SUBMITTED TO CIDB MALAYSIA | MAY 2013

CIDB MALAYSIA

TECHNICAL OPINION

TECHNICAL OPINION REPORT

PRODUCT
Proven Interlocking Brick

APPLICANT
Proven Engineering Block Sdn. Bhd

CIDB MALAYSIA

CONSTRUCTION INDUSTRY DEVELOPMENT BOARD
10th Floor, Menara Dato' Onn,
Putra World Trade Centre (PWTC)
No 45, Jalan Tun Ismail, 50480 Kuala Lumpur

CREAM
Construction Research Institute of Malaysia

CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA
Makmal Kerja Raya Maysia (MKRM),
IBS Centre, 1st Floor, Block E, Lot 8,
Jalan Chan Sow Lin, 55200 Kuala Lumpur

FOREWORD

Construction Industry Development Board (CIDB Malaysia) is a statutory body enacted under the Act 520 in 1994. Its mission is to develop Malaysian Construction Industry towards global competitiveness. To support that mission, a number of functions were formulated and one of them is to encourage the improvement of construction techniques and materials. Under that function, CIDB is to carry out assessment and appraisal of innovations of any kind of product and technology related to construction and to publish its finding, in the form of Technical Opinion.

This Technical Opinion will provide a reference to the relevant / interested parties in the construction industry. CIDB assess innovation based on application and evaluation by its Technical Opinion. Applicants may use it as a supporting document for regulatory and approving authorities, architects, engineers and others in dealing with the new products and technologies.

This Technical Opinion is prepared on behalf of CIDB by The Technical Expert Panel on construction products, construction material and technology in Construction Industry. The Technical Expert Panel was set-up by CIDB and its members are drawn from experts that represent relevant sectors in the construction industry.

This Technical Opinion has been modelled based on international recommended practice.

CIDB Technical Expert Panel Committee for Proven Interlocking Brick

Technical Expert Panel

Prof. Ir. Dr Zuhairi bin Abd. Hamid	(Chairman)	Construction Research Institute of Malaysia (CREAM)
Prof. Dato' Ir. Dr Mohd Saleh bin Jaafar	(Technical Expert Panel)	Universiti Putra Malaysia (UPM)
En. Azmi bin Musa	(Technical Expert Panel)	Sirim QAS International (SIRIM)
Ar. Chan Seong Aun	(Technical Expert Panel)	Persatuan Arkitek Malaysia (PAM)
En. Idrus bin Din	(Technical Expert Panel)	IBS Centre (IBS)

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Ahmad Hazim bin Abdul Rahim	CREAM
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GENERAL PROVISIONS

The purposes of this report are to assist respective parties concerned both applicant and granting approval authority, includes specification and also use of the subject. This report shall not be considered as approval.

Special note should be taken of the provisions and limitations set out and the period of validity of the Technical Opinion.

Technical Opinion is initially given a term of validity of three (3) years from the date of issue in the expectation that, after that period, the subject will no longer be an innovation. They can be reviewed within the first (12) twelve months and again as necessary during the life of the products or system described in the document. The limitation on the validity of the opinions should not be interpreted as implying a similarly limited life expectancy of the products or system described in the Technical Opinion. However, if experience shows poor overall standard of quality or performance, the Technical Opinion will be withdrawn.

The legitimacy and validity of the Technical Opinion can be verified at office of CIDB Head Office.

CIDB and the Technical Expert Panel shall accept no responsibility for the quality and performance of the products.

Disclaimer

While every effort is made to ensure accuracy of the information presented in this report, neither the Technical Expert Panel nor its Secretariats or CIDB can accept responsibility for any loss or damage incurred in connection with the use of the contents.

Definition

Technical Opinion Programme:	A programme that initiated by CIDB with the aim to evaluate products, materials, components or system with regard to, but not limited to IBS. It normally covers wide range of innovative products to be used in local construction industry
Technical Expert Panel:	Individuals selected based on their expertise in brick, Industrialize Building System (IBS), architecture and masonry.
Proven Interlocking Brick:	Standard sizing bricks for all building works that provides homes and buildings with a cooler and quieter environment.

