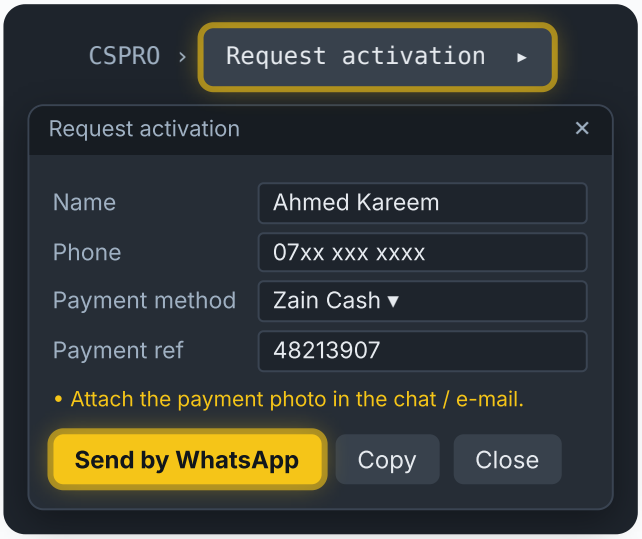
Receiver name	`Ali Dakhil`
Country	**Iraq**
Transfer fee	**paid by the sender**

- Write the name **exactly Ali Dakhil**, letter by letter. One different letter and the money cannot be collected.
- Keep the **MTCN** (10 digits) and a photo of the Western Union receipt: they go in the activation request.
- It usually arrives in minutes; sometimes it is held for checks. **If it is late, we activate you for 7 days** until it arrives.

3 Request activation

In **CSPRO** press **Request activation ▸**. Fill in the form (payment method, and the payment number or MTCN) and press **Send**: WhatsApp or an e-mail opens with the request and your Computer ID ready.

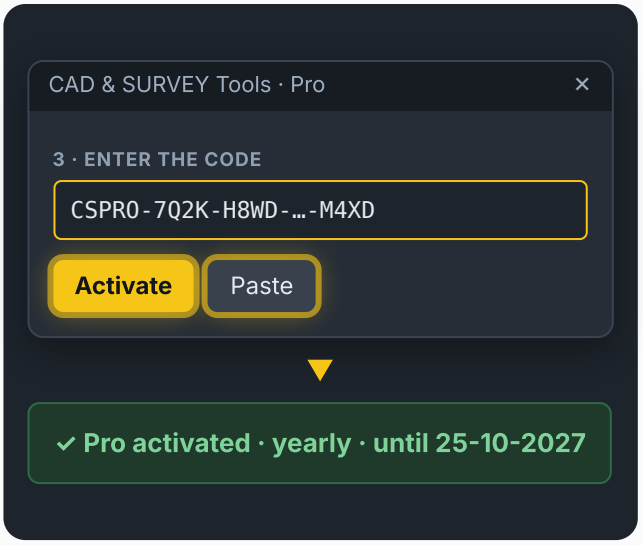
📎 Attach the payment photo in the chat or the e-mail, and send.



4 Paste the code and activate

You get a code that starts with `CSPRO-` (and a PDF receipt when you gave your e-mail). Copy all of it, open **CSPRO**, press **Paste** then **Activate**.

✓ You see **Pro activated**: all PRO tools are open for you. No internet needed.



i **Renew:** in the last 30 days of your subscription a **Renew** button shows in `CSPRO` : the same steps 2, 3 and 4. The new year starts where the old one ends, so you lose no day.

Stuck? Message us and we activate it with you, step by step.
WhatsApp +964 782 101 0363 · eng.alicadsurvey@gmail.com

More details → code types, the trial, questions and activation messages ›

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By Eng. Ali · CAD & SURVEY · Guide

Guide › COORDINATES

Super Labels CLABEL PRO Coordinate labels

Labels points with their coordinates: by picking, by selecting objects, or just querying. With a second system (local or geographic), table, Excel, PDF, points file and KML.

i While picking, type `N` : a small box opens next to the mouse to change the prefix and next number; Enter and carry on. The box is on by default; its clear **Turn off ✕** button switches it off (you then type in the command line), and the **Floating box** button in the palette (or `BOX` at that prompt) turns it back on. In the palette a gold line with a bulb 💡 reminds you of the key: a click opens this page, ✕ hides it and leaves a small bulb (a click brings it back). When the box is off the line turns grey with a **Turn it on** button.

i **Exercise 01:** number the four corners of plot WIP-2 / 7, put their coordinates in a table in UTM and in the plant system at once, and read the latitude / longitude of a corner. Files in `Training\01_CLABEL\` . Open the exercise ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The four pages

`Pick`
Click points one by one and drag the label into place (Enter = automatic place). LINES and STYLE (and DISPLAY on the System page) are set once, so they fold under a bar with `Edit ▾` / `Hide ▴` ; the closed bar shows the current settings in a few words.

`Select`
Select objects: every polyline vertex, line ends, blocks, points and COGO points get a label.

`Query`
Read the coordinates in all systems without drawing anything. **LAST POINT** shows the last

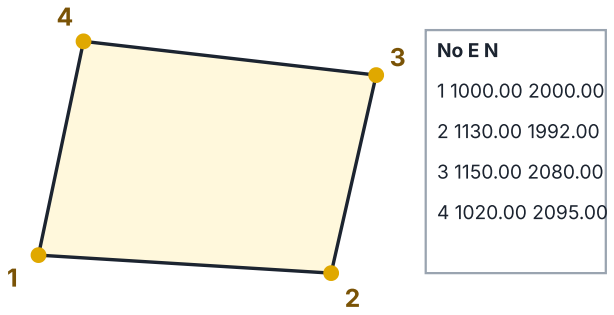
i **Label form:** `Separate` = one text per line, each kind on its own layer (hide one kind easily) · `Stacked` = one MText per point on one layer (moves and copies as one) · `Block` = one block per point with attributes (double-click to edit, export with ATTOUT or DATAEXTRACTION). Same place, height and spacing in all three.

click: `A` copies the drawing coordinates, `B` the second system, `Copy all` everything, and `Google Maps` opens the point on the map (needs internet). **LIST** collects the clicks; `Draw all` draws them as AutoCAD points.

`System`

The optional second system: local (from CTRANS) or geographic WGS 84.

- ✓ **Live edit after placing:** change the arrow, length, height or lines and the **last label** moves at once (U takes it back). `Apply to all` moves every label of the drawing and asks first, because labels placed by hand move too. `Auto` moves nothing.



Select → Number + table

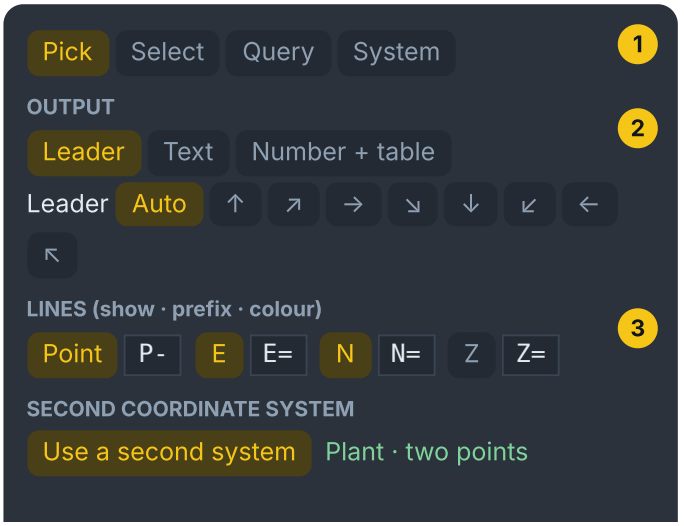
2 Example: plot corners with numbers and a table

A polyline with four corners. On `Select` choose `Number + table` and select the polyline: every corner gets a number, then you click where the table goes.

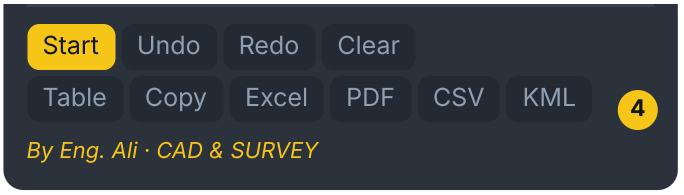
- ✓ Best for polylines with many vertices: the drawing stays clean and all coordinates are in the table.

3 Steps

1. Choose the page: Pick, Select or Query.
2. Choose the output: Leader, Text or Number + table.
3. Turn on the lines you want (#, E, N, Z, Desc) with prefix and colour; turn on the second system if needed.
4. `Start` and click in the drawing. `Undo` removes the last point, `Redo` puts it back.



5 In the list: clicking a row zooms to the point and circles it. The `Draw` chip draws an AutoCAD point and its name (where you choose with the small squares) for the rows you choose with Ctrl / Shift + click; with no row chosen it is `Draw all` and does every row. The dot of a row = print or skip.



4 Second system

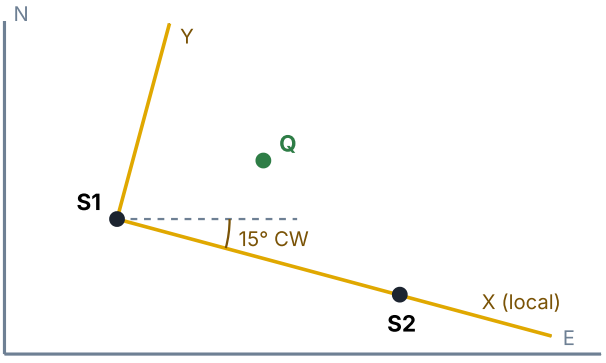
Local	A site / plant system: from one point (shift), a point + angle, or two known points. Save and load it in the CTRANS projects file.
Drawing is in	`GRID` if your drawing is in UTM (labels show the local values), `LOCAL` if your drawing is in the plant system (labels show GRID).
Two points	No scale factor: only the angle is solved. If the distance differs by more than 0.01 m between the two systems, `distance diff` shows in orange: one control coordinate is wrong.
Geographic	Latitude / longitude WGS 84 from UTM. Choose the zone, N/S and the angle format (DD, DMS or DM).
Check the drawing	Converts the drawing centre and tells if it is inside the zone.

⚠ A wrong zone gives wrong latitude / longitude everywhere. Use Check the drawing first.

5 The second system with numbers

The local system in CLABEL uses exactly the CTRANS math (see CTRANS → Calculation per method). A small example: the drawing is in GRID (`Drawing is in` = GRID), so the tool gets the local values with the reverse formula.

Point	X / E	Y / N
S1 local	500.000	500.000
S1 grid	681000.000	3381000.000
S2 local	600.000	500.000
S2 grid	681096.593	3380974.118
Q grid (click)	**681050.000**	**3381020.000**



Q clicked in GRID → label shows LOCAL

One point · point + rotation · two points

1 `ΔE = 681050.000 − 681000.000  ΔN = 3381020.000 − 3381000.000`

ΔE = 50.000 , ΔN = 20.000

Q relative to S1 in the grid.

2 `One point:  X = 500.000 + 50.000  Y = 500.000 + 20.000`

Q local = 550.000 , 520.000

One point: shift only (θ = 0).

3 `Point + rotation 15° CW:  c = cos 15° = 0.965926  s = +sin 15° = 0.258819`

CW → s is positive

The angle is CW, so sin is positive.

4
```
X = 500 + 50×0.965926 − 20×0.258819 = 500 + 48.29629 − 5.17638
Y = 500 + 50×0.258819 + 20×0.965926 = 500 + 12.94095 + 19.31852
```

Q local = 543.120 , 532.259

The reverse formula: X = X0 + ΔE·c − ΔN·s, Y = Y0 + ΔE·s + ΔN·c.

5
```
Two points S1, S2:  αL = atan2(0.000, 100.000) = 0°
αG = atan2(−25.882, 96.593) = −14.999991°   θ = 0° − (−14.999991°)
```

θ = +14.999991° → 14.999991° CW

With two points the angle is calculated (positive = CW); the distance is 100.000 in both.

6 `same formula as step 4 with θ = 14.999991°`

Q local = 543.120 , 532.259

Same result as point + rotation.

Geographic (UTM → Lat / Lon)

1 `Q: E = 681050.000  N = 3381020.000  zone 38 N  WGS 84`

input

The drawing is UTM zone 38 north.

2 `UTM → Lat / Lon (Transverse Mercator, same math as GEOUTM)`

Lat 30°32'52.580"N · Lon 46°53'14.904"E

In D° M' S" with 3 decimals of seconds. The full steps are on the GEOUTM page.

6 Output

Table · Copy · Excel · PDF	The point list in both systems. `Copy` copies it for Excel.
CSV	A CSV / TXT points file for the total station / GPS: column order, separator and system.
KML	The points for Google Earth. Only with the second system = geographic.
Leader (Place)	The leader direction as small arrows; the lit one is the chosen one: `Auto` = as before (Select: each label goes outward, away from the shape; Pick: it goes `↗` and you drag it), or one of the eight arrows `↑ ↗ → ↘ ↓ ↙ ← ↖` = every leader the same way (`→` 0°, `↗` 45°, `↑` 90°, `↖` 135°, `←` 180°, `↙` 225°, `↓` 270°, `↘` 315°). `Length` = the leader length. An old saved angle goes to the nearest arrow.
Reset	In the Style bar: puts the label settings back to default after asking (lines, prefixes, colours, height, decimals, arrow, style, layers, table, counter). The second system, the lists and the labels in the drawing stay.
Skip duplicate points	A point already in the list is not labelled again.
COGO point	Civil 3D points keep their own number and description.
OBJECTS · Polyline	In Select: `All vertices`, or `Start / end only`.
Table · rows · title	In Number + table: `rows` = rows before the table splits (25), `title` (COORDINATES).
2nd layer	In Text: the layer of the second-system lines (CLABEL-LABEL-2).
Note	A special note in its own colour, added to the next labels, with its own table column.

`Clear`	On Query it asks first, then clears the list and its drawn points. On Pick / Select it asks whether to erase the labels from the drawing too. An empty list shows `No labels yet - press Start`.

Defaults (Reset brings them back)	
UTM zone	38 N
Height · Decimals	2.5 · 3
Layer · Leader Length	`CLABEL-LABEL` · 5
Prefixes	`P-` `E=` `N=` `Z=` · `X=` `Y=` · `Lat=` `Lon=`

7 Questions

▼ CLABEL or CLEAD?

CLEAD is a small quick bar: one leader per click. CLABEL is complete: object selection, a second system, tables, files and KML.

▼ Labels overlap in Select mode?

On the `Leader` row choose `Auto` so each label goes away from the shape, or use Number + table.

i **Report options:** PDF or Excel opens a window to choose what goes in the report, with a preview of the pages and zoom: the columns of the LIST of Pick / Select and of Query (such as Lat / Lon or the second system), the settings lines, the drawing name and date, and the page shape. Each list keeps its own choices. Right-click the button to open the window without saving a file.

8 New in 2.4.1

1. A leader going left: the text lines up to the left and never turns around.
2. **The `Update` button:** every label is worked out again at the point its arrow is on now, with the system of the site that point is in and today's settings. Example: SITE C linked after its points were labelled → Update → "1 label(s) updated, 3 already right".
3. **The list is grouped by system** with filter chips in each site's colour; the filter decides what goes to the table, Excel and PDF. In a local drawing the lines read X= and Y=.
4. **It asks for a window first:** draw a window over the labels to update, or Enter = all. A plan copied elsewhere for printing stays out of the window and keeps its numbers.

5. **A fingerprint per label:** a label edited by hand, exploded, on a locked layer or from an older version is never touched. One U takes the whole update back.

6. **Both lists (Pick / Select and Query) are in order:** the first point on top, a new one at the bottom. The dot of a row = print or skip (`All` / `None`); every output (Table, Copy, Excel, PDF, CSV, KML) takes the ticked rows only. `Delete` erases the chosen rows (Ctrl / Shift + click) and their labels, `Undo` brings them back; `Renumber` closes the gaps (P1 P2 P4 → P1 P2 P3) and the labels follow. Drawing a point is on the `Draw` chip now: choose rows, then click it.

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Guide › COORDINATES

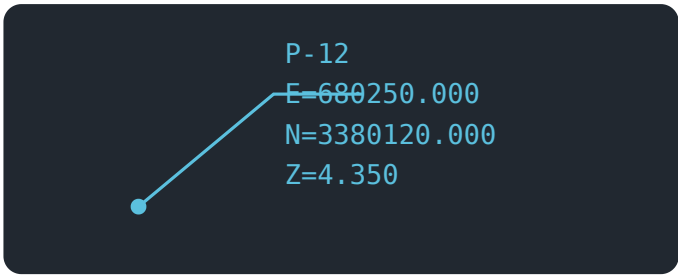
Quick Coord `CLEAD` Coordinate leader

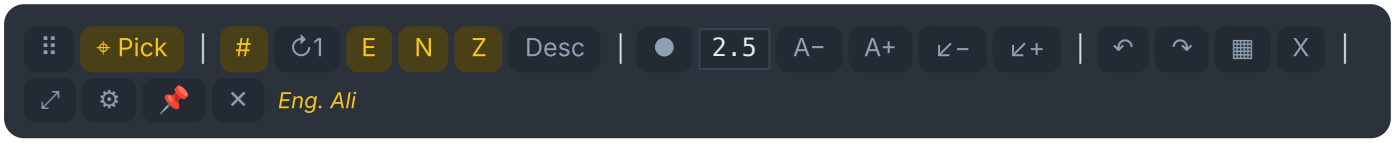
The fastest way to label a point: a small bar over the drawing; every click places a multileader with number, E, N and Z.

✓ **Exercise 02:** label the five valves of flowline FL-207 (number, E, N, Z), mark the live part with a special note, and make the table. Files in `Training\02_CLEAD\` . Open the exercise ›

1 How it works

1. Type `CLEAD` : a small bar appears over the drawing.
2. Press the yellow `Pick` button of the bar, then click a point, drag and click where the label goes (or **Enter** = automatic place): a multileader with the number and coordinates is placed.
3. Keep clicking. Any change on the bar applies to the next point.
4. `Enter` stops picking, the bar stays. `Esc` stops and closes the bar (unless pinned 📌). `▦` table and Excel: all labels, a range of numbers (from-to), or the ones you pick in the drawing, sorted by number.





The bar buttons (from the left)

⠿	Drag it to move the bar anywhere. The tool name sits next to it (drag it too). **Right-click** it: **One row** or **Two rows** (the work on top, options and outputs under it); the tool remembers your choice.
Pick	Starts clicking points in the drawing.
# · ↻1	Point number on / off, and next to it the reset-counter button (below).

E · N · Z	Show the easting, northing and elevation in the label. The table and Excel always have E and N.
Desc (Description)	Description on / off: the COGO point description or your own text.
● · 2.5	Colour of the next labels, and the text height (empty = from the multileader style).
A− · A+ · ↙− · ↙+	Text one step smaller / bigger, and the leader arrow smaller / bigger. The labels already in the list change too. ↑ / ↓ in the height box do the same.
↶ · ↷	Undo removes the last label and steps the numbering back; Redo puts it back.
▦ · X	A coordinates table in the drawing, or the points to Excel: all labels, a range of numbers (from-to), or the ones you pick, sorted by number. The table asks for its top-left corner; Excel opens a temporary CSV (keep it with Save As).
⤢	The size of the bar itself: 3 sizes (the buttons only, not the drawing text: that is A− · A+).
⚙ · 📌 · ×	Settings (section 3), pin (the bar stays after Esc), and close.
Eng. Ali	A click opens the YouTube channel.

i **Reset counter** (a round arrow with a 1, next to the number): a click starts the numbering again from 1. Right-click: **Start from…** another number, or **Undo reset** to get the old number back.

2 Keys while clicking

N	Number on / off.
Z	Elevation on / off.
U · R	Undo removes the last label and steps the numbering back; Redo puts it back.
Enter	Stops picking; the bar stays.
Esc	Finish and close the bar (it stays when pinned 📌).

i The keys are typed at the command line while picking (N, then Enter).

⚠ Labels always show world (WCS) coordinates, even when a rotated UCS is on.

3 Settings ⚙

Number	Prefix (P-) and the next number.
Prefixes	Before E, N and Z (like E= or X:).
Decimals	Number of decimals (0 – 4).
Elevation	`Z from object` from the clicked object, or `Z fixed` a value you type.
Label	`Stacked lines` one value per line, or `One line`. And the arrow: from the style, `Dot`, `Closed arrow` or `None`.
Layer · Style	Label layer (CLEAD-LABEL) and the CLEAD style (edit with MLEADERSTYLE).
COGO point	Clicking a Civil 3D point takes its number and description.
Special note	A short note (e.g. LIVE PIPE) added to the next labels as a line in its own colour, with a Note column in the table. Turn it on / off with its ✓; pick its colour in `Note colour`.

✓ Z in the label is optional, but the table and Excel always have E and N.

i Next to the number boxes (next number, Z fixed) **– / +** change the value one step; ↑ / ↓ in the box do the same.

Defaults	
Number · Prefixes	`P-` · `E=` `N=` `Z=`
Decimals · Elevation	3 · Z from object
Description · Colour	off · 4 (cyan)
Layer · Style	`CLEAD-LABEL` · `CLEAD`

Example: click a valve at `E 681234.567 N 3381234.568 Z 12.345` →
`P-1 / E=681234.567 / N=3381234.568 / Z=12.345`

★ New in 2.5

1 **All next to `A– / A+`:** off (default) = a new size is for the next labels only. On = the labels already placed change too.

2. **Edit the selected ones only:** select labels in the drawing (after the command, bar still open): `A− / A+`, the leader `↙` and the colour change only them; the size for the next labels stays. The selection wins over **All**.

4 New in 2.4.1

1. A leader going left: the text lines up to the left. The bar is pinned from the start.
2. **The `Update` button on the bar:** a leader in the wrong place? Drag its arrow grip to the right point and press Update: the label takes the E, N (and Z) of its new place, with the system of the site it is in.
3. **It asks for a window first:** draw a window over the labels to update, or Enter = all. A plan copied elsewhere for printing stays out of the window and keeps its numbers.
4. **A fingerprint per label:** a label edited by hand, exploded, on a locked layer or from an older version is never touched. One U takes the whole update back.

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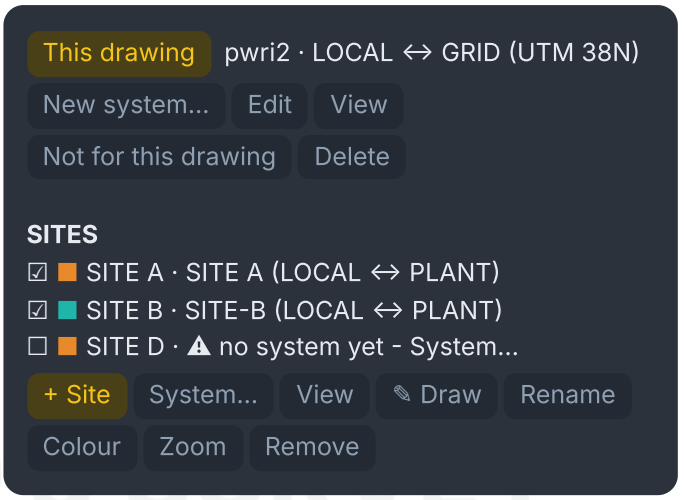
Guide › COORDINATES

Coord System `CSCOORD` Coordinate system & sites

One drawing, one main coordinate system, plus up to 10 sites each with its own system. Draw a site's boundary once and link it to its system: every point clicked in any tool is worked out with the system of the site it falls in.

1 How it works

1. Click the globe `Coord System` in the Coordinates panel (or type `CSCOORD`, or the 6th ring on the My Profile page).
2. **Main system:** choose a saved system from the list, or `New system…`.
3. **Sites:** draw each project's boundary as a closed polyline, click `+ Site`, type the name and click the boundary.
4. Select the site and click `System…` to link it to its own system.
5. Done: every tool (CLABEL, Quick Coord, CGRID, CBM, GEOUTM, Dual Draw...) follows the drawing's systems by itself.



✓ One drawing = one main system + up to 10 sites. A point inside a site is worked out with the site's system; outside all sites with the main system.

2 New system

`Names`	Two names for the two sides, e.g. `LOCAL` and `GRID` or `PLANT`.
`UTM zone`	The UTM zone (Rumaila and Basra: 38N).
`Drawn in`	Which side the drawing is drawn in (local or grid).
`Link`	One point (shift), a point + angle, or two points. The `Pick` buttons take the point from the drawing.

Check	A live green line shows what a point 100 m away becomes, so a wrong link is seen before saving.

3 Site buttons

+ Site	A new site: name, then click its boundary. One site per click. A boundary overlapping another site is refused.
System…	Links the site to its system (any time). A site not linked yet shows orange.
View	A read-only card of the site's system, with `Pick a point` to test it.
✎ **Draw**	Opens Dual Draw already on this site.
Rename · Colour · Zoom	Rename, the boundary colour (the same colour shows on the table filters), and zoom to the site.
☑	The tick next to a site: off = one coordinate only inside it (no second system).
⠿	Drag a site up or down to change the order.

4 Warnings

1. A point inside a site **with no system**: an orange ring flashes on the point and one card per site, with a `Coord System` button to fix it. The point uses the main system.
2. A point **exactly on a boundary** (snapped to a corner): uses the main system, with a card once.

5 Tables and labels

1. In CLABEL, CBM and the GEOUTM list: the list is grouped by system, with a `System` column and filter chips in each site's colour with its point count. The filter decides what goes out: Table, Copy, Excel, PDF, CSV, KML.
2. Labels write the second system's name on its own line above its coordinates. Local is written X / Y, UTM E / N.
3. **CGRID**: a grid inside a site takes the site's system. A frame crossing two sites: no second grid; draw one grid per site.

i Everything is saved inside the drawing itself: send the drawing to a colleague and the systems and sites go with it.

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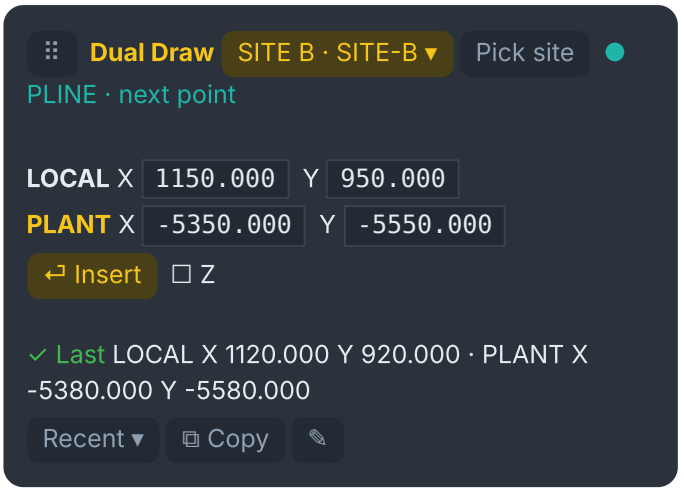
Guide › COORDINATES

Dual Draw CSDRAW Draw in two systems

Draw with AutoCAD's own commands (POINT, LINE, PLINE, CIRCLE...) using coordinates typed in either system of the drawing or of a site; the other system follows live.

1 How it works

1. Click the small `Dual Draw` button in the Coordinates panel (next to Quick Coord), type `CSDRAW`, or `✎ Draw` next to a site in Coord System.
2. In the list at the top choose the system: the drawing's system or a site linked to a system. The box names follow the system (local X / Y, UTM E / N).
3. Start any AutoCAD command (POINT, LINE, PLINE, CIRCLE, MOVE...), or none and points (POINT) are drawn.
4. Type in either row: **X → Enter → Y → Enter** (and Z when ticked) = the point goes in, the boxes clear and the cursor returns to X for the next point.
5. Done? Empty X + Enter = the command ends.



✓ Type in one row and the other row follows live; a gold ring shows where the point will land before Enter.

2 The bar

`Pick site` — Forgot the name of the site's system? Click the button, then click anywhere inside the site in the drawing: its system is chosen by itself and its boundary flashes in its colour. Outside every site = the drawing's system. Use it before starting LINE or PLINE.

▾	The systems list: the drawing + every linked site. A change applies at once to the next point.
●	The AutoCAD command running now (turquoise = live). "no command" = points are drawn.
1150,950	You can type X and Y together in the X box with a comma.
⏎ **Insert**	The same as the last Enter, with the mouse.
Z	On = after Y it goes to Z and the point takes it. Off = the point goes in after Y.
✓ **Last**	The last point in both systems. A click = a flash at its place in the drawing.
⧉ **Copy** · ✎	Copy for Excel (both systems in columns); ✎ puts its numbers back in the boxes to fix and draw again.
Recent ▾	The last 20 points of this drawing, newest first, with `Copy all`.

3 Safety

1. A site is chosen and the point falls outside it: an orange line and a card; the number is selected so what you type replaces it. Enter again with the same numbers = it goes in anyway.
2. The drawing's system is chosen and you typed drawing coordinates for a point inside a site with its own system: it goes in at once, with an **i** note only.
3. Typed points ignore object snaps and land exactly on the numbers, in any UCS.

i A PRO tool: needs Pro or the trial. It remembers the system, the Z tick and its place on the screen.

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Guide › COORDINATES

Coord Transform CTRANS PRO

Coordinate transformation

Transforms between a local (site / plant) system and the grid: from one point, a point + angle, or two points. With verify, query, labels, import and moving drawings.

i **Exercise 03:** set up the plant system of the Rumaila plant (one known point and a 37.8° rotation), prove it on control points, bring 20 local points to UTM, and move the plant drawing to the local system. Files in `Training\03_CTRANS\` . Open the exercise ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

i **Where is it?** Ribbon CAD & SURVEY › Coordinates panel › **Coord Transform**, or type `CTRANS` .

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The five pages

`Setup`

Project, the two system names, the transformation and moving objects. The yellow button of each page is its main work: `Transform` , `Check` , `Start` , `Import` .

`Verify`

Check the transformation on known points with a tolerance. `Clear` asks before it erases the typed points.

`Query`

Click points and read them in both systems. Click any row of the LIST: the drawing zooms to the point and marks it with a yellow mark (circle and +) for 3 seconds, then the mark goes by itself. `Start` (was Pick) begins picking. `Copy GRID` ,

i **Label form:** `Separate` = one text per line, each kind on its own layer (hide one kind easily) · `Stacked` = one MText per point on one layer (moves and copies as one) · `Block` = one block per point with attributes (double-click to edit, export with ATTOUT or DATAEXTRACTION). Same place, height and spacing in all three.

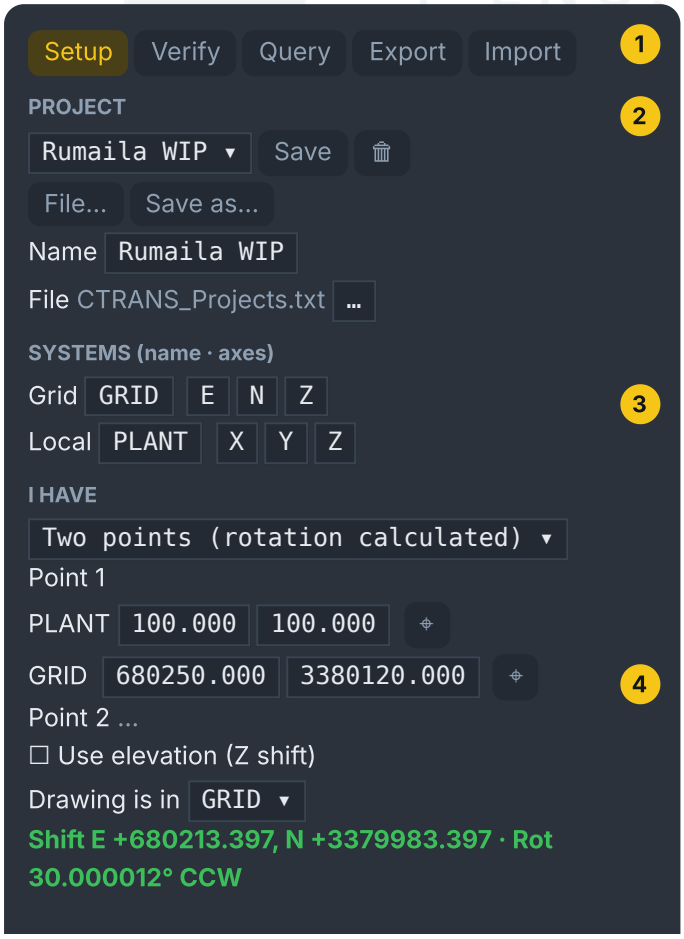
`Copy LOCAL` and `Both` copy the last point. `Clear` empties the list (asks first).

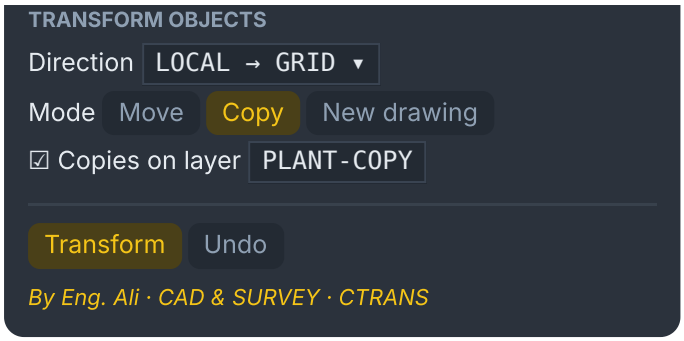
Export

Label points in both systems (by `Pick points` or `Select objects`), with a list, table, Excel and PDF. Here too, a click on a row of the list marks the point in the drawing for 3 seconds. Buttons: `Start · Undo · Clear`, then `Table · Copy · Excel · PDF · KML`. `Reset` sits with the settings (under LIST COLUMNS): it asks first and puts the label, text and list-column settings back to default; the list stays. LABELS and TEXT fold under a bar with `Edit ▾` / `Hide ▴`; the bar shows the current settings.

Import

A points table (CSV / TXT / Excel) in either system: draws points, labels and a polyline. `Clear` next to the file empties the page (file, columns, preview) so you can choose another file.





The Setup page in detail

PROJECT	The ▾ projects list opens a saved project. `Save` saves the current project, 🗑 deletes it from the projects file (it asks first). `File…` opens a `.ctrans` file (yours or one a friend sent) and adds it to your list; `Save as…` saves the project as one file. `Name` is the project name; `File` with `…` = the projects file itself (TXT), shared with CLABEL.
SYSTEMS	The name of each system (e.g. GRID and PLANT) and the letters of its axes (E N Z or X Y Z). These names appear on every page and report.
I HAVE · ⌖	The method (see 3) and the points in both systems. The ⌖ button beside each row takes the point with a click in the drawing.
Use elevation (Z shift)	Adds the level difference dZ between the systems (from the Z boxes).
Drawing is in	Which system the open drawing is in: GRID or LOCAL. Query and Export read your clicks on that basis.
Summary line	Shows the shift and rotation found, like `Shift E +680213.397, N +3379983.397 · Rot 30.000012° CCW`, or what is missing when the values are not complete.
TRANSFORM OBJECTS	`Direction` (LOCAL → GRID or GRID → LOCAL), `Mode` and `Copies on layer`, then `Transform` (see 5).

The Import page: the file

Box	Default
Point · X / E · Y / N	A · B · C
Z · Description	(none)
First row	2 + ☑ Row above is header
Separator	found by itself: Tab, ;, comma or spaces

A	B	C	D
Point	X	Y	Z
P1	100.000	100.000	10.000
P2	300.000	100.000	10.250

Table is in	LOCAL
Layer	CTRANS-IMPORT

i No header in the file: set First row = 1 and untick Row above is header. Old `.xls` files are not read: save as `.xlsx` or `.csv`. A bad row shows its reason in the preview Note and is skipped. `Labels` use the Export page settings.

The Export page: defaults

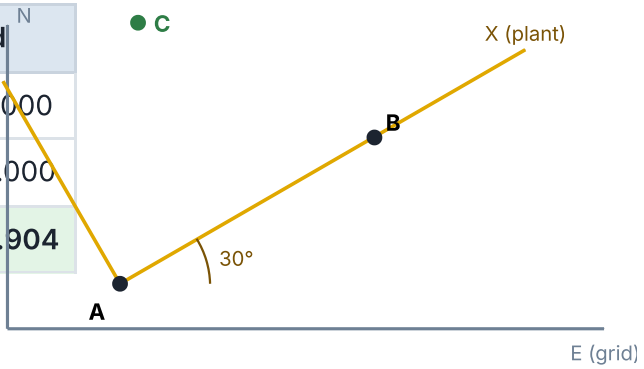
Option	What it does	Default
LABELS	per line (No., E, N, Z, X, Y, Z): show, prefix, end text, colour, layer	P- · E= N= · X= Y=
Height · decimals	text height and decimals	2.5 · 3
Position	where the label sits	Top-right
Next no.	number of the next point	1
POINT at each pick	draws a POINT at each click	☐ · CTRANS-POINT
LIST COLUMNS	columns of the list and report	E N X Y

i At the command line during Start: `S` = Select objects, `P` = Pick points, `U` = Undo, `Enter` = Finish.

2 Example: transformation from two points

The plant system is rotated from the grid (UTM). Two points are known in both systems, and `I have` = `Two points (rotation calculated)`:

Point	X plant	Y plant	E grid	N grid
A	100.000	100.000	680250.000	3380120.000
B	300.000	100.000	680423.205	3380220.000
C	**200.000**	**250.000**	**680261.603**	**3380299.904**



A, B = known points · C = check point

The tool calculates the rotation between the systems (here 30°) and the shift. A-B = 200.000 m in both systems, so it is right. C is the check point.

3 Step-by-step calculation for each method

Now we work the same example with numbers, for the three methods of `I have`. Same points A, B and C from the table above. All numbers are the same as the tool gives (3 decimals).

The general formula (all methods)

- $\Delta X = X - X0 \qquad \Delta Y = Y - Y0$

  (X0, Y0) → (E0, N0) = known point

  Difference from the known point in the local system.

- $c = \cos\theta \qquad s = +\sin\theta$ (CW) or $s = -\sin\theta$ (CCW)

  θ = rotation in degrees

  CW = the local axes are turned clockwise from the grid, CCW = the other way.

- $E = E0 + \Delta X \cdot c + \Delta Y \cdot s$
  $N = N0 + \Delta Y \cdot c - \Delta X \cdot s$

  Local → Grid

  From local to grid.

- $X = X0 + \Delta E \cdot c - \Delta N \cdot s$
  $Y = Y0 + \Delta E \cdot s + \Delta N \cdot c$

  Grid → Local (ΔE = E − E0, ΔN = N − N0)

  The reverse: from grid to local.

- Z grid = Z local + (Z0 grid − Z0 local)

  only with "Use elevation"

  The level only shifts (dZ); it does not rotate.

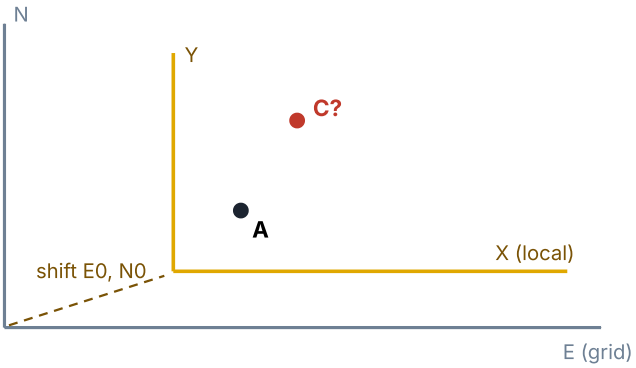
i The scale is always 1: the tool does not stretch or shrink. There is no Helmert with scale, no least squares and no affine from 3+ points. Extra points go to Verify, for checking only.

⚠ **UTM is not ground distance.** At Rumaila (E ≈ 722000) the UTM scale factor is about 1.0002: 100 m on the ground is about 2 cm longer in UTM. CTRANS does not scale, so with two known points far apart the ⚠ distance warning may come from this, not from a wrong point. Check the difference on Verify; if it is too big for your work, use points close to the work area. GEOUTM shows k for any point.

i **CW or CCW?** The default is CW. Not sure? Put one more known point on Verify: the wrong direction gives a big FAIL. Or use Two points, which finds the direction by itself.

A) One point (shift only)

Input	X / E	Y / N
A local	100.000	100.000
A grid	680250.000	3380120.000
θ	0 (no rotation)	



Shift only: the axes stay parallel

The calculation

1 `E0 = 680250.000 − 100.000`

`Shift E = +680150.000`

Shift in E (the same number shown in the summary line).

2 `N0 = 3380120.000 − 100.000`

`Shift N = +3380020.000`

Shift in N.

3 `E = X + 680150.000` `N = Y + 3380020.000`

`final formula`

No rotation: c = 1 and s = 0.

4 `C: E = 200.000 + 680150.000` `N = 250.000 + 3380020.000`

`C = 680350.000 , 3380270.000`

We compute the check point C.

5 $d = \sqrt{(88.397^2 + 29.904^2)}$

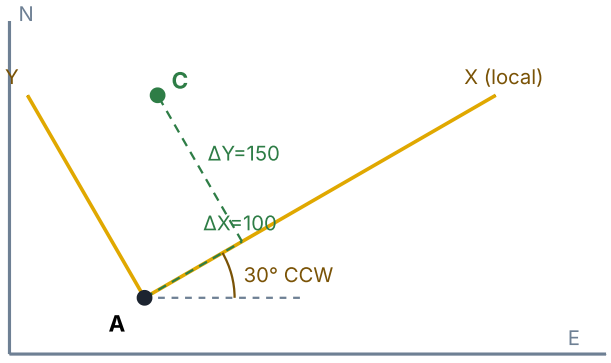
`d = 93.318 m → FAIL`

The difference from the known C (680261.603 , 3380299.904) is big.

⚠ In this example the plant is rotated 30°, so shift only is wrong. Use one point only when the axes are parallel.

B) Point + rotation

Input	X / E	Y / N
A local	100.000	100.000
A grid	680250.000	3380120.000
Rotation	30 ° CCW	



C = A + ΔX along X + ΔY along Y

The calculation

1 `c = cos 30° = 0.866025` `s = −sin 30° = −0.500000`

CCW → s is negative

The angle is CCW, so sin takes a minus sign.

2 `ΔX = 200.000 − 100.000` `ΔY = 250.000 − 100.000`

ΔX = 100.000 , ΔY = 150.000

Point C relative to A in local.

3
```
E = 680250.000 + 100.000×0.866025 + 150.000×(−0.500000)
  = 680250.000 + 86.603 − 75.000
```

E (C) = 680261.603

E of point C.

4
```
N = 3380120.000 + 150.000×0.866025 − 100.000×(−0.500000)
  = 3380120.000 + 129.904 + 50.000
```

N (C) = 3380299.904

N of point C.

5 `d = √(0.000² + 0.000²)`

d = 0.000 m → OK

Exactly the known C (0.001 is also normal: mm rounding).

6
```
E0 = 680250.000 − (0.866025×100 − 0.5×100) = 680250.000 − 36.603
N0 = 3380120.000 − (0.866025×100 + 0.5×100) = 3380120.000 − 136.603
```

Shift E +680213.397 , N +3379983.397 · Rot 30° CCW

This is the tool's summary line: the shift is where the local origin (0,0) lands on the grid.

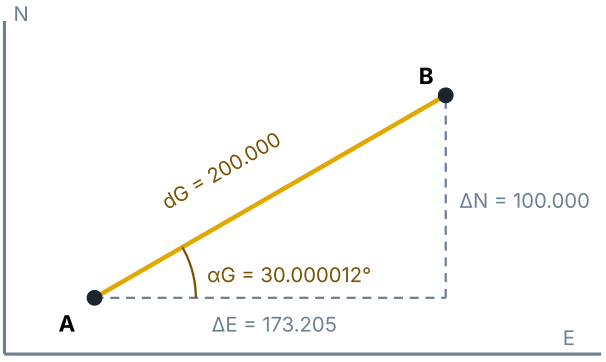
7
```
E = 680213.397 + 0.866025·X − 0.500000·Y
N = 3379983.397 + 0.500000·X + 0.866025·Y
```

final formula (any X, Y)

The final formula. The tool uses full precision, so by hand with these rounded numbers you may be 1 mm off.

C) Two points (rotation calculated)

Input	X / E	Y / N	Z
Point 1 = A local	100.000	100.000	10.000
Point 1 = A grid	680250.000	3380120.000	2.350
Point 2 = B local	300.000	100.000	
Point 2 = B grid	680423.205	3380220.000	



In local A→B is along X: αL = 0°

The calculation

1 `ΔX = 300.000 − 100.000  ΔY = 100.000 − 100.000`
`ΔE = 680423.205 − 680250.000  ΔN = 3380220.000 − 3380120.000`

ΔX = 200.000 , ΔY = 0.000 · ΔE = 173.205 , ΔN = 100.000

Differences from point 1 to point 2 in both systems.

2 `dL = √(200.000² + 0.000²)  dG = √(173.205² + 100.000²)`

dL = 200.000 , dG = 200.000 , diff 0.000

The distance must match. Over 0.01 m the tool warns you (scale = 1).

3 `αL = atan2(ΔY, ΔX) = atan2(0.000, 200.000)`
`αG = atan2(ΔN, ΔE) = atan2(100.000, 173.205)`

αL = 0.000000° , αG = 30.000012°

Direction of the line from the X (or E) axis, counter-clockwise.

4 `θ = αL − αG = 0.000000° − 30.000012°`

θ = −30.000012° → Rotation 30.000012° CCW

Negative = CCW, positive = CW. The 0.000012 comes from B being rounded to 3 decimals.

5 `origin = point 1 = A  c = 0.866025  s = −0.500000`

Shift E +680213.397 , N +3379983.397

From here the math is the same as "point + rotation".

6 `E = 680250.000 + 86.603 − 75.000`
`N = 3380120.000 + 129.904 + 50.000`

`C = 680261.603 , 3380299.904`

Point C (ΔX = 100, ΔY = 150).

7 `dZ = 2.350 − 10.000  Z (C) = 12.500 + (−7.650)`

`dZ = −7.650 , Z (C) = 4.850`

Only with Use elevation on. Say C has local Z 12.500.

8 `d = √((680261.6025 − 680261.603)² + (3380299.9038 − 3380299.904)²)`

`Verify: d = 0.001 m → OK`

Verify uses full precision: 0.0005 m → 0.001, from the rounding to mm.

9 `B back: ΔE = 173.205 , ΔN = 100.000`
`X = 100.000 + 173.205×0.866025 − 100.000×(−0.500000) = 100.000 + 150.000 + 50.000`
`Y = 100.000 + 173.205×(−0.500000) + 100.000×0.866025 = 100.000 − 86.603 + 86.603`

`B local = 300.000 , 100.000`

The reverse (grid → local) gives B back exactly.

✓ In short: the three methods use one formula. Only the angle differs: zero, typed, or calculated from two points.

4 Verify before work

1. On Verify type or paste known points: Point, X, Y, E, N.
2. Type the tolerance and press `Check` : each point shows pass / fail and its difference.

Button	What it does
Tolerance	default 0.010 m
Paste	pastes rows copied from Excel or text: Point, X, Y, E, N
Check	checks all points
Copy · PDF	the result for Excel, or a PDF report
Clear	erases the points (asks first)

✔ Verify before moving drawings. Point C of the example must come back with 0.000 or 0.001 (mm rounding).

5 Moving drawings between systems

Transform · Undo	Select objects, check the preview, then move them to the other system. `Undo` next to it undoes the last Move or Copy. `Undo` takes the Moves and Copies back one by one (press it again for the one before), in the same drawing (switch back to it first). After each Move or Copy a small card in the corner offers `Undo` too. `Cancel` in the preview window stops with no change.
Move	The selected objects move (default).
Copy	A copy in the other system, the originals stay (optionally on their own layer).
New drawing	A new drawing in the other system; the original is not changed.
Use elevation	The transformation also shifts the levels (dZ).
After	The view zooms to the result and the objects are selected, so you see where they went (Esc clears).
KML	On Export: a Google Earth file of the list or of selected objects. The GRID must be UTM on WGS 84; the zone is the `Drawing zone` in GEOUTM › Convert › Settings.

⚠ Move changes the original objects. Use Copy or New drawing when unsure.

