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Quality Elements and Measures of Relief and Aesthetics on Croatian Topographic Map TK25

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1. Introduction

Objective: to identifythe quality elements on printed (an analogous) sheets of TK25 and how they can be measured

- First sheet in 2002 available for official use
- Production 594 sheets
- Quality control by Croatian Geodetic Institute (CGI)

2. Quality control of TK25

Quality control in CGI 2002 – 2010:

- margin content,
- map frame and coordinate grid,
- map description,
- trigonometric points (according to the official database and compatibility with relief),
- relief review,
- check of settlements (spatial units registry), objects and utility (according to the TD, generalization),
- hydrography (objects, types of waters, compatibility with relief, generalization),
- traffic (categorization, objects, generalization),
- cover and land types,
- check of toponyms (according to the sources), edge matching, maritime and underwater objects, depth contours, field checking (check with reality, accuracy) and
- general alignment of topographic symbols with cartographic key (Specification) including standardization of different producers.

3. International Standard Organization (ISO)

Croatian Standards Institute adopted:

- EN ISO 19113
- EN ISO 19114,
- EN ISO 19115 and
- International document ISO/TS 19138

in English as Croatian technical specification.

3. International Standard Organization (ISO)

ISO 19113 : principles for describing the quality of geographic data

Data quality elements and subelements:

Completenes: commission and amission,

Logical consistency: conceptual, domain, format and topological consistency,

Positional accuracy: external or absolute, internal or relative accuracy,

Temporal accuracy: accuracy of a time measurement, temporal consistency, temporal validity

Thematic accuracy: classification correctness, quantitative attribute accuracy, non-quantitative attribute correctness

3. International Standard Organization (ISO)

ISO 19114: framework of procedures

ISO 19115: metadata elements

Theirs principles can be extended to other forms: maps, charts, textual documents

ISO 19138: multiple quality measures for each quality subelement

4. Quality elements as recommended by the ICA

The International Cartographic Association (ICA)

Quality elements:

- Lineage,
- Positional accuracy,
- Attribute accuracy,
- Completeness,
- Logical consistency,
- Semantic accuracy,
- Temporal information.

5. Application on printed maps

Table 1.

in columns: 9 quality elements

in rows: elements of control (report of examination detailed topographic maps in CGI)

Table 1 Quality elements and elements of control

		Quality elements								
		lineage	positional accuracy	attribute accuracy	completeness	logical consistency	semantic accuracy	temporal information / temporal accuracy	thematic accuracy	aesthetics
Elements of control	margin contents									
	the relief representation									
	buildings, settlements, lines									
	hydrography and facilities									
	roads and buildings									
	vegetation and soil types									
	names									
	edge matching									
	maritime and underwater objects, depth contours									
	field observations									

5. Application on printed maps

Table 2.

in columns: 9 quality elements

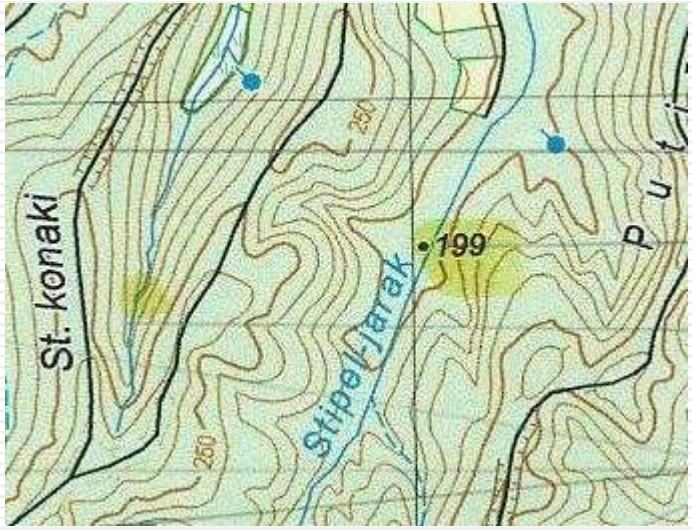
in rows: quality measures for relief presentation

