HARMONIZING THE NATIONAL STANDARDS FOR CONCRETE BLOCKS, FLAGS AND KERBS IN EUROPE

J. J. M. van der Vring
Centre for Research and Contract Standardization In Civil and Traffic Engineering, Ede, The Netherlands

SUMMARY

Since 1 January 1993 has been appointed as the targetdate for pulling down the tradebarriers, a unique process in the history of European unification is taking place. Under the European Committee for Standardization (CEN) several hundreds of committees are active to harmonize the specific national standards on a wide variety of subjects into European common standards. This has to be achieved in the end of 1992, creating free exchange of trade within the Common Market and the countries that have associated themselves to this market

One of the Technical Committees is CEN/TC 178 "Paving Units and Kerbs". This TC has created three workinggroups, based on the materials used in this field: concrete, burnt clay and natural stone.

One of the workinggroups is WG 1 "Small paving units made of precast concrete", dealing with blocks, flags and kerbs in concrete. The drafts of the required standards are prepared by a taskgroup consisting of a great number of European manufacturers..

Three separate drafts for blocks, flags and kerbs are in discussion. Especially producing the first draft standard on the blocks is a very difficult enterprise. General accepted regulations about the properties and requirements for the products are hard to reach. It is explained which details were discussed and the reasons for certain choices are given and the particular solutions are presented. This includes the testmethods and the procedures belonging to it.

Also definitions are given and some of the background of the problems is described.

1. INTRODUCTION

In Western Europe a big number of countries has joined hands in the European Economical Community (E.E.C.). The objective was to create a single "common" market and it goes back to the "Treaty of Rome", which established the Community in 1958. In 1985 the Heads of Government in this European Community committed themselves to complete the single market progressively by 31 december 1992. This was laid down in a package of Treaty reforms known as the "Single European Act" (S.E.A.), which became effective on 1 july 1987.

The Community has set up collective objectives to achieve and an organisation to rule the community as a coherent system.

The day-to-day management is carried out by the European Committee (E.C.). It is a kind of executive committee that also is responsible for drafting proposals for the European Council of Ministers. This Council is the heart of the European government. Here the common decisions are made and the European legislation takes shape. The members of this Council are the prime ministers of the affiliated countries.

Before taking a decision the Council takes the advice of the European Parliament. Since 1979 this organ, counting 518 members, is elected directly by the people of the Community by democratic elections. It is a reflection of the political balance in Europe. Only in matters of establishing the estimates of the European Market the European Parliament has rights on legislation and participation. The presidency of

the European Council, the legislation organ, changes every half of a year; the members take turns. These members are: Belgium, Denmark, England, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal and Spain. The European Council of ministers takes decisions and formulates points of view in relation with trading business and political affairs. The European Committee has the right to develop initiatives for affairs that are directly related to European Market matters. The Committee is also involved in verification of the fulfilment of the E.E.C.-rules (for instance: open competition). The set up of this organisation is shown in figure 1.

