CEN-NORD seminar

29 September 2006

Abstracts

THEME 1: General presentation of the CEN/TC 154 and CEN/TC 227 standards

Document: CEN/TC 154

N 746 E

(Supersedes N 735 E)

To all Participating and Liaison Members of CEN/TC 154

Merete Holmen Murvold: Overview of the TC 154 standards

BRITISH STANDARDS INSTITUTION

Secretariat of CEN/TC 154

Title: Aggregates

Our tel ext/ref: 7248: CEN/TC 154

Date: 4 November 2005

Direct tel: + 44 (0)20 8996 7228
Direct fax:: + 44 (0)20 8996 7799
Direct email: david.hyde@bsi-global.com

To the Members of the CEN/TC 154 Chairman's Panel

To the Convenors of CEN/TC 154 Task Groups

CEN/TC 154 PROGRAMME OF WORK
4 November 2005

SC2 'Aggregates for concrete including those for use in roads and pavements'
Chairman: P Nixon Secretary: D Hyde

Rev/Amd EN 12620:2002 00154*** 2005/*****
'Aggregates for concrete'
Status/comments: Stage 32. New recycled clauses required - see resolution CEN/TC 154 106/2003 (Paris). SC2 meetings held on 2004-10-05, 2005-04-11, 2005-09-22 – final draft agreed for CEN Enquiry.

SC6 'Test methods'
Chairman: J Lay Secretary: D Hyde

TG11
Convenor: Y Descantes

Rev EN 932-2:1999 00154*** 2005/*****
'Tests for general properties of aggregates — Part 2: Methods for reducing laboratory samples'
Status/comments: Stage 31. Output from 2004 5-year review

Rev EN 932-5:1999 00154*** 2005/*****
'Tests for general properties of aggregates — Part 5: Common equipment and calibration'

Status/comments: Stage 31. Output from 2004 5-year review

Rev EN 933-4:1999 00154*** 2005/*****
'Tests for geometrical properties of aggregates — Part 4: Determination of particle shape — Shape index'
Status/comments: Stage 31. Output from 2004 5-year review

Rev EN 933-8:1999 00154*** 2005/*****
'Tests for geometrical properties of aggregates — Part 8: Assessment of fines — Sand equivalent test'
Status/comments: Stage 31. Output from 2004 5-year review

Rev EN 933-9:1998 00154*** 2005/*****
'Tests for geometrical properties of aggregates — Part 8: Assessment of fines — Methylene blue test'
Status/comments: Stage 31. Output from 2004 5-year review

prEN 933-11 00154093 2002/01825
'Tests for geometrical properties of aggregates — Part 11: Classification test for the constituents of coarse recycled aggregate''
Status/comments: Stage 46. Report of CEN Enq. (doc. CEN/TC 154 N 720 E) addressed by TG11 at its meeting on 30 March/1 April 2005. In Berlin on 2005-09-21/22, SC2/SC4 agreed a list of constituents of coarse recycled aggregates for Table 2 in prEN 933-11 (resolution 46) - this will now allow TG11 to finalise prEN 933-11 for the Formal vote. This project is high priority.

EN 1097-2:1998/prA1 00154*** 2005/*****
'Tests for mechanical and physical properties of aggregates — Part 2: Methods for the determination of resistance to fragmentation'
Status/comments: Stage 51. Resolution CEN/TC 154/SC6 224/2005 (Tromsø) processed. Amendment submitted to CEN/CMC on 2005-11-03 for UAP (3-month).

Rev EN 1097-4:1999 00154*** 2005/*****
'Tests for mechanical and physical properties of aggregates — Part 4: Determination of the voids of dry compacted filler'
Status/comments: Stage 31. Output from 2004 5-year review.

Rev EN 1097-5:1999 00154*** 2005/*****
'Tests for mechanical and physical properties of aggregates — Part 5: Determination of the water content by drying in a ventilated oven'
Status/comments: Stage 31. Output from 2004 5-year review.

Rev EN 1097-7:1999 00154*** 2005/*****
'Tests for mechanical and physical properties of aggregates — Part 7: Determination of the particle density of filler — Pyknometer method'
Status/comments: Stage 31. Output from 2004 5-year review.

Rev EN 1097-8:1999 00154*** 2005/*****
'Tests for mechanical and physical properties of aggregates — Part 8: Determination of the polished stone value'
Status/comments: Stage 31. Output from 2004 5-year review.

TG12
Convenor: J-M Vanbelle

Rev EN 1367-1:1999 00154*** 2005/*****
'Tests for thermal and weathering properties of aggregates — Part 1: Determination of resistance to freezing and thawing'

Status/comments: Stage 40. Output from 2004 5-year review. Doc. CEN/TC 154/SC6 N 908 E to be approved for CEN Enq at SC6 meeting on 2005-11-28, in Bratislava.

prEN 1367-6 00154*** 2005/*****
'Resistance to freezing and thawing in the presence of salt'
Status/comments: Stage 40. Following the clear conclusion that a 1% NaCl normative test should be developed, it was agreed, resolution CEN/TC 154/SC6 225/2005 (Tromsø), that a new test method should be developed. Doc. CEN/TC 154/SC6 N 909 E to be approved for CEN Enq at SC6 meeting on 2005-11-28, in Bratislava.

Rev EN 1744-1:1998 00154*** 2005/*****
'Tests for chemical properties of aggregates — Part 1: Chemical analysis'
Status/comments: Stage 31. Output from 2004 5-year review. Review of comments to be continued at next TG12 meeting on 2006-02-9/10.

prEN 1744-2 00154*** 1989/07275
'Tests for chemical properties of aggregates — Part 2: Determination of resistance to alkali/aggregate reaction'
Status/comments: Stage 31. No target dates and unable to progress as awaiting results of research programme in 2006.

prEN 1744-5 00154094 2003/00033
'Tests for chemical properties of aggregates — Part 5: Determination of acid soluble chloride salts'
Status/comments: Stage 46. Report of CEN Enq. (doc. CEN/TC 154 N 721 E) addressed. Updated draft (N 906 E) to be approved for Formal vote at SC6 meeting on 2005-11-28, in Bratislava.

prEN 1744-6 00154095 2003/00035
'Tests for chemical properties of aggregates — Part 6: Determination of the influence of recycled aggregate extract on the initial setting time of cement'
Status/comments: Stage 46. Report of CEN Enq. (doc. CEN/TC 154 N 722 E) addressed. Updated draft (N 907 E) to be approved for Formal vote at SC6 meeting on 2005-11-28, in Bratislava.

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Information from
http://www.cenorm.be/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittees/Standards.asp?param=6136&title=CEN%2FTC+154

CEN / TC 154 - Published standards

Standard reference	Title	Citation in OJ	Directive
EN 1097-1:1996	Tests for mechanical and physical properties of aggregates - Part 1: Determination of the resistance to wear (micro-Deval)	No	89/106/EEC
EN 1097-1:1996/A1:2003	Tests for mechanical and physical properties of aggregates - Part 1: Determination of the resistance to wear (micro-Deval)	No	89/106/EEC
EN 1097-10:2002	Tests for mechanical and physical properties of aggregates - Part 10: Determination of water suction height	No	89/106/EEC
EN 1097-2:1998	Tests for mechanical and physical properties of aggregates - Part 2: Methods for the determination of resistance to fragmentation	No	89/106/EEC
EN 1097-2:1998/A1:2006	Tests for mechanical and physical properties of aggregates - Part 2: Methods for the determination of resistance to fragmentation	No	89/106/EEC
EN 1097-3:1998	Tests for mechanical and physical properties of aggregates - Part 3: Determination of loose bulk	No	89/106/EEC

