TOPOGRAPHIC
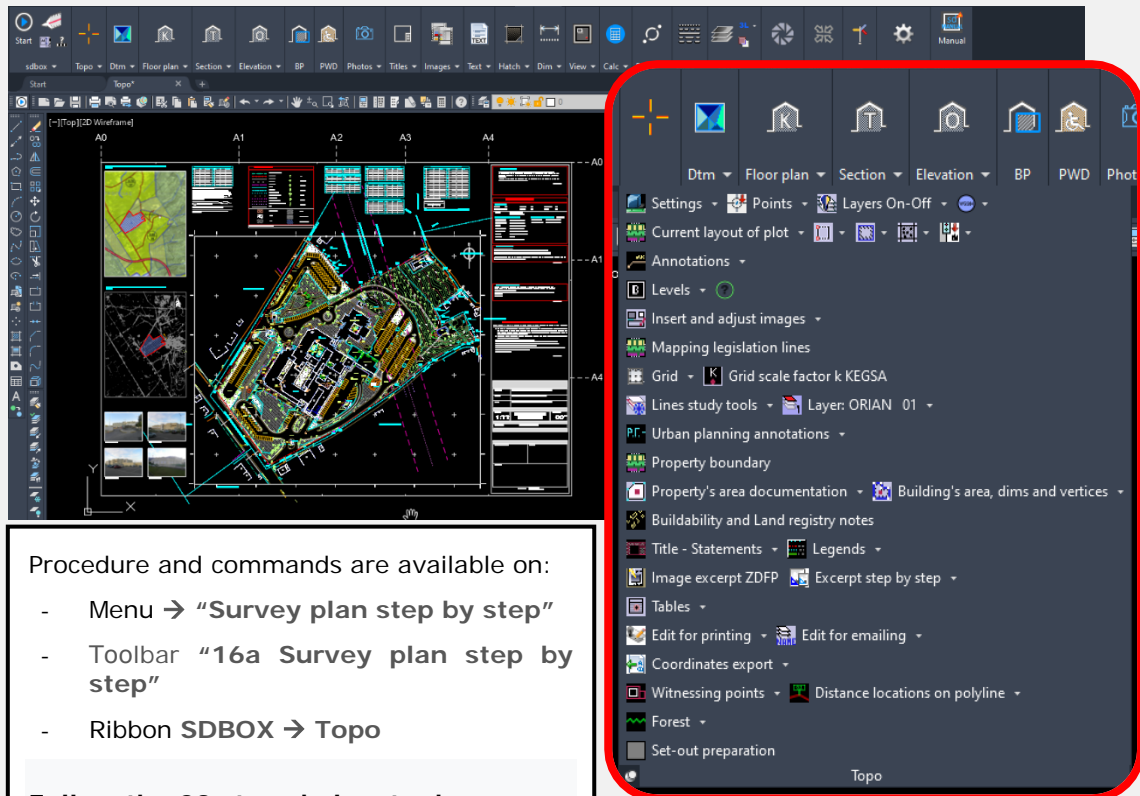
DETAILED INSTRUCTIONS FOR TOPOGRAPHIC SURVEY PLANS

Procedure and commands are available on:

- Menu → **"Survey plan step by step"**

- Toolbar **"16a Survey plan step by step"**

- Ribbon **SDBOX → Topo**

**Follow the 23 steps below to draw up a complete Survey plan:**

Note: Links for Manual in English are being developed and will be completed soon. Until then automatic translation is provided. (For those of the videos that are in Greek, subtitles are provided.)

0. Settings
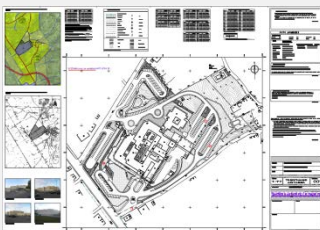
Recommended settings: **SDBOX → Settings→ Default settings for building mapping and topographic surveys.** This process only needs to be done once.

1. Units
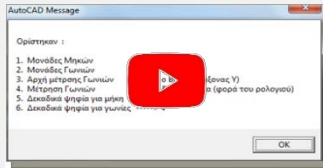
At the beginning of each plan, it is suggested to define, only once, the units of the drawing as following: Length-units in meters with precision of 3 decimals, angles in grad with precision of 4 decimals, beginning of angle measurement to be North and direction clockwise. (*SDBOX →Topographical→ Definition of Topographic Units*).

*Note: Alternatively, it is recommended to start each new Survey plan with the Template **ZZLF.dwt** included in the installation folder (usually C:\ SDBOX) which also includes useful Layers Filters. See video [here](#).*

2. IMPORT SURVEY POINTS

Importing Survey Stations, Points, GPS, Waypoints and other points from a coordinate file (txt, csv, xls, etc). The input file can have rows (records) such as **x,y** or **x,y,z** or **code,x,y,z** or **code,x,y,z,desr** etc.

SDBOX →Topography → Insert points from a coordinate file: Select the file and the type of points to be imported. See in detail **here** .
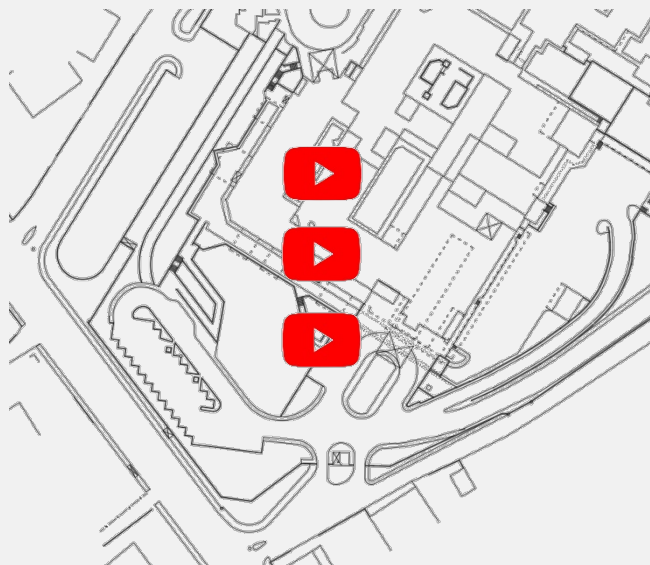
Point management

Resize points: You can resize points to be sharp (depending on density and scale) with the ZCS command.

On-Off points: You can open or close points layers automatically by SDD command (with setting SDD1) for easier drawing.

3. Draw current state of plot:

Add to plan all existing structures and configurations (Buildings, side walls, dry stone wall, hedges, wire fences, railings, shoreline, slopes, terraces, vegetation boundaries, asphalt limits, dirt roads, paths, floor dividers, porches, flower beds, etc.)

ZLL: Select item to add and type (line or polyline) and draw by typing the codes or use the point construction features .

Design tools *(that also work by typing codes of Survey nodes):*

Rectangle by 2 points (MR2)   Rectangle by 3 Points (MR3)

Spline by points (MSP)   Circle by 3 points (MK3)

Circle by Center+Radius (MKK)   Arc by 3 points (MJL)

Copy to Point (MCC)   Offset to Point (MOF)

Rectangle by sides (ZDTT)   Rectangle by 4 points (ZR4),

4. HATCH & FLOORS OF BUILDINGS

Hatch for Buildings

HKT: Specify a point inside a closed building polygon and the Hatch is automatically added.

PHKT: Specify the vertices of the building and Hatch is automatically added.

Characterization of buildings 1K

XKT : Choose from a dialog (number of floors and type of roof) 1B, 2R, 3L etc. and place each text to its final position (close to the center of the building).

