

# Learning specifications for land surveying with a home study package

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**Key words:** surveying, specifications, e-learning, GRB

## SUMMARY

While building up the Large Scale Database of Flanders (GRB) new surveying specifications are introduced. These specifications are very strict: on one hand the different object categories are very clearly defined and on the other hand the way of selecting points for modelling objects has to be followed rigorously in order to allow good quality-control.

It's difficult to learn all those specifications, certainly for students that aren't measuring on a daily base and only have got a little time to get the basics of it. The Flemish government (AGIV) has good reference manuals and some illustrated examples, but they are only available as a lot of documents and downloadable files.

In the outcomes of a research project about updating of the GRB, researchers from KaHo Sint-Lieven University of applied science, department of surveying, developed an e-learning website to introduce students and surveyors to these GRB-specifications.

The e-learning tool is constructed as a website with a clear structure, with a lot of images, with short but essential text frames and with some quizzes that allow the students to test their knowledge.

## SAMENVATTING

Bij het aanmaken van het grootschalige referentiebestand voor Vlaanderen (GRB) en de daaraan gekoppelde skeletmetingen verschenen uitgebreide lastenboeken waaraan opmetingen moeten voldoen. Deze bestekken zijn zeer strikt omschreven: enerzijds is er een uitgebreide en welomschreven objectencatalogus en anderzijds is zeer gedetailleerd vastgelegd hoe de verschillende objecten moeten gemodelleerd worden om een goede kwaliteitscontrole mogelijk te maken.

Het valt niet mee om zich in deze specificaties in te werken, zeker niet als student als je niet dagelijks moet meten en toch in een korte tijd de basis onder de knie wil krijgen. De Vlaamse overheid (AGIV) heeft goede handleidingen met geïllustreerde voorbeelden maar ze zijn enkel beschikbaar onder de vorm van een hele reeks documenten en downloadbare bestanden.

Als resultaat van een onderzoeksproject over de bijhouding van het GRB, werd door de afdeling landmeten van de KaHo Sint-Lieven Hogeschool een e-learning website ontwikkeld om studenten en landmeters vertrouwd te maken met deze lastenboeken.

De website heeft een duidelijke structuur, bevat heel wat beeldmateriaal als illustratie van de regels, bevat korte maar kernachtige tekstfragmenten en ook een aantal quizzes waarmee studenten zelf hun kennis kunnen testen.

# **Learning specifications for land surveying with a home study package**

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## **1. SITUATION**

Since the Flemish Government started making a large scale reference database (GRB), the surveying-assignments have changed drastically. Several evolutions were introduced: a lot more use of photogrammetry, working with specifications and quality control for surveys and the making of object-oriented spatial databases are examples of the changes that were experienced. The education of surveyors has to deal with those evolutions and the best way to integrate this knowledge in the education is by jumping into this domain by doing some research in order to prepare surveyors for this new challenges.

As mentioned above surveyors should make more use of spatial databases, but the change from a CAD – environment to a database environment is a big step for small surveying companies. At the moment only a few companies are involved in the process of creating the GRB-database. Nevertheless the GRB-process influences other commissioners as they use the same terrain model and specifications for measuring (GRB – skeleton surveys).

To make GRB – related assignments accessible for small surveying companies, the surveying department of KaHo Sint-Lieven did a TEchnology TRAnsfer research project from 2004 to 2006. These projects are financed by the TeTra-fund. The resources are managed by the Institute for the Promotion of Innovation by Science and Technology in Flanders and are reserved to enhance research in universities of applied science. The private sector is invited to cooperate in this type of projects by taking the co-financing of 7.5% at their expense. The participating companies in this project were surveying companies, technical offices and ICT companies. In return for their financial contribution they got access to intermediate research results and they were actively involved in some decision making processes during the project. This kind of involvement guarantees the practical usability of the project output.

One of the partners was the Agency for Geographical Information Flanders (AGIV), whose main objective is the optimisation of the use of geographical information in Flanders. AGIV is responsible for the production of the large scale reference database of Flanders (GRB).

### **What's the project about?**

One of the objectives of our first research project was to find an easy way to learn the specifications for land surveying as they are determined for the making of the Large Scale Reference Database (GRB).

Although GRB – surveys are demanding assignments in which only few companies are involved, the specifications that are used for determining the way objects are modelled have found their way to other applications.

GRB is produced in project zones that fall together with municipalities. Because the finalisation of the GRB is a long process that aims at 2014, a solution was looked for to

recover as much as possible of other surveys that will take place in the mean time. Public utility companies are the most important providers of surveying assignments. If they require the same specifications as for the GRB in their assignments, the surveys can be recovered at the moment GRB is been produced.

The so-called GRB-skeleton specifications have been derived from the original GRB – specifications. Skeleton surveys are terrestrial surveys of the area near the accessible roads, so the result resembles a skeleton that is not filled up in the areas between. The GRB-skeleton specifications are built up as different modules that fulfil different needs but that all contain a common part which can be recovered in the making of the GRB.