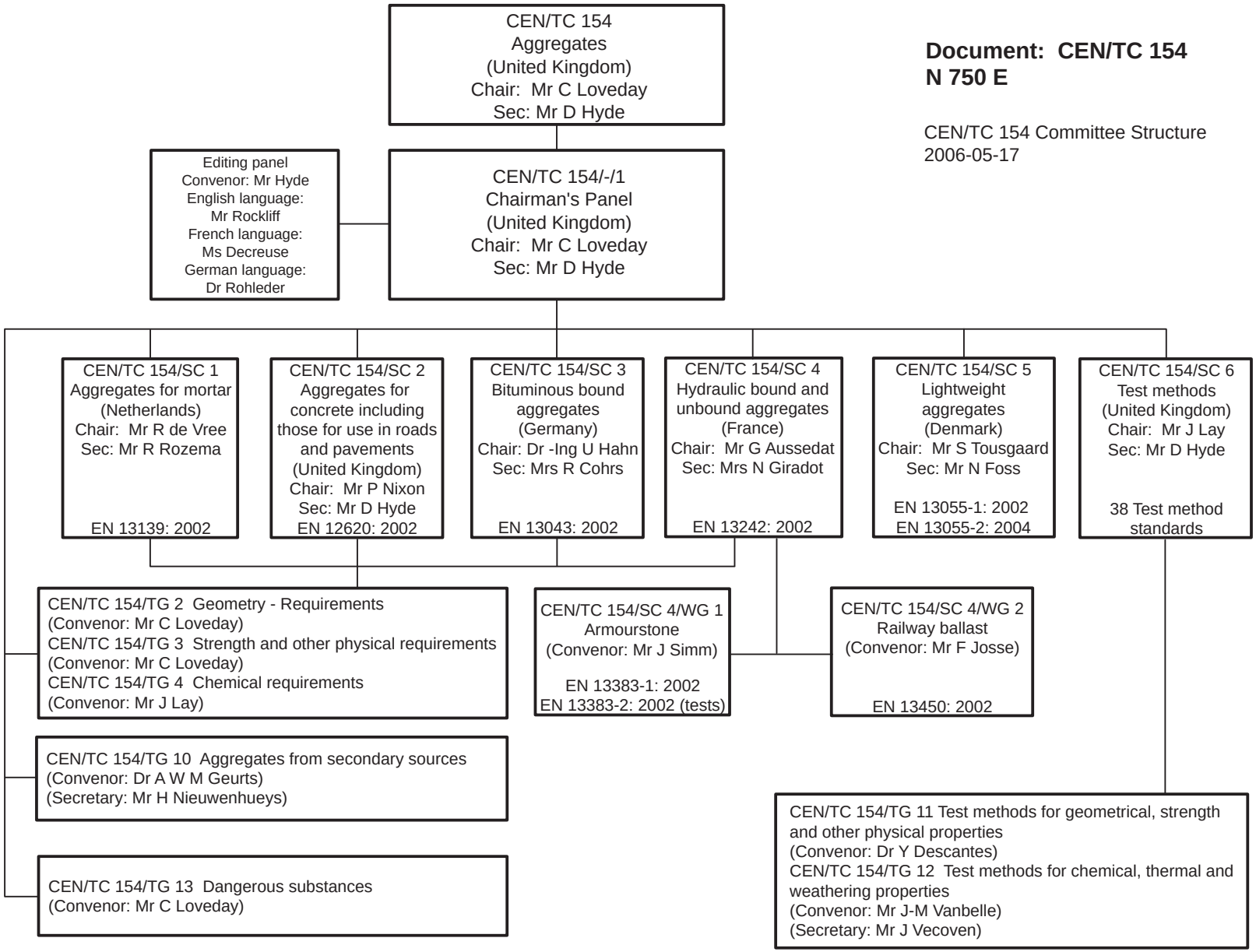
	density and voids		
EN 1097-4:1999	Tests for mechanical and physical properties of aggregates - Part 4: Determination of the voids of dry compacted filler	No	89/106/EEC
EN 1097-5:1999	Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven	No	89/106/EEC
EN 1097-6:2000	Tests for mechanical and physical properties of aggregates - Part 6: Determination of particle density and water absorption	No	89/106/EEC
EN 1097-6:2000/A1:2005	Tests for mechanical and physical properties of aggregates - Part 6: Determination of particle density and water absorption	No	89/106/EEC
EN 1097-6:2000/AC:2002	Tests for mechanical and physical properties of aggregates - Part 6: Determination of particle density and water absorption	No	-
EN 1097-7:1999	Tests for mechanical and physical properties of aggregates - Part 7: Determination of the particle density of filler - Pyknometer method	No	89/106/EEC
EN 1097-8:1999	Tests for mechanical and physical properties of aggregates - Part 8: Determination of the polished stone value	No	89/106/EEC
EN 1097-9:1998	Tests for mechanical and physical properties of aggregate - Part 9: Determination of the resistance to wear by abrasion from studded tyres - Nordic test	No	89/106/EEC
EN 1097-9:1998/A1:2005	Tests for mechanical and physical properties of aggregates - Part 9: Determination of the resistance to wear by abrasion from studded tyres - Nordic test	No	89/106/EEC
EN 12620:2002	Aggregates for concrete	Cited in OJ C 320 (2002-12-20), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 12620:2002/AC:2004	Aggregates for concrete	No	-
EN 13043:2002	Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas	Cited in OJ C 47 (2003-02-27), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13043:2002/AC:2004	Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas	Expected	89/106/EEC
EN 13055-1:2002	Lightweight aggregates - Part 1: Lightweight aggregates for concrete, mortar and grout	Cited in OJ C 212 (2002-09-06), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13055-1:2002/AC:2004	Lightweight aggregates - Part 1: Lightweight aggregates for concrete, mortar and grout	No	-
EN 13055-2:2004	Lightweight aggregates - Part 2: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications	Cited in OJ C 263 (2004-10-26), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13139:2002	Aggregates for mortar	Cited in OJ C 212 (2002-09-06), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13139:2002/AC:2004	Aggregates for mortar	No	-
EN 13179-1:2000	Tests for filler aggregate used in bituminous mixtures - Part 1: Delta ring and ball test	No	89/106/EEC
EN 13179-2:2000	Tests for filler aggregate used in bituminous mixtures	No	89/106/EEC

	- Part 2: Bitumen number		
EN 13242:2002	Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Cited in OJ C 75 (2003-03-27), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13242:2002/AC:2004	Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	No	-
EN 13383-1:2002	Armourstone - Part 1: Specification	Cited in OJ C 212 (2002-09-06), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13383-1:2002/AC:2004	Armourstone - Part 1: Specification	No	-
EN 13383-2:2002	Armourstone - Part 2: Test methods	No	89/106/EEC
EN 13450:2002	Aggregates for railway ballast	Cited in OJ C 47 (2003-02-27), C 139 (2005-06-08), C 319 (2005-12-14)	89/106/EEC
EN 13450:2002/AC:2004	Aggregates for railway ballast	Expected	89/106/EEC
EN 1367-1:1999	Tests for thermal and weathering properties of aggregates - Part 1: Determination of resistance to freezing and thawing	No	89/106/EEC
EN 1367-2:1998	Tests for thermal and weathering properties of aggregates - Part 2: Magnesium sulfate test	No	89/106/EEC
EN 1367-3:2001	Tests for thermal and weathering properties of aggregates - Part 3 : Boiling test for "Sonnenbrand basalt"	No	89/106/EEC
EN 1367-3:2001/AC:2004	Tests for thermal and weathering properties of aggregates - Part 3 : Boiling test for Sonnenbrand basalt	No	-
EN 1367-4:1998	Tests for thermal and weathering properties of aggregates - Part 4: Determination of drying shrinkage	No	89/106/EEC
EN 1367-5:2002	Tests for thermal and weathering properties of aggregates - Part 5: Determination of resistance to thermal shock	No	89/106/EEC
EN 1744-1:1998	Tests for chemical properties of aggregates - Part 1: Chemical analysis	No	89/106/EEC
EN 1744-3:2002	Tests for chemical properties of aggregates - Part 3: Preparation of eluates by leaching of aggregates	No	89/106/EEC
EN 1744-4:2005	Tests for chemical properties of aggregates - Part 4: Determination of water susceptibility of fillers for bituminous mixtures	No	89/106/EEC
EN 932-1:1996	Tests for general properties of aggregates - Part 1: Methods for sampling	No	89/106/EEC
EN 932-2:1999	Tests for general properties of aggregates - Part 2: Methods for reducing laboratory samples	No	89/106/EEC
EN 932-3:1996	Tests for general properties of aggregates - Part 3: Procedure and terminology for simplified petrographic description	No	89/106/EEC
EN 932-3:1996/A1:2003	Tests for general properties of aggregates - Part 3: Procedure and terminology for simplified petrographic description	No	89/106/EEC
EN 932-5:1999	Tests for general properties of aggregates - Part 5: Common equipment and calibration	No	89/106/EEC
EN 932-6:1999	Tests for general properties of aggregates - Part 6: Definitions of repeatability and reproducibility	No	-
EN 933-1:1997	Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method	No	89/106/EEC
EN 933-1:1997/A1:2005	Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method	No	-

