

# Official Handbook of the International Field Course and Soil Judging Contest

1-5, September

Gödöllő, Hungary

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# **GENERAL INFORMATION**

As part of the celebrations of the International Year of Soils (IYS), an International Field Course and Soil Judging Contest has been organized for September 1-5, 2015 in Gödöllő, Hungary. The occasion is a great opportunity for students, researchers and people interested in soils from around the world to interact and experience the landscapes and soils of Hungary and the Danube Basin.

The scope of the Soil Judging Contest is for participants to use their knowledge and practical skills to describe, understand and interpret soil characteristics in the field. Participants (in the form of teams and individuals) will describe a series of contest profiles using basic field tools, selected standards and guidelines. The winners will be selected on their ability to correctly describe each soil, evaluate potential soil functions and interpret their capacity to perform under different land use and management practices. To prepare for the event, a four day technical training course is offered.

This event follows the successful 1st International Soil Judging Contest that was held during the 20th World Congress of Soil Sciences in Jeju, Korea in June 2014.

## **Training (4 days)**

An international team of soil experts will give an overview of the site, profile descriptions and soil classification standards. Local experts will introduce the landscape and soil conditions of Hungary with a focus on the areas of the contest. Short classroom sessions will be followed by practical training of field procedures and techniques. Standard samples will be provided for training of texture type, clay % and sand % determination. The soils in question will cover a diverse geographical area with a range of topographic, parent material and moisture regime conditions. The training profiles will include Calcisols, Chernozems, Gleysols, Luvisols, Regosols, Solonetz and Vertisols soils – according to the World Reference Base of Soil Resources (WRB) (Entisols, Inceptisols, Alfisols, Mollisols, Vertisols – according to Soil Taxonomy (ST)).

## **The Contest (1 day)**

Participants (teams or individuals) will describe the contest profiles, based on the available field tools and selected standards and guidelines. Evaluation of potential soil functions and interpretation of the capacity of the soil to perform under different use and management will be also scored. The four contest soil profiles will be selected from the soil types used for training.

# EQUIPMENT AND REFERENCE MATERIALS

**The following equipment will be supplied to each team for the duration of the contest**

10 % HCl dropper bottle

Soil knife/digging tool

Hand lens

Water bottle

Container for soil samples

Abney level or clinometer

Clipboard

Plastic bags (for collection of standard soil samples for texture determination)

The teams are requested to bring their own Munsell Soil Color Chart books, as only limited number can be supplied by the organizers (1 copy/profile).

**The following reference materials will be permitted during the contest**

This printed handbook – provided by the organizers

World Reference Base for Soil Resources (IUSS Working Group WRB, 2014) – not provided by the organizers

Keys to Soil Taxonomy Twelfth Edition (Soil Survey Staff, 2014) – not provided by the organizers

(Simplified version is being produced and will be distributed)

Guidelines for Soil Description (FAO, 2006) – not provided by the organizers

Field Book for Describing and Sampling Soils (Schoeneberger et al., 2012) – not provided by the organizers

The listed not provided standards are available for download on the homepage:

<http://soiljudging-iys2015.com/rules-and-standards>

## Conduct of the training

On the 1<sup>st</sup> of September (Tuesday) after the opening there will be presentations on the soils, geomorphology, geology, hydrology of Hungary as well as an introduction to soil functions. After lunch there will be a field training on site and profile description near the campus. On the 2<sup>nd</sup> of September (Wednesday) training on soil classification will take place focusing on the diagnostic elements of the World Reference Base for Soil Resources (WRB) and the Soil Taxonomy. After lunch field training on soil classification will take place.

On the 3<sup>rd</sup> and 4<sup>th</sup> of September (Thursday and Friday) there will be a field training and an exercise in the countryside. One day half of the groups (8 teams) are going to travel to the west and the other half (8 teams) to the east. Next day teams swap directions. Each day 4-4 profiles will be investigated (2 in the morning 2 in the afternoon).

Following the rules of the 1<sup>st</sup> *International Soil Judging Contest* a typical section will be selected in each pit and clearly designated as the control section by the contest officials. The control section will be used for measurement of horizon depths and boundaries; it will constitute the officially scored profile and must remain undisturbed and unblocked. All measurements should be made within the designated area. A measuring tape will be placed in the control section at all pits and will be maintained by official pit monitors. Up to six horizons will be described within a given depth. A card at each site will give the profile depth to be considered, the number of horizons to be described, and chemical or physical data that may be required for classification.

Every participant will get 1 scoresheet/profile. Following the instructions of the coaches, considering the laboratory information and the instructions of this handbook the scoresheets are to be filled.

The team coaches will receive the full laboratory dataset and the already filled scoresheets that can be used for guidance.

## **Conduct of the individual contest**

Following the rules of the *1<sup>st</sup> International Soil Judging Contest* 60 minutes will be allowed for evaluating each site and soil for individual judging. Competitors will be assigned by team number to one of two groups at each site. One group will follow this schedule: 10 minutes in the pit, 10 minutes out, 10 minutes in, 10 minutes out, and 20 minutes free-for-all. The other group will follow the opposite in-and-out schedule. At alternating sites the competitors will switch the in-and-out schedule. Competitors may obtain a sample from the surface horizon while out of the pit, provided they do not enter the pit or disturb those already in the pit. Individual competitors will be assigned a number that will be used to identify their scorecard and the rotation schedule. The procedures for student rotation and time in and out of the pit may be altered prior to the contest to meet unanticipated difficulties at the site (Official Handbook of the Inaugural International Soil Judging Contest).