A growing number of surveyors have to deal with these specifications because more clients use them.

One of the goals of the research-project was to lower the thresholds for participating in GRB-related assignments.

## 2. PROBLEM

GRB – specifications describe the modelling requirements that have to be fulfilled to obtain a high quality standard. These specifications are very strict and are different from what surveyors were used to.

A few things are striking:

First of all you find a very detailed description of all object categories which results in an elaborated object catalogue. Then you find a very detailed description of the way every object has to be modelled in the survey. And at last there are a lot of rules concerning the format and digital controls.

In order to get a uniform digital map of Flanders, everyone has to reproduce reality in the same way. It is not acceptable that one surveyor puts the cycle path within the borders of the road and another one defines it as a road-annex. An example of a problem can be a carport near a building: is it a part of the building or should it be measured as another type of building? That is why different parts of the road, different types of buildings, different point and line-objects must be strictly defined.

For 29 objects a document of 52 pages is needed to make a clear object catalogue.

The terrestrial GRB – survey is merely made up in a CAD – environment that consists in several layers and that doesn't contain any closed polygons. Lines in a CAD – environment don't contain any attributes. In order to recover this terrestrial survey in the making of the object-oriented GRB database the datamodel in the CAD – environment has to be converted and transformed to a GIS – datamodel. This explains the use of well defined layers that will be gathered in one theme with different attributes.

In this object – oriented database polygons must be created, so topology must be scrupulous respected.

The way of modelling some well defined objects may let no room for discussion either.

Shall we map the edge of the roof or shall we take the façade? This is a typical problem for surveys where the choice between photogrammetry and terrestrial measurement can be made

by the surveyor himself unless for some specific houses the choice is not allowed. Houses on the corner of a street should be measured terrestrial.

But what to do when part of the housefront is slightly set back and in one case the roof does follow the housefront and in the other case it doesn't?

Surveyors realise that every choice they make to represent reality on a map is a kind of modelling, but not everyone has the same approach. To ensure that everyone handles in the same way in modelling reality, is a bigger challenge than cataloguing the real world into a limited range of object classes.

When we look to the amount of documents that try to describe these modelling rules, we are overwhelmed.

The need to describe these modelling rules so carefully, has its cause in the combining of photogrammetry and terrestrial measurement techniques and the need to make good criteria for quality control. If every surveyor is allowed to model reality in his own way, there could be discussion about every line, leap or jump when another surveyor is responsible for quality control.

Another perspective arises on this problem when we look to the updating of the GRB – database. If every time the terrain situation is checked for changes, one makes his own interpretation of reality, there will be a lot of changes in the map even if the situation on the terrain is not changed. Clearly described specifications avoid this problem. The Large Scale Reference database is used as a reference for the mapping of cables and pipes. Changing the position of reference objects should only be done if there were significant changes.

It's difficult to learn all the specifications, certainly for students that aren't measuring on a daily base and only have got a little time to get the basics of it. The Flemish government (AGIV) has good reference manuals and some illustrated examples, but they are only available as downloadable files and documents, and are not user-friendly or very didactic.

The threshold to participate to GRB –related surveys is high. So the question was what we can do to help the surveying community and our own students. The answer was creating a GRB – home study package.

### **3. E – LEARNING TOOL: GRB – home study package**

Our idea was to create some e-learning material to introduce people to the GRB-specifications. This e – learning tool is constructed as a website with a clear structure, with a lot of images, with short but essential text frames and with some quizzes that allow the students to test their knowledge.

#### **So where did we get the content?**

AGIV, the agency of the Flemish Government, that manages the producing of the GRB, has set all the necessary documents online. But as was said before, these are the official documents that make part of the contract with the surveying companies. They are not didactically structured and they are very extensive. There were some documents available with illustrations but not every case or exception was illustrated. So we begun to analyse the

specifications, studied them in detail and made a lot of photographs. Main part of this work was done by two students, Dries De Coene and Nathalie Aelvoet that made a master thesis in which the GRB – specifications played an important role. To make this bunch of rules, exceptions and detailed instructions digestible we tore the documents into pieces and tried to give the most essential information illustrated with an image. While our subject is about surveying and modelling real world, the content can be easily visualised. By drawing lines onto the photographs we could graphically explain where the rules where about.