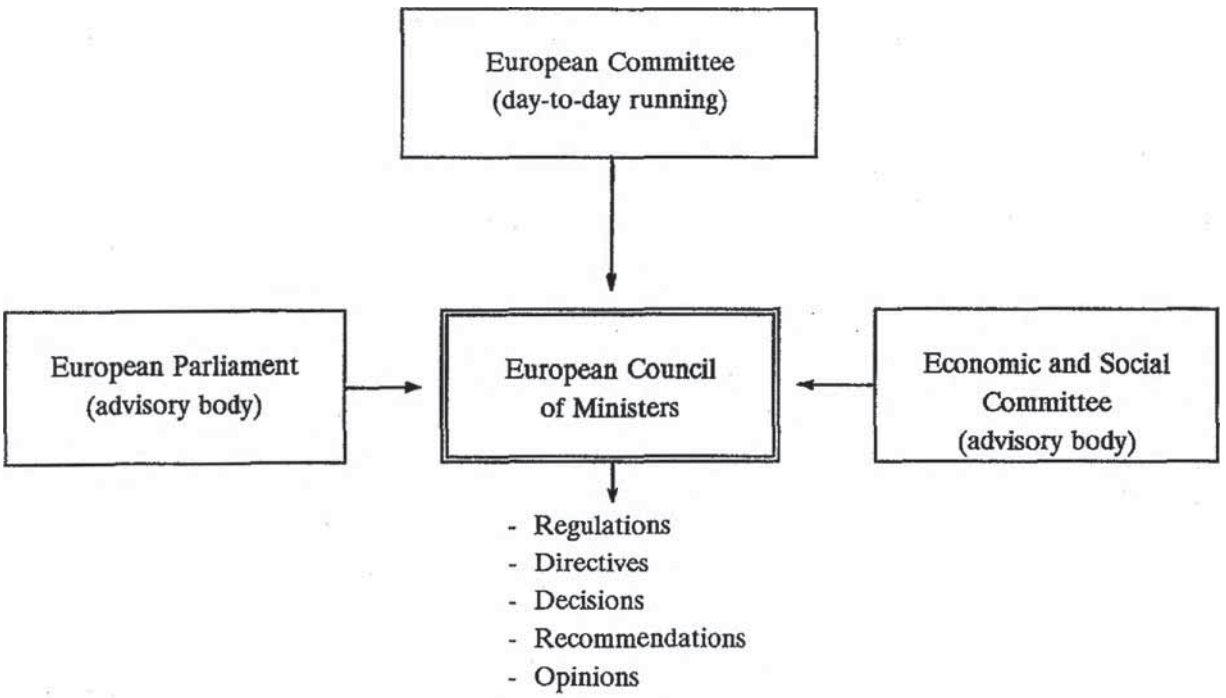


Figure 1: Organisation of the European Administration

The European rules and legislation are prepared by the European Court of Justice (E.C.J.). This court rules on the interpretation and application of Community laws. It has 13 judges including one from each Community country. Judgements of the Court are binding in each memberstate and (under the Treaties) have primacy over national laws.
Except for the twelve European countries just mentioned there are six other European nations pursuing free trade. They have united in the European Free Trade Association (EFTA). This interrelation is less committing as the E.E.C. In EFTA are working together: Finland, Sweden, Norway, Iceland, Austria and Switzerland.

EFTA as well as the E.E.C. are trying to take away the trade barriers like for instance tariffs and quota restrictions for import and export.
Despite the elimination of tariff and quota restrictions between the member states the common market, envisaged in the E.E.C.-Treaty, is not yet a reality. Free movement of goods, for example, is impeded by technical barriers such as differing national product standards.
Dismantling these remaining barriers is the main issue of the European Committee for Standardization (CEN). This organisation includes the national standards institutes of the E.E.C.-member states and all the EFTA-countries in the "General Assembly" and is now acting as an executive of the E.C.-directives and

active in harmonizing the national standards. Three main fields of action can be issued:

Avoiding new barriers

Since 1984 all kind of measures have been taken to avoid proposals for new technical regulations becoming new trade barriers protecting the national markets.

Drafting of European Standards and common rules

For a wide range of products workprogrammes have been drawn up. The initiative for this work comes from a range of sources, including industry, governments and national bodies. In connection with this, the Community's "New Approach to Technical Harmonization and Standards" was agreed in 1985.

Uniform requirements for testing and certification

Re-testing and re-certifying of products by the individual countries, whether imposed by law or by the individual buyers or users, can be very time-consuming and costly. This will mean a real barrier to trade. The Community is encouraging the mutual recognition of test results and certificates, mainly to reduce the extent of re-checking to meet buyers' and users' wishes. Developing common criteria for assessing the competence of national test laboraties and certification institutes is advancing well.

This rather extensive introduction is given to indicate the scale of what is happening and to set the scene. At the beginning of 1986 the Community had a domestic market of 323 million people, very nearly as many as the United States and Japan combined.

This process of integration never happened before. We see many individual independent historically grown nations building up an international legislation and working together on a voluntary basis in order to reduce business costs and stimulate increased efficiency. This will encourage the creation of wealth and jobs.

2. PAVEMENT UNITS AND KERBS

The movements described in the introduction have also their consequences for the national standards on pavement units and kerbs. In most European countries this kind of pavement is very popular and therefore a special Technical Committee (TC 178) was established to harmonize these national standards. The committee was founded in november 1989.

Each member of the E.E.C or EFTA is free to participate in a technical committee. In TC 178 there are 14 countries represented: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland and The United Kingdom.

TC 178 is responsible for pavers, paving stones, kerbs and edgings, intended for use in the open-air, up to a width of approximately 1 in, length and thickness are unspecified. During the first meeting it was decided to divide the field of action in three subjects: concrete, natural stone and clay products. According to this, three workinggroups were established like is shown in figure 2.

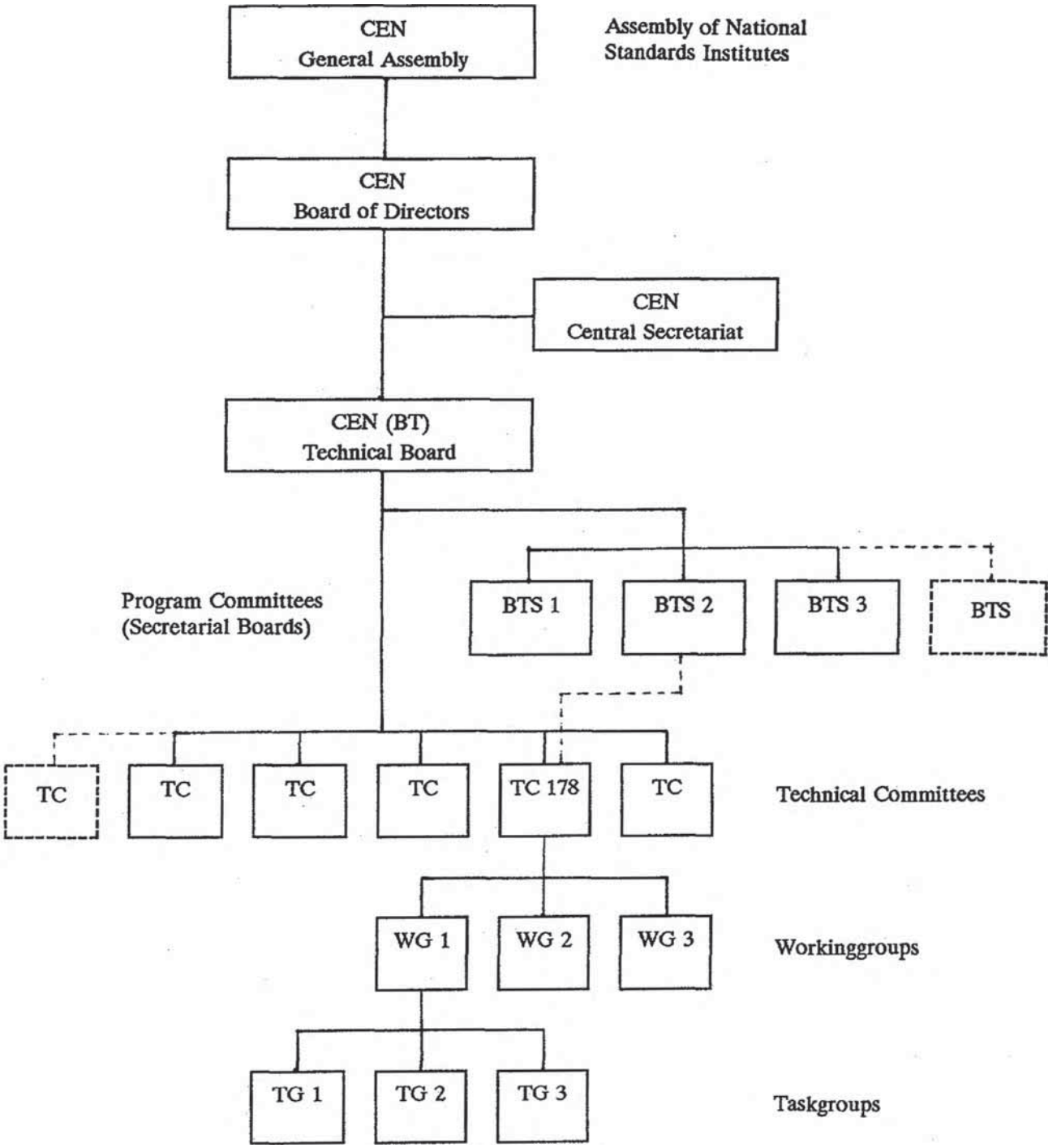
In this contribution the drafting of the standards for concrete precast paving units will be dealt with.

