# New Survey Regulations for Israel

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TS 79 – Cadastral Maps
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New Survey Regulations for Israel

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## INTRODUCTION

- SOI is responsible for preparing Survey Regulations for: Geodetic Control Networks, Topographic Mapping, Cadastral Surveys and related activities.
- Licensed Surveyors are obliged to work according to those regulations.
- The last regulations were published on June 1998.
- Detailed technical instructions were published in conjunction with the regulations.
- The state of the art technology of permanent GPS stations enabled new attitude .
- A Draft for new regulations should be authorized by SOI's Director General.



## GEODETIC CONTROL NETWORKS

- The National Geodetic Control Network will be defined as 3D control.
- The network is based on the Permanent GPS stations of Israel (constitute the higher order).

- Primary 3D class G
- Secondary classes:

S: horizontal coordinates .
E: ellipsoidal heights.



## Horizontal Control

- The primary objective of the horizontal control network is to serve the cadastral surveys.
- The goal is to define the cadastral boundaries with an accuracy of 5cm (95%).



## National Control Network Classification and Required Accuracy.

| Required accuracy (95%) relatively to the nominal coordinates of the Permanent GPS Stations, in millimeters | | | Class/ Level |
|---|---|---|---|
| Remarks | Vertical (ellipsoidal) | Horizontal | |
| By SOI only | 5 | 3 | $G_0$ |
| | 10 | 6 | $G_1$ |
| | 20 | 15 | $G_2$ |
| SOI & Private Surveyors | 70 | 25 | $S_1$ |
| | 100 | 35 | $S_2$ |



## Vertical Control

Ellipsoidal Control

- There is neither practical possibility nor actual need to maintain a country-wide vertical orthometric control network.
- SOI will maintain vertical ellipsoidal height control network .

## National Control Network Classification and Required Accuracy.

| Required accuracy (95%) relatively to the nominal coordinates of the Permanent GPS Stations, in millimeters | | | | Class/ Level |
|---|---|---|---|---|
| Remarks | | Vertical (ellipsoidal) | Horizontal | |
| By SOI only | | 5 | 3 | $G_0$ |
| | | 10 | 6 | $G_1$ |
| | | 20 | 15 | $G_2$ |
| SOI & Private Surveyors | | 70 | 25 | $S_1$ |
| | | 100 | 35 | $S_2$ |
| SOI & Private Surveyors | Relatively to the nearest G point | 10 | | $E_1$ |
| | | 20 | | $E_2$ |
| | | 50 | | $E_3$ |

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## Orthometric control

- The transition to ellipsoidal heights only, is premature yet.
- The orthometric heights will be used as having a local datum.
- $H_L$ can be measured either by geometric leveling, trigonometric leveling or GPS based on local benchmarks.
- $H_S$ (statutory heights) measured by GNSS and official geoid undulations model (OGUM).

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## Vertical Local Orthometric Control Networks Levels and Required Accuracy.

| Max. D in (km) | required accuracy ($2\sigma$) of height-difference (mm) | | Network-Level |
|---|---|---|---|
| 20 | $\sqrt{0.16+0.16D^2+4D}$ | 2.1 | $H_L1$ |
| 10 | $\sqrt{1.0+0.25D^2+16D}$ | 4.2 | $H_L2$ |
| 1 | $\sqrt{25+100D^2+100D}$ | 15 | $H_L3$ |
| 1 | $\sqrt{50+225D^2+225D}$ | 22 | $H_L4$ |
| 1 | $\sqrt{100+900D^2+2500D}$ | 59 | $H_L5$ |

- New: D is the horizontal distance.
- $H_L1$ and $H_L2$ can be measured by leveling only.
- $H_L3$, $H_L4$, $H_L5$ can be measured by GPS also.
- E1 will produce $H_S1$ and E2 will produce $H_S2$ .

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## CADASTRAL SURVEYS

- Surveying and Preparing Plans for Registration.
- SOI has to check and approve each registration plan.

**Legal Digital (Coordinate - Based) Cadastre.**

- Requirement to compute coordinates.
- Demand for demarcation.
- The mark is considered as the legal boundary, as long as it is regarded authentic.
- Authorization of the authenticity is the heaviest task.

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- The requirement for demarcation was needed as long as we could not achieve high accuracy.
- This situation was changed already.
- Proper EDM or GPS measurements, will assure the desired accuracy of the boundaries definition.
- A main issue in the new regulations is to assure the legality of the coordinate- based cadastre.
- There is still a debate whether the boundaries demarcation is optional or mandatory.
- The new regulations and technical instructions should make sure that the demarcation and measurement will be accurate and reliable.

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## Boundaries - Documentation Plans

- Reconstructing of old boundaries might be ambiguous.
- There is a growing demand for early approval of the registered boundaries.
- Changing to: " Preparing Plans for Registration and Plans for Boundaries-Documentation".
- SOI will approve the reconstruction and the coordinates of registered boundaries upon optional requests.

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## Reconstruction of Registered Boundaries

- Computation of old boundaries coordinates brings an accuracy of few decimeters.
- We can rarely find an authentic mark or a near-by old control points .
- Plenty of research works were and are still conducted in order to improve the boundaries-reconstruction accuracy, mainly by sophisticated transformations .
- A special set of technical instructions will be dedicated to reconstruction of old boundaries, based on the research.
- The most important thing is to enable achieving the same results by every surveyor.
- We should relate to the location of existing substantial fences with regard to the estimated accuracy .



## CONCLUSION

- The Israeli Survey Regulations published in June 1998, reflected its preceded technology innovations. It was the first time to mention GPS measurements in the survey regulations as well as digital photogrammetry, orthophoto and GIS.
- Conceptual revolutions which were enabled by the state of the art technology of permanent GPS stations dictated the need for new regulations.



The main renovations are:

- 3D geodetic control.
- National grid based on the permanent GPS stations.
- Vertical National ellipsoidal control.
- Different Datum for local orthometric networks ("orthometric- islands").
- Nation-wide orthometric heights based on ellipsoidal heights and Official geoid undulations model.
- Legal digital (coordinate - based) cadastre.

A lot of work has to be done in writing the new technical instructions. The new survey regulations will hopefully be published through 2007.



## Many thanks for your attention!