SPECIFICATION FOR CONCRETE BLOCK PAVING IN THE REPUBLIC OF SOUTH AFRICA

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SUMMARY

Successful paving requires paving units of adequate quality, suitable structural design of the pav with workmanship of a satisfactory standard. Details of new SABS specifications on the manufactur concrete paving blocks and the construction of segmented paving are given, together with comment quality control of manufacture, and structural design of CBP.

INTRODUCTION

Seventeen years after concrete paving blocks were first used in South Africa a national standard SABS 1058:1985 Concrete paving blocks was published setting standards for shape, compressive strength, thickness, chamfer and dimensional tolerances.
Assurance of compliance with the quality requirements of this specification is possible by obtaining the South African Bureau of Standards Mark for manufacture of concrete paving blocks.
Research at the National Institute for Transport and Road Research on full scale pavements is the basis of theories applied in the structural design of CBP either in the catalogue of designs or in the mechanistic design procedures used in South Africa.
A standardized specification for civil engineering construction on "Segmented Paving" SABS 1200MJ was published in 1984 covering the paving of roads and other areas with concrete paving blocks and is the basis of contract documentation on CBP.

SABS 1058 Concrete paving blocks[1]

Cement

Ordinary portland cement, rapid-hardening cement, or a blend of milled granulated blast-furnace slag with ordinary portland cement are permitted. In practice rapid-hardening cement is most frequently used.

Aggregates

Natural aggregates complying with SABS 1083[2] are permitted. However, artificial aggregates, such as slag, may be used provided they comply with the same requirements as for natural aggregates.

Admixtures and pigments

The benefits of chemical admixtures as accelerators, water reducers, extrusion aids, water repellants, etc., are recognised and thus permitted.
Pigments are required to be in accordance with S 1014.[3] Pigmentation may be partial, i.e. confined to the upper surface, or the block may be pigmented throughout.

Physical properties of paving block

Shape

The upper edges of the wearing surfaces blocks may be chamfered and must be uniform.

Three shapes, referred to as Types in specification, are specified.
a) Type S-A. Allows geometrical interl between all vertical faces of adjacent blocks
b) Type S-B. Allows geometrical interl between some vertical faces of adjacent block
c) Type S-C. Allows no geometrical interl between the vertical faces of adjacent blocks
Nominal block thicknesses are 50, 60, and mm, with tolerances of ±3mm on thickness ±2mm on length and width.

Compressive strength

Two compressive strengths are specified, 25 and 35 MPa.
The strength of blocks is defined as the co pressive strength of blocks soaked in water at least 24 hours and tested between 3mm shee of plyboard. The strength is based on wearing area of the block, i.e. the area closed within chamfers. No adjustment is ma to the strengths obtained to allow for blo thickness.
The quality of the concrete used for the man facture of concrete paving blocks normal ensures that the blocks will have an avera compressive strength of 25 MPa and a minim individual strength of 20 MPa. Even whe manufacturing processes are well monitored, compressive strength exceeding 30 MPa is nece sary in order to achieve the required minim individual strength. Research conducted by National Institute for Transport and Ro Research indicates that the structural perfo mance of a pavement is largely dependent on degree of interlock of the paving blocks, a is virtually unaffected by their compressi strength. The specifying of an unnecessari high minimum strength will therefore or increase the cost of the paving without impro ing its performance.
Where exceptional loads may be encounter (such as in container terminals) or whe severe service or environmental conditions a known to exist or are expected, the use special-strength blocks (e.g. paving blocks

average compressive strength 35 MPa and of minimum individual strength 30 MPa) may be justified.
Recommendations on the design and construction of segmental block pavements are given in SABS 1200: Part 3 Section MJ.[4]
It should be noted that South Africa has a mild climate and that freezing and thawing do not present a problem.
The abrasion resistance of concrete paving blocks is at present being researched to determine a satisfactory abrasion test in relation to actual wear of laid paving blocks subjected to various types of traffic. Further research on factors that influence abrasion resistance of concrete paving blocks will follow.