General rules of the individual contest:

- Competitors are not allowed to speak to each other;
- Competitors are not allowed to use mobile phones, tablets, PDA-s;
- Competitors are allowed to use the equipment provided on site, and the allowed standards.

## **Conduct of the team contest**

Following the rules of the *1<sup>st</sup> International Soil Judging Contest* 60 minutes will be allowed for teams to evaluate each of the two sites. The time will be divided into 10-minute segments similar to the individual contest. Teams will be randomly assigned a team number at registration. All competitors in a team may participate in the team contest. The starting time(s) of the team contest will be announced at the coaches' meeting (Official Handbook of the Inaugural International Soil Judging Contest).

General rules of the team contest:

- Team members are not allowed to speak to other team members;
- Competitors are not allowed to use mobile phones, tablets, PDA-s;
- Competitors are allowed to use the equipment provided on site, and the allowed standards.

# I. SITE CHARACTERISTICS

## Land use

Task on the scoresheet: Determine the land use class according to Table 1. (FAO Table 8.)

Class	Classification
A	Crop agriculture
M	Mixed farming
H	Animal husbandry
F	Forestry
P	Nature protection
S	Settlement, industry
Y	Military area
O	Other land uses
U	Not used and not managed

Table 1. Land use classification

## Slope position

Task on the scoresheet: Determine the slope position according to Figure 1. (FAO Figure 2.). Use the class codes indicated in Table 2.

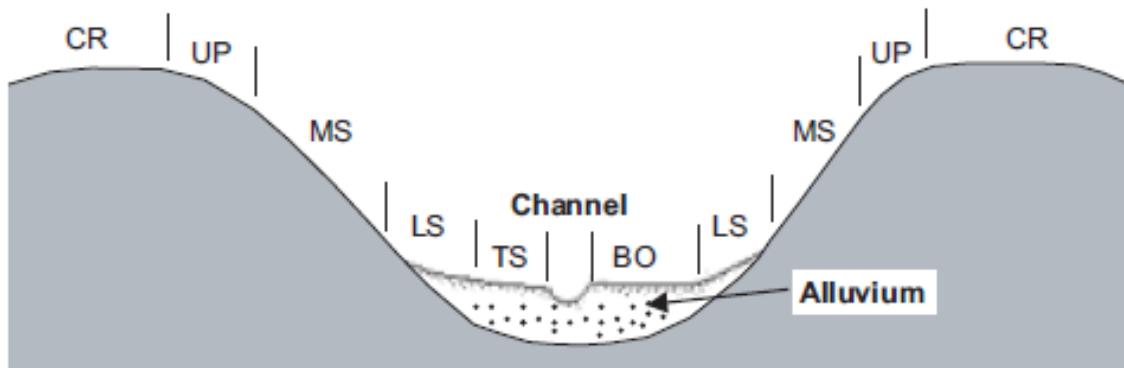


Figure 1. Slope positions

Code	Landform
CR	Crest (summit)
UP	Upper slope (shoulder)
MS	Middle slope (backslope)
LS	Lower slope (foot slope)
TS	Toe slope
BO	Bottom (flat)

Table 2. Slope positions and class codes

## Slope %

Task on the scoresheet: Use the clinometer to determine the slope gradient as a percentage according to the Table 3 (FAO Table 17.). If the slope gradient is between 0 and 2 % choose 01, 02, 03 or 04.

Code	Description	Slope gradient (%)
<b>01</b>	Flat	0-0.2
<b>02</b>	Level	0.2-0.5
<b>03</b>	Nearly level	0.5-1.0
<b>04</b>	Very gently sloping	1.0-2.0
<b>05</b>	Gently sloping	2-5
<b>06</b>	Sloping	5-10
<b>07</b>	Strongly Sloping	10-15
<b>08</b>	Moderately steep	15-30
<b>09</b>	Steep	30-60
<b>10</b>	Very steep	>60

Table 3. Slope gradient class codes

## Parent material

Task on the scoresheet: Determine the parent material according to Table 4. (simplified FAO Table 12.). If the parent material is igneous, metamorphic or consolidated sedimentary indicate only the major class code. If the parent material is unconsolidated sedimentary indicate the group code.

Major class code	Group code	Lithology
I		Igneous
M		Metamorphic
S		Consolidated sedimentary
U	<b>UR</b>	Unconsolidated sedimentary (weathered residuum)
	<b>UF</b>	Unconsolidated sedimentary (Fluvial)
	<b>UL</b>	Unconsolidated sedimentary (Lacustrine)
	<b>UC</b>	Unconsolidated sedimentary (Colluvial)
	<b>UE</b>	Unconsolidated sedimentary (Aeolian)

Table 4. Types of possible parent materials to be indicated

## Erosion

Task on the scoresheet: Determine the dominant erosion category using Table 5. (FAO Table 16.). Determine the degree of erosion using the Table 6. (FAO Table 18.). If the classification of erosion is "N" the degree of the erosion must be Ø.

