

DIRECTIONS OF THE PROPOSED CHANGES IN THE TECHNICAL STANDARDS IN THE FIELD OF ENGINEERING GEODESY

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ABSTRACT

The INSPIRE Directive and its implementation in Poland in the form of the Act on Spatial Information Infrastructure enforce the adjustment of Polish law to the new requirements. In the Head Office of Geodesy and Cartography work that exceeds changes adjusting technical standards to the requirements related to INSPIRE is currently ongoing.

In the article the changes of a general nature that concern all or almost all of the instructions and guidelines which are in force will be discussed. Moreover, the author will refer in more detail to the directions of the proposed changes relating to the engineering geodesy.

1. INTRODUCTION

In the Head Office of Geodesy and Cartography an intensive work on the drafts of the regulations, which are to replace the existing technical instructions and guidelines is currently ongoing. There were several reasons for the beginning of this work. On the one hand, certain actions are enforced by the INSPIRE Directive (Dyrektywa, 2007) adopted in 2007 by the European Parliament and the Council of Europe. The Directive is transposed to the Polish law by the Act on Spatial Information Infrastructure (Ustawa IIP, 2010), which requires making many technical issues more detailed. Regulations which are being prepared will be the annexes to this Act. On the other hand, the spur to action was the outdated technical instructions and guidelines that in numerous cases were established many years ago.

Regulations, which are going to be adopted, are not only to adapt the national law to the requirements of the European Union but also to clarify many issues. This clarifying the most frequently called harmonisation (the word that has made a great career in Poland after the adoption of the Directive) concerns many legal, organizational, financial and technical issues. The main of them are:

- unification of the applied methodology of creating and writing the database structure as well as the used terminology,
- coherence of the objects' definitions as well as their attributes that appear in several regulations (including IDs),
- ordering of the ways of position recording, utilised datum (spatial and temporal), means of visualization.

Obviously the points mentioned above do not cover all issues concerning harmonisation. In the article I will compare the draft of the regulation concerning the surveying of terrain details and elevations with both the G-3 Technical Instruction (Instrukcja G-3, 1988) and the G-3.1 Guidelines (Wytuczne G-3.1, 2007), which have replaced the G-3.1 and the G-3.2 Guidelines of 1987. The comparison will be done at two levels. The first level will comprise changes that apply to all prepared regulations. These changes include, among other things, the necessity to prepare the UML application schemas for individual regulations and GML application schemas, which will constitute the data exchange standards. They will be presented in chapter 2.

The second level of the comparison will deal with changes within the scope of engineering geodesy. It will be interesting (not only from the general point of view but also from the practical standpoint concerning geodetic performance) to determine whether the Head Office of Geodesy and Cartography introducing new regulations is going to make a revolution in measurement technologies (besides the necessary amendments arising from the technical progress) and the admissible accuracy of the final products, documentation contents, etc.

2. GENERAL CHANGES

A large part of these changes is the result of Poland's accession to the European Union, which, among other things means that the EU law applies to us, for example the INSPIRE Directive (Dyrektywa, 2007). Regulations that will replace the existing technical instructions and technical guidelines will constitute annexes to the transposition of the INSPIRE Directive to the Polish law, i.e. to the Act on Spatial Information Infrastructure (Ustawa IIP, 2010). It is one of the general changes, i.e. other legal legitimacy of the technical standards.

One of the main objectives of the INSPIRE Directive is to ensure the interoperability of the spatial data sets. Interoperability, within the meaning of the directive, is the ability to combine spatial data sets coming from different sources (different countries, different applications). As a result of the merger, which should take place without human interference, the value added should be created, i.e. on the basis of the combined data from different sets it should be possible to obtain new information. Interoperability will be provided by applying: conceptual modelling during database structures designing, UML language to write compiled models, harmonisation of the models and their integration with the ISO 19100 series of international standards and last but not least, utilisation of GML schemas as the standards for data exchange. This is so important issue that on 8 December 2010 the European Commission Regulation on the interoperability of spatial data sets and services was published (Rozporządzenie KE, 2010).