Table 2 Quality elements and quality measures

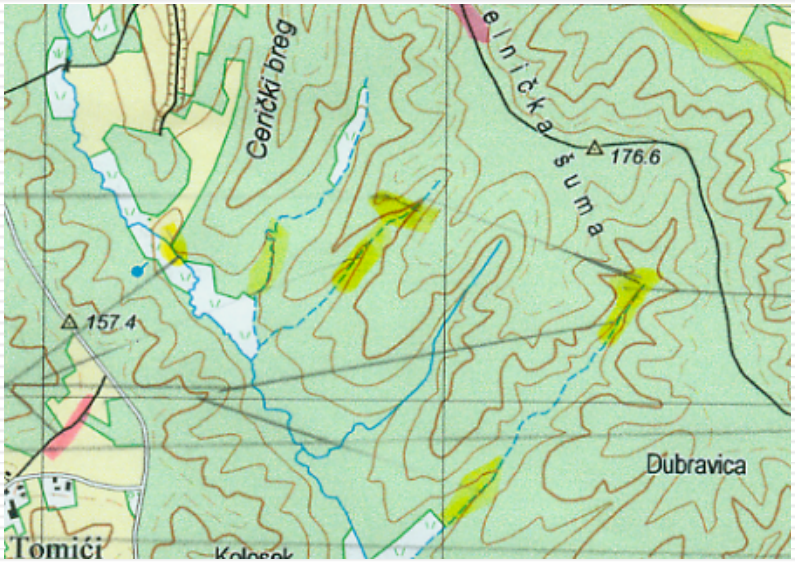
		Quality elements								
		lineage	positional accuracy	attribute accuracy	completeness	logical consistency	semantic accuracy	temporal information / temporal accuracy	thematic accuracy	aesthetics
Quality measures for relief presentation	checking the suitability of elevation point		■	■		■			■	
	checking compliance of relief with watercourses		■			■				■
	checking whether the saddles quoted				■	■				
	checking whether valleys are shown		■		■	■				
	checking the existence of angular and pointed cont. lines		■			■				■
	checking whether the relief representation completed				■	■				
	checking whether the eponymous elevation and contour lines harmonized					■				
	checking whether the auxiliary contour lines missing		■		■	■				
	checking if contour lines bonded together		■			■				■
	checking whether the contour lines are missing		■		■	■				
	examine the justification for display rockies			■		■				■

Example 1

Positional accuracy of the relief presentationis is estimated with the following quality measures:



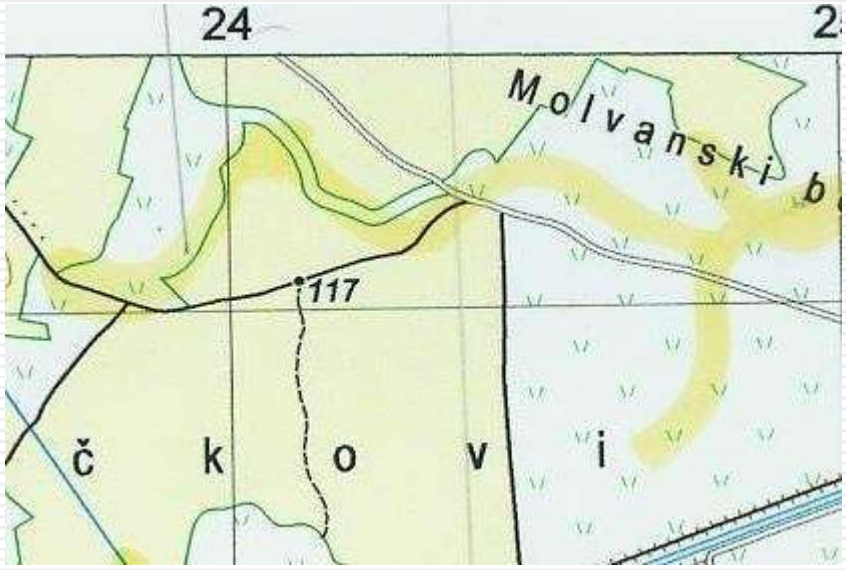
checking the suitability of elevation point, Figure 1



