STANDARDS AND UPDATE FOR CONCRETE BLOCK PAVING AND PAVING FLAGS IN THE UNITED KINGDOM

Dr. Allan Dowson
Allan Dowson Consulting
41 The Grove
Hipperholme, Halifax
West Yorkshire
United Kingdom HX3 8JN
Tel: +44 (0) 1422 201314, E-mail: ajdowson@abelgratis.com

SUMMARY

This paper reviews the complete suite of standards produced by the British Standards Institution for concrete, clay and natural stone products. In 2005, several new and revised standards were produced and added to the existing range of the BS 7533 suite.

The new standards introduced are:
Part 7: Code of practice for laying setts and concrete block paving. This standard incorporates rigidly laying block paving with plan sizes greater 200 mm x 100 mm. It includes the construction method of rigidly laying construction techniques for concrete block paving.
Part 8: Guide to the structural design of lightly trafficked pavements of precast concrete flags and natural stone slabs.
Part 10: Guide for the structural design of trafficked pavements constructed of natural stone setts and concrete block paving. This includes the design for rigidly laid concrete block paving.
Part 12: Guide to the structural design of trafficked pavements constructed of natural stone slabs and concrete flags. This includes the design for rigidly laid flags.

The revised standards are:
Part 3: Code of practice for laying precast concrete paving blocks and clay pavers for flexible pavements. This includes the methods of construction of porous pavements and the bedding and jointing requirements.
Part 4: Code of practice for the construction of pavements of precast concrete flags and natural stone slabs. This standard details the three methods of laying flags on a sand bed, sand cement mortar and high strength quality mortar.

1. INTRODUCTION

In 1901 the Institutions of Civil Engineers, the Chemical Engineers, Naval Architects and the Steel Institute created a committee to standardise iron and steel sections of bridges, railways and shipping. The Committee succeeded in cutting the production of different tram rails from 75 down to five. This saved industry about a million pounds the year. In 1929 the committee became the British Engineering Standards Association and was granted a royal charter, which defined the association's objectives. A year later the Association became the British Standards Institution. In 1946, in the aftermath of the Second World War, BSI was a founder member of the International Organisation for standardisation ISO and some years later, in 1964, was a founder member of the European equivalent CEN. In 2001

BSI celebrated its centenary and the year later signed a new memorandum of understanding with her Majesty's government.

The standard is the published document that contains a technical specification or other precise criteria designed to be used consistently as a rule, guidelines, or definitions. Standards help to make life simpler and to increase the reliability and the effectiveness of many goods and services we use. They are a summary of best practice and are created by bringing together the experience and expertise of all interested parties of producers, sellers, buyers, users and regulators having a particular material, product, process or service. They are designed for voluntary use and do not impose any regulations, however, laws and regulations may refer to certain standards and make compliance with them compulsory.

Any standard is a collective work. Committee consists of manufacturers, research organisations, government departments and consumers working together to draw up standards that evolve to meet the demands of society and technology. As the world's oldest national standards body, BSI has over 100 years' experience of bringing together these often very varied viewpoints and facilitating consensus.

The use of standards is becoming more and more of a pre-requisite to worldwide trade. Although standards are designed for voluntary use and do not impose any regulations, by law many industry bodies and trade associations require product to conform to a British Standard or European directives before they can be offered for sale in the UK or EU.

Standards are essential to trade to increase the lead competitive markets. They should insure any business offering products and services and process is cost-effective and time efficient and, commercially viable, credible, safe. Above all, any business, large or small, can benefit from the conformity and integrity of standards will bring.

Having produced standards for the quality of the product, it was necessary to provide guidance in the form of a Code of Practice to enable users to lay the product in a prescribed manner.

Trade Associations and along with the researchers had developed and produced methods of construction as early as the 1980s and to assist the designer the researchers along with industry developed methods of design primarily for concrete block paving and flags.

With the introduction of these design, the committee at BSI decided that it would be advantageous to have a suite of standards relating to concrete block paving, concrete flags concrete kerbs, clay pavers and natural stone. This was given a BS number BS 7533. Today, these suites of standards have in its range 13 different standards and are explained in the paper.