After the first meeting of Workinggroup 1 (WG1) the field of activities was divided in three parts:

* concrete paving blocks
* concrete paving flags
* concrete kerbs and edgings for pavements.

It was decided to develop one standard for each subject. The drafting of standards is tied to a lot of limitations, prescriptions and rules coming from the European Committee and its subcommittees or the CEN-organisation itself. For instance, there are three official languages: English, French and German.

If not one of these three languages is the national language of a country, which is true in many cases, one of the three must be chosen to act as a basic text for the national translation. This must be noted in the standard. In each standard must be dealt with the six "Essential Requirements". These requirements are protecting the interests of the user of a certain product.



BTS1 = "Mechanical"
BTS2 = "Bonding"
BTS3 = "Health, safety and environment"
TC178 = "Pavement Units and Kerbs"

WG1 = "Small paving units made of precast concrete"
WG2 = "Natural stone products"
WG3 = "Clay products"

TGI = "Drafting standards"
TG2 = "Freeze-thaw resistance"
TG3 = "Statistics"

Figure 2: Outline of the CEN-organisation

The six Essential Requirements are subject to:

* mechanical resistance and stability
* safety in case of Are
* hygiene, health and the environment
* safety in use
* protection against noise
* energy economy and heat retention

For concrete pavement elements only "stability" and "safety in use" are relevant Furthermore the E.C. is preparing a lot of guidance papers. CEN has its own "Internal Regulations" part 1 to 4.

In WG1 a special taskgroup has drafted the three standards. In this taskgroup the manufacturers of the precast concrete products for pavements of the different member countries are working together.
The workinggroups are trying to achieve uniform standpoints on the technical subjects. If this is impossible the different points of view are formulated as clear as possible and passed through to the TC. There a new discussion on the subject takes place and if necessary it is taken to a vote. After that, a procedure for adaptation the standard as an European Standard starts to work.

3. CONTENTS OF THE STANDARDS

3.1 General

Besides the Essential Requirements that have to be taken into account, very recently TC 178 has given a directive to the three workinggroups that the essential end-use tests for the products involved will cover at least:

* strength
* freeze/thaw with de-icing salt resistance
* abrasion resistance
* slip/skid resistance

TC 178 has also decided, that the workinggroups shall provide a minimum value for each property and if necessary a classification. The minimum value and the class boundaries shall be proposed by the workinggroups in relation to the end-use of the product.
Each draft standard has the same build-up in headings. After an introduction, the scope, the field of application, the references and the definitions are dealt with. This is followed by the paragraphs about the materials, the properties and the requirements, the testmethods, the marking and the conformity control. It is about these 5 paragraphs this contribution will give more information.

3.2 Materials

For all three drafts on blocks, flags and kerbs the subclauses are the same, even in content. These subclauses are: cement, aggregates, water, additions and pigments. Almost all these subjects are already in discussion and agreed upon in other TC’s. Only for the pigments a discussion took place and the result was: "Pigments may be inorganic or organic. If they are organic, their colour stability has to be comparable to inorganic pigments".
It is not surprising, that on this point it was rather easy to achieve a uniform text, because the national practice in the different countries was already more or less the same. For all three draft standards this part about materials is identic.

3.3 Properties and Requirements

In general it is accepted in all three draft standards that blocks, flags or kerbs may be manufactured with

a single concrete throughout or with different facing and backing concretes. When they are manufactured with a facing layer the thickness of this layer shall be not less than 4 mm.
For blocks and flags the same dimensions are given for chamfered arises. For kerbs the arises can be square, chamfered, radiused or splayed.