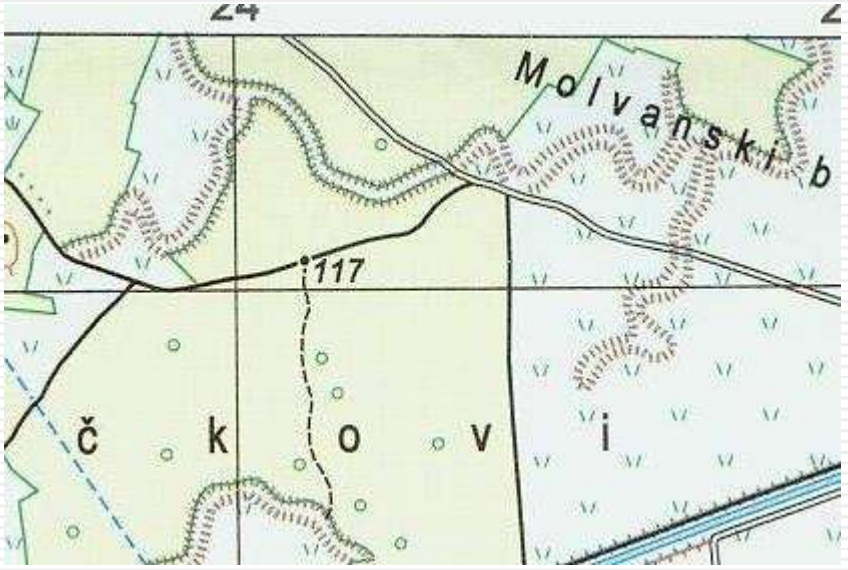
checking the compliance of relief with watercourses, Figure 2

Example 1

Positional accuracy of the relief presentationis is estimated with the following quality measures:



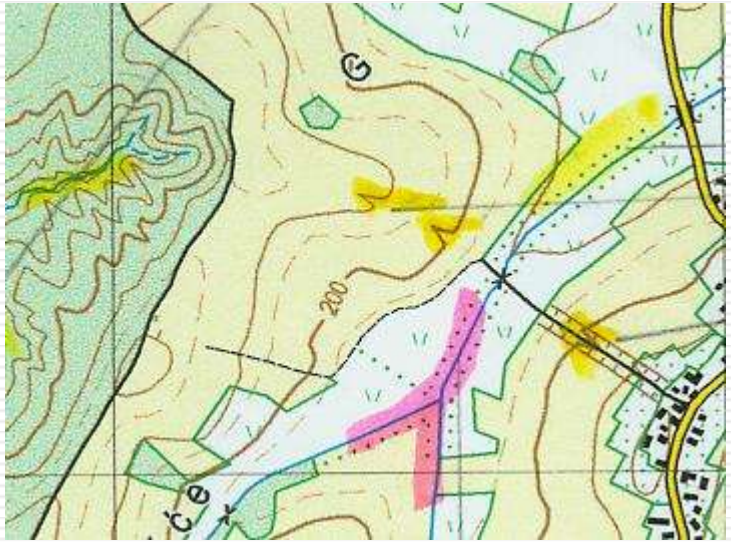
valleys are not shown, Figure 3



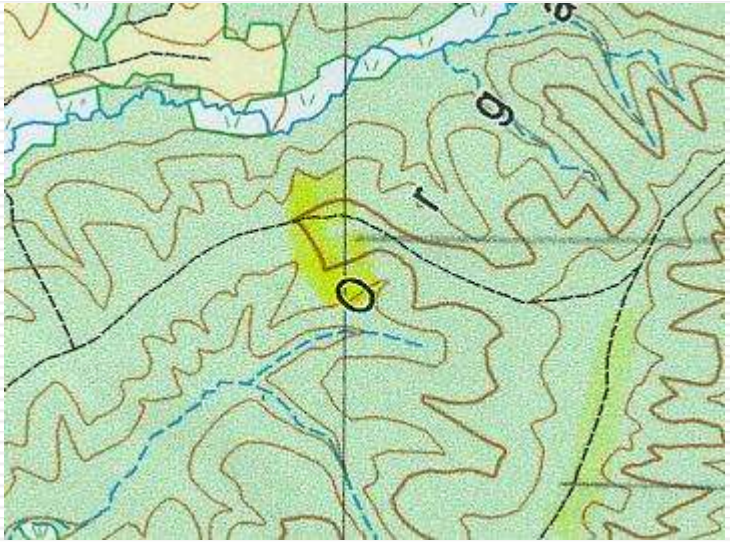
valleys are shown, Figure 4

Example 1

Positional accuracy of the relief presentationis is estimated with the following quality measures:



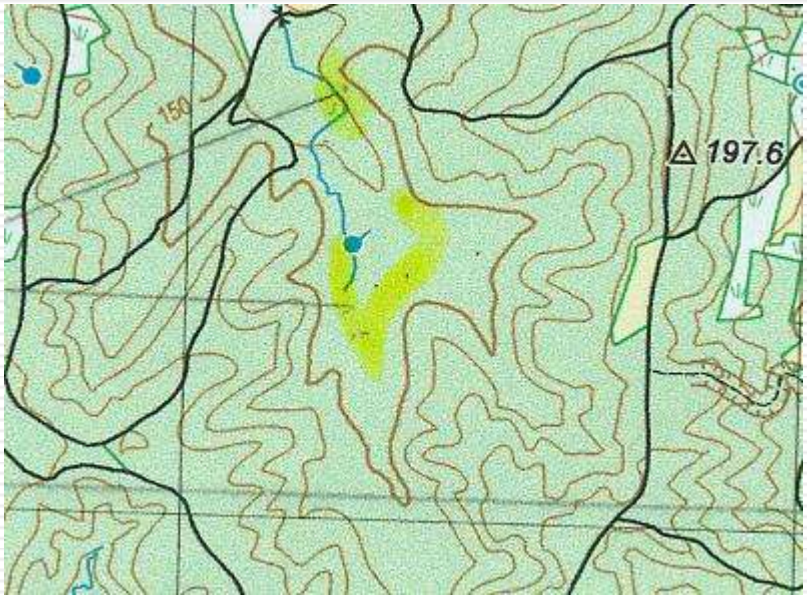
checking the pointed contour lines, Figure 5



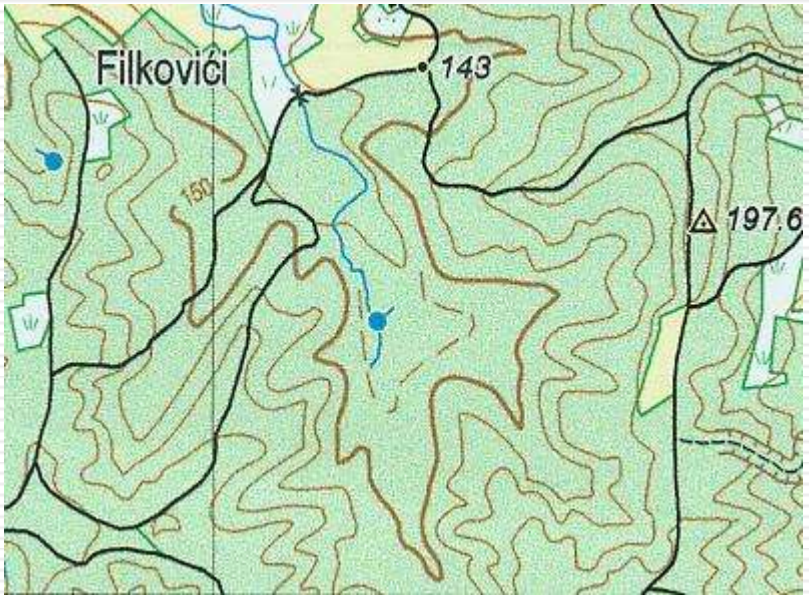
checking the angular contour lines, Figure 6