2. BS 7533 - SUITE OF STANDARDS

2.1 BS 7533 - 1: 2001

Guide to the structural design of a heavy duty pavements constructed of clay paving blocks or precast concrete paving blocks

Scope

This British Standard provides guidance on the design of flexible pavements surfaced with clay or concrete block pavers manufactured in accordance with BS 6677-1 and BS 6717-1 respectively and

laid in accordance with BS 7533-3. It applies to all pavements subjected to the usual road spectrum of axle loads up to 18 000 kg and trafficked by between 0.5 million standard axles (msa) and 12 msa, including both highway pavements and industrial pavements where the traffic is similar in character to highway vehicles. It specifically excludes heavy duty pavements with traffic exceeding 12 msa and other applications such as aircraft pavements and those in ports and specialized industrial areas.

2.2 BS 7533 - 2: 2001
Guide for the structural design of light the trafficked pavements constructed of clay concrete or precast concrete paving blocks

Scope
This British Standard provides guidance on the design of lightly trafficked pavements surfaced with clay or concrete block payers manufactured in accordance with BS 6677-1 or BS 6717-1 respectively and laid in accordance with BS 7533-3. It applies to all paved areas subjected to the usual road spectrum of axle loads up to 11000 kg and trafficked by up to 0.5 million cumulative standard axles (msa), e.g. cnls-de-sac, driveways,car parks, precincts, lightly tyrafficked roads and paved areas.

2.3 BS 7533 - 3: 2005
Code of Practice for laying precast concrete paving blocks and clay pavers for flexible pavements

Scope
This part of BS 7533 gives recommendations for the laying of conventional and permeable pavements using precast concrete paving blocks conforming to BS EN 1338 and clay pavers conforming to BS EN 1344. This standard is intended for flexible pavements for roads, industrial areas and other paved surfaces subjected to all categories of static and vehicular loading and pedestrian traffic. The principles given apply to all shapes and sizes of paving units covered by BS EN 1338 and BS EN 1344.
2.4 BS 7533 - 4: 2006
Code of practice for the construction of pavement of precast concrete flags or natural stone slabs

Scope
This part of BS 7533 gives recommendations for laying precast concrete flags conforming to BS EN 1339 and natural stone slabs conforming to BS EN 1341 intended for use in the construction of carriageways, footways, pedestrian areas and pavements for rigid and flexible construction for the different application as given in Table 5.
2.5 BS 7533 - 6: 1999
Code of Practice for laying natural stone, precast concrete and clay kerb units

Scope
This part of BS 7533 gives recommendations for laying natural stone and precast kerbs, channels, edgings and quadrants conforming to BS EN 1340, BS EN 1343 and clay kerbs conforming to BS EN 1344, intended for use in the construction of carriageways and footways. It also applies to combined drainage and kerb products, and linear drainage units.

2.6 BS 7533 - 7: 2002
Code of practice for construction of pavements of natural stone setts and cobbles

Scope

This part of BS 7533 gives recommendations for the laying of natural stone setts and cobbles, and rigid construction with concrete block paving intended for pavements, roads, industrial areas and other paved surfaces subjected to all categories of static and vehicular loading and pedestrian traffic.

2.7 BS 7533 - 8: 2003

Guide for the structural design of like the trafficked pavements of precast concrete flags and natural stone flags

Scope

This British Standard gives guidance on the design of flexible pavements surfaced with precast concrete flags or natural stone slabs and laid on a 30 mm sand laying course with sand filled narrow joints, in accordance with BS 7533-4. It applies to pavements subject to occasional overrun by no more than 15 commercial vehicles per day at speeds not exceeding 50 kph (30 mph). The fundamental objective is the assessment of the thickness of base material to be used beneath precast concrete flags and natural stone slabs to ensure that the allowable stresses in the paving units and the subgrade are not exceeded.

2.8 BS 7533 - 9:

Code of practice for rigid laying of clay pavers

2.9 BS 7533 - 10: 2004

Guide for the structural design of trafficked pavements constructed have natural stone setts

Scope

This part of BS 7533 provides guidance on the design of pavements surfaced with natural stone setts manufactured in accordance with BS EN 1342 and laid in accordance with BS 7533-7. It applies to all pavements including those subjected to commercial vehicular traffic, e.g. delivery vehicles.