Abbreviation

CIDB	Construction Industry Development Board
CREAM	Construction Research Institute of Malaysia
UPM	Universiti Putra Malaysia
SIRIM	Standard and Industrial Research Institute of Malaysia
PAM	Persatuan Arkitek Malaysia
IBS	Industrialized Building System
MKRM	Makmal Kerja Raya Malaysia
JBA	Jabatan Bekalan Air
PIB	Proven Interlocking Brick
PEBSB	Proven Engineering Block Sdn. Bhd
MS	Malaysian Standard
BS	British Standard
ISO	International Standard Organisation
AS / NZS	Australian Standard adopted as New Zealand Standard
BS EN	British Standard adopted as European Standard
ASTM	American Standard Test Method
QA / QC	Quality Assurance / Quality Control
XRF	X-Ray Fluorescent
PFA	Pulverised Fuel Ash
COA	Certificate of Analysis

Symbols

g	gram
kg	kilogram
mm	millimetre
cm	centimetre
m	metre
mm^2	millimetre square
cm^2	centimetre square
cm^3	centimetre cube
m^3	metre cube
%	percentage
<	not more than
>	not less than
dB	decibel
N	Newton

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1.0 IDENTIFICATION

1.1 Name of Product

Proven Interlocking Brick (PIB)

1.2 Country of Origin

Malaysia

1.3 Dates of Evaluation

18th December 2012	:	First meeting of Technical Expert Panel
23rd January 2013	:	Site Visit to Proven Engineering Block Sdn Bhd and presentation of product by the Applicant *(Note: Refer to Appendix J – Site Visit Photos)*

1.4 Purpose

The purpose of Proven Interlocking Brick (PIB) is to provide homes and buildings with a cooler and quieter environment. As it is in standard sizing, it will make the construction site neat, clean and organised. It is claimed to be as an alternative product for clients who are looking for inexpensive, less labour intensive and faster project completion.

1.5 Applicant & Address

Proven Engineering Block Sdn. Bhd (formerly known as CKYJ (M) Sdn Bhd)
No 11, Medan Setia 1,
Plaza Damansara, Bukit Damansara,
50490 Kuala Lumpur,
Malaysia.

Contact	Telephone	:	03 – 6034 2513 / 03 – 6034 2522
	Fax	:	03 – 2093 2546
	Website	:	www.provenholding.com

1.6 Manufacturer & Address

Proven Engineering Block Sdn. Bhd
Lot 1245, Jalan Kundang,
Kawasan Perindustrian Kundang,
48020 Rawang,
Selangor Darul Ehsan.
Malaysia

Contact	Telephone	:	03 – 2093 2703
	Fax	:	03 – 2093 2316
	Website	:	www.provenholding.com

2.0 DESCRIPTIONS

2.1 General Descriptions of Product

Proven Interlocking Brick (PIB) system is a system consisting of cement bricks (solid with grooves) which are manufactured with interlocking function consist of male and female joint. They are designed in such a way that each piece connects with its adjacent one, so that structurally they are all dependent on each other and able to stay in place. The system incorporated tongue and groove technology into the building components as a means to reduce the need of skilled construction workers. The product is manufactured and supplied by Proven Engineering Block Sdn Bhd (PEBSB).