EN 933-10:2001	Tests for geometrical properties of aggregates - Part 10: Assessment of fines - Grading of fillers (air jet sieving)	No	89/106/EEC
EN 933-2:1995	Tests for geometrical properties of aggregates - Part 2: Determination of particle size distribution - Test sieves, nominal size of apertures	No	89/106/EEC
EN 933-3:1997	Tests for geometrical properties of aggregates - Part 3: Determination of particle shape - Flakiness index	No	89/106/EEC
EN 933-3:1997/A1:2003	Tests for geometrical properties of aggregates - Part 3: Determination of particle shape - Flakiness index	No	89/106/EEC
EN 933-4:1999	Tests for geometrical properties of aggregates - Part 4: Determination of particle shape - Shape index	No	89/106/EEC
EN 933-5:1998	Tests for geometrical properties of aggregates - Part 5: Determination of percentage of crushed and broken surfaces in coarse aggregate particles	No	89/106/EEC
EN 933-5:1998/A1:2004	Tests for geometrical properties of aggregates - Part 5: Determination of percentage of crushed and broken surfaces in coarse aggregate particles	No	89/106/EEC
EN 933-6:2001	Tests for geometrical properties of aggregates - Part 6: Assessment of surface characteristics - Flow coefficient of aggregates	No	89/106/EEC
EN 933-6:2001/AC:2004	Tests for geometrical properties of aggregates - Part 6: Assessment of surface characteristics - Flow coefficient of aggregates	No	-
EN 933-7:1998	Tests for geometrical properties of aggregates - Part 7: Determination of shell content - Percentage of shells in coarse aggregates	No	89/106/EEC
EN 933-8:1999	Test for geometrical properties of aggregates - Part 8: Assessment of fines - Sand equivalent test	No	89/106/EEC
EN 933-9:1998	Tests for geometrical properties of aggregates - Part 9: Assessment of fines - Methylene blue test	No	89/106/EEC

Document: CEN/TC 154
N 750 E

CEN/TC 154 Committee Structure
2006-05-17



Theme 1: General presentations of the CEN/TC 154 and CEN/TC 227 standards

Overview of TC 227 standards

Per R. Persson, Denmark

The Beginning
Technical Board, BT of Comité Européen de Normalisation, CEN decided by resolution 312 in 1989 to create a new technical committee, TC for road construction and maintenance materials. It was number 227. The secretariat was allocated to Deutsches Institut für Normung, DIN. The first meeting of TC 227 was in Berlin on 1990-05-14/15.
The 17th meeting took place in Vienna on 2006-06-08/09.
The title and the scope were considered – and changed (a bit).

Structure
Some National Standardisation bodies had proposed different work items and working groups, WGs within TC 227. The first meeting decided one structure and allocated the WGs to National Standardisation Bodies. During time some minor changes have been proposed and approved. This slide shows the present structure in the two upper levels. In the third level we have task groups, TGs. The content of this overview should be the standards. There are nearly 150. Therefore I will follow the structure of WGs.

WG 1 Bituminous mixtures
In general WGs produce standards for specific materials and connected test methods. Within WG 1 there have been 5 TGs.
Standards for materials specifications of bituminous mixtures are in the **EN 13108** series while the supporting test methods are in the **EN 12697** series. In the first series we have 7 mixture groups: Asphalt Concrete, Asphalt Concrete for very thin layers, Soft Asphalt, Hot Rolled Asphalt, Stone Mastic Asphalt, Mastic Asphalt and Porous Asphalt. Part 8 is Reclaimed Asphalt and parts 20 and 21 are supporting standards to parts 1 to 7: Part 20 is Type testing and part 21 is Factory Production Control.
I think it is impossible to give some sort of grouping of the test methods for bituminous mixtures.

WG 2 Surface Dressing and Slurry Surfacing
This WG works on 2 materials. During the work we had 4 series of standards. Now it has been changed so we have 1 standard for each material and 1 series of standards for test methods for each of them, **EN 12271** to **EN 12274**.

WG 3 Materials for Concrete Roads
The general specification for concrete is EN 206. WG 3 has prepared supplement to this and supporting test methods in 2 series, **EN 13877** and **EN 13863**.
The specification series for Concrete pavement includes part 1: Materials for concrete pavements; part 2: Functional requirements for concrete pavements and part 3: Specifications for dowels ….

Joint Fillers and Sealants are parts of concrete roads. The materials are in the series **EN 14188** while the test methods are found in separate series, **EN 13880, EN 14187, EN 14840** and **EN 15466**.

WG 4 Unbound and Hydraulically Bound Mixtures
This WG goes the other way round: The specifications are in **EN 13285** and the **EN 14227** series This includes Part 1: Cement bound granular mixtures; Part 2: Slag bound mixtures; Part 3: Fly ash bound mixtures; Part 4: Fly ash for hydraulically bound mixtures; Part 5: Hydraulic road binder bound mixtures; Parts 10 to 14 are treated soil: 10 - by cement; 11 - by lime; 12 - by slag; 13 - by hydraulic road binder and 14- by fly ash
The test methods are in the **EN 13286** series.

WG 5 surface Characteristics
This WG has only test methods, most of which are in the **EN 13036** series.
It has also adopted 2 test methods from ISO, **EN ISO 11819-1** from ISO/TC 43/SC 1/WG 33 and **EN ISO 13473-1** from ISO/TC 43/SC 1/WG 38.

Published standards
When a European Standard is approved by CEN it is "published" in 3 languages: English, French and German. It is distributed to the National Standardisation Bodies.
In Denmark Danish Standards Association in general issues the English version with a cover page.
A list with "published" standards from a specific TC can be found on CEN's homepage www.cenorm.be
Business domains > Technical Committees and workshops > List of Tech… > Select Technical Committee > TC 227 > Published Standards
or directly
http://www.cenorm.be/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittees/Standards.asp?param=6208&title=CEN%2FTC+227

Initial summary
We have 10 series of standards for test methods. They are listed with increasing series numbers.
Similar we have 7 series of standards for materials however 3 of these are not divided up.

Construction Products
Why have we produced all these standards?
Because road materials are construction products – however not all of them. The unbound and hydraulically bound mixtures and the concrete for concrete roads are not construction product in the EC sense. The latter as a consequence of **EN 206-1** Concrete - Part 1: Specification, performance, production and conformity. The first ones probably because of the confusion about materials and mixtures, e.g. **EN 13242** Aggregates for unbound and hydraulically bound **materials** for use in civil engineering work and road construction and **EN 13285** Unbound **mixtures** – Specifications but that is the next point of Today's programme.

The European Commission has asked/required CEN to elaborate standards in a so-called Mandate. M124 was finalised 6th of July 1998. All similar mandates have an annex 1 stating materials and there use(s).
What does it mean?
It means that a producer of a construction product shall fulfil the standard in question including affixing a CE-mark to the product.
When may the producer CE-mark his product?
My answer to this often asked question is that it is stated in the Official Journal, OJ.
He **shall** CE-mark his product according to EN xyz after Date of the end of the co-existence period, DOW for EN xyz stated in OJ.
On the other hand he **may** CE-mark his product according to EN xyz in the co-existence period i.e. the period from Date of applicability to DOW for EN xyz stated in OJ.
However he may produce his product according to EN xyz from the date of availability, dav but he **may not** CE-mark it before the above mentioned Date of applicability for EN xyz stated in OJ.
The list from OJ is found on EC's homepage
www.ec.europa.eu
European Commission > Enterprise and Industry > Policy Areas > Single Market > New Approach > Harmonised standards > News and updates
or directly
http://ec.europa.eu/enterprise/newapproach/standardization/harmstds/whatsnew.html

Go to the bottom of the page Updates and News and under Subject construction products are found. Choose your (preferred) language. It could be English = EN.
The first TC 227 standard we find is **Dowels EN 13877-3**.
For the time being we only find 4 standards for road material – concrete roads.
We can hereby update slide number 18 as shown.

Conclusion
It is told that not all EC Member States intend to require CE-marked construction product. Nevertheless National Member Bodies of CEN are bound to implement approved European standards.
From a technical point of view there is no big difference while there concerning administration and thereby economy may be larger expenses.
Maybe we should not focus on that but the fact that we now have identical test methods although we in many cases have lost our experience through many years. It should be possible to transfer this important experience through parallel testing, certainly not all our experience but every bit is beter than nothing.

Copenhagen 2006-09-18
Per R. Persson
Road Directorate, Road Standards Division
prp@vd.dk

CEN-NORD seminar in Reykjavik 29. September 2006

Theme 1: General presentations of the CEN/TC 154 and CEN/TC 227 standards.

Flemming Berg, Denmark: Comparison of standards EN 13285 (TC 227) and EN 13242 (TC 154) and possible cooperation between TC 154 and TC 227 regarding harmonizing of these standards.

EN 13242 has been prepared by CEN/TC 154 "Aggregates", the secretariat of which is held by B51, with the following scope:

This European Standard specifies the properties of aggregates obtained by processing natural or manufactured or recycled materials for hydraulically bound and unbound materials for civil engineering work and road construction.

It provides for the evaluation of conformity of the products to this European Standard.