Code	Class
<b>N</b>	No evidence of erosion
<b>WS</b>	Water erosion or deposition (Sheet erosion)
<b>WR</b>	Water erosion or deposition (Rill erosion)
<b>WG</b>	Water erosion or deposition (Gully erosion)
<b>WT</b>	Water erosion or deposition (Tunnel erosion)
<b>WD</b>	Water erosion or deposition (Deposition by water)
<b>WA</b>	Water and wind erosion or deposition (Water and wind erosion)
<b>M</b>	Mass movement (landslides and similar phenomena)
<b>AD</b>	Wind (aeolian) deposition (Wind deposition)
<b>AM</b>	Wind (aeolian) erosion or Deposition (Wind erosion and deposition)
<b>AS</b>	Wind (aeolian) erosion or Deposition (Shifting sands)
<b>AZ</b>	Wind (aeolian) erosion or Deposition (Salt deposition)

Table 5. Classification of erosion, by category

<i>Code</i>	<i>Class</i>	<i>Determination</i>
Ø	-	Not applicable
S	Slight	Some evidence of damage to surface horizons. Original biotic functions largely intact.
M	Moderate	Clear evidence of removal of surface horizons. Original biotic functions partly destroyed.
V	Severe	Surface horizons completely removed and subsurface horizons exposed. Original biotic functions largely destroyed.
E	Extreme	Substantial removal of deeper subsurface horizons.

*Table 6. Classification of erosion, by degree*

## **Surface cracks**

Task on the scoresheet: Estimate the width of (in cm) depth of (in cm) and distance between (in m) the surface cracks using Table 7. (FAO Table 21.). Is no surface cracks are observable indicate Ø on the scoresheet.

<b>Width (cm)</b>			<b>Depth (cm)</b>			<b>Distance between (spacing) (m)</b>		
<i>Code</i>	<i>Class</i>	<i>Size</i>	<i>Code</i>	<i>Class</i>	<i>Size</i>	<i>Code</i>	<i>Class</i>	<i>Size</i>
Ø	-	-	Ø	-	-	Ø	-	-
F	Fine	<1	S	Surface	<2	C	Very closely spaced	<0.2
M	Medium	1-2	M	Medium	2-10	D	Closely spaced	0.2-0.5
W	Wide	2-5	D	Deep	10-20	M	Moderately widely sp.	0.5-2
V	Very wide	5-10	V	Very deep	>20	W	Widely spaced	2-5
E	Extremely wide	>10				V	Very widely spaced	>5

*Table 7. Classification of surface cracks*

## **Salt characteristics**

Task on the scoresheet: Estimate visually the percentage of surface salt cover using Table 8. (FAO Table 22.). Estimate the thickness of surface salt cover using Table 8. (FAO Table 22.).

<b>Cover</b>			<b>Thickness</b>		
<i>Code</i>	<i>Class</i>	<i>%</i>	<i>Code</i>	<i>Class</i>	<i>mm</i>
0	None	0-2	N	None	
1	Low	2-15	F	Thin	<2
2	Moderate	15-40	M	Medium	2-5
3	High	40-80	C	Thick	5-20
4	Dominant	>80	V	Very thick	>20

*Table 8. Classification of salt characteristics*

## II. SOIL DESCRIPTION

### Horizon designations

Task on the scoresheet: Indicate the horizon designation including a numeric prefix (Prefix), a capitalized alphabetic master designation (Master), a lower case alphabetic subordinate designation (Sub) and if applicable, a numerical subdivision (No.)

#### Horizon -Master - Letter (Master horizons and layers)

Horizon designations to be used are indicated in Table 9.:

Code	Determination
<i>Mineral horizons</i>	
<b>A</b>	Surface or near-surface mineral horizon with some organic accumulation, usually a darker colour than underlying horizons and/or smaller clay content than underlying horizons.
<b>E</b>	A near-surface mineral horizon characterised by a loss of clay, iron, aluminium, or some combination of these; usually lighter in color (higher value and/or lower chroma) than the overlying A and underlying B.
<b>B</b>	A mineral horizon characterised by one or more of the following: a concentration of clay, iron, aluminium, organic material or several of these; a structure and/or consistence unlike the horizons above and below; stronger colours (higher chroma and/or redder hue) than the horizons above and below.
<b>C</b>	Consolidated or unconsolidated material, usually partly weathered, little affected by pedogenic processes.
<b>R</b>	Hard bedrock that cannot be cut with a spade.
<i>Organic horizons</i>	
<b>O</b>	Horizons dominated by organic material consisting of undecomposed organic materials that have accumulated on the surface of either mineral or organic soils. O horizons are not saturated with water for prolonged periods.
<b>H</b>	These horizons dominated by organic material formed from accumulations of undecomposed or partially decomposed organic material. All H horizons are saturated with water for prolonged periods, or were once saturated but are now drained artificially.

Table 9. The master horizons

#### Transitional horizons

There are two kinds of transitional horizons: those with properties of two horizons *superimposed*; and those with the two properties *separate*.

For horizons dominated by properties of one master horizon but having subordinate properties of another, two capital letter symbols are used, such as AB, EB, BE and BC. The master horizon symbol that is given first designates the kind of horizon whose properties dominate the transitional horizon.

Horizons in which distinct parts have recognizable properties of two kinds of master horizons are indicated as above, but the two capital letters are separated by a virgule (/), such as A/C, B/E, B/C and C/R. Commonly, most of the individual parts of one of the components are surrounded by the other.