2.2 Element of Product

2.2.1. Series and sizing

PIB consist of several series as shown in Table 2.1:

Table 2.1: Series and Sizing

No	Series	Nominal Size (Length x Width x Height)
1	Full Interlocking Brick	200 mm x 100 mm x 100 mm
2	Half Interlocking Brick	100 mm x 100 mm x 100 mm
3	Service Interlocking Brick	200 mm x 100 mm x 100 mm

(Note: Refer to Appendix A – Product Certification by SIRIM QAS, Part A)

2.2.2. Materials

The bricks were processed from the following materials respectively as in Table 2.2:

Table 2.2: Product Materials

No.	Materials
1.	Cement
2.	Aggregate (10mm)
3.	Quarry dust
4.	Sand
5.	Tap water

(Note: Refer to Appendix A – Product Certification by SIRIM QAS)

2.2.3. *Adhesive*

The adhesive used is skim grip white thin bed adhesive. It is a pre-blend of white Portland, specially sized inert aggregates and approved chemical additives. It is cement based adhesive for clay / cement bricks, cement / light weight blocks and tiles. It is claimed to have good workability and strong adhesion.

2.3 Usage Application

Proven Interlocking Brick is used as an alternative from normal bricks in building and house construction. The system incorporates “tongue and groove” technology into the building components.

2.4 Usage Limitation

This PIB system is more suitable for non-load bearing wall by itself. For application of load bearing wall, PIB system has to be incorporated with columns and beams as integral part of the wall.

2.5 Usage Advantages

The advantages of using PIB System are as follows:

- The use of modular coordination and standard sizing allow flexibility to integrate with other IBS system.
- It has interlocking system and simplified the tedious and time-consuming traditional brick-laying tasks.
- It allows accuracy up to ± 1.5 mm
- The process of production promotes the adoption of sustainable construction with generation of only minimal material wastage hence, less clean up at site.
- The product used recycled materials in each batch of production which are Quarry Dust and Aggregate.

2.6 Installation Method

2.6.1. *Method Statement*

Prior to installation, the following steps are taken as mentioned in the Method of Statement. The steps are as follows:

2.6.1.1. Proven Interlocking Brick System

i. Decide the house size and built up areas that is intended to build.
ii. Place order of bricks as per design drawing
iii. Cast foundation
iv. Ensure all starter bars are placed correctly
v. Ensure all underground pipes are placed in position

vi. Cast floor slab and wait for it to harden
vii. Setting out of block position
viii. Check materials delivered at site
ix. Check completed floor level and height variance in the completed slab
x. Laying first course using correct strength mortar mix.
xi. Continue with second course
xii. Grouting if columns
xiii. Bond beam construction

(Note: Refer to Appendix B – Method Statement of PIB)

2.6.1.2. Application of Skim Grip White Thin Bed Adhesive

i. Ensure surfaces are sound, clean and free from any contamination materials
ii. Mix the powder with about 35% to 40% of clean water for laying of bricks / blocks and 18% to 20% for laying of tiles.
iii. Thoroughly mix using an electric drill with stirrer attachment until the mix is homogenous
iv. Apply onto the bricks or blocks with a notch trowel or a dispenser.

(Note: Refer to Appendix C – Skim Grip White Thin Bed Adhesive Description)

2.7 Technology / Skill Required

The system makes it possible for unskilled workers to effectively and efficiently install this system within a week's training.

2.8 Special Conditions for Usage and Installation

2.7.1. Storage

The brick is cured for 24 hours after production. Bricks stored on site should be covered and kept off the ground. Pallets are arranged based on 'first in first out' system.

2.7.2. Installation

If roof trusses is to sit on the bond beam, make sure all the holding down bars are in correct position and securely braced.

2.9 Inspection and Maintenance

Not provided by the Applicant,

3.0 BASIS OF APPRAISAL

3.1 Check on Document Received from Proven Engineering Block Sdn. Bhd.

Copies of the following documents were received from PEBSB to confirm appraisal of the products.