3.3.1 Physical Shape

About the worksize it is stated that for all units it shall be specified by the manufacturer. For non-rectangular units the manufacturer shall also specify all the workdimensions that are required to define the unit. For blocks the wofkthickness shall be at least 60 mm. Current workthicknesses are recommended as: 60 to 65 mm, 70 mm, 80 mm, 100 mm, 120 mm, 140 mm. A block is defined by its face area (less than or equal to 0.065 m^2) and the fact that its length divided by its thickness shall be less than or equal to 4. For flags the overall length shall not exceed 1 m, its face area shall be greater than 0.065 m^z and its length divided by its thickness shall be equal to or greater than 4.

Blocks and flags can be manufactured with or without spacer nibs. When spacer nibs are provided, the manufacturer shall declare the worksize of the nibs, but these shall not be included in the workdimensions of a unit. They shall be dimensioned and positioned in such a way that they provide a small joint in the final pavement surface to reduce the incidence of spalling under load. For kerbs spacer nibs are irrelevant. A wide variety of interlocking features between kerbs is possible.

About the permitted deviations a lot of discussion has taken place.
Individual blocks, when tested in accordance with the testmethod described in the standard, shall conform to the manufacturers declared workdimensions subject to the tolerances given below, except when the blocks are deliberately textured.

Block Thickness mm	Mean deviations for length and width mm	Mean deviations for thickness mm
≤ 100	± 2	± 3
> 100	± 3	± 4

For the other dimensions of non-rectangular blocks the tolerances shall be declared by the manufacturer. The draw shall not exceed 2 mm, see figure 3.

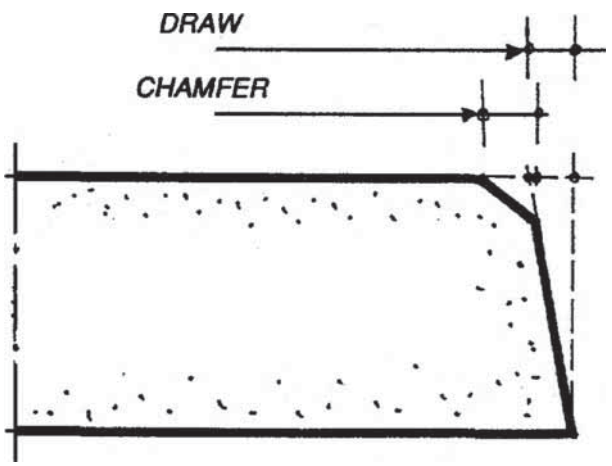


Figure 3: Definition of draw and chamfer

Individual flags, when tested in accordance with the testmethod described in the standard, shall conform to the manufacturers declared worksize subject to the tolerances given below:

Class	flag dimensions mm	deviations for length and width mm	deviations for thickness mm
1	≤ 600 > 600	± 2 ± 3	± 3 ± 3
2	≥ 600 > 600	± 3 ± 4	± 3 ± 3

but no more than 3 mm between any measurement of a specified dimension on a single flag.

The maximum difference between the measurement of the two diagonals of a rectangular flag shall not exceed the figures given below.

Class	diagonal mm	difference mm
1	< 850 ≥ 850	3 6
2	< 850 ≥ 850	5 8

The following tolerances shall apply for flatness and bow unless the surfaces have been deliberately profiled, or by secondary processing where the manufacturer shall supply information on tolerances and methods of measurements.

Gauge length mm	maximum convex deviation mm	maximum concave deviation mm
300	1.5	1.0
500	2.5	1.5
800	4.0	2.5
1000	5.0	3.0

In this case for flags two classes have been introduced. This was necessary to meet the actual existing situation of flags being layed in parks or scenic areas where the width of a joint is not important and the traffic loading is mainly caused by pedestrian activities.

3.3.2 Requirements for Physical and Mechanical Properties

In general the CEN-Rules are stating that the properties of a product must be described by existing testmethods. New methods are not considered. The choice of a certain testmethod must be determined by the fact that the properties of a product must be estimated in relation to the use in practice. Testmethods therefore have to be performance-related.

Strength is one of the four properties that according to the wish of TC 178 should be covered in the standards. Except for one country it is decided in the standard for blocks to use a splittingtest as will be described later. The country opposing to this proposes a compression test. The majority of the members has the opinion, that splitting is more performance-related than compression, but it must be kept in mind that a strength property never stands alone. All the physical and technical properties have an interaction. It looks like that this point will become a decision of the T.C. after taking the subject to a vote.
In the standards for flags and kerbs there is no problem with the testmethod to establish the strength, but in practice the use of flags needs to accept classes. This is still in discussion and will delay the progress of the drafting slightly. The problem is to define the right boundaries of the classes. They must also be performance-related and it is not very clear yet how the kinds of use can be translated in acceptable classes, At the moment a proposal to have four classes is in discussion.
The test for the strength of flags will be a bending test.

Slip-/Skidresistance is another property that should be incorporated in the standard. It also has to do with the Essential Requirement on safety in use. The problem is that the surface of concrete pavements and in particular of concrete pavement units in common is sufficient skidresistant. So, a special clause on this is not needed. The following solution is written down for all pavement units:
"Normally concrete blocks (flags) provide satisfactory slip-/skidresistance. If a value for slip-/skidresistance is required, the testmethod of Workinggroup 3 (Clay products) shall be used".
So far Workinggroup 3 has not yet reached accordance on a test for this property but it looks like that a kind of pendulumtest will be chosen.