### **Horizon -Master – Prefix** (Discontinuities)

In mineral soils, Arabic numerals are used as prefixes to indicate discontinuities. Wherever needed, they are used preceding the Master Letters. These prefixes are distinct from Arabic numerals used as suffixes to denote vertical subdivisions.

Where a soil has formed entirely in one kind of material, a prefix is omitted from the symbol; the whole profile is material 1. Similarly, the uppermost material in a profile having two or more contrasting materials is understood to be material 1, but the number is omitted. Numbering starts with the second layer of contrasting material, which is designated 2. Underlying contrasting layers are numbered consecutively. Even where a layer below material 2 is similar to material 1, it is designated 3 in the sequence. The numbers indicate a change in the material, not the type of material.

### **Horizon – Suffix** (Subordinate characteristics within master horizons and layers)

Designations of subordinate distinctions and features within the master horizons and layers are based on profile characteristics observable in the field and are applied during the description of the soil at the site. Lower case letters are used as suffixes to designate specific kinds of master horizons and layers, and other features.

Subordinate characteristics to be used:

<i>Suffix</i>	<i>Short description</i>	<i>Used for</i>
<b>b</b>	Buried genetic horizon	mineral horizons
<b>c</b>	Concretions or nodules	mineral horizons
<b>g*</b>	Stagnic conditions / *USA strong gley	no restriction
<b>h</b>	Illuvial accumulation of organic matter	mineral horizons
<b>i/*ss</b>	Slickensides / *USA	mineral horizons
<b>k</b>	Accumulation of pedogenetic carbonates	no restriction
<b>l*</b>	Capillary fringe mottling (gleying) *only in FAO	no restriction
<b>n</b>	Pedogenetic accumulation of exchangeable sodium	no restriction
<b>p</b>	Ploughing or other human disturbance	no restriction, E, B or C as Ap
<b>r*</b>	Strong reduction *only in FAO	no restriction
<b>w</b>	Development of colour or structure	B horizons
<b>z</b>	Pedogenic accumulation of salts more soluble than gypsum	no restriction

*Table 10. The suffixes to be used*

### **Horizon – No** (Vertical subdivisions)

Horizons or layers designated by a single combination of letter symbols can be subdivided using Arabic numerals, which follow all the letters.

These conventions apply whatever the purpose of subdivision. A horizon identified by a single letter symbol may be subdivided on the basis of evident morphological features, such as structure, colour or texture. These subdivisions are numbered consecutively.

## **Horizon boundary**

Task on the scoresheet: Determine the *depth (in cm)* from the mineral soil surface to lower boundary of each horizon except the last horizon. Determine the *distinctness* of the horizon boundaries according to Table 11. (FAO Table 24.). Determine the *topography* of the horizon boundary according to the Table 11. (FAO Table 24.) and Figure 2.

Distinctness			Topography		
Code	Class	cm	Code	Class	Determination
<b>A</b>	Abrupt	0-2	<b>S</b>	Smooth	Nearly plane surface
<b>C</b>	Clear	2-5	<b>W</b>	Wavy	Pockets less deep than wide
<b>G</b>	Gradual	5-15	<b>I</b>	Irregular	Pockets more deep than wide
<b>D</b>	Diffuse	>15	<b>B</b>	Broken	Discontinuous

Table 11. Classification of horizon boundaries by distinctness and topography

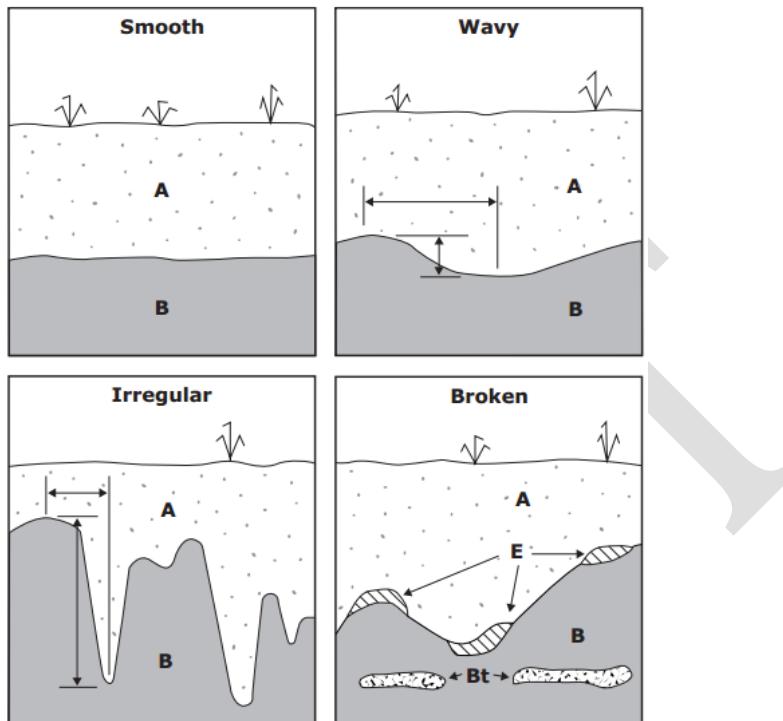


Figure 2. The categories of horizon topography (Schoeneberger et al., 2011)

## Soil color

Task on the scoresheet: Use the Munsell color chart to determine the moist color of each horizon described. Colors must be designated by Hue, Value and Chroma.