3.1.1. *Test report on the material:*

The test reports on the material can be referred in section 4.2

3.1.2. *Detailed Illustration of PIB*

Detailed illustration of PIB is attached in Appendix D

3.1.3. *Method statement*

Method statement to apply PIB system is attached in Appendix B

3.1.4. *QA/QC Flow Chart*

QA/QC Flow Chart is attached in Appendix E

4.0 STANDARDS, SPECIFICATIONS AND TESTS.

4.1 Material Standards and Specifications

4.1.1. The technical composition for material aspect is shown in Table 4.1:

Table 4.1: Material Technical Composition

No.	Material	Type	Technical Data
1.	Cement	a) Pulverised fuel ash cement b) Portland fly ash cement	a) Certified to MS 1227: 2003 b) Certified to MS 522: Part 1: 2007 (CEM II/A-V 52.5N)
2.	Quarry dust	Granite quarry dust	Size: < 5.0 mm
3.	Aggregate	Granite aggregate	Size: 10 mm
4.	Sand	Mining sand	Size: < 5.0 mm
5.	Water	Tap water	Supplied by JBA

(Note: Refer to Appendix A – Product Certification by SIRIM QAS)

4.1.2. The technical properties for finished product is shown in Table 4.2:

Table 4.2: Finished Product Technical Properties

No.	Property	Technical Data
1.	Model	Full Brick
2.	Density	2000 kg/m^3
3.	Nominal size	200 mm x 100 mm x 100 mm (L x W x H)
4.	Sound properties	Sound Reduction Index : 49 db

No.	Property	Technical Data
5.	Water absorption	7.1%
6.	Water : cement ratio	1 : 9
7.	Moisture content of mix	15% to 21%
8.	Gap size from tongue to groove	1 mm

(Note: Refer to Appendix F – Test reports)

4.1.3. The technical properties for adhesive is shown in Table 4.3:

Table 4.3: Skim Grip White Thin Bed Adhesive Technical Properties

No.	Property	Technical Data
1.	Colour	White
2.	Density	1.4 g / cm^3
3.	Thickness	3 mm
4.	Coverage	3.5 kg – 4.5 kg / m^2 using notch trowel
5.	Opening time	about 20 minutes
6.	Initial setting time	5 hours
7.	Compressive strength	170 kg / cm^2
8.	Bonding strength	0.20 N / mm^2
9.	Storage	6 months if product is stored in cool dry place
10.	Packing	40 kg per bag

(Note: Refer to Appendix C – Skim Grip White Thin Bed Adhesive Product Description)

4.2 Type of Tests

The following type of tests has been carried out by the applicant in accordance with acceptable International Standards. The tests are shown in Table 4.4:

Table 4.4: Type of Tests

Element	Type of Test
Finished Product (Proven Interlocking Brick)	i. Fire Insulation Test ii. Product Specification Test • Dimensional deviation • Strength • Drying shrinkage iii. Sound Insulation Test iv. Water Absorption Test v. Compressive Strength Test

Element	Type of Test
Material: a) Cement b) Quarry dust c) Aggregate d) Coarse Sand	i. Sieve Test ii. Setting time Test iii. Soundness Test iv. Compressive Strength Test (Cement mortar) v. Chloride Test vi. Sulphate Test vii. Proportion of P
Thin Bed Adhesive	i. Pull Off Strength

(Note: Refer to Section 4.4 for Test Results and Section 6.1 for Reference Standards used)

4.3 Additional Test Conducted

Proven Engineering Block Sdn. Bhd is to notify to the Technical Expert Panel Committee on any additional test conducted (if any) other than those mentioned in 4.2.

4.4 Summary of Test Results Provided by Proven Engineering Block Sdn Bhd.

The following test results have been summarised from the documents provided by the Applicant.

4.4.1. Fire Resistance Test

Fire Resistance Test for the product Precast Concrete Masonry Unit (Cement Brick Solid with Groove) was conducted by SIRIM QAS Sdn. Bhd. The results are shown Table 4.5:

Table 4.5: Fire Resistance Test

Fire Resistance Test	Reference Standard	Results	Unit
Integrity	BS 476: Part 22: 1987	130	minutes
Insulation		130	minutes

Note: Average thickness of plastering at the time of testing is 9.5 mm

(Note: Refer to Appendix F (1) – Test Report for Fire Resistance Test)

4.4.2. *Product Specification Test:*

Product Specification Test of the brick was conducted by SIRIM QAS International Sdn Bhd. The nominal size of sample is 200 mm x 100 mm x 100 mm. The results are as shown Table 4.6:

Table 4.6: Product Specification Test Results.