6 Questions

▼ **Where is the project saved?**

In `Documents\CTRANS_Projects.txt` (change it with `File …`); the same projects open in CLABEL → System → Local. You can also save a project as one `.ctrans` file with `Save as…` and send it; your friend opens it with `File…`.

▼ **I have only one point?**

Choose `One point (shift only)`, or `Point + rotation` when the angle is known from the drawing.

Message	Fix

Check the Setup values first.	Fill the Setup points (both systems) or the angle.
⚠ The distance is different in the two systems	A wrong point, or the UTM scale effect (see 3). Check on Verify.
Old Excel format: save the file as .xlsx or .csv first.	Save it from Excel as .xlsx or .csv.
Cannot open the file - is it open in another program?	Close it in Excel and try again.
The last transform was in another drawing	Switch to that drawing, then press Undo.
⚠ Already taken back with AutoCAD U	That transform was already taken back with AutoCAD U, so it left the Undo list. Press Undo again for the one before.
only Model space objects can be sent to a new drawing	Select objects in Model, not in a layout.

i **Report options:** PDF or Excel opens a window to choose what goes in the report, with a preview of the pages and zoom: the list columns, the settings lines (systems, method, parameters), the drawing name and date, and the page shape. Each list (Verify, Query, Export, Import) keeps its own choices. Table only gives the table without the settings. Right-click the button to open the window without saving a file.

7 New in 2.4.1

1. **The lists in order:** on Query and Export the first point is on top (Q1 or P1); a new point comes in at the bottom with a gold flash and the list follows it.
2. **Choose what goes out:** the dot at the start of a row: filled = the point goes out, empty = it does not (the row turns grey). `All` and `None` for every point. Table, Copy, Excel, PDF and KML take the ticked points only. `Copy GRID`, `Copy LOCAL` and `Both` copy the last point as before.
3. **More than one row:** Ctrl + click adds or takes a row, Shift + click takes a range. A click on the dot of a chosen row turns all the chosen rows.
4. `Delete`: click a point (or more), then Delete: it goes off the list, and on Export its labels and POINT are erased from the drawing. The other numbers stay (P1 P2 P4). `Undo` brings it back to its place. Query now has an `Undo` too.
5. `Renumber`: numbers the list again in order from its first number (P1 P2 P4 → P1 P2 P3). On Export the labels of the points that change are written again in their place, and `Next no.` follows.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · **eng.alicadsurvey@gmail.com**

By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

Geo ↔ UTM GEOUTM PRO Geographic ↔ UTM

Converts latitude / longitude and UTM on WGS 84, imports points from a table or KML, and exports the drawing to Google Earth.

i **Exercise 04:** convert a Basra point from latitude / longitude to UTM 38N by hand and with the tool, read the wells of a lease, import a GPS list and send the lease to Google Earth. Files in `Training\04_GEOUTM\` . Open the exercise ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

i **Where is it?** Ribbon CAD & SURVEY › Coordinates panel › **Geo ↔ UTM** (small button), or type `GEOUTM` .

⚠ **WGS 84 only.** GEOUTM works on WGS 84 (GPS, Google Earth). Karbala 1979 or Nahrwan coordinates are another datum: converted as WGS 84 they land in the wrong place, by a large amount. The tool does no datum shift.

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The four pages

`Convert`

Convert one point: `To UTM` from latitude / longitude, `To Geographic` from E / N. `Pick` from the drawing, `Draw point` draws it. `Clear` only empties the boxes (the drawing is not changed). SETTINGS (and STYLE, ALTITUDE and BALLOON on the KML page) are set once, so they fold under a bar with `Edit ▾` / `Hide ▴` ; the closed bar shows the current settings in a few words.

`Convert` › SETTINGS

`Zone` : **Auto** = conversion to UTM uses the zone of the point itself, **Fixed** = always the drawing

i **Local system:** in the same window. Choose a project saved in CTRANS, or type one of the three methods: shift (one point) · shift + rotation · two points. Scale is always 1. After each conversion the local X and Y show under UTM, and Enter in them converts back (local → UTM → geographic). When it is on, Pick, Draw point, Import, Query and KML work in the local drawing. A point in another zone, or two points that do not keep the distance, give a ⚠ with the reason.

zone (use it when the whole project is in one zone). `Drawing zone` is the zone of the drawing with N / S. `Angle` and `dec` are the angle format and its decimals (see 6). `Direction` : N / E letters or a + / – sign; `m dec` the decimals of metres. `Combined scale factor, height` shows the combined factor at the height you type (see 5). The closed bar says them like `Auto · UTM 38N · DMS 4 dec · N/E · m 3 dec`.

Query

Press the yellow `Start` and click points in the drawing (the drawing must be UTM of the drawing zone). Each point gets a name (P1, P2 ...) and is shown in large text in both systems: E / N (UTM) and latitude / longitude in the angle format of the settings, and it is marked in the drawing with a yellow circle and cross for 3 seconds. Enter or Esc stops. The list below holds all the points in order (P1 on top, a new point at the bottom); click a row to zoom to that point and mark it in the drawing. Nothing is drawn. `Copy UTM` , `Copy Geo` and `Both` copy the last point. `Undo` removes the last point, `Clear` empties the list (asks first). `Table` inserts the list as an AutoCAD table, `Copy` copies it all for Excel, `Excel` and `PDF` give a report in both systems. The list stays until AutoCAD or its drawing is closed.

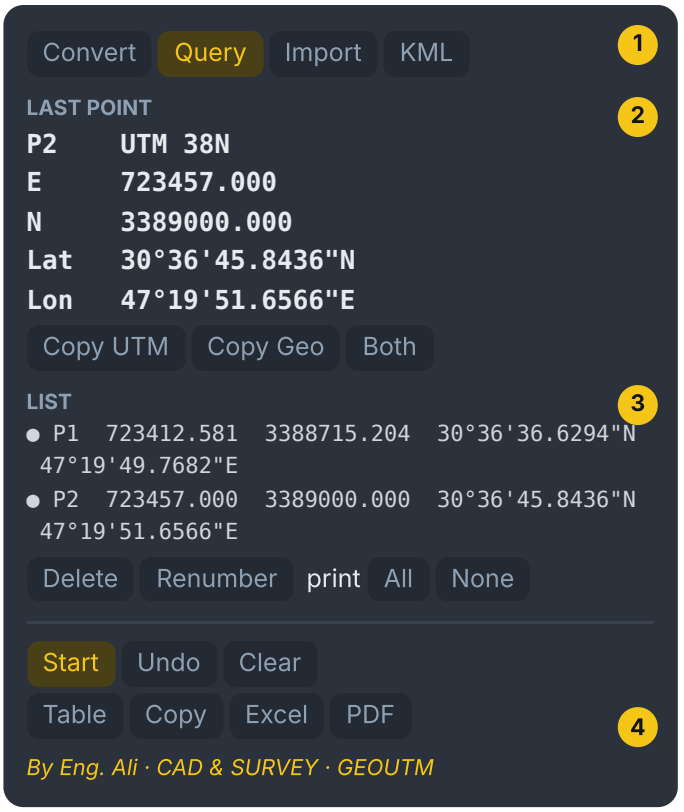
Import

Reads a table (CSV / TXT / Excel) or a KML / KMZ file, shows a preview and draws points, names and lines with the yellow `Draw` button (was Import). `Clear` next to the file empties the page (file, columns, preview) so you can choose another file.

KML

Exports points, lines and polygons of the drawing to Google Earth, with layers as folders.

> *i* **A file over several zones:** everything is drawn in the drawing zone so the shapes stay together, and a card says which zones the file has and how much the far parts stretch. For exact work in the other zone, open a drawing for that zone.



The Import page: the table

Box	Choices (default first)
Table is in	Geographic · UTM
Angles	One column · D / M / S columns
Lat · Lon	B · C
Lat dir · Lon dir	N/S and E/W column, else Default N · E
UTM: E · N · Zone	B · C · drawing zone, or a column (38, 38N)
Point · Z · Description	A · (none) · (none)
First row	2 + ☑ Row above is header
DRAW	Points ☑ · Names ☑ · Zoom ☑ · Polyline ☐ · Table ☐ · height 2.5 · GEOUTM-IMPORT
KML / KMZ	Folders → layers ☑ · Paths and polygons ☑

A	B	C	D
Point	Lat	Lon	Z
BM-01	30.590071	47.337181	6.223
W-12	30 36 45.84	47 19 51.66	7.010

ℹ Old `.xls` files: save as `.xlsx` or `.csv` first. A bad row shows its reason in the preview and is not drawn.

2 Example: a point in Basra

Latitude	30°30'00.000" N
Longitude	47°48'00.000" E
Zone	38 N (WGS 84)
E	**768741.716**
N	**3377525.984**

Zone 38 covers 42° to 48° E and most of Iraq. The far west is zone 37, the far east zone 39.

⚠ **Basra and the 48° edge:** Fao and the east bank of the Shatt al-Arab are in zone 39, and Auto (the default) switches zone there. For a Basra project set `Zone` = **Fixed**, 38 N, so every point stays in one zone.

ℹ Angles can be typed in any form: `30.5` , `30 30 00` or `30°30'00"N` .

CAD & SURVEY | ENG. ALI

Combined scale factor	Shows the combined scale factor (grid × height) of the point, to turn ground distances into grid distances.
Google Maps	Opens the point on the map.
Copy	Copies E, N, latitude, longitude (Tab-separated, pastes into Excel as columns).
Draw point · Enter	`Draw point` draws a POINT on layer GEOUTM-POINT. Enter in any box converts at once. For Excel / PDF use Query or Import.

3 How it is calculated: Geographic → UTM step by step

The tool uses the Transverse Mercator projection with the Krüger series to n^4 (Karney's method), better than 1 mm inside a zone. We work the same point as the example: φ = 30.5° N, λ = 47.8° E.

Constant	Value
Semi-major axis a	6 378 137 m
Flattening f	1 / 298.257223563
$e^2 = f\,(2 - f)$	0.00669437999

Central scale factor k0	0.9996
False easting	500 000 m
False northing	0 north, 10 000 000 south
n = f / (2 − f)	0.0016792204
A = a / (1 + n) · (1 + n²/4 + n⁴/64)	6 367 449.146 m
k0 · A	6 364 902.166 m
α1 · α2 · α3 · α4	8.377318e−4 · 7.608528e−7 · 1.197638e−9 · 2.443376e−12
β1 · β2 · β3 · β4	8.377322e−4 · 5.905870e−8 · 1.673489e−10 · 2.167738e−13

From φ, λ to E, N

1

```
zone = floor((λ + 180) / 6) + 1 = floor(227.8 / 6) + 1 = floor(37.9667) + 1
λ0 = 6 · zone − 183 = 6 · 38 − 183
Δλ = λ − λ0 = 47.8 − 45 = 2.8° = 0.0488692191 rad
```

zone = 38 N, λ0 = 45°, Δλ = 2.8°

The zone comes from the longitude. λ0 is the middle of the zone and Δλ is the distance of the point from it.

2

```
φ = 30.5° = 0.5323254219 rad,  e = √e² = 0.0818191908
τ = tan φ = 0.5890450164
σ = sinh(e · atanh(e · τ / √(1 + τ²))) = 0.0033996163
τ′ = τ · √(1 + σ²) − σ · √(1 + τ²)
```

τ′ = 0.5851028525 (χ = atan τ′ = 30.33202441°)

The latitude becomes the conformal latitude χ, so the next step works as on a sphere.

3

```
ξ′ = atan2(τ′, cos Δλ) = 0.5299145399
η′ = asinh(sin Δλ / √(τ′² + cos² Δλ)) = 0.0421879030
```

k0·A·ξ′ = 3 372 854.203 m, k0·A·η′ = 268 521.875 m

This is the Transverse Mercator on the sphere.

4

```
ξ = ξ′ + Σ αj · sin(2jξ′) · cosh(2jη′)      (j = 1…4)
η = η′ + Σ αj · cos(2jξ′) · sinh(2jη′)
terms × k0·A (m):   j=1: +4667.590 / +220.271
                    j=2:    +4.190 /   −0.428
                    j=3:    −0.000 /   −0.002
                    j=4:    −0.000 /   −0.000
```

ξ = 0.5306485309, η = 0.0422224425

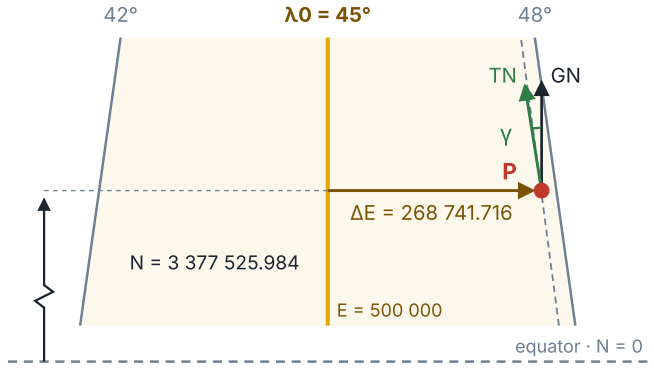
The Krüger series brings us back from the sphere to the ellipsoid. The first term is the big one; the others get small fast.

5

```
E = 500 000 + k0·A·η = 500 000 + 268 741.716
N = k0·A·ξ + 0 = 3 377 525.984        (+ 10 000 000 south of the equator)
```

E = 768741.716 N = 3377525.984

Exactly the values of the example (3 decimals = mm).



Zone 38 · P = 30.5° N 47.8° E · γ = +1°25'19.1" (drawn bigger)

E is measured from the central meridian (500 000), so the point is 268 741.716 m east of it. N is measured from the equator.

i The point is 2.8° from λ0, close to the zone edge (48°). Beyond 3.5° the tool warns that it is outside the zone.

4 The other way: UTM → Geographic

We start from E = 768741.716, N = 3377525.984 in zone 38 N and go back to latitude / longitude.

From E, N to φ, λ

1

```
ξ = (N − 0) / (k0·A) = 3377525.984 / 6364902.166
η = (E − 500 000) / (k0·A) = 268741.716 / 6364902.166
```

ξ = 0.5306485309, η = 0.0422224425

Remove the false values and divide by k0·A.

2

```
ξ′ = ξ − Σ βj · sin(2jξ) · cosh(2jη)      (j = 1…4)
η′ = η − Σ βj · cos(2jξ) · sinh(2jη)
```

ξ′ = 0.5299145400, η′ = 0.0421879030

The β (inverse) series goes back to the sphere.

3

```
τ′ = sin ξ′ / √(sinh² η′ + cos² ξ′)
Δλ = atan2(sinh η′, cos ξ′)
```

τ′ = 0.5851028526, Δλ = 2.80000000°

The conformal latitude and the longitude difference.

4

```
τ = τ′ (start), then Newton:  τ ← τ + (τ′ − τ′(τ)) / √(1 + τ′(τ)²) · (1 + (1
− e²)τ²) / ((1 − e²) · √(1 + τ²))
step 1: τ = 0.5890450166   (+3.94e−3)
step 2: τ = 0.5890450165   (−7.5e−11)
step 3: change −1.1e−16 < 1e−14 → stop
```

τ = tan φ = 0.5890450165

From χ back to φ by iteration (Newton). It settles after two steps.

5 φ = atan τ = 30.5000000042°
λ = λ0 + Δλ = 45 + 2.8000000013 = 47.8000000013°

30°30'00.0000"N 47°48'00.0000"E

The 0.000000004° left over is about half a millimetre, from rounding E and N to the mm.

✓ **Round-trip check:** converting the result to UTM again gives E = 768741.716, N = 3377525.984, the same to the mm.

5 k, γ and the combined scale factor

After each conversion the tool shows a line for the point under UTM. For our point, with `Combined scale factor` ticked and a height of 5 m:

k	1.000491
conv	+1°25'19.1"
CSF	**1.000490** (h = 5 m)

How k, γ and CSF are calculated

1 p = 1 + Σ 2j · αj · cos(2jξ′) · cosh(2jη′) = 1.0008206376
q = Σ 2j · αj · sin(2jξ′) · sinh(2jη′) = 0.0001238984

p = 1.0008206376, q = 0.0001238984

Using ξ′ and η′ from step 3 above.

2 γ = atan(τ′ / √(1 + τ′²) · tan Δλ) + atan2(q, p)
= 1.41486742° + 0.00709303° = 1.42196045°

γ = +1°25'19.1"

The convergence between grid north (GN) and true north (TN). Positive east of λ0.

3 k = k0 · √(1 − e² sin²φ) · √(1 + τ²) / √(τ′² + cos² Δλ) · √(p² + q²) · A / a
= 0.9996 × 1.0017493470 × 1.0008206453 × 0.9983242984

k = 1.000491 (1.000491061)

Point scale factor: 0.9996 on λ0, about 1 at ±180 km, and bigger further out.

4 W = √(1 − e² sin²φ), M = a(1 − e²) / W³ = 6 351 862.351, N = a / W = 6 383 643.480
R = √(M · N) = 6 367 733.088 m
elevation factor = R / (R + h) = 6367733.088 / 6367738.088 = 0.999999215

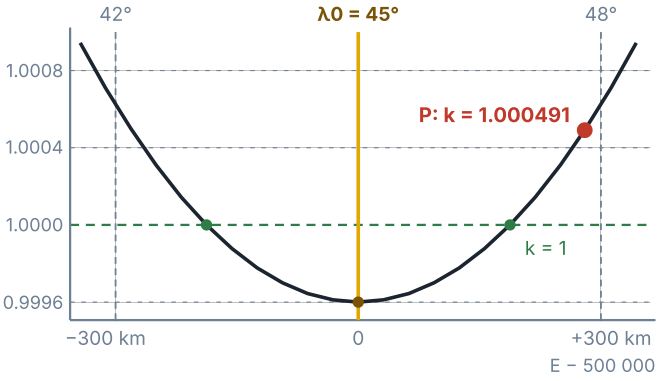
R = 6 367 733.088 m

R is the Gaussian mean radius at the latitude; h is the ellipsoidal height.

5 `CSF = k × R / (R + h) = 1.000491061 × 0.999999215 = 1.000490275`

CSF = 1.000490

The tool shows 6 decimals.



k across zone 38 at φ = 30.5° · k = 1 at ±180 km

Distance	Calculation	m
Ground	—	1000.000
Grid	**1000.000 × 1.000490275**	**1000.490**
Back: grid → ground	1000.000 ÷ 1.000490275	999.510

So here every 1 km on the ground is 49 cm longer in UTM. Take it into account when you measure with a total station and plot on the drawing.

⚠ h is the ellipsoidal height from GPS, not the level. Its effect is small: every 6.4 m of height changes 1 km by 1 mm.

6 Angle formats

In `Angle` choose how angles are shown, and in `decimals` the decimals (0-4, default DMS and 4). Typing accepts any form. Example: a point in Rumaila, E = 723457.000, N = 3389000.000 in zone 38 N.

Format	Latitude	Longitude
D° M' S" (dec 4)	30°36'45.8436"N	47°19'51.6566"E
D° M' (dec 4 → 6)	30°36.764060'N	47°19.860944'E
Decimal degrees (dec 4 → 9)	30.612734329°N	47.331015727°E
+ / − sign	30°36'45.8436"	47°19'51.6566"

From decimal degrees to D° M' S"

1. `t = round(30.612734329 × 3600, 4) = 110205.8436″`

   `t = 110205.8436″`

   Everything becomes seconds and is rounded once, so 60″ never appears.

2. `D = floor(110205.8436 / 3600) = 30,  rest = 110205.8436 − 108000 = 2205.8436″`
   `M = floor(2205.8436 / 60) = 36,  S = 2205.8436 − 2160 = 45.8436″`

   `30°36'45.8436"N`

   Degrees, then minutes, the rest is seconds.

3. `DD = D + M/60 + S/3600 = 30 + 36/60 + 45.8436/3600 = 30.6127343333°`

   `30.6127343°`

   The other way. The difference from 30.612734329 comes from rounding the seconds (0.00004″ ≈ 1 mm).

4. `30.5° → 30° + 0.5 × 60 = 30°30' → 30°30'00.0000"`
   `DM:  round(30.5 × 60, 6) = 1830 → 30°30.000000'`

   `30.5° = 30°30'00.0000" = 30°30.000000'`

   The example point: 30.5° is exactly 30 degrees 30 minutes.

All of these are read as the same value, about 30.612734°:

You type	Note
30°36'45.8436"N	DMS with letter
30 36 45.8436	spaces; no letter = north / east
30:36:45.8436	colons
30 36.76406	D M
N30.612734 · 30,612734	decimal; decimal comma is fine
-30.612734 · 30.612734S	south (negative)

7 Export to Google Earth

1. On KML choose what to export: points, blocks, texts, lines and closed shapes as polygons.
2. Names come from a text or attribute near the point.
3. Press `KML` (was Select and export...) and select the objects; Google Earth can open by itself.

⚠ The drawing must be UTM of the chosen zone, otherwise the points land elsewhere in the world.

Part	Options (default)
OBJECTS	Points, blocks, texts ☑ · Lines ☑ · Closed → polygons ☑
NAMES	From the drawing · Numbers · Prefix `P-` · next 1 · Text within 5 drawing units
STYLE	Folders from layers ☑ · Layer colours ☑ · Line width 3 · fill 35 %
ALTITUDE	Clamp to ground · Above ground 2.0 m
BALLOON	shown on a click in Google Earth: UTM + Geo ☑ · Length ☑ · Area ☑
FILE	KMZ · KML · Open Google Earth ☑

8 Questions

▼ **Label points with latitude / longitude?**

Use CLABEL → System → Geographic.

▼ **A KMZ file from Google Earth?**

Import reads KML and KMZ directly; folders become layers.

i **Report options:** PDF or Excel opens a window to choose what goes in the report, with a preview of the pages and zoom: the columns of the import table, the settings lines (zone, angle format), the drawing name and date, and the page shape. Right-click the button to open the window without saving a file.

9 New in 2.4.1

1. **The Query list in order:** P1 on top; a new point comes in at the bottom with a gold flash and the list follows it. Above the list, the count line: `5 point(s) · 3 ticked`.
2. **Choose what goes out:** the dot at the start of a row: filled = the point goes out, empty = it does not (the row turns grey). `All` and `None` for every point. Table, Copy, Excel and PDF take the ticked points only (after the site filter). Ctrl / Shift + click chooses more than one row; the dot of a chosen row turns them all.
3. **`Delete` and `Renumber`:** click a point (or more) in the list, then Delete: it leaves the list only, the drawing does not change. `Undo` brings it back to its place first. `Renumber` numbers the list again in order from its first number (P1 P2 P4 → P1 P2 P3).

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

Guide › SURVEY QC

Survey Report SREPORT PRO Survey report

Design against field: anchor bolts, steel, roads and topo. Pass / fail by tolerance, results drawn in the drawing and an A4 report (PDF, Excel and AutoCAD).

i **Exercise 05:** check 24 anchor bolts of six pedestals against the field survey with pass / fail by tolerance, and check the benchmark levels of the site before the work. Files in `Training\05_SREPORT\` . Open the exercise ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

i **Where is it?** Ribbon CAD & SURVEY › Survey QC panel › **Survey Report**, or type `SREPORT` .

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 Kinds of check

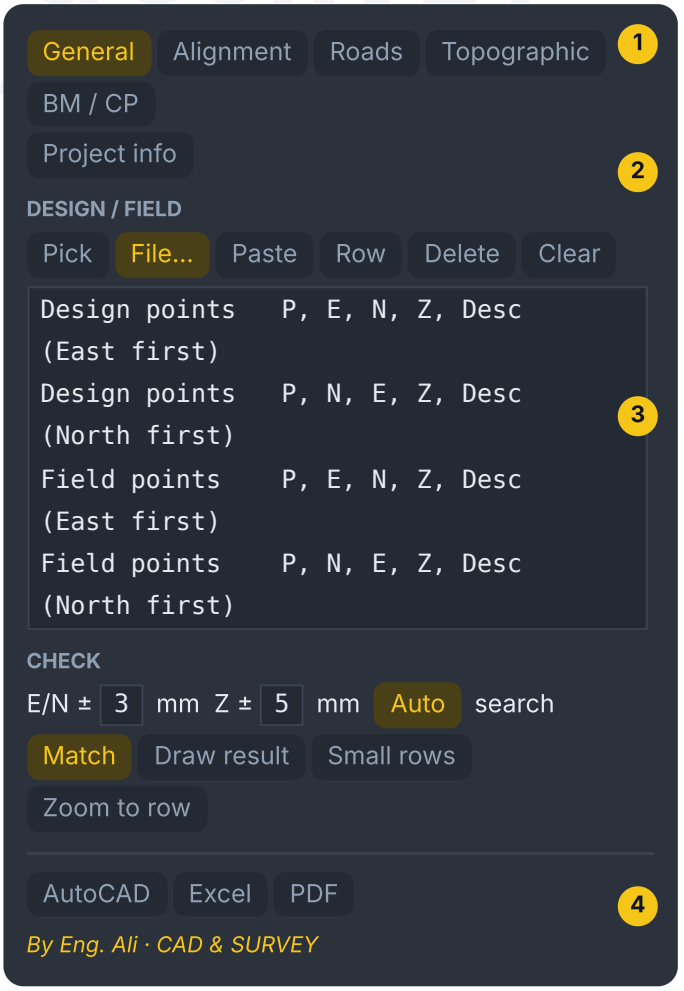
`General`
Design against field coordinates: anchor bolts, pedestals, plates … pass / fail by tolerance.

`Alignment`
Steel: column verticality (mm per m of height) and beam top of steel (TOS).

`Roads`
Road levels: left, centre line and right against design, with crossfall (%).

`Topographic`
Natural ground points, with a compare level for cut / fill.

`BM / CP`
Benchmarks and control points: known against measured, Level, XY or XYZ, with its own report,



an ACCEPTED / NOT ACCEPTED result and a sketch.

2 Example: anchor bolts at ±5 mm

Point	ΔE mm	ΔN mm	ΔZ mm	Result
AB-1	+2	−3	+1	PASS
AB-2	**+7**	+1	−2	FAIL
AB-3	−4	+4	**−6**	FAIL
F9	no design point near			NO DESIGN

Each difference is checked by itself: AB-2 fails in E and AB-3 fails in level.

3 Steps

1. Choose the tab (e.g. General) and fill `Project info` once: project, instrument, logos and signatures.
2. Design points: `Pick` , `File…` from a text file (CSV, TXT, XYZ, PNT, ASC), or `Paste` from Excel (select the cells in Excel, Copy). `File…` does not read an Excel file itself. `File…` opens a menu: **Design points** or **Field points**, each in two orders: `P, E, N, Z, Desc (East first)` or `P, N, E, Z, Desc (North first)` . Choose the order of your file.
3. Field points the same way, and type the tolerance.
4. `Match` pairs each field point with the nearest design; `Draw result` draws arrows and colours.
5. `AutoCAD` (A4 layouts), `Excel` or `PDF` . The message at the bottom is green when done, orange when something is missing.

i **Pick:** design points = click, or select circles / polylines / blocks (the centres of anchor-bolt circles become design points). Field points = select POINTs, COGO points or survey blocks. **File...** reads Tab, comma, semicolon or space separators; lines without numbers (titles) are skipped.

How to fill each tab

Tab	Input	Default

General	design + field, then `Match` and `Draw result`. `Description` = the element name on the report; `Draw typed points` draws the points you typed	E/N ± 3 · Z ± 5 mm · Auto ☑ (50 mm)
Alignment	choose `Column` or `Beam`. Right-click a row › Pick bottom and top / Pick the top of steel, or File / Paste in the order shown in the File… menu	3 mm / 5 m · TOS ± 5
Roads	`Row` adds the station by itself; type or paste design and field L · CL · R	± 15 mm · 2.50 % ± 0.30 · 3.5 m
Topographic	Pick, File or Paste: P, E, N, Z, Desc; turn on Compare level	—
BM / CP	see 6	H ± 20 · V ± 10 mm

i **Floating box:** on the General tab, while picking the design points with `Pick`, type `Z` for the design level or `D` for the description: a small box opens next to the mouse; Enter and go on picking. The box is on by default; its **Turn off ×** button switches it off (you then type in the command line), and **Floating box** in any tool palette (or `BOX`) turns it back on. In the palette a gold line with a bulb 💡 reminds you of the key: a click opens this page, × hides it and leaves a small bulb (a click brings it back). When the box is off the line turns grey with a **Turn it on** button.

i **Project info › Auto-fill:** copies project, location, client, names and logos from the last Project info saved in any tool; empty boxes come from My Profile. Report no. and date are never copied. **Report no.:** an empty box shows the next number in grey (after SUR-XXX-007 → 008); double-click to use it.

4 Pairing field and design

`Auto search` — Search distance = half the shortest design spacing. Keep it on for foundations and anchor bolts.

`Field no. = design no.` — After Match, field points numbered by the tool (F5) take the design number (1F). Instrument names stay.

`E / N swapped` — If the file is P, N, E and you chose (East first), or the other way, the points land more than 1 km from the other side (design or field) and would sit near it with E and N swapped. The tool notices and asks: `E and N of this file look swapped … Swap E and N?` Press Yes. When you know the order beforehand, choose (North first) in the `File…` menu.

Column width	The text columns (Pt, Description) grow by themselves to their longest value, so names like AB-01 are never cut. The number columns share the rest.
Zoom to row	Click a row: the drawing zooms to its point.
Small rows / Full	Main columns only, or all columns.
Row · Delete · Clear	`Row` adds an empty row to type in, `Delete` removes the selected row, `Clear` empties the table.

⚠ With Auto off and a small search, far points become NO DESIGN instead of FAIL.

5 Worked calculations: Alignment, Roads, Topographic

Alignment: column verticality and beam TOS

Tolerance `3` mm per `5` m height (that is 0.6 mm per metre), and TOS ± `5` mm. The field reads the bottom and the top of each column.

Pt	H (m)	Bottom E / N	Top E / N
C1	6.000	722650.412 3375512.806	722650.414 3375512.803
C2	8.500	722656.412 3375512.806	722656.416 3375512.810

Column: horizontal shift of the top from the bottom

1 `Allow = Tol × H / per = 3 × 6.000 / 5 = 3.6` `(C2: 3 × 8.500 / 5 = 5.1)`

C1 Allow = 3.6 mm · C2 Allow = 5.1 mm

A taller column is allowed more. When H is empty, the tool takes it from top Z − bottom Z.

2 `C1: Dev = √((722650.414 − 722650.412)² + (3375512.803 − 3375512.806)²) × 1000`
`= √(0.002² + 0.003²) × 1000`

Dev = 3.6 mm ≤ 3.6 → PASS

Both are rounded to 0.1 mm before the check. Equal = PASS.

3 `C2: Dev = √(0.004² + 0.004²) × 1000`

Dev = 5.7 mm > 5.1 → FAIL

5.7 ÷ 8.500 = 0.67 mm/m, more than 0.6.

Beam: top of steel (TOS)

1 B1: ΔZ = (Field TOS − Design TOS) × 1000 = (106.497 − 106.500) × 1000

ΔZ = −3 mm, |−3| ≤ 5 → PASS

Minus = the steel is lower than design.

2 B2: ΔZ = (106.507 − 106.500) × 1000

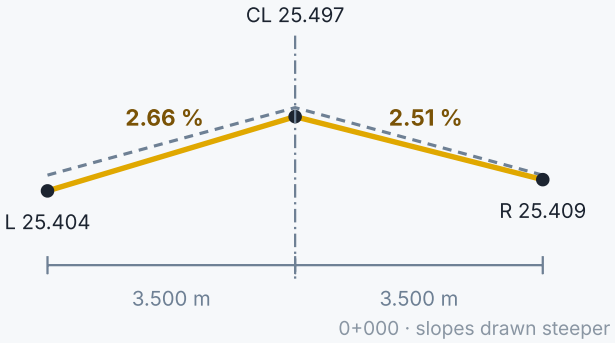
ΔZ = +7 mm > 5 → FAIL

Plus = 7 mm above design.

Roads: level differences and crossfall

Tolerance Level ± `15` mm, Crossfall `2.50` % ± `0.30`, half width `3.5` m.

Station		L	CL	R
0+000	Design	25.412	25.500	25.412
0+000	Field	25.404	25.497	25.409
0+020	Design	25.462	25.550	25.462
0+020	Field	25.455	25.558	25.480



Gold = field, dashed = design. The crossfall comes from the field levels.

Δ = field − design; crossfall = (CL − edge) ÷ half width

1 0+000: ΔL = (25.404 − 25.412) × 1000 = −8 ΔCL = (25.497 − 25.500) × 1000 = −3 ΔR = (25.409 − 25.412) × 1000 = −3

−8 · −3 · −3 mm, all within ±15

Each difference is checked by itself.

2 XL = (Z_CL − Z_L) / 3.5 × 100 = (25.497 − 25.404) / 3.5 × 100 = 2.66 %
XR = (Z_CL − Z_R) / 3.5 × 100 = (25.497 − 25.409) / 3.5 × 100 = 2.51 %
|2.66 − 2.50| = 0.16 ≤ 0.30 |2.51 − 2.50| = 0.01 ≤ 0.30

0+000 → PASS

Plus = the edge is lower than the CL (normal camber). The sign does not matter in the check: the value without sign is compared with 2.50 %.

3 0+020: ΔL = −7 ΔCL = +8 ΔR = (25.480 − 25.462) × 1000 = +18 > 15

ΔR +18 ×

The right edge is 18 mm above design.

4 `XL = (25.558 − 25.455) / 3.5 × 100 = 2.94 %` `|2.94 − 2.50| = 0.44 > 0.30`
`XR = (25.558 − 25.480) / 3.5 × 100 = 2.23 %` `|2.23 − 2.50| = 0.27 ≤ 0.30`
`0+020 → FAIL (ΔR and XL)`
One bad value is enough for FAIL; the bad cell is coloured.

Topographic: cut and fill

Turn on `Compare level` and type `24.800`. Point T4 has its own Level typed in its row (25.000).

Pt	NGL	Level	Cut / Fill (m)
T1	25.137	24.800	C 0.337
T2	24.652	24.800	F 0.148
T3	24.800	24.800	0.000
T4	25.214	25.000	C 0.214

Cut / Fill = NGL − Level

1 `T1: 25.137 − 24.800 = +0.337`
`C 0.337`
Plus = the ground is above the level: cut (C).

2 `T2: 24.652 − 24.800 = −0.148`
`F 0.148`
Minus = the ground is lower: fill (F).

3 `T4: 25.214 − 25.000 = +0.214`
`C 0.214`
Taken against the Level of its own row, not 24.800.

4 `Cut: T1, T4 → max 0.337` `Fill: T2 → max 0.148`
`Cut 2 pts, max 0.337 m · Fill 1 pts, max 0.148 m`
The summary of the report. T3 is right on the level (0.000), so it is neither cut nor fill.

6 Benchmarks and control points (BM / CP)

Before the work starts, check the benchmarks and control points with your instrument: the published value against what you measured.

Check	Columns	Report title

Level	Known and measured Z, ΔZ, and Dist (metres from the point before)	BENCHMARK LEVEL CHECK REPORT
XY	E, N, ΔE, ΔN, ΔH	CONTROL POINTS CHECK REPORT
XYZ	E, N, Z, ΔE, ΔN, ΔH, ΔZ	CONTROL POINTS CHECK REPORT

1. Choose `Check`, `Method`, `Type` and the tolerance `H ±` and / or `V ±` in mm. Method: GNSS RTK, GNSS Static, Total station, Traverse, Levelling. Type: BM, TBM (temporary benchmark carried to the site), CP, GCP, Station. You can type your own; they are printed on the report.
2. `Paste` → known: the published points. Then `Paste` → measured: from your instrument. The same names go into the same rows. In Level the form is `P, Z, Dist`. In XY and XYZ: known = `P, E, N, Z, Type`, measured = `P, E, N, Z` (East first).
3. Type the `Reference` and the `Closure`. In Level type the closure in mm; the allowed value is `C × √K`.
4. `Sketch`: Auto (plan of the points), Auto + polygon (joined in the table order), Picture (yours) or None.
5. `PDF`: a dark / gold title, the table, a big RESULT row, and the sketch page.

i **Level example:** run BM-01 → BM-02 → BM-03 with 180, 200 and 180 m: K = 0.560 km. Allowed = 12 × √0.560 = 8.98 ≈ 9.0 mm. A closure of 4 mm = OK; 11 mm = NOT OK and the result is NOT ACCEPTED.

Allowed closure	Rule	Example
× √K (km)	C × √K	C = 12, run 380 m → 12 × √0.380 = 7.4 mm
× √n (setups)	C × √n	C = 3, 9 setups → 3 × √9 = 9.0 mm (the column becomes Setups)
fixed (mm)	C	C = 10 → 10 mm whatever the length

C and the rule come from the project specification. The tool does not adjust or distribute the error: it only compares the closure you type with the allowed value.

Benchmark cards

Turn on `BM cards`: after the report there is one page per point with the big top view, its data and result, a small site plan (the point in red among its neighbours, or the level run when there are no coordinates), location, mark and dates, and the four views.

Photo name	Box on the card

`BM-01.jpg` · `BM-01 TOP.jpg`	Top view
`BM-01 N.jpg` · `BM01 north.jpg` · `BM-01 looking north.jpg`	North view
`… S` · `… E` · `… W`	South · East · West
Folder `BM-01` with the photos	Folder name = point, file name = view

i BM-01, BM01 and bm 01 are the same name, and BM-1 never takes BM-10's photos. Put a photo by hand from `Card…` : click a box, drag a photo between boxes, or drop files from Windows.

i $\Delta H = \sqrt{(\Delta E^2 + \Delta N^2)}$. Example: $\Delta E = +13$, $\Delta N = +13 \rightarrow \Delta H = \sqrt{(169 + 169)} = 18.4$ mm, inside ±20. A known point with no measurement is MISSING and the result is NOT ACCEPTED.

7 The report

An A4 report with client and contractor logos, project and instrument info with calibration, the results table and signatures. Each tab can be portrait or landscape.

Roads · Station from / every

`Row` fills the station by itself: the first row from the start value, the next ones every interval (e.g. 0+000 every 20 m). Form: 0+000, 0+000.00 or metres. Any station can still be typed by hand.

Alignment · Report: columns + beams

The report has the columns table, then the beams table, in one file. The panel still shows one table at a time.

Report options

PDF, Excel or AutoCAD opens a window: choose what goes in the report (info lines, table columns, summary and signatures, the sketch page, and the parts of a benchmark card such as Lat / Long and the photos), see the pages in the preview, then OK and choose where to save. Every tab keeps its own choices. `Hide empty rows` leaves out any empty line. `Preset` : ready sets (Local grid hides Lat / Long for plant coordinates) and your own sets by name. With `Show this window every time` off the report is made at once; right-click the button to open the window again.

Style

The `STYLE` box at the top of Report options: the colours of this report. `Use global` takes the style chosen in the About window (default `CAD & SURVEY Light` = the colours as before). With `Print Mono` and `Clear Contrast` the Result column reads `✓ PASS` / `✗ FAIL` (not colour only); the Panel styles give the BM / CP sketch its own

	background. The layout drawn in AutoCAD keeps the usual colours.The presets: **Paper** (the report blends with the white sheet): `CAD & SURVEY Light` (default), `Print Mono` (black only, for official issue), `Earth` (client reports), `Clear Contrast` (colour-blind safe). **Panel** (the pictures get their own background): `CAD & SURVEY Dark`, `Soft Panel` (saves ink), `Cream Panel` (presentations), `Blueprint` (videos, slides). The meaning stays in all of them: cut warm and fill cool, pass green and fail red.
`About → Reports`	The tools' mark at the bottom of the report: Logo, Text only (default) or None for Pro users. The top is always your logos. Next to it, the global style for every report (the one `Use global` takes).

i Verticality: a 6.000 m column with a 9 mm top shift = 1.5 mm/m. With 2 mm/m tolerance = PASS.

8 Questions

▼ **All points are NO DESIGN?**

The search is smaller than the real offsets. Turn on Auto or raise Search.

▼ **Is the work saved?**

Yes, the report data is kept inside the drawing and comes back when you open it, as long as you save the drawing (Ctrl+S). Settings and tolerances stay on this PC.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

By Eng. Ali · CAD & SURVEY · Guide

Guide › SURVEY QC

Benchmark Manager CBM PRO

Benchmarks and control points

A library of benchmarks (BM) and control points (CP) per project, kept on your PC, not in the drawing. Pick a point, COGO point, block or text, type the name and level in a small window, and the benchmark is drawn as a symbol with a CAD & SURVEY label box. Then table, Excel, KML and a PDF report with one card per benchmark.

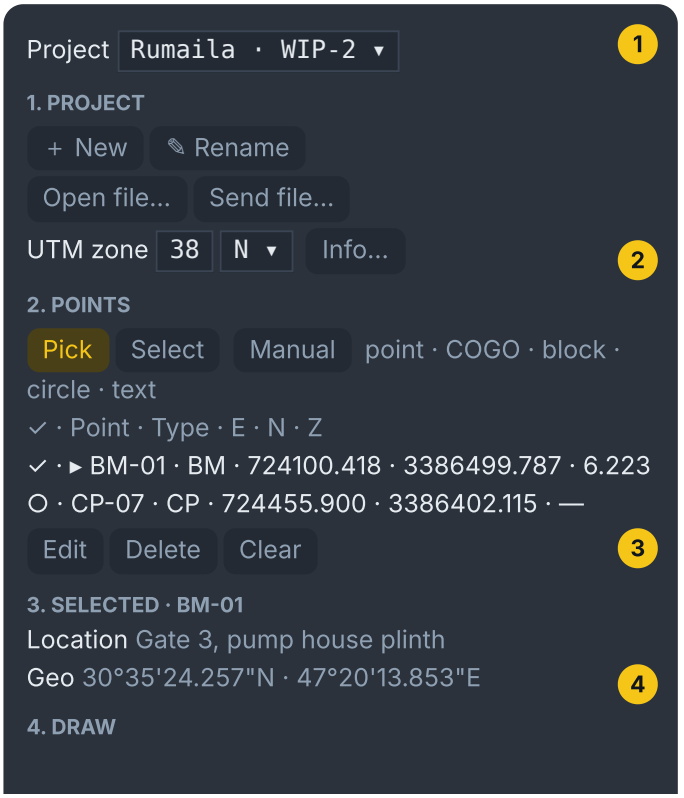
i **Exercise 17:** build a benchmark project from points, texts and a block, draw them with a style set and check the geographic coordinates by hand. Files in `Training\17_CBM\` . Open the exercise ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

i **Where is it?** Ribbon CAD & SURVEY › Survey QC panel › **Benchmark Manager**, or type `CBM` .

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The palette



1. PROJECT

Choose the project from the list at the top. `New` makes a new project, `Rename` renames it, `Open file…` opens a `.cbm` file a friend sent you, `Send file…` saves the project as one file (benchmarks and photos inside). `UTM zone` is the zone of the project (latitude / longitude in the PDF and KML; when E / N are local, the UTM of the Second system is used); `Info…` holds client, surveyor, approved by, height datum and logo (`×` removes the logo). `Auto-fill` brings client, names and logo from the last Project info you saved in any tool.

2. POINTS

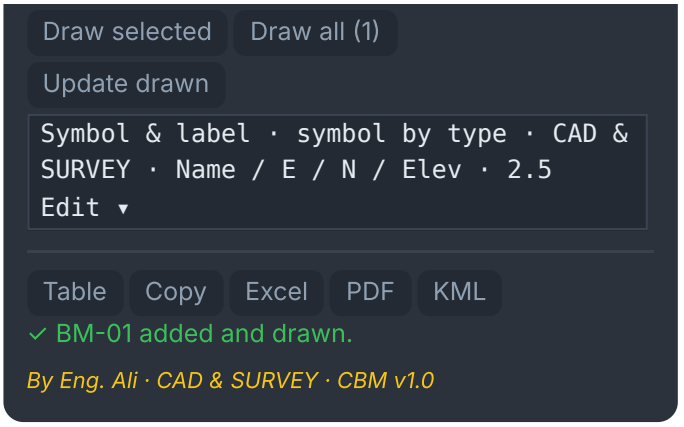
The yellow `Pick` starts picking (see below). `Select` adds many objects at once, with no window. The table: name, type, E, N, elevation, and ✓ = drawn in this drawing (O = not yet). Click a row = zoom to it and mark it for 3 seconds. `Edit`, `Delete` and `Clear` (it asks first).

3. SELECTED

The selected row: location, geographic coordinates, last level and the photos (click to open them).

4. DRAW

`Draw selected` and `Draw all` draw the benchmarks not drawn yet (e.g. in a new drawing of the same site); `Update drawn` redraws the drawn ones with the data of now. The `Symbol & label` bar holds style, symbol, rows and height.



2 Pick and the small window

1. Press `Pick` and click a POINT, a COGO point, a block, a circle / arc (its centre) or a text. Click an empty place and that place is taken (use OSNAP). To type the coordinates, type `M` (Manual) or press `Manual` in the palette.
2. The tool reads E, N, Z: from a COGO point its name, elevation and description; from a block its attributes (NAME / ELEV / DESC when there); from a text its position and the number when it looks like a level (6.223, EL 6.223).
3. A small window opens: name, type BM / CP / TBM, elevation, date levelled, location / description, note, up to 2 photos and the label side in 8 directions (↑ ↗ → ↘ ↓ ↙ ← ↖). E and N are there too: correct them, or type them for Manual. Fill what is empty. The label side can be changed later in `3. SELECTED › Label side`, redrawn at once. The window title and the gold line on top say what was taken: `COGO point 12`, `Block NAME`, `Circle centre`, `Text '12.345'`, `Empty place` (the point you clicked) or `Manual`.
4. `Enter` = save to the project + draw, `Esc` = cancel this one. Go on with the next point; Esc at the prompt finishes.

i The picked object is never erased: the symbol and the label box go on top of it, on layer `CBM`.

i **Grey row:** a benchmark whose level was last checked more than 6 months ago (from Level checked) - it may need checking again. Write the date as `20-10-2026` or `2026-10-20`; other forms are kept as text but the row is not greyed.
New with My Profile: New offers your My Profile projects first: the project gets the same name, client and surveyor filled. The PDF takes client and surveyor from My Profile when they are empty. In My Profile › Projects you see the benchmark count and can open the project with `Open in Benchmark Manager`.

3 The drawn symbol

Each benchmark is drawn as ONE block: the symbol on the point, a leader, and a framed box with the chosen rows. Change the look in the `Symbol & label` bar:

Style	Four ready sets only (no colour pickers): **CAD & SURVEY** (gold, default), **Print Mono** (black / white for printing), **Survey Blue**, **Earth**. One click changes symbol, frame and texts together.
Symbol	`By type` (default): each point by its type, BM and TBM a triangle ▲ with a centre dot, CP the survey circle ◖ with two filled quarters; change the type of one point and only its symbol changes. Or `▲ All` / `◐ All` for one symbol on every point.
Show	The rows Name · E · N · Elev · Description · Note, each on or off. An empty row (no level, for example) is left out.
Height	Text height in drawing units; the symbol and box grow with it.
Symbol ×	The size of the symbol alone, × the text height: 0.25 to 6 (1 = normal). The texts and the box stay as they are.

i Any change in this bar redraws every drawn benchmark of this drawing at once (after the running command ends, if any). One `U` brings the old look back.

⚠ Want other colours or a hand edit? `EXPLODE` the block and edit freely — but an exploded benchmark is no longer updated by `Update drawn` and has no ✓ in the table.

4 Projects (the library)

Each project is a `.cbm` file in `Documents\CAD & SURVEY\CBM`, with its photos in a folder next to it (`<project>_photos`). Open any drawing, choose the project, the benchmarks are there; `Draw all` draws them in the new drawing.

`UTM zone`: each project keeps its own zone (the first time it is taken from the GEOUTM setting, else 38N). Iraq: 37 west of 42° E, 38 between 42° and 48° E, 39 east of 48° E.

5 Second system (Plant / local) and Elev 2

Each project can have a second coordinate system (e.g. the Plant coordinates) and a second elevation. Set it in the `Second system` fold under `1. PROJECT` : `Name` of the system (default Plant) and `Mode` : `Off`, `Manual` (you type the second E / N in the window of each benchmark) or `Auto` (calculated from E / N with the drawing's coordinate system — Coord System, each site with its own — when it has one, otherwise with a CTRANS project).