'Technology' described above, the aim of which is to ensure the achievement of interoperability of datasets, is used for the preparation of drafts of the regulations in the field of Geodesy and Cartography. In the regulations and in the attachments, besides many other elements, the information content of databases is described. On this basis the conceptual model of the databases contents will be created. This model written in the UML language is called an application schema. The application schema should be harmonised with other schemas. A proposal of the mean of the harmonisation was presented in the paper during the Conference of the Polish Association for Spatial Information in 2007 (Pachelski, Parzyński, 2007). It referred to developing and using a General Geodetic Model (GGM). In this model the definitions of the elements common to several regulations would occur. In the ongoing work in the Head Office of Geodesy

and Cartography concerning the drafts of the regulations the concept of GGM is being used under the name of the Basic Model. In the Figure 2.1 a part of the Basic Model under the name 'Basic types' is showed. It presents a definition of three classes which will be used in most or even all regulations. Definition of the identifier of the spatial information infrastructure objects is given i.a. in part 2.1 of annex no 1 to the regulation on interoperability (Rozporządzenie KE, 2010). In accordance with this definition a class 'BT_Identyfikator' has been defined, which will be the type of the attribute 'idIIP'. This attribute will be 'possessed' by every spatial object of the infrastructure. Similar situation occurs in the case of the class 'BT_CyklZyciaInfo'. This class will be used to describe the succeeding versions of the object.

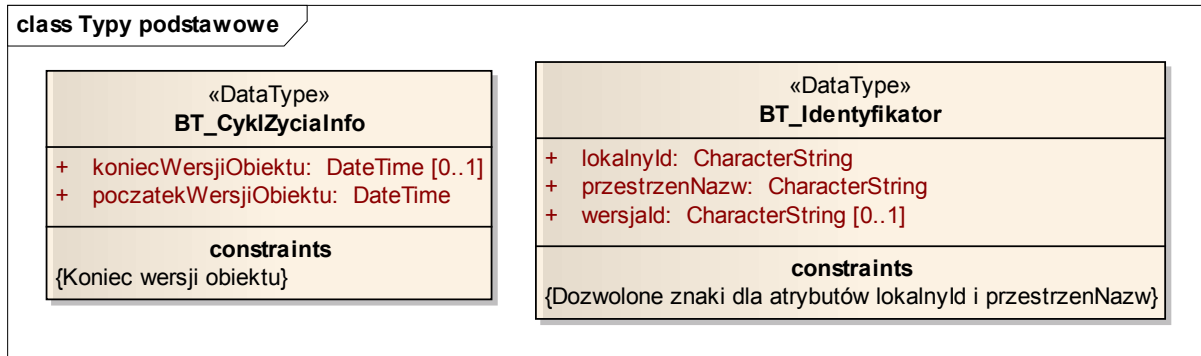


Fig. 2.1. An example of the part of the Basic Model – Basic types.

In the case of any change neither the object will be deleted from the database nor the new one will be created but the next version of the object will be formed and the older one will be moved to the archive. Because of that it will be possible to restore the situation for a specific date from the past. In the case of the majority of the geodetic data changes are made on the basis of the document, for example administrative decision or accepted geodetic work. In order to describe the grounds for the change the third class visible in the Figure 2.2 – 'BT_Dokument' – can be used. In the definitions of the classes presented in the Figures 2.1 and 2.2 an issue of the integration of the application schemas with the ISO standards is also taken into account. Integration with the ISO standards consists in using in the application schemas with the greatest possible degree classes defined in the ISO standards. These classes are most frequently used to define the types of attributes. Class 'CharacterString' being a string is defined in the ISO 19103 technical specification (ISO 19103, 2005). Classes 'Date' and 'DateTime' are defined in the ISO 19108 standard (ISO 19108, 2005) and they are both used to describe the date and the time with different precision. Class 'CI_OnlineResource' is defined in the ISO 19115 standard (ISO 19115, 2010).

On the basis of the application schemas in UML, the GML application schemas will be generated, in which the model structure will be saved in the GML language. These schemas will serve as data exchange standards (eventually the sole, official standard). During a transition period standards which are currently in force, for example SWDE, will play the role of standard in parallel with GML. An exemplary part of the GML application schema is shown in Figure 2.3.