Reference Standard used: BS 6073 – Part 1: 1981

Type of test	Specification	Results	Unit
Dimensional Deviation	Length: + 4 mm - 2 mm	200	mm
	Height: + 2 mm - 2 mm	100	mm
	Thickness: + 2 mm - 2 mm	100	mm
Strength	The average crushing strength of ten masonry units shall be: a) Not less than G and b) Not less than 6.7 N/mm^2 as calculated from 0.9G + 0.62 s	11.8	N/mm^2
Drying Shrinkage	The average shall not exceed 0.06%	0.03	%

(Note: Refer to Appendix F (2) – Test Report for Product Certification)

4.4.3. *Sound Insulation Test*

Sound Insulation Test of the brick was conducted by SIRIM QAS International Sdn Bhd. The nominal size of sample is 200 mm x 100 mm x 100 mm. The size of the wall installed to perform the test has a dimension of 3.60 meter (height) x 2.80 meter (width). Both sides of the wall were plastered with thickness of 5 mm. The results are shown in Table 4.7:

Table 4.7: Sound Insulation Test Results

Reference Standard	Sound reduction (Average Results)	Unit
ISO 140 – 3 : 1995	49	dB

(Note: Refer to Appendix F (3) – Test Report for Sound Insulation Test)

4.4.4. *Water Absorption Test*

Water Absorption Test of the brick was conducted by SIRIM QAS International Sdn Bhd. The nominal size of sample is 200 mm x 100 mm x 100 mm. The method used is Clause 9.2: Cold Water 24 hour's immersion test as stated in AS/NZS 4456.14: 2003. The results are shown in Table 4.8:

Table 4.8: Water Absorption Test

Reference Standard	Water Absorption (Average Results)	Unit
AS/NZS 4456.14: 2003	7.1	%

(Note: Refer to Appendix F (4) – Test Report for Water Absorption Test)

4.4.5. *Pull-Off Strength Test*

Pull-Off Strength Test of the adhesive was conducted by SIRIM QAS International Sdn Bhd. A 300 mm x 300 mm x 40 mm of concrete slab with thin bed-adhesive overlay was used as test sample. The results are shown in Table 4.9:

Table 4.9: Pull-Off Strength Test Results

Reference Standard	Average Results	Unit
ASTM D4541: 1995	0.22	N/mm^2

(Note: Refer to Appendix F (5) – Test Report for Pull - Off Strength Test)

4.4.6. *Compressive Strength Test*

Determination of compressive strength of the bricks was performed by Makmal Kerja Raya Malaysia (MKRM). A total of nine (9) samples were tested with nominal size of 200 mm x 100 mm x 100 mm. The test results are shown in Table 4.10:

Table 4.10: Compressive Strength Test Results

Reference Standard	Compressive strength (Average results)	Unit
BS EN 772 – 1: 2000	11.87	N / mm^2

(Note: Refer to Appendix F (6) – Test Report for Compressive Strength Test)

4.4.7. *Sieve Test Analysis*

Sieve test analysis was performed internally by the applicant during Quality Control process.

(Note: Refer to Appendix F (7) for the detailed results.)

4.4.8. *Physical Properties test*

The test was conducted by Lafarge Cement on the concrete. The material used is Portland Fly Ash Cement. The test results are shown in Table 4.11:

Table 4.11: Physical Properties Test Results

Properties	Reference Standard	Specifications	Results	Unit
Setting Time	MS 522 - Part 5: 2007	Not less than 45	120	minutes
Soundness: Expansion	MS 522 - Part 5: 2007	Not more than 10	1.0	mm
Compressive Strength • 2 days • 28 days	MS 522 – Part 3: 2007	Not less than 20 Not less than 52.5	23.6 62.0	N/mm^2

(Note: Refer to Appendix F (8) – Test Report for Physical and Chemical Properties of Cement)

4.4.9. *Chemical composition*

The test was conducted by Lafarge Cement on the material, Portland Fly Ash Cement. The test results are shown in Table 4.12:

Table 4.12: Chemical Composition Results.