Auto · CTRANS	`File…` chooses the CTRANS projects file (`CTRANS_Projects.txt`, taken by itself the first time) or one `.ctrans` project file; then choose the project in the list. `Points are` : `Grid` = the E / N of the benchmarks are the CTRANS grid, so system 2 is the local one; `Local` = the other way. The maths is CTRANS's own (shift + rotation). The values are calculated on pick and shown read-only in the window (with "auto"); after the project changed in CTRANS press `Calculate again`. The path is kept in the `.cbm` file.
Elev 2	An optional second level (e.g. the plant datum), always typed in the window, even when the second system is Off.
Show	The `Symbol & label` fold has a third Show row: `Plant E`, `Plant N`, `Elev 2` (off at first). The palette table gets E2 · N2 columns; Copy, Excel, Table and PDF take the new columns. KML stays on UTM.

i **Example (Manual):** `Mode = Manual`, name `Plant`. Pick BM-01 (E 724100.418 · N 3386499.787 · Elev 6.223). In the window type `Plant E / N = 1250.000` and `3480.500`, `Elev 2 = 106.223`, Enter. The PDF card shows a UTM 38N column and a Plant column, an Elevation row and an Elev 2 row.

6 Outputs and the PDF report

Table	An AutoCAD table of the benchmarks: click its top-left corner.
Copy · Excel	The list with latitude / longitude, date and notes.

PDF	Page 1: project info, an overview plan of all benchmarks (north arrow, scale bar) and the list of all of them. Then one card per benchmark: UTM and geographic coordinates, elevation, location, a key plan (this one gold, the others grey, north arrow, scale bar; the drawing behind as clear as you choose in `Drawing under the plan`: Off / Faint / Medium / Clear), up to 2 small photos (no row when there is none), notes and signatures. It follows the report style presets and the Report options window.
KML	The benchmarks for Google Earth, in the zone of the project.

i **Report options:** right-click `PDF` or `Excel` to open the options without saving a file: pages (list, overview plan, cards), list columns and card parts. Presets Full, List only and Cards only.

i **Plans:** the overview plan writes each benchmark's level under its name in a smaller line, and is taller when there are few points (12 or less). `Drawing under the plan` (Report options › Pages): Off / **Faint** (default) / Medium / Clear = the lines of the open drawing behind the overview and the card key plans; a busy drawing gives only its big buildings and main roads, and with no drawing open the plans have no background.

7 Questions

▼ Erased a symbol by mistake?

`U` brings it back, or select the row and press `Draw selected`. The benchmark itself is still in the project.

▼ Changed the coordinates of a point?

Pick it again with the same name: the tool asks to replace it and its drawn symbol moves to the new place. Or press `Update drawn` after any edit.

▼ How do I send the project to a colleague?

`Send file…` saves one `.cbm` file with the benchmarks and photos inside; your colleague opens it with `Open file…` and it joins his library.

▼ I have the client's benchmark list in Excel?

CBM has no file import. Import them first with CPOINTS (as COGO points in Civil 3D, so names and levels come along), then `Select` them all; or add each with `Manual`. `Select` takes the name from the COGO point or block NAME, else BM-nn; a name already in the project is skipped without asking.

▼ Delete or Clear by mistake?

They remove benchmarks from the project file on this PC; `U` does not bring them back (only drawn symbols). Keep a copy with `Send file…`. `Clear` asks: Yes = remove and erase their symbols, No = remove, keep the symbols.

▼ CBM or SREPORT › BM / CP?

CBM = the library of your benchmarks (position, level, photos, cards). SREPORT › BM / CP = a check report: the published value against what you measured, with ACCEPTED / NOT ACCEPTED.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com



By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
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Guide › SURVEY QC

Object Notes CNOTE PRO Notes on the drawing

Write a note and link it to an object in the drawing, to an area (window or polygon), or to a point — add photos, screen snips, a voice note and files, and give it a reminder date. Everything is kept inside the DWG itself, so when you send the drawing to a colleague the notes go with it. A coloured pin shows next to each note; a late note has a red pin that pulses, and when the drawing opens an alert lists the notes that are late.

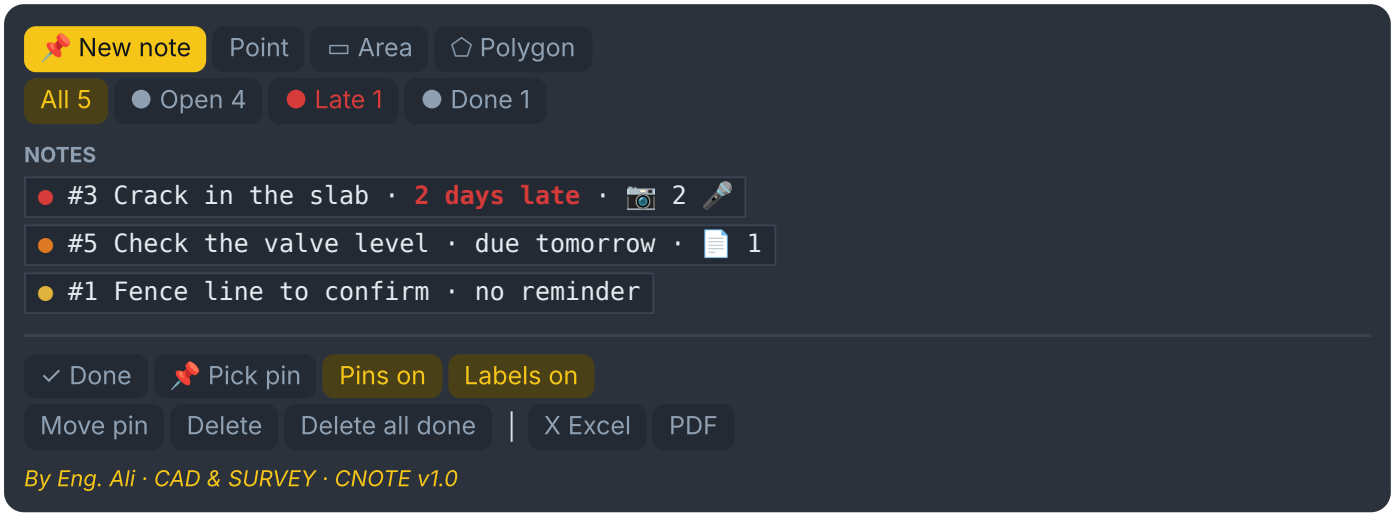
i **Quick notes with `Q` :** press New note and type `Q` ; every click becomes a note in a small box next to the mouse. Step by step: Quick notes ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. **How to activate ›**

i **Exercise 20:** leave four site notes (on a footing with a photo, on an area, on a polygon, and a voice note), set reminders, and see the red alert when the drawing opens. Files in `Training\20_CNOTE\` . Open the exercise ›

1 The palette

Type `CNOTE` (or Object Notes on the CAD & SURVEY ribbon, Survey QC panel). A side palette opens with every note of the open drawing.



`All · Open · Late · Done`	List filters with their counts. Open = everything not done yet (late ones too); Late = past the reminder date.

Click · double-click	Click a note = zoom to it; its object or area blinks gold 3 times. Double-click = the note window opens.
✓ Done	Marks the chosen note done (grey, no alerts). On a done note: opens it again.
Delete · Delete all done	**Delete** deletes the chosen note with its attachments (asks first; the Delete key in the list does the same). **Delete all done** shows with the Done filter and deletes every done note at once. U in AutoCAD brings them back.

2 Making a note

Button	What it does
📌 New note	Pick an object (line, polyline, block, point, text...). The note is linked to it and its pin follows it when it moves. For a note at a place without an object: the `Point` button (OSNAP works).
Point	Click a place (OSNAP works: a corner, a centre, an end...): the note sits at that point, no object.
▭ Area	Drag a window over a part of the drawing.
⬠ Polygon	Click the corners of the area, then Enter (3 points or more).

i An area (window or polygon) draws NOTHING in the DWG: its outline is kept inside the note and only the pin shows. Click the note in the list and the outline glows gold for a moment.

After the pick the note window opens: title, text, attachments and reminder. Save saves (Ctrl + Enter); U in AutoCAD undoes any save or delete.

i In the note window: **Mark done** marks it done (on a done note: **Open again**), **Delete** deletes it, **Cancel** (Esc) closes without saving.

Quick notes: the letter `Q`

Want to mark 10 mistakes on a drawing one after another, fast? Use quick notes: each note is a title and one line of text, typed in a small box next to the mouse, without the big window.

1 Press 📌 **New note** in the palette.

2. The command line shows `Pick the object for the note or [Point/Quick]`. Type `Q` and press Enter (or click the word **Quick** in that line).
3. It asks `Quick note - click a place`: click the place you want (OSNAP works).
4. The floating box opens next to the mouse with two fields: **Title** and **Text** (optional). Type, e.g. "Check the level here", and press **Enter**. Esc cancels this one only.
5. A numbered gold pin (#1) is placed and the tool asks for the next click at once: click and type note #2... and so on.
6. When you are done: press **Enter without a click**.

i **Note:** `Q` is not an AutoCAD command on its own and does not clash with your commands. It is an option inside New note only, active while the line shows `[Point/Quick]`. Any quick note can be opened later from the list to add photos, voice, files and a reminder. Switch the floating box off with its **Turn off ✕** button (you then type in the command line) and back on with **Floating box** in the palette or by typing `BOX`. In the palette a gold line with a bulb 💡 reminds you of the key: a click opens this page, ✕ hides it and leaves a small bulb (a click brings it back). When the box is off the line turns grey with a **Turn it on** button.

3 Attachments and size limits

Kind	How it is kept
📷 Photo	Inside the drawing. A picture over 2 MB is made smaller by itself (JPEG).
✂ Snip	The window hides; drag a rectangle on the screen (the drawing, a PDF page, a photo...). Inside the drawing.
🎤 Voice	Up to 1 minute, inside the drawing; a quiet microphone is made louder by itself.
📄 File	Up to 2 MB inside the drawing. Bigger files are kept as a **link** (name and path only). A PDF can be set to "link only".

i 2 MB per item: photos and snips are made smaller by themselves; a voice note over 2 MB is refused (record a shorter one). "Link only" is offered for a PDF under 2 MB; bigger files are always a link.

i 🎙️ **Tip:** keep voice notes short: 20–30 s is enough (the limit is 1 min). Shorter is clearer and lighter on the file.

ℹ All embedded attachments of one drawing are limited to 50 MB so the DWG stays light; you get a clear message when it is full. Click a tile = open (picture in a viewer, file as a copy in TEMP, link from its path); × = remove (asks).

A big PDF? Keep it as a link, then right-click its tile → page snip: the file opens, go to the page, OK, drag a rectangle. The snip is kept inside the drawing.

4 Voice notes

Press 🎤 Voice and speak: ● **REC 0:12 / 1:00** shows. Press Stop to end (it stops by itself at 1 minute). Click its tile = play. Needs a working microphone in Windows.

5 Reminders and the alert

In the note window, REMIND ME: pick a date, or Today / +1 day / +1 week, or None (no reminder). When a drawing opens with notes that are late, due today or due within 2 days, an alert shows:

Level	Look	Buttons
LATE	red, ringing bell, pulsing border, "2 days late"	Show them · Remind in 1 h
TODAY	orange, ringing bell, "due TODAY"	Show it · Later
SOON	gold, still bell, "in 2 days"	Show it · OK

⚠ The red alert has no plain close: "Remind in 1 h" brings it back after an hour while the drawing is open. "Show" opens the list on the late notes and zooms to the first. The alert language follows the help language (Help: عربي / EN); your note text stays as typed. With Windows "show animations" off nothing moves.

ℹ **When does a reminder show?** Only when the drawing is opened in AutoCAD (with Pro or the trial). There is no Windows or phone notification; a drawing left open past the date alerts the next time you open it.

6 Pins and colours

Colour	Meaning
gold	open
orange	due within 2 days (today included)

● red	LATE — the pin pulses
● grey	done

ℹ The alert colours above are for the alert window only: the pin of any note due within 2 days stays **orange**, even when the alert is gold (SOON).

Pins are not DWG objects (they never print or save) and show in model space. **Pins on/off** hides them; **Labels** writes the number and title of each note next to its pin. **Pick pin**: click a pin in the drawing to choose its note.

ℹ **Pin shape:** in the note window, `PIN : Pin , Flag` (e.g. problems) or `Diamond` (e.g. questions), to tell the notes apart from far. The colour still shows the state.
Move pin: choose the note in the list, press `Move pin` and click a new place. A point note moves; an object / area note keeps its link and only its pin is shifted (it still follows the object). U brings it back.

7 PDF and Excel

PDF: an A4 report with summary tiles (total, open, late, done), the notes table (No, title, status, due, link, attachments), then each note with its text and up to 4 photos / snips; voice is listed as "voice note 0:42". Right-click = report options (sections, presets, Project info...). **Excel**: the notes table with their text.

Report options	
Presets	**Full** everything · **Open notes** without done ones · **Table only** just the table.
`Done notes too` · `Photos in the blocks`	On; switch off to leave out done notes or photos.
`Created`	Creation date column (off).
`Drawing under the plan`	Default **Faint**.

ℹ **Auto-fill:** in Project info, `Auto-fill` (next to Save) fills project, location, client, names and logos from the last Project info you saved in any tool; still-empty boxes come from My Profile. Report no. and date are not copied.
Report no.: an empty box shows the next number in grey (after SUR-NOTE-007: SUR-NOTE-008). **Double-click** = use it. The box keeps your last number, so empty it first to see the suggestion.

i Arabic text does not print right in the PDF yet (the PDF font is Latin only). In Excel it is fine.

i **Master plan:** in the PDF before the table: the whole drawing with every note's pin (number, shape, state colour), the outlines of area notes dashed, north arrow and scale bar. How clear the drawing is behind it: `Drawing under the plan` (Off / Faint / Medium / Clear, default Faint) in Report options.

8 Questions

▼ Where are the files kept?

Inside the DWG itself (dictionary CADSURVEY_CNOTE). There is no folder next to it. Only big files (links) stay where they are.

▼ I send the DWG to a colleague - do the notes go too?

Yes, all of them with the photos, voice and small files. Links do not: send the big file with it. To see them your colleague needs CNOTE (Pro or the trial); without it the drawing works normally and the notes stay hidden inside it.

▼ A big 60 MB PDF?

It is kept as a link (name and path). If the file moves you get a "not found" message. Add snips of the important pages so they stay inside the drawing.

▼ I erased the linked object?

The note stays and its pin stays at the last place, marked "(erased)". U brings the object and the link back.

▼ Pins too small or too big?

Their size follows the zoom: they adjust by themselves after you zoom.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › SURVEY QC

DWG Compare `CCOMP` Drawing compare

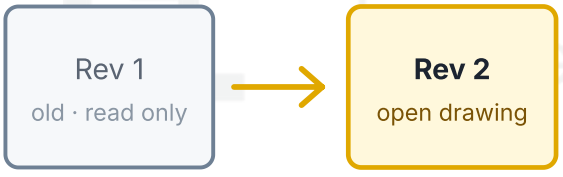
Compares two drawings (or two sets in one drawing) and finds what **moved**, what was **added** and what was **deleted**, with the shift of each object. The changes are coloured in the drawing and listed in a table and a report.

i **Exercise 06:** compare 12 design foundation centres with the as-built survey in the same drawing, and find what moved, what is missing and what is new. Files in `Training\06_CCOMP\` . Open the exercise ›

i **A free tool. Where is it?** Ribbon CAD & SURVEY › Survey QC panel › **DWG Compare** (small button), or type `CCOMP` .

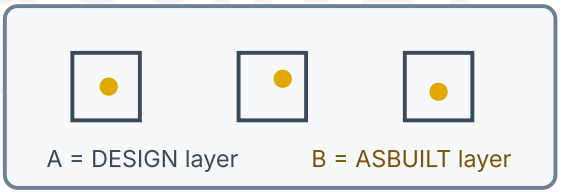
i **– / +** next to number boxes step the value (↑/↓ keys too).

1 Source



Two files

The open drawing = new. Choose the old one with `File…` ; it is read in the background, never opened or changed. For two revisions, or the contractor's file against yours.



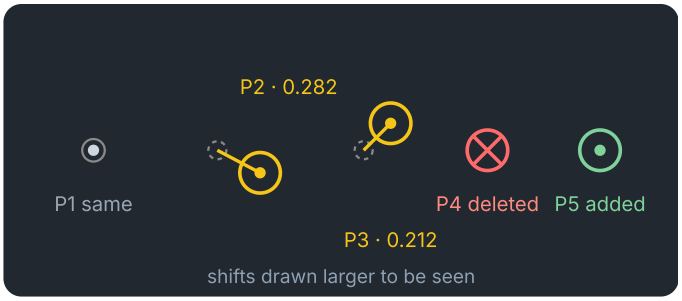
Same drawing

Two sets in one drawing: A = design, B = as-built, by layer or by selection. Best for shifting: survey points brought onto the design drawing.

2 Example: foundation point shifts

Design points on layer `DESIGN` , survey points on `ASBUILT` , 5 m apart, tolerance `0.010` m:

Point	ΔE	ΔN	Shift	Result
P1	+0.004	−0.003	0.005	Same
P2	+0.250	−0.130	**0.282**	Moved
P3	+0.150	+0.150	**0.212**	Moved
P4	not surveyed			Deleted
P5	new point in the survey			Added

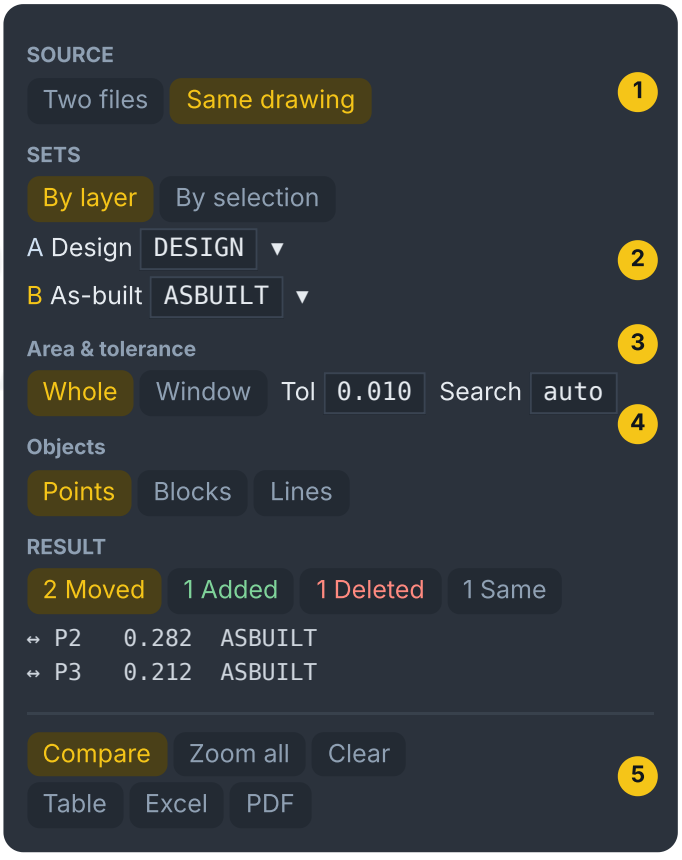


The colours are temporary: nothing is added. `Clear` removes them.

i P5 is 5 m from P4, more than the automatic search (2.5 m = half the point spacing), so they are not the same point: one deleted and one added.

3 Steps

1. Choose `Same drawing` → `By layer` and set the A and B layers (type, ▾, or the pointer button and click an object).
2. Type the `Tolerance`; keep `Search` on auto.
3. Choose the kinds of objects (e.g. Points) and press `Compare`.
4. Click a count (Moved, Added ...) to list those objects; click a row to zoom to it.
5. `Table`, `Excel` or `PDF` for the report.



4 How does it know it is the same object?

1. **By number or name:** the COGO point number, the block name with its first attribute, or the same text (when not repeated).
2. **By handle:** between two revisions of one drawing (Save As) every object keeps its identity. The tool first checks the files really belong together.

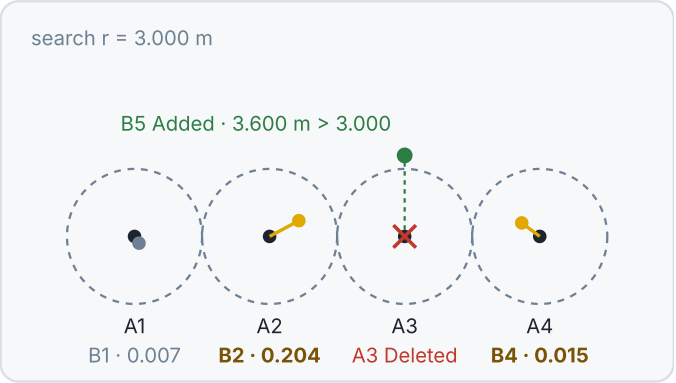
3 **By nearest:** the rest pairs with the nearest object of the same kind inside the search distance, closest first.

Points	The shift between the points; the level difference (dZ) in the note when above the tolerance.
Blocks	The insertion point; rotation in the note.
Lines	The bigger shift of the two ends.
Polylines	The biggest vertex shift; a change in vertex count in the note.
Circles	The centre and the radius (arcs also their ends).
Texts	The text position; a changed text in the note.

5 The calculation with numbers

Four design points (A) in a row, 6 m apart, and four survey points (B). Tolerance = `0.010` m, Search = auto. All plain points (POINT), so they have no number or name.

Pt	E	N
A1	722640.000	3375410.000
A2	722646.000	3375410.000
A3	722652.000	3375410.000
A4	722658.000	3375410.000
B1	722640.004	3375409.994
B2	722646.180	3375410.095
B4	722657.988	3375410.009
B5	722652.000	3375413.600



Shifts drawn larger to be seen. Dashed circle = the search distance.

From matching to the result

1 `nearest spacing of A = 6.000 m (all four)`
`r = 6.000 / 2`
`Search (auto) = 3.000 m`
auto = half the small spacing (the lowest 10 % of the nearest-neighbour distances), not under 3 × tolerance (nor 2 cm) and not over 25 m.

2 `1) same number / name  2) same handle  3) nearest ≤ 3.000 m`
`B1→A1 · B4→A4 · B2→A2`

Plain points have no number, and handles are only for Two files, so here they pair by nearest: closest pairs first.

3 `10 pairs by handle, 8 within 4 × 3.000 = 12.000 m`
`8 ≥ 0.6 × 10 = 6`

handles used

(Only for Two files, not used in this example.) With two files: handles are used only when 60 % of their pairs (or more) are near, so the files really are revisions of one drawing. Else they are left and nearest is used.

4 `B1: Shift = √(dE² + dN²) = √(0.004² + (−0.006)²) = √(0.000016 + 0.000036)`

0.007 ≤ 0.010 → Same

dE and dN = new minus old.

5 `B2: √(0.180² + 0.095²) = √(0.032400 + 0.009025)`

0.204 > 0.010 → Moved (ΔE +0.180, ΔN +0.095)

Above the tolerance = moved.

6 `B4: √((−0.012)² + 0.009²) = √(0.000144 + 0.000081)`

0.015 > 0.010 → Moved (ΔE −0.012, ΔN +0.009)

Even 5 mm over is enough. A shift exactly equal to the tolerance = Same.

7 `B5 ↔ A3: √(0.000² + 3.600²) = 3.600 > 3.000`

A3 Deleted · B5 Added

Further than the search, so no pair. A3 has no partner = deleted, B5 = added.

✓ Result: 2 Moved · 1 Added · 1 Deleted · 1 Same. The list starts with the biggest move: B2 0.204, then B4 0.015.

6 Options

Tolerance	A shift above it = Moved, below = Same. Drawing units (m): `0.005` = 5 mm (default).
Search · auto	How far it looks for the same object. auto = half the small spacing between objects. Type a number for big moves.
Whole / Window	The whole drawing, or an area picked by two corners.
Labels	Writes the name and the shift next to each change (temporary).
Table	AutoCAD table on layer `CCOMP-TABLE`, text height = `TEXTSIZE`.

PDF / Excel	A4 report: files, tolerance, the four counts, a coloured sketch of the changes and the list with ΔE, ΔN (ΔX, ΔY in a local drawing) and shift.

i **Area & tolerance** and **Objects** fold under a bar: **Edit ▾** opens them, **Hide ▴** closes them, and the bar shows the current settings (e.g. Whole · tol 0.005 m · search auto).

⚠ With two files: both drawings must be in the same coordinate system and units.

i COGO points in the old file are read only when AutoCAD is Civil 3D.

⚠ Only Model space objects are compared; layouts and xrefs are not read. The old file must be a DWG.

7 Questions

▼ A moved object shows as Deleted + Added?

It moved further than the search distance. Type a bigger `Search` (e.g. 1 or 2 m) and Compare again.

▼ CCOMP or SREPORT?

CCOMP is quick: it finds what changed between drawings. SREPORT is the formal QC report: tolerance per axis, pass / fail, project info and signatures.

▼ An object in both sets?

It is left out with a message, since it would be compared with itself.

▼ I switched drawings and the colours are gone?

Normal: the colours are temporary and belong to the compared drawing. Go back and `Zoom all` shows them again.

i **Report options:** PDF or Excel opens a window to choose what goes in the report, with a preview of the pages and zoom: the four counts, the sketch of the changes, the list of changes and its columns (Layer, dE / dN, Shift, Note), and the info lines. Summary only gives the summary without the list. Right-click the button to open the window without saving a file.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help

most surveyors go into the next versions. · **eng.alicadsurvey@gmail.com**

By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

Guide › DESIGN & EARTHWORK

Pipeline Survey CROUTE PRO Pipeline route

Reads the route points from a picture of the table, a PDF snip, Excel or a polyline, and checks them before drawing: angles, order, missing and repeated points, points off the route.

✓ **Exercise 07:** read a route table, check every bend angle and KP by hand, draw flowline FL-123 and check the points the crew staked. The files are in `Training\07_CROUTE\`. Open the exercise ›

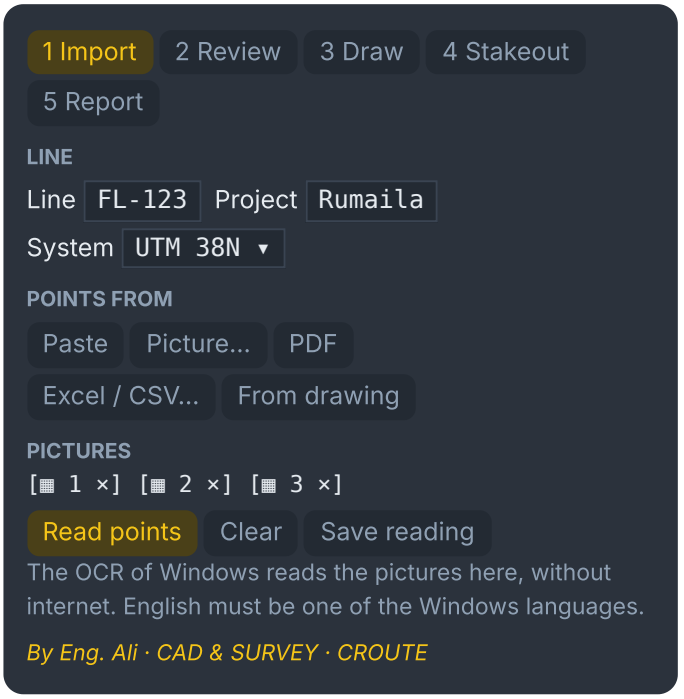
PRO A PRO tool: fully working for 30 days from the first use of any PRO tool (one trial for all PRO tools), then it needs an activation code. How to activate ›

i Five pages at the top of the palette: **1 Import** (line, system and points) · **2 Review** (checks and fixes) · **3 Draw** (drawing and KML) · **4 Stakeout** (setting out and the as-staked check) · **5 Report** (PDF and Excel report). The buttons of each page sit at the bottom of the palette, with the message line under them.

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 Steps

1. Type `CROUTE` or click **Pipeline Survey** on the ribbon (CAD & SURVEY tab, Design & Earthwork panel).
2. On page **1 Import** type the line name (**Line**, like `FL-123`; filled by itself when it is seen in the picture) and the project, and choose the **System** (Rumaila and Basra: `UTM 38N`).
3. Open the PDF or picture and zoom on the coordinates table.
4. Press **Win+Shift+S** and snip the table. A long table: snip it in parts, each one zoomed in.



5. In `CROUTE` press **Paste** (or Ctrl+V) after each snip.
6. Press **Read points**: the pictures are read and the **Review** page opens.
7. Fix the red rows: click the row and compare with the picture under the list; double-click a cell to edit it, or **Apply fix**.
8. **3 Draw**: **Text height** (1:1000 = 2.5) → **Draw route**.
9. **4 Stakeout**: **Make list** → **CSV / TXT** or **GSI** for the instrument, **Crew sheet PDF** for the crew.
10. **5 Report**: fill **Cover** once → **PDF report**.

✓ Overlapping snips are fine: a row read twice with the same values is kept once.

i **Clear** (next to Read points) removes all the pictures and points of the list, and asks first. **Save reading** keeps them in a ZIP. The message at the bottom is green when done, orange when something is missing, red on an error.

⚠ **Note:** the list of points, the photos, the notes on sections and the KEY NOTES stay only while AutoCAD is open. To go on another day: before closing, press **CSV** on the Review page and keep the file, then load it with **Excel / CSV...**: names, E, N, Z, descriptions, table angles and your corrections all come back. Photos, notes and Accept marks are added again. **Save reading** (ZIP) does not open in the tool: it is for sending to Eng. Ali when a table is read badly.

What is kept where	
The drawn route and pegs	In the DWG
Settings (text height, stakeout, cover...)	On this computer, for the next job
Points, photos, notes	Until AutoCAD closes (save a CSV)

i The route = the CR points in order, starting at the first SP and ending at the last SP when they lie before CR01 / after the last CR. The other SP and CP are marks (crossings, culverts): they get a KP and their distance from the route only; they need not be on it.

2 Sources

Source	Note
Paste / Picture	The Windows OCR, offline. English must be one of the Windows languages.
PDF	The PDF opens inside the tool page by page: wheel to zoom, a box on every table, Add selection.
Excel / CSV	Name, E, N and angle in any column order.
From drawing	Click the polyline near its start: SP00, CR01 ... and the last SP.
Picture...	Picture files (PNG, JPG, BMP, TIF): a photo or a scan of the table. A straight, sharp photo reads best.

i `Excel / CSV…` and `From drawing` replace the points of the list. `Paste` also reads copied Excel cells or text directly, with no picture.

Click a picture in the list to cut out the table only, or turn it.

Table forms that are read:

In the table	How it is read
`E 722791.708, N 3375811.395`	E and N in one cell (also with no space after the comma). The letters decide which is E and which is N.
ELEVATION · CHAINAGE · CP	The elevation column becomes Z. The CHAINAGE column (like 1+250.50) is compared with the calculated KP. The CP column links a CP to its SP.
IP-G01 · CR1 · EX01 · START POINT	Names with a letter inside, without zeros, EX, and START POINT / END POINT as the name or in the description.
CHANGING ROUTE (45°)	The point becomes a bend of the route with a 45° angle, even when it is not named CR. A description on two lines is joined.
Nothing · Design conditions · MTO	"Nothing" in the head is read as Northing. Design conditions and MTO tables are passed over.

Excel / CSV file

Rule	Details
Files	.xlsx, .csv, .txt. Old .xls is not read: Save As .xlsx or .csv.
Headers	`E / X / EASTING` · `N / Y / NORTHING` · `ELEVATION / Z / RL` · `CHAINAGE / CH` · `CP`

Coordinates	5 to 7 digits before the decimal point (UTM). Small local values (like 1250.000) are not read.
Angle	`36°13'05" R` · `36-13-05 L` · `36 13 05` · `36.2181 RT`

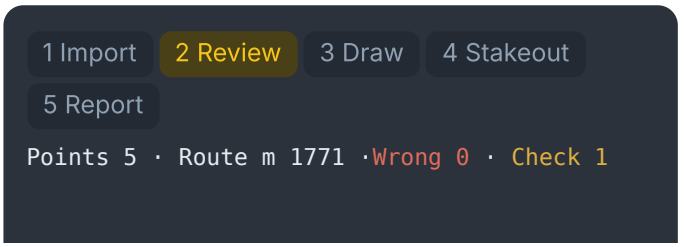
```
NO,POINT,EASTING,NORTHING,ANGLE,DESCRIPTION
1,SP00,722410.250,3375205.480,,START POINT
2,CR01,722795.630,3375720.115,36°13' R,CHANGING ROUTE
```

3 Checks

Check	Meaning
angle ✕ / ≈	The angle of each bend comes from the coordinates. When the table has angles they are compared (interior or deflection, found by itself): more than Angle ± (2°) is gold, much more is red, usually a misread digit.
Fix?	One digit of E or N makes all the near angles right, or the table angle itself was misread.
twice	The same name with different values: delete the wrong one.
missing	A number missing in the series (CR01, CR02, CR04 → CR03).
order?	The start is nearer to the last CR: check the numbering or use Reverse.
≠ SP	A CP within 0.5 m of an SP but not at the same place (or linked to it in the CP column).
chainage	The CHAINAGE written in the table does not match the KP from the coordinates (more than 1 m). When the table starts at another chainage, the offset is taken from the first point.
tie-in	The description says Tie in: a note only.
no E/N · no name	Red: E, N or the name was not read. Double-click the cell and type it.
name?	Gold: the name was not read; it was guessed from the rows around it. Compare with the picture.
E? · N?	A different digit count from the other points = a digit lost by the reading (red). A different number of decimals (gold).
side	The angle is right but the table says L and the coordinates turn R (or the other way).

Points · Route m · Wrong · Check

The tiles above the list: number of points, route length, wrong (red) and to check (gold). Click



Wrong or Check and the list jumps to the next such point.

Note

The note of the selected point: the DESCRIPTION of the table (road crossing, existing loop ...) or your own. It goes to the drawing and the report.

Zoom · Delete · Row

Zoom goes to the point and marks it with a temporary yellow cross, Delete removes it (no question, no undo: type it again with Row), Row adds a row to type in (one the OCR missed).

Swap E/N · Reverse · Zoom on click

Swap E/N swaps E and N of every point. Reverse runs the route from the last SP (KP 0+000 there). Zoom on click: section 5.

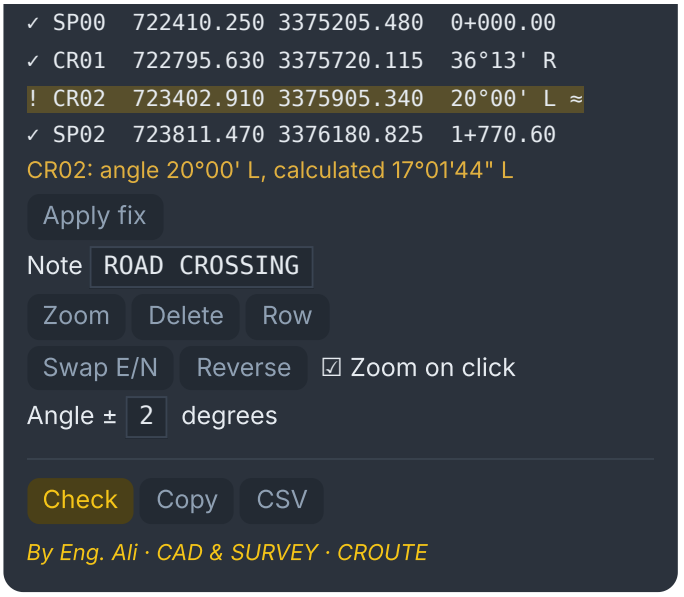
Reverse is an on/off switch (lit = on) and stays on for the next line, even after AutoCAD is closed: switch it off before you start a new line. **Swap E/N** also stays lit; a second press puts E and N back.

Angle ±

The angle tolerance in degrees (2° by default, enough for a pipeline).

Check · Copy · CSV

At the bottom: Check runs the checks again (they also run after every edit), Copy copies the points (Point, E, N, Z, Description, Angle (table), Angle (calc), KP, Off route, Check, Note) to paste into Excel, CSV saves them to a file.



The point menu: click the **!** or **✕** at the start of a row (or right-click the row):

Item	What it does
Accept ✓	The value is right as it is: it shows a gold ✓, counts as OK and the report notes it as accepted. A red (Wrong) point asks to confirm. Undo accept brings the check back; any edit of the point clears it.
Modify...	Opens the cell with the problem (name, E, N or angle) for typing.

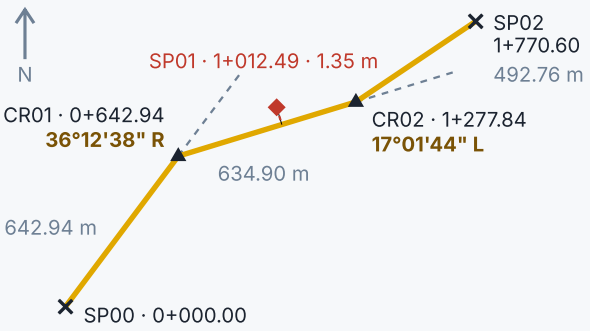
Apply fix	Puts the suggested value (when there is one).
Zoom · Delete	Zooms to the point in the drawing, or deletes it from the list.

4 Route math, step by step

A small example in UTM 38N: start SP00, two bends CR01 and CR02, end SP02. SP01 is a road crossing in the middle: a mark, not a point of the route.

Point	E	N	Table angle
SP00	722410.250	3375205.480	—
CR01	722795.630	3375720.115	36°13' R
SP01	723148.710	3375829.218	—
CR02	723402.910	3375905.340	20°00' L
SP02	723811.470	3376180.825	—

Point	KP	Leg m · Azimuth	Calc
SP00	0+000.00		start
CR01	0+642.94	642.94 36°49'39"	36°12'38" R ✓
CR02	1+277.84	634.90 73°02'16"	17°01'44" L ≈
SP02	1+770.60	492.76 56°00'32"	end
SP01	1+012.49	mark: 1.35 m from the route	



Dashed = the leg before, carried on; the angle between it and the next leg is the deflection. The SP01 offset is drawn larger to be seen.

Length and azimuth of each leg

Leg SP00 → CR01

1 ΔE = 722795.630 − 722410.250
ΔN = 3375720.115 − 3375205.480
ΔE = 385.380 · ΔN = 514.635
End point minus start point.

2 L = √(ΔE² + ΔN²) = √(385.380² + 514.635²) = √(148517.744 + 264849.183) = √413366.928

L = 642.94 m

The report shows the leg with two decimals.

3 Az = atan2(ΔE, ΔN) = atan(385.380 / 514.635) = 36.8274°

Az = 36°49'39"

The azimuth is from north, clockwise (0 – 360°). A negative value gets +360°.

4 CR01 → CR02: ΔE = 607.280, ΔN = 185.225
L = √(368788.998 + 34308.301) Az = atan(607.280 / 185.225)

L = 634.90 m · Az = 73.0379° = 73°02'16"

The same for the second leg.

5 CR02 → SP02: ΔE = 408.560, ΔN = 275.485
L = √(166921.274 + 75891.985) Az = atan(408.560 / 275.485)

L = 492.76 m · Az = 56.0089° = 56°00'32"

And the last leg.

Deflection angle and the table check

Deflection = azimuth out – azimuth in

1 CR01: θ = 73.0379° − 36.8274° = +36.2105°

36°12'38" R

Plus = right (R), minus = left (L). The difference is kept between −180° and +180°.

2 CR02: θ = 56.0089° − 73.0379° = −17.0290°

17°01'44" L

Minus: the route turns left.

3 36°13' ↔ 36°12'38" (deflection) or 180° − 36°12'38" = 143°47'22" (interior)

deflection

The tool sees which one the table angle is nearer to: deflection or interior. Here both bends are nearer to the deflection.

4 CR01: |36°13' − 36°12'38"| = 0°00'22" ≤ 2°

✓ Angle 36°13' R = calculated 36°12'38" R

Inside Angle ± (2° by default), and the side R is the same.

5 CR02: |20°00' − 17°01'44"| = 2°58'16" 2° < 2°58'16" ≤ 2.5 × 2° = 5°

angle ≈ (gold)

Over 2° but not over 5°: gold, a small difference in the drawing itself. Over 5° it is red.

i The tolerance = Angle ± or the rounding of the table angle + 1', whichever is bigger. A table in minutes (20°00') is ±0.5', in whole degrees (20°) ±0.5°: either way the 2° still rules.

KP (chainage)

KP = sum of the legs from the start

1 `KP(SP00) = 0`

`0+000.00`

The start is always zero.

2 `KP(CR01) = 0 + 642.94`

`0+642.94`

Kilometres before the +, metres after it with three digits and two decimals.

3 `KP(CR02) = 642.94 + 634.90 = 1277.84`

`1+277.84`

1277.84 m = 1 km and 277.84 m.

4 `KP(SP02) = 1277.84 + 492.76 = 1770.60`

`1+770.60 = length 1770.60 m`

The KP of the last point is the route length. The tool adds the lengths unrounded and rounds only for display.

Mark SP01: KP and offset from the route

Perpendicular projection on the nearest leg

1 $t = ((E - E_1)\cdot\Delta E + (N - N_1)\cdot\Delta N) / L^2$

$= (353.080 \times 607.280 + 109.103 \times 185.225) / 403097.299$

$= (214418.422 + 20208.603) / 403097.299$

$t = 0.582061$

The tool tries every leg and takes the nearest, here CR01 → CR02 (E_1, N_1 = CR01). t between 0 and 1: the foot is inside the leg; outside, it is held at the leg end.

2 $E = 722795.630 + 0.582061 \times 607.280 = 723149.104$

$N = 3375720.115 + 0.582061 \times 185.225 = 3375827.927$

E 723149.104 · N 3375827.927

The foot of the perpendicular on the route.

3 `KP = KP(CR01) + t × L = 642.94 + 0.582061 × 634.90 = 642.94 + 369.55`

`KP 1+012.49`

The KP of the mark = the KP of the foot.

4 `Off = √((723148.710 − 723149.104)² + (3375829.218 − 3375827.927)²) = √(0.394² + 1.291²)`

`1.35 m from the route`

The distance in metres, without a side. Under 0.005 m it says "on the route".

5 `CHAINAGE in the table 1+012.00 → 1012.00 − 1012.49 = −0.49 m  |−0.49| ≤ 1 m`

`✓ Chainage 1+012.00 = calculated 1+012.49`

When the table has a CHAINAGE column starting at 0+000. Over 1 m is gold, over 10 m red.

5 Draw

Option	What it draws
Text height · Width	Label height in drawing units (1:1000 → 2.5); blocks and ticks follow it. Width = global width of the centerline (0 = thin).
Centerline	The centerline polyline on layer <line>_CL, CENTER, gold.
Pipe outline Ø · ROW · START / END	Two lines at half the diameter each side of the centerline; dashed right-of-way lines at the typed distance; START / END with the point names at the two ends.
Blocks	CR ▲, SP ×, CP ◆, FS ■ with attributes: name, E, N, KP, note.
Symbols	For each type (CR, SP, CP, FS, others) choose the symbol and colour.
Labels	Multileader, text, or number + table. Points at one place share a label (SP01 / CP01). **Name + E / N** and **Note** add the coordinates and the note to the label. **Text style** (current = the current style of the drawing) and **Leader style** (CROUTE = made by the tool, or a style of your drawing). The show column of the Review list turns off the label of one point.
KP · Angle · Length	KP ticks at the typed interval, the angle at each bend (`As the table` / `Interior` / `Deflection`), length and azimuth of each leg, flow arrows.

Notes on sections: one line each: `SP05 ; SP07 ; UNDERGROUND PIPELINE ; dashed` . From / to are points or KP (1+640); dashed (optional) draws that part dashed. Or press **Pick section**.

On the Review page, **Zoom on click** zooms to the point of the clicked row and lights up its block and label.

✔ The Draw page buttons at the bottom: **Draw route** · **Update** · **Zoom** · **Clear**. The whole drawing is one group: Draw route again replaces it, **Update** draws it again with the new settings and the view stays put, **Zoom** shows the whole route, **Clear** erases it from the drawing (it asks first; the list stays). **KML** saves a Google Earth KMZ; the list next to it chooses `Route only` / `Route + points` / `Route + points + notes` (needs the UTM zone in Import → System).

Layer	What is on it
`<line>_CL` · `_PIPE` · `_ROW` · `_SECT`	Centerline, pipe outline, ROW, dashed sections
`_PTS` · `_LBL`	Blocks and labels
`_KP` · `_ANG` · `_NOTE`	KP ticks, angles and lengths, section notes
`_STAKE` · `_STAKE_CHECK`	Pegs and the as-staked check

<line> = the Line name; empty = `ROUTE`. To take the drawing back: **Clear** on the Draw page, or `U` in AutoCAD.

6 Stakeout

Page **4 Stakeout**: the points the crew sets out, in the order of the route.

Option	What it does
Route points · Marks	Start, bends and end, and the marks (crossings, SP, CP) at their own coordinates.
Every ... m	A point on the line every N m by KP: 0+025, 0+050 ...
Offset pegs	Pegs left and right. At a bend the peg is on the bisector, a bit further (offset ÷ cos(θ/2)), so the peg lines stay parallel to the route. The list next to it: **Both** (default), **Left**, **Right**, **None**.
Range	**Whole route**, **Point to point** from the lists, **Pick on drawing** two clicks on the route (KP rounded to the metre), or **KP from – to** typed (1+250 or 1250). A line under it shows the range: KP 0+000 – 1+250 · 1250 m · CR01 → CR06.
Names	`0+025 · 0+025L / R` = KP names (route points keep their names, offset pegs end with L / R), or `ST001, ST002 …` = one running number.
Make list · Draw pegs	At the bottom: Make list makes the stakeout points with these settings (make it again after a change), Draw pegs draws them with their names on layer <line>_STAKE (the old ones are replaced).
Excel · CSV / TXT · GSI · KML	Files for the instrument: Name, E, N, Z, Code, or Leica GSI-16.

Crew sheet PDF	An A4 sheet in route order with a Done column to tick, and the signatures.
Import staked... · tolerance ±	The staked points from the instrument (Name, E, N [, Z] or GSI) are compared with the design: dH = √(dE² + dN²) against the tolerance in mm. Matched by name, else the nearest point within 0.5 m.
Staked file	CSV / TXT in exactly this order: **Name, E, N, Z** (Z optional, a header line is skipped). Your instrument gives **Name, N, E** (PNEZ)? Swap the two columns in Excel first. GSI is read directly. Excel files are not accepted here.
Draw differences · Check report PDF	A line from the design point to the staked point with its dH, on layer <line>_STAKE_CHECK: green OK, red out of tolerance. And a PDF report of the check.

i **Example:** offset = 5 m, deflection θ = 30°. The peg at the bend is 5 ÷ cos(15°) = 5 ÷ 0.966 = 5.18 m from the CR point. If the crew staked 0+050R with dE = +61 and dN = +22 mm: dH = √(61² + 22²) = 64.8 mm, more than ±50 = OUT.

Defaults	
Every · Offset pegs · tolerance ±	25 m · 5 m (Both) · 50 mm
Text height · KP ticks every	2.5 · 100 m
Pipe outline Ø · ROW	0.324 m · 10 m
Angle ± · System	2° · UTM 38N

7 Report

Page **5 Report**. The first page of the report holds it all: the logos and title, **1 PROJECT** (project info), **2 PIPELINE** (length, bends, crossings, start and end with KP, the checks), **KEY NOTES** and the signatures (Prepared / Checked / Approved) at the bottom.

Option	What it does
Cover	The cover info: Project, Drawing no., Report no., **Date** (empty = today), **Client logo...** (top left) and **Contractor logo...** (top right); Cancel in the logo window = remove it.
KEY NOTES	One important note per line: `SP10 ; LIVE PIPE - HOT TAP NEEDED` or `1+640 ; ROAD CROSSING`. Shown on the first page with a red edge.
Map page	**From the coordinates**: a clean plan of the route. **Page of the drawing PDF**: choose your plotted PDF and the page; it is turned to fill the A4. **None**: no map.