5. HATCH FOR GROUND:

⊞ Flowerbed or Soil (HHP)

⊞ Grass (HGR)

⊠ Poes (HPOES)

⊞ Shrubs-plants (HTHAM)

⊞ Paving (ZHH).

You can also mark areas by delineation ⊿(HHD) or dotted ⊞ (HHT) hatch.

6. INSERT SYMBOLS
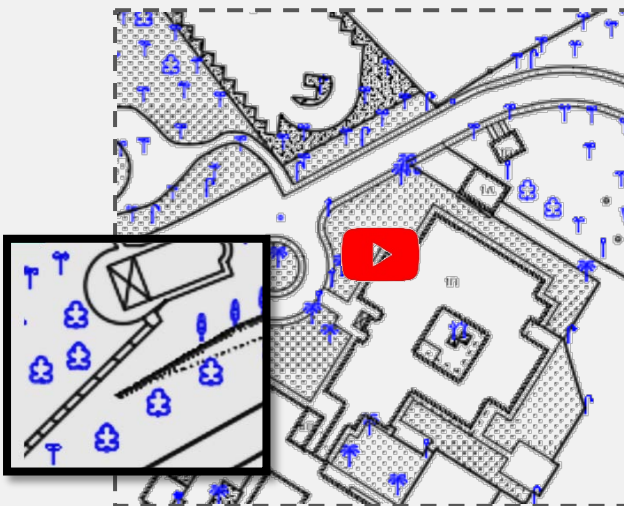
Insert symbols for existing state (trees, bushes, pillars, lanterns, wells, etc.).

MBL: Select the symbol and add it by typing the codes or use the point construction features .

You can also enter symbols in bulk (eg from code 142 to 188).

Note: The symbol size is automatically adjusted by the print scale.

7. ANNOTATIONS

Block annotation NNB (e.g., road curb, balcony, overhead projection etc.)

Text annotation NNA (e.g., concrete, asphalt, soil)

Building usage NNX (e.g., Shop)

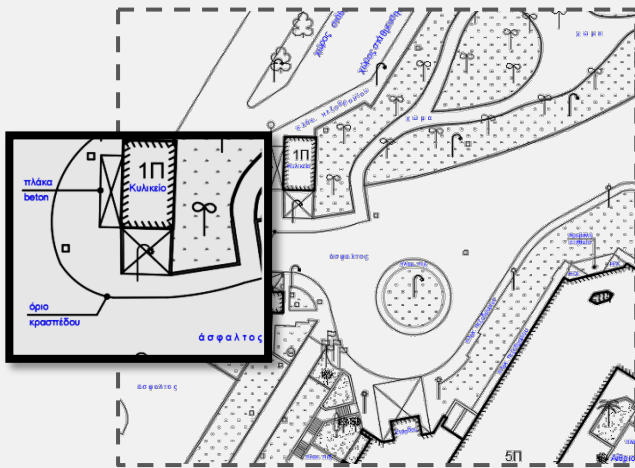**Road names** NNOD (e.g., Avenue, Agricultural Road)

Toponyms-areas-places NNTOP (e.g., Square, Village)

NNT **Arrow pointer** (e.g. towards the sea)

ZNN : All annotations commands.

ELE **Personal Notes:** Leader for personal notes or for observations. The Layer of these notes must be closed when printing.

POP **For On- Site Inspection:** Leader for that pertain to on-site inspection or an important note that needs to be resolved prior to delivery. They are printed in red on all sdbox's plot styles. Their Layer must be closed for final printing.

VLV **Dimension for inspection:** Line with arrows on both ends concerning a dimension for on-site inspection or a significant difference that must be resolved before delivery. They are printed in red on all sdbox's plot styles. Their Layer must be closed for final printing.

8. DATUM LEVEL

Change datum level: In the event that the elevations of the plan are not absolute altitudes, then it is suggested to set datum level (0.00 at one of the peaks of the face of the property or that of the architectural design) and change all elevations of the survey points with the **ZNMB command** .

Coordinate export: After changing the elevations of the points, it is recommended to export them to a file in case you need to re-import them or use them for new measurements or set-out.
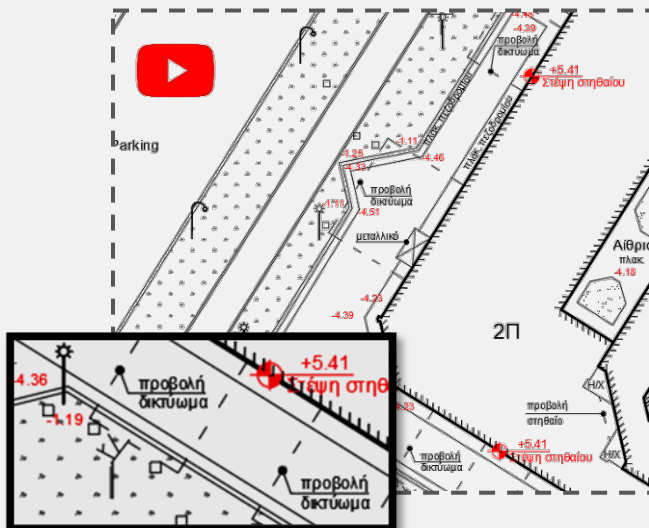
ZXPOL : Export survey stations.

ZXTAX : Export survey point.

9. INSERT DATUM LEVEL (0.00)

Enter the datum level symbol with the **ZST command** where you select "zSt01 Level 0.00".

10.   ELEVATION DISPLAY

BVC: Elevations at characteristic points: Pick which altitudes of the survey points will be displayed (recommended on the peaks of the plot, on the ground of neighbors, on leveled areas, terraces, on the curb and other characteristic points).

ZST Levels at the roof ridge, and levels of the building (ground floor, basement, etc.): Use the command with option "zSt38 Level with note".

TERRAIN: TRIANGLES - CONTOURS
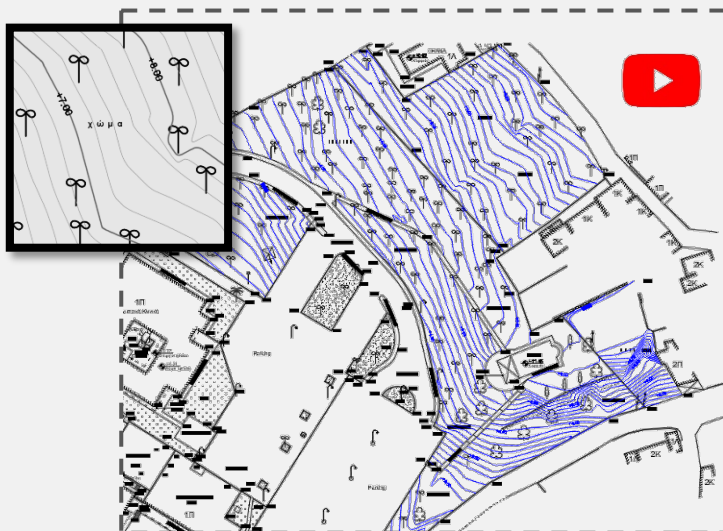
Calculating contours example in 6 simple steps:

1. ZDTS : Select the points that will be able to participate in DTM.

2. ZDTMA : Calculation of triangles in any area you specify. ZDTM : Specify closed areas for calculations.

 3. ZDTMB : Redesign of contours based on break - lines . *(Select the break-lines (Lines, Polylines and Splines) that are gradient lines, and then the triangles near those lines are automatically recalculated. There is no need to have survey points on each vertex of those lines.)*

4. IIJ : Temporary drawing of contours for checking. *(You can browse the design by command IIJK to see the contours and if you need to add triangles by ZTIN , to mass delete triangles within closed regions of your choice by ZDTMD , to delete individual triangles by TTD , transpose neighboring triangles by TTR etc.).*

Check triangles calculation:

ZTTDBL Double triangles **ZTTKK** Perpendicular Triangles **ZTTSD** Problematic Triangles

5. ZDTMISO : Final design of contours.

6. IP2S : Smoothing contours and SSA : display elevations on basic contours or individually wherever you want.

11. GRID ▶

KNBS : Specify the area and Grid crosses, frame and coordinates display is automatically added.

