

Experiences on Interlaboratory comparisons & Proficiency Testing Schemes for Construction Products



Presentation during the two day training course organized by the Division of Quality Assurance of the Pancyprian Union of Chemists (PUC), in cooperation with Eurachem

**CRITICAL ISSUES OF THE ACCREDITATION STANDARDS -
ISO/IEC 17025:2017 AND ISO 15189:2012**

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Construction products

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Aggregates (gravel, sand etc)



Asphalt concrete



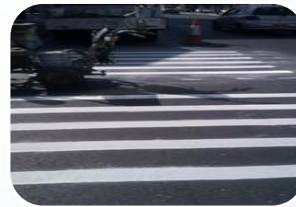
Bitumen



Concrete



Precast concrete products (kerbs, flags, pavers etc)



Thermoplastic paint for road markings



Soils

Major tests for construction products

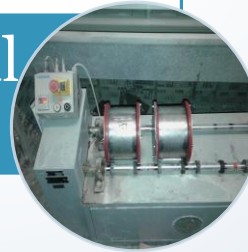
- Gradation
- Water absorption
- Compaction of asphalt roads

Physical Tests



- Resistance to breaking
- Compressive strength of concrete
- Strength of concrete pipes, flags, kerbs, pavers

Mechanical tests



- Methylene Blue
- Magnesium sulphate resistance
- Soluble binder content

Chemical tests



Implications for failed tests

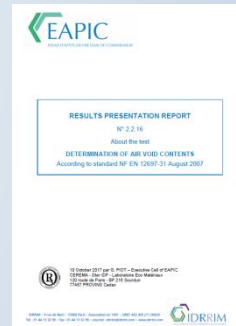
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- ▶ If after testing, specimens are found out of the specification limits the contractor or producer may face the following:
 - financial penalties on contractors by PWD
 - order to destruct and re-construct of the works by PWD
 - withdrawal of materials from the market by the Ministry of Interior (Competent Authority for Construction Products)
 - restrictions on the sale of the materials by the Ministry of Interior (Competent Authority for Construction Products)



Proficiency Testing Schemes: General issues [1/2]

- Lack of Accredited Proficiency Testing Schemes
 - CYS – Accreditation Body requires the use of Accredited PT Schemes where available
 - Participated in PT scheme from Australia
- High Participation Cost
 - Additional cost for translating the report in English
- Lack of or Rare Proficiency Schemes for some tests,
 - Big countries run their own national schemes (examples: EAPIC in France, VTI schemes in Sweden etc.)



Proficiency Testing Schemes: General issues [2/2]

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► ISO 17025

► Not construction products oriented

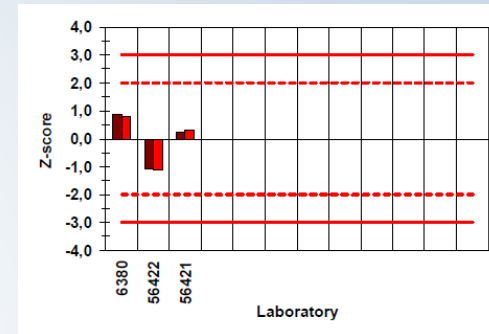
Accredited Clinical Laboratories	Accredited Chemical Laboratories	Accredited Construction Laboratories
35	26	8
* Retrieved on 20-2-2019 from the website of Cyprus Accreditation Body (CYS-AB)		

► Proficiency testing schemes not an issue that has been addressed in depth by and for the construction sector

► Contractual issue the acceptance of materials

Proficiency Testing Schemes: Particular issues

- ▶ Small Number of Participants in the Schemes
 - ▶ As little as **three participants**
- ▶ Lack of clarity on test methods
 - ▶ One Accredited PT scheme stated that we should use the normal method used in a test that involved sieving. The aperture of the sieves we used was different than that of other participants. Result: z-score > 2 but not representative.
- ▶ Specimens from PT Schemes often have different qualities (mostly better) than Cyprus construction products
 - ▶ Especially for aggregates eg. For a test critical values in Cyprus are close to 30%, but PT scheme test average result may be 7%.
 - ▶ **No added value for our laboratory – only for box-ticking**
- ▶ Samples from a particular Accredited PT scheme were lost and another time destroyed