Tables · Section notes · Checks · Photo pages	The parts of the report (CONTENT): the points and route tables, the section notes, the checks page (wrong, to check, accepted; off by default) and the photo pages.
Site details	Your own fields on the first page, one per line: `Weather ; Sunny, 34 °C`. They stay for the next job; **Save template…** / **Open template…** keep more templates.
Photo info box	What the photo box shows: Point name, E / N, KP, Angle, Note, Date / time and Photographer (his name in the box next to it). **Box at** = the corner (Top left …), **Top view sketch** = a small plan of the point (the route 25 m around it, the near points, north and scale).
Per page	1 = one big photo with the info box and sketch. 2 / 4 / 6 = smaller photos, each with a strip under it: number, point, KP, E/N and note.
Header band	Every page after the first starts with a band: both logos, the line, the page title, project, report no. and date.
Add photos… · Link by GPS	Adds site photos (JPG / PNG). Photos with GPS are linked to the nearest point or KP by themselves; Link by GPS links the photos that have a position and no link yet.
Link by name	Links photos by the file name: `CR07.jpg`, `SP10 road.jpg`, `KP 1+640.jpg`. Adding photos does this by itself, then GPS.

i **Cover**, **Site details** and **Photo info box** are set once per project, so they fold under a bar: **Edit ▾** opens it, **Hide ▴** closes it, and the closed bar shows the current settings.

The photo window (click a photo): link it to a point or KP, to several points (`SP05, SP06`) or give it your own caption (`Camp entrance` , or `SP05, Valve pit`), write the note and time, and draw on it:

Tool	Use
Arrow · Line	Drag from start to end. Heads: at the end, both ends or none.
Polyline · Polygon	Click the points; double-click (or right-click or Enter) to finish.
Rectangle · Circle	Drag the box. Hold Shift for a true circle.
Point · Text	Click for a point. Text: click and type, Enter = done, Shift+Enter = new line. Box = dark box behind it.
Select	Select a mark and drag it; change its colour, width, line type and fill, or Del to delete. Double-click a text to edit it. Ctrl+Z undoes.

✔ The marks go to the PDF as vectors, not pixels: sharp at any zoom.

⚠ The PDF prints Latin letters only; Arabic goes to the Excel file.

i **The tools' mark in the report:** About → Reports: **Logo** (a small logo at the bottom of the pages), **Text only** (a small grey line, the default) or **None** for Pro users. The top of the report is always yours: client and contractor logos.

i **Report options:** `PDF report` or `Excel` (and `Crew sheet PDF`, `Check report PDF`) opens a window: the pages, the parts of the cover (project, pipeline, site details, key notes, signatures), the project lines, the table columns and the photo info box, with a preview of the pages. The page and photo-box choices are the same settings as on the Report page. Right-click the button to open the window without saving a file.

8 Questions

▼ **It says the English reader is missing**

Settings → Time & language → Language & region → Add a language → English (United States), then read again.

▼ **No points were read**

Cut the picture to the table only and zoom in more before the snip. Each row needs a name (CR01), E and N.

▼ **E and N are swapped**

Press **Swap E/N** on the Review page. A second press puts them back.

▼ **I closed AutoCAD: where are my points?**

The list lives only while AutoCAD is open; the drawn route stays in the DWG. Next time press **CSV** before closing, then load it back with **Excel / CSV...**: the list comes back with your corrections.

▼ **The route starts at the wrong end**

Press **Reverse** on the Review page. If it is still lit from an earlier job, press it to switch it off.

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ENG. ALI

▼ **My coordinates are a local grid**

The tool reads coordinates with 5 to 7 digits (UTM). Small values like 1250.000 are not read from a picture or file: draw a polyline and use **From drawing**.

▼ **The as-staked check is all OUT or nothing matches**

The file must be **Name, E, N, Z**. If your instrument puts N before E, swap the two columns in Excel.

▼ **KML shows the line in the wrong place**

Choose the right zone in Import → **System** (Rumaila and Basra: UTM 38N).

▼ **Arabic comes out wrong in the PDF**

The PDF prints Latin letters only. Write notes in English; Arabic goes to the Excel file.

9 New in 2.4.1

1. **Erase** of the drawn route: a corner card with `Undo` for 8 s brings it back.

★ New in 2.5

1. **Layer names** now follow the other tools: `CROUTE-CL`, `CROUTE-PTS` ..., or `CROUTE-<line>-CL` when the line has its own name.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › LAND

Land Subdivision CDIV Land subdivision

Divides a parcel (closed polyline or circle) into plots by area, ratio or equal parts, leaves out roads and services, draws the plots with their areas and side lengths, and gives a table and an A4 report.

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

✓ **Exercise 08:** divide 2 : 1 : 1 between partners on two parcels (one rectangular on a street, one irregular), with and without a road deduction, and prove every area by hand. The files are in `Training\08_CDIV\` . Open the exercise ›

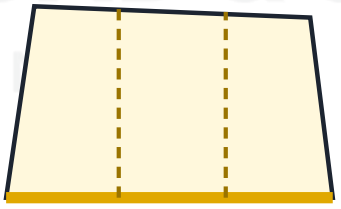
i **– / +** next to number boxes step the value (↑/↓ keys too).

1 Methods



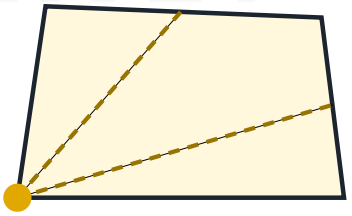
Parallel to a side

Cuts run parallel to the chosen side; the first plot starts at it. For long parcels and shares between partners.



Perpendicular to a side

Cuts are square to the side, so every plot gets a frontage on the same street.



Swing from a point

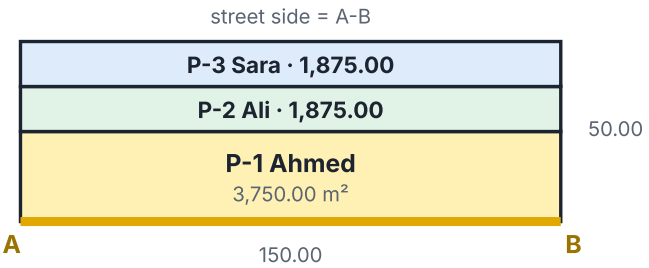
Cuts turn around a point on the boundary (a shared well or gate), so all plots meet there.

2 Example: three partners 2 : 1 : 1

A 150 × 50 m parcel (7,500 m² = 3 dunam). Three partners share by 2 : 1 : 1 (Ahmed paid half); cuts parallel to the street (side A-B).

Parcel	7,500.00 m²
Method	Parallel to a side · A-B
Shares	By ratio · `2 : 1 : 1`
Names	`Ahmed, Ali, Sara`

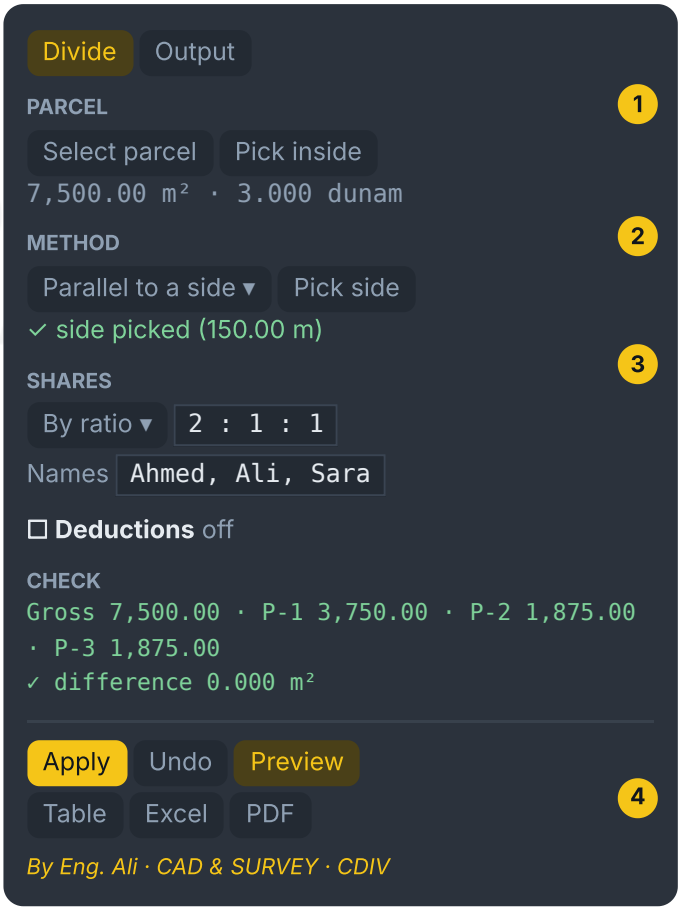
Plot	Name	m²	dunam	Size
P-1	Ahmed	3,750.00	1.500	150 × 25
P-2	Ali	1,875.00	0.750	150 × 12.5
P-3	Sara	1,875.00	0.750	150 × 12.5
TOTAL		**7,500.00**	**3.000**	



CHECK: difference = 0.000 m²

3 Steps

1. Type `CDIV` (or **Land Subdivision** on the CAD & SURVEY ribbon, **Land** panel): the CDIV palette opens.
2. Two pages at the top: **Divide** (the division) and **Output** (labels, report and KML). Apply · Undo · Preview and Table · Excel · PDF stay at the bottom on both pages.
3. Choose the parcel: `Select parcel` for a closed polyline, or `Pick inside` and click inside an area drawn with lines.
4. Choose the method, press `Pick side` and click near the side to start from (or `Pick point` for Swing).
5. Choose the shares, type the value and the names. CHECK calculates at once.
6. `Preview` draws the cuts temporarily and follows every change. Happy? `Apply` (the yellow button). Before Apply, CHECK shows the names that will be used; after Apply it shows the names really drawn (e.g. P-18 … P-22) marked `applied`.



7 At the bottom: `Table`, `Excel` or `PDF` (what goes into the drawing and the report is set on the Output page).

⚠ A **red** plot in the preview = it fell in two pieces (a strongly bent parcel). Change the method or the side.

CHECK message	Fix
`One plot (…) is bigger than the net area`	Make the plot area smaller, or remove deductions.
`The list needs … m², the net area is …`	The list is bigger than the net area: lower the values or end with `rest`.
`Type at least two ratios`	Type like `2 : 1 : 1`.
`More than 500 plots` · `(1 - 500)`	The limit is 500 plots per subdivision.
`Nothing is left to divide after the deductions`	Deductions take everything: make the road or fixed area smaller.
`P-x is in 2 separate pieces`	Change the method or the side.
`An area to leave out is fully inside the parcel`	Make it touch the boundary or the road, or draw a corridor to it.
`Pick the side to start from.` · `Select the parcel first.`	Do the missing step (Pick side / Select parcel).

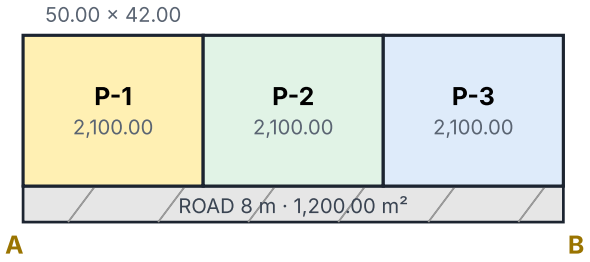
Default	
Numbering · height · Decimals	P-1 · 2.5 · 2
Layers	CDIV-PLOTS · CDIV-DEDUCT

4 Kinds of shares

Equal parts · 3	A number of equal plots.
By area · 600	Every plot has this area; what is left becomes a separate REMAINDER plot.
By ratio · 2 : 1 : 1	Ratios (like partners' shares). Fractions work too: `0.5 : 0.25 : 0.25`.
List of areas · 600, 800, rest	The area of each plot in order; `rest` = what is left.
Unit · m² / dunam / ha	Unit of the typed areas. 1 dunam = 2,500 m² = 25 olk (1 olk = 100 m²); 1 ha = 10,000 m². Dunam is a decimal: 0.75 dunam = 1,875 m² = 18 olk 75

	m².
Names	Names in order, separated by commas. Empty = numbers only (P-1, P-2 ...).

5 Example: road deduction



The same parcel (150 × 50). An 8 m road along A-B, the rest in 3 equal plots, each facing the road:

1. Turn on `Deductions` → `Road`, press `Side`, click A-B and type `8`.
2. Method `Perpendicular to a side` on the same side, shares `Equal parts · 3`.

	m²
Gross	7,500.00
Road 8 m	−1,200.00
Net	6,300.00
3 × 2,100.00	**6,300.00**

Road	A strip of the typed width along one side.
Drawn areas · Select	Closed polylines you draw (mosque, open space, station), chosen with `Select` and cut out before dividing. Their count and area show next to the button.
Fixed · 500 m² · at the end / at the start · Name	A fixed area at the start or the end, with its own name typed in `Name` (e.g. SERVICES).

⚠ A drawn area must touch the parcel boundary or the road. An island in the middle (a hole) is refused.

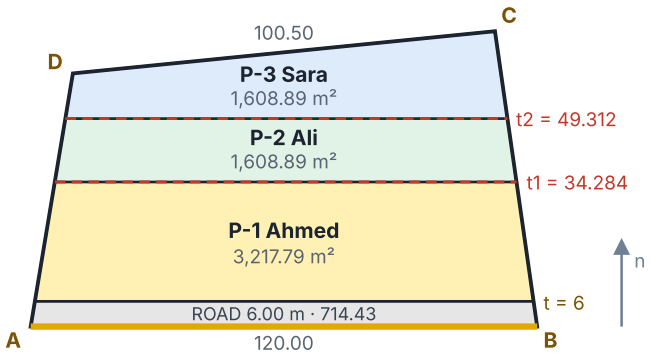
✓ Deductions are optional: keep them off when the whole parcel is divided.

6 Worked example: how the tool finds a cut

An irregular four-corner parcel (coordinates in the table). A 6 m road along side A-B, and the rest is shared `2 : 1 : 1` between Ahmed, Ali and Sara, with cuts parallel to A-B. Here is where every number comes from.

Corner	E	N
A	0.000	0.000
B	120.000	0.000
C	110.000	70.000
D	10.000	60.000

Method	Parallel to a side · A-B
Shares	By ratio · `2 : 1 : 1`
Deduction	Road · A-B · `6` m



t = distance from side A-B into the parcel (n)

A. Area, deduction and shares

1

$$A = \tfrac{1}{2}\,|\Sigma\,(E_i \cdot N_{i+1} - E_{i+1} \cdot N_i)|$$
$$= \tfrac{1}{2}\,|(0\cdot 0 - 120\cdot 0) + (120\cdot 70 - 110\cdot 0) + (110\cdot 60 - 10\cdot 70) + (10\cdot 0 - 0\cdot 60)|$$
$$= \tfrac{1}{2}\,|0 + 8\,400 + 5\,900 + 0| = \tfrac{1}{2} \times 14\,300$$

Gross = 7,150.00 m² = 7,150.00 ÷ 2,500 = 2.860 dunam

Whole parcel area with the shoelace (Gauss) formula. 1 dunam = 2,500 m².

2

road edge: $t = 6 \rightarrow$ width $= (120 - 6/7) - 6/6 = 118.14$

$$\text{Road} = (120.00 + 118.14) \div 2 \times 6$$

Road = 714.43 m²

The road is cut off parallel to A-B at 6 m; it is a trapezoid.

3

$$\text{Net} = 7{,}150.00 - 714.43$$

Net = 6,435.57 m² = 2.574 dunam

The net area that is shared.

4

$$2 + 1 + 1 = 4$$
$$\text{P-1} = 6{,}435.57 \times 2/4 \qquad \text{P-2} = \text{P-3} = 6{,}435.57 \times 1/4$$

P-1 = 3,217.79 m² P-2 = 1,608.89 m² P-3 = 1,608.89 m²

Each share = net × its ratio ÷ sum of the ratios.

B. Where does the cut line go?

5

side A-D: $E = t/6$ side B-C: $E = 120 - t/7$

$$\text{width } w(t) = (120 - t/7) - t/6 = 120 - 13\cdot t/42$$

area from A-B up to t: $A(t) = 120 \cdot t - 13 \cdot t^2/84$ $(t \le 60)$

A(6) = 714.43 (the road)

The cut = side A-B moved into the parcel by t. The bigger t, the bigger the area.

6 target: A(t) − A(6) = 3,217.79

t = 35.000 → 3,295.99 (too big, go down)

t = 17.500 → 1,338.18 (too small, go up)

t = 26.250 → 2,328.93 (go up)

t = 30.625 → 2,815.42 (go up) … ~36 halvings

t1 = 34.284 m

The tool halves the range each time (bisection) and measures the area, until the difference is below 0.0000001 m². It works for any shape, arcs too.

7 check by hand: A(t1) = 714.43 + 3,217.79 = 3,932.21

$t1 = (120 - \sqrt{(120^2 - 4 \cdot (13/84) \cdot 3{,}932.21)}) \div (2 \cdot 13/84)$

$= (120 - 109.388) \div 0.309524$

t1 = 34.284 m ✓ same

For this simple shape a quadratic gives the same answer.

8 left end: E = 34.284/6 = 5.714 right end: E = 120 − 34.284/7 = 115.102

cut length = 115.102 − 5.714

cut 1 = 109.39 m

The ends of the first cut and its length.

9 A(t2) = 3,932.21 + 1,608.89 = 5,541.11

t2 = (120 − 104.737) ÷ 0.309524

t2 = 49.312 m cut 2 = 104.74 m

The second cut starts from the first one and moves on until Ali's share is in.

10 P-3 = 6,435.57 − 3,217.79 − 1,608.89

P-3 = 1,608.89 m²

The last plot takes all that is left; no third cut is needed.

11 714.43 + 3,217.79 + 1,608.89 + 1,608.89 = 7,150.00

✓ difference 0.000 m²

The sum must equal the gross area; this is what CHECK shows.

Plot	Owner	Area m²	dunam	Perimeter
ROAD 6.00 m		714.43	0.286	250.29

Plot	Sides (m)
ROAD	120.00 · 6.06 · 118.14 · 6.08
P-1	118.14 · 28.57 · 109.39 · 28.67
P-2	109.39 · 15.18 · 104.74 · 15.23

P-1	Ahmed	3,217.79	1.287	284.78
P-2	Ali	1,608.89	0.644	244.54
P-3	Sara	1,608.89	0.644	236.97
TOTAL		**7,150.00**	**2.860**	

P-3	104.74 · 20.90 · 100.50 · 10.84

What the deduction does to the shares

	No road	With 6 m road	Change
Net	7,150.00	6,435.57	−714.43
P-1 Ahmed (2/4)	3,575.00	3,217.79	−357.21
P-2 Ali (1/4)	1,787.50	1,608.89	−178.61
P-3 Sara (1/4)	1,787.50	1,608.89	−178.61
t1 · t2 (m)	31.034 · 47.611	34.284 · 49.312	

i The road comes off the whole parcel before dividing, so each partner loses by his own ratio: Ahmed carries half of the road (357.21), Ali and Sara a quarter each (178.61). Total = 714.43.

7 Output

Name · Area · dunam
What is written in each plot. The label shrinks and turns to stay inside.

Side lengths
Every side length along it.

Corner numbers
A number at each corner, the same as in the coordinates table.

Hatch
A light colour per plot, deductions in grey.

Prefix · next · height
Numbering start (P- and 1) and the text height.

Decimals
Decimals of the written areas and lengths (0 – 4).

Layer · Deduct.

Table
AutoCAD table: plot, owner, area, dunam, perimeter (and corners when Coordinates is on).

PDF / Excel
A4 report with two logos, project info, a sketch, areas, sides and signatures.

Sketch · Project info…
Sketch = a small drawing of the plots in the report; `Drawing under the plan` (Off / Faint / Medium / Clear, default Off) shows the drawing around them. Project info... = see the note at the end of the page.

Lengths · Bearings · Coordinates
Side details in the report: lengths by default, bearings and coordinates optional.

PLOTS · Rename

The layer of the plots and the layer of the deductions; the ▾ button next to each box picks a layer of the drawing.

The plots of the last subdivision. A click on a plot zooms to it. After Apply: click a plot, type the new name in Name and press Rename; the label in the drawing changes too.

⚠ The PDF prints Latin letters only. For Arabic names use the Excel file.

8 Google Earth (KML)

On the **Output** page under PLOTS, section GOOGLE EARTH (KML): both buttons save the KML file at once (one click). It opens in Google Earth, each plot a coloured polygon with its name and area, and its details on a click.

`Plots of the last subdivision`
(the yellow button) Saves at once the plots drawn by the last Apply with their numbers, areas, owners and shares, and the parcel outline as a line with no fill.

`Select objects`
Select the objects in the drawing, then the file is saved: closed polylines and circles → polygons, open polylines, lines and arcs → paths, points and blocks → placemarks.

`UTM zone · North / South · Check`
The zone of the drawing (Basra / South Iraq = 38N). Check turns the centre of the plots into latitude / longitude, like `✓ 30.5214° N 47.7712° E`, so you see the place first. Red: the coordinates are not UTM in this zone. Zone and hemisphere are remembered.

`KML style`
Line colour and width, fill colour and strength (0 = no fill), what goes in the name (plot no., area, owner / share), and the folder name.

`Balloon`
A click on a plot: its number, area m² and dunam, owner and share, perimeter, zone, and the corner coordinates E / N.

`open in Google Earth`
After saving, the file opens in its program (Google Earth when installed). Arcs are divided into short pieces (every 2°).

⚠ The drawing must be in UTM (WGS 84) coordinates of the chosen zone. If it is in local coordinates, convert it with **CTRANS** first, or the plots land in the wrong place.

9 Questions

▼ The parcel has arcs - does it work?

Yes. Arcs stay arcs in the plots and the areas are exact.

▼ The parcel is drawn with lines, not a polyline?

Use `Pick inside` and click inside; the tool finds the boundary.

▼ I pressed Apply and want to go back?

`Undo` removes the last subdivision (plots and labels) and rolls the numbering back; press it again for the one before. The parcel itself never changes. After AutoCAD is closed, Undo no longer knows old subdivisions: erase their plots on the layers CDIV-PLOTS and CDIV-DEDUCT.

▼ Why is the total slightly different from the parcel?

CHECK adds the exact areas, so it is normally 0.000. The labels in the drawing are rounded to Decimals, so adding them by hand can be off by a few hundredths: raise Decimals. An orange line `P-x differs from its target by … m²` means the parcel is too bent: try another method or side.

▼ The drawing is in millimetres?

The tool works in metres (m^2). If the coordinates look like millimetres (very large) or the object is huge, it warns you in an orange line, without stopping you. INSUNITS alone does not give a warning.

i **Report options:** PDF or Excel opens a window to choose what goes in the report, with a preview of the pages and zoom: the sketch, the areas table, the signatures, the info lines, and the sides of each plot (lengths, bearings, coordinates). Lengths, bearings and coordinates are the same choices as in the CDIV palette. `Drawing under the plan` is **Off** by default. Presets: **Full** has everything; **Areas only** gives the areas without the sides. Right-click the button to open the window without saving a file.

i **Project info:** project, parcel no., location, owner, date (empty = today), three signatures (Surveyor, Checked by, Approved by) and the two logos. `Auto-fill` (next to Save) fills project, location, client, names and logos from the last Project info you saved in any tool; empty boxes come from My Profile. Parcel no. and date are not copied.

10 New in 2.4.1

1. **Apply twice on the same parcel:** it asks first: Replace, Draw again (a second copy) or Cancel.
2. **Fast naming:** Output tab, click a plot, type the owner and press Enter: the next plot is ready. Type the names one after another without clicking.
3. **Sub-division:** select a plot → `Divide this plot` : P-3-1, P-3-2 … (and deeper). The parent label hides; Undo brings it back at once.
4. A subdivision you erase yourself (ERASE) is dropped from the plots list.
5. **Undo** of a whole subdivision: a corner card with `Undo` for 8 s brings it back if it was a mistake.
6. PDF report: the plot labels stay inside even narrow plots; if a hatch could not be drawn, the reason shows.

★ New in 2.5

1. **A side of several parts:** after the first click on the side, click its other parts (they must touch it), they turn gold, then Enter. The division follows the line from the first end to the last.
2. **Grid method:** choose `Grid (rows × plots)` , type the plot area (e.g. 2500) and the row depth (e.g. 50 m), and pick the side. Rows and plots come in one step. A small rest at a row end joins the plot next to it, a thin last row joins the row before, and plots that are not the plot area get ≠ and a gold-orange colour.
3. **Streets:** in Deductions turn on `Streets` , click `Centre lines` , select the centre line of each street and type the width. The street is cut out and the land on each side becomes a block that is divided on its own. `Drawn areas` are deducted as before.
4. **Report:** plots erased from the drawing are not in the report; `U` brings them back.
5. **Print only what you want:** the **All** chip next to Table: click it and select plots (their polyline or label) in the drawing (click or Window). Table, Copy, Excel and PDF then take only those, and the total is theirs. Click it again to go back to All.
6. **Changing the unit** keeps the area: 4 dunam becomes 10000 m² (not 4 m²).

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › LAND

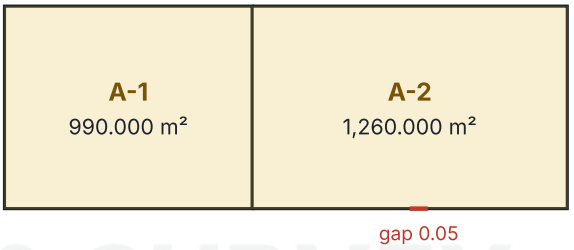
Area Calc CAREA Areas

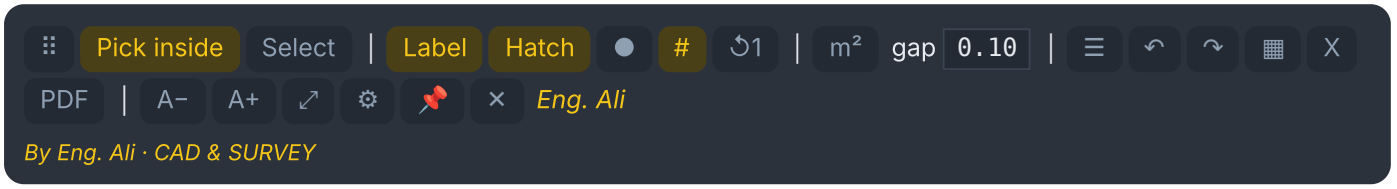
The area of any closed shape with one click inside, written in the drawing with a number and a hatch, with a list, a table, Excel and a PDF report.

i **Exercise 09:** get three areas the way they come on site (a plot with a building inside, a lot with a curved front, a yard drawn with a small gap) and prove each by hand. Files in `Training\09_CAREA\` . Open the exercise ›

1 How it works

1. Type `CAREA` (or **Area Calc** on the CAD & SURVEY ribbon, **Land** panel): a small bar appears.
2. Click inside any closed area (I), or select closed objects (S): polylines, circles, ellipses, splines, regions, hatches.
3. The area is written inside with a number and a transparent hatch, so you see what is counted.
4. ☰ list: copy, zoom, remove on each row, and under it `Table` , `Copy` , `Excel` , `PDF` and `Clear` (it asks whether to erase the labels and hatches too). ▦ table; X Excel.





i **Reset counter** (a round arrow with a 1, next to the number): a click starts the numbering again from 1. Right-click: **Start from...** another number, or **Undo reset** to get the old number back.

⠿ Grip: drag the bar anywhere with it. The tool name sits next to it (drag it too). **Right-click** it: **One row** or **Two rows** (the work on top, options and outputs under it); the tool remembers your choice.

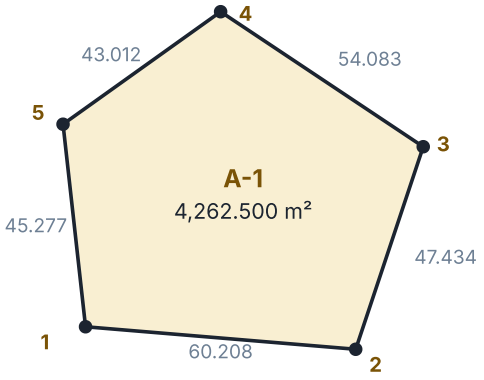
Pick inside · Select	Two ways: click inside a closed area (I on the command line), or select closed objects one by one or by window (S). Both are live: each click or window is counted and hatched at once, no Enter needed.
Label · Hatch · ●	Turn on/off the area label inside the shape and the transparent hatch that marks what is counted, and their colour (● opens the colour list).
# · ↺1	# numbering on/off (A-1, A-2 ...), and ↺ the counter reset (above).
☰ · ↶ · ↷	☰ the list. ↶ Undo removes the last area (with its label and hatch), ↷ Redo puts it back.
▦ · X · PDF	An AutoCAD table of the areas (click its top-left corner), an Excel file, and an A4 PDF report (see 4). The same buttons are in the ☰ list: Table · Copy · Excel · PDF · Clear.
A− · A+	Area labels in the drawing one step smaller / bigger (labels of the list change too).
⤢ · ⚙ · 📌 · ×	Bar size (3 sizes), settings (see 3), pin (the bar stays after Esc), and close. *Eng. Ali* opens the YouTube channel.

i **The list where you want it:** it opens under the bar and follows it. Drag it by its title somewhere else (the side of the screen, say) and it stays there, also next time; 📌 `Follow bar` in its title brings it back under the bar.

2 Worked example: how the area is calculated

AutoCAD gets the area of a closed shape with the shoelace (Gauss) formula, and adds or takes away a circle segment for every arc. Here we do it by hand on a five-sided shape.

Point	E (x)	N (y)
1	10.000	10.000
2	70.000	5.000
3	85.000	50.000
4	40.000	80.000
5	5.000	55.000



Numbers on the sides = lengths (m)

A. Area with the shoelace formula

1 $A = \frac{1}{2} \left| \Sigma \left(x_i \cdot y_{i+1} - x_{i+1} \cdot y_i \right) \right|$ (after the last point comes point 1 again)

5 terms

Each point is cross-multiplied with the next one.

2

```
1→2:  10·5   − 70·10 =   50 −  700 =  −650
2→3:  70·50  − 85·5  = 3500 −  425 =  3075
3→4:  85·80  − 40·50 = 6800 − 2000 =  4800
4→5:  40·55  − 5·80  = 2200 −  400 =  1800
5→1:  5·10   − 10·55 =   50 −  550 =  −500
```

Σ = −650 + 3075 + 4800 + 1800 − 500 = 8 525

Some terms are negative; that is normal. Only the sum matters.

3

$A = \frac{1}{2} \times |8\ 525|$

A = 4,262.500 m² = 1.705 dunam = 0.4263 ha

dunam = m² ÷ 2,500, hectare = m² ÷ 10,000. Drawn anticlockwise the sum is positive, clockwise it is negative; the tool takes the absolute value.

B. Perimeter

4

$L = \sqrt{(\Delta E^2 + \Delta N^2)}$

```
1→2: √(60² + 5²)  = 60.208     2→3: √(15² + 45²) = 47.434
3→4: √(45² + 30²) = 54.083     4→5: √(35² + 25²) = 43.012
5→1: √(5² + 45²)  = 45.277
```

Perimeter = 250.014 m

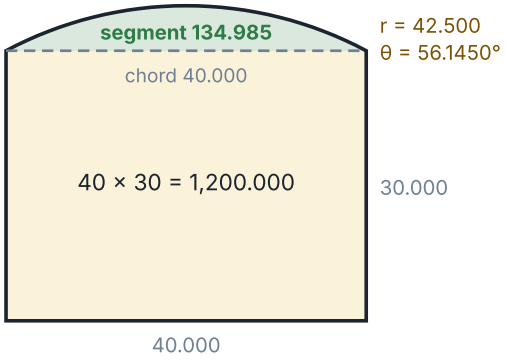
The sum of the side lengths.

The drawing shows `A-1` and `4,262.500 m²`. The ☰ list gives the perimeter with two decimals (250.01), the ▦ table and Excel with three (250.014):

No.	From	Area m²	dunam	Perim. m
A-1	Polyline	4,262.500	1.705	250.01

A curved side (bulge)

A 40 × 30 m lot; the top side is an arc bowing outward, bulge = 0.25 (from point 40,30 to point 0,30).



C. Area of the arc segment

1 `chords only: A = ½ |0 + 1200 + 1200 + 0|`

1,200.000 m²

First, the shoelace on the chords (as if the arc were straight).

2 `θ = 4 · atan(bulge) = 4 · atan(0.25)`

θ = 0.979915 rad = 56.1450°

The arc's central angle from the bulge.

3 `r = c ÷ (2 · sin(θ/2)) = 40 ÷ (2 × 0.470588)`
`sagitta = bulge × c/2 = 0.25 × 20`

r = 42.500 m sagitta = 5.000 m

Radius from the chord c = 40, and the rise of the arc above the chord.

4 `segment = r²/2 · (θ − sin θ) = 42.5²/2 × (0.979915 − 0.830450)`
`= 903.125 × 0.149465`

segment = 134.985 m²

The area between the chord and the arc.

5 `arc outward (bulge +):  1,200.000 + 134.985`
`arc inward  (bulge −):  1,200.000 − 134.985`

A = 1,334.985 m² (0.534 dunam) · inward: 1,065.015 m²

An arc bowing out adds the segment; an arc bowing in takes it away.

6 `arc length = r · θ = 42.5 × 0.979915 = 41.646`
`P = 40.000 + 30.000 + 41.646 + 30.000`

Perimeter = 141.646 m

The perimeter uses the arc length, not the chord.

i **Islands and gaps:** with Pick inside, an island inside the shape (e.g. a 10 × 10 building) is taken away: 4,262.500 − 100.000 = **4,162.500 m²**, and the list says `Click inside (1 island)` . The perimeter stays the outer boundary only (250.014). With Select, an open polyline whose gap is not bigger than the gap value (e.g. 0.05 ≤ 0.10) is closed with a straight line and shows `Polyline (gap closed)` .

i **Units:** the tool works in metres (m²). It warns you on the command line and in the list only when the coordinates look like millimetres (very large numbers) or the shape is huge (over 200 km), without stopping you. INSUNITS alone gives no warning.

i **Dunam is a decimal:** 1.705 dunam = 4,262.5 m², not "1 dunam 705 m²". In the Iraqi form (1 dunam = 25 olk, 1 olk = 100 m²): **1 dunam 17 olk 62.5 m²**. 1 hectare = 10,000 m².

i **What is kept:** labels and hatches stay in the DWG (layers CAREA-LABEL and CAREA-HATCH). The list belongs to each drawing and is emptied when the drawing closes, so make the Table, Excel or PDF first. Excel asks where to save the file (named CAREA - project - date) and then opens it.

3 Options

gap	Small openings up to this size are closed when you click inside.
m² / dunam / ha	Area unit; click to change. 1 dunam = 2,500 m².
Label ⚙	Number + area, area only, or number + area + dunam. Height (empty = TEXTSIZE).
A− · A+	Text one step smaller / bigger. The labels of the list change too.
Numbering ⚙	Prefix (A-) and the next number.
Decimals ⚙	Decimals of the area in the label (0 to 4).
Hatch ⚙	Hatch transparency.
Layers ⚙	Text layer CAREA-LABEL and hatch layer CAREA-HATCH.
Report ⚙	**Project info…**: project, location, owner, report no., date (empty = today), the names under the signatures, and the two logos (left and right) of the PDF report.
Help ⚙	The language of the tips (Arabic / English) and a link to this guide.

i Next to the number boxes (gap on the bar, next number, height) **− / +** change the value one step; ↑ / ↓ in the box do the same. An empty height starts from TEXTSIZE.

⚠ A big gap can join two areas into one. Keep it small (0.05 – 0.10).

✓ The perimeter comes with every area in the list and the table.

Default	
gap	0.10
Decimals	3
Label	Number + area

Numbering	A-1
Hatch	70 % transparent, yellow
Mode	Pick inside

Message	Fix
`No closed area found here.`	Close the boundary, or raise the gap a little.
`This area is already in the list.` · `Already counted - skipped.`	Normal: the same area is never counted twice.
`Open object skipped (gap … > tolerance …)`	The polyline is open by more than the gap: close it (PEDIT › Close) or raise the gap.

4 PDF report

The **PDF** button (on the bar or in the list) makes an A4 report of the areas of the list, in this order:

1. The title **AREA REPORT** between your two logos, then a line with the project, the date and the page number.
2. Project lines: Project, Location, Owner / client, Report no., the drawing name and Date (from ⚙ › Project info...).
3. Four summary tiles: number of areas, total m², dunam and the total perimeter.
4. The table **No · From · Area m² · Dunam · Perimeter m · Layer** with a **TOTAL** line. A long table goes on to the next page with its heads again.
5. **SKETCH**: a small drawing of the numbered areas (each with its area under the number), islands dashed, and a north arrow. It uses the outline kept when each area was counted, so it stays even if the hatch is erased.
6. Signatures: Surveyor and Checked by (names from Project info).

Before saving, the **Report options** window shows a preview of the pages: choose the parts (tiles, table, sketch, signatures), how clear the drawing around the areas is in the sketch (`Drawing under the plan`: Off / Faint / Medium / Clear, default **Off**), `Area under the number` (on), the project lines, the table columns and the **STYLE** (report style presets; default CAD & SURVEY Light). Presets: **Full** has everything; **Table only** leaves out the tiles and the sketch. Right-click the PDF button to open only this window.

i **Free version:** CAREA is a free tool, so every page of its report carries a small faint mark in the bottom-right margin: the CAD & SURVEY icon and *Free version*, never over the table or the sketch. It and the *Made with CAD & SURVEY Tools* line go away when Pro is activated. The same mark is on the reports of the other free tools (CGRID, CCOMP and the PTX list).

i **Auto-fill:** in Project info, `Auto-fill` (next to Save) fills project, location, client, names and logos from the last Project info you saved in any tool; still-empty boxes come from My Profile. Report no. and date are not copied. Check, then Save.
Report no.: an empty box shows the next number in grey (after SUR-AREA-007: SUR-AREA-008). **Double-click** = use it. The box keeps your last number, so empty it first to see the suggestion.

i **Note:** the PDF prints Latin letters only; write the project and people names in English.

5 New in 2.4.1

1. **Draw mode** (`Draw` on the bar, a Pro part): click the corners; from the third one the shape closes to the mouse with a gold fill, area, perimeter and side lengths live.
2. `Enter` with only two points: a warning "an area needs at least 3 corners", nothing is lost.
3. The same Insert / Cancel card, and 5 free saves after the trial.
4. **Clear** of the whole list: a corner card with `Undo` for 8 s brings the list, labels and hatches back.

★ New in 2.5

1. **Erased objects leave:** what you erase from the drawing leaves the list and every export by itself (the status says how many). `U` brings it back in its place.
2. **The total is always right:** an erased area leaves the total. A number is never used twice: when A-1 is in the list the counter jumps to the next one.
3. **Report sketch:** each label fits its area, and a label that would cover another moves out with a short leader. Areas far apart are drawn closer in groups (each to scale, a dashed line between). The drawing shows faintly behind, as in CBM.
4. **Layer column** is filled for Click inside (the layer of the line the boundary runs on). **✕ in the list** now has Undo on the corner card.
5. **Print only what you want:** the **All** chip next to Table in the list: click it and select areas in the drawing (click or Window). Table, Copy, Excel and PDF then take only those, and the total is

theirs. Click it again to go back to All.

6. **Edit the selected ones only:** select labels in the drawing (after the command, bar still open): `A– / A+` and the colour change only them; the size for the next labels stays. The selection wins over **All**.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

Guide › LAND

Length Calc CLEN PRO Lengths

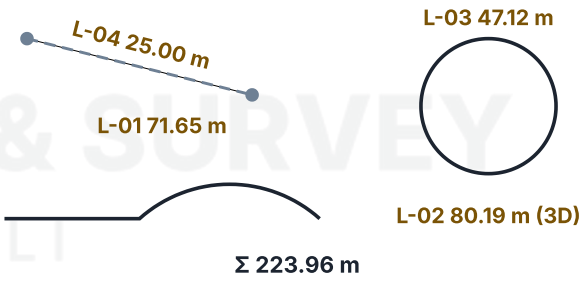
The length of any line, polyline, arc or circle, one by one, by window or between two points, with a summary by type and the total, an AutoCAD table, Excel and a PDF report. The sister of CAREA: the same bar and the same list.

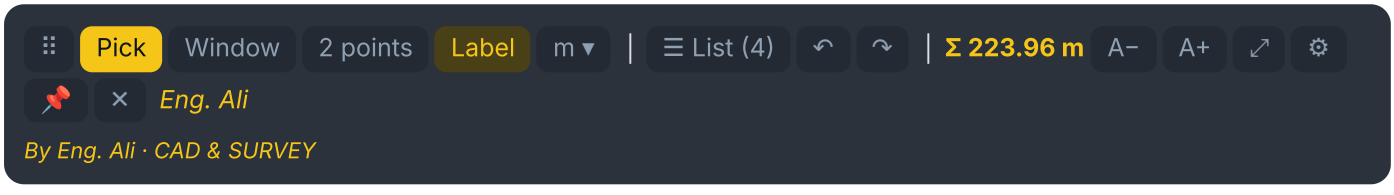
i **Exercise 18:** measure 9 objects of known length (arc, 3D, perimeter, circle) and match the total with the hand calculation. Files in `Training\18_CLEN\` . Open the exercise ›

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

1 How it works

1. Type `CLEN` (or **Length Calc** on the CAD & SURVEY ribbon, **Land** panel): a small bar appears over the drawing.
2. **Pick**: click objects one by one. **Window**: select many objects at once by window (W). **2 points**: click two points and the length between them is added (T).
3. Every object gets a number (L-01, L-02 ...) and the total Σ shows on the bar. **Label** (optional) writes the length on the object itself in the drawing.
4. **List**: on top the **BY TYPE** summary (type · count · length with TOTAL), below it the **ITEMS** of the type you click. Under them `Table` , `Copy` , `Excel` , `PDF` and `Clear` . `Clear` empties the list and numbering starts again from L-01 (you choose to erase the old labels or keep them).





⠿	Grip: drag the bar anywhere with it. The tool name sits next to it (drag it too). **Right-click** it: **One row** or **Two rows** (the work on top, options and outputs under it); the tool remembers your choice.
Pick · Window · 2 points	Three ways: object by object, window (W), or two points (T). The way in use is lit. When the command is not running, the button starts it that way.
Label	Turn on/off writing the length on the object (at its middle, above it, along it). The labels go on the layer CLEN-LABEL.
m ▾	Length unit: m, km or ft. The drawing must be in metres; the unit only changes what you see.
☰ List · ↶ · ↷	☰ the list (the count in brackets). ↶ Undo takes back the last pick as a whole (a window of 300 objects goes back together), ↷ Redo puts it back.
Σ	The total length. Click it to copy the number.
A− · A+	Text one step smaller / bigger. The labels of the list change too.
⤢ · ⚙ · 📌 · ×	⤢ bar size (3 sizes), settings (see 4), pin (the bar stays after Esc), and close. *Eng. Ali* opens the YouTube channel.

i **The list where you want it:** it opens under the bar and follows it. Drag it by its title somewhere else (the side of the screen, say) and it stays there, also next time; 📌 `Follow bar` in its title brings it back under the bar. **Gold marks:** every counted object shows in gold on the screen while the bar is open (nothing is added to the drawing); switch it off in ⚙ › Mark counted objects. The list and the PDF show a small icon for each type.

i **What is counted:** `Line` . `Polyline` open. `Closed polyline` the perimeter (with the closing side). `Polyline · arcs` has arcs: the arc length is counted, not the chord. `3D polyline` the true 3D length (with the level differences). `Arc` . `Circle` the circumference only (no radius). `Ellipse` and `Spline` their true length. `2 points` the distance between the points, like DIST (points at different levels include the height difference).

2 Worked example

Four lengths: a polyline with an arc, a 3D polyline, a circle and two points. We work them out by hand and compare with the list.

> **A. Polyline with an arc (L-01)**

1 straight side: (0,0) → (30,0) = 30.000

30.000 m

An ordinary straight side.

2 arc side: (30,0) → (70,0), chord c = 40, bulge = 0.25

θ = 4 · atan(0.25) = 0.979915 rad

r = c ÷ (2 · sin(θ/2)) = 40 ÷ (2 × 0.470588) = 42.500

arc = r · θ = 42.5 × 0.979915 = 41.646 m

The arc counts with its true length, not the chord (40).

3 30.000 + 41.646

L-01 = 71.646 m · Polyline · arcs

The list shows `Polyline · arcs`.

B. 3D polyline (L-02)

4 $L = \sqrt{(\Delta E^2 + \Delta N^2 + \Delta Z^2)}$

A (0,0,10) → B (30,40,12): $\sqrt{(30^2 + 40^2 + 2^2)} = \sqrt{2504} = 50.040$

B (30,40,12) → C (60,40,9): $\sqrt{(30^2 + 0^2 + 3^2)} = \sqrt{909} = 30.150$

L-02 = 80.190 m (2D only: 80.000)

The level differences add 0.19 m: this is the true length on the ground.

C. Circle and two points (L-03, L-04)

5 circle r = 7.5: $2 \cdot \pi \cdot 7.5$

L-03 = 47.124 m

The circumference only.

6 (10,5) → (34,12): $\sqrt{(24^2 + 7^2)} = \sqrt{625}$

L-04 = 25.000 m

Its type is `2 points`; it has no layer.

7 71.646 + 80.190 + 47.124 + 25.000

Σ = 223.960 m = 0.224 km = 734.78 ft

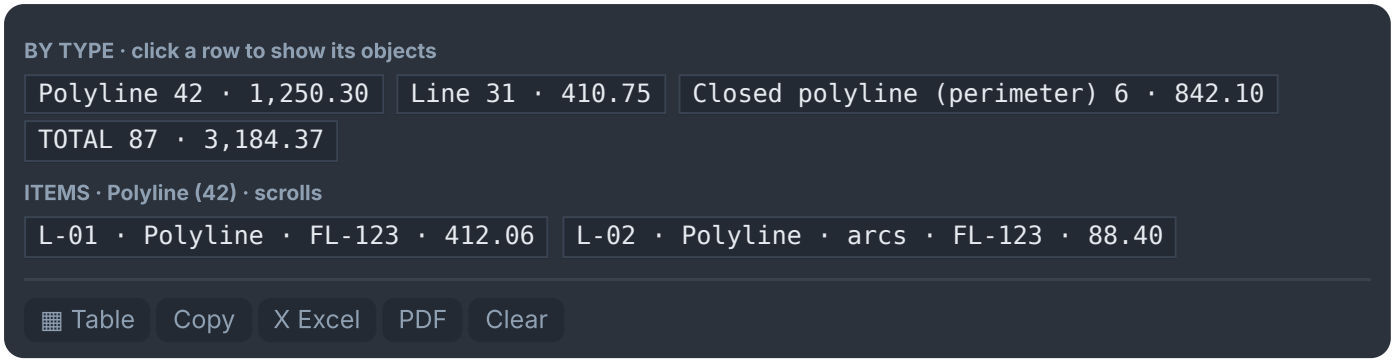
Share = type length ÷ total × 100. ft = m ÷ 0.3048.

The list (two decimals) and the report show:

Type	Count	Length m	Share
Polyline	1	71.65	32.0 %

3D polyline · true 3D length	1	80.19	35.8 %
Circle · circumference	1	47.12	21.0 %
2 points · picked	1	25.00	11.2 %
TOTAL	**4**	**223.96**	**100 %**

3 The list and the outputs



BY TYPE — One row per type: count and length, with TOTAL under them. Click a type: its objects show in ITEMS below, all of them are highlighted in yellow for 3 s and the view zooms to them. Click TOTAL: every object.

ITEMS — No · Type · Layer · Length; scroll with the wheel. Click an object: it is highlighted and zoomed to. Right-click: copy, or remove it from the list (with its label).

Table — An AutoCAD table: BY TYPE with the share, then every object and the total. Click its top-left corner.

Copy · Excel — The same columns with their heads; Copy to paste into Excel or a report, Excel opens a file.

PDF — A4 report: the two logos, project and date, summary tiles (objects · total · longest), the summary by type with share %, every object (continues on the next pages, the column heads repeat), the total and the signatures. The Report options window opens with a preview and presets (Full · Summary only) and follows the report style. Right-click PDF: the options only. Project, names and logos: ⚙ → Project info....

Clear — Empties the list and asks first. When there are labels in the drawing: Yes erases them too and the numbering starts again from 1; No keeps them.

✓ The same object is never added twice. Up to 2,000 objects per pick are added at once; above that it asks Yes/No.

ℹ **One list per drawing:** every open drawing has its own list; closing the drawing drops its list. An object erased in the drawing (ERASE or U) leaves the list by itself.

