BRNO UNIVERSITY OF TECHNOLOGY

FACULTY OF CIVIL ENGINEERING
institute of building testing

ilac-MRA

Z 7008

PROFICIENCY TESTING PLAN

ZK 2027/1 – Testing of aggregates and natural stone (ZK 933, 1097, 1367, 137, 721179)

Proficiency Testing Provider at the SZK FAST
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Contents

1 Basic Information about the Proficiency Testing Program

The aim of the Proficiency Testing Program (PTP) is to compare and evaluate the results of tests conducted on aggregate in compliance with selected parts of EN 933 [1–6], EN 1097 [7–13], EN 1367 [14–16], EN 1744-1 [17], EN 1926 [18], EN 1936 [19], EN 12372 [20], EN 13755 [21], EN 14231 [22], TP 137 [23] and ČSN 72 1179 [24] standards.

The objective of the program is to provide objective information regarding the measurement capabilities of the PT (Proficiency Testing) participants. The fundamental criterion for participation is the timely submission of the program application. The primary requirement for receiving the Certificate of Participation and the Final Report on the results of the precision experiment is the timely payment of the participation fee.

This proficiency testing scheme is organized in collaboration with BETOTECH, s.r.o. (Beroun 660, 266 01 Beroun, Company ID: 25066153), which cooperates in the preparation of the proficiency test items.

Important dates:

Application deadline:	**February 28, 2027**
Distribution of samples:	**April 26–30, 2027**
Realization/initiation of testing:	**May 17, 2027**
Submission of results to the organizer:	**June 14, 2027**
Evaluation by:	**August 31, 2027**

Submit of test results – exclusively via http://ptprovider.cz/OutcomesCode. To log in, it is necessary to enter the participant's code, which is automatically sent when registering in PTP.

2 Implementation of the Proficiency Testing Program

2.1 Specifications and Characteristics

Testing laboratories and other institutions interested can register for the PTP. The minimum number of participants is 5. If the number of participants is close to the minimum, the coordinator will consider the evaluation of PTP results using Horn's procedure to determine the assigned value and measurement uncertainty. The maximum number of participants is 30. If the minimum number of participants is not reached, the PT Provider reserves the right to cancel the PTP. This takes place according to Chapter 3 of the "Cancellation and Complaint Proceedings" instructions [25] available on http://ptprovider.cz/?lang=en.

2.1.1 Offered test procedures within the scope of accreditation Z7008 (aggregates)

1. **EN 933-1** [1]
    - Characteristics: Particle size distribution
    - Units: %
    - Material: Fine aggregate - G_F 85
    - Amount: cca 2,5 kg
    - Range of observed parameters: max G_c 80/20
    - Number of determinations: 3
    - Perform using sieves with aperture size 4, 2, 1, 0,5 0.25, 0.125 a 0.063 mm – dry sample without washing.
    - A collective sample will be prepared from which you prepare 3 sub-specimens.

2. **EN 933-3** [2]
    - Characteristics: Flakiness index (FI)
    - Units: %
    - Material: Coarse aggregate
    - Amount: cca 3 kg
    - Range of observed parameters: max FI_{35}
    - Number of determinations: 3
    - Perform 3 times on the same sample.
3. **EN 933-4** [3]
    - Characteristics: Shape index (SI)
    - Units: %
    - Material: Coarse aggregate
    - Amount: cca 1.5 kg
    - Range of observed parameters: max SI_{40}
    - Number of determinations: 3
    - Perform 3 times on the same sample.
4. **EN 933-8** [4]
    - Sand equivalent test (SE_4)
    - Units: -
    - Material: Coarse aggregate
    - Amount: cca 1 kg
    - Range of observed parameters: -
    - Number of determinations: 3
    - An aggregate sample will be prepared, from which the laboratory will prepare 3 partial batches.
    - Perform the test according to EN 933-8 + A1 [1], Annex A.
5. **EN 933-9** [5]
    - Characteristics: MB value
    - Units: g/kg
    - Material: Fine aggregate - G_F 85
    - Amount: cca 1.5 kg
    - Range of observed parameters: -
    - Number of determinations: 3
    - A collective sample will be prepared from which you prepare 3 sub-specimens.
    - Preparation of test runs according to Chapter 4 of EN 933-9 [5].
6. **EN 933-10** [6]
    - Characteristics: Grading of filler aggregates
    - Units: %
    - Material: Filer
    - Range of observed parameters: -
    - Number of determinations: 3
    - A collective sample will be prepared from which you prepare 3 sub-specimens.