Also abrasion is a requirement that has to be dealt with. Two methods are considered to be the most performance-related, the "Capon-test" and the "Böhme-test". Both methods also seem to have a rather good correlation between the results that can be obtained. For practical reasons the Capon-test is in favour. The use of the Böhme-test is more expensive than the Capon-test and a little more complicated.
So far it is proposed that the abrasion requirement shall be satisfied if no individual test value exceeds 25 mm. The testvalues are obtained with the Capon-test apparatus.
At least one country is opposing this proposal.

Resistance against ftost and de-icing salts is discussed in a special taskgroup. In Austria, Denmark, France, Germany and Sweden a testmethod is in practice. The members of the taskgroup will make a synthesis of these five methods and present WG1 a proposal for a test that seems to be most performance-related. It looks like that this will be not to difficult since the 5 testmethods are not differing to much in principle. They all have the disadvantage that they are time-consuming and that special equipment for performing the freeze-thaw cyclil is required.
This property has to be brought in connection with the Essential Requirement on stability and mechanical resistance.

Waterabsorption has been rejected as an unreliable and not performance-related test. There is no suitable correlation with frostresistance or durability. For two countries this is only acceptable as long as a relevant test for durability is included in the standards.

3.3.3 Aspects

Under this heading a number of properties are described that have to do with the external appearance of the unit, for instance:

The surfaces of a block (flag) shall not exhibit any defects such as cracking, deformation, flaking or delamination when examined in accordance with a testprocedure described in the standard. Surface efflorescence occurs occasionally and is not deleterious.

About this text discussion is still going on.

According to finish it is described that in the case of blocks with special surface textures the texture shall be described by the manufacturer.

Colours may be provided in a facinglayer or through the unit at the manufacturers discretion. Variations in the colour consistency of the flags can be caused by inavoidable variations in the shade and properties of cement and aggregates.

Units described as being of natural colour shall not contain any pigments or pigmented cement When examined in accordance with a description in the standard, compliance shall be established on the basis of comparison with examples supplied by the manufacturer and approved by the purchaser.

3.4 Testmethods

3.4.1 Measurement of Dimensions

The preparation of samples is the first thing to do. For blocks to be measured any irregularities or burrs are removed by using a hard brush. The thickness of surface layers shall be measured on units which have been split in the strength test. For flags being measured all flashings, burrs, etc. are removed by using a carborundum stone.

The format of a block is measured by a metal rectangular box large enough to enclose a block The horizontal baseplate and two adjoining vertical sides are fixed. The two other vertical sides can be moved horizontally parallel to the fixed sides. The distance between the pairs of parallel sides can be read from a scale to a whole number of millimetres. The construction of the apparatus must be such that the accuracy of measurements obtained to a whole number of millimetres can be justified.

The measuring procedure is described as follows:

Place the block face downwards on the base plate and press it as tightly as possible to the two vertically faced sides. Determine the length and width of the block by successively pressing each of the moveable sides against the block and reading the dimension to a whole number of millimetres on the scale. Note the length and width of the block, Where the side comes against a spacer nib the work projection of the spacer shall be deducted from the dimension measured before the result is recorded.

To measure the plandimension of a flag, measuring equipment, with an accuracy of 0.5 mm is used. The length of a flag is measured at two points within 50 mm of the corner. The two results and the mean are recorded. The width of the flag is measured in the same way. After that the diagonal is measured.

The thickness of a block is measured to 0.5 mm using sliding head calipers. Measurements shall be taken at four opposite corners along a line bisecting the angle of the corner. The four measurements shall be recorded and the average determined. The thickness of a flag is measured at 4 points to the nearest millimetre, 30 mm from the comer. The mean of the 4 results and the two extreme values are recorded.

The chamfer and draw can be measured by a square graduated in millimetres on the inner edges and a rule graduated in millimetres. See figure 4.

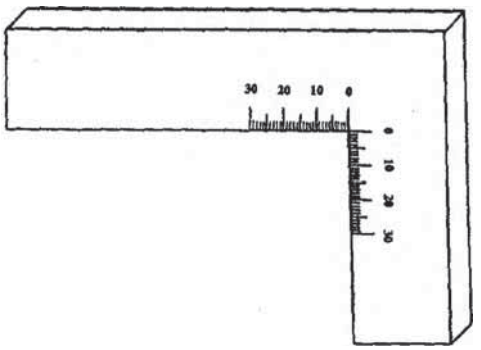
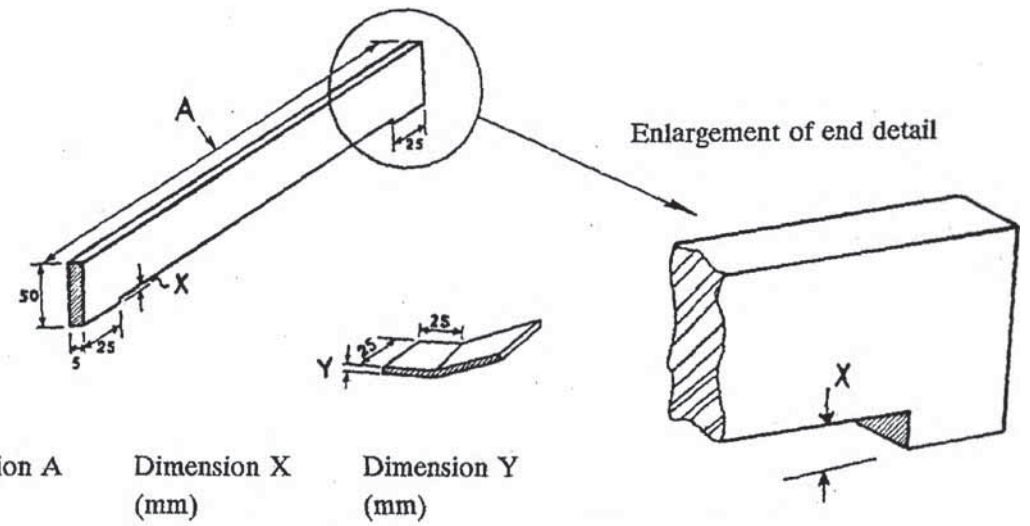