ℹ **Units:** the tool counts in metres. It warns you on the command line and in the list only when the coordinates look like millimetres or an object is huge (over 200 km), without stopping you.

⚠ **Not counted:** objects inside blocks or xrefs, MLINEs and texts. Explode a copy, or measure with `2 points`. The command line says `(n without a length skipped)`.

ℹ **Excel:** asks where to save the file (named CLEN - project - date) and then opens it.

4 Settings ⚙

Numbering	Prefix (L-) and the next number.
Label	Number + length, or length only, and the height (empty = TEXTSIZE).
Decimals	Decimals of the length (0 to 4; km shows at least 3).
Colour · Layer	The colour of the labels and the layer CLEN-LABEL.
Bar size	3 sizes of the bar (same as ⤢ on the bar).
Report	Project info...: project, location, client, the names of the surveyor and the checker, and the two logos. No report number; the date is today's.
Help	The language of the tips (Arabic / English) and a link to this guide.

ℹ Next to the number boxes (next number, height) **– / +** change the value one step; ↑ / ↓ in the box do the same. An empty height starts from TEXTSIZE.

⚠ The drawing must be in metres. km and ft change only what you see, not the drawing.

Default	
Label	off
Decimals	2
Numbering	L-01
Colour / layer	yellow · CLEN-LABEL
Mark counted objects	on

i **Auto-fill:** in Project info, `Auto-fill` (next to Save) fills project, location, client, names and logos from the last Project info you saved in any tool; still-empty boxes come from My Profile. Check, then Save.

5 New in 2.4.1

1. **Path mode** (`Path` on the bar): click point after point; the length of every segment is written in gold on the line as the mouse moves, the total in the tooltip.
2. Click near the first point and the shape closes: the area and perimeter appear inside it.
3. `Enter` = a card: text place (On line / Above / Below), `A−` `A+`, `+ dunam` for a closed shape, then `Insert` or `Cancel`. Every change shows at once on the gold preview.
4. `Esc` while drawing: a "Measurement not kept" card with Insert for 10 s. `L` (Last) brings back the last path.
5. After the trial: the preview stays free, Insert has 5 free saves (the button shows `N of 5 free`).
6. **Clear** of the whole list: a card in the bottom-right corner with `Undo` for 8 s brings the list and the labels back.

★ New in 2.5

1. **Removing one row** from the list now has Undo on the corner card (8 s).
2. **Print only what you want:** the **All** chip next to Table in the list: click it and select lengths in the drawing (click or Window). Table, Copy, Excel and PDF then take only those, and the total is theirs. Click it again to go back to All.
3. **Edit the selected ones only:** select labels in the drawing (after the command, bar still open): `A− / A+` change only them; the size for the next labels stays. The selection wins over **All**.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › LAND

Auto Number ANUM Automatic numbering

Numbers by clicking, along a line by distance, count or at each vertex, or renumbers texts already in the drawing, with frames, prefixes, end texts and kinds of numbers (1, A, a, I).

✓ **Exercise 10:** number the posts of a fence every 25 m, compare Count and Vertices, and put the plot numbers of block B in order. Files in `Training\10_ANUM\` . Open the exercise ›

i While clicking, type `N` : a small box opens next to the mouse - change the prefix, next number and end text, press Enter and carry on without going back to the palette. The box is on by default; its clear **Turn off ×** button switches it off (you then type in the command line), and the **Floating box** button in the palette (or `BOX` at that prompt) turns it back on. In the palette a gold line with a bulb 💡 reminds you of the key: a click opens this page, × hides it and leaves a small bulb (a click brings it back). When the box is off the line turns grey with a **Turn it on** button.

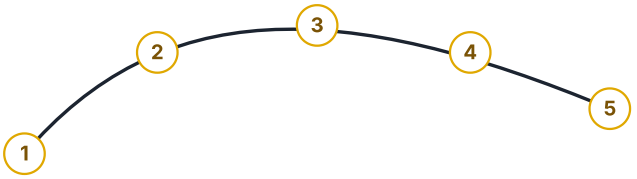
i **– / +** next to number boxes step the value (↑/↓ keys too).

1 Three ways

`Click`
Each click writes the next number.

`Divide`
Numbers along a line, polyline, arc or circle: by count, every distance, or at each vertex.

`Renumber`
Click existing texts in the new order and their numbers change (B-12 → B-3).



Divide · by distance 20 m · circle frame · ends numbered

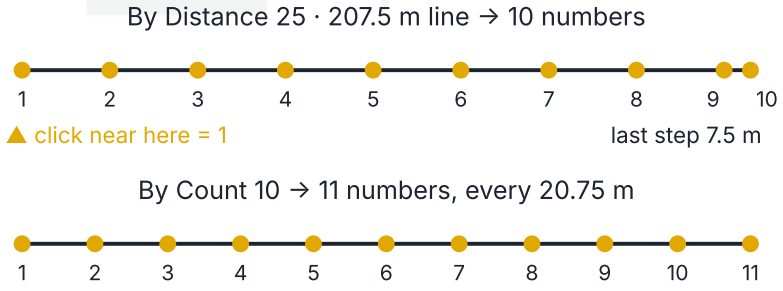
i **Reset counter** (a round arrow with a 1, next to the number): a click starts the numbering again from 1. Right-click: **Start from...** another number, or **Undo reset** to get the old number back.

✓ A click on Click, Divide or Renumber starts the command in that mode, even after Esc with the palette still open (no need to start it again from the ribbon).

Divide and Renumber options

By	`Count` = how many equal parts (an open line gets Count + 1 numbers, a closed shape Count numbers), `Distance` = a number every distance (typed in the box next to it), `Vertices` = a number at each polyline vertex (nothing on a circle or ellipse).
Text	Where the number sits: `Left side`, `Right side` or `On the line`. The distance from the line is the `offset` in the Text part. On closed shapes the numbers are always outside.
Circle	Closed shapes only (circle, closed polyline): numbering starts at the point you click and goes `Clockwise` or `Counter-clockwise`.
Number start and end	Also numbers the first and the last point of the line. When the last step is short (e.g. 7.5 m of 25) the end point is still numbered.
Keep the words, change only the number	In Renumber: only the number part changes and the words around it stay (B-12 → B-3). When off, the whole text becomes the new number with its prefix and end text. It starts from NEXT, and the **last** number in the text changes. Click the texts one by one, **Enter** to finish.

⚠ **Divide: where does it start?** Click the line **near the end where number 1 should be**. To number between two points with no line, type `P` (Points) and click the two points.



A 207.5 m line: every 25 m = 10 numbers · Count 10 = 11 numbers

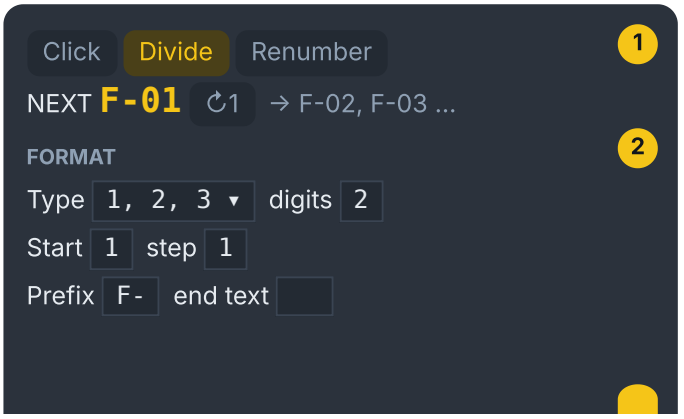
2 Number format

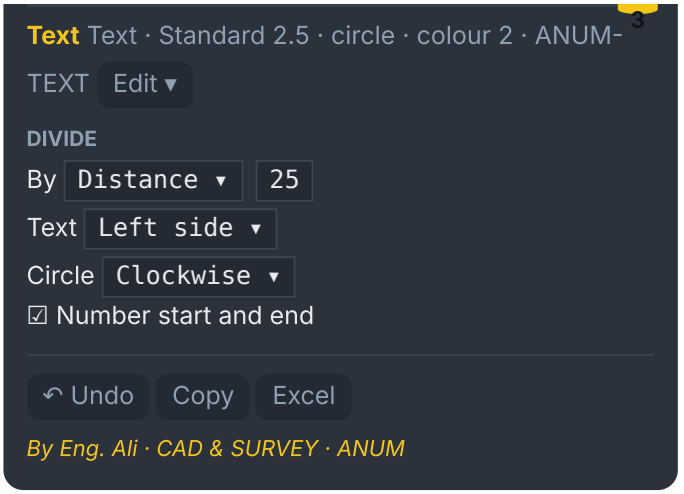
NEXT

At the top: the next number in large type, followed by the ones after it (→ F-02, F-03 ...) so you can check the format before clicking.

Type

`1 2 3`, `A B C`, `a b c` or `I II III`.





digits

Leading zeros: 3 = 001, 002 ...; 1 = no zeros.

Start · step

The first number, and the step (2 = 1, 3, 5 ...).

Prefix · end text

Text before and after the number (e.g. `F-` or `/A`).

Kind · Style · height

Text or MText, the text style and height.

Frame · gap

`No frame`, a `Circle` or a `Box` around the number; `gap` is the space between the number and the frame.

Rotation

`Angle` a fixed angle you type, `Pick` it in the drawing, or `Along path`. The small grid next to it sets the text justification (middle, left, top ...).

Color · layer

Colour of the numbers and their frames, and their layer.

Point at the exact place

In Click (the PLACE part): also draws a POINT exactly where you click.

i The **Text** settings (kind, style, height, frame, colour, layer) fold under a bar: **Edit ▾** opens them, **Hide ▴** closes them, and the bar shows the current settings.

✓ The palette stays open while you work; any change applies to the next number. `Undo` removes the whole last batch (all numbers of the last line, or the last renumber) and steps NEXT back. `Copy` copies the list (Number, X / E, Y / N, Z) to paste into Excel; `Excel` asks where to save the file, then opens it (the list is lost when AutoCAD closes). The palette stays open after Enter and Esc and closes only with ✕.

Defaults	
Prefix · digits	`P-` · 1

Layer · Colour	`ANUM-TEXT` · 2 (yellow)
Frame · height	No frame · `TEXTSIZE`
Count · Distance	10 · 20
Number start and end	✓
Limit	20 000 numbers per line

⚠ Renumber changes the existing texts in the drawing.

3 New in 2.4.1

1. The palette stays open while you number; no need to open it again.
2. **Live:** any change in the palette (size with + / −, offset, angle, frame, style, layer, prefix, digits...) redraws at once the numbers placed in this run; their numbers stay. The `Live` tick in the Text section turns it off.

★ New in 2.5

1. **Erased objects leave:** what you erase from the drawing leaves the list and every export by itself (the status says how many). `U` brings it back in its place.
2. **After Renumber** a number comes out once, with its new text read from the drawing.
3. **All / Selected:** click the chip beside Copy and select in the drawing (click or Window, Enter = done): Copy, Excel and PDF take only those. Click it again for All.
4. **Renumber takes the new prefix:** with Keep text, the prefix glued to the number becomes the palette prefix (P-12 → BH-1); the other words stay (12.5 and Point 5 are not touched).

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › DESIGN & EARTHWORK

Volume Calc CVOL PRO Volume calculation

The volume of sand, gravel and soil stockpiles from survey points: select the points, check the bad ones, get volume, area, weight and truck count, and a one-page PDF report per pile on the same day as the survey. And the quantities of fill layers (Layers): each new survey against the one before, the thickness at every point, and how much is left to the design. And a grading area design before the work (Grading): cut and fill with the side slopes, the daylight line and the balance level.

PRO A PRO tool: fully working for 30 days from the first use of any PRO tool (one trial for all PRO tools), then it needs an activation code. How to activate ›

i All three pages work fully: **Stockpile** (piles), **Layers** (fill layers) and **Grading** (a grading area design: cut and fill before the work, section 11).

You want...	Tab
The volume of a pile that is there now	Stockpile
The quantity of each fill layer (survey before and after)	Layers
Cut and fill of a grading area before the work starts	Grading

✓ **Exercise 11:** prove CVOL on a pile whose volume is known by formula (2,133.33 m³), get its weight and trucks, then design a grading area on flat ground and check its fill by hand. Files in `Training\11_CVOL\` . Open the exercise ›

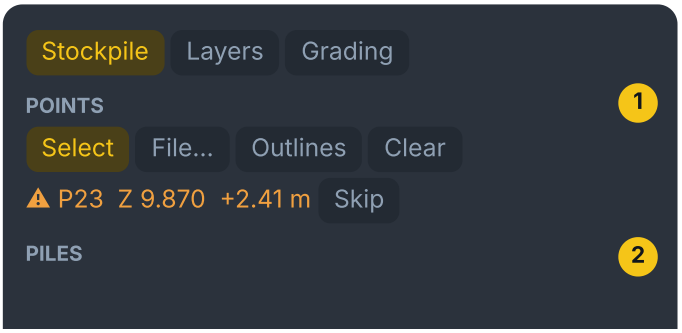
i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The palette: four parts

The palette has three tabs at the top: **Stockpile** (piles, sections 1 to 8), **Layers** (fill layers, section 9) and **Grading** (grading area design, section 11).

1 · POINTS

Select the pile points in the drawing (or several piles at once) or read them from a file (`File…`), outlines if you want, and the list of doubtful points.



2 · PILES

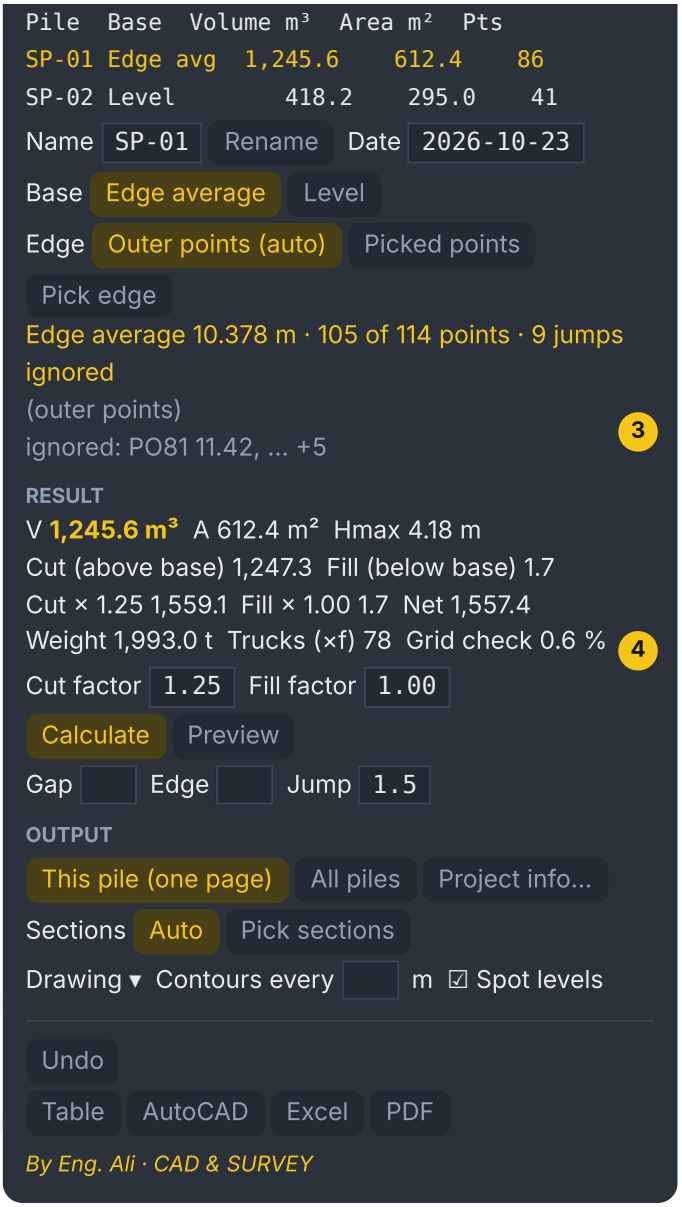
The list of piles: name, base, volume, area, number of points and survey date. And the base (`Edge average` or `Level`) and the edge (`Outer points` or `Picked points`) with the result line.

3 · RESULT

Volume (with **Cut (above base)** and **Fill (below base)** as in Civil 3D), area, max height, weight and trucks, and the grid check. `Cut factor` and `Fill factor` , `Calculate` , `Preview` and the settings.

4 · OUTPUT

Report kind, project info and the AutoCAD output (outline, triangles, contours, spot levels). Buttons at the bottom: a row with `Undo` , then `Table` · `AutoCAD` · `Excel` · `PDF` . The drawing options (the **Drawing** fold: label, triangles, contours, spot levels, layer and height) and Gap / Edge / Jump (Limits) are set once, so they fold under a bar with `Edit ▾` / `Hide ▴` ; the bar shows the current settings (e.g. `Label · contours 0.5 m · CVOL-PILE · 1.0`).



2 Steps

1. Type `CVOL` or click **Volume Calc** on the ribbon (CAD & SURVEY tab, Design & Earthwork panel).
2. `Select` : pick the pile points with a window. When the window holds several piles, the tool splits them by itself. Or `File…` : read the points from the instrument file (CSV / TXT / Excel) and press `Add N points` .
3. Check the doubtful points in orange: click the row to see it in the drawing; if it is wrong, press `Skip` .
4. Choose the base: `Edge average` (default) or `Level` (a datum, typed or picked). And the edge: `Outer points (auto)` (the most used) or `Picked points` with the `Pick edge` button.
5. `Calculate` works it out; `Preview` draws the triangles and outlines so you can check by eye.

6. Fill `Project info…` once: project, contractor, instrument, material, logos (or **Auto-fill**, see section 8).
7. `PDF` : the pile page, ready to sign.

✓ The piles are kept inside the DWG: close the drawing and carry on another day from the same place.

3 Points

`Select`	Takes AutoCAD points, Civil 3D COGO points, survey blocks (Z from the insertion or from an ELEV, LEVEL, Z or RL attribute) and TEXT / MTEXT with the level written in it: the place of the text = the position, the number in it = the level.
`Level texts`	`EL +3.250` , `3,25` and `P12 3.25` all read 3.25. When a text holds several numbers, the one with decimals wins (not the point number 12).
`Zero points`	When level texts are selected together with points at exactly 0.000, those zero points are left out: they are only marks.
`Gap`	Several piles in one window are split by the gaps between the points. Empty = automatic = 4 × the usual point spacing (at least 1 m). If two close piles come out as one, make Gap smaller or use Outlines. **Note:** a pile needs at least 6 points; a smaller group (e.g. a stray shot) is left out without a message.
`File…`	Opens the **Points from a file** window: reads a points file from the total station or GPS instead of selecting in the drawing. Details below.
`Select again`	Selecting again adds points: another window of the same pile joins it.
`Outlines`	Optional: closed polylines or circles around the piles. Each outline = one pile with the points inside, and the volume stops at the outline.
`Clear`	Removes the piles from the tool only (it asks first). Nothing is erased in the drawing. The delete button (bin) next to the name removes only the highlighted pile, and it asks first too.

Doubtful points

A point whose level is far from the points around it: more than `Jump` (default 1.5 m) and more than 6 × the usual difference between neighbours. For example a shot on top of a truck, or with the wrong prism height.

- They are listed in orange. Click a row: the drawing zooms to it and marks it.

- Its button skips it or uses it again. The tool never decides for you.
- Skipped points are listed in the report, so everyone sees what was left out.

4 Points from a file (File...)

The `File…` button in section 1 · POINTS opens the **Points from a file** window. It takes CSV or TXT (comma, tab, semicolon or spaces) or Excel .xlsx, as exported by total stations and GPS: PENZ, PENZD, PNEZ, ENZ ... The `Clear` button next to the file name empties the window.

The columns are found by themselves

The first data row and the header row (if any) are found by themselves, and the window says e.g. `Looks like PENZD`. A column is never given to two fields. Each field has its own colour in the lists and the preview headers.

Field	From the header name	No header: from the values
Point	Point · PT · No · Name · ID	A text or whole-number column before E and N. Without it the rows are numbered.
E	E · East · Easting · X	The two big-number columns. In UTM E has 6 digits and N 7.
N	N · North · Northing · Y	
Z	Z · Elev · Level · RL · H	A decimal column after E and N.
Code	Code · Desc · Description · Remark	A text column.

If the guess is wrong:

In the window	What it does
Sheet	The Excel sheet that holds the points.
First row	The number of the first data row (when titles or notes sit above it).
Row above is header	Tick it when the row above the first data row holds the headers.
2. COLUMNS	Five lists (Point, E, N, Z, Code): choose the right column for each field. E and N swapped? Fix it here.

i Old Excel `.xls` is not read: Save As `.xlsx` or `.csv`.

The point name can be any text: P1, point 3, BM-2, 101A, PO1.

Preview

Every row. Rejected rows in red with the reason (E is not a number, Z is empty, same E, N as an earlier row ...), doubtful levels in orange (far from their neighbours), codes switched off in grey.

Codes

One toggle per code with its count (EG, TS, NGL, FGL, TOP, TOE ...). Off = those points are left out.

Outline from code

The points of one code, in the order of the file, make the outline of the pile (like a Civil 3D boundary). It is chosen by itself when the points of a code go round the other points (most of them inside) without crossing.

Plan

A small plan of the points: blue = outline, sand → brown = low → high, orange ring = doubtful. Click a row = the point is marked on the plan and in the drawing (yellow circle and cross, zoom). Click a point on the plan = its row is chosen.

Result

Points to add, rejected rows (the first one with its reason), duplicates, doubtful levels, codes left out, outline area.

Options

Draw the points in the drawing (layer `CVOL-POINTS`), names as labels.

`Add N points` · `×`

`Add N points` adds the points to the piles. `Clear` next to the file name empties the window. The file is not kept by the tool: the points are kept in the DWG with the piles.

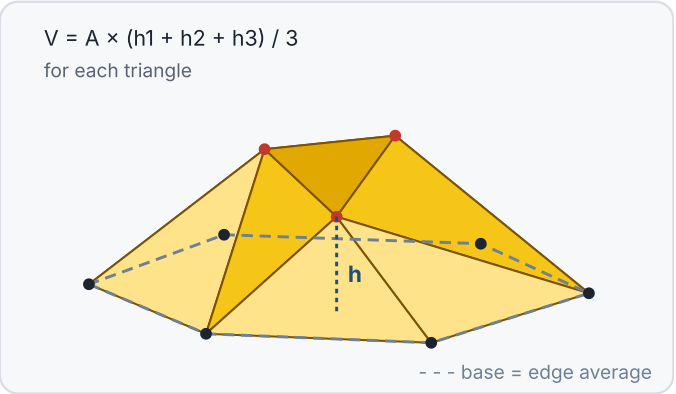
Example file (PENZD)

```
PO1,731464.945,3382220.558,10.291,EG
PO2,731471.302,3382236.114,10.274,EG
PO3,731462.880,3382251.730,10.305,EG
...
PO115,731393.356,3382263.412,10.120,TS
PO116,731420.118,3382240.906,13.862,TS
...
```

EG = the edge points in order: they become the outline by themselves. TS = the points on top. The window says `Looks like PENZD`.

✔ Rejected rows are not added but are shown in the preview with the reason: fix them in the file and open it again if you need them.

5 Piles and the base



Black = edge points (the outline of the pile). Red = points on top. h = the height above the base. Every triangle = a prism with a sloped top.

Piles list

Pile, Base, Volume m³, Area m², Pts. Click a row = zo and choose it.

Name · Rename

Name the pile (e.g. SP-01). A pile can be removed fro

Date

The survey date of that pile, printed on its page.

Edge average

Default: one level = the average level of the edge points of the pile. Each edge point weighs half of the two sides next to it (so a side surveyed with many points does not pull the result). Points far from the other edge points are "jumps" and are ignored by themselves, with no setting (how). The result is one line: `Edge average 10.378 m · 105 of 114 points · 9 jumps ignored`, then `(outer points)` and the jumps ignored with their names and levels: `ignored: P081 11.42, ... +5` .

Level (datum)

A level you type or pick (a datum), e.g. 10.22: type it, or `Pick` a point or a level text.

Edge: Outer points (auto)

The most used: the edge points are found by themselves, the points on the outside of the surface.

Edge: Picked points · Pick edge

Press `Pick edge` and select: points, COGO points, level texts or a 3D polyline (its corners with their levels). A 2D polyline at 0.000 has no levels and is refused. The picked points are added to the surface and become the outline of the pile: the volume is cut on them. Choosing `Outer points` again removes that outline. A boundary survey done separately (points around the pile) is picked this way.

Same base for all piles

One base for all piles at once.

i Comparing a survey before with a survey after (e.g. the ground before the pile with the pile) belongs to the Layers page.

6 Result and settings

Volume	Volume in m³. When part of the surface is below the base, two lines show it in Civil 3D words: `Cut (above base)` = the material above the base, `Fill (below base)` = the empty part below it. **Why Cut?** The pile is what is taken away down to the base, so the material above it = cut. Civil 3D uses the same word when the pile is the Base surface; if you set the datum as the Base, it calls the same quantity Fill.
Cut factor · Fill factor	As the Cut Factor and Fill Factor of Civil 3D (default 1.00): cut × its factor, fill × its factor. When one of them is not 1.00 an extra line `Cut × f / Fill × f / Net` shows the factored numbers. This replaces the old Swell: the old value became the Cut factor.
Area	Plan (horizontal) area in m².
Max height	The highest point above the base.
Weight	In tonnes, when the density (t/m³) is filled.
Trucks	Truck m³ (default 20; empty = no trucks). Worked out from the factored volume: cut × Cut factor − fill × Fill factor; with a factor other than 1.00 it says `Trucks (×f)`.
Grid check	A second calculation by a grid of squares (cell size automatic) and the difference in %. Orange when above 2 %.
Calculate · Preview	`Preview` is a temporary display (not saved): triangles, outlines, names, and doubtful points in red.
Gap	The gap that splits piles. Empty = 4 × the usual spacing.
Edge	The longest triangle side kept on the outside. Empty = 3.5 × the usual side. Longer outside triangles are cut so the surface follows the points and does not bridge gaps (e.g. an L-shaped pile).
Jump	The limit for doubtful points, default 1.5 m.

7 Worked calculation

The points are joined into triangles (a TIN, Delaunay). For each triangle: its plan area A and the heights h1, h2, h3 of its corners above the base. The base is one level (`Edge average` or `Level`), so a height = the level of the point − the base.

Example 1: a small pile (a pyramid)

1 Edge: 4 points at 2.00, a square 10 m × 10 m
Top: 1 point in the middle at 4.40 → h = 4.40 − 2.00 = 2.40

4 triangles, each A = 100 / 4 = 25 m²

Each triangle: one side of the square and the top point.

2 V = A × (h1 + h2 + h3) / 3 = 25 × (0 + 0 + 2.40) / 3

V = 20 m³ per triangle

Two corners on the edge (0), one on the top.

3 Total = 4 × 20
Check: pyramid = base area × height / 3 = 100 × 2.40 / 3 = 80

Volume = 80.0 m³ ✓

Exactly the pyramid rule.

Example 2: a triangle partly below the base

1 A = 12 m² ha = +0.60 hb = −0.30 hc = −0.30

corners on both sides → cut on the zero line

The triangle is cut on the zero line: tip a above, the rest below.

2 t1 = ha / (ha − hb) = 0.60 / 0.90 = 0.6667
t2 = ha / (ha − hc) = 0.60 / 0.90 = 0.6667

t1 = t2 = 0.6667

Where the zero line crosses the two sides (part of the side length).

3 Tip = A × t1 × t2 × ha / 3 = 12 × 0.6667 × 0.6667 × 0.60 / 3

Above = 1.067 m³

The tip is a small pyramid with area A × t1 × t2.

4 Signed total = 12 × (0.60 − 0.30 − 0.30) / 3 = 0
Below = Above − Signed total = 1.067 − 0

Below = 1.067 m³

The rest comes from the difference.

Grid check: V ≈ Σ h × cell²

1 Example 1, cell 0.5 m: 400 cells, h read at the centre of each cell

$V \approx \Sigma\ h \times 0.5^2 = 80.4$

(80.4 − 80.0) / 80.0 × 100 = 0.5 % ≤ 2 % ✓

The grid is approximate; the triangles are the real calculation. Over 2 % = check the points and Edge.

How Edge average is found

The edge average step by step

1 w(i) = (side before + side after) / 2

weight of each edge point

Each edge point weighs half of the two sides next to it: a side surveyed with many close points does not pull the result.

2 d(i) = how far point i is from the other edge points

the usual spread s

The ground may slope a little; that is taken into account when looking for jumps.

3 limit = max(3 × s, 0.10 m)

|d| > limit → jump, ignored

A point further from the others than 3 × the usual spread (at least 10 cm) is left out.

4 repeat 2–3 with the points kept until nothing changes

left out ≤ 30 % of the points

more than 30 % → warning

Never more than 30 % is left out: if more would be, a warning (the edge is not one ground).

5 Edge average = Σ w × Z / Σ w (points kept)

one base level

The average of the points kept, each with its weight.

Example 3: a large area from a field file (114 EG edge points, area 28,873 m²)

1 Plain average of all 114 edge points = 10.53 m

Net = 6,425 m³

The plain average is pulled up by the high points on the edge.

2 Median of the edge points = 10.38 m

Net = 10,900 m³

The median ignores the jumps but not the lengths.

3 Edge average: usual spread ± 0.23 m, 9 jumps 11.4 – 12.9 m ignored

105 of 114 kept → Edge average = 10.378 m

Net ≈ 10,930 m³

The jumps (e.g. PO90 12.92, +2.24 above the other edge points) are ignored and listed by name.

4 `Level = 10.22 (the agreed datum)`

Net = 15,491 m³

As Civil 3D with the same boundary.

5 `28,873 m² × 0.10 m = 2,887 m³`

every 10 cm of base ≈ 2,900 m³

On a big flat area, the base decides the quantity.

Base	Base level	Net m³
Plain average of all edge points	10.53	6,425
Median	10.38	10,900
Edge average (105 kept, 9 jumps ignored)	10.378	≈ 10,930
Level (agreed datum)	10.22	15,491

⚠ Lesson: on a big flat area every 10 cm of base is about 2,900 m³, so the base must be agreed before the calculation. `Edge average` is the fair choice when there is no datum; `Level` when a datum is agreed.

Weight and trucks

1
```
Weight = V × density = 1,245.6 × 1.6
```
Weight = 1,993.0 t

Density from the lab or the specification. The weight uses the volume without factors.

2
```
Factored = Cut × Cut factor − Fill × Fill factor
         = 1,247.3 × 1.25 − 1.7 × 1.00 = 1,557.4 m³
Trucks = 1,557.4 / 20 = 77.9
```
Trucks = 78

Rounded up: the last truck is not full but still counts.

8 Report and AutoCAD output

This pile (one page)
Default and the usual case: the pile report is ready the day the pile is surveyed.

All piles in one report
A summary page with all piles, the total and a site plan, then a page per pile.

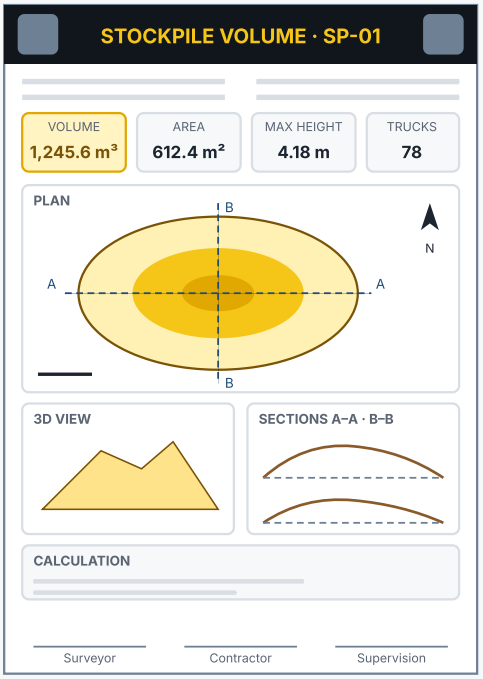
Project info…
Project, location, contractor, report no., survey date, instrument, material, surveyor, contractor rep., supervision, two logos.

Auto-fill
In the Project info window: copies project, location, contractor, surveyor, instrument and the two logos from the last Project info saved in any tool; empty boxes come from **My Profile**. Report no., date and material are never copied, nor contractor rep. and supervision (other people). Nothing is saved until you press Save.

Report no.
An empty box shows the next number in grey (e.g. `SUR-VOL-008`); double-click to use it.

Sections: Auto · Pick · Pick sections
`Auto` (default): A–A along the pile and B–B across it, through its middle. `Pick` or the `Pick sections` button: click the start and end of A–A (a rubber-band line follows the cursor), then B–B (Enter = no B–B). The points can be outside the pile: in the report the line is cut to where it crosses the pile plus a margin (5 % of the crossed length, at least 2 m), and the chainage starts at 0 at the cut start. Outside the pile only the base shows; a gap inside (an L-shaped pile) shows the base. Saved with the pile; back to `Auto` removes them.

Drawing (fold)
In the **Drawing** fold of 4 · OUTPUT: what is drawn in AutoCAD (label, triangles, contours, spot



The PDF page of a pile (A4).

levels, layer and height).

AutoCAD

Outline and label (name, V, A) on layer `CVOL-PILE`; optional triangles as 3D faces coloured by height on `CVOL-TIN`; text height.

Contours every [ ] m

AutoCAD contours: polylines at their level on layer `CVOL-CONTOUR`, every 5th in another colour. Empty interval = automatic (about 10 lines over the height).

Spot levels

The level of every point written next to it on layer `CVOL-LEVELS`.

Table

An AutoCAD table of all piles with the total.

Right-click PDF / Excel

Report options only: pictures (coloured plan, *Contours and spot levels on the plan*, 3D view, two sections), numbers (max height, weight, trucks), parts (calculation and check, *Cut / fill summary (as Civil 3D)*, signatures, list of the points, and *Extra info (surface area, perimeter, heights)*), info lines, and presets Full / Short.

Undo

Takes away what CVOL drew last in the drawing. Press again for the one before.

What is on the pile page

Part	Shows
Header	The two logos and the info lines.
Four big numbers	VOLUME in gold, AREA, MAX HEIGHT, and TRUCKS or WEIGHT.
PLAN	Colour = height above the base, points (small light dots), outline, contours and spot levels (with many points fewer levels are written, spaced so they can be read), section lines A–A along the pile and B–B across (or the ones picked with Pick

	sections, the letters at the cut ends), north arrow, scale bar, coordinates. With a level base: `DATUM ELEVATION = 10.00 m`.
3D VIEW	Height exaggerated, the factor printed.
SECTIONS	A–A and B–B: top line brown, base dashed. The height is made bigger by itself by a round number, printed on the section, e.g. `V ×5`.
Picture size	The plan and the sections take the free space before the signatures, and the plan height follows the shape of the pile.
EXTRA INFO	Optional (off by default, in the report options): surface area 3D from the triangles, perimeter 2D, average height (volume ÷ area), top and lowest levels, and the point count and density.
CALCULATION	The base explained, the calculation lines, the grid check, the skipped points, and the CUT / FILL / NET table. For example: `Base = edge average 10.378 m: the average level along the edge (each point weighs half of its two sides) of 105 of 114 edge points (outer points). Ignored as jumps (far from the other edge points; the usual spread is ± 23 cm): PO90 12.92 (+2.24), ...`
Signatures	Surveyor · Contractor · Supervision

Cut/Fill Summary (as Civil 3D)

In the CALCULATION part: **Cut** = the material above the base × Cut factor, **Fill** = below it × Fill factor, and **Net** = the difference with `<Cut>` or `<Fill>`, whichever is bigger. With a level base the datum elevation is written in the title. The summary page (All piles) has the same table for all the piles with Totals. Option: *Cut / fill summary (as Civil 3D)*.

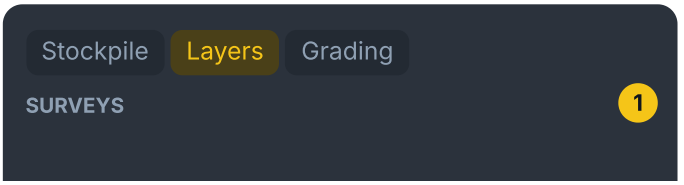
Name	Cut Factor	Fill Factor	2d Area (sq.m)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
SP-01	1.000	1.000	612.40	1,247.30	1.70	1,245.60<Cut>

⚠ The PDF prints Latin letters only: write pile names and project info in English.

9 Fill layers (Layers)

The **Layers** tab: the quantity of every fill layer (sand, gravel, soil) from two surveys: the survey after the layer against the survey before it. The first survey = the natural ground (NGL), then Layer 1, Layer 2 … With the design (FGL) it also gives what is left to the final level and the % done.

1 · SURVEYS



The surveys in order: Survey, Date, Points and kind (survey / design). Add a survey, from a file, or the design.

2 · SITE OUTLINE

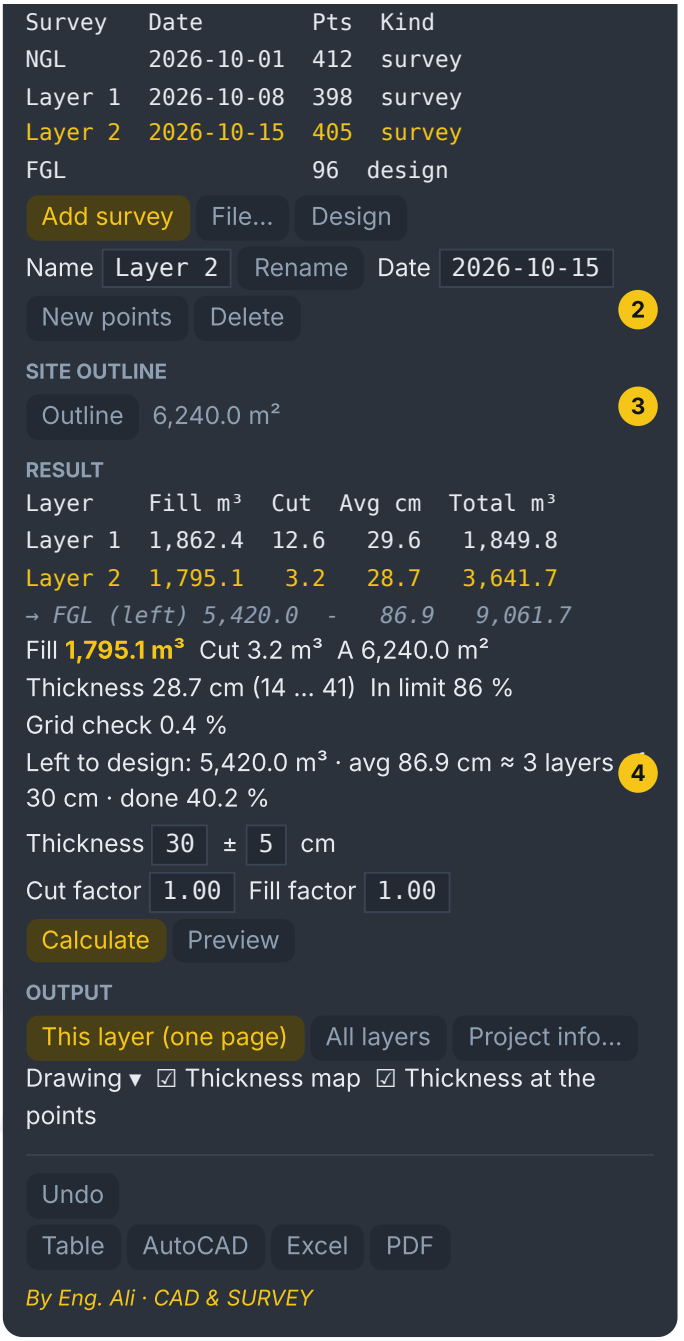
Optional: the outline of the site or grading area. The volumes stop exactly on it.

3 · RESULT

The list of layers with fill, cut, thickness and total, the details of the chosen layer, the thickness limit, `Cut factor` and `Fill factor`, `Calculate` and `Preview` (the thickness map).

4 · OUTPUT

Report kind, project info and the AutoCAD output (thickness map, thickness at the points). Buttons at the bottom: `Undo`, then `Table` · `AutoCAD` · `Excel` · `PDF`. The drawing options fold under a Drawing bar with `Edit ▾` / `Hide ▴`; the bar shows the current settings.



Steps for a layers job

1. Open the `Layers` tab. `Add survey`: select the points of the natural ground before the fill. It is named **NGL**. Type its date.
2. If you have the design: `Design` and select the final level points in the drawing or from a file. It is named **FGL** and stays last in the list.
3. Optional: `Outline` and pick the grading area outline (a closed polyline or circle).
4. After each layer is laid and compacted: `Add survey` (or `File…`) for its survey. It is named **Layer 1**, the next one **Layer 2** … Type the date.
5. Type the thickness asked by the specification and its tolerance (e.g. `30 ± 5` cm), press `Calculate`, then `Preview` (the thickness map) to see where it is thin and where thick.
6. Click the layer in the list, then `PDF`: the layer page, ready to sign.

✔ Everything is kept inside the DWG: surveys, dates, outline and design. Add the next layer another day, in the same drawing.

1 · SURVEYS (in order)

Surveys list	Survey, Date, Points and kind: `survey` or `design`. The order matters: each layer = a survey against the one before it. The list grows with the surveys (up to 7 rows). The row you click stays highlighted, and `Rename` and `Delete` work on it.
Drag to reorder	Drag a layer up or down to put it in its right place (when it was added in the wrong order). The NGL stays first and the design (FGL) last. After the drop everything is calculated again. When the new order does not follow the survey dates a ⚠ warning shows.
Add survey	Selects the points of the next survey in the drawing: AutoCAD points, COGO points, blocks and level texts (as in Points on the Stockpile page). The first one is named **NGL**, then **Layer 1**, **Layer 2** …
File…	The same Points from a file window as the Stockpile page: columns found by themselves, preview, codes, outline from a code. When there is no site outline yet, the outline from the code is used as the **Site outline**.
Design	Design points in the drawing or from a file: the **FGL** (final level). It is always kept last, and there is one design only.
Name · Date · Rename	Name and date of the chosen survey, printed in the report. `Rename` changes the name (e.g. Sub-base 1).
New points	Selects the points of the chosen survey again and replaces them, when a point is missing or wrong.
Delete	Removes the highlighted survey from the tool only, after asking. Nothing is erased in the drawing.

2 · SITE OUTLINE (optional)

A closed polyline (or circle) around the site or grading area. The volumes stop exactly on it (like a Civil 3D boundary). Without it the volumes are where both surveys are.

3 · RESULT

Layers list	Layer, Fill m³, Cut m³, Avg cm (average thickness), Total m³ (the total up to that layer). Click a row = choose the layer. When empty it tells you what to do (add the NGL, then the survey after a layer).

Fill · Cut	Fill = the new survey above the old one. Cut = the part that goes below the old level.
Area	The plan area worked out.
Thickness	Average thickness = net / area, with min … max at the points.
In limit %	When a thickness limit is given: the % of the points in the limit, and the counts of thin and thick.
Grid check	A second calculation by a grid and the difference in %, as for piles.
→ FGL (left) · Left to design	With an FGL a last, faded row `→ FGL (left)` shows in the list: Fill = the m³ still to fill from the last survey up to the FGL, Cut = the part above the design (if any), Avg cm = the thickness left (left ÷ area), Total = the grand total NGL → FGL (done + left). Under the list a line: `Left to design: 360.00 m³ · avg 60.0 cm ≈ 2 layers of 30 cm · done 33.3 %` — layers = thickness left ÷ `Thickness`, rounded up (0 when nothing is left), and done % = total / (total + left).
Above the design	When the last survey is higher than the FGL somewhere: the m³ to cut.
Left out	The area not covered by the survey before: not counted, and reported.
Thickness [30] ± [5] cm	The thickness asked by the specification and its tolerance. Empty = no limit; the map then shows thirds: thin / middle / thick.
Cut factor · Fill factor	As in Civil 3D (default 1.00): the cut of the layer × Cut factor and its fill × Fill factor. When one is not 1.00 a line `Cut × f / Fill × f / Net` shows in the result, and the report has the Cut/Fill Summary table.
Calculate · Preview	`Preview` (the thickness map) shows the chosen layer coloured by thickness in the drawing: **red** = below the old level, **light blue** = thin, **blue** = in the limit, **dark blue** = thick.

4 · OUTPUT

This layer (one page)	Default: one page for the chosen layer.
All layers	A page per layer.
Project info…	The same project info and logos as for piles, with **Auto-fill** and the next report no. in grey (section 8).
Drawing (fold)	In the **Drawing** fold: what is drawn in AutoCAD (thickness map, thickness at the points, labels and their height).
AutoCAD: Thickness map	Triangles coloured by thickness on layer `CVOL-<layer>-THICK`.
AutoCAD: Thickness at the points	The thickness in cm (+31) written at every point of the new survey: **green** in the limit, **red** out of it or below the old level. With a label of the

	layer: name, date, fill, cut, average. On layer `CVOL-<layer>-LABELS`. Labels in cm without or with one decimal; text height.
Table	An AutoCAD table of all layers with the line `To design (FGL)` and % done.
PDF / Excel	The same report options with a right-click (below).

10 Layers: calculation and report

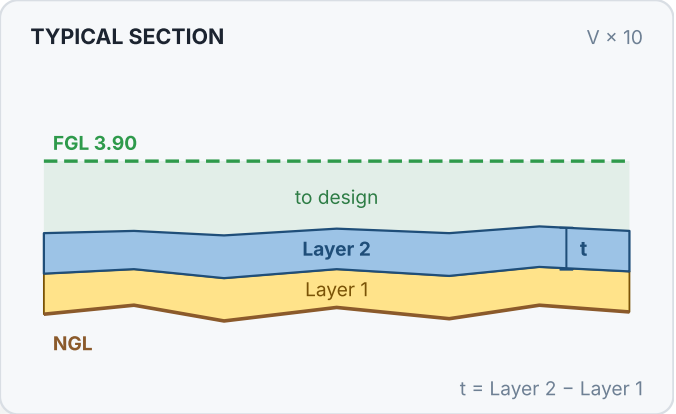
The layer volume = the survey after the layer against the survey before it. Each triangle of the new survey is cut into small ones, and the old level is read under every corner. Thickness at a corner = new − old. The part going below the old level (negative thickness) is **CUT**, split on the zero line as in example 2.

Example 4: Layer 1 on a grading area

1 `Grading area 20 m × 30 m = 600 m²`
`NGL flat at 3.00  Layer 1 at 3.30`
`t = 3.30 − 3.00 = 0.30 m`
The same thickness at every corner.

2 `Fill = A × t = 600 × 0.30`
`Fill = 180.0 m³  Cut = 0`
No point below the old level.

3 `Average = net / area = 180 / 600`
`Average = 0.30 m = 30 cm`
The average comes from the volume, not from averaging the points.



A section along the site: the natural ground NGL in brown, Layer 1 in sand colour, the chosen layer (Layer 2) in blue and the FGL dashed green. Light green = left to the design.

To design and % done

1 `FGL at 3.90, last survey 3.30`
`To design = 600 × (3.90 − 3.30) = 600 × 0.60`
`To design = 360.0 m³`
From the last survey up to the FGL.

2 `Done = 180 / (180 + 360) × 100`
`Done = 33.3 %`

Total / (total + to design).

3 Layer 2 at 3.62: Fill = 600 × 0.32 = 192.0
Total = 180 + 192 = 372.0
To design = 600 × (3.90 − 3.62) = 168.0
Done = 372 / (372 + 168) × 100

Done = 68.9 %

Total + to design stays 540 m³ (600 × 0.90).

Thickness limit 30 ± 5 cm

1 Limit = 30 − 5 … 30 + 5 = 25 … 35 cm

in the limit: 25 ≤ t ≤ 35

From the specification.

2 Point +24 cm → 24 < 25
Point +33 cm → 25 ≤ 33 ≤ 35
Point −3 cm → below the old level

+24 thin (red) · +33 in limit (green) · −3 below (red)

On the map: thin light blue, in the limit blue, below the old level red.