7. **EN 1097-1** [7]
    - Characteristics: Determination of the resistance to wear M_{DE}
    - Units: -
    - Material: Coarse aggregate
    - Range of observed parameters: max M_{DE} 20
    - Number of determinations: 1
    - One unwashed sample weighing at least 5 kg will be prepared in accordance with § 6 EN 1097-1 [7].
8. **EN 1097-2, chapt. 5** [8]
    - Characteristics: Determination of resistance to fragmentation *LA*
    - Units: -
    - Material: Coarse aggregate
    - Range of observed parameters: max LA_{30}
    - Number of determinations: 1
    - Laboratory will prepare the sample in accordance with clause 5.2 EN 1097-2 [8].
9. **EN 1097-2, chapt. 6** [8]
    - Characteristics: Determination of resistance to fragmentation *SZ*
    - Units: %
    - Material: Coarse aggregate
    - Range of observed parameters: max SZ_{26}
    - Number of determinations: 1
    - Laboratory will prepare the sample in accordance with clause 6.2 EN 1097-2 [8].
10. **EN 1097-3** [9]
    - Characteristics: Determination of loose bulk density and voids ρ_b , *V*
    - Units: Mg/m^3, %
    - Material: Fine aggregate - G_F 85
    - Amount: cca 10 kg
    - Range of observed parameters: -
    - Number of determinations: 3
    - A collective sample will be prepared from which you prepare 3 sub-specimens.
11. **EN 1097-5** [10]
    - Characteristics: Water content (*W*)
    - Units: %
    - Material: Fine aggregate - G_F 85
    - Amount: cca 3 kg
    - Range of observed parameters: -
    - Number of determinations: 3
    - A collective sample will be prepared from which you prepare 3 sub-specimens.

12. **EN 1097-6, Chapt.. 8** [11]
    - Characteristics: Determination of apparent particle density and water absorption (ρ_a, WA_{24})
    - Units: Mg/m^3, %
    - Material: Coarse aggregate
    - Amount: cca 5 kg
    - Range of observed parameters: -
    - Number of determinations: 3
    - A collective sample will be prepared from which you prepare 3 sub-specimens.
13. **EN 1097-7** [12]
    - Characteristics: Determination of the particle density of filer (ρ_f)
    - Units: Mg/m^3
    - Material: Filer
    - Range of observed parameters: -
    - Number of determinations: 1
14. **EN 1097-8 [13]**
    - Characteristics: Polished stone value (PSV)
    - Units: -
    - Material: Coarse aggregate, 10 kg, part 8/11 mm
    - Range of observed parameters: -
    - Number of determinations: 1
    - A collective sample will be prepared from which you prepare 4 sub-specimens.
    - Results see 12.1. e) f) and g)
15. **EN 1367-1** [14]
    - Characteristics: Resistance to freezing and thawing (F)
    - Units: %
    - Material: Coarse aggregate
    - Amount: cca 10 kg
    - Range of observed parameters: max F_4
    - Number of determinations: 3
    - A collective sample will be prepared from which you prepare 3 sub-specimens.
16. **EN 1367-2** [15]
    - Characteristics: Magnesium sulfate test (MS)
    - Units: %
    - Material: Coarse aggregate
    - Amount: cca 5 kg
    - Range of observed parameters: max MS_{35}
    - Number of determinations: 1
    - A comulative sample will be prepared. The laboratory will prepare 2 partial samples.
17. **EN 1367-3** [16]
    - Characteristics: Weight loss (M_1), Strength loss (S_{LA})

- Units: %, %
- Material: Coarse aggregate
- Range of observed parameters: -
- Number of determinations: 3