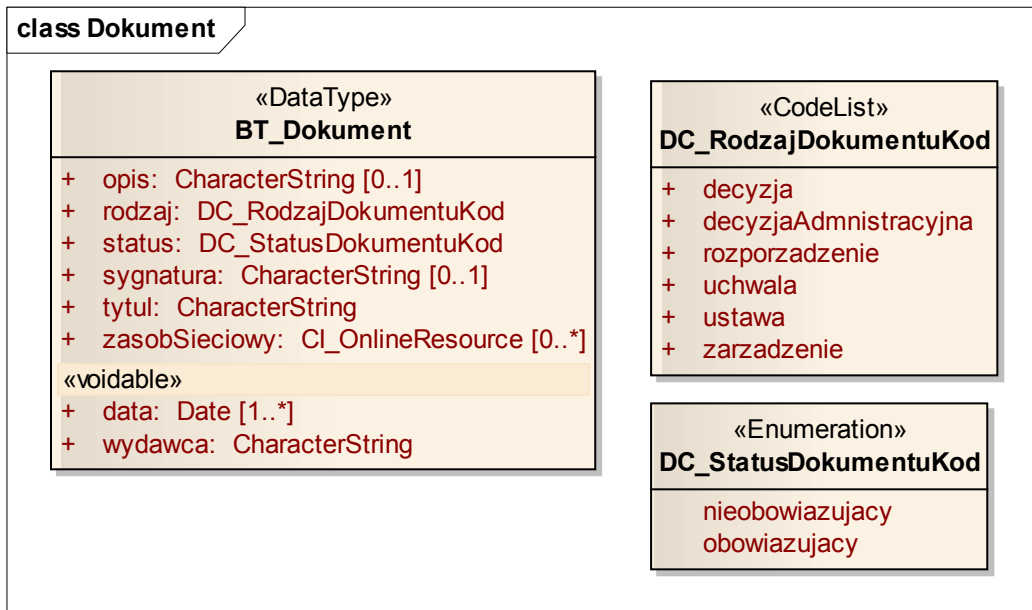


Fig. 2.2. An example of a part of Basic Model – Document.

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<simpleType name="DC_StatusDokumentuKodType">
  <restriction base="string">
    <enumeration value="nieobowiazujacy"/>
    <enumeration value="obowiazujacy"/>
  </restriction>
</simpleType>
<simpleType name="DC_RodzajDokumentuKodType">
  <union memberTypes="bt:DC_RodzajDokumentuKodEnumerationType
bt:DC_RodzajDokumentuKodOtherType"/>
</simpleType>
<simpleType name="DC_RodzajDokumentuKodEnumerationType">
  <restriction base="string">
    <enumeration value="decyzja"/>
    <enumeration value="ustawa"/>
    <enumeration value="rozporzadzenie"/>
    <enumeration value="uchwala"/>
    <enumeration value="zarzadzenie"/>
    <enumeration value="decyzjaAdmnistracyjna"/>
  </restriction>
</simpleType>
<simpleType name="DC_RodzajDokumentuKodOtherType">
  <restriction base="string">
    <pattern value="other: ?v{2,}"/>
  </restriction>
</simpleType>
    