Example 1

Positional accuracy of the relief presentationis is estimated with the following quality measures:



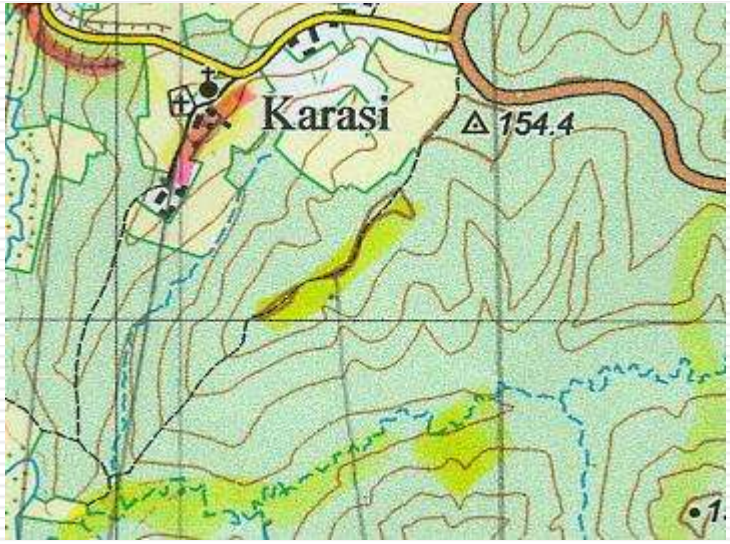
the auxiliary contour lines are missing, Figure 7



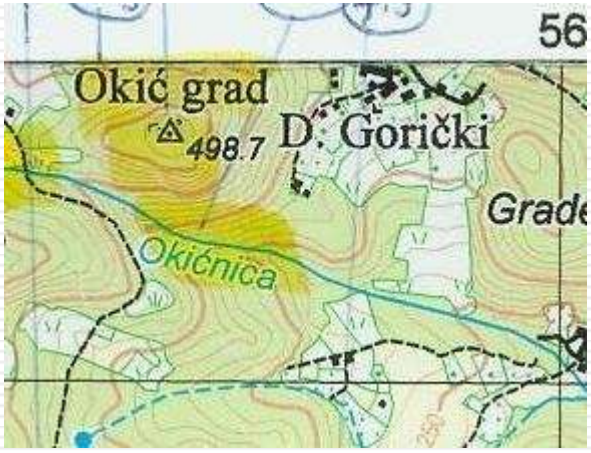
the auxiliary contour lines are not missing, Figure 8

Example 1

Positional accuracy of the relief presentationis is estimated with the following quality measures:



contour lines bonded together , Figure 9



contour lines are missing, Figure 10

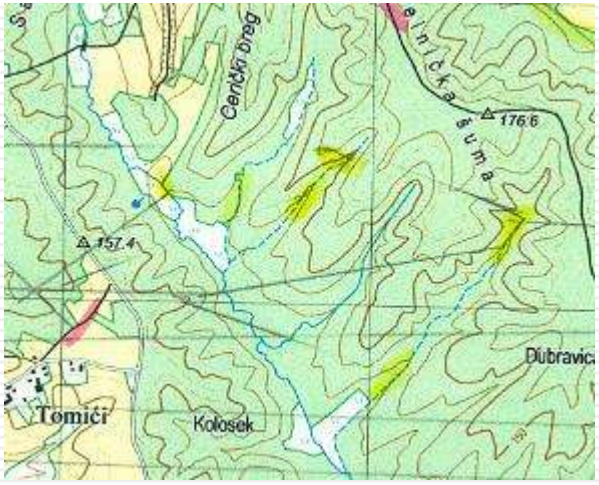
Example 1

Recommended procedures for improving the quality of maps are:

- to choose a new location for the elevations,
- to align relief with watercourses,
- to display the valleys,
- to round square and pointed contour lines,
- to draw auxiliary contour lines,
- to show contour lines that are missing,
- to separate contour lines that are bonded together .

