



National Standards Authority of Ireland

STANDARD RECOMMENDATION

S.R. CEN/TR 15463:2007

ICS 13.030.20

**CHARACTERIZATION OF SLUDGES -
PHYSICAL CONSISTENCY - THIXOTROPIC
BEHAVIOUR AND PILING BEHAVIOUR**

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TECHNICAL REPORT
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English Version

**Characterization of sludges - Physical consistency - Thixotropic
behaviour and piling behaviour**

Caractérisation des boues - Consistance physique -
Comportement thixotrope et comportement au tassement

Charakterisierung von Schlämmen - Physikalische
Beschaffenheit - Thixotropes und Schüttverhalten

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Contents

Page

Foreword.....	4
1 Introduction	6
1.1 The Horizontal project and the Work Package 7	6
1.2 Desk study subject	7
1.3 Evaluation of needs for control of operations and material characteristics	7
1.3.1 Evaluation of needs for control of operation	7
1.3.2 Material characteristics	8
1.4 Search for existing standards and methods.....	15
1.5 Basic information.....	16
1.5.1 Flowability	16
1.5.2 Solidity	18
1.5.3 Thixotropic behaviour of solid materials	19
1.5.4 Piling behaviour.....	21
2 Existing standards or draft standards.....	22
2.1 Flowability	22
2.2 Solidity	22
2.3 Thixotropic behaviour	23
2.4 Piling behaviour	23
3 Evaluation of drafting a Horizontal standard	24
3.1 Flowability	24
3.1.1 Capillary viscometers.....	24
3.1.2 Penetrometer.....	28
3.1.3 Rotational viscometers	33
3.1.4 “Flow” apparatus	37
3.2 Solidity	43
3.2.1 Shearing apparatus	43
3.2.2 Vane testing apparatus	45
3.2.3 Penetrometer.....	49
3.3 Thixotropic behaviour of solid materials	57
3.3.1 Laboratory or field test feasibility	57
3.3.2 Apparatus	57
3.3.3 What is measured and how	62
3.3.4 Material to be examined	63
3.3.5 Feasibility of the methods to the materials of investigation	63
3.4 Piling behaviour.....	63
3.4.1 Laboratory or field test feasibility	63
3.4.2 Apparatus	64
3.4.3 What is measured and how	67
3.4.4 Material to be examined	68
3.4.5 Feasibility of the methods to the materials of investigation	68
4 Critical point and recommendations	69
4.1 Flowability	69
4.1.1 Comparison (discussion: pro/contra).....	69
4.1.2 Recommendations.....	70
4.2 Solidity	71
4.2.1 Comparison (discussion: pro/contra).....	71
4.2.2 Recommendations.....	75
4.3 Thixotropic behaviour of solid materials	75
4.3.1 Comparison (discussion: pro/contra).....	75
4.3.2 Recommendations.....	76

4.4	Piling behaviour.....	76
4.4.1	Comparison (discussion: pro/contra)	76
4.4.2	Recommendation	77
4.5	Summary of recommended methods	77
4.5.1	Flowability	77
4.5.2	Solidity, thixotropic behaviour and piling behaviour	77
4.6	Research needs	78
4.6.1	Basics of methods.....	78
4.6.2	Applicability of methods to the materials of investigation	79
4.6.3	Questions to be answered.....	80
4.6.4	Route, how to answer them.....	80
4.6.5	Steps to be taken.....	80
	Bibliography.....	81

CEN/TR 15463:2007 (E)

Foreword

This document (CEN/TR 15463:2007) has been prepared by Technical Committee CEN/TC 308 "Characterization of sludges", the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This CEN-Report "Physical Consistency" derives from the Desk Studies "Physical Properties – Flowability" (HORIZONTAL Report No. 21 [60]) and "Physical Properties – Solidity, Thixotropic Behaviour and Piling Behaviour" (HORIZONTAL Report No. 22 [61]) of the *Horizontal* Project. The "*Horizontal*" project has the objective to develop horizontal and harmonised European Standards in the fields of sludge, bio-waste and soil to facilitate regulation of these major streams in the multiple decisions related to different uses and disposal governed by EU Directives. The Horizontal Project includes the Work Package 7 "*Mechanical properties*" consisting in the development of Desk Studies on physical consistency, because it is recognized that this property is very important for the characterization of sludge, since it affects almost all treatment, utilization and disposal operations, such as storage, pumping, transportation, handling, land-spreading, dewatering, drying, landfilling. The importance of the physical consistency is also true for the characterization of bio-waste and soil. Also handling and utilization of many other materials, such as cement and asphalt are strictly depending on their physical consistency. The needs for control of operations and also material characteristics are described.

The first action carried out is consisted in searching for existing standards to be possibly used or adapted for utilisation in the specific field of consistency evaluation. The complete list of standards is reported in Annex 1 of the HORIZONTAL Reports No. 21 [60] and No. 22 [61], from which it can be seen that more than 250 standards and non-standardised methods are potentially applicable to consistency evaluation. On the basis of the selected list of standards and non-standardised methods for further consideration the methods for the determination of flowability, solidity, thixotropic behaviour and piling behaviour of sludge, bio-waste and soil have been divided into several groups, according to the instruments used for measuring:

- Flowability: Capillary viscometers, Penetrometers, Rotational viscometers and Flow apparatus.
- Solidity: Shearing apparatus, Vane testing apparatus and Penetrometers.
- Thixotropic behaviour: It should be investigated a combination of methods for determination of the solidity like penetration, etc. and an energy-input in terms of "flow" apparatus to simulate the shear stress.
- Piling behaviour: Slump test apparatus, Compacting apparatus, Cubic Piling Box (CPB) and "Turned Box".

For each group was evaluated the laboratory or field test feasibility. Apparatuses of the measuring procedures and existing applications to different materials were described. On this basis the applicability of the described methods to the materials of investigation was evaluated and documented in the lists of analysed standards.

The recommended methods are for flowability the coaxial cylinder viscometer as laboratory apparatus, while field apparatus are flow cone, magnesium penetration cone and extrusion tube viscometer. The recommended methods are for solidity the "Laboratory vane shear apparatus" and "Vicat needle" as laboratory reference and the pocket penetrometers for field test. The penetrometers in general could be used for both laboratory reference method and field test. Also for determination of the thixotropic behaviour the penetrometer is together with an energy-input in terms of a vibrating table or a hammer a suitable instrument. For measuring the piling behaviour the Cubic Piling Box (CPB) and the Oedometer are the recommended methods, whereby the CPB could be used in both laboratory and field while the Oedometer could be used only in the laboratory. All methods should be tested and optimized to adapt design and part dimensions to the materials in a future experimental activity.

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