```

Fig. 2.3. An example of the GML application schema relating to the classes ‘DC_StatusDokumentuKod’ and ‘DC_RodzajDokumentuKod’.

The components described above, i.e. UML application schemas, integration with the ISO standards and GML application schemas, are new elements, which do not occur within the current technical instructions and guidelines.

3. DETAILED CHANGES

The changes discussed in this chapter relate to the engineering geodesy, mainly to the investment handling. So far the G-3 Technical Instruction (Instrukcja G-3, 1988) and the G-3.1 Technical Guidelines (Wytyczne G-3.1, 2007) have been devoted to these issues. Among the drafts of the regulations, which are being prepared, there will not be a separate regulation on the geodetic service of the investments. These matters will be included in a regulation of the Minister of Interior and Administration ‘on the technical standards for the performing of the surveying of terrain details and elevations and the compilation and the transmission of the results of these measurements to the national geodetic and cartographic resources’. In the draft of the regulation (version from the beginning of January 2011 which is now being consulted) two sections are going to be placed: section V ‘Procedures of the performing of the surveying of terrain details and elevations for the building, including the geodetic service of the construction projects’, and section VI ‘Technical of the surveying of terrain details and elevations’. In these sections the issues concerning, among other things, project purpose maps, setting out network, setting out of the project elements and measurement of displacements and deformations will be discussed. Section VI will be mainly devoted to the railway geodetic measurements with minor additions on the performance of the geodetic measurements in the areas covered by the influences of mining exploitation and geodetic and cartographic elaborations for the purposes of road engineering. The analysis will be based on a few selected issues because the material to be analysed is the draft of the regulation, which may be changed.

SETTING OUT NETWORK

Many elements in the draft of the regulation concerning the network have been ‘borrowed’ or simply copied from the G-3.1 Guidelines (Wytyczne G-3.1, 2007), for example when the network is established, what it should be connection to, issues connected with the local datum, etc.

In the guidelines the entire paragraph is devoted to the stabilisation of the points of the setting out network. The draft of the regulation contains a statement that the points of the setting out network should be stabilised by the signs made of durable material, but in the case of railway horizontal networks points should be stabilised by the concrete bars with steel head. However, a separate chapter is devoted to the network established by the GNSS technique. It should be a homogenous network with the reference stations of the ASG-EUPOS system. For the static and rapid static measurements POZGEO-D service should be used. Initial verification of the observation by the free adjustment is recommended. For the proper adjustment the software of the contractor can be used. Vectors between measured points and reference stations should be adjusted jointly with the aid of the least squares method, assuming the correctness of the ASG-EUPOS station, and then converted to the required coordinate systems. In the guidelines it is only mentioned that one of the forms of the setting out network can be a network of the points measured by the GPS technique.

The draft of the regulation lacks certain elements that can be found in the G-3 Technical Instruction and guidelines, for example enumerations of what the choice of the type of network depends on or which quality standards for the determination of the horizontal setting out network can be applied (mean errors, error ellipses, etc.).

SETTING OUT OF THE PROJECT ELEMENTS

The authors of the draft have not avoided enumerating what should be laid out depending on the type of object (an industrial plant, railway, road, etc.). Similar situation occurs in the case of the G-3 Technical Instruction in which this point runs as follows: ‘the object of the setting out in particular are: ...’. In the draft of the regulation and in the guidelines, in turn, it runs as follows: ‘the object of the setting out are: ...’. The instruction clearly suggests that apart from the listed items something else can also be laid out, whereas the draft lacks such explicit permission. It can cause certain consequences in the acceptance of the work, because the regulation do not clearly indicate that some other elements can also be laid out (I've heard of such a situation in the case of the measurement of the feed silo – surveyor could not use the laser scanner for the measurement because this technique has not been enumerated in the technical instruction!). It seems to be a step backwards in comparison with the instruction.

The draft of the regulation, as well as the guidelines, includes the issue of the accuracy, besides the methods with help of which the setting out of terrain details can be performed are enumerated, the contents of the setting out sketch, control measurements. The draft of the regulation extends the list of possible methods in relation to the guidelines by adding the GNSS satellite method.

MEASUREMENTS OF DISPLACEMENTS AND DEFORMATIONS

As far as the matters relating to the measurements of displacements and deformations are considered among other things the following contents have been moved: when such measurements are performed, the accuracy of measurements and the frequency of the measurements of displacements and deformations. Differences occur in other elements, namely:

- in the draft of the regulation the emphasis is laid on the objects with particular characteristics (chimney, dam, bridge) requiring slightly different approach in matters of the network and the original measurement (it can be even concluded that only in the case of such objects the original measurement should be performed); in the guidelines, in turn, the original measurement should always be done;
- in the guidelines, contrary to the draft of the regulation, there is a paragraph devoted to the contents of the project of measurements;
- in the draft, more than in the guidelines, an issue of the documentation is discussed, the entire chapter is devoted to documenting the results of the measurements and what kind of documentation is to be transferred to the documentation centers.

4. CONCLUSIONS

In the title I have pledged myself to determine the directions of the proposed changes in the law relating to the engineering geodesy and the conclusion section is the most appropriate place to name these directions:

‘towards the Union’ – it is the result of Poland’s accession to the European Union. Since then we are obliged by the EU directives and regulations, i.a. the INSPIRE Directive. This situation is the main reason for occurring in the regulations (for the first time) the annexes in the form of the UML application schemas, the object directory and the GML application schemas being simultaneously data exchange standards;

‘instead of the guidelines’ – it is due to the replacement of the existing technical instructions (statements), guidelines and standards by the regulations. It results in the necessity of the introduction of new elements to the regulations. As an example section VI of the draft of the regulation can serve;

‘towards the 21st century’ – the laser scanning technique that is mentioned few times in the regulation as well as the GNSS and the GPS techniques introduced to the draft of the regulation entitle me to determine such direction. I would put into it also the modifications which consist in the determination of the features of the final product instead of the existing enumerations: with the help of which methods, when, under what conditions and with the aid of which equipment it is allowed to perform the measurements. Separation of this direction of changes does not mean that from the draft of the regulation all the enumerations have been deleted;

‘continuation’ – it results from the introduction to the draft of the regulation very many elements from the currently valid G-3 Technical Instruction and G-3.1 Guidelines.

I reckon that the above-mentioned trends are positive and the changes go in the right direction. However, in the case of two last aforementioned directions the maintaining of the positive evaluation will depend on the contents introduced from the technical instructions and the guidelines to the final version of the draft, which does not exist yet. It causes also a problem and leads to the question about the point of the establishment of the last direction of changes, which would include all the modifications made in relation to the technical instructions and the guidelines in the draft of the regulation, which have not been covered by the above-mentioned directions, for example resignation from the determination of the elements that should be included in the project of the displacement measurements and noting that the project is to be found in the final documentation of measurements.

The similar situation occurs in the case of the attempt to determine the impact of the changes on the entities (companies, administration) acting in the field of the geodetic performance. Establishing GML as data exchange standard results in the necessity of the software adjustment to these requirements (data import and export in GML) both on the side of the commercial companies and on the side of the centers of documentation and various administrative units. And this is incontestable fact. Other above-mentioned consequences depend on the specific formulations.

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