

DIN EN 1744-1:2010-04 (Eng lisch)

Tests for chemical properties of aggregates - Part 1: Chemical analysis

| Contents | | Page |
|-----------------|--|-------------|
| Foreword | | 7 |
| 1 | Scope | 8 |
| 2 | Normative references | 8 |
| 3 | Terms and definitions | 9 |
| 4 | Reagents | 9 |
| 4.1 | General | 9 |
| 4.2 | Reagents for determination of water-soluble chloride salts using the Volhard method (Clause 7) | 10 |
| 4.3 | Reagents for determination of water-soluble chloride salts by potentiometry (Clause 8) ... | 11 |
| 4.4 | Reagent for factory production control determination of water-soluble chloride salts using the Mohr method (Clause 9) | 11 |
| 4.5 | Reagents for determination of water-soluble sulfates (Clause 10) | 11 |
| 4.6 | Reagents for determination of total sulfur content (Clause 11) | 11 |
| 4.7 | Reagents for determination of acid soluble sulfide content (Clause 13) | 11 |
| 4.8 | Reagents for determination of lightweight contaminators (see 14.2) | 13 |
| 4.9 | Reagents for determination of potential presence of humus (see 15.1) | 13 |
| 4.10 | Reagents for determination of fulvo acid content (see 15.2) | 13 |
| 4.11 | Reagents for determination of free lime by complexometry (see 18.2) | 14 |
| 4.12 | Reagent for determination of free lime by conductometry (see 18.3) | 14 |
| 4.13 | Reagents for determination of free lime by acidimetry (see 18.4) | 14 |
| 4.14 | Reagent for the determination of the expansion of steel slag (see 19.3) | 15 |
| 4.14.1 | Silicone oil | 15 |
| 4.14.2 | Hydrochloric acid diluted (1 + 5) | 15 |
| 5 | Apparatus | 15 |
| 5.1 | General requirements | 15 |
| 5.2 | Apparatus for general purposes | 15 |
| 5.3 | Additional apparatus required for determination of water-soluble chloride salts following Volhard (see Clause 7) | 16 |
| 5.4 | Additional apparatus required for potentiometric determination of water-soluble chloride salts (see Clause 8) | 16 |
| 5.5 | Additional apparatus required for factory production control determination of water soluble chloride salts following Mohr (see Clause 9) | 17 |
| 5.6 | Additional apparatus required for determination of water-soluble sulfates (see Clause 10) | 17 |
| 5.7 | Additional apparatus required for the determination of total sulfur content (see Clause 11) | 17 |
| 5.8 | Additional apparatus required for determination of sulfide content (see Clause 13) | 17 |
| 5.9 | Additional apparatus required for determination of lightweight contaminators (see 14.2) .. | 18 |
| 5.10 | Additional apparatus required for determination of the potential presence of humus (see 15.1) | 18 |
| 5.11 | Additional apparatus required for determination of fulvo acid content (see 15.2) | 19 |
| 5.12 | Additional apparatus required for determination of organic contaminators by mortar method (see 15.3) | 19 |
| 5.13 | Additional apparatus required for determination of free lime by complexometry (see 18.2) | 19 |
| 5.14 | Additional apparatus required for determination of free lime by conductometry (see 18.3) | 19 |