Figure 4: Square to measure chamfer and draw

The measurement is made at four positions on a unit, one on each side. One side of the square is placed on the face of the specimen and it is slit across until the other side comes into contact with the side of specimen. The vertical and horizontal dimensions of the chamfer are recorded to a whole number of millimetres. The rule is used for measuring the draw and it is recorded to a whole number of millimetres.

To measure the surface layer a rigid standardised rule graduated in millimetres is used. Take a block which has been split in the strength test or take o whole block and split or cut it through the middle. Using the rule measure the thickness of the surface layer on the split face at the point where, by visual inspection, the value will be a minimum. Record the measurement in whole millimetres.
A similar procedure can be followed in the case of flags. Take a flag which has been broken in the strength test or take a whole flag and split or cut it through the middle. Using the rule measure the thickness of the surface layer'em the split face at the point where, by visual inspection, the value will be a minimum. Record the measurement in whole millimetres.

Flatness and straightness of a flag can be measured by a notched straight edge and gauge block, both made of steel, as shown in figure 5.



Dimension A (mm)	Dimension X (mm)	Dimension Y (mm)
300	1.5	2.5
500	2.5	4
800	4	6.5
1000	5	8

Figure 5: Example of gauge block

Use a whole flag and remove any loose dust or material with a hard brush. Use the appropriate flag dimensioned notched straight edge and gauge (see figure 5). Place the straight edge on the unit in the position to be tested. The unit does not conform to this specification if the straight edge rocks on an contact between the unit and its notched length or if the gauge block can be passed between the unit and the notched length at any point along it, if used, or if using a callibrated gauge, take a reading.

3.4.2 Measurement of strength

Since for paving blocks no test is generally accepted, the principle is given of the splitting test which has been accepted by most of the members of WG1. A machine capable of applying compressive loads must be available. It shall have a scale with an accuracy of ± 3% at the anticipated failure load of the block and a load pacing device shall be fitted. A special device with two circular rollers, 40 mm diameter, one fixed rigidly and the other able to rotate in its longitudinal axis is placed in the machine (see figure 6).

Two packing pieces 15 mm wide (b) and 4 mm thick (a) and longer than the anticipated fracture plane are placed between the rollers and the paving block. They shall be plywood and may only be used once.

A rule graduated in millimetres is also needed.

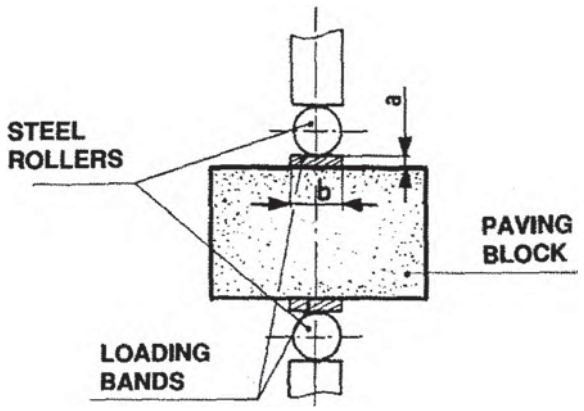


Figure 6: Principle of splitting test

The testing procedure can be described as follows:

Use whole blocks and remove any burrs, high spots, etc. with a carborundum stone. If a face is rough or textured it shall be prepared by capping or grinding. If capping, a cement paste shall be used and if grinding, the least amount of material shall be removed to produce a flat face. Immerse the blocks in water at 20 ± 5°C during 4 ± 1 hour, remove and wipe dty with a damp cloth or sponge and place the block in the testing machine immediately ensuring that the block is correctly centered and that the packing pieces and the axis of the rollers are in line with the test axis of the block The block shall be adjusted along a longitudinal axis but at all points along the axis the perpendicular distance from it to the closest point on the side of the block shall be at least 0.5 times the thickness of the block. If these requirements cannot be satisfied the block may be tested along the transverse axis 0.5 times the thickness of the block from the closest point on the bed of the block.

Apply the load smoothly and progressively at a rate which corresponds to an increase in stress of 0.05 N/mm^2 per second. Record the failure load.

Using the rule obtain the area of the failure plane $S = l \times t$

l = is the length of the failure plane and is the mean of two measurements, one at the top and one at the bottom of the block.

t = is the thickness of the block at the failure plane and is the mean of three measurements: one in the middle and one at either end.