Other Grid commands:

KNB : The cross threads of the Grid are drawn (without frame).

KNBT : Coordinates are drawn at points specified on the Grid.

KNBFT : Size factor of Grid coordinates.

KNBK : Grid is drawn as in the extracts from the National Land Registry.

COMPASS

ZBOR: Import compass at a point within the canvas.

Coordinates system

Choose from the tab of the ZTITLOIS command to enter the Grid Reference System which you place in the upper left corner inside the Grid (UTM, WGS84, Local etc).

12. IMPORTING IMAGES AND ADJUSTING THEM ON THE DESIGN

If you have images such as City map, Street diagram, Location map, Distribution, older topographical maps, etc. that you want to adjust behind the design then:

1. Import the image by **ZIMIN command** .

2. Adjust image to its actual dimensions with ZDFA (adjust by one length) or ZIMDD (average of known sides) or adjust the image to common point pairs by ZMRS.

Note: Suggested layers for images are prefixed with **tiff_p_**** to be grouped by the tiff prefix and distinguish those that have been adjusted to the drawing (**_ p _**), as opposed to cliped images (for printing as an excerpt) which are prefixed with **tiff _ a _****.

In case you have georeferenced images, you can import them with the **ZIMGEO command** .

Note: During drawing you can check or redefine a georeferenced image with the ZIMGS command .

13. DRAWING STATE LINES
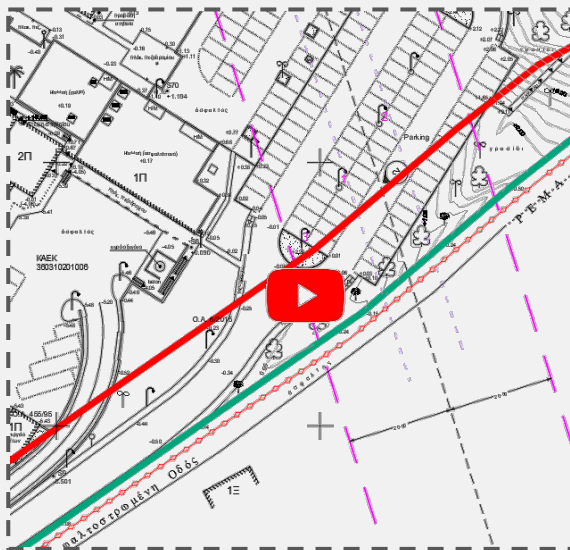
ZLL : Design of all town planning Lines (street limits, building lines, delimited stream, Beach, Forest, Settlement boundary, Expropriation boundary, Road axis, etc.).

Tools:

 Isolate Objects (ZF)   Unfreeze All (ZFF),

 Display all layers in gray color except those selected with ZFG command and reset all with ZFGG.

 Optimum straight line (BLST)   Distances between 2 Polylines (ZDD2).

 Average polyline (ZKMX)   Open close images (SDD)

URBAN INDICATIONS:

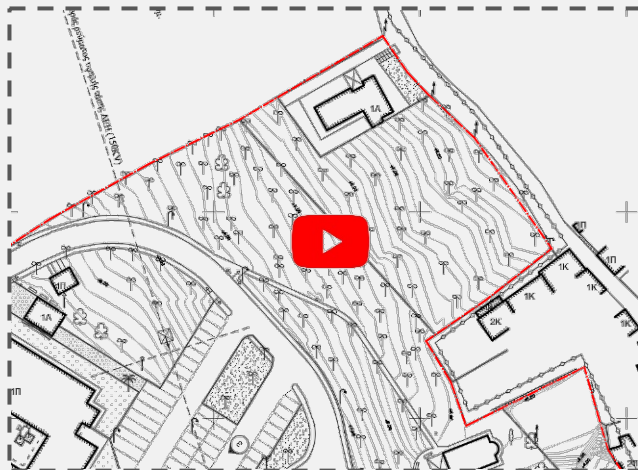 **Inscriptions on state lines (**RGOG **)**

 City block names (ZKYK **),**

 Town planning areas (NNM**),**

 Width of roads (ZDA**).**

14.   PROPERTY BOUNDARIES:

Property boundary (LXID),

Limits of neighbors (LXOMR),

Vertical ownership axis (LXKATH).

Check out the rest of the drawing commands:

LXAD - PXAD	Initial property limits
LXAG - PXAG	Pipeline shaft
LXANAD - PXANAD	Land reclamation liimits
LXDIAN - PXDIAN	Distribution limits
LXDOYL - PXDOYL	Rigth of passing
LXIA - PXIA	Initial limits
LXID - PXID	Plot limits today
LXKATH - PXKATH	Vertical ownership limits
LXKTHM - PXKTHM	Cadaster boundary
LXOD - PXOD	Road axis
LXOMR - PXOMR	Neighbours limits
LXPEA - PXPEA	Implementation act initial lim
LXPET - PXPET	Implementation act final limit

15. PROPERTY'S AREA DOCUMENTATION
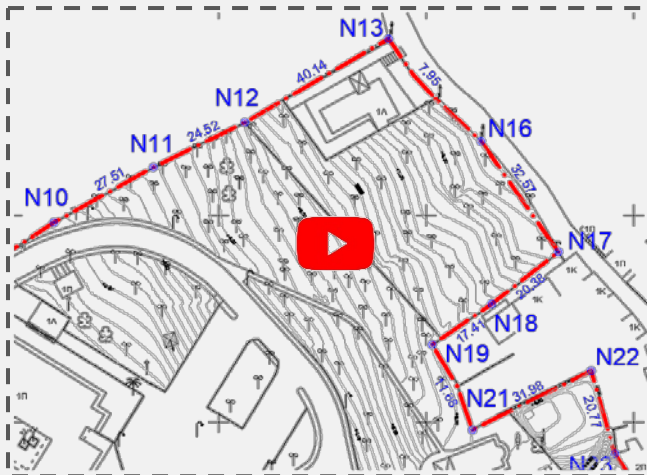
Auto insert Vertices, Side lengths, Area and Coords Table by the two following ways:

ZID : Specify a point in the center of the property (by ZF you can isolate the boundary lines surrounding it) or select a Polyline.

ZIDS : Specify area by picking consecutive points.