## Carbonates

Task on the scoresheet: Estimate the CaCO<sub>3</sub> content adding some drops of 10% HCl to the soil. Use the codes indicated in Table 12. (FAO Table 38.). Determine the forms of secondary carbonates. Use the codes indicated in Table 13. (FAO Table 39.).

Code	%	Class	Reaction
<b>N</b>	0	Non-calcareous	No detectable visible or audible effervescence.
<b>SL</b>	0 - 2	Slightly calcareous	Audible effervescence but not visible.
<b>MO</b>	2 - 10	Moderately calcareous	Visible effervescence
<b>ST</b>	10 - 25	Strongly calcareous	Strong visible effervescence. Bubbles form a low foam.
<b>EX</b>	> 25	Extremely calcareous	Extremely strong reaction. Thick foam forms quickly

Table 12. Classification of carbonate reactions in the soil matrix

<i>Code</i>	<i>Form</i>
<b>SC</b>	soft concretions
<b>HC</b>	hard concretions
<b>HHC</b>	hard hollow concretions
<b>D</b>	disperse powdery lime
<b>PM</b>	pseudomycelia
<b>M</b>	marl layer
<b>HL</b>	hard cemented layer or layers of carbonates

Table 13. Classification of secondary carbonate forms

## Texture

Task on the scoresheet: Estimate the clay and sand content for each horizon. Determine the textural class using the USDA Textural Classification chart (Figure 2., FAO Figure 3.) and use the coding indicated in Table 14. (FAO Figure 4.)

<i>Code</i>	<i>Textural class</i>	
<b>S</b>	Sand	Sand
<b>LS</b>	Loamy sand	
<b>SL</b>	Sandy loam	
<b>SCL</b>	Sandy clay loam	
<b>SiL</b>	Silt loam	Loam
<b>SiCL</b>	Silty clay loam	
<b>CL</b>	Clay loam	
<b>L</b>	Loam	
<b>Si</b>	Silt	Silt
<b>SC</b>	Sandy clay	
<b>SiC</b>	Silty clay	Clay
<b>C</b>	Clay	

Table 14. The coding of texture classes

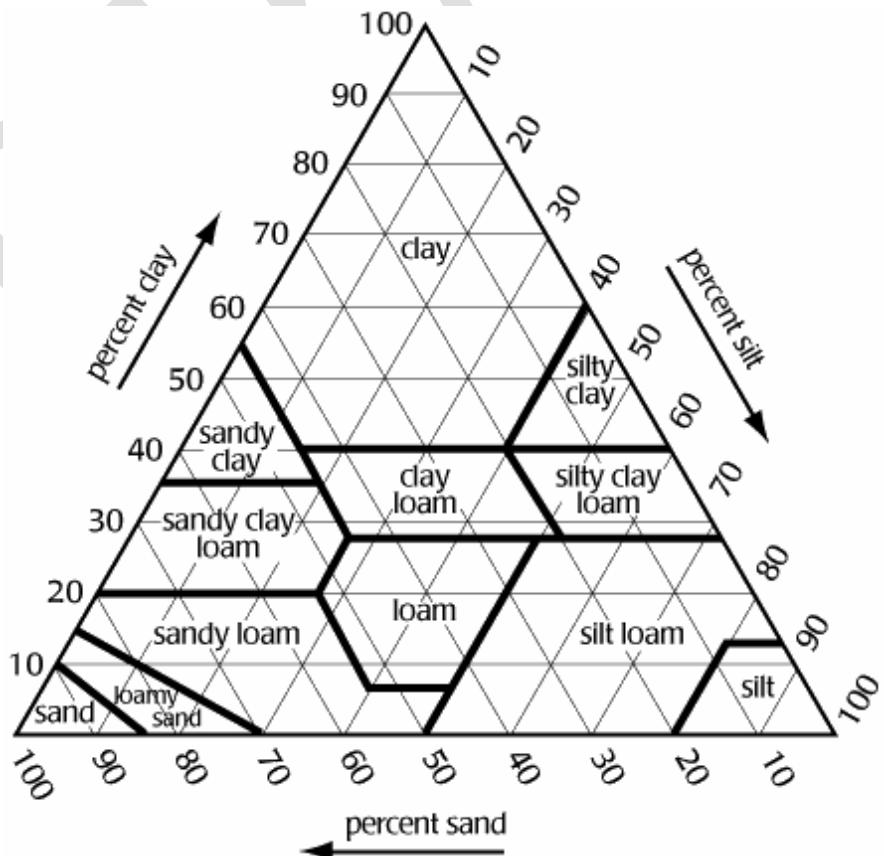


Figure 3. Relation of constituents of fine earth by size, defining textural classes

In addition to the textural class, a field estimate of the percentage of clay and sand are given. This estimate is useful for indicating increases or decreases in clay and/or sand content within textural classes, and for comparing field estimates with analytical results. The relationship between the basic textural classes and the percentages of clay, silt and sand is indicated in a triangular form in Figure 3.

## Structure

Task on the scoresheet: Record the dominant ped type for each horizon using Table 15. (FAO Table 48.) and Figure 4. Record the dominant structure grade for each horizon using the codes indicated in Table 16. (FAO Table 47.).