Calculation of Results

The strength ***T*** of the block tested is obtained using the formula:

$$T = 0.637 \frac{P}{S} \quad [N/mm^2]$$

where ***P*** = is the failure load in newtons

S = is the area of the failure plane in mm^2

For flags a bending test is described using a transverse testing machine.

The transverse testing machine shall have an accuracy of ± 3% over the range of anticipated test loads. It shall be constructed in such a way it can induce 3 point bending into the sample without torsion on spans up to 950 mm. The length of the supports and the load shall be at least equal to the width of the sample to be tested (see figure 7). The actual span between the rollers should be within 0.5% of the specified span rounded to the nearest millimetre.

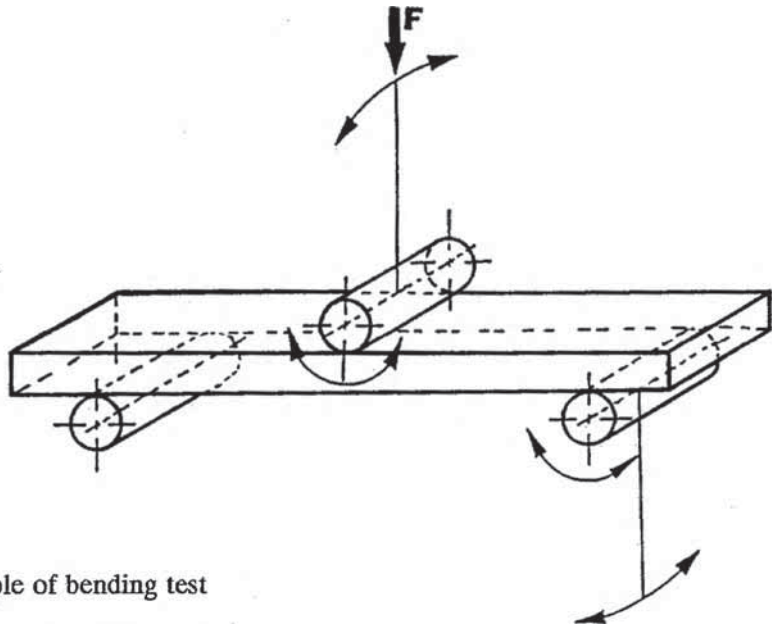


Figure 7: Principle of bending test

The procedure of the test can be described as follows:

Use whole units and remove any burrs, etc. with a carborundum stone. Store the units under water at 20 ± 5°C during 4 ± 1 hours. Remove the units and wipe dry with a damp chamois or sponge and test immediately. The supports of the test machine must be positioned with their centres 25 mm from the edge of the flag. Place the specimen symmetrically on the bearers of the testing machine and with its shorter sides parallel to the supporting rollers. The plywood is placed under the upper roller and positioned on the upper surface of the specimen at the midpoint of the span extending the whole width of the specimen parallel to the supporting rollers or bearers.

Apply the load without shock and increase the stress at a rate of 0.05 ± 0.01 N/mm^2 per second until the specimen fails. Record the failure load P to 0.1 kN. Measure the dimensions of the failure plane taking the mean of the two readings for breadth b and three readings for thickness t. Take account only of material that will actively resist the bending and not of projecting aggregate particles etc.

Testing of non-rectangular flags will be provided later.

The strength ***T*** of the flag tested is obtained using the formula:

$$T = \frac{3 P L}{2 b t^2} \quad [N/mm^2]$$

where ***P*** = failure load in ***N***
L = distance apart of the supports in mm
b = breadth of failure plane in mm
t = thickness of failure plane in mm

Record the individual result.

3.4.3 Verification of Appearance and Structure

For observing the appearance the blocksamples are layed at floor level in a locking pattern approximating to a square. In case of flags at least 4 flags are layed out close together at floor level in a shape approximating to a square. In natural daylight conditions an observer shall stand at a distance of 2 m from each edge of the square in turn and record any blocks or flags showing cracks, deformation or flaking.

Verification of structure is described as follows:

Each half of a block or flag, which has been subjected to the strength test shall be examined.

Examine both halves of the test piece visually and record any specimen showing signs of voids, fissures, deleminations or any defect indicating structural weakness.

3.4.4 Abrasion Resistance

Although for abrasion resistance no test is generally accepted it looks like that the Capon test will be in favour of other testmethods. Therefore this testing machine and the test procedure are described.

The test machine consists essentially of the following (see figure 8):

A vertically mounted disc D rotating at a speed of 75 r/min.

A trolley R mounted on ball bearings and caused to move towards the abrasion drum by counter-weight M having a mass of 14 kg. The trolley incorporates a supporting and fixing device to keep the test piece in a vertical attitude; it also has a recess to accommodate the abrasion disc.