With the above ZID command, a coordinates Table and the Area are automatically imported:

ΣΥΝΤΕΤΑΓΜΕΝΕΣ ΚΟΡΥΦΩΝ ΙΔΙΟΚΤΗΣΙΑΣ (ΕΓΣΑ '87)							
AA	X	Y	Μήκη	AA	X	Y	Μήκη
N1	334385.322	4110785.047	N1-N2: 98.91	N17	334631.856	4110991.146	N17-N18: 20.38
N2	334327.269	4110865.127	N2-N3: 222.56	N18	334615.796	4110978.594	N18-N19: 17.41
N3	334444.197	4111054.494	N3-N4: 22.07	N19	334601.446	4110968.742	N19-N20: 11.68
N4	334460.931	4111040.097	N4-N5: 8.60	N20	334607.455	4110958.729	N20-N21: 11.16
N5	334466.368	4111033.436	N5-N6: 11.91	N21	334611.123	4110948.193	N21-N22: 31.98
N6	334473.767	4111024.098	N6-N7: 6.08	N22	334639.774	4110962.406	N22-N23: 20.77
N7	334476.431	4111018.633	N7-N8: 9.97	N23	334645.488	4110942.438	N23-N24: 14.20
N8	334481.701	4111010.165	N8-N9: 26.00	N24	334653.223	4110930.524	N24-N25: 10.62
N9	334499.688	4110991.385	N9-N10: 12.56	N25	334643.179	4110927.084	N25-N26: 10.57
N10	334510.215	4110998.237	N10-N11: 27.51	N26	334632.991	4110924.265	N26-N27: 37.99
N11	334534.246	4111011.619	N11-N12: 24.52	N27	334599.700	4110905.959	N27-N28: 18.05
N12	334556.278	4111022.380	N12-N13: 40.14	N28	334585.487	4110894.831	N28-N29: 36.00
N13	334590.924	4111042.651	N13-N14: 10.58	N29	334558.038	4110871.543	N29-N30: 94.06
N14	334596.876	4111033.904	N14-N15: 7.95	N30	334480.749	4110817.929	N30-N31: 8.03
N15	334602.301	4111028.098	N15-N16: 14.97	N31	334473.682	4110814.121	N31-N32: 89.75
N16	334613.232	4111017.871	N16-N17: 32.57	N32	334394.026	4110772.763	N32-N1: 15.06

Κορυφές: 32   Περίμετρος: 1024.62 μ.

ΤΥΠΟΣ ΥΠΟΛΟΓΙΣΜΟΥ ΕΜΒΑΔΟΥ

$$E = 0.5 \sum_{i=1}^{v} X_i (Y_{i-1} - Y_{i+1})$$

E (N1, N2, N3, ..., N30, N31, N32, N1) = 889.45 τμ

In case you have imported a property's vertices and want to add the table later you can use the Property Vertices Table command (ZPID).

Arrange vertices and side lengths

Check on the screen if the vertices and side lengths need to be arranged to print clearly. For the vertices you use the STRETCH command of AutoCAD and for the sides the MOVE command.

16. BUILDING's AREA, CORNERS & DIMENSIONS
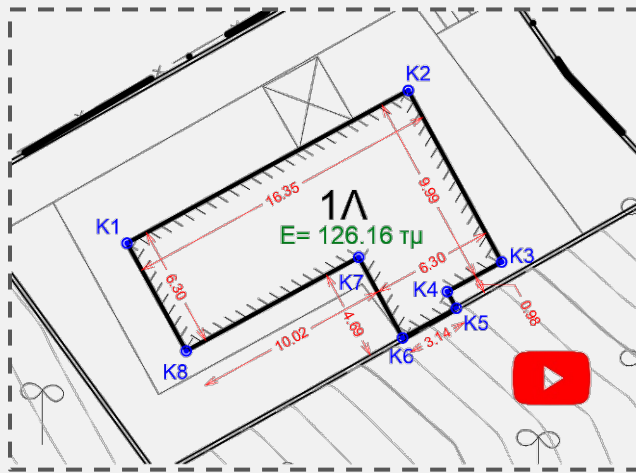
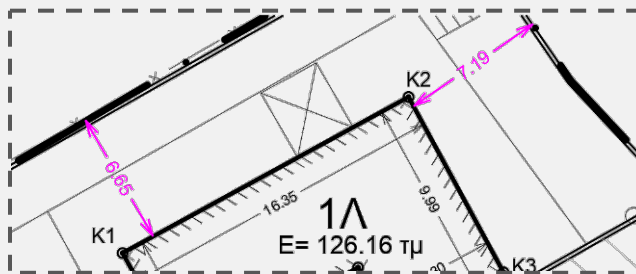**ZAA :** Import coverage area of the building or its individual parts.
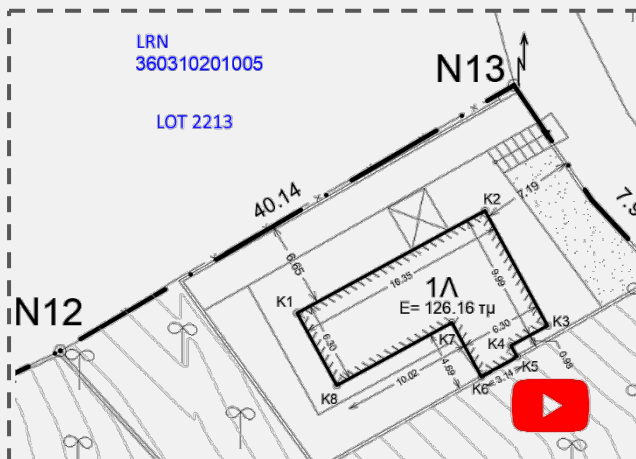
ZIK : Import marks at its base corners.

ZDAM : Basic Building Dimensions.

Lateral distances D

ZDA : Place dimensions at the shortest building distances from the boundaries on each side. Do the same for the sides of neighboring Buildings.

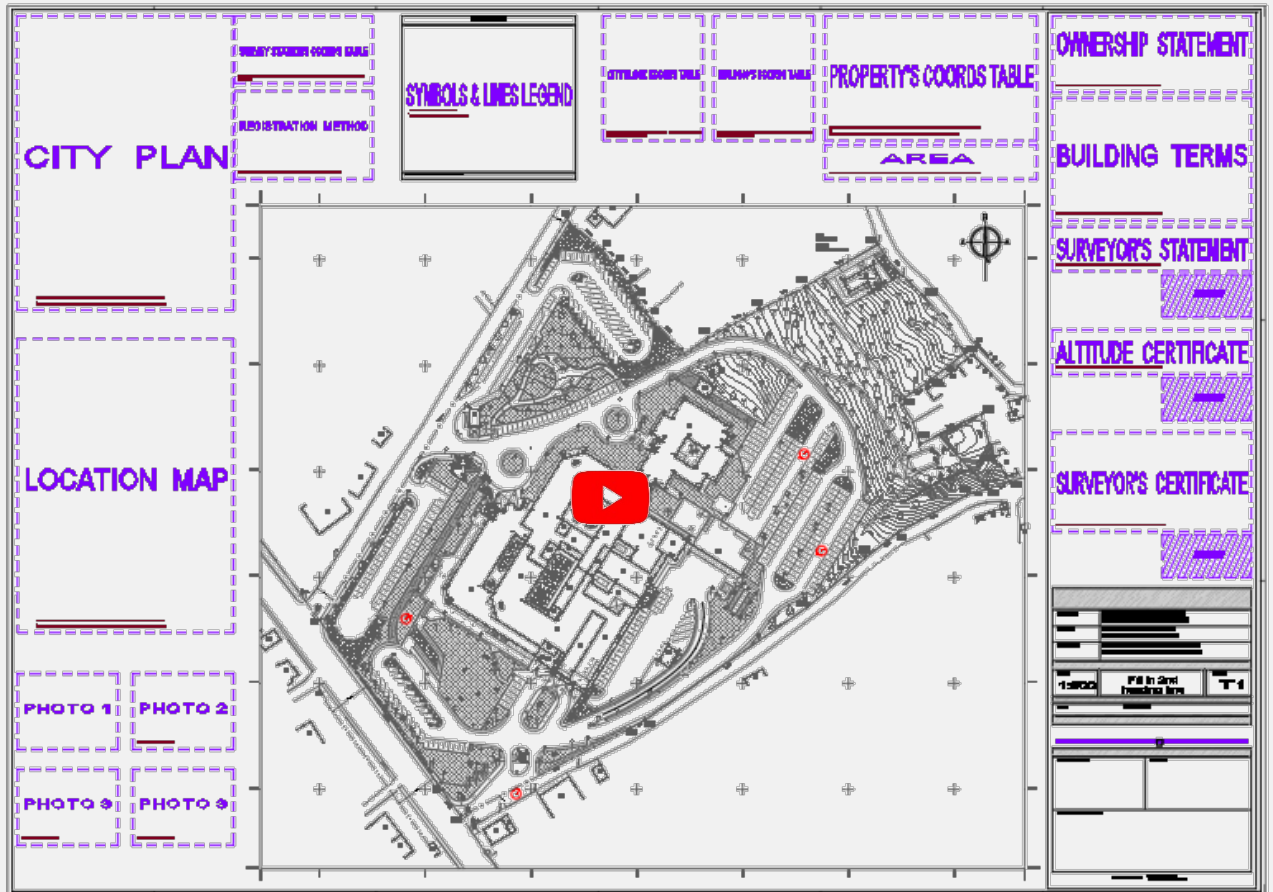## *Adequacy of neighbors – Land Registry*