Note 1 Aggregates used in construction should comply with all the requirements of this European Standard. As well as familiar and traditional natural and manufactured aggregates Mandate M/125 "Aggregates" included recycled aggregates and some materials from new or unfamiliar sources. Recycled aggregates are included in the standards and new test methods for them are at an advanced stage of preparation. For unfamiliar materials from secondary sources, however, the work on standardisation has only started recently and more time is needed to define clearly the origins and characteristics of these materials. In the meantime such unfamiliar materials when placed on the market as aggregates must comply fully with this standard and national regulations for dangerous substances (see Annex ZA of the standard) depending upon their intended use. Additional characteristics and requirements may be specified on a case basis depending upon experience of use of the product, and defined in specific contractual documents.

Note 2 Properties for lightweight aggregates are specified in EN 13055-2.

En 13285 has been prepared by CEN/TC 227 "Road Materials", the secretariat of which is held by DIN, with the following scope:

This European Standard specifies requirements for unbound mixtures used for construction and maintenance of roads, airfields and other trafficked areas. The requirements are defined with appropriate cross-reference to EN 13242.

This European Standard applies to unbound mixtures of natural, artificial and recycled aggregates (see annex A) with a upper sieve size (D) from 8 mm to 80 mm and lower sieve size (d) = 0 at the point of delivery.

Note 1 Mixtures with an upper sieve (D) greater then 80 mm are not covered by this European Standard but may be specified in the place of use.

Note 2 Water content of the mixture and the density of the installed layer are not specified mixture requirements. Both parameters are related to the control of the construction of the layer, and are outside the scope of this European Standard.

For the end user it is essential that the two standards EN 13242 and EN 13285 are compatible.

For this purpose close liaison between TC 154/SC4 and TC 227/WG 4 has been upheld during the creation of the two standards (Flemming Berg has been and still is liaison officer between the groups).

EN 13242 defines the aggregates characteristics under the headlines geometrical requirements (aggregates sizes, shape of coarse aggregate, crushed particles in coarse aggregate), physical requirements (resistance to fragmentation of coarse aggregate, resistance to wear of coarse aggregate, particle density and water absorption), chemical requirements (acid – soluble sulphate, total sulphur and other constituents) and durability requirements (resistance to freezing and thawing etc.).

EN 13285 defines the mixtures characteristics under the headlines mixture requirements (mixture designation, fines content, oversize), grading requirements (general grading curve, grading of individual batches) and other requirements (frost susceptibility, permeability and leaching).

Both standards EN 13242 and EN 13285 contain a clause for evaluation of conformity with a factory production control procedure.

In so far the standards has worked well together technically.

However EN 13242 operates under a mandate from the European Commission which is not the case for EN 13285.

In the opinion a number of countries this leads to confusion on the market since aggregates shall be CE – marked and mixtures shall not.

Based on the opinions expressed by the member countries TC 227 may decide one of the following three options.
Options 1: To leave it as it is.
This option seems acceptable to 4 out of 9 countries but unacceptable to 3 out of 9 countries.
Options 2: To let EN 13285 and EN 13242 merge into one standard.
This would make life easier for the end user of the standards but would leave the question which committee should be responsible for creating the standard.
Since EN 13242 is already mandated, the decision would probably be to give TC 154 responsibility for creating the merged standard.
Would it be acceptable to TC 227 Road Materials to let TC 154 Aggregates develop specifications for road materials.

Options 3: To ask for a TC 227 mandate for EN 13285 (and possibly the other WG 4 matters).
This would enable TC 227 to have hands on standards for road materials and have standards with the same status (CE-marking) as the aggregate standards.
This will require good liaison (as it is today) between TC 154 and TC 227 to make sure that the two standards EN 13285 and EN 13242 are compatible.

At its last meeting June 2006 TC 227 decided to follow option 3.

Presently EN 13242 is being upgraded in relation to recycled aggregates.

This together with the fact that TC 154 and TC 227 have decided to join forces in the liaison with the new CEN/TC 351 "Dangerous substances" – means that it is vitally important to uphold close liaison between TC 154/SC4 and TC 227/WG4 and TC 227/WG4. TC 227 will probably have to amend EN 13285 to uphold good compatibility between EN 13242 and EN 13285.

Presently TC 227 is asking the member countries whether a European frost heave test standard for unbound and/or hydraulically bound mixtures is wanted. If the answer is yes the frost heave test is to be developed by TC 227/WG 4 (Flemming Berg).

THEME 2: Nordic experience of the standardisation work, implementation and the content of the standards

The practical implementation of EN's seen from an aggregate producer's point of view
Lars Møller Nielsen, Technical Manager, M. Sc. Geologist - NCC Roads A/S.

Introduction
This is a description of my personal experience on the change from Danish to EN tests, and product standards. My colleagues in the laboratories and quality control functions had a very busy year (2004). Extra resources were used to run the new tests methods, revision of the quality procedures and developing a system for CE-mark documentation. The final results have given us a good system and fewer samples in the laboratories, compared with the Danish product standards. Today we use approximately the same resources to tests, quality control and paperwork, as before implementation of the EN standards.

Danish conditions
The use of EN standards in relation to aggregates was introduced in the Danish building legislation, the process started in 2002, and the CE mark at construction products was implemented in 2002 by a new law:
Bek nr. 118 (2002): Bekendtgørelse om CE-mærkning og markedskontrol af byggevarer.
In accordance with **bek no. 118** it is not allowed to sell or market a product with a matching harmonized EN standard without a CE mark on. The law has an extensive paragraph referring to market control, ex. the authorities can prohibit the selling and marketing of a product that does not fit the specifications, or with incorrect documentation following the CE mark.

Effect of implementation
Revision and practical use of new Danish construction standards or regulations, have resulted in implementation of the product standard ranged below from effect use against infrequent use:

- Aggregate for concrete - EN 12620
- Aggregate for asphalt – EN 13043
- Unbound mixtures - EN 13285 (EN 13242)
- Aggregates for mortar – EN 13139
- Aggregates for railway ballast – EN 13450
- Armourstones – EN 13383-1

The reason for infrequent use of EN 13383-1 you will find in the lack of Danish regulations but more important, the ignorance of project owners and the consulting engineers.

Improvement of the EN standards – CEN/TC 154 (wishes for the future standards)
- Hold the focus on the properties which have influence on the final product in use and durability of the construction
- Remove requirements which mainly influence the process properties (ex. workability)
- New tests for properties of aggregates, which require little manpower and have better reproducibility (ex. EN 933 suite)
- Nordic coordination of the future review processes of the EN standards

Recommendations for the practical implementation of EN standards
- Separate papers in relation to the CE mark from daily life important data between producer and customer

Tests for geometrical properties of aggregates, ex. sieving require a lot of man-power. Many of the methods have a bad reproducibility ex. determination of crushed and broken surfaces.

NCC Roads produces high quality aggregates from the sea.

In Denmark the major part of aggregate is produced from gravel deposits (60 mio. tons per. year). Only the island Bornholm has deposits of hard rock (0,3 mio. per. year).
In Denmark every inhabitant uses 11 tons aggregates per year.

CEN-NORD Seminar, Reykjavík 29.09. 2006

Implementation of CEN/TC 154 and TC 227 standards in Iceland

Pétur Pétursson, petur.p@rabygg.is
Icelandic Building Research Institute

1. Relevant facts about Iceland

Iceland has a population of only 300.000 although the coastline of the island is about 5.000 km, the total area 103.000 km^2, whereof desert/wasteland is about 64.500 km^2 and glaciers 12.000 km^2

The climate is temperate; moderated by North Atlantic Current. Winters are therefore relatively mild but windy and these conditions result in many freeze/thaw cycles (up to 100 each winter), especially in the southwest region. The ability of construction aggregates to withstand the repeated cyclic action of freezing and thawing is a fundamental property. This is especially important in climatic regions where freeze/thaw cycling is frequent and in saline environment (use of de-icing salt on road surfaces, bridges over fjords and channels etc.).

The geology of Iceland is quite different from that of the rest of the Nordic countries. Iceland being a volcanic island on the North Atlantic Ocean ridge results in rock formations which are predominantly young basalts of differing porosity and alteration stages. The alteration is complex and connected with central volcanism and hydrothermal activity.

2. Road network and traffic

The total road network is approximately 13.000 km whereas bituminous bound surfaces cover 4.600 km and unpaved roads 8.700 km (2005). The distinguishing features concerning the Icelandic road system are:

- Low traffic rate
- Long road network per capita
- Many gravel pits along the road network
- Few large producers
- Heavy load traffic is increasing rapidly
- Older roads not designed for increasing heavy load traffic
- Results in basecourse stabilisation and more expensive surfacings
- Requirements for produced aggregates need to be re-evaluated

The figure below shows the location of the many ICERA´s gravel pits and quarries, distributed along the main roads of the country.

Figure 1. ICERA's ~ 3000 gravel pits and quarries.