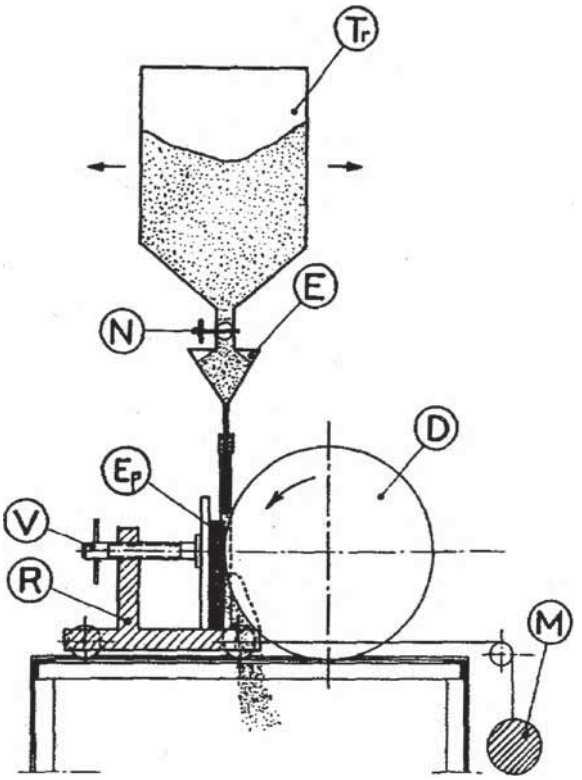
An adjustable hopper Tr containing dry abrasive, feeding into a constant-level funnel E; the abrasive flows from the funnel at a regular rate of (3 ± 0.5) dm^3/min onto the abrasion disc.

The disc is made of steel A70 of Brunell hardness within the range 203 HB and 245 HB and has a diameter of 200 mm and a widt of 70 mm when new; it shall be replaced when its diameter becomes less than 199 mm. The diameter shall be checked at least once per year using calipers accurate to 1/20 mm.

The abrasive used in the tests shall be sharp-grained Fontainebleau sand having a granulometry of 0.2/0.5 and a coefficient of fineness equal to 1.4 ± 0.2.

It shall not be used more than twice. The nature of the granulometric analysis to define the granular class and the determination of the coefficient of fineness shall be stipulated for each delivery.

Note: This sand needs a more international specification and it would be better if a non-geographic material could be used.



D : Abrasion drum
Tr : Adjustable hopper
R : Mounting trolley for the test piece
E : Constant-level funnel
V : Fixing screw
N : Butterfly control valve
M : Counter weight
Ep : Test piece

Figure 8: Principle of test machine for abrasion

A measuring device, e.g. engineers rule or sliding head caliper capable of being read to 0.5 mm is needed.
The test procedure can be described like this:
The sample shall be a whole block or flag or a piece cut from it measuring about 70 mm x 100 mm. The sample shall be clean, dry and at least 28 days old.
Immediately before testing the sample shall be cleaned with a stiff brush and covered with a surface dye to facilitate measuring.
If the surface is rough or textured it should be prepared by capping with a cement paste of:

aluminous cement	: 50%
calcarous filler (0/0.2 mm)	: 50%
water	: W / (C + filler) -- 0.40

The hopper is filled with dry abrasive, the trolley is moved away form the disc, and the test piece is placed in position, clamping down moderately. The butterfly valve is opened, and the test piece is brought into contact with the abrasion disc, and the motor is started up. The regularity of the flow of the abrasive should be checked during the test.
When the revolution counter indicates 75 revolutions of the drum, the trolley is withdrawn and the butterfly valve closed.

3.5 Marking

The following particulars relating to paving blocks supplied in accordance with this standard shall be marked clearly on the delivery note, invoice, manufacturers or suppliers certificate or brochure supplied with the consignment of blocks:

a) The name, trade mark or other means of identifying the supplier
b) The number of this standard

3.6 Conformity Control

Conformity Control is still in discussion how it has to be formulated in these standards. There is no doubt about the fact whether it has to be mentioned or not. The Workinggroup 1 is waiting for instructions from the TC178 to draft a text that can be accepted by all the members of the commission. Sofar it looks like that there will be four conformity attestation systems:

1. certification of the conformity of the product by an approved certification institute.
2. first possibility: declaration of conformity of the product by the manufacturer, with certification of factory production control by an approved institute.
3. second possibility: declaration of conformity of the product by the manufacturer, with initial type testing by an approved institute and factory production control by the manufacturer.
4. third possibility: declaration of conformity of the product by the manufacturer, with initial type testing and factory production control by the manufacturer.

Several guidance papers have been produced by the E.C. with instruction how to handle this subject while producing a harmonized product standard. In the standard will be indicated what system is appropriate and which provisions are necessary for factory production control.

4. CONCLUSIONS

It will be clear that although a lot of work has been done already, the harmonized standards for blocks, flags and kerbs are far from reality at this moment. A lot of discussion is going on about testing and estimating very essential properties. It is very hard for a specific country that has produced fine products for, let’s say, 20 years to be obliged to change the standards according to which these products where manufactured. It’s for sure that there are all kinds of specifications possible for producing the same products that are fit for purpose. The different national standards illustrate this since it cannot be assumed that some countries are producing worse products for pavements than others. From the use in practice during a considerable amount of years it can be learned, that each country is producing comparable, satisfying products while having different standards and testing criteria. Accepting new standards and criteria when the standards and criteria that are in use have proven to be satisfactory is a difficult matter, especially for the manufacturers. They have to rearrange their way of production and make extra costs for the new testmethods and the devices belonging to it. This is one of the biggest difficulties to overcome.
Another difficulty is the time limit of 31 december 1992. This target date was set very tight when the Technical Committee and the Workinggroups were installed. Six months ago it was decided that Attestation of Conformity shall be dealt with in the standards for products. This will cost considerable extra time and will delay the introduction of the standards.
Nevertheless, the process of harmonizing the European product standards cannot be stopped and will become reality within a few years.
A remarkable "spin off" effect is the stimulation of the use of the english language, in spite of the fact that there are three official languages in formulating the standards.