GEOMETRIC DOCUMENTATION OF STRUCTURES AFTER AN EARTHQUAKE

E. Lambrou, G. Pantazis

FIG Working Week Athens, Greece
May 22–27 2004

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3 – D Registration of shape, size and place at a given time

Geodetic methods
Modern digital total station
Credibility

Methods (depends on):
- The final required accuracy of the documentation.
- The choice of the proper instrumentation.
- The design of the measurements.
- Measurement of detail points by the same accuracy.
- The calculation method
- The digital procedure of the measurements and the design of the structure’s elements
- The procedure of the statistical control of the results.

DRAWINGS

- General plan
- Horizontal sections
- Vertical (cross or longitudinal) sections and façades

ACCURACY

Demand of the study (user)

Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Accuracy (σx, σy, σh) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:100</td>
<td>±25</td>
</tr>
<tr>
<td>1:50</td>
<td>±13</td>
</tr>
<tr>
<td>1:25</td>
<td>±6</td>
</tr>
<tr>
<td>1:20</td>
<td>±5</td>
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</tbody>
</table>

PROCEDURE

3 – dimensional Network
- Coordinates X, Y and Z
- The errors in the coordinates value
- The absolute error ellipses for each point
- The relative error ellipses for all the pairs of points.

The detail points of the structure may be surveyed by using mainly the following two methods:

- The polar coordinates method
- The intersection method

CASE STUDY

Prefabricated industrial building
Had suffered serious damages during the 1999 earthquake in Athens
80m in length, 20m in width and 10m in height
**CASE STUDY**

Produced plans in 1:100 scale

- **Two** plans of horizontal sections.
- **Three** vertical longitudinal sections - façades.
- **Eleven** vertical cross-sections - façades.

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**CONCLUSIONS**

- The geodetic method by using the digital total stations without reflectors proved to be efficient for the reliable documentation of a structure. The produced plans, provided full and accurate geometric information for all the elements that composed every detail of the structure.

- The main characteristics of the geodetic method as applied in this project are:
  - The convenience and speed of the measurements.
  - The accuracy within a few millimeters was achieved in the positioning for even the inaccessible points of the structure.

- This accurately and trustworthy documentation produced by Surveying engineers offers an enormous assistance to other Geoscientists and Structural engineers in order for the right decision to be reached concerning the failure of any given structure.

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