PT and Interlaboratory Schemes: Issues regarding interpretation of results [1/2]

- ▶ Lack of precision limits within the standard methods
 - ▶ e.g. paving flags, cement pipes
- ▶ Standards refer to precision tests undertaken years ago and which were based on different standards
 - ▶ e.g. EN 1097-6 refers to a precision test undertaken in 1996 in accordance to a similar (but not same) DIN standard
- ▶ Standards give different precision limits for the same characteristic
 - ▶ e.g. Determination of bitumen content in asphalt mixtures to EN 12697-1 refers to an experiment with $R=0,31\%$ and to another experiment with $R=0,5\%$

PT and Interlaboratory Schemes: Issues regarding interpretation of results [2/2]

- ▶ Similar EN standards but by different committees have contradictory precision limits
 - ▶ e.g. EN 12697-2 for gradation of the aggregates in asphalt mixtures provides precision limit $R=1,7\%$ but EN 933-1 for gradation of sand prior to including it in an asphalt mixture provides the formula $R = 0,086 * \sqrt{x(100 - x)}$ with different results
- ▶ Especially difficult when assessing the results against the limits of the Governmental Decree
 - ▶ Ministry of Interior uses the full extent of the stated uncertainty of the laboratory
- ▶ Identical tests provide different precision limits
 - ▶ e.g. Penetration of Bitumen to ASTM D5 provides different precision statement than the almost identical EN1426

Reasons to address the issue

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(a) Follow CYS-
AB regulations

(b) To confirm
laboratory
methods &
procedures

(c) To verify
that results are
valid

Conventional Solutions adopted by PWD Laboratory Sector [1/3]

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1. Participation in available proficiency schemes
 - Depending on budget, needs
2. Participation in PT Schemes for **similar tests**
 - e.g. PT scheme was dedicated to Determination of bitumen content by the “Soxhlet extractor” method (top photo) but we participate using the “Reflux method”
3. Make use of the PT schemes results on **similar items**
 - e.g. PT scheme results for “water absorption test” of **precast concrete pavers** were used to provide evidence of the competence for “water absorption test” of **precast concrete flags**

Conventional Solutions adopted by PWD Laboratory Sector ... 3/3

4. Participation in comparison schemes with laboratories within Cyprus for precision evaluation
5. Use automation and technology where available
 - Rely on calibration of machinery
 - Use accredited calibration bodies



Solutions to enhance the reliability of everyday testing

(a) Follow CYS-AB regulations

(b) To confirm laboratory methods & procedures

Especially for “critical” tests

(c) To verify that results are valid

Supplementary Solutions adopted by PWD Laboratory Sector to enhance reliability of results [1/4]

1. Comparison tests between operators of the sector and statistical analysis
2. Interlaboratory comparison tests between laboratories of the sector



Supplementary Solutions adopted by PWD Laboratory Sector to enhance reliability of results [2/4]

3. Execute the test on two specimens of the same sample and report the average value for routine tests on PWD works
 - e.g. Aggregates water absorption, asphalt concrete compaction



Supplementary Solutions adopted by PWD Laboratory Sector to enhance reliability of results [3/4]

4. Perform two different methods on same material to establish the correlation between them
 - e.g. Soluble binder content: more than 100 duplicate tests in the “Reflux Hot Extractor” and “Asphalt Analyser”



Supplementary Solutions adopted by PWD Laboratory Sector to enhance reliability of results [4/4]

5. Reject the use of certain methods
 - e.g. based on evidence from bibliography and when found to not correlate well with results from other methods
6. Re-allocate resources

Thank you for your attention

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