| | | |
|--------|--|----|
| 5.15 | Additional apparatus required for acidimetric determination of free lime (see 18.4) | 22 |
| 5.16 | Additional apparatus required for the determination of CaO in steel slag by X-ray diffraction (see 18.5) | 22 |
| 5.17 | Additional apparatus required for the determination of dicalcium silicate disintegration of air-cooled blast-furnace slag (see 19.1) | 23 |
| 5.18 | Additional apparatus required for determination of the volume expansion of steel slag (see 19.3) | 23 |
| 6 | General requirements for testing | 26 |
| 6.1 | Number of tests | 26 |
| 6.2 | Repeatability and reproducibility | 26 |
| 6.3 | Expression of mass, volume, factors and results | 26 |
| 6.4 | Drying of materials | 26 |
| 6.5 | Ignitions of precipitates | 27 |
| 6.6 | Check for the absence of chloride ions (silver nitrate test) | 27 |
| 7 | Determination of water-soluble chloride salts using the Volhard method (Reference method) | 27 |
| 7.1 | Principle | 27 |
| 7.2 | Sampling | 27 |
| 7.3 | Preparation of test specimens | 27 |
| 7.4 | Preparation of extracts | 28 |
| 7.5 | Procedure for the determination of the chloride content of the extracts | 28 |
| 7.6 | Calculation and expression of results | 29 |
| 8 | Determination of water-soluble chloride salts by potentiometry (Alternative method) | 29 |
| 8.1 | Principle | 29 |
| 8.2 | Sampling, preparation of test specimens and extracts | 29 |
| 8.3 | Procedure for the determination of the chloride content of the extracts | 29 |
| 8.4 | Calculation and expression of results | 30 |
| 9 | Determination of water-soluble chloride salts using the Mohr method (Alternative method) | 30 |
| 9.1 | General | 30 |
| 9.2 | Principle | 30 |
| 9.3 | Sampling | 30 |
| 9.4 | Preparation of test portion | 31 |
| 9.5 | Preparation of extracts | 31 |
| 9.6 | Procedure for the determination of the chloride content of the extracts | 31 |
| 9.7 | Calculation and expression of results | 31 |
| 10 | Determination of water-soluble sulfates | 31 |
| 10.1 | Determination of water soluble sulfates in natural and manufactured aggregates | 31 |
| 10.1.1 | Principle | 31 |
| 10.1.2 | Sampling | 32 |
| 10.1.3 | Preparation of test portion | 32 |
| 10.1.4 | Preparation of extracts | 32 |
| 10.1.5 | Procedure for the determination of the sulfate content of the extracts | 32 |
| 10.1.6 | Calculation and expression of results | 33 |
| 10.2 | Determination of water soluble sulfates in recycled aggregates | 33 |
| 10.2.1 | Principle | 33 |
| 10.2.2 | Sampling | 33 |
| 10.2.3 | Preparation of test specimen | 34 |
| 10.2.4 | Preparation of extracts | 34 |
| 10.2.5 | Procedure for the determination of the sulfate content of the extracts, using a spectrophotometer | 34 |
| 11 | Determination of total sulfur content | 35 |
| 11.1 | Determination of total sulfur content by acid digestion (Reference method) | 35 |
| 11.1.1 | Principle | 35 |
| 11.1.2 | Sampling | 36 |
| 11.1.3 | Preparation of test portion | 36 |

| | | |
|---------|---|----|
| 11.1.4 | Procedure | 36 |
| 11.1.5 | Calculation and expression of results | 36 |
| 11.2 | Determination of total sulfur content by high temperature combustion (Alternative method) | 37 |
| 11.2.1 | Principle | 37 |
| 11.2.2 | Sampling | 37 |
| 11.2.3 | Preparation of test portion | 37 |
| 11.2.4 | Procedure | 37 |
| 11.2.5 | Calculation and expression of results | 37 |
| 12 | Determination of acid soluble sulfates | 37 |
| 12.1 | Principle | 37 |
| 12.2 | Sampling | 38 |
| 12.3 | Preparation of test portion | 38 |
| 12.4 | Procedure | 38 |
| 12.5 | Calculation and expression of results | 38 |
| 13 | Determination of acid soluble sulfides | 39 |
| 13.1 | Principle | 39 |
| 13.2 | Sampling | 39 |
| 13.3 | Preparation of test portion | 39 |
| 13.4 | Procedure | 39 |
| 13.5 | Calculation and expression of results | 40 |
| 14 | Determination of components affecting the surface finish of concrete | 40 |
| 14.1 | Examination for the presence of reactive iron sulfide particles | 40 |
| 14.1.1 | General | 40 |
| 14.1.2 | Sampling | 40 |
| 14.1.3 | Procedure | 41 |
| 14.2 | Determination of lightweight contaminators | 41 |
| 14.2.1 | General | 41 |
| 14.2.2 | Principle | 41 |
| 14.2.3 | Procedure | 41 |
| 14.2.4 | Calculation and expression of results | 42 |
| 15 | Determination of organic components affecting the setting and the hardening of cement | 42 |
| 15.1 | Determination of potential presence of humus | 42 |
| 15.1.1 | Principle | 42 |
| 15.1.2 | Sampling | 42 |
| 15.1.3 | Preparation of test portion | 42 |
| 15.1.4 | Procedure | 43 |
| 15.1.5 | Expression of results | 43 |
| 15.2 | Determination of fulvo acid content | 43 |
| 15.2.1 | Principle | 43 |
| 15.2.2 | Sampling | 43 |
| 15.2.3 | Preparation of test portion | 43 |
| 15.2.4 | Procedure | 43 |
| 15.2.5 | Expression of results | 44 |
| 15.3 | Determination of organic contaminators by mortar method | 44 |
| 15.3.1 | Principle | 44 |
| 15.3.2 | Sampling | 44 |
| 15.3.3 | Preparation of test portions | 44 |
| 15.3.4 | Preliminary treatment of test portions | 44 |
| 15.3.5 | Constituents | 45 |
| 15.3.6 | Mix quantities | 45 |
| 15.3.7 | Mixing procedure | 45 |
| 15.3.8 | Measurement of stiffening time | 46 |
| 15.3.9 | Compressive strength of hardened mortar | 46 |
| 15.3.10 | Calculation and expression of results | 46 |
| 16 | Determination of water solubility | 47 |
| 16.1 | Determination of water solubility of aggregate, excluding filler | 47 |