Code	Type	Determination
<b>NATURAL SOIL STRUCTURAL UNITS (<i>pedogenic structure</i>)</b>		
<b>GR</b>	Granular	Small polyhedrals with curved or very irregular faces.
<b>ABK</b>	Angular blocky	Polyhedrals with faces that intersect at sharp angles (planes).
<b>SBK</b>	Subangular blocky	Polyhedrals with subrounded and planar faces lacking sharp angles.
<b>LP</b>	Lenticular	Overlapping, lens-shaped peds generally parallel to the soil surface that are thick at the center and taper toward the edges; formed by active or relict periglacial frost processes. Most common in soils with moderate to high water-holding capacity in moist conditions.
<b>PL</b>	Platy	Flat and platelike units.
<b>WEG</b>	Wedge	Elliptical, interlocking lenses that terminate in acute angles, bounded by slickensides; not limited to vertic materials.
<b>PR</b>	Prismatic	Vertically elongated units; flat tops.
<b>COL</b>	Columnar	Vertically elongated units with rounded tops that commonly are "bleached."
<b>STRUCTURELESS</b>		
<b>SGR</b>	Single grain	No structural units; entirely noncoherent; e.g., loose sand.
<b>MA</b>	Massive	No structural units; material is a coherent mass (not necessarily cemented).
<b>ARTIFICIAL EARTHY FRAGMENTS OR CLODS1 (<i>nonpedogenic structure</i>)</b>		
<b>CDV</b>	Cloddy	Irregular blocks created by artificial disturbance; e.g., tillage or compaction.

Table 15. Classification of soil structure (Schoeneberger et al., 2011)

Code	Class	Determination
<b>WE</b>	Weak	Aggregates are barely observable in place and there is only a weak arrangement of natural surfaces of weakness. When gently disturbed, the soil material breaks into a mixture of few entire aggregates, many broken aggregates, and much material without aggregate faces. Aggregate surfaces differ in some way from the aggregate interior.
<b>MO</b>	Moderate	Aggregates are observable in place and there is a distinct arrangement of natural surfaces of weakness. When disturbed, the soil material breaks into a mixture of many entire aggregates, some broken aggregates, and little material without aggregate faces. Aggregate surfaces generally show distinct differences with the aggregate interiors.
<b>ST</b>	Strong	Aggregates are clearly observable in place and there is a prominent arrangement of natural surfaces of weakness. When disturbed, the soil material separates mainly into entire aggregates. Aggregate surfaces generally differ markedly from aggregate interiors.

Table 16. Classification of structure of pedal soil materials

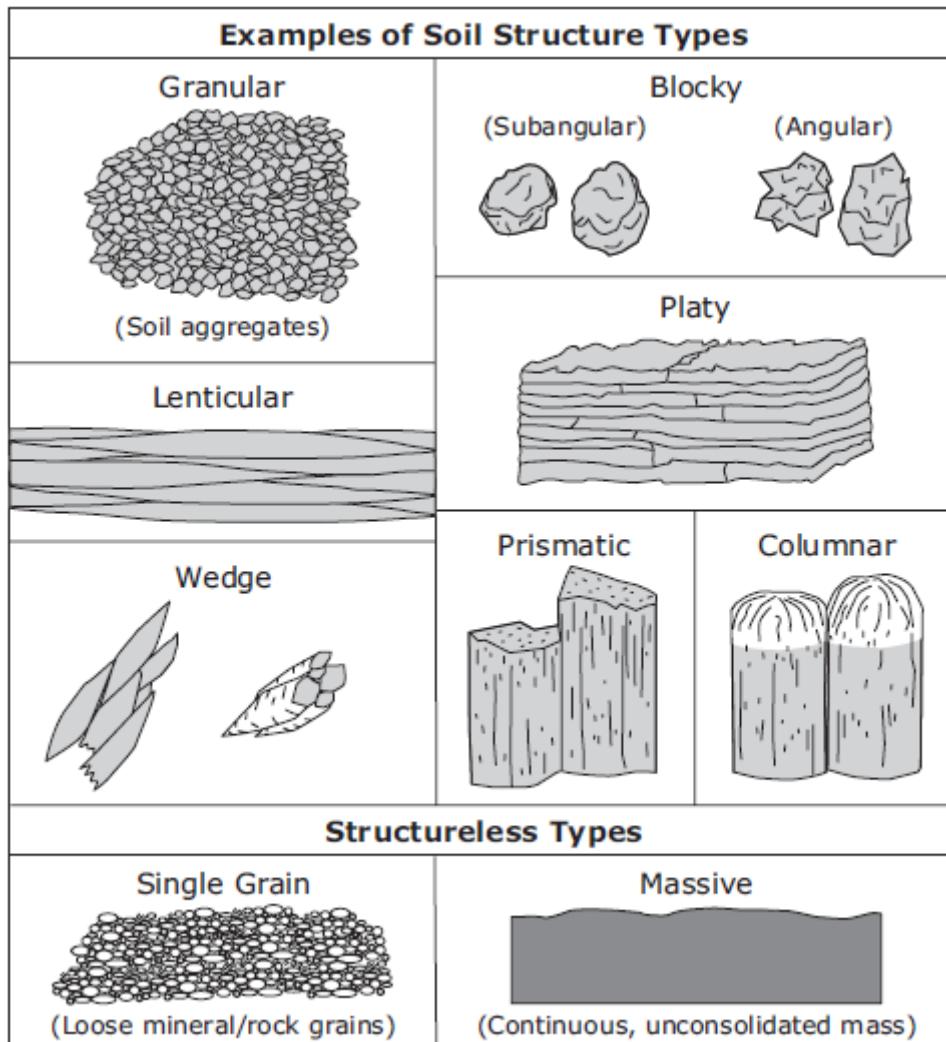


Figure 4. Examples of soil structure types (Schoeneberger et al., 2011)

## Redoximorphic features

Task on the scoresheet: Indicate the type of redox concentrations or depletion according to Table 17.