NN2 : Annotations by two rows of text.

17. IMPORT TITLE-BLOCK

Import a Title-block (**ZTITLOIT**). Choose one from SDBOX's database of Title-blocks or add your one in the specified folders.

Each box, as below, contains information to complete it.

BUILDING TERMS

The building terms frame *Topo->Titles-Statements->Building Restrictions (ZTITLOIO)* is added and the terms can be filled in.

OTHER STATEMENTS

You can also import other statements, certificates or declarations such as Surveyor's certificates and statements, Ownership declaration, Forest map and Land registry certificates etc. by command ZTITLOI . You can format existing statements and add your own to existing or new folders.

18. LINES-SYMBOLS-HATCH MEMO

 ZYPGR : Line legend   ZYPBL : Symbol legend

 ZYPHH : Hatch legend

When selecting the area of objects to be listed in the memos, it is suggested to select area within the grid frame. It is also suggested that the Lines Legend should contain all the linetypes which is also useful for sending the drawings as dwg's to others.
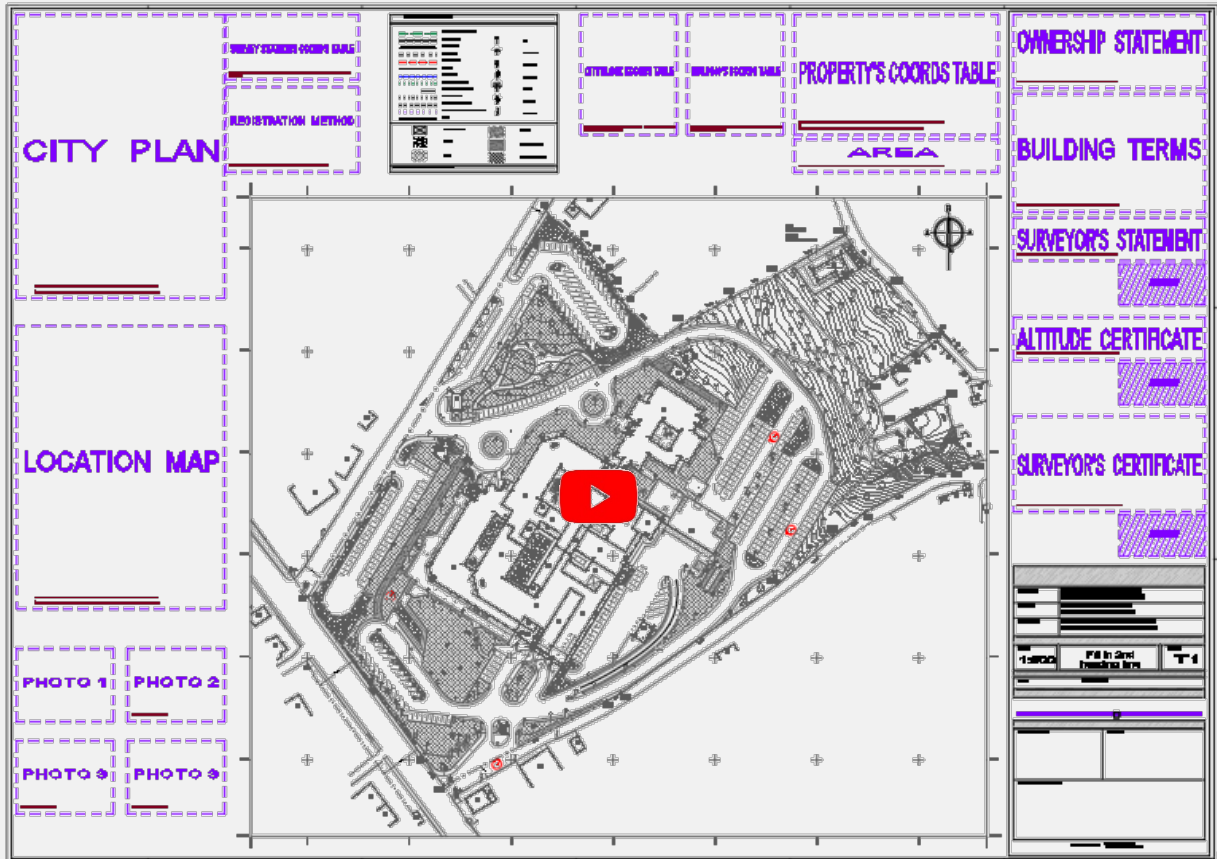
19. EXCERPTS AND PHOTOS

ZDFP Image Excerpt: Select an image that is aligned to its actual dimensions and position (behind the Plan) and also the boundaries to be displayed on the extract, set print scale and enter the Header of the extract and the extract is automatically created with compass and header.

HHA : Hatch for locating the area on the excerpt.