Quality Standards

From January 1987 only manufacturers of concrete paving blocks who hold the SABS mark for their products may be producer members of the Concrete Masonry Association.
In 1984 the South African Bureau of Standards published the standard specification SABS 1058-1984 "Concrete paving blocks".
The Association decided that the above specifications should apply to the quality of products made by its members. It was agreed it was necessary that quality of products should be monitored by independent external authorities. Acquisition of the SABS mark was considered as an eminently suitable way of achieving this objective.

SABS Mark Scheme

In 1979 the South African Bureau of Standards published the Code of Practice SABS 0157 "Quality management systems".[5] This code has recently been revised to comply with the international code ISO 9000 series of documents on quality systems. The code is a guide for manufacturers and suppliers who wish to improve their quality management systems, as well as for purchasers who require parameters for judging the effectiveness of such systems.
The SABS Standardization Mark Scheme was introduced to assist manufacturers in improving their product quality and to indicate to purchasers that their products are produced under acceptable controlled conditions.
The SABS standardization mark may be applied only if the manufacturer is in possession of a valid permit issued by the SABS and the product complies with the relevant standard specification i.e. SABS 1058 "Concrete paving blocks".
In addition, other specified conditions have to be met by the manufacturer, and in particular he is required to maintain an effective quality management system which is based on, and is assessed by the SABS in accordance with SABS 0157.
The SABS mark gives the purchaser of a product maximum assurance that such product will perform its intended function. In the unlikely event of the product failing to comply with the specification and the supplier not giv satisfaction, the purchaser may take up matter with the SABS.
The SABS, in conjunction with the manufactur will take the necessary action to prevent recurrence of such non-compliance.
Obtaining the permit for concrete paving blo involves pre-testing to ascertain that blocks comply with SABS 1058 and pre-inspect of the factory and of the quality managem system to ensure that all aspects of manuf ture are adequately controlled.
After issue of the permit the SABS inspects factory and quality management system on regular basis and also regularly tests samp of the product to ensure that the manufactu continues to comply with the conditions of permit.
The SABS may withdraw a permit for a number reasons, particularly noncompliance of product or deficiencies in the quality mana ment system.
The aim of the mark scheme is to ensure t manufacturers establish an adequate qual level and achieve consistent control of final product with control being based statistical concepts.

Structural Design of CBP

While there are a variety of methods for structural design of CBP two predominate.
A comprehensive guide for the design of CBP given in Technical Report RP/9/84 "Structu design of segmental block pavements for sou ern Africa".[6] Recommendations for the dim sions and strengths of the various lay comprising the pavement structure are given the form of a catalogue of designs.
The emergence of sophisticated mechanis design procedures has provided engineers wit powerful new tool for studying a wide range practical pavement materials and subgrades particular advantage of such methods is t they are capable of accurately modelling c plex loading conditions. Moreover, they r possible the rapid assessment of a wide ra of materials used either singly or in comb tion with other materials. This facilit achievement of an optimal economical design.
B Shackel's program has been used since for the design of industrial and road p ments. Designs to date have proved satis tory.

Construction and specification

SABS 1200MJ - 1984 "Standardized specifica for civil engineering construction. Segme paving" covers the paving of roads and c areas with precast concrete segmental blocks Details are given of permissible material paving units, kerbs and channels, sand bedding and jointing; plant - rollers compactors; construction - subgrade and base, placing and compacting of bedding s laying of units, compaction, joint fil surface tolerances and testing.
The standards are similar to those reporte

the Delft Conference.[7]

CONCLUSION

Where standards of materials, design and construction adhere to accepted norms CBP performs satisfactorily. Failures that do occur usually manifest themselves in the block surface, excessive rutting or isolated depressions being typical failures. Structural cracking of blocks rarely occurs though spalling, caused by tight laying, and loss of initial surface of the block do occur.

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