The layer page (EARTHWORK LAYER REPORT)

Part	Shows
Header	The two logos and the two surveys: `NGL 01-10 → Layer 1 08-10`.
Info lines	Project, location, contractor, report no., surveys, instrument, material, thickness limit.
Four big numbers	FILL, CUT, AVERAGE THICKNESS, and the fourth: DONE TO DESIGN % (last layer with a design) or IN THE LIMIT % or TOTAL TO DATE.
THICKNESS MAP	The whole page width, its height from the shape of the site: the layer coloured by thickness, the legend under it: colour, band and % of the points; points, min, max, in the limit %. The thickness is written at the points with room around it (with many points only some get it, so they do not crowd).

LAYERS TO DATE	A table of the last 6 layers, the chosen layer highlighted, a faded row `→ FGL (left)` (left, cut above the design, thickness left, total to the FGL), and the line "Left to design … ≈ N layers of L cm · done %" with a green progress bar.
CUT / FILL SUMMARY	A table as in Civil 3D: Name, Cut Factor, Fill Factor, 2d Area, Cut, Fill, Net.
TYPICAL SECTION	A section along the site: NGL, each layer filled, the chosen one in blue, the FGL dashed green. The height is made bigger by itself by a round number that is printed (e.g. `V ×10`), and the section takes the free space before the signatures.
EXTRA INFO	Optional (off by default): surface area 3D of the survey, perimeter 2D, mean thickness, min / max thickness, top and lowest levels, and the point count and density.
CALCULATION	Method, area, net, average = net / area, the grid check, the area left out.
Signatures	Surveyor · Contractor · Supervision
Last pages	With *Thickness at the points*: a list with E, N, thickness and thin / thick / below.

`Right-click PDF / Excel` Layer report options: *Thickness map*, *Typical section*, *Layers to date*, *Cut / fill summary (as Civil 3D)*, *Calculation and check*, *Signatures*, *Thickness at the points*, *Extra info (surface area, perimeter, heights)*, info lines, and presets Full / Short.

i Name and date each survey on the day it is taken: the date is printed in the report with the layer name (`Layer 1 08-10`).

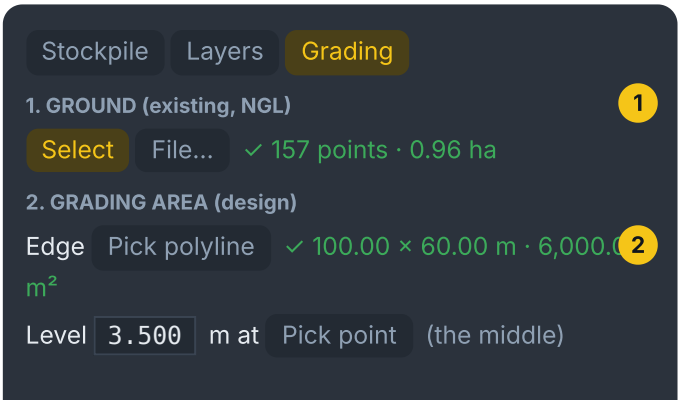
11 Grading: a grading area before the work

The **Grading** tab: design the grading area **before the work starts**. Give it the ground survey (NGL), the grading edge (a closed polyline), one level at a point, the slope (flat, one way, or two ways from a ridge line) and the side slopes for fill and cut. You get the cut and fill (grading area + side slopes), the daylight line (where the slopes meet the ground) and the **balance level** where the cut is enough for the fill. One click makes it the design (FGL) of the Layers page.

1 · GROUND

The ground as it is (NGL): `Select` in the drawing (points, COGO, blocks, level texts) or `File…` . Shows the number of points and the area.

2 · GRADING AREA



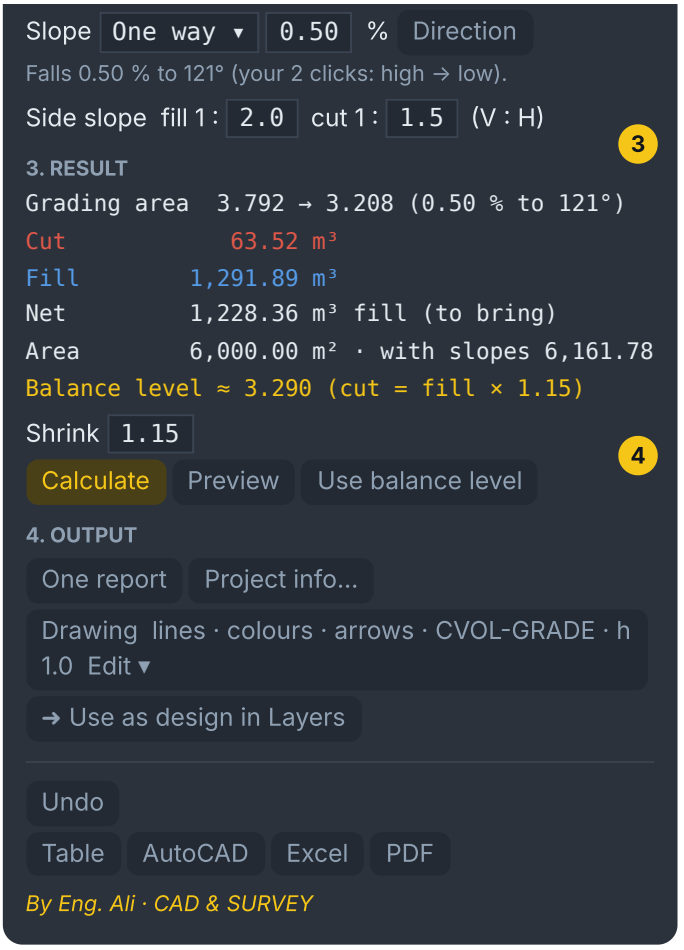
`Edge` : the closed polyline of the grading area. `Level` : the level and `Pick point` where it applies (none = the middle). `Slope` : Flat / One way / Two ways with the slope (% or 1:N), or `Levels at points` (levels at the corners and at high / low points). `Side slope` : fill 1 : H and cut 1 : H.

3 · RESULT

Grading area levels, **Cut**, **Fill**, net (to bring or spare), the area with the slopes and the balance level. `Shrink` , `Calculate` , `Preview` , `Use balance level` . When there is a warning, only the ⚠ warning lines are orange.

4 · OUTPUT

Report and project info. The drawing options fold under a `Drawing` bar: lines, colours, arrows, levels, sections, layer and text height. And `Use as design in Layers` .

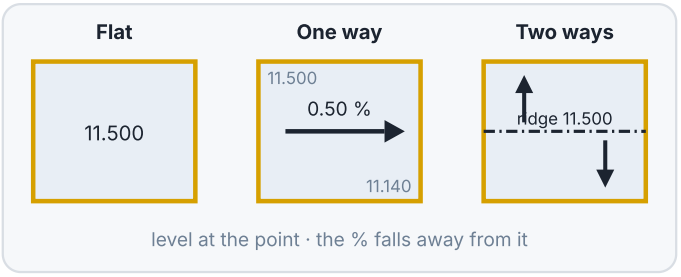


Steps

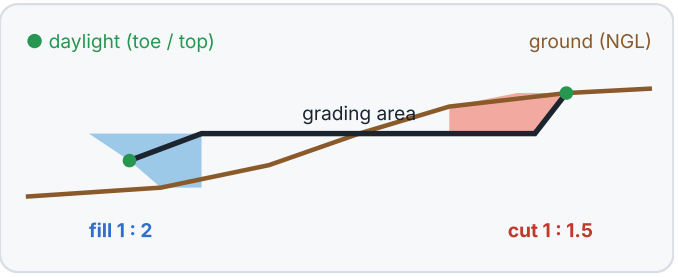
1. Draw the grading edge in AutoCAD (a closed polyline). Open the `Grading` tab.
2. `Select` (or `File…`): the points of the present ground. Let the survey go a little past the grading area so the slopes can meet the ground.
3. `Pick polyline` : select the edge. It shows length × width and the area.
4. Type the level and, if you want, `Pick point` for where it applies. Choose the slope and the %, then `Direction` (2 clicks: high to low) or `Ridge` (2 clicks on the ridge line).
5. Type the side slopes and the `Shrink` (default: fill 1 : 2, cut 1 : 1.5, Shrink 1.15), press `Calculate` . `Preview` draws cut red, fill blue and the daylight line green.
6. If the cut should be enough for the fill: `Use balance level` . Then `PDF` or `AutoCAD` , and `Use as design in Layers` to follow the layers against it.

✓ All the inputs (ground, edge, level, point, slope, direction, the design points and their levels, side slopes, shrink) are kept in the DWG with the rest of CVOL.

The slope: Flat · One way · Two ways



Flat: one level. One way: the grading area falls the % in the direction of your 2 clicks (high to low), through the level at the point. Two ways: a ridge line at the level, each side falls the same % away from it.



Side slopes 1 : H (vertical : horizontal). Fill 1 : 2 = 1 m down every 2 m out until it meets the ground. Cut 1 : 1.5 = 1 m up every 1.5 m. The green point = the daylight line.

The slope as % or 1:N

The slope box takes the percent **or** the ratio as the drawings write it: `0.20` = 0.20 %, and `1:500` = 100 ÷ 500 = 0.20 % (`1:300` = 0.333 %). It is shown back the way you typed it, and so in the drawing and the report.

How it is worked out

On the grading area the calculation is **exact**: the ground triangles are cut on the grading edge (and on the ridge line) and compared with the design surface, as in example 2. The side slopes are added by a **fine grid** (cells of 0.25 m, bigger for big grading areas): in each cell the slope level = the level of the nearest edge point ∓ distance ÷ H, compared with the ground. Cells on the edge line count only their part outside. Where there is no survey it is left out and written in the result.

Example 5: a grading area on flat ground

1. Ground flat at 10.00 · grading area 100 m × 50 m at 11.00
   Grading area fill = 5,000 m² × 1.00
   Grading area fill = 5,000.00 m³
   The whole grading area is 1 m of fill.

2. Fill slope 1 : 2, height 1.00 → goes out 2.00 m
   Section of the slope = 1.00 × 2.00 / 2 = 1.00 m²
   Sides = 1.00 × perimeter 300 m = 300.00
   Sides = 300.00 m³
   A triangle all along the edge.

Example 6: the balance level

1. Ground rises 2 %: 10.00 (west edge) → 12.00 (east edge)
   Grading area 100 m × 50 m flat · fill 1 : 2 · cut 1 : 1.5
   at 11.000: cut 1,314.68 · fill 1,337.45
   Grading area: cut 1,250 and fill 1,250 exactly (the ground crosses 11.00 in the middle); the rest is the side slopes.

2. Shrink 1.15: we want cut = fill × 1.15
   Try 10.961: the ground crosses it at (10.961 − 10) / 0.02 = 48.05 m
   Grading area cut = 50 × 0.02 × 51.95² / 2 = 1,349.40

3 4 corners = one cone r 2.00, h 1.00
π × 2.00² × 1.00 / 3 = 4.19
Total = 5,000.00 + 300.00 + 4.19
Fill = 5,304.19 m³ ✓ (CVOL 5,304.19)

At the corners the slope goes round (a quarter cone each). The daylight line is 2.00 m out.

Grading area fill = 50 × 0.02 × 48.05² / 2 = 1,154.40
+ slopes: cut 70.97 · fill 79.40

CVOL tries levels (halving the gap) until the two sides are equal.

3 Cut = 1,349.40 + 70.97 = 1,420.37
Fill × 1.15 = (1,154.40 + 79.40) × 1.15 = 1,418.87
Balance level ≈ 10.961 ✓

On flat ground (example 5) the balance level = the ground level 10.000.

i **Shrink**: compacted fill takes more soil than its volume in the cut. 1.15 = every 1 m³ of fill needs 1.15 m³ of cut. So the balance level comes a little lower than the "cut = fill" level.

Levels at points

The fourth slope choice. The grading area becomes **triangles (TIN)** through the corners of the edge (each with a level) and the high / low points (HP / LP) you add, each with its level - the same FGL points as on the drawing. Each triangle is a plane. Outside the grading area the side slopes start from the design level on the edge, as before.

The list	The corners (C1, C2 ...) come from the vertices of the edge polyline by themselves, at the `Level` box (shown `(Level)`) until you change them. Then the extra points.
+ Point	Click a point in the drawing: a small box opens next to the mouse for its level (Enter = the Level box), and go on clicking; Enter ends. Or type `S` (Select) and select points, COGO points, blocks or level texts (like *EL.+11.070*): each takes its own level. A point on a corner (within 1 % of the grading area size, 5 cm ... 1 m) gives its level to that corner.
Set level · Remove	Choose a row: `Set level` changes its level (corners too); `Remove` takes an extra point away, and a corner goes back to the Level box.
Use balance level	Here every point (the corners too) moves up or down **by the same height**, so the shape stays. The balance is written as "all points `-0.123` m" with the level of the first corner after the move.

i **Floating box:** with `+ Point` the level box opens next to the mouse by itself after each click, and `Set level` uses the same box. Its **Turn off ✕** button switches it off (the level is then asked on the command line); **Floating box** in any tool palette (or `BOX`) turns it back on. In the palette a

gold line with a bulb 💡 reminds you of the box: a click opens this page, × hides it and leaves a small bulb (a click brings it back). When the box is off the line turns grey with a **Turn it on** button.

Calculation: the grading area is split on the triangles (each cut on the edge) and each part is worked out **exactly** against its triangle, as for the other kinds; the slopes by the grid as before. Note: a rectangle with only four corners at different levels is split on one of its two diagonals (both are right) - when it matters which, add a point in the middle.

Example 7: one corner higher

1 Ground flat at 10.00 · grading area 100 m × 50 m
4 corners at 11.000 (Levels at points)

Fill = 5,304.19 m³ = Flat 11.000 ✓

Exactly example 5.

2 Corner (100, 0) at 12.000, split on (100, 0)–(0, 50)
2 triangles × 2,500 m², heights 1, 1, 2 above the ground
2 × 2,500 × (1 + 1 + 2) / 3 = 6,666.67

Grading area fill = 6,666.67 m³ ✓

On the other diagonal: 3,333.33 + 2,500 = 5,833.33.

3 Balance (shrink 1.00): mean height 6,666.67 / 5,000 = 1.333
all points − 1.334 m → corners 9.666, (100, 0) 10.666

Balance: all points −1.334 m

On flat ground the balance puts the mean of the design on the ground.

Example 8: DS01 (Rumaila) against Civil 3D

1 Sub-grade survey 157 points · grading area 164 × 62 m
E 723262.668–723426.668 · N 3383180.519–3383242.519
4 corners FGL 11.000 (LP) · HP 11.070 at E 723400.67 N 3383211.519
Side slope 1 : 1.5 · Fill Factor 1.100

Civil 3D: Fill 15,329.84 (raw 13,936.2)

From the drawing: slopes 1:500, swales 1:300.

CVOL design	Raw fill m³	× 1.100	vs Civil
Flat 11.000	13,990.71	15,389.79	+0.39 %
Levels at points: corners 11.000 + HP 11.070	14,227.97	15,650.76	+2.09 %
HP 11.070 in the middle	14,227.97	15,650.76	+2.09 %
Two ways, ridge 11.070	14,353.5	15,788.9	+3.0 %

2 HP adds area × 0.070 / 3 = 10,168 × 0.070 / 3 = 237.25
(wherever the HP is inside: each triangle adds its area × Δh / 3)
13,990.71 + 237.25 = 14,227.97 ✓
So the HP where it is or in the middle gives the same volume. Grading area 13,664.37 + slopes 563.60.

i Civil 3D comes a little under the HP case because its surface has the swales (1:300) and the roads that bring the design down; CVOL works only from the points you give it. Add the swale points (LP) to come closer.

Output and report

AutoCAD	As set in the `Drawing` bar: the grading edge and the daylight line as 3D polylines at their levels, slope ticks between them (long and short, blue fill, red cut); see-through cut / fill colours (`CVOL-GRADE-CUTFILL`); an arrow with the %; spot levels every N m; section lines S1, S2 ...; and the grading area label: levels, cut, fill, net.
Table	An AutoCAD table: grading area, side slopes, total (cut, fill, area), net, the design and the balance level.
PDF / Excel	Page 1: info, four big numbers (CUT, FILL, NET, BALANCE LEVEL), the coloured plan with edge, daylight, arrows, levels and a legend, the quantities, and a **Cut/Fill Summary** in the columns of Civil 3D (below). Page 2: up to 4 sections (ground brown, design black, cut red, fill blue, the height made bigger by a round number that is printed, e.g. `V ×10`) and the calculation in plain words. Signatures on each page. The plan box follows the shape of the grading area (a long narrow site takes the page width with the legend under it), and the pictures fill the free space before the signatures. Optional: *Extra info* (ground surface area 3D, perimeter of the edge and the daylight line, average depth, top and lowest levels, point count and density). Right-click = the options.
Use as design in Layers	The grading area and its slopes become points (a grid every 2 – 5 m + the edge + the ridge + the daylight line) and go to the Layers page as the **FGL** (replacing the old design). The m³ left and the % done after each layer come from it.

Cut/Fill Summary (as Civil 3D)

The same columns as the volume report of Civil 3D, to compare line by line. Cut Factor = 1.000, Fill Factor = the `Shrink`; cut and fill are multiplied by the factors, and Net = the bigger minus the other with `<Fill>` or `<Cut>`. The big numbers above stay without factors. DS01 example (corners 11.000 + HP 11.070, Shrink 1.10):

Name	Cut Factor	Fill Factor	2d Area (sq.m)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
Grading area	1.000	1.100	10,168.00	0.00	15,030.80	15,030.80<Fill>
Side slopes	1.000	1.100	815.71	0.00	619.96	619.96<Fill>
Totals			**10,983.71**	**0.00**	**15,650.76**	**15,650.76<Fill>**

Civil 3D for the same site: 2d Area 10,739.20, Fill 15,329.84, Cut 0.

i When a slope line leaves the survey before it meets the ground, the ground is taken level from the last surveyed place and a warning is written. Survey a little wider round the grading area for full numbers.

12 Questions

▼ Why does my volume differ a little from Civil 3D?

Three reasons: a different base (`Edge average` or `Level`), a different boundary (picked edge or Outline), or grid against TIN. Use the same base and boundary and the difference comes close to zero.

▼ I have points at 0.000 with level texts

Select them together. Points at exactly 0.000 are left out by themselves, as they are only marks; the level is read from the text.

▼ Several piles in one window?

Fine: they are split by the gap. If two close piles come out as one, make Gap smaller or draw a polyline around each and select it with Outlines.

▼ The pile sits on a slope?

`Edge average` and `Level` are each one level. The ground may slope a little; that is taken into account when looking for jumps. When you have the ground survey from before the pile, comparing the two surveys (before and after) belongs to the Layers page.

▼ I surveyed the boundary of the pile separately: how do I use it?

Choose `Picked points`, press `Pick edge` and select the boundary points (or COGO points, level texts or a 3D polyline). They are added to the surface and become the outline of the pile. A 2D polyline at 0.000 is refused, as it has no levels.

▼ Why do Edge average and Level give such different volumes?

Because the base decides the quantity. On a big flat area every 10 cm of base is about 2,900 m³ (28,873 m² × 0.10). In example 3 the edge average 10.378 gives about 10,930 m³ and the agreed datum 10.22 gives 15,491 m³ (as Civil 3D with the same boundary): 16 cm ≈ 4,500 m³. So agree the base before the calculation: `Edge average` is the fair choice when there is no datum, `Level` when a datum is agreed.

▼ Can I continue another day?

Yes, the piles and their settings are kept in the DWG. Save the drawing and open it any time.

▼ My file has a comma at the end of every line

Fine, nothing to do: it is read as an empty last column and is not given to any field.

▼ Arabic names come out wrong in the PDF

The PDF prints Latin letters only. Use English names (SP-01, Sand, Basra).

▼ The layer was laid on part of the site only

Fine: the volume is worked out only where both surveys (old and new) are, and the area not covered by the survey before is written as "left out". To stop the volume on a given line, select a `Site outline`.

▼ A survey point is missing or wrong

Choose the survey in the list, fix the points in the drawing and press the button to select the points of that survey again. The old points are replaced by the new ones; press `Calculate`. The layers after it are worked out again on top of it.

▼ Can I see the thickness at every point?

Yes: in OUTPUT choose AutoCAD › `Thickness at the points`. The thickness in cm is written next to every point of the new survey (+31), green when in the limit, red when out of it or below the old level. In the report, the option *Thickness at the points* gives a list with E, N and the thickness.

▼ What is the difference between Layers and Grading?

Layers = what was done: a survey before and after each layer, the quantity from the difference of the two surveys. **Grading** = before the work: no survey after yet, the design comes from a level, a slope % and the side slopes, and the quantity = design against the ground. Start with Grading to know the quantities and the balance level; `Use as design in Layers` makes that design the FGL of the Layers page, then follow each layer against it.

▼ The balance level says "none"

Between the lowest and highest ground levels the cut cannot equal fill × shrink (e.g. the grading area must all be filled). Check the survey and the edge, or lower the shrink.

▼ The drawing is in millimetres?

CVOL counts 1 drawing unit = 1 m. If your points are in millimetres the volume is wrong: `SCALE` the points by 0.001 (base point 0,0), or import the file again in metres. An orange line warns you when the coordinates look like millimetres.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › DESIGN & EARTHWORK

Profile Maker CPROF PRO Road and pipe profiles

A road or pipeline profile, clean and simple: the route from a polyline, points or the survey itself, the ground lines (centre line only, or left · centre · right) from a file, the drawing or typed; the tool checks the errors (the same station twice, a level that jumps) and draws a clean grid with bands, with an optional design line (grade points and vertical curves) and the cut / fill or the cover of a pipe. After the first draw, any change in the tables updates the drawn profile by itself. For drawing and checking profiles quickly; it does not replace a full Civil 3D corridor design.

✓ **Exercise 12:** build a road profile and a pipe profile from the files in `Training\12_CPROF\` : ground, design line, crossings with their clearance, sheets and the PDF report, with every number checked by hand. Open the exercise ›

PRO A PRO tool: fully working for 30 days from the first use of any PRO tool (one trial for all PRO tools), then it needs an activation code. How to activate ›

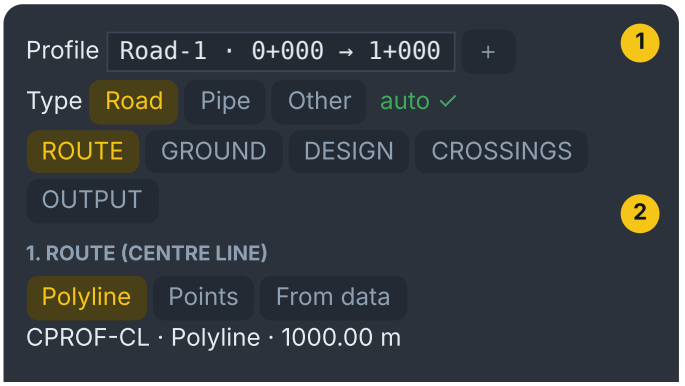
i Everything is in: ROUTE, GROUND, **DESIGN** (design line, cut / fill, pipe cover, checks), **CROSSINGS** (pipes, roads, cables and culverts crossing the route, at their true size, and the remarks) and **OUTPUT**: the look, drawing a part (From / To), **sheets** for long routes with match lines, an overview and a key plan, several profiles, the **PDF report**, Save as DWG and Send to Survey Report.

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The palette

At the top: **Profile** (several profiles in one drawing: `+` new, pencil = rename, bin = delete, it asks) and **Type**: `Road` / `Pipe` / `Other`. The type is guessed from the data (`auto ✓`) and changes with one click. Then five pages: **ROUTE · GROUND · DESIGN · CROSSINGS · OUTPUT**. Always at the bottom: `▶ Draw profile` and `Zoom`, then `Table` · `Copy` · `Excel` · `PDF`.

`Road / Pipe / Other`
The type sets the defaults: **Road** interval 20 m, H 1:1000 / V 1:100. **Pipe** interval 50 m, H 1:2000 / V 1:200. **Other** = as Road, with no max grade. The look (scales, grid, lines, bands) is saved per type,



so every road comes out the same and every pipe the same.

`auto` ✓

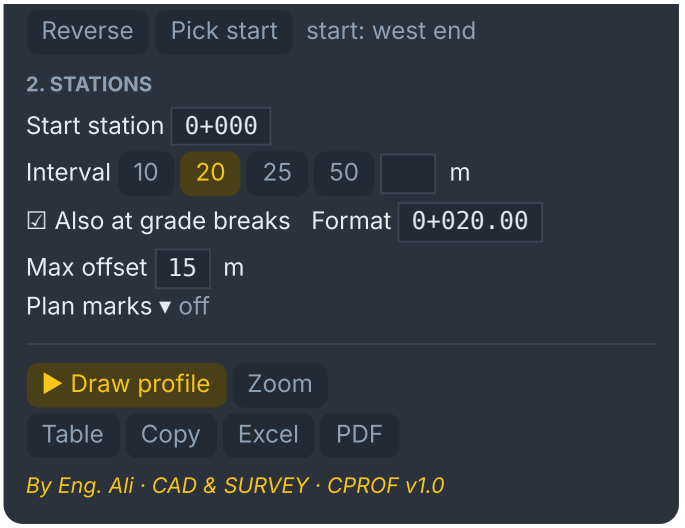
The guess: descriptions with PIPE / TOP OF PIPE / INVERT (3 or more and a fifth of the points), a file column called TOP / INVERT / COVER, or about 50 m between the stations = Pipe; else Road. One `PIPE 8"` on a road is a crossing, so the road stays a Road. A click on a type fixes it; a click on `auto` guesses again.

`DESIGN`

The design line (optional): section 9.

`CROSSINGS`

Pipes, roads, cables crossing the route, with their symbols and labels, and the remarks: section 10.



▼ **Words used (click to open)**

Word	Meaning
Station (0+250)	Distance along the route from the start: 0+250 = 250 m.
Grade %	Slope of the design line: 0.5 % = 0.5 m per 100 m.
PVI · Grade break	A point where the grade changes.
VC · BVC · EVC	Vertical curve of length L (m) around the PVI; starts at BVC, ends at EVC.
Crossfall	Cross slope of the road from the centre line to the edge.
Invert · Top · Cover	Bottom of the pipe · top of the pipe · soil over the pipe (NGL − Top).
Datum · H / V	Level at the bottom of the grid · horizontal / vertical scale (V larger so heights show).
Match line	The cut line between two sheets.

2 Steps

1. Type `CPROF` or click **Profile Maker** on the ribbon (CAD & SURVEY tab, Design & Earthwork panel).
2. **ROUTE**: `Polyline` and pick the centre line (polyline, 3D polyline, line or arc). Or `Points` and click the route points. Or, with ground coordinates only: `From data` builds the route from them.

3. Type the **Start station** (e.g. `0+850`) and the interval (`20`). If the stations run the wrong way: `Reverse` or `Pick start`.
4. **GROUND**: choose `CL only` or `L · CL · R`, pick the line in the table and add its points with `File…`, `Drawing` or `Manual`.
5. Look at the red and orange rows and fix them (section 8).
6. (Optional) **DESIGN**: grade points (PVI) from `File…`, `Drawing` or `Manual`, or a start level + grade, or a fixed level (section 9).
7. (Optional) **CROSSINGS**: the pipes, roads and cables that cross the route from `File…`, `Drawing` or `Manual`, and the remarks (section 10).
8. `▶ Draw profile` and click the bottom-left corner. From now on the drawing is live: every change updates it by itself. A wrong change? `U` (or Ctrl+Z) takes it back.
9. **OUTPUT**: scales, datum, lines and bands, set once per type. And the table: `Table` / `Copy` / `Excel`.
10. (A long route to print) OUTPUT › `Split into sheets`: choose the paper (A1 / A2 / A3) and the profile is cut into sheets (section 12). Then `PDF` for the report, or `Save as DWG…` (section 15).

✓ The profiles, their points and where they are drawn are kept inside the DWG: close the drawing, come back another day, and the live update carries on with the same drawing.

3 Route and stations (ROUTE)

Polyline	A polyline, 3D polyline, line or arc. Arcs are followed (a point about every 1 m). The drawing direction = the direction of the stations.
Points	Click the route points in order; `Enter` = finish.
From data	The route is built from the ground coordinates themselves (the CL points first, else all), in their order along their main direction, starting at the west (or south) end. No polyline needed. For a very winding route (like a U) a polyline is better.
Clear route · Reverse · Pick start	The eraser button (`Clear route`) next to the route name takes the route away after asking; points with coordinates keep their stations until a new route is made. `Reverse` turns the stations round. `Pick start`: click near the end where they start. After Reverse or Pick start the points with coordinates get their stations again, and the line next to the buttons says where the start is (e.g. `start: west end`).
Start station · Interval	The start station (`0+850` or `850`). The interval `10 / 20 / 25 / 50` or another typed in the box next to them (**Other interval**, e.g. 30 or 100): the

	stations written in the bands and the vertical grid lines.
Also at grade breaks · Format	The stations of the grade breaks are written in the bands too. Format: `0+020.00` / `0+020` / `20.00`.
Max offset	A point farther than this from the route (default 15 m) is coloured orange and listed under the table. It is still drawn: either the point or the route is wrong.
Plan marks	Optional (off): tick `Draw station marks along the route in plan` for ticks across the route in plan (**Ticks every**, default 20 m) and the station written (**labels every**, default 100 m, and at both ends) at **Text height** in drawing units, on layer `CPROF-STA`. They follow the route and the start station by themselves.

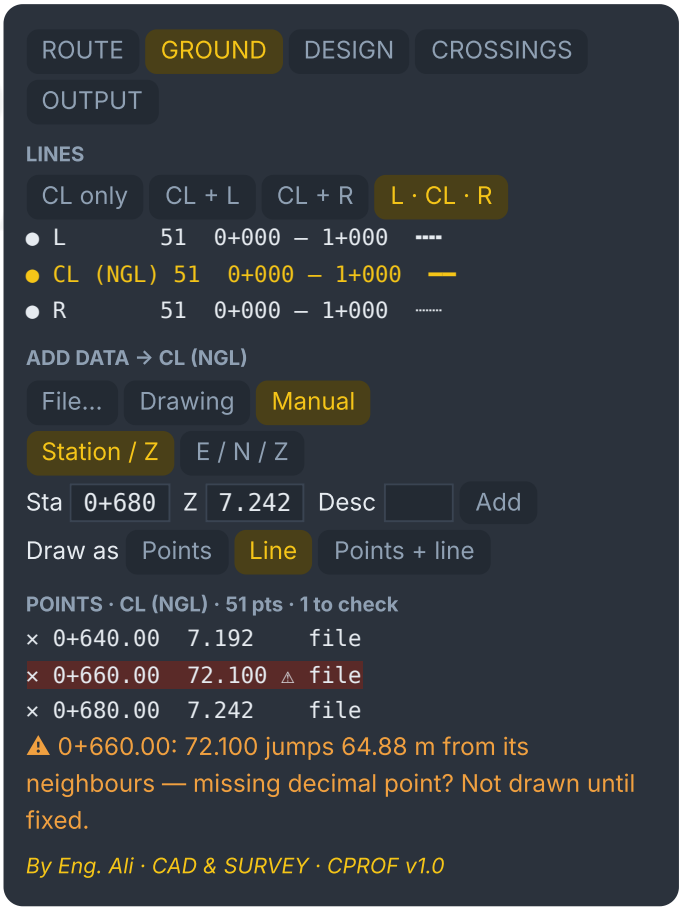
4 The ground (GROUND)

At the top: `CL only` · `CL + L` · `CL + R` · `L · CL · R` (each side optional). The lines table: Line, Points, Range, Style - click a line to work on it. Then the same three buttons on every page:

File…
A TXT / CSV / Excel file. Details in section 5.

Drawing
Pick points in order: click the points in order (snap Node to get the level). **Select … (any order)**: window points / COGO points / level texts; they are sorted along the route. With no route: the farthest two points are the ends, a temporary line numbered 1 → n shows the order and you may choose `Reverse`. **3D polyline**: its corners with their levels.

Manual
One entry line, not a grid. **Station / Z**: the station fills itself (last station + interval), type the level and `Enter` - the point is added and drawn at once and the box clears. **E / N / Z** (X / Y / Z in a local drawing): coordinates from paper; the station is worked out from the route as you type.
Description is optional. **Draw as**: `Points` / `Line` / `Points + line` for each line.



POINTS

The points of the chosen line: Station · Z · Description · From, in station order whatever order they came in. A click on a row = its point lights up on the profile and on the route in plan for 3 seconds. ✕ at the start of the row deletes the point. `Clear` deletes all the points of the line (it asks).

5 Points from a file (File...)

The file is read in any encoding (UTF-8 or Arabic ANSI), split by comma, tab, semicolon or spaces, or Excel .xlsx (choose the sheet). The window says what it found: `✓ Detected: Station / Elevation / Description`, the station format and the header row.

> *i* Old Excel `.xls` is not read: Save As `.xlsx` or `.csv`.

Data is	Columns	How it is found
Station / Z	Station · Elev [· Desc]	A station column (`0+020`) or increasing numbers, then the level.
Pt · E · N · Z	Pt · E · N · Z [· Code]	Two big-number columns = E and N. In UTM E has 6 digits and N 7: when they are swapped in the file they are read the right way and a ⚠ says so.
L · CL · R	Station · L · CL · R [· Desc]	A station and three levels on each row.

Header names that are known: `STA, STATION, CH, CHAINAGE, KP` (station) · `RL, Z, NGL, LEVEL, ELEV, H` (level) · `E, EAST, X` · `N, NORTH, Y` · `DESC, CODE, REMARK` · `PT, POINT, NO, NAME` · `L / LT / LEFT`, `CL / C / CENTRE`, `R / RT / RIGHT`. Each column has a list to change its kind, and `Data is` changes the kind of data. The preview shows every row with **Read as (m)** (the station in metres), **→ line** and the check: red = rejected (not added), orange = comes in but is not drawn until fixed.

Example Station / Z

```
STA,RL,DESC
0+000,6.809,BEGIN ROAD-1
0+020,6.860,
0+340,7.811,"PIPE 8"""
0+660,72.10,          ← 7.210 typed wrong
```

Example coordinates with codes

```
Point,E,N,Z,Code
L0000,729995.000,3381008.660,6.559,L
CL0000,730000.000,3381000.000,6.809,CL
R0000,730005.000,3380991.340,6.559,R
```

✔ When the line already has points it asks: `Yes` = replace them with the file, `No` = add the file to them.

6 Station formats and the 0+20 question

In the file	Read as
`0+020` · `0+020.50` · `1+250`	20 · 20.50 · 1250 m
`20` · `1250` · `20,5`	20 · 1250 · 20.5 m
`K0+020` · `KM1+250`	20 · 1250 m
`0+20` · `1+00` (two digits after +)	asked once

When the file has stations with two digits after the + (like `0+20`), the tool asks once: **Yes** = `0+20` is 20 m (the + splits km and m), **No** = `1+00` is 100 m (the + splits hundreds of metres). The answer is remembered, and the window has a `Stations like 0+20` line to change it. When the stations jump (e.g. 0+80 then 1+00 = 1,000 m) a ⚠ tells you the other reading may be the right one.

7 Left · centre line · right

A road surveyed on 3 lines: choose `L · CL · R` (or `CL + L` / `CL + R` for one side). From coordinates: one file with codes, or each line on its own. Every point goes onto the route and gets its **station** and **offset** (negative = left, positive = right).

- The codes `L / LT / LEFT`, `CL / C / CENTRE`, `R / RT / RIGHT` (alone or the first word of the description, e.g. `L EG`) split one file into the lines.
- Without a code: the side of the offset decides. Points close to the route (less than half the usual side distance) = CL.
- No route yet? It is built from the CL points of the file (From data).
- Drawn: CL solid, L dashed, R dotted - all ByLayer.

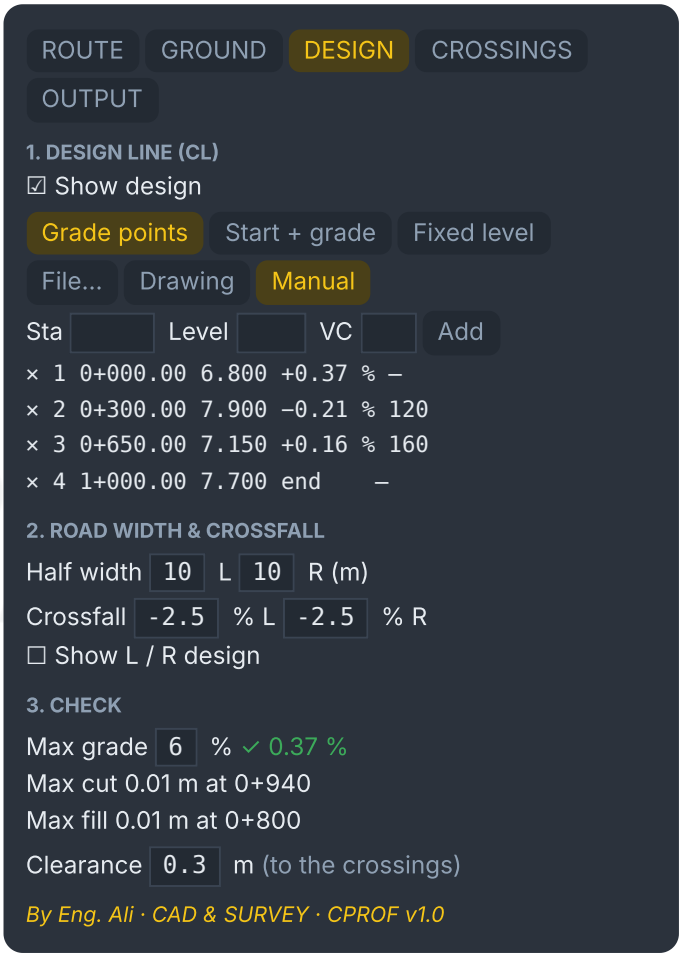
8 Errors

`Same station twice`	The second point at the same station is red and not drawn. Delete one with ✕.
`A level that jumps`	A level farther from both its neighbours than max(2 m, 5 × the usual step between the points) - like `72.10` among levels of about 7.2 (a missing decimal point). The row is red and the line under the table says `⚠ 0+660: 72.100 jumps 64.88 m from its neighbours — missing decimal point?`. It is not drawn until fixed.

Far from the route	Farther than `Max offset` : orange, but drawn.
How to fix	Open `Manual` , click the wrong row (it comes into the boxes), correct the level and `Enter` : the point at that station is replaced and drawn again.

9 The design (DESIGN)

The design line is **optional**: `Show design` draws it with its bands and checks; untick it for the ground profile only (the design stays kept). Three ways, and the same buttons `File…` · `Drawing` · `Manual` :



Grade points

Grade points (PVI): **Station · Level** and an optional **VC** (vertical curve length in m, a symmetric parabola). The table shows **Grade →** (to the next point), worked out by itself.
The drawing gives **K**? L = K × |A| (A = grade change in %). Example: K = 20, A = 0.58 % → L ≈ 12 m.

Start + grade

The start station, level and grade %, then one row for each station where the grade changes (with a VC if wanted). The line runs to the end of the ground.

Fixed level

One level all along (a platform, a channel bed ...).

File… · Drawing · Manual

File...: a file with Station · Level (· VC length) columns, the same import window and detection. **Drawing**: points with their level (Z), COGO points or level texts, picked in order or selected in any order; the station comes from the route (a route is needed). **Manual**: one line Sta · Level · VC and `Enter` ; a row at a station that is already there replaces it.

The table

A click on a row = its point lights up on the profile and in plan for 3 s (with Manual open it comes into the boxes to correct). ✕ deletes the row, `Clear`

deletes them all (it asks). The same station twice = red and not used.

Road: width and crossfall

Half width left and right in m and **Crossfall** % (negative = the edge is lower than the centre line). Edge level = centre line level + half width × crossfall: `10 × −2.5 % = −0.25 m`. The L and R design is drawn by itself when the ground has L / R lines, or when `Show L / R design` is ticked. No separate design to enter.

> *i* Crossfall is one value per side for the whole road: superelevation on horizontal curves is not modelled.

Pipe: top of pipe or invert

For a pipe the design line is the **Top of pipe** or the **Invert** (choose). **Diameter**: `8` or `8"` = inches (`8" = 203.2 mm`), `200` or `200mm` = mm (a number up to 60 is read as inches, above as mm). The diameter turns one into the other: `Top = Invert + diameter`. **Cover = NGL − Top**. When the ground file (GROUND › File...) has a `TOP`, `INVERT` or `COVER` column, after the import the tool asks: use it as the design line? (COVER gives Top = NGL − Cover).

> ⚠ **Note:** a plain number up to 60 is read as **inches**. A 40 mm cable typed `40` becomes 40" = 1016 mm! Write the unit for small sizes: `40mm`, `50 mm`.

Worked example: a level inside a vertical curve

The design (file `CPROF_Road1_design_PVI.csv`): find the level at station **0+270**, inside the crest curve at 0+300.

PVI	Station	Level	VC	Grade →
1	0+000	6.800	—	(7.900 − 6.800) / 300 = +0.367 %
2	0+300	7.900	120	(7.150 − 7.900) / 350 = −0.214 %
3	0+650	7.150	160	(7.700 − 7.150) / 350 = +0.157 %
4	1+000	7.700	—	end

1. The curve starts (BVC) at 0+300 − 120/2 = **0+240** and ends (EVC) at **0+360**. 0+270 is inside.
2. Level of the BVC on the first grade: 7.900 − 0.003667 × 60 = **7.680**.
3. x = 270 − 240 = 30 m. Tangent level: 7.680 + 0.003667 × 30 = **7.790**.
4. Grade difference A = g2 − g1 = −0.214 − 0.367 = **−0.581 %**. Correction = A × x² / (200 × L) = −0.581 × 900 / 24000 = **−0.022** m.

5. Level at 0+270 = 7.790 − 0.022 = **7.768**.
6. Check at the PVI with e = A × L / 800 = −0.581 × 120 / 800 = −0.087 → 7.900 − 0.087 = **7.813** (the same as the band at 0+300).

✓ The full design levels of this file: 0+000 6.800 · 0+100 7.167 · 0+240 7.680 · 0+300 7.813 · 0+360 7.771 · 0+460 7.557 · 0+570 7.321 · 0+650 7.224 · 0+730 7.276 · 0+800 7.386 · 1+000 7.700.

Drawing and bands

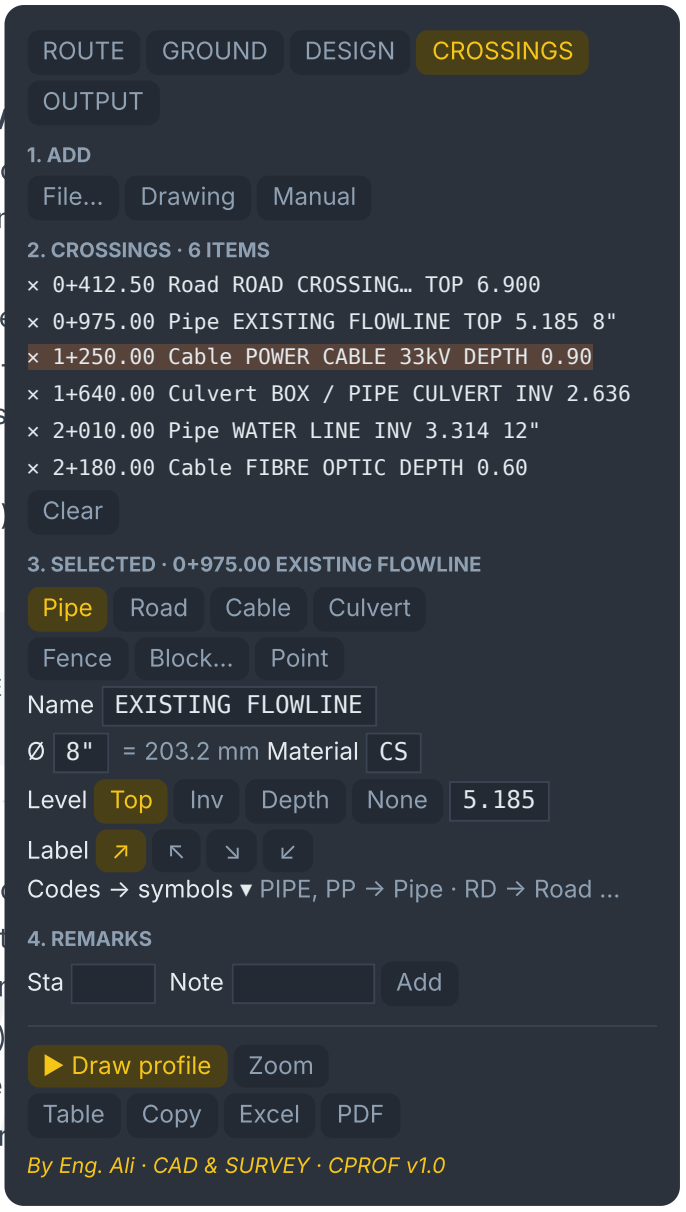
- The design line on layer `CPROF-DESIGN` (gold, colour 40, continuous), L / R on `CPROF-DESIGN-L` (dashed) and `CPROF-DESIGN-R` (dotted).
- The design grade % with an arrow under the line, in the middle of each straight part. At each PVI a circle and its level only (the station is in the band), and under a curve a small `VC 120` with two ticks at its start and end.
- **Road**: bands `DESIGN (CL)` and `CUT − / FILL +` (design − ground: minus = cut, red; plus = fill, blue; the sign keeps the meaning in black and white), and `DESIGN (L)` / `(R)`. **Pipe**: `TOP OF PIPE`, `COVER` and `INVERT` (hidden by default). On / off and drag in OUTPUT.
- Cut / fill shading is optional (OUTPUT › `Cut / fill shading`, off) on layer `CPROF-CUTFILL`. The grid and the datum take the design levels into account too.

Checks (CHECK)

`Max grade`	The steepest design grade against the limit (road 6 % by default, pipe none): ✓ or ⚠ with the part.
`Max cut · Max fill`	The biggest cut and fill (road) and their stations.
`Min cover`	The least cover over the pipe (default 0.8 m) and its station. Example: file `CPROF_Pipe_route_NGL_TOP.csv` → min cover 1.20 m, max 2.10 m ✓.
`Clearance`	The least vertical gap between the design line and each crossing that has a level (default `0.3` m, editable, empty = no limit). A pipe: its top and bottom (top − diameter); a road: the design level. The crossing: its top and bottom (level ± its diameter). A summary line (`⚠ 1 of 6 under 0.30 m`), then one line per crossing with its station: above or below and the gap, ✓ / ⚠ under the limit / × they meet. Fences and crossings without a level are not checked. Worked example in section 10.

10 Crossings (CROSSINGS)

Anything that crosses the route: a pipe, a road, a cable, a culvert, a fence, a block of your own, or a point projected from the plan. It is drawn on the profile with its symbol **at its true size** and a clean label, and its gap to the design is checked in DESIGN › CHECK. The same three buttons as the other pages: `File…` · `Drawing` · `Manual`.



File…

A TXT / CSV / Excel file: **Station · Item · Level type · V**
Diameter · Material (or Top / Invert / Depth columns,
N instead of the station, put onto the route). The colur
are found by their names or values and each can be
changed; a preview shows how every row is read. The
comes from the name: ROAD → road, CABLE / FIBRE
cable, CULVERT / BOX → culvert, FENCE → fence, els
Pipe. Diameter: `8"` = inches (203.2 mm), `150 mm` =
Level type: `Top` (T, TOC) · `Inv` (Invert, IL, I, Bottom)
`Depth` (D). Example (`CPROF_Pipe_crossings.csv`):

```
Station,Item,Level type,Value,Diameter,Material
1+250.00,POWER CABLE 33kV,Depth,0.900,150 mm,XLPE
2+010.00,WATER LINE,Inv,3.314,"12""",HDPE
```

Drawing

Pick in plan: click the line (or point) that crosses the r
one after another; the station comes from where it cut
route, and the offset. **Auto-detect on layers**: select or
object of each layer (or Enter = the layers of last time)
every line / polyline / arc on those layers that cuts the
= one crossing at its station; they are marked in the dr
and it asks before adding them. The kind comes from
layer name (PIPE-EX → Pipe). A 3D polyline gives the level
too. **Project points / blocks / texts**: see below.

Manual

Two lines: `Sta` · `Type` · `Name` , then `Level` (Top / Inv /
Depth / —) · value · `Ø` · `Mat.` and `Enter` .