18. **TP 137 Appendix 1 and 2** [23]
    - Characteristics: Reactivity of aggregates in connection with alkalies
    - Units: %
    - Material: Coarse aggregate
    - Amount: cca 1 kg
    - Range of observed parameters: -
    - Number of determinations: 1
19. **ČSN 721179 – chapt. B** [24]
    - Characteristics: Reactivity of aggregates in connection with alkalies
    - Units: %
    - Material: Coarse aggregate
    - Amount: cca 1 kg
    - Range of observed parameters: -
    - Number of determinations: 1

2.1.2 Offered tests outside the scope of accreditation Z7008 (New)

Aggregates

20. **EN 1744-1+A1, chapt. 10.1 [17]**
    - Characteristics: Content of water-soluble sulfates in natural and artificial aggregates, SO_3
    - Units: %
    - Range of observed parameters: -
    - Material: Fine aggregate, 10 kg
    - Number of determinations: 2
    - A collective sample will be prepared from which you prepare 2 sub-specimens.
21. **EN 1744-1+A1, chapt. 11 [17]**
    - Characteristics: Total sulfur content, S
    - Units: %
    - Range of observed parameters: -
    - Material: Fine aggregate, 10 kg
    - Number of determinations: 2
    - A collective sample will be prepared from which you prepare 2 sub-specimens.
22. **EN 1744-1+A1, chapt. 12 [17]**
    - Characteristics: Acid-soluble sulfate content, SO_3
    - Units: %
    - Range of observed parameters: -

- Material: Fine aggregate, 10 kg
- Number of determinations: 2
- A collective sample will be prepared from which you prepare 2 sub-specimens.

23. **EN 1744-1+A1, chapt. 14.2 [17]**
    - Characteristics: Content of light contaminants, m_{LPC}
    - Units: %
    - Range of observed parameters: -
    - Material: Fine aggregate, 10 kg
    - Number of determinations: 2
    - A collective sample will be prepared from which you prepare 2 sub-specimens.
24. **EN 1744-1+A1, chapt. 15.1 [17]**
    - Characteristics: Potential presence of humus (comparison with normalized color solution)
    - Units: -
    - Range of observed parameters: -
    - Material: Fine aggregate, 10 kg
    - Number of determinations: 2
    - A collective sample will be prepared from which you prepare 2 sub-specimens.

Natural stone

25. **EN 1926 [18]**
    - Characteristics: Uniaxial compressive strength, R
    - Units: MPa
    - Material: Cube (50 ± 5) mm
    - Number of determinations: 10
    - Specimen without present anisotropy planes
26. **EN 1936 [19]**
    - Characteristics: Open porosity and apparent density
    - Units: %, kg/m^3
    - Material: Cube with volume of at least 60 ml
    - Number of determinations: 6
27. **EN 12372 [20]**
    - Characteristics: Flexural strength under concentrated load, R_{tf}
    - Units: MPa
    - Material: Prism $50 \times 50 \times 300$ (± 3) mm
    - Number of determinations: 10

28. **EN 13755 [21]**
    - Characteristics: Water absorption at atmospheric pressure, A_b
    - Units: %
    - Material: Cube (50 ± 5) mm
    - Number of determinations: 6
29. **EN 14231 [22]**
    - Characteristics: Slip resistance by means of the pendulum tester, SRV "dry"
    - Units: %
    - Material: 136×86 mm (76 mm wide slider with 126 mm span)
    - Number of determinations: 6

2.2 Ensuring Homogeneity and Stability

PT Provider employees and any suppliers they may utilize are aware of the significance of the homogeneity and stability of test specimens for the results of the Proficiency Testing Program. The homogeneity and stability of specimens is ensured in the following ways:

1. preparing the material for the preparation of samples from one bearing,
2. the distribution of bodies made of more bearings so as to ensure homogeneity of bodies in the field of testing of related characteristics,
3. by review the material before releasing participants.