Class	Types
Ø	Redoximorphic features absent
CONC	Nodules and concentrations, Masses, Pore linings
DEP	Iron depletions, Clay depletions
CONC/DEP	Concentrations and depletions

Table 17. Types of redoximorphic features to be indicated on the scoresheet

## Coatings

Task on the scoresheet: Determine the nature (type) of the coatings using Table 18. (FAO Table 64.)

Code	Nature
C	Clay
H	Humus
CC	Calcium Carbonate
S	Salt coatings

Table 18. Classification of nature of coatings (simplified)

### **III. DIAGNOSTICS AND SOIL CLASSIFICATION**

The competitors can choose between the Soil Taxonomy (Twelfth Edition, 2014) and the World Reference Base for Soil Resources (2014). For each contest profile, the maximum possible points obtainable from the Soil Classification part will be the same for both the Soil Taxonomy and WRB parts. Chemical data necessary for the classification will be provided at each pit on a pit card.

#### **World Reference Base for Soil Resources (2014)**

##### **Diagnostic horizons/properties/materials**

Task on the scoresheet: Use a cross (X) to select as many diagnostic horizons/properties/materials that apply to the profile within the specified judging depth. For detailed information on the horizons/properties/materials see pages 11-78 in the WRB 2014.

##### **Reference soil group**

Task on the scoresheet: Use a cross (X) to select one Reference Soil Group (RSG) only. Use the key to the RSG of the WRB on pages 79-110.

##### **Principal qualifiers**

Task on the scoresheet: Use a cross (X) to select only the first principal qualifier that applies to the profile within the specified judging depth. For detailed information on the principal qualifiers see pages 111-130 in the WRB 2014.

### **Soil Taxonomy (2014)**

##### **Epipedon**

Task on the scoresheet: Use a cross (X) to select one epipedon that applies to the profile. For detailed information on the epipedon definitions see pages 7-11 of the Keys to Soil Taxonomy, 12<sup>th</sup> Edition.

##### **Subsurface horizons**

Task on the scoresheet: Use a cross (X) to select as many of the subsurface horizons to the profile within the specified judging depth. For detailed information on the subsurface horizon definitions see pages 11-17 of the Keys to Soil Taxonomy, 12<sup>th</sup> Edition.

##### **Diagnostic characteristics**

Task on the scoresheet: Use a cross (X) to select as many of the diagnostic characteristics to the profile within the specified judging depth. For detailed information on the diagnostic characteristic definitions see pages 17-36 of the Keys to Soil Taxonomy, 12<sup>th</sup> Edition

##### **Order**

Task on the scoresheet: Use a cross (X) to select only one soil order. See pages 37-41 for the Key to Soil Orders in the keys to Soil Taxonomy, 12<sup>th</sup> Edition.

##### **Suborder**

Task on the scoresheet: Use a cross (X) to select only one soil suborder.

##### **Great group**

Task on the scoresheet: Use a cross (X) to select only one soil great group.

## **REFERENCES**

FAO (2006): Guidelines for Soil Description. Food and Agriculture Organization of the United Nations, Rome

IUSS Working Group (2014): World Reference Base for Soil Resources. World Soil Resources Report 106. Food and Agriculture Organization of the United Nations, Rome

Official Handbook of the Inaugural International Soil Judging Contest, June 5 -7, 2014, Jeju, Korea

Schoeneberger, P. J., Wysocky D. A., Benham, E. C., Soil Survey Staff (2012): Field Book for describing and sampling soils, Version 3.0., National Resources Conservation Service, National Soil Survey Center, Lincoln, NE.

Soil Survey Staff (2014): Keys to Soil Taxonomy. United States Department of Agriculture National Resources Conservation Service. Twelfth Edition