The table

Station · Type · Name · Level / depth · Ø · Material · Offset. A click on a row = the crossing lights up on the profile and in plan for 3 s, and comes below (3. SELECTED) to change. ✕ deletes it, `Clear` deletes them all (it asks). Orange = closer to the design than the clearance limit, red = it meets the design.

3. SELECTED

The kind (`Pipe` `Road` `Cable` `Culvert` `Fence` `Block…` `Point`), the name, diameter and material, the level: `Top` /

`Inv` (its bottom) / `Depth` (from the NGL CL down to its top) / `None`, and where the label goes with the arrows `↗ ↖ ↘ ↙` (as in PTX, ↗ by default). Every change is drawn at once.

`Codes → symbols`
A fold with the codes of each kind: `PIPE, PP` → Pipe · `RD` → Road · `CBL` → Cable · `CUL` → Culvert · `FNC` → Fence (editable). A ground point whose description starts with a code (like `PIPE 8"`) becomes a crossing at its station with its diameter: after the import it asks once *N crossing(s) found in the descriptions - add them?* (no level: a dashed line until you type it). A code repeated on many points (a surveyed pipe) is not a crossing.

The symbols

Kind	Drawn as
Pipe	An ellipse **at its true diameter**: as wide as the diameter along, as high as the diameter × the vertical exaggeration (H/V). When too small to see, a small ring is added round it.
Cable	A small dot at its level / depth (and its size when it shows).
Culvert	A box of its size (Ø = the size), its bottom at the invert.
Road	A short road-surface mark at its level (or on the ground).
Fence	A post on the ground line.
Block...	A block of the drawing (chosen from the list), 1 unit = 1 mm on paper.
Point	A small × at its level.
No level	A dashed vertical line at the station, from the bottom of the grid to just over the ground.

- **The label**: two lines on a slanted leader with a short shoulder - the name above, the diameter and level below (`Ø 8" · TOP 5.185`). The direction by the arrows of each crossing; when a label would meet another (or a remark) it steps further out until it finds room, so they never pile up.
- The station of every crossing is always written in the bands. A `CROSSINGS` band (off by default, switch it on in OUTPUT) writes the kind + name at its station.
- Layers: `CPROF-CROSS` (the symbols, orange colour 30), `CPROF-CROSS-TEXT` (the labels) and `CPROF-REMARK` - in the Lines table like the other parts.
- Everything is kept with the profile inside the DWG; older drawings open as before.

Project to profile (points from the plan)

`Drawing` › `Project points / blocks / texts to the profile…`: select points, COGO points, blocks or texts near the route. Each one goes onto the route (station + offset) and is drawn at its level (Z, the COGO elevation, an ELEV / LEVEL attribute, or a number in the text like `EL 3.250`) as a small × with a label, and is listed in the table as kind `Point`. Those without a level: it asks you to type a level for them, or `Enter` = they become **remarks**. Farther than `Max offset` (ROUTE page) = left out.

Worked example: the clearance above and below the pipe

The files `CPROF_Pipe_route_NGL_TOP.csv` (our 10" line) and `CPROF_Pipe_crossings.csv` (6 crossings):

1. GROUND › `File…` › `CPROF_Pipe_route_NGL_TOP.csv` › Import, and answer `Yes` to the TOP column question: it becomes the design line (top of pipe). The type becomes Pipe by itself.
2. DESIGN › 2. PIPE › `Diameter` = `273.1` (the true outside diameter of a 10" pipe, in mm). *Note: `10"` is read as 254 mm.*
3. CROSSINGS › `File…` › `CPROF_Pipe_crossings.csv`: the columns are found by themselves (Station · Item · Level type · Level · Diameter · Material) and 6 crossings are added. The diameters: `8"` = 203.2 mm, `12"` = 304.8 mm, `150 mm`, `900 mm`, `40mm`.
4. Example 1+250.00 POWER CABLE 33kV (Depth 0.900, Ø 150 mm): the NGL at this station is 4.411 → top of the cable = 4.411 − 0.900 = **3.511**, its bottom = 3.511 − 0.150 = **3.361**. Our top of pipe = **3.211** (cover 1.20). The cable is above the pipe: gap = 3.361 − 3.211 = **0.150 m**, under 0.30 → ⚠.
5. Example below the pipe 2+010.00 WATER LINE (Inv 3.314, 12"): top of the water line = 3.314 + 0.3048 = **3.619**. Our top of pipe between 2+000 (4.363) and 2+025 (4.422) = 4.363 + 0.059 × 10/25 = **4.387**, its bottom = 4.387 − 0.2731 = **4.113**. Gap = 4.113 − 3.619 = **0.495 m** → ✓.

Station	Crossing	Level	Ø	Top / bottom	Our top	CHECK
0+412.50	ROAD CROSSING (asphalt)	TOP 6.900	—	6.900	4.809	✓ above · 2.091 m
0+975.00	EXISTING FLOWLINE	TOP 5.185	8"	5.185 / 4.982	4.682	✓ above · 0.300 m
1+250.00	POWER CABLE 33kV	DEPTH 0.90	150 mm	3.511 / 3.361	3.211	⚠ above · 0.150 m
1+640.00	BOX / PIPE CULVERT	INV 2.636	900 mm	3.536 / 2.636	2.286	✓ above · 0.350 m
2+010.00	WATER LINE	INV 3.314	12"	3.619 / 3.314	4.387	✓ below · 0.495 m

2+180.00	FIBRE OPTIC	DEPTH 0.60	40 mm	4.801 / 4.761	4.201	✓ above · 0.560 m

✓ DESIGN › CHECK › Clearance `0.3` shows: `⚠ 1 of 6 under 0.30 m` and the six lines under it. 0+975 has 0.2998 → `0.300` : the tool compares to the millimetre, so it is ✓ right on the limit. And the 1+250 row of the CROSSINGS table turns orange.

Remarks (REMARKS)

Remarks come from: the description column of the ground file (Description), the COGO descriptions, a note typed at a station without a point (CROSSINGS › 4. REMARKS: `Sta` · `Note` · `Add`), or a text / point without a level from Project. A code repeated on many points (like NGL) is not a remark. Shown as (OUTPUT › `Remarks`): `Label` (default) = a label above the line on a thin vertical line, labels that would meet are stepped up; or `Band` = a `REMARKS` row under the grid; or `Off`. The remark goes into the Description column of the export table (a note at a station with no reading gets its own row, Source = remark).

✓ Example: file `CPROF_Road1_CL_STA_RL_DESC.csv` → after the import it asks: *1 crossing(s) found in the descriptions: 0+340 PIPE 8"*. `Yes` = a Pipe crossing of 8" without a level (a dashed line at 0+340; type its level in 3. SELECTED). And `BEGIN ROAD-1` and `END ROAD-1` show as remarks at 0+000 and 1+000.

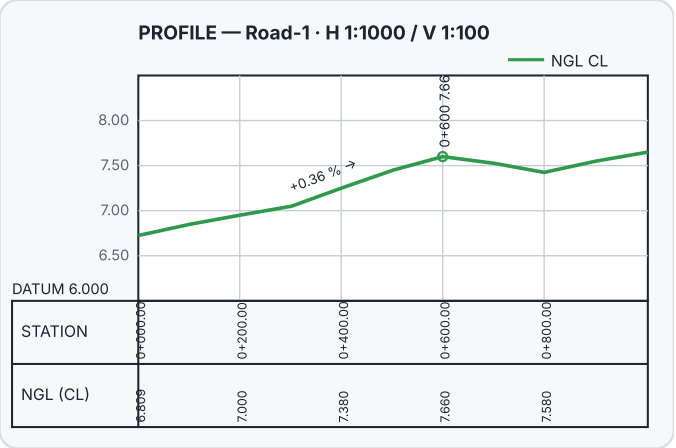
11 The look (OUTPUT)

`Grid & scale`

H 1:... and V 1:... (levels drawn × H/V, e.g. ×10; along, 1 m = 1 unit). **Datum**: empty = automatic (rounded below the lowest level) or typed. A level line every 0.5 / 1 / ... m (**Level lines every**), labelled on both sides. **Text height** in mm on paper.

`Lines`

One row per part: Grid major / minor, Frame + bands, NGL CL, NGL L, NGL R, Design, Design L, Design R, Cut, Fill, Crossings, Crossing text, Remarks, Text, Match lines, Key plan / overview, Key: this sheet. Colour (ByLayer or a colour), linetype (loaded by itself, with a dash size that suits the scale) and layer: `CPROF-GRID`



The drawn profile: title and legend, the grid with its levels on both sides, the ground line with grades and breaks, and the bands under it.

`CPROF-FRAME` `CPROF-NGL` `CPROF-NGL-L` `CPROF-NGL-R` `CPROF-DESIGN` `CPROF-DESIGN-L` `CPROF-DESIGN-R` `CPROF-CUTFILL` `CPROF-CROSS` `CPROF-CROSS-TEXT` `CPROF-REMARK` `CPROF-TEXT` `CPROF-MATCH` `CPROF-KEY` (a layer is made only when something is drawn on it). Everything is ByLayer: change a layer colour in Layer Properties and it stays. Frame and texts colour 7 (white on screen, black on paper). `Reset` puts the look of the type back.

`On the profile line`

Grade % with an arrow in the middle of each part between grade breaks · **Grade breaks** (circle and station + level) · **Measured dots** (off) · **Level at every point** (off) · **Cut / fill shading** (off) · **Remarks**: `Label` / `Band` / `Off` (section 10). Grade % and Grade breaks work on the design line too. Clean, not crowded: a text that does not fit is left out.

`Bands`

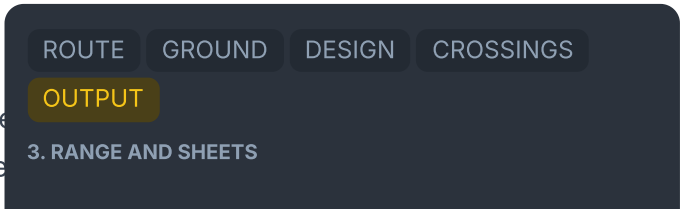
`STATION` and `NGL (CL)`, and `NGL (L)` / `NGL (R)` when those lines have points, and the design bands (section 9), and `CROSSINGS` (off by default) and `REMARKS` (when the remarks are a band). Drag a band to order it; the round button shows or hides it. Values every interval + grade breaks + crossings; crowded values are thinned by themselves (the ends, crossings and breaks first).

12 Part of the profile and sheets (long routes)

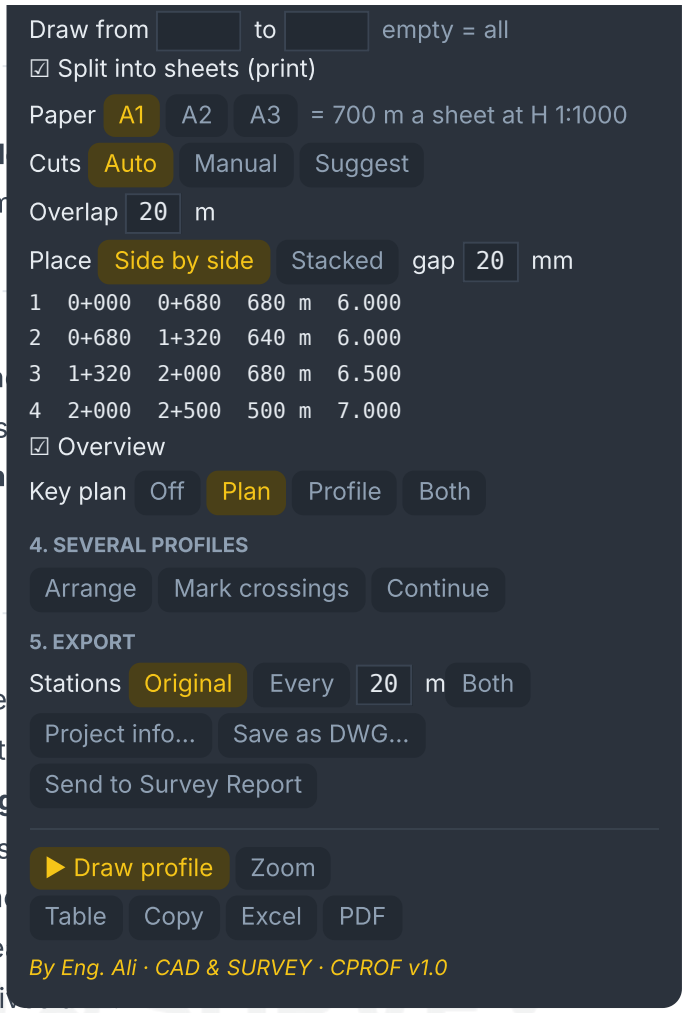
In OUTPUT › **4. RANGE AND SHEETS**. Work in AutoCAD is fine at any scale with one frame (the default). Sheets are for printing only: the profile is cut into parts that fit the paper at the H scale, and the stations stay continuous.

`Draw from … to …`

Draw only a part (e.g. `3+000` to `4+500`). Empty = the
Works for the single frame and for the sheets; the title



range.



`Split into sheets (print) · Place`

Off by default = one frame as before. On = sheets **sid**
stacked (`Side by side` / `Stacked` , and a `gap` in m
in model space and all live.

`Paper`

`A1` / `A2` / `A3` landscape. The clear frame width (th
margins, the column of band titles and the level labels
A1 ≈ 700 mm, A2 ≈ 480 mm, A3 ≈ 330 mm. **Sheet len**
width ÷ H scale, shown next to the buttons
(`= 700 m a sheet at H 1:1000`).

`Cuts: Auto / Manual`

`Auto` : a cut every (sheet length − overlap), each one
earlier (at most 10 % of a sheet, so the sheet still fits t
nearest station on the interval that is **clear of crossing**
breaks and design PVIs (clear = more than 3 % of a s
least 5 m). `Manual` : type the cut stations yourself (th
automatic ones), and `Suggest` moves each to the ne
station within ±10 %. A sheet longer than the paper gi

`Overlap · Match lines`

Each sheet runs on past its cut by the overlap (default `20` m). At the cut a red line goes from the bottom of the bands to over the grid (layer `CPROF-MATCH`) with `MATCH LINE 2+800 · see sheet 4` along it; the next sheet starts on the same line and writes `see sheet 3` .

`Datum · title`

Each sheet has **its own datum** from its lowest level, rounded down (a datum typed in Grid & scale is used for all sheets). Title:
`Road-1 · Sheet 3 of 11 · 2+800 – 4+200 · H 1:1000 / V 1:100` .
A **datum break** inside one frame is not offered: each sheet has its own datum instead.

`Overview`

A small profile of the whole route (ground and design) above the frames, its scale chosen so it is about one sheet wide (e.g. H 1:10000), with each sheet boxed and numbered. Works with the single frame too.

`Key plan`

`Off` (default) · `Plan` = the route in a small box (70 × 40 mm) under the bands at the right, the part of the sheet thick and red (needs coordinates; else the profile key is drawn) · `Profile` = a thin bar of the whole profile with the part shaded (stations only) · `Both`. Same corner of every sheet, layer `CPROF-KEY`.

`Sheets list`

Sheet · From · To · Length · Datum. A click on a row zooms to that sheet.

Worked example: sheet length (A1, H 1:1000)

A road from **0+000** to **2+500** (2500 m), H 1:1000, paper A1, overlap 20 m, interval 20 m, and a pipe crossing at **1+355**.

1. A1 frame width ≈ **700 mm**. At 1:1000, 1 mm on paper = 1 m → sheet length = 700 × 1000 / 1000 = **700 m**.
2. Step between cuts = 700 − 20 = **680 m**. First cut at **0+680** (sheet 1 is drawn to 0+700).
3. The second cut would be 0+680 + 680 = **1+360**, but it is 5 m from the pipe (1+355) and the limit is 3 % × 700 = **21 m**. It steps back on the interval: 1+340 (15 m, too close) → **1+320** (35 m, clear ✓). Within 10 % (70 m).
4. Third cut = 1+320 + 680 = **2+000**. What is left, 2+000 → 2+500 = 500 m, is under 700: the last sheet.

Sheet	From	To (match line)	Drawn to	Length
1 of 4	0+000	0+680	0+700	680 m
2 of 4	0+680	1+320	1+340	640 m
3 of 4	1+320	2+000	2+020	680 m
4 of 4	2+000	2+500	2+500	500 m

✓ And each sheet has its own datum: e.g. sheet 2 has 6.37 as its lowest level → `DATUM 6.000`. At H 1:2000 the same paper takes 1400 m a sheet.

13 Several profiles

The **Profile** list at the top holds every profile of the drawing. And in OUTPUT › **5. SEVERAL PROFILES**:

`Arrange` Draws every profile that has data one under the other with a 30 mm gap, from the point you click (top-left corner). Afterwards each keeps its own

	place and updates by itself; `▶ Draw profile` moves one.
Mark crossings	Where two routes cross in plan, each profile gets a crossing of the other (From = `profile`): kind Pipe or Road from the other profile's type (Other = Point), the level from its design (pipe: top of pipe), else from its ground at that station, and the diameter from the pipe's design. Press it again after a change: updated, not doubled. Two routes that only meet end to end (one continues the other) do not count.
Continue	A new profile starting at the end station of this one (start = end + 0), with the same type, interval, station format and sheet settings. Then give it a route and ground.

14 Live drawing

- `▶ Draw profile` always asks for the bottom-left corner: click a new place, or Enter = the same place.
- After that, any change (a point, a file, the route, a scale, a band, a colour ...) updates the drawing by itself a moment later. While an AutoCAD command runs, it waits until it ends.
- Every update = one U, and the tables of the palette go back with it. An update replaces only what it drew itself (your drawing is not touched).
- If you erase the profile, the next change draws it again at the same place. It is kept with the DWG and carries on after you open it again.
- A long route? If you only work in AutoCAD the scale does not matter: use any scale. When the frame is longer than 3 m on paper a calm **i** note says so: to print, switch the sheets on (section 12).
- The sheets, the overview and the key plans are live like the single frame: every change updates them together, and one U takes it back.

15 Export and report

In OUTPUT › **6. EXPORT**: **Stations** = `Original` (measured) / `Every` X m (worked out between the readings) / `Both`. Columns: Station · E · N (from the route, also for the computed stations) · NGL CL / L / R · with a design: Design CL / L / R · Cut/Fill (+ fill, – cut) · Grade % (pipe: Top · Invert · Cover) - worked out on the design line, inside the curves too · Description (descriptions and remarks) · **Source** (measured / design PVI / remark / interpolated, so computed rows never mix with real readings). And at the bottom: `Table` (an AutoCAD table, click its corner) · `Copy` (paste into Excel) · `Excel` (saves and opens) · `PDF` (the report, below). No GSI / TXT / CSV. The same section holds `Project info…`, `Save as DWG…` and `Send to Survey Report` (below).

The crossings = a second table: Station · Offset · Type · Name · Level · Top · Bottom · Ø (mm) · Material · Clearance (with a design) · From. In Excel on a sheet called `Crossings`, with Copy under the stations after a `CROSSINGS` line, with Table a second AutoCAD table under the first.

PDF report

The `PDF` button at the bottom (next to Table · Copy · Excel). First the **Report options** window opens with a preview: choose the pages and info lines and the style preset (the global one or one for this report - presets are for reports only, the drawing in AutoCAD never changes), then OK and where to save. Right-click on `PDF` = Report options only. A4 landscape:

- **Page 1**: title and the two logos, the project info (`Project info…`), the summary (length, start and end, highest and lowest NGL and design, max grade with its limit ✓ / ×, number of crossings, min cover or the clearance result, max cut and fill), the overview picture and the sheet table (Sheet · From · To · Length · Datum).
- **One page per sheet**: the profile itself (the same code that draws it in AutoCAD: grid, NGL CL / L / R, design, crossing symbols, grades, bands, match lines) fitted to the page. With sheets off and a profile longer than a sheet, the report splits it the same way by itself.
- The **stations table** (Station · NGL · Design · Cut/Fill or Cover · Grade % · Description, as the export Stations), the **crossings** with their clearance (`✓ above · 0.300 m` / `LOW` under the limit / `✗` they meet), **Legend & symbols** drawn with the same symbols, the **key plan** (the route with the sheet numbers) and the signatures. The branding at the foot of each page follows the global setting.
- Report options presets: `Full` · `Profile pages only` · `Tables only` .

Save as DWG and Send to Survey Report

`Save as DWG…`	Writes the drawn profile (all sheets, the overview and the key plans) to a new DWG at the same coordinates, with its layers and linetypes. With several drawn profiles it asks: `Yes` = all of them, `No` = this one. The drawing itself does not change.
`Send to Survey Report`	Sends the L / CL / R levels by station (the same Stations as the export) to the **Roads** tab of SREPORT in this drawing: the design → Design level, the ground (NGL) → Field level, the description → Remark. Without a design it asks: the ground is Field (`Yes`) or Design (`No`). SREPORT opens on Roads with the rows added and worked out (Δ and Pass / Fail).
`Project info…`	Project, location, client, contractor, report no., date, the names under the signatures and the two logos - one for all CPROF reports.
`Auto-fill`	In the Project info window: copies project, location, client, contractor, the names and the two logos from the last Project info saved in any tool; empty boxes come from **My Profile**. Report no. and date are never copied. Nothing is saved until you press Save.
`Report no.`	An empty box shows the next number in grey (e.g. `SUR-PRF-008`); double-click to use it.

16 Questions

▼ A 12 km route: how do I print it?

OUTPUT › `Split into sheets` and choose the paper: A1 at H 1:1000 gives about 18 sheets (680 m each with the overlap), H 1:2000 about 9. Switch on `Overview` and `Key plan`, then `PDF` or `Save as DWG…`.

▼ Why is a pipe so small on the profile?

Because it is at its true size: an 8" pipe at H 1:2000 / V 1:200 is 0.1 mm wide and 1 mm high on paper. So that it shows, a small ring is added round it, and the label writes its diameter and level.

▼ A crossing is not drawn

Its station is outside the ground / design (a ℹ message says so), or its level is a Depth and there is no ground at that station. Without a level it is drawn as a dashed line.

▼ I only have a station and level file, no coordinates

No problem: the profile does not need a route. `File…` then `▶ Draw profile`. A route only adds E and N to the table and the mark in plan.

▼ The points are mixed, not in order

Fine: everything is sorted by station. From the drawing use Select (any order).

▼ The stations run the wrong way

`Reverse` or `Pick start` on the ROUTE page. Points with coordinates get their new stations by themselves.

▼ I answered the 0+20 question wrong

Open the file again: the `Stations like 0+20` line in the window changes the reading.

▼ Why is the level not written at every point?

To keep the profile clean: the levels are in the band. If you want them: OUTPUT › `Level at every point`.

▼ **I changed a layer colour: does it come back?**

No. The objects are ByLayer and an existing layer is never changed, so your colour stays.

▼ **The drawing is in millimetres?**

The tool works in metres. When the coordinates look like millimetres an orange line says so (once per drawing).

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

Guide › POINTS & DRAWING

Coord Grid `CGRID` Coordinate grid

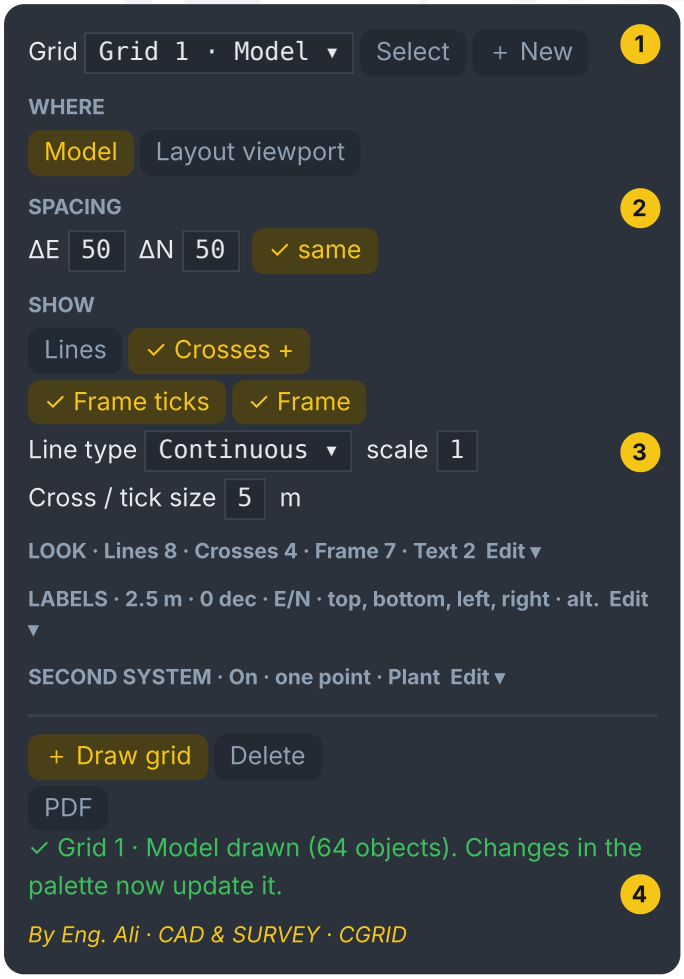
Draws a coordinate grid in model space or inside a viewport: lines, + crosses at the intersections or ticks on the frame, with E / N labels and an optional second system (for example the plant system). Each grid keeps its own settings, and any change in the palette edits the active grid at once.

i **Exercise 13:** draw a 50 m grid on camp 4 with crosses, ticks and alternating labels, add the plant numbers under each label, and edit the grid live. Files in `Training\13_CGRID\` . Open the exercise ›

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The palette

Type `CGRID` (or **Coord Grid** on the CAD & SURVEY ribbon, **Points & Drawing** panel): a side palette opens.



1. **Grid**: the grid you are working on now (the active grid), with `Select` and `+ New` beside it (see 4).
2. Where to draw, the spacing, and what is shown: lines, + crosses, ticks and the frame.
3. Look, Labels and Second system fold away: the closed bar shows the current settings in a few words, and `Edit ▾` opens it.
4. `+ Draw grid` (the yellow button) draws a new grid. Under it the status line: green ✓ = done, ⚠ = look at this.

2 Where and what

`Model`

A grid in model space: after Draw grid pick two corners, or type `P` (Polyline) and choose a closed polyline. Sizes in metres.

`Layout viewport`

A grid inside a layout viewport, at its scale and twist; the sizes (text height, cross size) are in mm on paper. Open the layout first; after Draw grid click the viewport's **edge**.

`Spacing ΔE / ΔN (ΔX / ΔY)`

Spacing of the grid lines. `same` = one value for both directions.

`Show`

`Lines` full lines, `Crosses +` a + at each intersection, `Frame ticks` ticks on the frame, and `Frame` the frame itself.

`Line type · scale`

Line type of the grid (Continuous, DASHED ...) and its scale.

`Cross / tick size`

Length of the + and the ticks (m in model, mm on paper in a layout).

`Look`

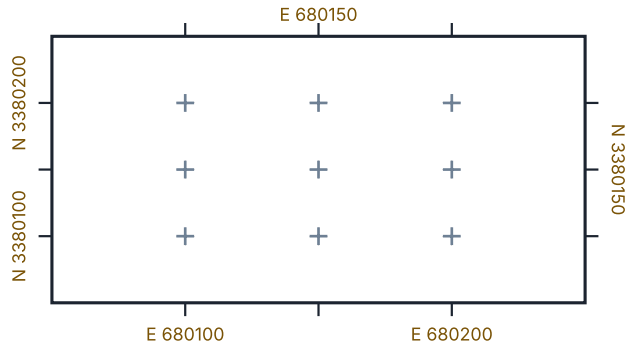
Colour and transparency (%) of each part: Lines, Crosses (with the ticks), Frame and Text.

`Labels`

`Height` and `decimals` of the labels, `E / N` writes E / N before the numbers (X / Y in a drawing drawn in a local system), `Sides` (Top, Bottom, Left, Right), and `Alternate sides` shares the labels between the two sides in turn so they do not crowd.

i **Free and Pro:** free: one grid in Model, one coordinate system, lines or crosses, frame, E/N labels (sides, height, prefix), draw and delete. Pro: grid in a Layout viewport, second system, live update, several grids, frame ticks, alternate sides, own colours / transparency / line type, and the PDF report. Pro parts show `· PRO` next to them - nothing is hidden. In the free version, `Draw grid` again replaces the old grid with the new one.

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Crosses + · frame ticks · alternate sides

3 Second system

You can add a second grid (X / Y) of a local system over the main one. Tick `Use a second coordinate system` in Second system and choose the method:

One point (offset)	One point known in both systems, no rotation: the same grid lines get both numbers (for example E 724100 with Plant X 1080 under it).
Two points	Two points known in both systems: the rotation and scale are worked out, and the second system gets its own grid.
Point + angle	One point and the rotation angle (° counter-clockwise, from the drawing to the second system).
Point 1 · Point 2 · Pick	For each point: drawing E / N → second-system E / N. `Pick` takes the drawing coordinates with a click.
Name · Colour · Text	A prefix before X / Y (such as Plant), the line colour, its transparency and the text colour, and its text height. Under them a line shows the rotation and scale found.
Its grid	When there is a rotation: lines, crosses or ticks for the second grid, its line type (e.g. DASHED) and scale, and its cross size.

4 Editing

Grid ▾	The first row of the palette: the grids of this drawing (Grid 1 · Model, Grid 2 · Layout A1 …) in the order they were drawn, and `New grid` at the top. Choose one and it becomes the **active grid**; its own settings come into the palette.
Select	Click any part of a grid in the drawing: it becomes the active grid.
+ New	Clears the active grid: change the settings freely (no grid changes), then Draw grid makes a new grid.

Live editing	While a grid is active, any change in the palette (spacing, colours, labels, second system ...) redraws it in place a moment later. Other grids never change. If a command is running it waits until it ends (your command is never cancelled), and each update is one step for AutoCAD U. Switching Model / Layout starts a new grid.
Draw grid	The main (yellow) button: draws a new grid with these settings; it becomes the active grid. Each grid is one group and keeps its settings in the DWG.
Delete	Deletes the active grid after asking (U brings it back). With no active grid, click the grid to delete.
Status line	Under the buttons: what the last action did. For example if the active grid is erased or undone it shows ⚠ and there is no active grid any more.

✓ For printing use Layout viewport: labels keep a fixed size in mm at any scale.

✓ The Update button is gone: the active grid is updated live. An older grid takes the current palette settings the first time you edit it.

i **Layers:** `CGRID-LINES` (lines and crosses), `CGRID-FRAME` , `CGRID-TEXT` , `CGRID-SECOND` (second system). Turn them off or freeze them to hide the grid.

Message	Fix
`The spacing is too small for this area (… x … lines)`	Over 2,000 lines: make ΔE / ΔN bigger.
`open a layout first`	Go to the layout, or choose Model.
`this object is not part of a CGRID grid`	Click a line, cross or label of the grid itself.
`the second system is not complete`	Two points needs two different points; until then only the main grid is drawn.

5 PDF report

The **PDF** button (under Draw grid) makes an A4 report **COORDINATE GRID** of the grid chosen in the Grid row (no grid chosen: all grids), in this order:

1. The title between the two logos, a line with project, location, drawing and date, and the project lines (from Report options › Project info...).
2. **GRID SETTINGS**: grid name and place (Model / Layout), interval E / N, first and last lines, number of lines, frame, labels and second system.
3. **SKETCH**: the grid lines inside the frame, the E / N values on the edges (when tight they alternate: bottom / top, left / right; still tight: only every 2nd or 3rd line is labelled, all values are in GRID LINES), the drawing under the grid as clear as you choose (`Drawing under the grid`: Off / Faint / Medium / Clear, default **Faint**), and a north arrow.
4. **GRID LINES**: two lists side by side, E1 ... and N1 ..., with 3 decimals.
5. Signatures: Prepared by (the Surveyor name from Project info) · Checked by · Approved by (left blank to sign by hand).

✓ The **Report options** window opens before saving: tick the sections, the chosen grid or all grids, the report style, with a live preview. Right-click PDF to open it without saving. In the free version a small "Free version" mark sits in the page corner; it goes after Pro activation.

Report options	
`Grids › Report`	**The grid chosen in the palette** (default) · **All grids of the drawing** · **Some grids**: tick the grids under it (none ticked: all).
`Coordinate labels`	E / N values on the sketch edges (on).
Presets	**Full** everything · **Lists only** no sketch.

i **Auto-fill:** in Project info, `Auto-fill` (next to Save) fills project, location, client, names and logos from the last Project info you saved in any tool; still-empty boxes come from My Profile. Report no. and date are not copied.
Report no.: an empty box shows the next number in grey (after SUR-GRD-007: SUR-GRD-008).
Double-click = use it. The box keeps your last number, so empty it first to see the suggestion.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

Guide › POINTS & DRAWING

Point Table PTX Point table

Pick points or select objects; each point is labelled in the drawing (the number as text or in a circle, with E, N and Z if you want), and the list goes to an AutoCAD table, Excel or PDF, or to a file for the instrument (CSV, Leica GSI or Topcon PNT).

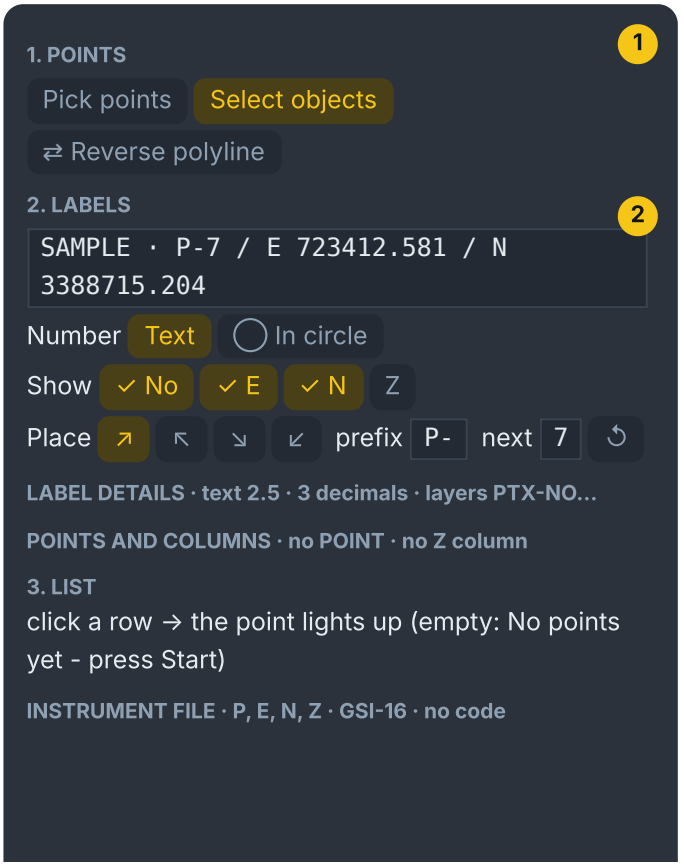
i While picking, type `N` : a small box opens next to the mouse to change the prefix and next number; Enter and carry on. The box is on by default; its clear **Turn off ✕** button switches it off (you then type in the command line), and the **Floating box** button in the palette (or `BOX` at that prompt) turns it back on. In the palette a gold line with a bulb 💡 reminds you of the key: a click opens this page, ✕ hides it and leaves a small bulb (a click brings it back). When the box is off the line turns grey with a **Turn it on** button.

i **Exercise 14:** number the corners of a new control room with one click, add two benchmarks, and write the points for the total station as CSV and Leica GSI-16, knowing every character of the file. Files in `Training\14_PTX\` . Open the exercise ›

i **– / +** next to number boxes step the value (↑/↓ keys too).

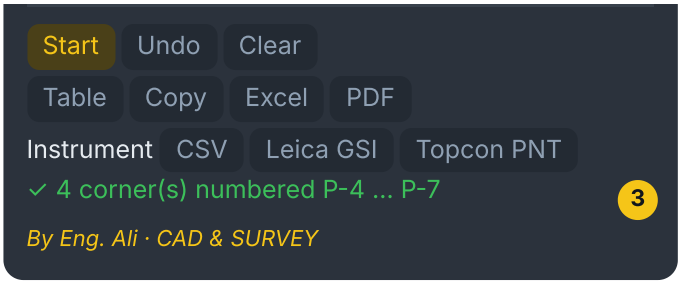
1 How it works

1. In **2. LABELS** look at the **SAMPLE**: it shows exactly what will be written at each point and changes with every setting. Choose **Number**, **Show** and **Place**.
2. `Start` and click points. `S` = select objects, `P` = pick, `U` = undo, Enter or `E` (Exit) = finish.
3. The list builds up as you pick: click a row and the point lights up in the drawing. AutoCAD table, Excel, PDF, copy to paste in Excel, or a file for the instrument.



✓ Select objects takes polyline vertices, line ends, blocks, points and COGO points, all labelled the same way, with the same

layers and size, as a pick. A polyline is numbered with one click from the corner nearest to where you click it, with no questions (see 2).



LABEL DETAILS · POINTS AND COLUMNS · INSTRUMENT FILE	These are set once, so they fold under a bar with `Edit ▾` / `Hide ▴`; the closed bar shows the current settings in a few words. **Label details** holds, for each line (No, E, N, Z), the prefix, end text, colour and layer, and the text height, decimals and style. **Points and columns** holds the POINT at each pick with its layer, and the Z column; the closed bar says for example `POINT on PTX-POINT · Z column`.
Draw a POINT at each pick	Draws a POINT at every pick (layer PTX-POINT).
Z column	Adds the elevation column to the table, Excel and PDF.
Start · Undo	`Start` begins picking (or selecting, with Select objects). `Undo` removes the last point from the list with its labels.
Clear	Empties the LIST (it asks first). The labels stay in the drawing, but after it a change of the settings no longer updates them.
LIST	One list for all open drawings; it is lost when AutoCAD closes (not saved in the DWG), and the next number carries on in another drawing. Before a new drawing press **Clear** and ↺ to start from 1.
Reset	Under the settings (not next to Start): puts all PTX settings back to default after asking (or the PTXRESET command). The list and the labels in the drawing stay.
Status line	Under the buttons: what the last action did. Green ✓ = done, orange ⚠ = look at this (for example a duplicate point was skipped).

i **Label form:** `Separate` = one text per line, each kind on its own layer (hide one kind easily) · `Stacked` = one MText per point on one layer (moves and copies as one) · `Block` = one block per point with attributes (double-click to edit, export with ATTOUT or DATAEXTRACTION). Same place, height and spacing in all three.

✓ **Live update:** any change of the label settings (Show, Number as text or circle, Place, prefixes and end texts, colours, layers, height, decimals, style) updates the labels already drawn for every point of **LIST** at once. The numbers and places of the points do not change, and the name in the list follows the new prefix. While you type a height or a prefix it waits a short moment after the last key, then redraws. Each update is one step for AutoCAD Undo. While

picking with Start, the picking stops for a moment and goes on by itself. A point whose labels you erased by hand is not labelled again.

i **Report options:** PDF or Excel opens a window to choose what goes in the report, with a preview of the pages and zoom: the list columns (such as Z), the settings lines, the drawing name and date, and the page shape. Right-click the button to open the window without saving a file.

2 Numbering a polyline with one click

In Select objects, click the polyline (Polyline, 2D or 3D) **near the corner** where the numbering should start. The tool asks nothing: the numbers start at the vertex nearest to your click and follow the direction it was drawn.

- **Closed polyline:** the numbers go round from the nearest corner; the closing vertex (on the first one) is not numbered twice.
- **Open polyline:** it starts at the end nearer to your click and runs to the other end.
- `⇄ Reverse polyline` (a palette toggle, saved): a closed polyline goes the other way round from the same corner. It has no effect on an open one, as the direction already comes from the end you clicked near.
- Other objects (line, block, point, COGO ...) are added with no questions.

Example:

```
Select object for P-4: (click the polyline near a corner)
3 corner(s) numbered P-4 ... P-6 - 1 already in the list (P-2) skipped.
```

i **Duplicates:** a point that is already in the list (same E, N and Z) is not added again, such as a vertex shared by two lines or a polyline selected twice. The status line of the palette says how many were added and skipped and which, for example `3 corner(s) numbered P-4 … P-6 · 1 already in the list (P-2) skipped` . If the whole polyline is already in the list, it simply says `This polyline is already numbered (P-38 … P-43)` .

3 Labels in the drawing (2. LABELS)

Option	What it does
SAMPLE	A small drawing that shows exactly what will be drawn (the point, the number, and E, N, Z with their prefixes, end texts and colours, at the chosen corner) with made-up values: P-

	7, 723412.581, 3388715.204, 10.874. It changes with every setting.
Number: Text	The number with its prefix and end text (like P-7) is the first line, then the chosen E, N and Z.
Number: ◯ In circle	The number (without the prefix) in a circle a little away from the point, with a short line to it; the circle grows with the length of the number. The chosen E, N and Z are written beside the circle as one neat block. On a polyline the circle goes outside the shape.
Show	`No` , `E` , `N` and `Z` : the lines that are drawn. With No off, no number is drawn (neither text nor circle).
Place	`↗ ↖ ↘ ↙` : the corner of the point where the label goes (the lit arrow is the chosen one). `prefix` = the prefix of the number, `next` = the next number; the ↻ chip next to it sets the counter back to 1 with one click (labels already drawn do not change; the status line tells the next label, like `✓ Counter back to 1: the next label is P-1`).
Label details	For each line: prefix, end text, colour and layer, and the text height, decimals and style. The closed bar says them in a few words, like `text 2.5 · 3 decimals · layers PTX-NO…` .

i The list, the table, Excel, PDF and the instrument files always keep No, E, N and Z, whatever the choice.

✓ **LIST:** click a row of the list: the view moves to the point without changing the zoom much (it only comes nearer when the view is very large), a yellow mark (circle and cross) shows on the point and its labels light up; after 3 seconds they go by themselves (also when the palette is closed).

4 Instrument files

Button	File	Line example
CSV	A header line, commas, 3 decimals or more (Decimals).	`Point,E,N,Z,Code` `P-1,723412.581,3388715.204,10.874,STK`
Leica GSI	GSI-16 or GSI-8: word 11 (point id), 81 / 82 / 83 (E / N / Z in mm), 71 (code).	`*110001+0000000000000P-1 81..00+0000000723412581 ...`
Topcon PNT	No header, commas, 3 decimals.	`P-1,723412.581,3388715.204,10.874,STK`

Order `P, E, N, Z` or `P, N, E, Z` , for CSV and PNT (GSI has words, no

	order needed).
GSI-16 / GSI-8	GSI-16 holds 16 digits per word: enough for UTM coordinates. GSI-8 holds 8 only: UTM coordinates (like 723412.581 = 723412581 mm, 9 digits) do not fit, and the tool stops and says to use GSI-16. Point id: 16 characters in GSI-16, 8 in GSI-8, no spaces.
code	Optional: written as word 71 in GSI and as the 5th column in CSV and PNT. Empty = no code.

i The save window opens in the drawing's folder. A point with no level is written as `Z = 0.000` . Default prefix of the level line in the drawing: `EL=` .

✓ CPOINTS reads these same files back into a drawing (GSI-8 and GSI-16 are found by themselves).

⚠ In GSI the data is filled with zeros on the left, so on reading the zeros at the start of a point id or code are dropped: `007` comes back as `7` , and the code `0` comes back empty. PNT and CSV keep them. In a file with no header (PNT) and small local coordinates, choose the E and N columns in CPOINTS when the order is P, N, E, Z.

5 New in 2.4.1

1. **The list in order:** P1 on top; a new point comes in at the bottom with a gold flash and the list follows it.
2. **Choose what goes out:** the dot at the start of a row: filled = the point goes out, empty = it does not (the row turns grey). `All` and `None` for every point. Table, Copy, Excel, PDF and the instrument files take the ticked points only.
3. `Delete` **:** click a point in the list, then Delete: its labels and its POINT are erased from the drawing; the other numbers stay (P1 P2 P4). `Undo` brings it back to its place.
4. `Renumber` **:** numbers the list again in order from its first number (P1 P2 P4 → P1 P2 P3); the labels in the drawing change at once.

★ New in 2.5

1. **Erased objects leave:** what you erase from the drawing leaves the list and every export by itself (the status says how many). `U` brings it back in its place.
2. **All / Selected:** click the chip beside Copy and select in the drawing (click or Window, Enter = done): Copy, Excel and PDF take only those. Click it again for All.

3. **New group:** keeps the points of the list with their style (a later settings change does not touch them, they stay in the list for the table and the exports) and starts a new group (G2, G3 ...): change the style now, e.g. number in a circle, no coordinates. `Clear` empties the list; the labels stay in the drawing.
4. **Axis letters by site:** a point inside a local site gets X / Y; in UTM it stays E / N.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

Guide › POINTS & DRAWING

Import Points `CPOINTS` Points from a file

Choose a points file (TXT, CSV or Excel, or instrument files: Leica GSI, XYZ, Topcon PNT, ASC), the tool finds the columns by itself, you check a preview, and one click draws the points with their texts (name, level, code ...) neatly next to each point, each kind of text on its own layer. A free tool.

i **Exercise 16:** import a day of field survey (30 points) with neat texts and one layer per code, see how bad rows and N-before-E files are handled, and check a distance by hand. Files in `Training\16_CPOINTS\` . Open the exercise ›

i **– / +** next to number boxes step the value (↑/↓ keys too).

1 The palette: four steps

1 · FILE

`File…` chooses the file; its name and the number of rows are shown. `Clear` empties everything and forgets the file (points already drawn stay). `Split by` is for text files only (Auto, Comma, Semicolon, Tab, Space), `Sheet` for Excel files. Untick `First row is a header` when the first line is already a point, or that point is lost.

2 · COLUMNS

Four fixed columns: Point, E, N and Z, each in its colour. `Column` adds Code, Description or Other; `Swap E/N` swaps E and N.

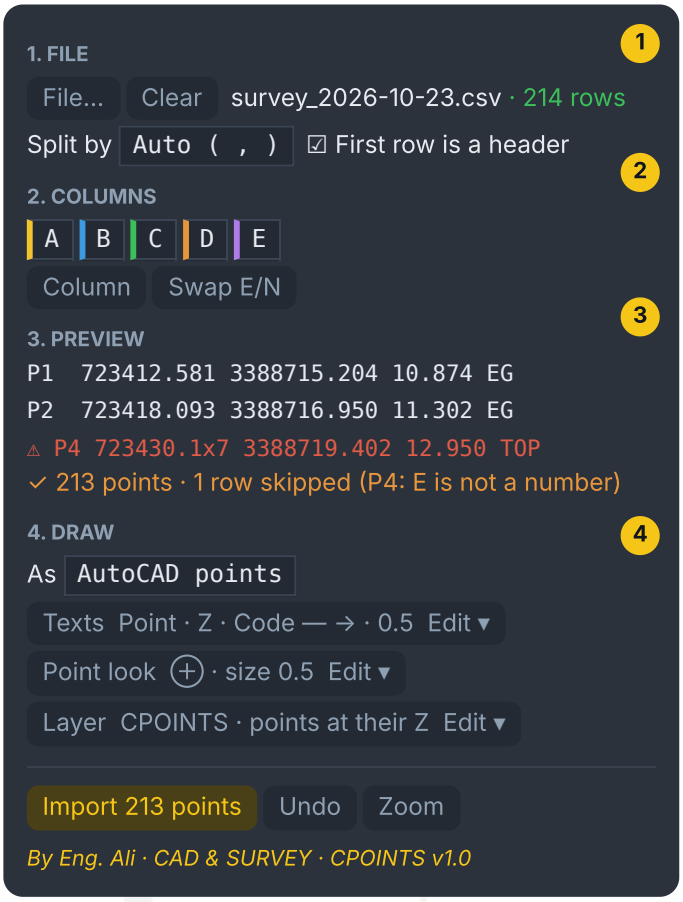
3 · PREVIEW

The first 200 rows, the bad ones marked ⚠ with the reason in the Note column, and the result line under them. Import draws all valid rows, not only these 200.

4 · DRAW

AutoCAD points or COGO points, and three folding parts: Texts, Point look and Layer. At the bottom: `Import` , `Zoom` and `Undo` .

i **Label form:** `Separate` = one text per line, each kind on its own layer (hide one kind easily) · `Stacked` = one MText per point on one layer (moves and copies as one) · `Block` = one block per point with attributes (double-click to edit, export with ATTOUT or DATAEXTRACTION). Same place, height and spacing in all three.