2.3 Instructions for Eliminating Major Sources of Errors and Risks

PTP participants have the obligation:

- to handle the proficiency testing materials in the same way they handle the majority of routinely tested samples,
- to follow the instructions of the PT Provider employee responsible for the PTP, especially regarding the type of testing carried out, the number of result determinations and the PT schedule,
- to state measurement uncertainties in accordance with their documented procedures, including the corresponding expansion coefficient. Participants will use expansion coefficient 2, which approximately represents the 95 % reliability level, unless stated otherwise,
- Adhere to the rules and principles of ethical behavior, avoiding unfair practices that could negatively impact the evaluation of the PT program,
- adhere to the rules and principles of ethical behavior, avoiding unfair practices that could negatively impact the evaluation of the PT program,
- follow occupational health and safety and fire protection regulations, using only electrical equipment and instruments with valid inspections,
- to send the test results obtained during proficiency testing, including measurement uncertainties, to the PT Provider by the set deadline (see part 1).

2.4 PTP Schedule

All other information, forms and records not included in this document are accessible in updated form at http://ptprovider.cz/?lang=en.

3 Procedures used in the Statistical Analysis of Laboratory Results

Procedures used in the statistical analysis of proficiency testing programs can be found here: http://ptprovider.cz/?lang=en.

4 Certificate of Participation and the Final Report on the Results of Interlaboratory Comparison

The PT Provider gives expert commentary on participant efficiency evaluation in the Final Report as part of training courses the PT Provider organises. The Final Report preserves the anonymity of the PTP participants. Each participant, or the participant's test results, is represented by an ID number. The Certificate of Participation in the PT programme is part of the Final Report. The Certificate is unique to each participant and includes the participant's ID number.

5 Safeguards for Confidentiality

The identity of PTP participants is confidential and only known to persons/subjects involved with the PTP. All participant information is considered confidential by the PT Provider. The participant may renounce this confidentiality for the purposes of discussion and mutual assistance until the PTP results are obtained. The PT Provider reveals the proficiency testing results to no third party with the sole exception of a written request by a regulatory authority submitted prior to the commencement of the PTP and which has been granted a written consent by the PTP participants.

6 Related Documents

- Quality Handbook of the PT Provider at the SZK FAST
- Cancellation and Complaint Proceedings available at http://ptprovider.cz/?lang=en [25]
- MPA 20 – 01 - . . for application of EN ISO/IEC 17043 Concordance Assessment – General Requirements for Proficiency Testing in the Accreditation System of the Czech Republic.

References

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[3] EN 933-4. *Tests for geometrical properties of aggregates - Part 4: Determination of particle shape - Shape index*. 2008.

[4] EN 933-8. *Tests for geometrical properties of aggregates - Part 8: Assessment of fines - Sand equivalent test*. 2015.

[5] EN 933-9. *Tests for geometrical properties of aggregates - Part 9: Assessment of fines - Methylene blue test*. 2022.

[6] EN 933-10. *Tests for geometrical properties of aggregates - Part 10: Assessment of fines - Grading of filler aggregates (air jet sieving)*. 2010.

[7] EN 1097-1. *Tests for mechanical and physical properties of aggregates - Part 1: Determination of the resistance to wear (micro-Deval)*. 2024.

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[10] EN 1097-5. *Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven*. 2008.

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[14] EN 1367-1. *Tests for thermal and weathering properties of aggregates - Part 1: Determination of resistance to freezing and thawing*. 2007.

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[18] EN 1926. *Natural stone test methods - Determination of uniaxial compressive strength*. 2006.

[19] EN 1936. *Natural stone test methods - Determination of real density and apparent density, and of total and open porosity*. 2006.

[20] EN 12372. *Natural stone test methods - Determination of flexural strength under concentrated load*. 2022.

[21] EN 13755. *Natural stone test methods - Determination of water absorption at atmospheric pressure*. 2008.

[22] EN 14231. *Natural stone test methods - Determination of the slip resistance by means of the pendulum tester*. 2003.

[23] TP 137. *Příloha 1 a 2 – Reaktivnost kameniva s alkáliemi*.

[24] ČSN 721179. *Determination of reactivity of aggregates in connection with alkalies*. 2004.

[25] *Cancellation and Complaint Proceedings – available at www.ptprovider.cz*.