ZIMPH Import Photos: Select an image for the photo you want to import which is automatically inserted in size according to the print scale and also header is added.
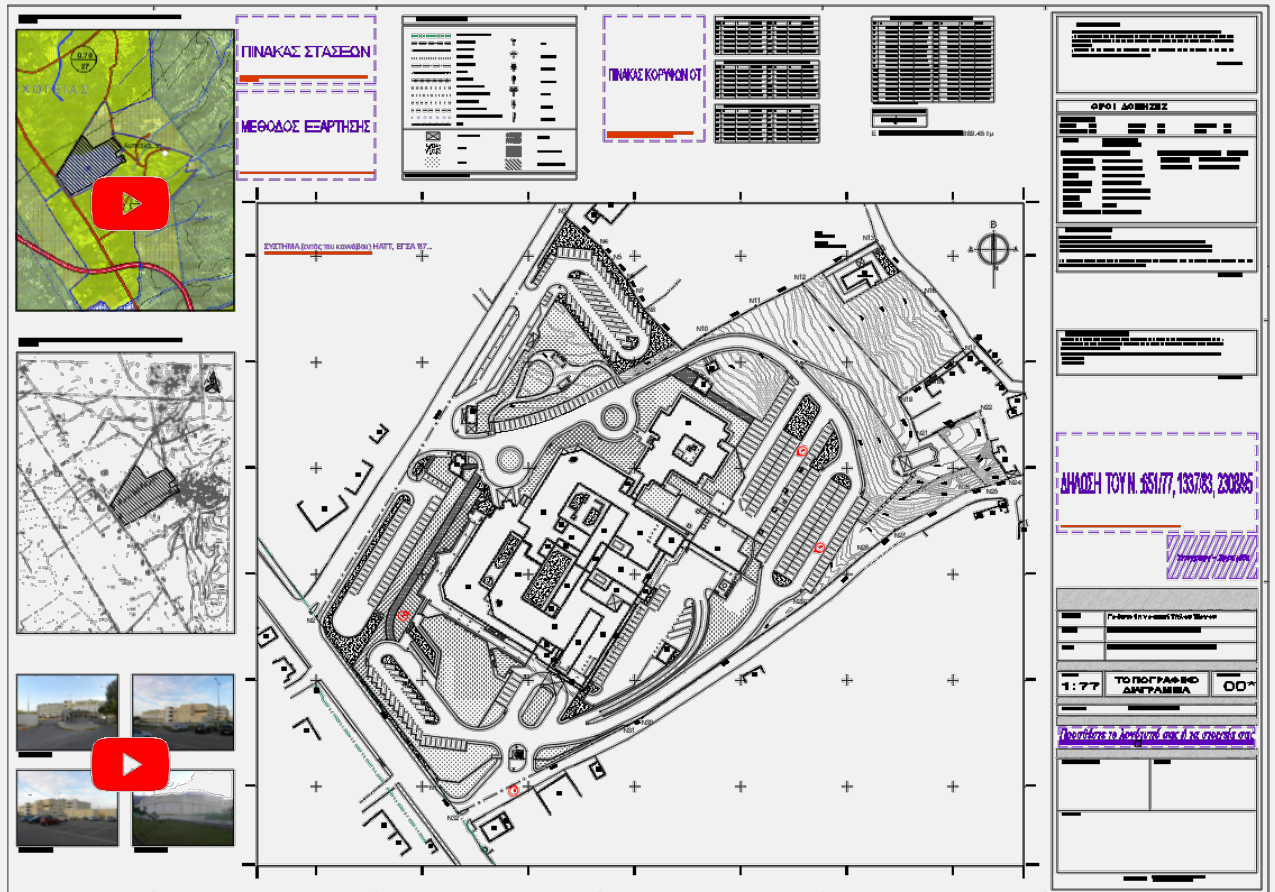
20. SURVEY STATIONS – REGISTRATION METHOD ▶

ZPPOL : A table of selected Survey Stations is automatically created. It is suggested to add an empty column at the end of the table, where you where you can add the Station's implementation description (control point (nail) in asphalt, stake in soil, color on rock etc.).

ZTITLOIE : Description of the registration method can be added.

You can also import other coordinate tables with commands like ZPOT for City blocks corners and you can always use ZPBL for any symbols (blocks) you choose.
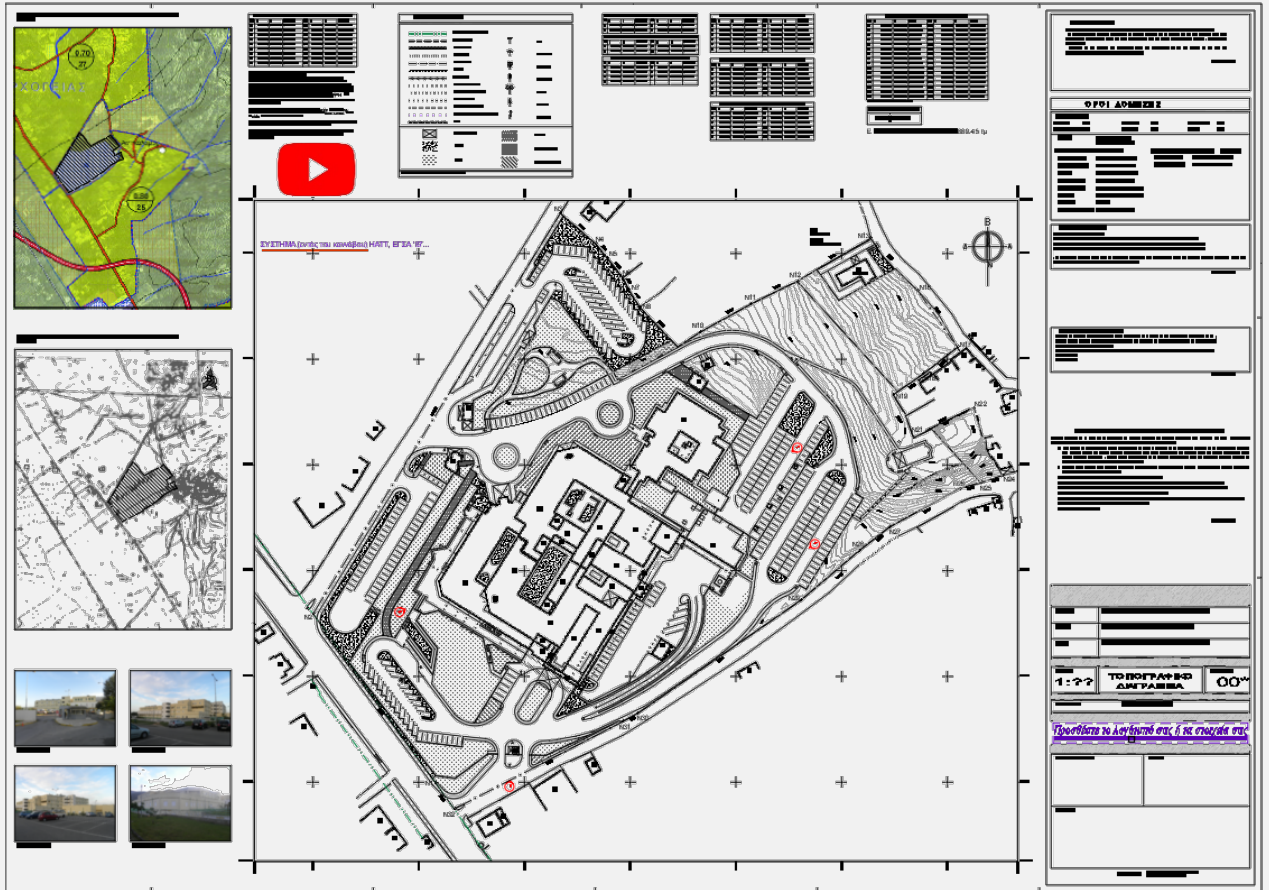
21. Hide overlay lines