3. Some aspects of the test standards from TC 154 and TC 227

a. Sieving analysis

- Iceland changed from ASTM aperture sizes to ISO in the late eighties
- We have mostly taken up perforated plate sieves with > 4 mm aperture size, good experience
- Sweden has been trying to include mechanical sieve shakers to more extent in the procedure of sieving as well as testing Flakiness Index
- Iceland supports this request from Sweden

b. Humus content, EN 1744-1

- The pass/fail requirement is questionable
- According to the color scale used before, the reference color is too dark (equals approximately color no. 3 to 4 on the Nordic scale)
- An option would be to test the loss on ignition, which is not really a part of the chemical test methods to test for humus
- More research is needed on the comparison between the NaOH and loss on ignition methods
- More humus categories are needed in order to cover all end uses such as concrete, bituminous materials as well as base course and gravel wearing course.

c. Freeze/thaw test, prEN 1367-6

- Icelandic frost resistance test developed in the years of 1985 to 1990
- Test involved 70 freeze/thaw cicles, 10 per 24 hours with the temp. range from +4°C to –4°C

- A strong correlation was found between test results and performance of aggregates in surface dressing
- The test method was introduced to CEN/TC 154/TG 9 in the early 1990's as a response to prEN 1367-1, which was considered unsuitable for Icelandic aggregates and conditions
- A Nordic test method was developed in 1995-1996, based on Icelandic experience and with reference to prEN 1367-1
- The Nordic test method was issued as a NT BUILD standard in 1998
- The FRAS co-operation was established in 2003 and finished in 2004
- A draft freeze/thaw test method was written by TG 12 in 2005
- The new method is at CEN enquiry stage at the moment

d. Petrographic analysis

- Iceland commented that the test standard for petrographic analysis was too simplified and that subdivision of basalt was necessary
- Documented reply from TC 154 that each country can adjust the petrographic analysis to their needs if it does not conflict the European standard
- Iceland commented that a minimum of particles needed to be analysed
- A minimum of 150 particles was included in the test standard

e. Nordic abrasion test

- Iceland has always supported the Swedish Ball Mill test
- Icelandic research established good correlation between Nodic abrasion value and the former Dorry value
- Some Nordic countries would have liked to have this test method also available for unbound aggregates

f. Harmful fines

- Methylene Blue test and Sand Equivalent test are not traditional tests in Iceland,
- The requirements regarding fines in the ICERA guidelines are based on plasticity of fines as well as quantity of fines < 0,063 mm and additionally the quantity of fines < 0,02 mm (measured with hydrometer or laser method).
- Laser method correlates well with hydrometer test

g. Adhesion

- No direct adhesion test from TC 154
- Vialit Plate Test for surface dressing from TC 227 adopted for emulsion surface dressing but not for cutback surface dressing
- The wet mix test (with constant binder) is still in use to test adhesion properties of aggregates for cutback surface dressing, based on long time tradition
- Indirect tensile test for hotmix asphalt not used in Iceland

h. New optional test methods

- **From Mandate 125**

…..In any other case, two or more test/ calculation methods for the determination of one characteristic can be accepted only if a correlation between them exists or can be developed. The relevant harmonized product standard must then select one of them as the method of reference.

- **Resolution CEN/TC 154/SC6 234/2005 (Bratislava)**

Add the following wording into the scopes of its standards at the time of their 5-year review:

"This standard describes the reference method for (a certain property) . For the purposes of type testing and in case of dispute only the reference method should be used. For other purposes, in particular factory production control, other methods may be used provided that an appropriate working relationship with the reference method is established."

Petroscope - New optional test method for production control

- For grain size distribution of coarse aggregate.
- For shape measurements.
- For simplified petrographic analysis (under development).

Figure 2. The Petroscope instrument.

The photograph and drawing above show the Petroscope apparatus. It consists of a feeder (left), conveyor belt, two cameras for 3D analysis above the belt and collection tray (right). It is hoped that the wording of the Mandate as well as the Bratislava resolution will open up on new development and technique as optional test methods.

4. Implementation of TC 154 and TC 227 standards in Iceland

- National guidance document (in Icelandic) for TC 154
- No National guidance document for TC 227

Figure 3. National guidance document

Contents of guidance document for TC 154 (in Icelandic):

Short description of all test methods from TC 154

- Scope.
- Summary of method.
- Relationship to equivalent standards, correlation between new European standards and old national standards.
- Implications, including evaluation of the need for each test method, cost, available equipment etc.

Product standards

- Each chapter of the main product standards is discussed.
- Requirements, which methods should be chosen to test aggregate properties in Iceland.

Extract from Annex ZA

- States that attestation of confirmity for aggregates for concrete is +2, but 4 for all other purposes.

5. Research and requirements – ICERA guidelines

ICERA has been working on *Guidelines for design, production and construction.* The document is divided onto 7 chapters, each one giving guidance concerning testing and requirements for different road layers. The document also has 7 Appendices, giving practical information as their names below indicate, see table below:

Table 1. Contents of the ICERA guidelines.

Main text:	**Appendices:**
1. Preface 2. Introduction 3. Subgrade 4. Subbase 5. Base course 6. Wearing Course 7. Concrete structures	1. Test method description 2. Product types for road construction 3. Geological formations 4. Deviations 5. Sampling procedure 6. Production methods 7. Definitions

To give an example of the subdivision of each chapter, see Chapter 5 Base course below:

5.1 Role, properties and products
5.2 Tests at design stage
- 5.2.1 Procedures
- 5.2.2 Tests for aggregates
- 5.2.3 Tests for mixtures
- 5.2.4 Frequency of tests

5.3 Tests at production stage
- 5.3.1 Procedures
- 5.3.2 Tests for aggregates
- 5.3.3 Tests for mixtures
- 5.3.4 Frequency of tests

5.4 Tests and measurements during construction
- 5.4.1 Procedures
- 5.4.2 Tests for aggregates
- 5.4.3 Tests for mixtures
- 5.4.4 Frequency of tests

5.5 Requirements
- 5.5.1 Requirements for aggregates
- 5.5.2 Requirements for mixtures
- 5.5.3 Requirements during construction

6 Proposal:

- The ICERA guidelines could be used when deciding on test methods for aggregates and road materials for different end uses.
- The ICERA guidelines should be considered as being the National reference document concerning the production of aggregates and road materials.

This would mean that special care needs to be taken to ensure that the new revised ICERA guidelines include everything that is needed to serve as a National reference document that does not conflict with the European Standards.

THEME 3: Special Nordic issues concerning the standards of TC 154 and/or 227

Implementing CEN standards in Icelandic Road Guidelines

Gunnar Bjarnason Icelandic Road Administration (ICERA)

Introduction

In the presentation a perspective is given on the implementation of CEN Standards in the new Icelandic Road Guidelines. The main focus is on requirements for unbound aggregates in base courses and therefore two Product Standards for unbound materials are explored. The CEN TC 154 unbound aggregate standard EN 13242 gives categories based on testing of aggregate properties for different use in all civil engineering work such as their strength and resistance to weathering and abrasion. The CEN TC 227 road material standard EN 13285 is to cover the properties and performance of the mixture of unbound aggregates in roads but in fact that standard has focused mainly on grading categories but does not for instance include requirements for the Mechanical behaviour of unbound mixtures such as requirements for stiffness and sensitivity to permanent strains.
As grading can be considered both as an aggregate property and a mixture property there are categories in both of the above product standards for that property.

Grading requirements

For road materials it is important to give more detailed information about the grading requirements than the EN 13242 standard does give. Below is an example of how the 13242 standard presents requirements for an All-in 0 – 32 mm material.

0/32 G_A85

There is only information about the minimum and maximum size aggregates and oversize (minimum 85% passing D.

Additionally, there are categories for maximum fines content in EN 13242 but there are no categories for minimum fines content. These values are for the produced aggregate in the quarry but it is not clear in the standard if requirements could be set for fines content in the road after compaction. Usually the fines increase about 1 – 2 % from quarry to the road. In the Icelandic guidelines it is preferred to define the fines content in the quarry because of practical reasons.

In the Unbound Mixtures standard EN 13285 there are categories for minimum fines and that is important since it increases the stability of base course materials to have a minimum of 1 – 2 % fines. The standard (EN 13285) is not harmonized which means that there are no CE markings required. The grading requirements are put forward as upper and lower grading limits as well as maximum and minimum fines content (see figure 1). In some cases it is difficult to find categories that describe traditional Icelandic unbound road mixtures. The categories of EN 13285 are only for all in material of sizes 0/8 – 0/80 mm but not for coarser material. There are no limits for the grading range 0,063– 0,5 mm.