2.10 BS 7533 - 11: 2003

Code of practice for opening, maintenance and reinstatement of pavement of concrete, clay and natural stone

Scope

This part of BS 7533 provides recommendations and guidance on the opening, reinstatement and cleaning of surfaces paved with concrete, clay and natural stone products. It applies to trench reinstatement and the opening and relaying of laying courses and surface layers of pavements laid in accordance with the other parts of BS 7533.

2.11 BS 7533 – 12: 2006

Guide to the structural design of trafficked pavements constructed of rigidly laid concrete paving flags and natural stone slabs

Scope

This part of BS 7533 provides guidance on the design of rigid pavements surfaced with concrete paving flags manufactured in accordance with BS EN 1339 and natural stone slabs manufactured in accordance with BS EN 1341, both laid in accordance with BS 7533-4. It applies to all pavements including those subjected to commercial vehicular traffic traveling at speeds less than 50 kph with a design life of 40 years.

2.12 BS 7533 - 13:

Guide for the structural design of porous pavements (Committee draft stage)

Scope

This British Standard provides guidance on the design of porous pavements surfaced with clay or concrete block pavers manufactured in accordance with BS EN 1344 and BS EN 1339 respectively and laid in accordance with BS 7533-3. It applies to all pavements subjected to the usual road spectrum of axle loads up to 5000 kg, including both highway pavements and light industrial pavements where the traffic is similar in character to highway vehicles. It specifically excludes heavy duty pavements with traffic and other applications such as aircraft pavements and those in ports and specialized industrial areas.

3. THE CHANGES, AMENDED AND NEW STANDARDS

3.1 BS 7533 - 3

The change of this standard compared with this standard written in 1997 includes laying permeable pavements. The relevant clauses have been amended in to include sub-base, laying course material and preparation for permeable pavement.

A further addition is a flow chart for the general sequence of operations involved in the constructing a pavement. Other changes include one sand thickness for the laying course for conventional pavements of 30 mm and one sand thickness layer for permeable pavements of 50 mm. In line with the European standard for aggregate the changes in sieve sizes are given. The grading limits of the sub-base for permeable pavements have been introduced.

3.2 BS 7533 – 4

This standard has introduced a table of bedding material applications for the different categories of use, ranging from adopted highways to car parks receiving no commercial vehicular traffic. This table refers to the different clauses of installation methods.

For laying bound flags (laying paving units rigidly) for all site category, the bedding and jointing mortar requirements are listed - minimum compressive strengths, minimum adhesive strength, modulus of elasticity, and maximum shrinkage. The Standard describes the method of laying paving flags rigidly for heavy-duty applications to lightly trafficked pavements.

3.3 BS 7533 - 6

Is currently under revision to include an all kerbs and for the different applications ranging from gardens to a major road. The construction methods will include concrete, clay, stone and plastic recycled materials kerb products.

3.4 BS 7533- 7

This standard, which was originally designed for natural stone setts and cobbles, will include concrete block paving laid rigidly. The method of laying setts and concrete block paving is detailed in Clause 9.2 and the block paving is treated in the same way as natural stone setts. The bedding mortar requirement and his minimum compressive strength, minimum adhesive strength, modulus of elasticity and shrinkage.

3.5 BS 7533 - 8

This standard is based on the original Design Guide produced by Interpave several years ago and the fundamental objective of assessing the thickness of base material used beneath.

3.6 BS 7533 – 10

This standard provides guidance on a design of pavements and details the compressive strength of the joints for the different categories of applications.

3.7 BS 7533 – 12

This standard provides guidance on the designs for bound pavements surfaced with concrete paving flags and natural stone slabs when laid in accordance with BS 7533 - 4. It applies to all pavements including those subject to commercial vehicles travelling at speeds less than 50 kilometres an hour. The site categories for application are the same as part 7and part 4. This standard contains minimum plan areas, with maximum length/width ratio not greater than two-to-one. It contains tables for jointing material and laying course material specifications recommendations, sub-base and roadbase thickness and minimum paving unit thickness and physical properties of the surfacing material.

3.8 BS 7533 - 13

This standard is currently being written to cover the structural design of porous pavements; it is based on the Interpave's guide the structural design.

4. CONCLUSIONS

This suite of standards is complete and provides specifiers and contractors with definitive guides to the construction of all pavements.

After 5 years, each standard is reviewed and amended, if necessary, to be brought into line with current practice.

5. REFERENCES

British Standards Institution: BS 7533 parts 1 to 13. London. UK