When a boundary line of the plot coincides with the boundary of a building or retaining wall or another continuous line, then this line should be transferred to another Layer that is closed during printing so that the boundaries of the plot display clearly. This process is done automatically with the **2R** command .
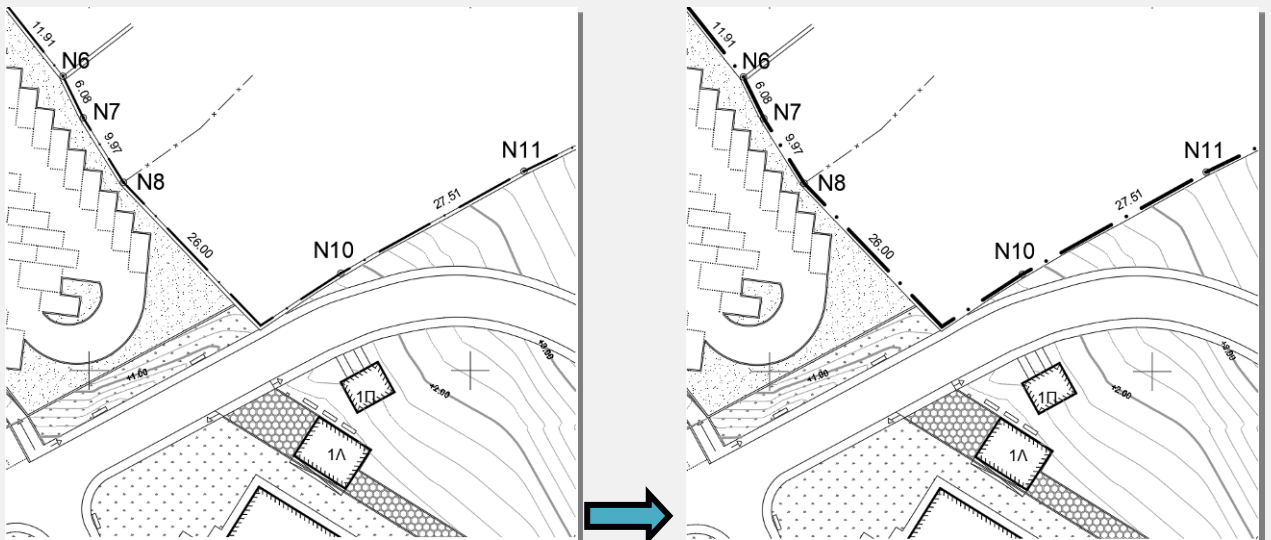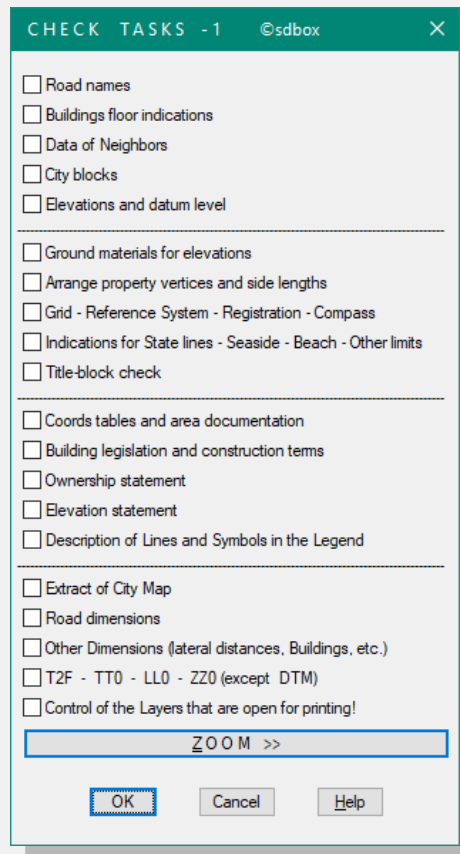
22. Spell check in Word

T2F : The texts that are open for printing are exported to a *.doc file where the spelling can be checked. You can also use Text Editor (command **TTT**) to find and replace phrases or words.

23. Task Control

Before printing or sending the drawing by email it is recommended to check if the basic tasks for the Plan have been done (command: **CEC** setting: **CEC5**).

```
CHECK TASKS -1        ©sdbox        ✕

☐ Road names
☐ Buildings floor indications
☐ Data of Neighbors
☐ City blocks
☐ Elevations and datum level
-----------------------------------------------
☐ Ground materials for elevations
☐ Arrange property vertices and side lengths
☐ Grid - Reference System - Registration - Compass
☐ Indications for State lines - Seaside - Beach - Other limits
☐ Title-block check
-----------------------------------------------
☐ Coords tables and area documentation
☐ Building legislation and construction terms
☐ Ownership statement
☐ Elevation statement
☐ Description of Lines and Symbols in the Legend
-----------------------------------------------
☐ Extract of City Map
☐ Road dimensions
☐ Other Dimensions (lateral distances, Buildings, etc.)
☐ T2F - TT0 - LL0 - ZZ0 (except DTM)
☐ Control of the Layers that are open for printing!

          Z O O M  >>

     OK        Cancel        Help
```

✔ **1. Road Names (listing, arrange, certificates, etc.):** Check the existence of a name/type for all roads and also arrange objects in cases of overlap. (Add street name: **NNOD**). You can also check if any certificates are needed to be added.

✔ **2. Building floors indication (1/C, 1/R ... Hatch):** Press "ZOOM >>" then select command "**ZF**" and select a Building line, a Building Hatch and a building label text on screen, so only those layers remain open and you can see if all buildings have hatch and label. After you finish checking, type **ZFF** to reopen the Layers you closed before. With right click or enter you can return to the control tab. If during the check you need to fill in something in the plan you can do it with the **ZZ command** from the commands tab.

✔ **3. Data of neighbors:** Add the information needed for the neighboring area of the property. Press "ZOOM >>" and check whether there is information that's missing. To add information use **NN2** command.

✓ **4. Ground materials (soil-asphalt-concrete):** Check if where level or altitude is indicated, there is also the corresponding ground material. It is also useful to list the ground materials in key areas close to the property. To add materials, use NNA command.

✓ **5. City blocks or other area coding:** Check the correctness of the names of the city blocks (ZKYK) compared to the City Plan. You can also check the need to indicate (NNTOP) other encodings from the approved plans.

✓ **6. Towards placemarks:** It is useful to indicate (NNT) the direction to some relatively well-known placemarks as an orientation aid other than compass.

✓ **7. Legend's descriptions:** Check the correct description of the lines, symbols and hatches contained in the legend (ZYPGR, ZYPBL, ZYPHH).

✓ **8. Elevations and datum level:** Check for datum level entry (ZST) and the level marks (BVC) on each property vertex and other main points.

✓ **9. Arrange property vertices and side lengths:** Check the label of each property vertex (ZID) and building (ZIK) and sides lengths if needed to be moved or arranged. You can use commands STRECH for the vertices and MOVE for sides lengths.

✓ **10. Grid - Reference System - Registration - Compass:** Check if Grid crosses and coords have been entered (KNBS) and if some additional statements are needed regarding Registration. Also check if the Grid Reference System (ZTITLOIS) is indicated and if Compass (ZBOR) is placed within the canvas.

✓ **11. Indications for State lines - Seaside - Beach - Other limits:** Press " ZOOM >>" , then select command "ZF" and pick a state line, a building line and/or other line and State Indicators, so only these Layers remain open and you can see if all lines have a marked designation. With right click or enter you can return to the control tab. If during the check you need to fill in something in the plan you can do it with the ZZ command from the commands tab.

✓ **12. Title-block** (ZTITLOIT) Check if title-block has been completely filled in with regard to the owners or clients, print scale and date. Also check the plan coding (e.g., T1) which must be changed in the event of a second delivery or change of plan.

✓ **13. Coordinates tables and area documentation:** Check the existence and correctness of the property vertices table (ZID or ZPID), building vertices table (ZIK or ZPIK) and Survey stations table (ZPPOL). Also check area documentation to be identical if it is written more than once in different parts of the plan.

✓ **14. Building legislation and construction terms:** Check the listed building restrictions (ZTITLOIO) whether they coincide with the brochures or other documents from Urban Planning.

✓ **15. Surveyor's certificates:** Review and check.

✓ **16. Extracts of Urban and Location maps:** Check that all excerpts have a title, property location and compass (ZDFP).

☑ **17. Road Dimensions:** Isolate with ZF the intended lines and dimensions (added by ZDA) and check that all the required widths are listed. When finished you can restore layer states by ZFF command.

☑ **19. Other Dimensions (lateral distances, Buildings, etc.):** Check that existing buildings are described with dimensions and that distances from property boundaries have been added.