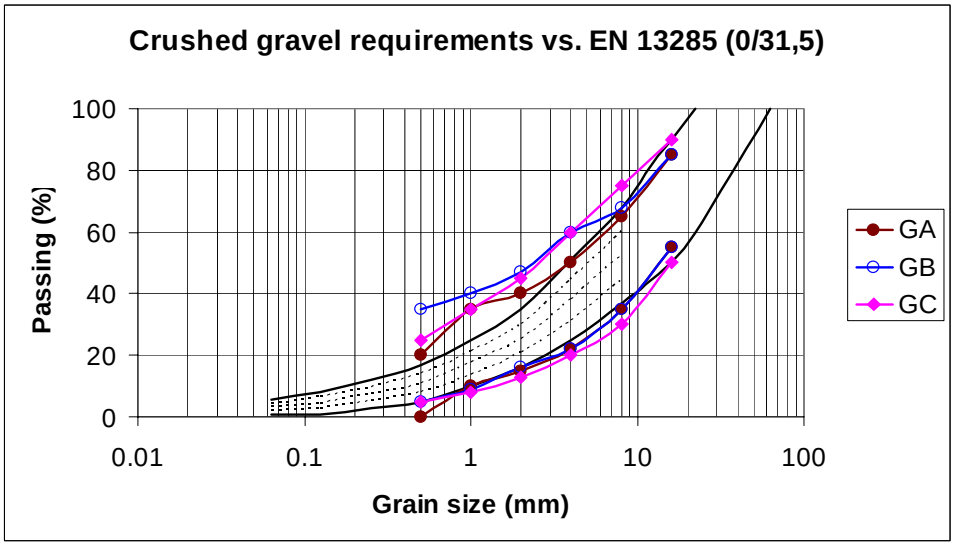


Figure 1 Grading limits in Icelandic Road guidelines and some EN 13285 Categories

Icelandic (ICERA) grading limits in figure 1 for crushed gravel are the same regardless of maximum grain size. The method has been to give maximum grain size and then grading limits that define i.e. maximum and minimum fines content as well as the passing ratio for all other sieves up to the maximum grain size. An example is that no more than 51% should be in the sand and fines fraction (< 4 mm) to maintain the stability of the base course material. The aggregate is to have a grading within the inter medium (dotted in fig. 1) grading limits (not crossing more than 2 lines) which in effect gives different grading limits for aggregates with different maximum grain sizes. Work is ongoing on how to refer to the EN 13285 grading limits (GA, GB and GC curves on the plot have been extracted from tables in EN 13285). Only a few of many possible gradings in the standard are shown on the plot. Notice how both upper and lower EN limits all point towards maximum grain size which however is in between the Icelandic grading limits. The GA category is close to the Icelandic grading limits, but still it has been considered to keep the traditional limits but state that they resemble closely the GA category. What makes this approach tempting is that the GA category limits make little sense in places. It is difficult to explain the 1 mm hunchback and the 0% at the 0,5 mm limit, that makes little sense in a 0/32 mm material and why indeed no limits between 0,063 mm and 0,5 mm. However, the EN 13285 standard has lower grading limits that are in good accordance with the maximum size in this case 31,5 mm.

Other requirements

The ICRA grading requirements for unbound material, including fines content will be based on categories in EN 13285 but other requirements discussed in this paper are from the EN 13242 standard for unbound aggregates.

Since there is much freezing and thawing in Iceland during the winter and in the springtime it is important to be extra careful regarding the fines quantity and quality. The methods for assessment of fines in ICERA guidelines are testing of humus, plasticity and grading of fines (hydrometer test). These test methods have the purpose of making sure that the base course materials are not frost susceptible. These methods except the Sodium Hydroxide test for organic matter (humus) are not part of the CEN standards for aggregates. They are included in the ICERA guidelines on the bases of Article 4.5 in EN 13285 which states that requirements may be given in the place of use based on direct or indirect assessment of frost susceptibility and frost heave. The ICERA methods are indirectly based on the assumption that low content of non plastic fines content and no organic matter ensures that the base course material is not frost susceptible.

In the Product Standard EN 13242 there are no requirements for Petrographic Analysis. An Icelandic method gives a detailed description of the petrography of the aggregate for example based on alteration stage and porosity. The aggregates are divided into three classes that give an indication of the quality of the aggregate. Since the classes are not according to the CEN standards the guidelines refer to the petrographic requirements as guiding requirements. What is unusual is that less 3rd class aggregate is allowed if it is altered than if it is porous fresh (see table 1). The reason for this is that highly altered basalt can produce harmful fines when it brakes down in the road. Porous fresh basalt can have low resistance to fragmentation but mostly sand is produced when it brakes down.

Table 1 ICERA requirement proposals for base course aggregates

Road type	Requirement proposals for crushed gravel in base course							
	≤0,063 LF (%)	≤0,02 mm (%)	Maximum fines UF (%)	Petrogr. Analysis (%)*	Freeze/ Thaw (%)	Crushed/ Broken $C_{X/Y}$ (%)	Flakiness Index FI (%)	Resistance to fragmentation LA (%)*
A – B1	LF_2	3	UF_5	≤7/12	≤8	$C_{50/10}$	FI_{20}	LA_{20}/LA_{25}
B2 – B3	LF_2	3	UF_5	≤10/20	≤14	$C_{50/10}$	FI_{20}	LA_{20}/LA_{30}
C1 – C2	LF_2	3	UF_5	≤15/30	≤14	$C_{50/30}$	FI_{35}	LA_{25}/LA_{35}
D	LF_2	3	UF_5	≤15/30	NR	$C_{NR/50}$	FI_{50}	LA_{30}/LA_{40}

***Maximum 3rd class material. More stringent requirements for altered basalt than for fresh basalt**

In the ICERA guidelines Freeze/thaw test shall be performed on base course materials, only if it does not fulfil the guiding petrographic analysis and if the 3rd class material is mostly altered basalt. It has been a long process to get the Nordic frost resistance test method (with salt) included in the package of TC 154 standards, but at the moment the salt water method is at the CEN enquiry stage. It is very important for Iceland to have this test method accepted, since various research shows that the Freeze Thaw testing in pure water and the Magnesium Sulphate Test are inadequate tests for estimating resistance to freezing and thawing of Icelandic aggregates.

The CEN categories for crushed/broken surfaces of aggregates are based both on the percentage of crushed particles and the percentage of totally rounded particles. This is a good method of describing the fraction of crushed and rounded particles and this criterion is important for base course materials.

The Flakiness Index test method has been chosen by CEN/TC 154 to be a reference test method over the Shape Index method. It is well known how important aggregate shape is for the stability and stiffness of base course materials. The Icelandic lava aggregates usually have good qualities regarding both shape and texture which increases the quality of for example tephra sand.

The Los Angeles test method has been chosen by TC 154 to be a reference fragmentation test method. Icelandic research has shown that the LA method does not distinguish well between strong and medium strong aggregates. The LA method is preferred anyway by ICERA over the German Schlagversuch method since the LA testing equipment is simpler and less expensive than the Schlagversuch equipment.

The ICERA aggregate requirements are dependent on road class and petrography (see table 1). There are more stringent requirements for altered basalt than for fresh unaltered basalt. This way of connecting the petrography with physical properties is similar to what is practiced in Austria and Hungary. These methods are based on the fact that at the time of construction it is not necessarily the quantity of degradation in the base course layer that concerns you but much rather the quality of the degradation products where harmful fines such as swelling clays are of particular concern.

There is a clause in Mandate M 125 for the Aggregate TC 154 standards which states that alternative test methods can be used provided that good correlation can be demonstrated with the reference method. This clause in a way opens up the standards since there is in many cases good correlation between test methods that are designed to test for the same property of aggregates.

Conclusion

In 2004, NVF 34 conducted a comparison between requirements in the Nordic Countries which revealed considerable difference both in test methods and in requirements. This comparison brings to light how important it is to have harmonized European Standards. The work of the standardization committees has taken considerable time and effort and now we must make sure that the implementation of the standards in our countries can be successful. When criticizing the CEN standards it is important to bear in mind their main objective which is to remove barriers to trade. The committees have not always chosen the best test methods and in some instances the categories and requirements could be improved. This is partly because it has been necessary to compromise. The most powerful nations of the European Union all wanted their test methods included in the standards. The compromise has not only been between member countries since there also had to be compromise between producers and buyers.

Expanded Clay Light Weight Aggregate for Civil Engineering Applications.

Linking the test methods of TC 88 for light weight aggregates to TC 154 and TC 227.

Authors: *Arnstein Watn, SINTEF Buidling and Infrastructure, Norway*
Oddvar Hyrve, maxit Group, Norway
Inge Brorsson, Swedish Geotechnical Institute, Liaison CEN TC 227.

Abstract:
Expanded Clay Light Weight Aggregates (Expanded clay LWA) is a ceramic light weight aggregate produced by expanding selected clays in large rotary kilns at temperatures over 1.150ºC. Typically with grain size up to 32mm. The material has for more than 40 years been used in a number of different civil engineering applications as light weight fill to improve stability, reduce settlements and reduce earth pressure, as insulation material in roads and buildings and as frost insulation and drainage material in drainage systems.