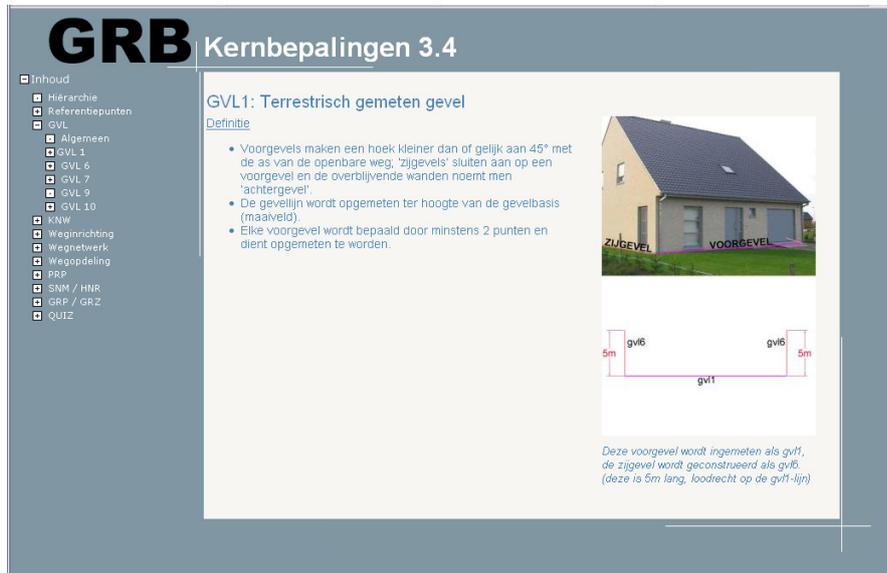


Figure 1 - Example of a page

## Technical

To realise this idea we had to face another challenge. One of the project workers, Jennifer Van Vooren, is a computer scientist and could make the website. The main concern was filling up the website, this is a big job (one particular module contains more than 200 pages in the home-study package) and it should be possible for everyone to fill it up or to update. So Jennifer wrote the package in ASP.NET, language C#, and made small content management system (CMS) in order to supply a way to put easily new content in. One of the most important highlights of this CMS is a Javascript based WYSIWYG editor which was embedded in the code.



possibility for adding a picture at the right and text near the picture. To enlarge the picture you just have to click on it.

One of the requirements of an online course is the possibility to evaluate one's knowledge. We chose for a self-evaluating application. The user has to make choices and answer several pages with questions in different quizzes, and at the end the application walks through the questions again, showing which answers were good or bad and giving an explanation. We made quizzes at the level of beginner, intermediate and expert.

Testing them out with experienced surveyors caused a lot of discussion, so we were once more convinced that there's a large need for clear and didactic material in this matter.



Figure 3 - Example of a quiz question

## Access and Reaching possible users

The website is accessible for a wide range of people.

First of all the website is used in the introduction for master students during their project work around GRB. The website is subject of a one day introduction for master students during the project work around GRB. It introduces the students with the theoretical part, before they start practicing there modelling rules on the street. The end product of this project is a small piece of GRB measured by the students following these modelling rules.

Professional surveyors can use the home-study package for instructing new employees. In our postgraduate training program that is organised for professional surveyors, we use the package to introduce surveyors to GRB.

Professional surveyors can also use the home-study package as a reference work, where they can quickly find specific information about the modelling rules when needed. (compendium)

In order to promote our home-study package and to reach possible users, future GRB-surveyors, we mention the package in our publications about GRB, and the updating of large scale measurements.

The most powerful advertising however is by oral testimony so we were very glad once in the break during a conference to hear two surveyors at the nearest table talking about the useful information at our website.

#### **4. FUTURE**

The content of the website must be correct because it has consequences for quality control executed by the people of AGIV. AGIV was therefore asked to check the content before publishing on the internet. In the future, updates of the information will be necessary if changes are made by AGIV in the documents about the modelling rules on which the website's data is based on.

The GRB-skeletonspecifications are built up as different modules that fulfil different needs but that all contain a common part which can be recovered in the making of the GRB. This common part is already described in our home-study package.

Another possibility in the future is to add the extra modules of the GRB-skeletonspecifications to the website. When new modules are created by AGIV, these modules can also be added to the site.

At the time the website was developed the AJAX technology wasn't available yet, also the WYSIWYG editor that was used in the back end has evolved and the new developments in .NET 3.5 are being thought of.

A user is free to put other data than GRB in the content management system, so there is a possibility to reuse this system for other subjects.

#### **5. CONCLUSIONS**

The e-learning tool fulfils a need of the surveying-world and surveying students and can be used by both groups.

The fact that the content is easy to illustrate, to structure and for questioning, makes it very suitable for working it out as e-learning material.

There is a lot of work filling it up and make a complete course out of it, so at the moment it can be used more as an introducing course and there can be a need for a more elaborated version. Before doing this we are waiting for signals of the working field, users of our home-study package. A good way of feedback is given by the Google statistics.

The experience we've got, will be used for communicating the results of new research projects.

## REFERENCES

Direct link to the home-study package: <http://www.tetragrb.be/Zelfstudie/index.aspx>

Link of research group website: <http://www.tetragrb.be>

## BIOGRAPHICAL NOTES

The department of surveying of KaHo Sint-Lieven in Ghent, Belgium, has started research in 2004 in the domain of great scale surveying and geodata management. The group consists of 4 people, two of them are full-time researchers and two others are involved in education of surveyors. The research-items are linked with the transition between CAD and GIS and are inspired by the making and using of the GRB.

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