☑ **20.** T2F - TT0 - LL0 - ZZ0 (except DTM): Spell check - Delete null texts - Delete null lines - Move items, other than contour lines and 3dfaces, to Z=0.00

☑ **21. Check the Layers that are open for printing!** Check the final Layer status before printing.

Note: With commands CEC1 up to CEC5 you can modify the present list or make new lists of your own.

24. Emailing the design to third parties

As long as the above List has been checked, then it is recommended to do the following for emailing the Plan to third parties:

1. First set all the Layers that are needed for **printing** to be open and also open the ones that still need to be delivered. (Note: You can use AutoCAD's LMAN command to save this kind of layer states.)

2. **ZWB:** A new drawing is automatically created to a folder you define (containing only what's selected). During the creation of the new drawing, you are informed regarding common layers that should or should not be delivered. Images, fonts and ctb files are automatically copied to the folder you specified.

3. **Open the new drawing** and start SDBOX**.**

4. In case source drawing was rotated, then use AutoCAD command _ view and select _ top .

5. ZCIMD: Automatically set images paths to the folder where you saved the new design.

6. **00:** Set 0 as current layer.

7. ZLAYREN**:** Layers can be automatically renamed if needed. It is suggested to check the Layers that were not renamed and rename them accordingly. For auto-filling of the auto-rename list see here.

8. Run the commands: **PURGE -** T2F **-** TT0 **-** LL0 **-** ZZ0 (except the DTM layers).

9. Check for unwanted entries such as **Xrefs, Images, Layer Filters, LMAN, Views** and remove those that are not needed.

10. **ZZARIAL:** Automatically convert all SDBOX fonts to **Arial** so that problems do not occur in different versions of AutoCAD that third parties may use.

11. ZOOM: Extends.

12. SAVE: Save your drawing as AutoCAD 2007 version.

13. **ZZPDF:** Automatic pdf generation.

14. Delete from the folder the *. bak file.

25. Other Notes and Tips

- It is recommended that during design you follow the commands of the "Survey Plan step by step" Menu or from the Ribbon or have the Toolbar "14a. Survey Plan step by step"
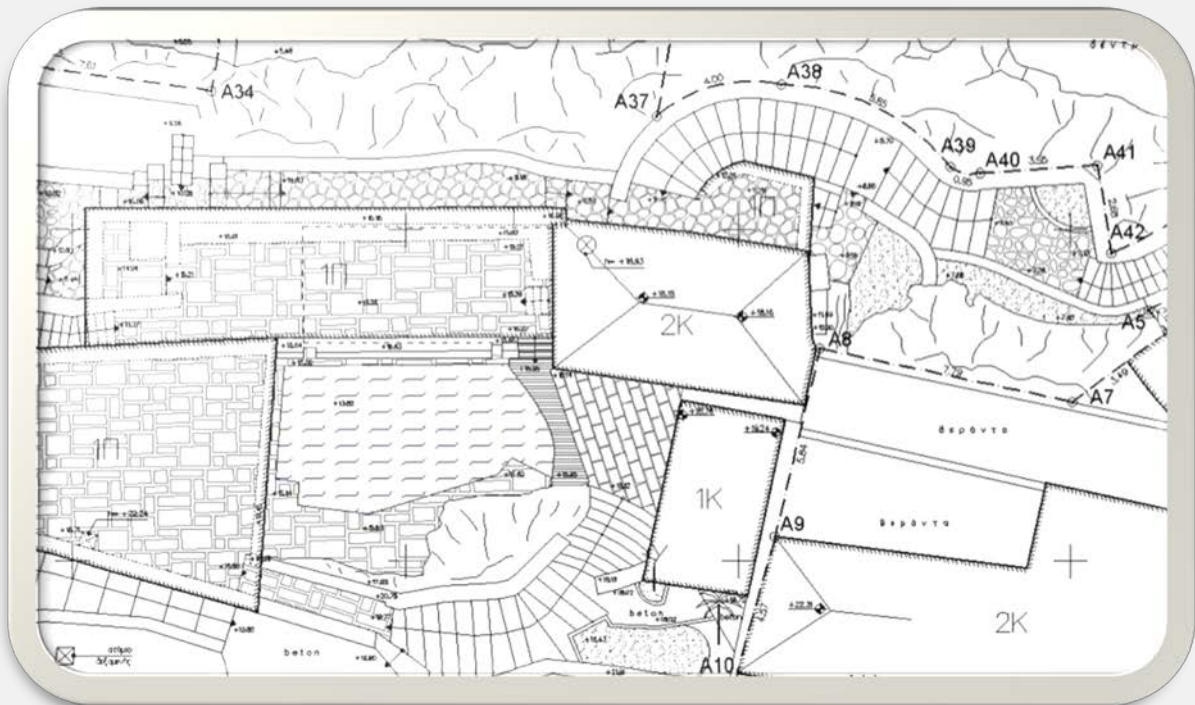
- **DFF Opening a Photo:** If you have specified (with the FFCHDIR command) the Windows folder that contains the photos of the Project, then you can enter the number of the photo in the project and it will open **automatically** .

- Before each printing or email, review the Task List .

When printing

It is recommended to use the SDBOX Plot styles. See print example below:

The following commands were used:

LKT for buildings   LANB for the upperclassmen

PMD for retaining walls   LSKAL for the stairs

BS for ladder climbing arrow

LDOK for overhead projections

MBL for symbols

ZST for elevations and heights

BVC for altitudes

NNH for overhead proj. heights

**NNA** for simple indications

**NNB** for block indications

XKT for the characterization of buildings

HKT and PHKT for buildings

**ZHH** for all Hatches (flower bed-soil, paving, slabs, stonework, water, etc.)

LXID for property boundary

2R to hide the lines that coincide with the property boundary

ZID for area documentation, vertices insertion and side lengths

Examples of drawing management:

ZMSB: (Match Block Scale). First select the Block that has the desired X, Y, Z Scales and then the Blocks that you want to acquire the same Scales.

ADA: Automatic deviation calculation between two numbers that you select on the screen or write them down.

ZMRS: Automatic adjustment of objects (average rotation, move, scale) with data of as many pairs of points as you choose on the screen.

S2P: (Spline to Polyline). Conversion of the selected Splines to Polylines with possibility to configure the density of points between the vertices of the original Splines.

ZONELAY: (Transfer to 1 Layer). Whatever objects you select are transferred to an existing or new Layer, keeping their Color and Linetype.

ZDLAYT : (Layer Based Dimensioning). Automatic listing of Dimensions (plain Text) of all objects on the same Layer.

ZDRC: Open current drawing's folder

D+D: Operations with distances and numbers.

ZCXRD: (Change Xref paths). If the drawing doesn't find the Xrefs you can redefine the folder or folders that contain them in one go.

KTT: (Text Line Spacing). Select the lines of text you want and set the distance between them (default, at a certain distance or with dynamic scaling on the screen).

PP: (Perpendicular to line point). Select any point on an object (eq line, pline), where a perpendicular new line is drawn to the desired length and side.

LLOL: (Highlight Layer). Select any Layer you want which starts to flash on the screen while you are informed about how many and what kind of objects it contains.

ZVPMC: (New Viewport from Model to Layout in the same coordinates). Define an area in Model which automatically appears in a layout at the same coordinates.

ZDFS: (Resize according to different print scale). If, for example, you have inserted an image in random size which you want to be printed at 1:5000 scale while the rest of the design will be printed at 1:200. Just choose a dimension on the image, enter its actual value and the two print scales.

ZIMAA: (Transfer objects between images). Select two images (initial and final) and based on the difference in the size, position and rotation, as many objects as you choose are moved or copied from the 1st to the 2nd.

Thank you for using SDBOX!