Example 2

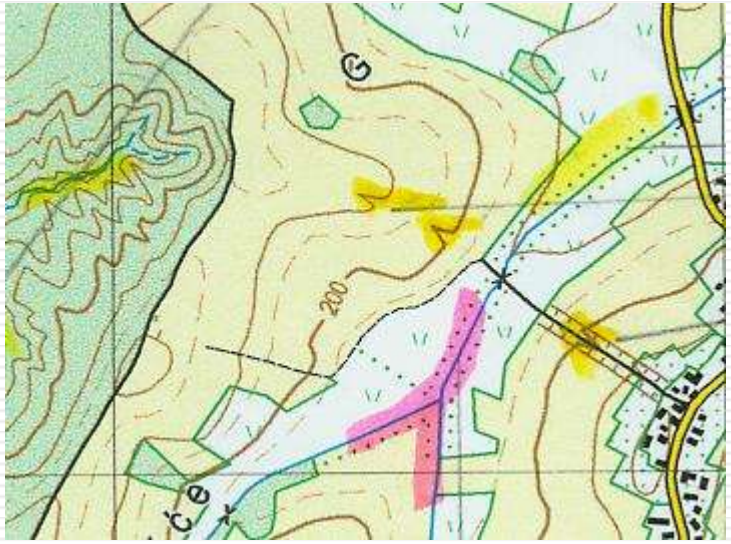
Aesthetic of the relief presentationis is estimated with the following quality measures:



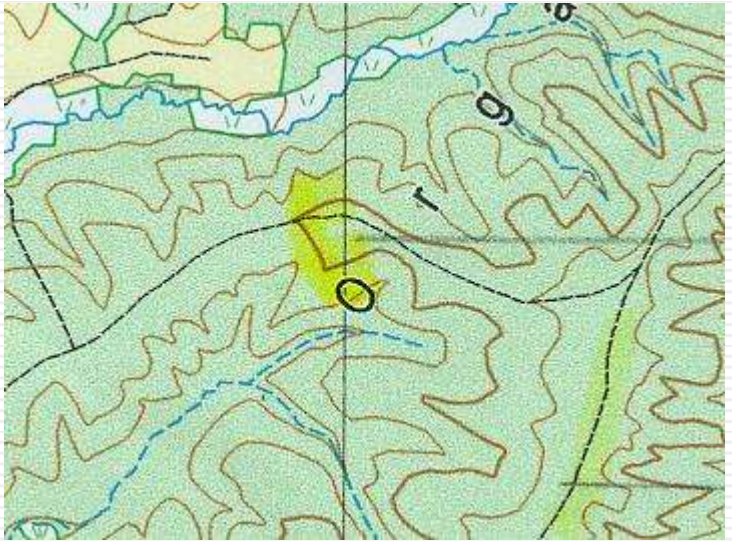
compliance of relief with watercourses, Figure 2

Example 2

Aesthetic of the relief presentationis is estimated with the following quality measures:



pointed contour lines, Figure 5



angular contour lines, Figure 6

Example 2

Aesthetic of the relief presentationis is estimated with the following quality measures:

checking contour lines that are bonded together ,
Figure 9

Example 2

Aesthetic of the relief presentationis is estimated with the following quality measures:

the justification for display rockies, Figure 11

the justification for display rockies, Figure 12

Example 2

Recommended procedures for improving the quality of maps are:

- to align relief with watercourse,
- to round angular and pointed contour lines,
- to separate bonded together contour lines,
- to display rockies on correct places.

6. Conclusions

- almost all quality elements can be determined using the elements of control, except lineage,
- quality measures that affect the positional accuracy are recognized,
- quality measures that affect the aesthetics are recognized,
- I identified the existence of quality measures,
- I determined procedures to improve the quality of the map,
- for all statements in this article I have used examples, proofs and my experience in quality control.

Thank you for your attention!