## SCORING INFORMATION

SITE CHARACTERISTICS / EROSION/SURFACE CHARACTERISTICS																											
Land use type	Only one answer for each is correct. If the correct answer is given, 1 point will be awarded. If incorrect answer is given 0 point will be awarded.																										
Slope position																											
Slope %																											
Parent material																											
Erosion category																											
Erosion degree																											
Crack width																											
Crack depth																											
Crack distance																											
Salt characteristics (cover %)																											
Salt characteristics (thickness)																											
SOIL DESCRIPTION																											
Master prefix	Only one answer is correct. If the correct answer is given, 1 point will be awarded. If incorrect answer is given 0 point will be awarded.																										
Master horizon letter	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 point will be awarded.																										
Suffix	Multiple suffixes might be correct. The maximum number of indicated suffixes is three. If all of the required suffixes are indicated 3 points will be awarded. The following examples illustrate the case when incorrect answer is given or suffix/suffixes is/are missing.																										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #cccccc;">Correct answer</th><th style="background-color: #cccccc;">Your answer</th><th style="background-color: #cccccc;">Calculation</th><th style="background-color: #cccccc;">Point(s)</th></tr> </thead> <tbody> <tr> <td>Bk</td><td>Bk</td><td>3-0</td><td>3</td></tr> <tr> <td>Bk</td><td>Bl</td><td>3-3</td><td>0</td></tr> <tr> <td>Bhs</td><td>Bs</td><td>3-1</td><td>2</td></tr> <tr> <td>Btnh</td><td>Bt</td><td>3-2</td><td>1</td></tr> <tr> <td>Btnh</td><td>Btsg</td><td>3-2</td><td>1</td></tr> </tbody> </table>			Correct answer	Your answer	Calculation	Point(s)	Bk	Bk	3-0	3	Bk	Bl	3-3	0	Bhs	Bs	3-1	2	Btnh	Bt	3-2	1	Btnh	Btsg	3-2	1
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Bhs	Bs	3-1	2																								
Btnh	Bt	3-2	1																								
Btnh	Btsg	3-2	1																								
No.	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.																										
Boundary lower depth	The threshold of correct lower depth readings will depend on the distinctness of the boundary. Abrupt/Clear: $\pm 5$ cm, Gradual/Diffuse: $\pm 10$ cm. If the answer is correct 2 points will be awarded. If the answer is incorrect 0 point will be awarded.																										
Boundary distinctness	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.																										
Boundary topography	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.																										
Soil Color HUE	If the correct answer is given 1 point will be awarded. If incorrect answer is given 0 points will be awarded.																										
Soil color value	If the correct answer is given 2 points will be awarded. If the answer is lower or higher than the correct one by 1 value category 1 points will be awarded. If the answer is lower or higher than the correct one by 2 value category 0 point will be awarded.																										
Soil color chroma	If the correct answer is given 2 points will be awarded. If the																										

	answer is lower or higher than the correct one by 1 chroma category 1 points will be awarded. If the answer is lower or higher than the correct one by 2 chroma category 0 point will be awarded.								
Carbonate content	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.								
Carbonate forms	Multiple answers might be correct. If correct forms are marked 2 points will be awarded. If incorrect answer is given -2 points will be awarded. The overall score cannot be lower than 0.								
Texture clay %	A scaled range for correct answers compared to values obtained from laboratory data, will be used according to: <table border="1"> <thead> <tr> <th>Actual clay content</th><th>Range for grading</th></tr> </thead> <tbody> <tr> <td>&lt;20 %</td><td>± 3 %</td></tr> <tr> <td>20-40 %</td><td>± 4 %</td></tr> <tr> <td>&gt;40 %</td><td>± 5 %</td></tr> </tbody> </table>	Actual clay content	Range for grading	<20 %	± 3 %	20-40 %	± 4 %	>40 %	± 5 %
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20-40 %	± 4 %								
>40 %	± 5 %								
Texture class	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.								
Structure grade	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.								
Structure type	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.								
Redox features	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.								
Coatings nature	Only one answer is correct. If the correct answer is given, 2 points will be awarded. If incorrect answer is given 0 points will be awarded.								
<b>DIAGNOSTICS AND SOIL CLASSIFICATION - WRB</b>									
Horizons	Multiple answers might be correct. If correct horizons are marked 10 points will be awarded for each one. If incorrect horizons are marked -10 points will be awarded. The overall score cannot be lower than 0.								
Properties	Multiple answers might be correct. If correct properties are marked 5 points will be awarded for each one. If incorrect properties are marked -5 points will be awarded. The overall score cannot be lower than 0.								
Material	Multiple answers might be correct. If correct materials are marked 5 points will be awarded for each one. If incorrect materials are marked -5 points will be awarded. The overall score cannot be lower than 0.								
RSG	Only one answer is correct. If the correct RSG is marked 15 points will be awarded. If incorrect RSG is marked 0 points will be awarded.								
Principal qualifiers	Multiple answers might be correct. If correct prefix qualifiers are marked 5 points will be awarded for each one. If incorrect								

	prefix qualifiers are marked -5 points will be awarded. The overall score cannot be lower than 0.
<b>DIAGNOSTICS AND SOIL CLASSIFICATION - SOIL TAXONOMY</b>	
Epipedon	Only one answer is correct. If the correct RSG is marked 10 points will be awarded. If incorrect RSG is marked 0 points will be awarded.
Subsurface horizon	Multiple answers might be correct. If correct materials are marked 5 points will be awarded for each one. If incorrect materials are marked -5 points will be awarded. The overall score cannot be lower than 0.
Diagnostic characteristics	Multiple answers might be correct. If correct materials are marked 5 points will be awarded for each one. If incorrect materials are marked -5 points will be awarded. The overall score cannot be lower than 0.
Order	Only one answer is correct. If the correct RSG is marked 10 points will be awarded. If incorrect RSG is marked 0 points will be awarded.
Suborder	Only one answer is correct. If the correct RSG is marked 5 points will be awarded. If incorrect RSG is marked 0 points will be awarded.
Great Group	Only one answer is correct. If the correct RSG is marked 5 points will be awarded. If incorrect RSG is marked 0 points will be awarded.