Backfill for bridge abutment

Frost insulation in road

Frost insulation in drainage ditch

Light weight fill in railway embankment

An internordic research and development project, LWA Geolight, was carried out in the period 1998-2002. The aim of the project was to improve the knowledge on the material itself and to prepare a sound basis for material characterization and design and construction methods for civil engineering applications.

The project was also intended to give a basis for preparing product standards for Expanded clay LWA for civil engineering applications. CEN TC 154 had already prepared a product standard (EN13055) for light weight aggregates in general, while in parallel CEN TC 88 was preparing specific product standards for light weight products (EPS and XPS) for civil engineering applications. Thus CEN TC 227 requested that a similar specific product standard should be prepared for expanded clay LWA for this application. A specific product standard for loose fill

insulation materials in floors (EN 14063) had already been developed within TC88/WG15/TG2. A new working group, WG 20, was established under TC 88 to prepare the new standard. The draft product standard "prEN 00088199 Light weight fill and thermal insulation products for civil engineering applications (CEA). Expanded clay lightweight aggregate products (LWA)" is now finished and ready to be sent out for enquiry at a national level from the CEN secretariat.

The proposed standard include required characteristics and corresponding test methods for physical, mechanical, thermal, hydraulic, durability and environmental properties for expanded clay LWA. Relevant standardized test methods are used when such are existing but the standard also include specific test methods where no standardized test method currently is existing. An overview of some of the required characteristics and relevant test methods are given in Table 1.

Clause				
No.	Title	Test method	Minimum number of test specimens to get one test result	Specific conditions
4.2.1	Loose bulk density	EN 1097-3	3	
4.2.2	Particle size distribution	EN-933-1	1	
4.2.3	Reaction to fire (organic content)	EN 13820	See Annex ZA, reaction to fire class A1 without testing	
4.3.3	Thermal conductivity	In accordance with 14063-1		
4.3.4	Particle density	EN 1097-6, Annex C	2	
4.3.5	Water content	EN 1097-5	3	Not applicable for ITT
4.3.6	Water absorption	EN 1097-6, Annex C	2	
4.3.7	Compressibility and compressive strength	Compressibility and compressive strength (EN13055-2, Annex A)	3	
4.3.8	Compressive creep	Annex C	3	
4.3.9	Shear strength –static loading	Annex A	4	
4.3.10	Cyclic compression	Annex B	2	
4.3.11	Shear strength –cyclic loading	EN 13286-7	3	
4.3.14	Chemical content	EN 13055-2	1	
4.3.15	Freezing and thawing resistance	EN 13055-2, Annex B	3	
4.4.1	Crushing resistance	EN 13055-1, Annex A	3	

Table 1 Test methods, test specimens and specific conditions

There is a clear need to link the required characteristics and test methods to requirements for other materials and also to link this to design characteristics and design models for different applications. The cooperation and coordination with ongoing work on standardisation accordingly is crucial for the implementation of the standard.

The proposed standard is related to the characterisation and quality control of the material itself. Equally, or even more, important is the construction work and the quality control as a part of the complete structure. An ad hoc working group has also been formed to prepare guidelines for construction works and quality control for the use of Expanded clay LWA in Civil Engineering Applications. This is intended to be issued as a technical report and include recommendations for structural solutions, installation, compaction and quality control in the field.

Implementation of EN 13043 in Finland

Pirjo Kuula-Väisänen
Tampere University of Technology
Institute of Earth and Foundation Structures

1 INTRODUCTION

Implementation of European aggregate product standards in Finland has been quite slow. The translation work took its own time; in fact the translations were ready just before the transition time was over in 2004. After the translation work the implementation could really start. The main problem in the beginning in motivating companies to learn about the standards was the lack of official requirements.
During the year 2004 and 2005 the official requirements for CE-marking were published for railway ballast, asphalt aggregates and unbound aggregates in road construction. Also a detailed instruction documents for aggregate producers and users were done. Informing the producers and users was done by giving presentations in seminars and publishing papers. Also the mirror group worked active to make national application standards.
The CE-marking has been obligatory for railway ballast from the beginning of 2006. For asphalt aggregates and some other road building aggregates the CE-mark is demanded in the beginning of year 2007. At the moment the national application standards are in final commentary round and will be published at the end of this year. Also the national guidance papers are almost ready the asphalt aggregate document has been just published and the paper for concrete will be ready at the end of this year. Also a guidance document for aggregate producers concerning factory production control has been published this year.

2 ASPHALT AGGREGATE REQUIREMENTS IN FINLAND

The Finnish national guidance paper (Asphalt norm) has been following the standardisation work since 2000 e.g. in Nordic ball mill and flakiness index requirements. The national asphalt norm is not a standard, however, it is guidance which is accepted to be used in all projects and by all contracting parties. Anyhow there has been no actual grading requirement for aggregates published in Asphalt norm since they were published in other document. The earlier Finnish grading requirements have been have been different from those in European standards especially when all-in aggregates are in concern. There has also been some national requirements for properties which are not specified in European test methods.

The main requirements of national guidance standard of EN 13043 and guidance paper are shown in table 1. Both of these documents will be used from the beginning of year 2007. The selection of classes was made together with producers and users.

Table 1. The asphalt aggregate requirements in Finland according to EN 13043.

Property	Classes	Note
Grading	Coarse aggregate: $G_C90/10$ and $G_C90/15$, $G_C85/15$ Fine aggregate: G_F85 All in aggregate: national interpretation see chapter 3	The classes are selected by the producer and asphalt designer.
Tolerances for typical grading	Coarse aggregate: $G_{20/15}$, $G_{20/17,5}$ All in aggregate: national interpretation see chapter 3	
Particle shape	FI_{10}, FI_{15}, FI_{20}, FI_{35} SI_{20}	The national guidance document contains information and recommendations of the selection of class according to the traffic amount and speed limit. Shape index (SI) is used only in aggregates for surface dressing.
Particle density	Declared value	
Amount of fines	Coarse aggregate $f_{0,5}$, f_1,f_2,f_4 Fine aggregate f_3,f_{10},f_{16},f_{22}	
Quality of fines	If swelling minerals are specified according to EN 932-3 MB_F10. If not specified MB_FNT.	The petrographic description must contain information of harmful minerals.
Amount of crushed an broken surfaces	$C_{50/30}$	Only for crushed gravel
Resistance to abrasion of studded tyres	A_N 7, A_N 10, A_N 14, A_N 19, A_N30	The national guidance document contains information and recommendations of the selection of class according to the traffic amount and speed limit.
Water absorption	$WA_{24}1$	Declared value If WA_{24}>1 a freeze-thaw test must be performed.
Resistance to freezing and thawing	F_1 MS_{18}	Magnesium sulphate test is used only in airports.
Chemical composition	Declared value	EN 932-3
Iron disintegration of air cooled blastfurnace slag	No disintegration	
Dicalcium silicate disintegration of air cooled blastfurnace slag	No disintegration	
Volume stability of steel slag aggregate	$V_{3,5}$	

Table 2 The filler aggregate requirements in Finland according to EN 13043...

Property	Classes	Note
Grading	Declared by producer as described in EN13043	
Particle density	Declared value	
Voids of dry compacted filler	$v_{28/45}$	
Harmful fines		
Los of inginition	Declared by producer, range < 6%	Only for fly-ash
Calcium carbonate content	CC_{70}	Only for limestone filler

Table 2. An example of preliminary selection of aggregate using Nordic abrasion value category and traffic flow.

Speed limit	Traffic flow			
(km/h)	Average daily traffic (cars/d)			
>60	500-2000	2000-5000	5000-10000	> 10000
≤ 60	500-3000	3000-7500	7500-15000	> 15000
Asphalt type	Minimum Nordic abrasion value category			
AC, SMA, MA	A_N19	A_N14	A_N10	A_N7
AB K base course	A_N19	A_N19	A_N19	A_N19
Soft asphalt	A_N19	-	-	-
Surface dressing	A_N19	A_N14	-	-

The values in Table 2 are giving only guidance for aggregate selection. The final selection of aggregate is always based on abrasion category of the asphalt.

3 THE MAIN PROBLEMS IN IMPLEMENTATION OF EN 13043

One of the main problems in EN 13043 is grading and other properties of all-in aggregates. The grading requirements for all-in aggregates contain on 2*D, 1,4*D and D as control sieves and the class for amount of fines. For additional grading requirements the standard text is “The following additional requirements shall apply to control the variability on the fine aggregate and all-in aggregate 0/D with D≤ 8 mm.” In Finland we produce all-in aggregates 0/16 or even 0/20 to be used in asphalt. The requirements in EN 13043 do not cover these kinds of products and also the requirements for e.g. 0/8 are not good enough. If the all-in aggregate is produced by mixing coarse and fine aggregates there is no problem, because one may use the categories for coarse and fine aggregates. The poor applicability of EN 13043 in our practices lead to a compromise solution: The Finnish unofficial national guidance document gives recommendations for grading of all-in aggregates. These recommendations are based on the earlier requirements.