| | | |
|--------|---|----|
| 16.1.1 | Principle | 47 |
| 16.1.2 | Sampling | 47 |
| 16.1.3 | Preparation of test portion | 47 |
| 16.1.4 | Extraction of soluble components | 47 |
| 16.1.5 | Calculation and expression of results | 47 |
| 16.2 | Determination of water solubility of filler | 48 |
| 16.2.1 | Principle | 48 |
| 16.2.2 | Sampling | 48 |
| 16.2.3 | Preparation of test portion | 48 |
| 16.2.4 | Extraction of soluble component | 48 |
| 16.2.5 | Calculation and expression of results | 48 |
| 17 | Determination of loss on ignition | 49 |
| 17.1 | Principle | 49 |
| 17.2 | Sampling and preparation of test portion | 49 |
| 17.3 | Procedure for the determination of loss on ignition | 49 |
| 17.4 | Calculation and expression of results | 49 |
| 18 | Determination of free lime in steel slag | 50 |
| 18.1 | General | 50 |
| 18.2 | Determination of free lime by complexometry (Reference method) | 50 |
| 18.2.1 | Principle | 50 |
| 18.2.2 | Sampling and preparation of test portion | 50 |
| 18.2.3 | Procedure | 50 |
| 18.2.4 | Calculation and expression of results | 51 |
| 18.3 | Determination of free lime by conductometry (Alternative method) | 51 |
| 18.3.1 | Principle | 51 |
| 18.3.2 | Sampling and preparation of test portion | 51 |
| 18.3.3 | Procedure | 51 |
| 18.3.4 | Evaluation and expression of results | 51 |
| 18.4 | Determination of free lime by acidimetry (Alternative method) | 51 |
| 18.4.1 | Principle | 51 |
| 18.4.2 | Sampling and preparation of test portion | 52 |
| 18.4.3 | Procedure | 52 |
| 18.4.4 | Calculation and expression of results | 52 |
| 18.5 | Determination of CaO in steel slag by X-ray diffraction | 52 |
| 18.5.1 | Principle | 52 |
| 18.5.2 | Procedure of analysis | 53 |
| 18.5.3 | Calibration procedure | 54 |
| 18.5.4 | Analytical results | 55 |
| 19 | Determination of unsoundness of blast-furnace and steel slags | 55 |
| 19.1 | Determination of dicalcium silicate disintegration of air-cooled blast-furnace slag | 55 |
| 19.1.1 | General | 55 |
| 19.1.2 | Principle | 55 |
| 19.1.3 | Sampling | 55 |
| 19.1.4 | Preparation of test portion | 55 |
| 19.1.5 | Procedure | 55 |
| 19.1.6 | Expression of results | 55 |
| 19.2 | Determination of iron disintegration of air-cooled blast-furnace slag | 56 |
| 19.2.1 | General | 56 |
| 19.2.2 | Principle | 56 |
| 19.2.3 | Sampling | 56 |
| 19.2.4 | Procedure | 56 |
| 19.2.5 | Expression of results | 56 |
| 19.3 | Determination of the expansion of steel slag | 56 |
| 19.3.1 | General | 56 |
| 19.3.2 | Principle | 56 |
| 19.3.3 | Sampling | 56 |
| 19.3.4 | Preparation and compaction of the specimens | 56 |
| 19.3.5 | Steam test procedure | 58 |
| 19.3.6 | Calculation and expression of results | 58 |

| | |
|---|-----------|
| Annex A (informative) Precision | 60 |
| A.1 Symbols | 60 |
| A.2 Determination of water-soluble chloride salts using the Volhard method (Reference method) (See Clause 7) | 60 |
| A.3 Determination of water-soluble chloride salts by potentiometry (Alternative method) (See Clause 8) | 60 |
| A.4 Determination of water-soluble sulfates in recycled aggregate (See 10.2) | 60 |
| A.5 Determination of total sulfur content by acid digestion (Reference method) (See 11.1) | 60 |
| A.6 Determination of acid soluble sulfates (See Clause 12) | 61 |
| Bibliography | 62 |