Setting	Default
Height · decimals · Gap	0.5 · 3 · 1.2
Texts shown	Point · Z · Code (E, N ☐)
Point look	⊕ (PDMODE 34) · 0.5
Layer	CPOINTS · points at their Z ☑
A layer per code · Join	☐ · ☐

Point	E	N	Z	Code
P1	723412.581	3388715.204	10.874	EG
P2	723418.093	3388716.950	11.302	EG
P3	723425.640	3388718.115	12.904	TOP

2 Steps

1. Type `CPOINTS` or click **Import Points** on the CAD & SURVEY ribbon (Points & Drawing panel).
2. `File…` and choose the points file. The separator, the header row and the columns are found by themselves.
3. Check the preview: if a column is wrong, change it in the lists (or `Swap E/N`). Click a row to see where the point is in the drawing.

4. Click `Import N points`: the points and their texts are drawn and the drawing zooms to them. `Undo` erases the whole last import.

5. Not happy with the texts? Change the **Texts** settings and the texts of the last import update in the drawing at once (see Live update).

i **The same file again:** when you click Import for the same file as the last import in this drawing, the tool asks: `Yes` = **Replace** (erases the last import, points and texts, then imports again), `No` = **Add again** (the old import stays and the points are drawn once more), `Cancel` = nothing happens. Replace is one step: AutoCAD `U` brings everything back as it was.

✓ All settings are kept when AutoCAD is closed. The mouse wheel over a closed list never changes it.

3 Columns: how they are found

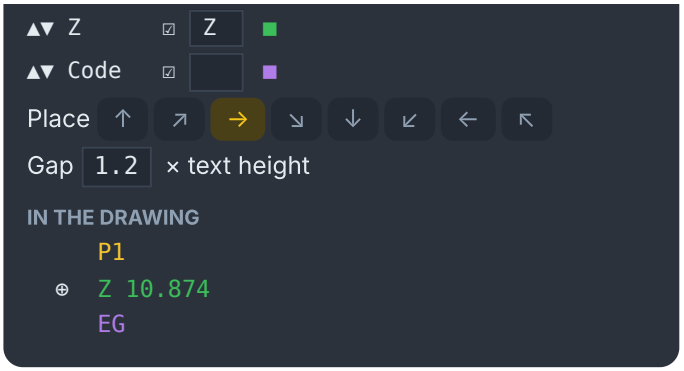
First by the header names: `E / X / EAST / EASTING`, `N / Y / NORTH / NORTHING`, `Z / H / ELEV / LEVEL / RL`, `POINT / PT / NAME / ID / NO`, `CODE / FEATURE`, `DESC / DESCRIPTION / REMARK`. Without a header, by the numbers: E and N are the big numbers (in UTM, E has about 6 digits and N about 7, so a file with N before E is found and swapped by itself), Z is a small number after them, the point name is text or a whole number before them, and the first text column left becomes Code.

Point	The point name. `(none)` = the points are numbered 1, 2, 3 ... in the order of the file.
E · N	Must be numbers. A row with an empty or wrong E or N is skipped (⚠).
Z	The level. `(none)` = no levels. An empty Z cell = the point at 0 without a Z text; a Z that is not a number = the row is skipped.
Column	Adds one more column: **Code**, **Description** or **Other**, with ✕ to remove it. Every extra column can be written next to the point.
Swap E/N	Swaps the E and N columns, for files with N before E that were not found.

4 Texts

Click **Edit ▾** on the Texts bar. On top: the style, the height and the decimals. Then a table, one row for each kind of text (Point, E, N, Z and every extra column):





▲ ▼

The order of the lines in the block of texts.

Show

Written or not.

Before

Text before the value, e.g. `Z ` or `EL=`.

Colour

The colour of the text (BL = ByLayer).

Place

Eight small arrows `↑ ↗ → ↘ ↓ ↙ ← ↖`; the lit one is the chosen one: where the block of texts goes from the point. `→` right = left-aligned, `←` left = right-aligned, `↑` above and `↓` below = centred. The diagonals (`↗ ↖ ↘ ↙`) put the corner of the block at the point moved by the Gap, the texts lined up away from the point. An old setting (right / left / above / below) stays the same.

Gap

The distance from the point × the text height (1.2).

i The texts of one point are a neat block: the same alignment, equal line spacing, in the order you choose. Each kind is on its own layer: `CPOINTS-POINT`, `CPOINTS-Z`, `CPOINTS-CODE` ... so you can freeze one kind later (e.g. hide the levels).

✓ **Live update:** after Import, any change of the Texts settings (which texts, the ▲▼ order, Before, colours, style, height, decimals, Place and Gap) updates the texts of the **last import** in this drawing at once; the points stay where they are. While you type a height it waits a short moment after the last key, then redraws. Each update is one step for AutoCAD Undo. If the drawing was closed or the points were erased, nothing happens. **Point look** applies at once to the whole drawing (see 5); the **Layer** settings apply to the next import only.

5 Point look

Five shapes: `·` `+` `×` `⊕` `○` (PDMODE 0, 2, 3, 34, 33) and the size (PDSIZE): a positive number = drawing units, a negative number = % of the screen. Click a shape or change the size and the points in the drawing change at once (with a regen): no Import needed.

⚠ PDMODE and PDSIZE belong to the whole drawing: they change all the points of the drawing, not only the new ones. If a command is running at that moment the drawing is not changed now; the shape is set with the next Import.

6 Layer and drawing

Layer	The layer of the points (default `CPOINTS`). The texts go on `<Layer>-<KIND>`.
A layer per code	When there is a Code column: each point goes on `CPOINTS-<code>`, e.g. `CPOINTS-EG` and `CPOINTS-TOP`.
Points at their Z (3D)	The points at their level. Off = all at Z 0, but the Z text is still written.
Join by a polyline	Joins the points in the order of the rows: a 3D polyline when the points are at their Z, else a polyline.
As: COGO points	Civil 3D only: the points are made as COGO points with the next free numbers; the name goes to Name and the code to Description. Without Civil 3D, or if they can not be made, AutoCAD points are drawn and a note says so.
Undo · Zoom	`Zoom` zooms to the points of the last import. `Undo` erases the whole last import (points, texts and polyline); click it again for the import before.

★ New in 2.5

1. **File in** (PRO part): when the drawing has two systems, choose that the file is in the second system (or a site's), and the points are converted to the drawing before they are drawn. The list shows the file values and the drawing values (→), and warns when points of a site fall outside it.
2. **Column names** follow: X / Y in a local drawing, E / N in UTM.

7 Questions

▼ **The file has N before E?**

In UTM the tool finds it from the number of digits and swaps them by itself. If not (small local coordinates, for example), click `Swap E/N` and check the preview.

▼ **The file has no point names?**

Leave Point on `(none)`: the points are numbered 1, 2, 3 … in the order of the rows.

▼ Numbers with a comma decimal (723412,581)?

They are read right when the columns are split by `;`, Tab or spaces (Auto takes the separator found on every line). If the columns themselves are split by commas the numbers break: save the file from Excel as a semicolon CSV.

▼ Instrument files (GSI, XYZ, PNT)?

Leica GSI (GSI-8 and GSI-16): found by itself even with a .txt extension; reads the point number (11), E, N, Z (81, 82, 83) and the code (71, or a 41 code block), in every metre unit (mm, 1/10 mm, 1/100 mm). Station and measurement lines without coordinates are left out. **XYZ** and **ASC**: columns split by spaces or commas; without names the points are numbered 1, 2, 3. **Topcon PNT**: comma text; N before E is swapped by itself for UTM numbers — for local coordinates use `Swap E/N`.

▼ An Excel file with several sheets?

Choose the sheet in the `Sheet` list. Old .xls files: save them as .xlsx or .csv first. Excel does not need to be installed.

▼ Why is a row marked ⚠?

The reason is in the Note column: E or N empty or not a number (e.g. `723430.1x7`), or Z not a number. Fix the file and choose it again, or leave it: bad rows are not drawn.

▼ I want to hide only the levels?

Freeze the layer `CPOINTS-Z`. Each kind of text has its own layer.

▼ The drawing is in millimetres?

The tool works in metres. If E or N is over 50,000,000 the file is likely in mm, and it warns you in an orange line after Import.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · **eng.alicadsurvey@gmail.com**

By Eng. Ali · CAD & SURVEY · Guide

Guide › POINTS & DRAWING

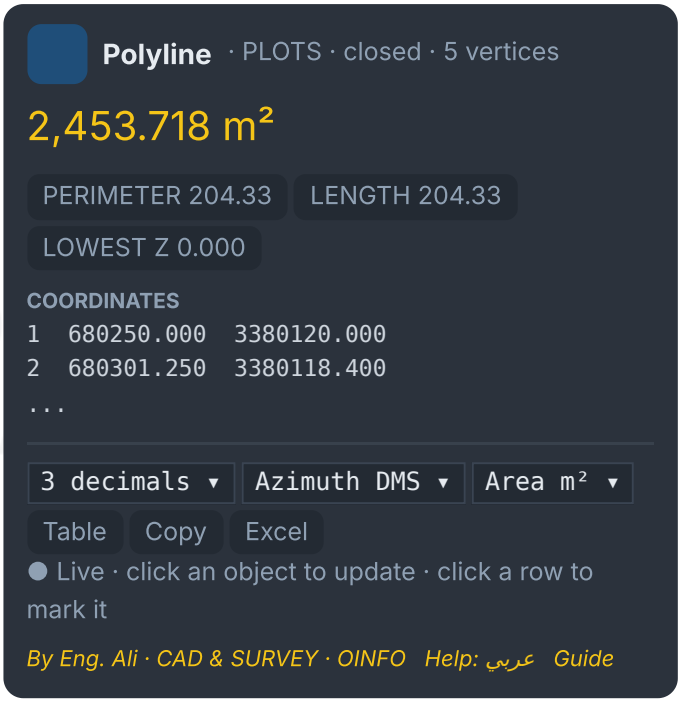
Object Info `OINFO` Object info

Everything about the clicked object in one palette: length, area, coordinates, bearing and layer, with copy, Excel and a table.

i **Exercise 15:** read a line, an arc and a closed polyline with OINFO, and work every card (length, bearing, arc, chord, area, perimeter, centroid) by hand. Files in `Training\15_OINFO\` . Open the exercise ›

1 How it works

1. Type `OINFO` and click any object, then the next one. Esc to stop.
2. While the palette is open, selecting one object with the cursor updates it even without the command. It stays open after Esc.
3. Click a card to copy its value, or use the buttons at the bottom: `Table` (AutoCAD table), `Copy` (all the information) and `Excel` .



2 What it shows

Point · COGO	E, N, Z, and the COGO number and description.
Line	Length, bearing, slope, delta Z, start and end.
Arc · Circle	Radius, diameter, arc length, chord and its bearing, delta angle, centre.
Polyline	Area, perimeter and all vertex coordinates (and the highest and lowest Z for a 3D polyline).
Hatch · Ellipse · Spline	Area, perimeter and hatch pattern; ellipse and spline sizes.
Block · Text	Name, insertion, rotation, scale, attributes and the text.

Options and buttons

0 – 4 decimals	Number of decimals for lengths, coordinates and areas (0 – 4). The coordinates are named X / Y in a drawing drawn in a local system, E / N otherwise.
Azimuth DMS · Bearing N..E · Decimal deg	The bearing style: azimuth in degrees, minutes, seconds, a bearing like S 53°02'41" E, or decimal degrees (see the table in example 1).
Area m² · dunam · ha	The unit of the big area in the summary (dunam = 2500 m², hectare = 10000 m²).
Table · Copy · Excel	`Table` places an AutoCAD table of the information (for example the vertex table of a polyline), `Copy` copies all of it as text, `Excel` makes a real Excel file (.xlsx) with headers and the numbers at their decimals, and opens it. The table asks for its top-left corner; its text height is `TEXTSIZE`.
Esc	Esc only ends the picking; the palette stays open where it is (no pin needed). Close it with ✕ or the same ribbon button.
A table row	Click a row (for example one vertex of a polyline) and its place is marked in the drawing.
Status line	● `Live` = the palette follows every object you click. After a copy it shows ✓; warnings are orange.

i **Defaults:** 3 decimals · Azimuth DMS · m². If you select several objects, the palette asks you to select one.

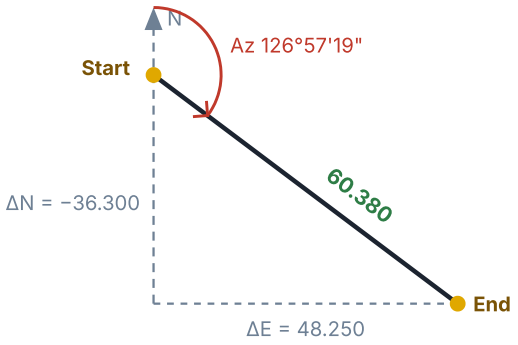
3 Worked example: where the numbers come from

Three objects: a line, an arc and a closed polyline. Numbers with three decimals (the default); the bearing is an azimuth from north, clockwise. Small numbers keep the hand calculation easy; the same works with UTM coordinates (like 680250 / 3380120).

1. Line

	E	N
Start	1000.000	2000.000
End	1048.250	1963.700

Card	Shows
LENGTH	60.380 m · horizontal length
BEARING	126°57'19"
DELTA	dE 48.250 · dN -36.300



Length and bearing

1 `ΔE = 1048.250 − 1000.000 = 48.250`
`ΔN = 1963.700 − 2000.000 = −36.300`
`dE 48.250 dN -36.300`
End minus start.

2 `L = √(ΔE² + ΔN²) = √(2328.0625 + 1317.6900) = √3645.7525`
`LENGTH = 60.380 m`
The horizontal length (with a level difference, the 3D length shows under it).

3 `Az = atan2(ΔE, ΔN) = atan2(48.250, −36.300)`
`= 180° − atan(48.250 ÷ 36.300) = 180° − 53.0447°`
`Az = 126.9553°`
ΔE positive and ΔN negative = south-east quarter, so the azimuth is between 90° and 180°.

4 `0.9553° × 60 = 57.318'  →  57'`
`0.318' × 60 = 19.08"  →  19"`
`126°57'19"`
To degrees, minutes, seconds; seconds rounded to whole.

Bearing style (▾)	Rule	Result
Azimuth DMS	Az	126°57'19"
Bearing N..E	S (180° − Az) E	S 53°02'41" E
Decimal deg	Az	126.9553°

2. Arc

Centre E 1100.000 N 2000.000, radius 25.000, start angle 20° and end angle 95°30' (AutoCAD angles: from east, anticlockwise).

The arc cards

1. `Δ = 95.5° − 20° = 75.5°`
   `DELTA ANGLE 75°30'00"`
   The central angle.

2. `arc length = r · Δ(rad) = 25 × 1.317724`
   `ARC LENGTH 32.943 m`
   The angle must be in radians: 75.5 × π ÷ 180.

3. `chord = 2 · r · sin(Δ/2) = 2 × 25 × sin 37.75° = 50 × 0.612217`
   `CHORD 30.611 m`
   The straight distance from start to end.

4. `Start = (1100 + 25·cos 20°, 2000 + 25·sin 20°)`
   `End = (1100 + 25·cos 95.5°, 2000 + 25·sin 95.5°)`
   `Start E 1123.492 N 2008.551 End E 1097.604 N 2024.885`
   The two arc ends in the POINTS list.

5. `chord direction (from east) = (20° + 95.5°)/2 + 90° = 147.75°`
   `Az = 90° − 147.75° + 360° = 302.25°`
   `CHORD BEARING 302°15'00" (N 57°45'00" W)`
   The chord is square to the middle line. Do not use the rounded coordinates: they give 302°14'59".

Arc	ARC LENGTH 32.943 m · radius 25.000 m · angle 75°30'00"

3. Closed polyline

The same five-sided shape as in the CAREA example (area by the shoelace formula). OINFO shows:

Polyline	Closed · 5 vertices
AREA	4,262.500 m²
	1.705 dunam · 0.4263 ha
PERIMETER	250.014 m
CENTROID	E 42.937 · N 38.861

#	E	N	Length	Bearing	To
1	10.000	10.000	60.208	094°45'49"	2
2	70.000	5.000	47.434	018°26'06"	3
3	85.000	50.000	54.083	303°41'24"	4
4	40.000	80.000	43.012	234°27'44"	5
5	5.000	55.000	45.277	173°39'35"	1

i In the Azimuth DMS style the degrees always have three digits (094°, not 94°). For an arc inside a polyline, the Length column shows the radius and the arc length, like `R 42.500 41.646` .

i **Units:** the tool works in metres (m, m²). It warns you in an orange line under the summary only when the coordinates look like millimetres (very large numbers) or the object is huge (over 200 km). INSUNITS alone gives no warning: many survey drawings say mm there and are drawn in metres.

4 New in 2.4.1

1. When you select a new object, the table starts at the first row (the top).

★ New in 2.5

1. **Pick another object:** after Esc the pick button stays at the top (smaller): one click to look at another object.

💡 **Got an idea?** Something that would make this tool better, or a new tool that would save you time? Tell us: you are part of the team that designs these tools. We read every message, and the ideas that help most surveyors go into the next versions. · eng.alicadsurvey@gmail.com

ENG. ALI

Guide › POINTS & DRAWING

Survey Select CSEL PRO Smart selection

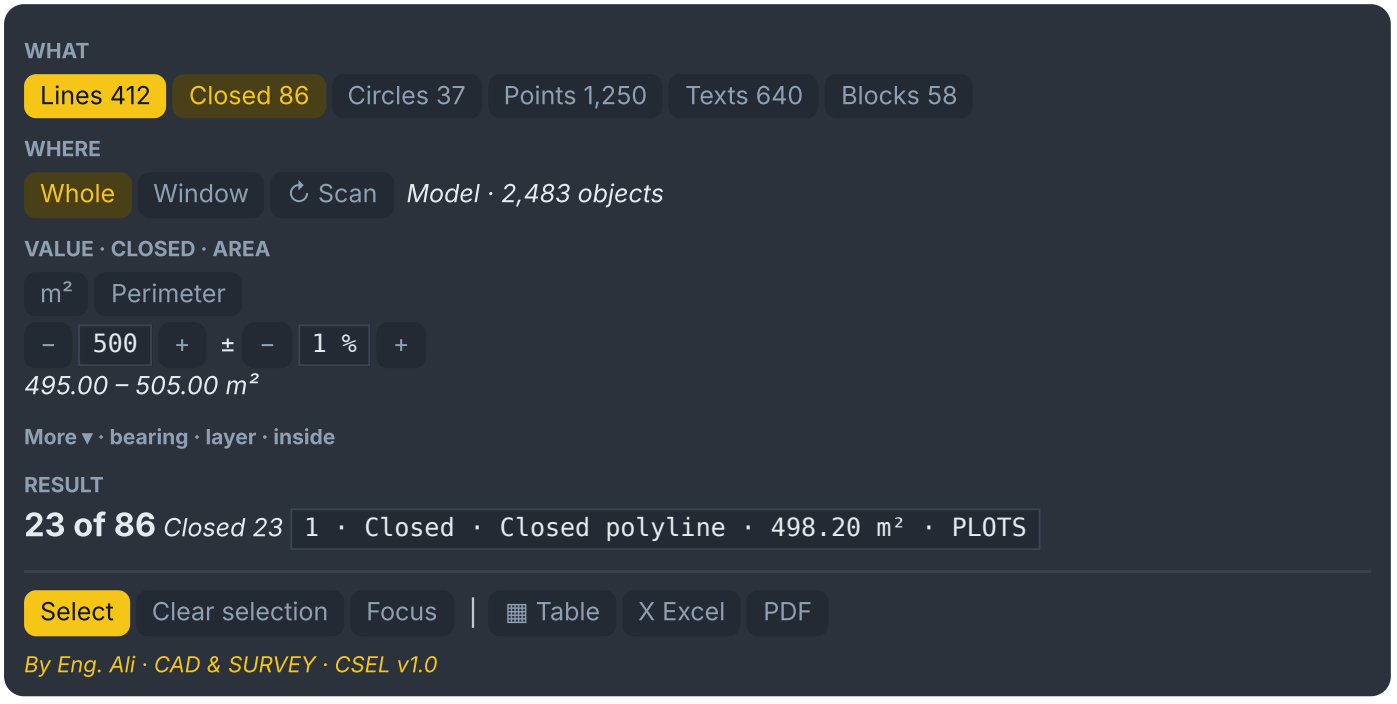
Choose a kind of object and type a value: the tool finds everything in the drawing that fits - plots between 400 and 600 m², pipes of Ø 0.60, lines bearing 45°, points with a level between 7.00 and 8.50, level texts, blocks by name. The count follows while you type, the objects glow gold in the drawing, then you select them and use any command, or put them in a table, Excel or a PDF report.

PRO A PRO tool: one 30-day trial for all PRO tools, from the first use of any of them; then it needs an activation code. How to activate ›

i **Exercise 19:** find objects by value in a busy site drawing: plots of about 500 m², 6 m kerbs, Ø 0.60 pipes, levels in a band, then Focus and a PDF report. Files in `Training\19_CSEL\` . Open the exercise ›

1 The palette

Type `CSEL` (or Survey Select on the CAD & SURVEY ribbon, Points & Drawing panel). A side palette opens and reads the current space (Model or the layout you are in) by itself.



2 The kinds and the value of each

Every tile under WHAT is a kind; the number under it = how many there are (whole drawing, or inside the Window). The palette opens with no kind chosen: click a kind to turn it on or off; **more than one** can be on (each with its own value). Each chosen kind gets its value box under VALUE:

Kind	What it takes	Value
Lines	LINE and open polylines (2D and 3D)	Length (3D = true length)
Closed	Closed polylines, circles, hatches	Area m² or dunam (2500 m²), perimeter optional
Circles	Circles and arcs	The diameter Ø, the radius R or the circle area m² (the chips Ø · R · Area side by side, the chosen one gold)
Points	POINT and Civil 3D COGO points	Level (Z or elevation), one value or a range like `7-8.5`. Or the code with the `Code` chip next to `Level`: part of the description or name, several with commas (`MH, TBM`)
Texts	TEXT · MTEXT	**Number**: the number written (7.25, EL 7.25, +7.25). **Contains**: words in the text
Blocks	Blocks (survey symbols)	Name (MH*, VALVE); ▾ lists all names

i A circle is a closed shape and a circle: with only Closed on it is judged by its area; with Circles on, by its diameter.

i **Circles** counts circles and arcs together; the split shows under the value box and in the tile note (e.g. `164 = 156 circles + 8 arcs`). **m · mm:** for Lines and Circles you can type the value in millimetres: choose `mm` and type `40`; it is divided by 1000 (the drawing is in metres) and the grey line shows it in metres, `0.0396 – 0.0404 m`.

3 The smart value box

You type	Meaning	The box becomes
`500`	About 500 ± the tolerance (default 1 %)	[−][500][+] ± [−][1 %][+]
`400-600` · `400 600` · `400..600`	From - to	From [−][400][+] To [−][600][+] ⇄
`>500` · `<500`	More than / less than	[>][−][500][+]

empty	All	

– / +	Step the value by a tidy step of about 1 % (500 → 5, 12.5 → 0.1, 0.60 → 0.01). Hold = repeat; ↑ / ↓ in the box do the same. The count and the gold marks follow every step.
±	The tolerance: `1 %` of the value, or an absolute value like `5`. – / + widen / narrow it (0.5 % a step). Hidden for a range.
⇄ one value	Back to one box.
The grey line	The real window that counts, e.g. `495.00 – 505.00 m²`.

4 Where and More

Whole · Window	Whole = the whole space. Window: pick two corners; only objects whose centre is inside count, and every change after it is live. Scan reads the drawing again (it also happens by itself after a command changes the drawing, a drawing switch or a layout switch).
Bearing	Lines only: the bearing clockwise from north (grid north = +Y), as `45` · `45.5` · `45°30'` · `45 30 00`, with a ± tolerance. **Both ways**: a line drawn the other way (225°) counts too. A polyline counts when **any** of its straight segments fits. A grey line under the box shows the real range, e.g. `→ lines 40° – 50°`.
Layer	Layer names with commas, * and ? allowed (FL-*). ▾ lists the layers of the space.
Inside	Pick… a closed polyline: only objects whose centre / point is inside count. ✕ forgets it.

5 Result and buttons

23 of 86	How many fit, of the objects of the chosen kinds in the chosen place, with the count per kind under it. They glow gold in the drawing (the first 1000, once a condition is set) while the palette is open; nothing is written in the drawing.
The list	No · Kind · Name / Code · Value · Layer. Click a row = zoom to it and mark it for 3 s.
Select	Selects the objects in AutoCAD (grips). Then run any command: MOVE, ERASE, CHPROP, COPYCLIP, PROPERTIES…

Clear selection	Clears the AutoCAD selection (grips); the found list stays and Select picks them again.
Focus	Hides every other object of the space so only the found ones show. Show all brings them back. Right-click: show every hidden object of the space.
Table · Excel	An AutoCAD table at a picked point, or an Excel file (No, kind, name / code, value, unit, layer, E, N, Z; X, Y in a local drawing).
PDF	A4 report: logos and project info, summary tiles (count, total, min - max, average) and the filter used, the distribution chart, the plot plan (the drawing behind as clear as you choose in `Drawing under the plan`: Off / Faint / Medium / Clear, default **Faint**; the other objects faint grey, the found objects gold and numbered up to 300, north arrow and scale bar) and the list. Presets **Full** or **Summary only**. Right-click = report options and Project info....

⚠ Focus really hides the objects (their Visible flag). Saving is safe: the file is saved with everything visible and the focus comes back after the save. Closing the drawing or the CSEL palette shows all again. If something stays hidden: open CSEL and right-click Focus.

i **Limits:** splines and ellipses are not read. The gold glow shows the first 1,000 objects (Select, Focus and reports take all). A table over 1,000 rows asks first.

i **Nothing found?** When the result is 0 for a kind with a typed value, the 5 most common values in the drawing show under the count (e.g. `Ø 0.040 ×800`). Click one to put it in the value box (mm off) and count again. When a drawing has very few texts but very many short lines, a tip after the Scan says the texts look exploded into lines (they count as Lines).

i **Auto-fill:** in Project info, `Auto-fill` (next to Save) fills project, location, client, names and logos from the last Project info you saved in any tool; still-empty boxes come from My Profile. Check, then Save.

6 Examples

A. Plots between 400 and 600 m²

1 `WHAT: Closed only · VALUE: 400-600 (m²)`

`400.00 – 600.00 m²`

Type 400-600: the box becomes From / To.

2 More › Layer: PLOTS

23 of 86

In dunam: switch m² to dunam and type 0.16-0.24.

B. Pipes Ø 0.60

3 WHAT: Circles · Ø · VALUE: 0.60 ± 0.005

0.595 – 0.605 m

With the default 1 % the window is 0.594 – 0.606.

C. Lines bearing 45° ± 0°30'

4 WHAT: Lines · More › Bearing 45 ± 0°30' · Both ways

44°30' – 45°30' and 224°30' – 225°30'

Bearing = atan2(ΔE, ΔN). A line (0,0) → (10,10): atan2(10, 10) = 45°.

D. EG points with a level between 7.00 and 8.50

5 WHAT: Points · VALUE: 7.00-8.50 · More › Layer: EG

7.00 – 8.50

COGO points are read with their elevation in Civil 3D; in plain AutoCAD they are not counted, use POINTs or level texts (Texts › Number with the same values).

7 Questions

▼ **Why is the count 0?**

Look at the grey line under the box (the real window), and empty Layer and Inside under More. After drawing something new, press Scan.

▼ **What counts as inside the window?**

The centre of a closed shape, the middle along a line or polyline, the centre of a circle, the insertion point of a block or text.

▼ **Kilometres or millimetres?**

The tool reads drawing units as metres. If the drawing is in millimetres, type the values in millimetres; areas are then mm² (1 m² = 1,000,000 mm²) and the dunam chip gives wrong values.

▼ **Select them and change their layer?**

Select, then pick the layer in the Layers toolbar or Properties. U undoes it.

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By Eng. Ali · CAD & SURVEY · Guide

CAD & SURVEY
ENG. ALI

My Profile `CSPROFILE` Me, my instruments, my projects

Write your name, instruments and projects once, and the tools use them: reports fill themselves, each drawing remembers its project, an alert comes before a calibration ends, and friendly messages say your name. Everything stays on your PC and is never sent anywhere. Free for everyone.

1 Open it

Press **My Profile** on the CAD & SURVEY panel of the ribbon, or type `CSPROFILE`. At the top: your photo (or initials), name and role; below, three tabs **Me · Instruments · Projects**. **Save** keeps it, **Cancel** goes back to the last save.

2 Me

- **Name (English)** (needed): goes on the reports as Surveyor. **Name (Arabic)** (optional): for the Arabic messages.
- Role (Surveyor / Engineer), phone, e-mail (optional), company, country and a photo (cut to a circle; the switch *Show my photo on the ribbon button* puts it on the ribbon). Your name, phone and e-mail fill the activation / price requests of `CSPRO` and the Help & support request by themselves, so the answer reaches you. Empty is fine: you can type them there.
- **Messages language:** Auto (by country: Iraq = Iraqi, Gulf, Egypt, Levant, others MSA) · Iraqi · MSA (the chip says فصحى) · English. Tooltips stay as they are.
- Switches: call me by my name · a short 'well done' after a report (at most twice per drawing) · break reminder after 2 hours (off by default).

⚠ Fields that go to the PDF reports (English name, company, project, client, location, instrument model): write them in English so they print right. Arabic letters show a small note.

3 Instruments

Press **+ Instrument**: type (Total station / GPS / Level / Other), model, serial, last calibration, next due (empty = one year later) and the certificate (PDF or photo, **Open** shows it). The list shows each state: **valid** · **soon** (≤ 30 days) · **late**. Dates as `dd-MM-yyyy` (e.g. `15-03-2026`). The certificate is not copied: only its path is kept, so keep certificates in a fixed folder.

Calibration alert: when AutoCAD starts (and once a day) for the instruments of the current project (or all your instruments when none are ticked for it): calm gold 30 days before, orange 7 days before, pulsing red when it has ended. Buttons: *I renewed it* (opens the instrument to type the new date) · *Remind me tomorrow* · *In a week* · *Don't remind me for it* (until its date changes).

4 Projects

Project ▾ with **+** / Rename / Delete: client, location, people, and tick its instruments. **Link this drawing** stores the project inside the DWG; opening the drawing makes its project the active one.

The project question: after the first save of a new drawing a small card shows at the bottom-right (never during the save): Project ▾ · *Link* · *Not now* (asks at the next save) · *Not for this drawing* · and "Don't ask me anymore". Setting: At the first save (default) · When I make a report (choose in Project ▾ of Report options) · Never.

i **BENCHMARKS:** the project card shows how many benchmarks the Benchmark Manager project of the same name has; `Open in Benchmark Manager` opens it (makes it when there is none) when this window closes.
Report no.: the Project info windows show in grey the number after the last one saved in that tool (SUR-GRD-007 → SUR-GRD-008); double-click the empty box to use it.

5 Where it is used

- **Project info…** of every report (CAREA, CLEN, CDIV, CVOL, CPROF, CGRID, CNOTE, CBM, CSEL, SREPORT): only EMPTY fields fill: project, location, client, surveyor.
- SREPORT: the ▾ next to the instrument box lists the project's instruments and fills model, serial and "calibrated until".
- The CNOTE alert speaks the messages language (Iraqi / فصحى / English).

✓ Stored in `HKCU\Software\CADSURVEY\Profile`, `%AppData%\CADSURVEY\profile.dat` and `profile.jpg`; the project inside each DWG. Nothing is sent.

i **New computer?** Copy `profile.dat` and `profile.jpg` from `%AppData%\CADSURVEY` to the same place on the new PC. Type your name and role again (they are in the registry).

6 New in 2.4.1

1. **My Profile is now a social-media style page:** a survey cover (contours, E/N grid ticks, benchmark, scale bar, north arrow), your big photo, name and role.
2. **A ring around your photo** = how complete your profile is, with a gold line telling what is missing. 100 % = a gold ring with ✓.
3. **MY WORK:** Projects, Drawings, Reports, Subdivisions, Instruments, Active days. The numbers count up when the page opens; click one to see the newest items with Open. All time / This month.
4. **How it counts:** only main jobs and the result that stayed: a drawing once, the same report of the same drawing on the same day once, a subdivision goes off again with Undo or erase. Counting starts when 2.4.1 is installed.
5. **Instruments:** a ring with the days left to calibration: green, orange at 30 days or less, red pulsing when late. **Projects:** a ring of 5 facts (client, location, people, instruments, drawings).
6. **Badges:** at 10, 25, 50, 100 ... reports, drawings or subdivisions, with a short gold toast. `My badges ›` = your badges and a 7-day log; 🔥 days in a row (a Friday off never breaks it).
7. **Continue where you stopped:** the last drawing you worked on, with Open. **Edit profile** opens the editor and comes back to the page after Save.
8. An empty profile: a quiet corner hint "your profile page is waiting", 3 times only, on 3 days. Arabic messages take your name from the Arabic name field only.

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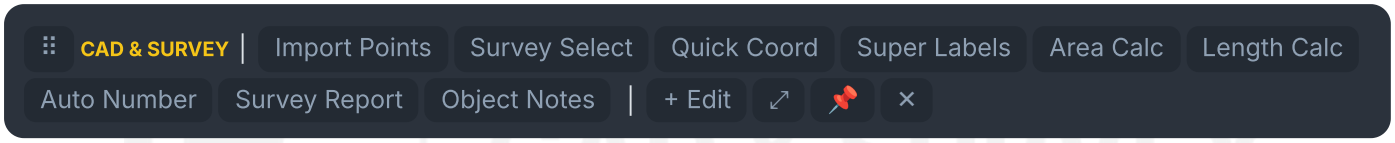
Guide › CAD & SURVEY

Quick Bar CSBAR Favourite tools bar

A small floating bar over the drawing with the tools you use most: icon and name; one click starts the tool exactly like its ribbon button. Free for everyone.

1 How it works

1. Type `CSBAR` or press **Quick Bar** on the **CAD & SURVEY** ribbon panel: the bar appears.
2. Click a tool to start it. Hover it to see its note (Arabic and English).
3. **Edit** opens the list of all tools, grouped like the ribbon panels: tick the ones you want. They show in the ribbon order.
4. The bar remembers its place, size and choices; if it ends up off the screen it comes back inside.



2 The bar buttons

⠿	Drag it (or the CAD & SURVEY mark) to move the bar. **Right-click**: **One row**, **Two rows**, **Vertical** (one column, the name beside the icon, ⠿ on top and the buttons at the bottom), **Names** under the icons on / off, **Open with AutoCAD** (the bar opens by itself when AutoCAD starts), **Edit tools...** and **Help**.
Tools	The same icons and names as the ribbon. PRO tools carry a small PRO mark. Right-click a tool for the same menu as ⠿.
+ Edit	Choose the tools of the bar. **Default** ticks the starting set again: Import Points, Survey Select, Quick Coord, Super Labels, Area Calc, Length Calc, Auto Number, Survey Report, Object Notes.
⤢	Bar size: 3 sizes.
📌	Pinned (default): the bar stays open after you start a tool. Off: it hides after the click; `CSBAR` brings it back.
×	Closes the bar.

i The bar follows the AutoCAD theme (dark or light) by itself. The settings stay on this PC only.

Defaults	One row · names on · pinned 📌 · Open with AutoCAD off
+ Edit	My Profile can be added too (CAD & SURVEY group)
Stored in	`HKCU\Software\CADSURVEY\QBar`

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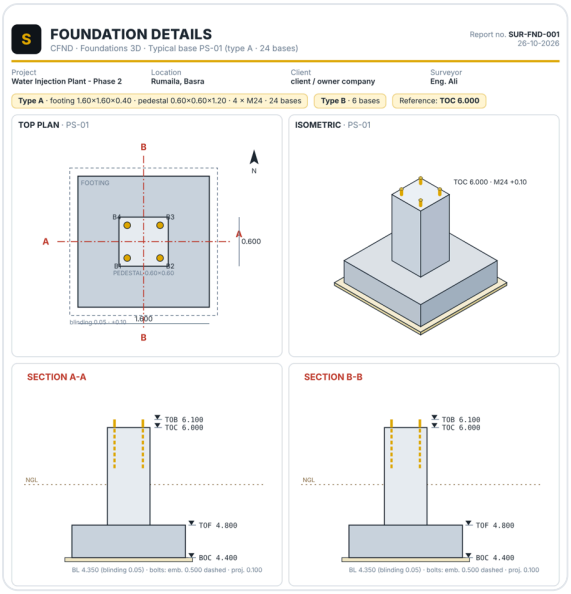
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🚀 Coming soon

These tools are on the way in the next versions, and some of them came from your ideas.

🚀 Soon



★ The big one

CFND Foundations 3D PRO

- Turns bases and pipelines from 2D into light 3D solids at their real levels, anchor bolts included.
- Select tens of bases at once: the tool groups them by type, and you enter the sizes once per type.

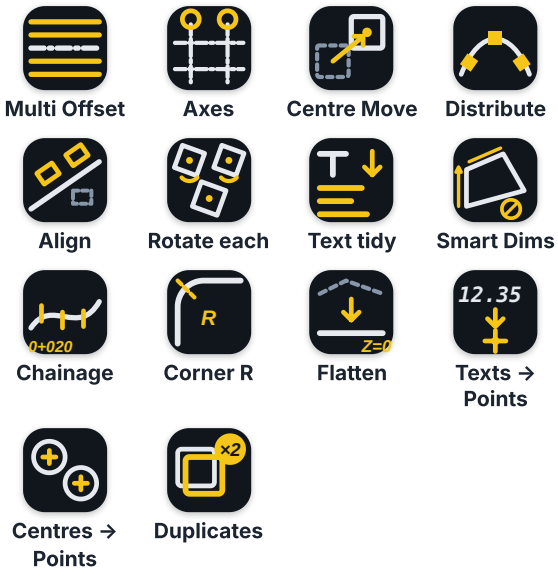
Pipe supports · Sleepers · Combined footings · Grade slabs + pedestals · Flare bases: octagonal pedestal, bolts on a ring · Pipelines

The report gives you:

- Plan · Isometric
- Sections with levels `TOB · TOC · TOF · BOC`
- Anchor-bolt table `E · N · Z` · Excel

> **“Every bolt and every corner gets its X Y Z and level in one click. Nothing forgotten.”**

🚀 Coming soon · PRO



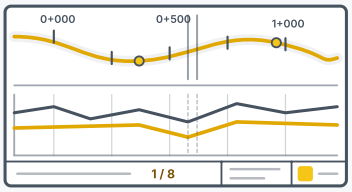
★ One palette · 14 actions

SEDIT Smart Edit PRO

14 one-click smart edits for surveyors: each does ONE job on many objects at once, with a live gold preview before placing.

- **Multi Offset**: The road centre line from the design → carriageway, curb and sidewalk lines for setting out, in one step.
- **Axes**: Pipe-rack or building axes to set out the columns and check them against the as-built.
- **Centre Move / Copy**: One typical foundation dropped on all the centre points you surveyed.
- **Distribute**: Supports around a tank ring or along a pipe route at the design spacing.
- **Align**: Footings turned to the pipe route before setting out.
- **Rotate / Scale each**: Symbols, north arrows and blocks fixed in place, without moving them.
- **Text tidy + Merge**: Point no., level and description scattered around → one clean label.
- **Smart Dims**: Plot or fence sides measured and dimensioned for the client sketch.
- **Chainage**: Stations along the route, just like the design drawings.
- **Corner R**: Curb returns at road junctions, before setting out.
- **Flatten**: random Z in contractor drawings fixed · **Texts → Points**: written levels become real levels · **Centres → Points**: anchor-bolt centres for the total station.
- **Duplicates** + **Overlaps**: double or overlapping lines and points in contractor drawings glow gold, then go or merge in one step.

"Every action = one step, many objects, preview first, one Undo."

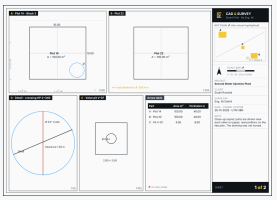


Soon

CSHEET Alignment Sheet PRO

- Plan and profile sheets of a pipeline or a road along the route, page by page.
- Stations, crossings, vertices and the title block included.

"A 10 km route comes out as sheets ready to hand over, without drawing each one by hand."



Soon

CPLOT Smart Print PRO

- Professional PDFs with no plot setup: pick windows anywhere, get sheets with viewports and a title block filled from Project info.
- Modes: True scale · Close-up (far parts gathered on one sheet + key plan) · Sketch (not to scale).
- Readability check and split into chained sheets, detail magnifier; key plan, north arrow, scale bar and table on every sheet.
- Line weights tamed for print, plus a WhatsApp-ready image.

"Windows from anywhere in the drawing → neat PDF sheets, no Page Setup."

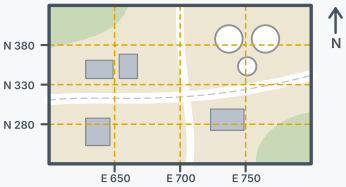


Soon

CPDF PDF to CAD FREE

- Brings lines, arcs and texts from a PDF drawing back into AutoCAD.
- At the right scale, as real lines, not a picture.

"The consultant only sent a PDF? Work on it like a DWG."

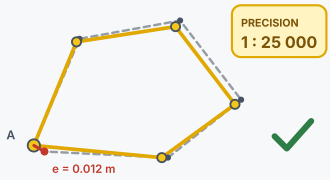


Soon

CIMAGE Aerial Image PRO

- An aerial picture of the site, placed in its right spot in the drawing.
- With a coordinate grid, ready to print.

"The office gets the site at first glance, with coordinates on the frame."

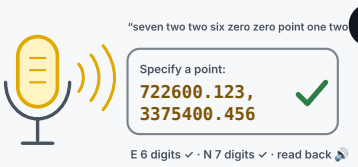


🚀 Soon

CADJ Closure Fix FREE

- Traverse and levelling-loop adjustment: finds the misclosure and spreads the error.
- Then gives a quick report with the precision.

“The 1 : 25 000 ratio is ready before the consultant asks.”



🚀 Soon

CVOICE Voice Input PRO

- Press 🎤 and read the coordinates aloud in English: single digits or numbers like “twenty five”, plus “point” and “next”.
- It goes into AutoCAD prompts and our tool boxes, checks the digit count and reads it back before drawing.

i 🔇 Best in the office: noise and loud voices disturb the recognition. Speak clearly and calmly, number by number.

“Eyes on the contractor’s sheet, your voice types the coordinates.”

Your idea could be next

Send it from `CSABOUT` › 💡 Suggest an idea, or to eng.alicadsurvey@gmail.com

These tools come in the next versions; details may change a little until they are ready.

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SEDIT Smart Edit · the 14 actions PRO

One palette, 14 smart edits, each one click. Pick many objects, watch the live gold preview, then place.

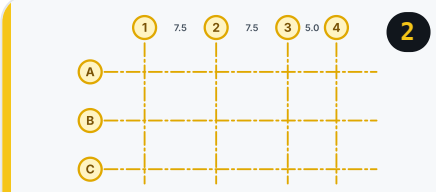
your objects before the result



Multi Offset PRO

Several offsets in one go from a centre line or outline, left / right / both, saved as presets.

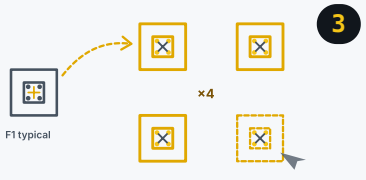
For the surveyor: the road centre line from the design → carriageway, curb and sidewalk lines for setting out, in one step.



Axes PRO

An axis grid from typed spacings (e.g. 2×7.5 + 5), with numbered and lettered bubbles.

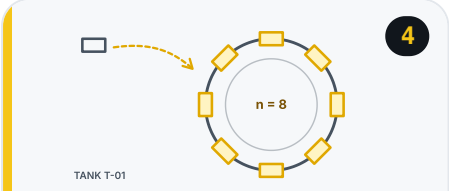
For the surveyor: pipe-rack or building axes to set out the columns and check them against the as-built.



Centre Move / Copy PRO

Drops a shape or a whole group with its centre on a point, or copies it onto many points.

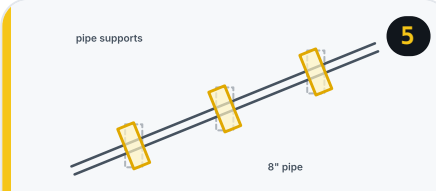
For the surveyor: one typical foundation dropped on all the centre points you surveyed.



Distribute PRO

Spreads an object along a line, arc or circle by distance or count, turned to the path or as the original.

For the surveyor: supports around a tank ring or along a pipe route at the design spacing.



Align PRO

Turns many objects to follow a line, each in its own place.

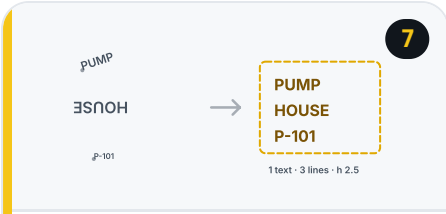
For the surveyor: footings turned to the pipe route before setting out.



Rotate / Scale each PRO

Rotates or scales every object about its own centre, not about one base point.

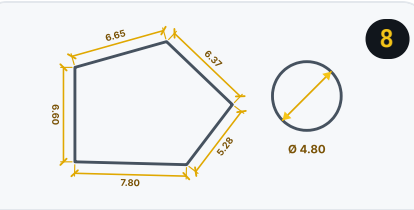
For the surveyor: symbols, north arrows and blocks fixed in place, without moving them.



Text tidy + Merge PRO

Makes texts readable at one height; Merge joins the texts you click into one multi-line text.

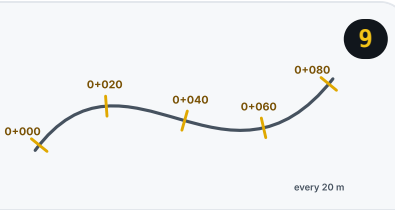
For the surveyor: point no., level and description scattered around → one clean label.



Smart Dims PRO

Every polyline side dimensioned in a clear spot; arcs get R, circles Ø.

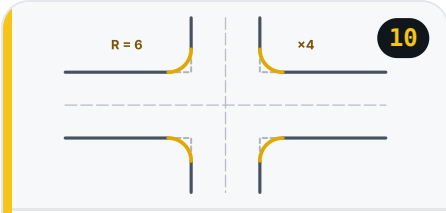
For the surveyor: plot or fence sides measured and dimensioned for the client sketch.



Chainage PRO

Station ticks and labels every N m: 0+000, 0+020 ...

For the surveyor: stations along the route, just like the design drawings.



Corner R PRO

One radius on many corners in one go.

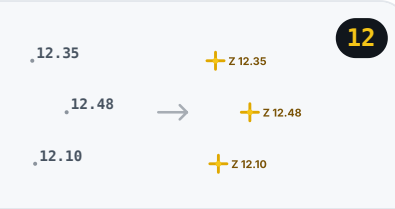
For the surveyor: curb returns at road junctions, before setting out.



Flatten PRO

Puts lines, polylines and blocks on Z = 0.

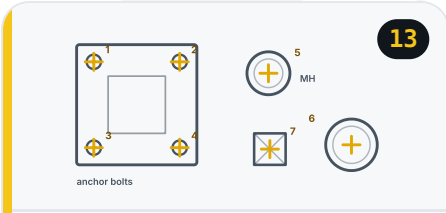
For the surveyor: contractor drawings with random Z: snaps and lengths come out right.



Texts → Points PRO

Level texts become points; Z = the number in the text.

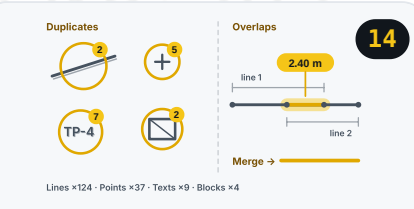
For the surveyor: old drawings with written levels become real levels for volumes and contours.



Centres → Points PRO

A point at the centre of every circle or block.

For the surveyor: anchor-bolt centres as points, ready to send to the total station.



Duplicates PRO

Finds what is drawn twice (lines, points, texts, blocks): a gold circle with the count, extras removed with one Undo. Overlaps mode: partly overlapping lines show the overlap length; Merge makes them one line.

For the surveyor: double lines and points in contractor drawings that make lengths, counts and areas wrong.

"Every action = one step, many objects, preview first, one Undo."