The other main problem concerning all-in aggregates is the physical requirements. The Nordic abrasion value and also other physical properties requirements are given only to coarse aggregate. In Finnish national application standard we simply adjusted the requirement of Nordic abrasion value and flakiness index also for all-in aggregate.

Chemical composition of aggregates is requires in EN 13043 to be measured by EN 932-3 (pertographic description). The term chemical composition is wrong the term should be mineralogical composition. After the Finnish interpretation the petrographic description is very important to evaluate the harmful minerals in asphalt aggregates e.g. sulphides, swelling minerals and carbonates.

Ragnar Bragstad:
"Implementation of new European asphalt specifications and standards - Nordic co-operation on new requirements for deformation"

Background

The new asphalt standards shall be implemented within 1st of January, 2008 in each European country .The new standards involve new procedures for test methods and material specification as well as initial type testing and factory production control. The new standards represent significant changes for the whole road construction sector and there is big uncertainty connected to the requirements to be set. Especially the new methods for documentation of deformation properties have created a big debate.
A Nordic working group was established to obtain as good basis as possible for setting the requirements according to the new standards and at the same time harmonize the requirements in these three Nordic countries. The members of the working group are:

- Katri Eskola, Finland (The Public Road Administration)
- Vesa Laitinen, Finland (Lemminkäinen oy)
- Rainer Laaksonen, Finland (VTT)
- Nils Ulmgren, Sweden (NCC)
- Torsten Nordgren, Sweden (Public Road Administration)
- Leif Bakløkk, Norway (Public Road Administration)
- Nils Uthus, Norway (Public Road Administration)
- Ragnar Bragstad, Norway (ATI)

Deformation requirements

The test methods for documenting deformation properties in the new European asphalt standards are:

- Triaxial testing (only for AC-mixes)
- Wheel track (For Nordic conditions the small equipment)
- Marshall (AC-mixes for airfields)
- Indentation tests (Asphalt mastic)

Sweden, Finland and Norway have no experience with the type of wheel track which the standard prescribes. In the last few years there is a growing interest to focus on the properties of the finished pavement. Therefore instead of establishing a new test method for laboratory testing it might be better to look at the possibilities of basing the requirements on testing of specimens from the pavement. Since the new CEN-standards only apply to the mix delivered from the production plant, and not to the finished pavement, putting requirements on the finished pavement gives more degrees of freedom. One possibility could be to base the requirements on the cyclic uniaxial creep on cores drilled from the pavement like Sweden already is doing.

A simple form of triaxial testing is to use vacuum to make the confining pressure, but the minimum confining pressures that are allowed when testing AC is too high for that method. For that reason and because vacuum triaxial testing is not allowed for Stone Mastic Asphalt according to the new standard, it is left out as an alternative for a new deformation test.

Nordic investigations

At the moment the following equipments are available in the three countries:

Country	Wheel Track		Compaction of slabs (EN 12967-33)	Test rigs	
	According to the standard	Not according to the standard		NAT-rigs[1)]	Triaxial
Finland	0	1	1-2 ?	2	2
Sweden	0	4-5	7	10-12	3
Norway	1	3	1	4	2

[1)] Nottingham Asphalt Tester or equivalent testing rig.

Sweden has carried out some tests which compared different Wheel Track tests and uniaxial cyclic compression test. Different ranking of the mixes was obtained with different test methods, but ranges were small and all tested mixes could be classified as good mixes. Earlier tests have shown better correlation, but they had a greater difference in quality between the mixes and the Wheel Track equipment used was not the one allowed in the new standard.

Finland and Norway want to (try to) establish correlation between Wheel Track and cyclic uniaxial creep test results for both laboratory-made specimens and specimens from the pavement. Table 1 shows the combinations that shall be tested.

Table 1 Overall program (F=Finland, N=Norway)

Mixes	Lab			Field	
	Marshall	Uniaxial	Wheel T	Uniaxial	Wheel T
12->	N	F, N	F, N	F, N	N

The four biggest contractors in Norway will contribute with 3-5 mixes each.

Currently laboratory testing of these mixtures is underway and field samples will be tested during the autumn. The results are expected to be ready at the beginning of the year 2007.

THEME 4: Co-operation between Nordic Mirror Groups in the future

CEN-NORD Seminar
Reykjavik, 28 September 2006





CEN-NORD / TC 154 Mirror Groups Meeting

Agenda

CEN-NORD / TC 154 Mirror Groups Meeting

Participants

DENMARK:	Pernille Nyegaard
	Per Persson
FINLAND:	Tuomo Laitinen
	Pirjo Kuula Väisänen
	Jukka Vätanen
ICELAND:	Gunnar Bjarnason
NORWAY:	Geir Berntsen
	Svein Helge Fräkaland
	Merete Holmen Murvold
SWEDEN:	Jan Bida
	Henrik Broms

CEN-NORD / TC 154 Mirror Groups Meeting

Aggregate Production and Consumption, Mton

	Crushed Rock	Sand & Gravel	Recycling	Summa	*Ton/capita*
DENMARK:	< 1	60	6	**66**	***13***
FINLAND:	43	57	<1	**100**	***25***
ICELAND:	2	23		**25**	***83***
NORWAY:	35	15	<1	**50**	***12***
SWEDEN:	53	23	2	**78**	***9***

Total Nordic Countries	**319 Mton**	***14.5 ton***
Europé	**3000 Mton**	***6 ton***

CEN-NORD / TC 154 Mirror Groups Meeting

Product standards:

• Merge of EN 13242, EN 13043, EN 12620 and (possibly) EN 13450 – one aggregate standard instead of one per use.

• Interaction between EN 13242 and EN 13285

- Separate but Compatible !
- Harmonization of EN 13285 ?

Test methods:

Possible future modifications – Resolution TC 154/SC 6 - Scope of each Test Method (5 year review) is to include following statement:

"This standard describes the reference method used for type testing and in case of dispute for determination of property XX. For other purposes, in particular FPC, other methods may be used provided that ***an appropriate working relationship*** *with the reference method has been established.*

CEN-NORD / TC 154 Mirror Groups Meeting
Test methods – proposed work items

- Petrographic analysis
  - Replacement/complement to Petrographic description
  - Recomendation for use (concrete, unbound, asphalt etc.)
  - Mica content/distribution
- Humus content (e.g. Loss on ignition)
- Harmul fines (Sed. Analys)
- Nordic Ball Mill for Unbound ….
- Minimum MD- values (gravel surface layer)
- Limiting amount of cubical particles
- Mechanised sieving
- Other ……

CEN-NORD / TC 154 Mirror Groups Meeting
Possible future work isues for CEN-NORD TC 154

- Dangerous substances
  - WT/WFT
  - Release to soil and water
  - Emissions into the Indoor air – Radioactivity ?
- FPC, Certification and CE-marking
  - Multi-site
  - Alternative Test Frequency
- New Conformity criteria
- Modified Test Methods – development towards automation
- Other ……..

Summary of discussion from the TC227 mirror group meeting Yesterday

Participants

Klas Hermelin	Sweden
Terje Bøe	Norway
Nils Uthus	Norway
Ragnar Bragstad	Norway
Petur Peturson	Iceland
Math-T. Virtanen	Finland
Osmo Anttila	Finland
Vesa Laitinen	Finland
Tuomo Kallionpod	Finland
John Skalshøi	Denmark
Flemming Berg	Denmark

CPD implementation of standards and CE-Marking,State of the art in the nordic countries

- Norway, Sweden, Finland and Denmark: Started implementation proces to be ready Jan 2008.
- Iceland has not as yet started the proces.
- All Countries translates Language vise (at least test methods) and technically.
- CE-Marking Volantary in Finland,Sweden and Norway,Obligatory in Denmark.

The EN 13242/EN13285 co-existence

- TC 227 has decided to ask for a mandate for Unbound and/or Hydraulically bound Mixtures (extention of M124)

Detailed questions of different TC 227standards

- Frost heave questionary with deadline today.
- D schould include 125mm in both EN13242 and EN 13285 (EN 933-1)
- Mica content important
- Important that functional requirements are included in next EN-generation
- EN 13286-2 should be valid for subgrade.

Dangerous substances

- General information about TC351
- Liaison between TC351 and TC154/TC227
- New Nordic Project presented by Harpa Birgisdottir.
-

Nordic cooperation within TC227/TC154

Buttom-up

- Contact list of Nordic delegates to CEN
- Coordination meetings between Nordic countries imidiately before CEN-meetings

Top-down

•Formal Nordic meetings to look into the future (politics,research etc.)