Properties	Reference Standard	Specifications	Results	Unit
Chloride	MS 522 – Part 4: 2007	Not more than 0.1	0.02	%
Sulphate	In – House Test Method (XRF Analysis)	Not more than 3.5	2.85	%
Proportion of PFA	MS 1227 : 2003 – Appendix A 3.2	N/A	11	%

(Note: Refer to Appendix F (8) – Test Report for Physical and Chemical Properties of Cement)

5.0 DESIGN

5.1 Illustration of Proven Interlocking Brick

Detailed technical drawing of PIB System is attached in Appendix D – Detailed Illustration of PIB.

5.2 Structural Design Analysis

Design analysis and calculation is not provided by Applicant

Please contact Applicant for further details

5.3 Design Capacities

Design capacities is not provided by Applicant

Please contact Applicant for further details

6.0 COMPLIANCE TO INTERNATIONAL/ MALAYSIAN STANDARDS

6.1 Product Tests Standard

A series of tests performed were in compliance with International Standards and equivalent. The standards are shown in Table 6.1:

Table 6.1: Standards for All Type of Tests Reported

No.	Type of tests reported	Standard *(Reference from documents received from the Applicant)*
1.	Fire Resistance Test	**BS 476 - Part 22: 1987** Fire tests on building materials and structures. - Method for determination of the fire resistance of elements of construction (general principles)
2.	Sound Insulation Test	**ISO 140-3:1995** Acoustics-Measurement of Sound Insulation in Buildings and of Building Elements - Part 3: Laboratory Measurements of Airborne Sound Insulation of Building Elements
3.	Sound Insulation Rating	**ISO 717-1: 1996** Acoustic Rating of sound insulation in buildings of building elements - Part 1: Airborne sound insulation
4.	Water Absorption Test	**AS/NZS 4456.14:2003** Masonry Units, segmental pavers and flags – Methods of Test Methods 14 : Determination water absorption properties

5.	Compression Test	**BS EN 772 – 1: 2000** Methods of test for masonry units. Determination of compressive strength
6.	Dimensional Deviation	**BS 6073 – Part 1 : 1981** Precast Concrete Masonry Units Method for specifying for Precast Masonry Units
7.	Strength	**BS 6073 – Part 1 : 1981** Precast Concrete Masonry Units Method for specifying for Precast Masonry Units
8.	Drying Shrinkage	**BS 6073 – Part 1 : 1981** Precast Concrete Masonry Units Method for specifying for Precast Masonry Units
9.	Setting Times	**MS 522 – Part 5 : 2007** Determination of Setting Times and Soundness
10.	Soundness : Expansion	**MS 522 – Part 5 : 2007** Determination of Setting Times and Soundness
11.	Compressive Strength	**MS 522 – Part 3 : 2007** Determination of Strength
12.	Chemical Composition • Chloride % • Sulphate %	**MS 522 – Part 4: 2007** Chemical Analysis of Cement
13.	Pull-Off Strength (Thin Bed – Adhesive)	**ASTM D 4541:1995** Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
14.	Sieve Analysis	**ASTM C33 / C33M – 11a** Standard Specification for Concrete Aggregates
15.	Sieve Analysis	**MS 29:1995** Specification for Aggregate from Natural Sources for Concrete.
16.	Proportion of PFA (Portland Fly Ash)	**MS 1227 : 2003** Specification for Portland pulverised-fuel ash cement

7.0 QUALITY ASSURANCE / QUALITY CONTROL

7.1. QA / QC plan

This document is important to ensure quality in production is observed at all time during process of production of the product. QA/QC flow chart is attached in Appendix E – Quality Control Flow Chart

7.2. QC Check Points and Frequency

QC plan was performed in various check points. The check points and frequency are shown in Table 7.1:

Table 7.1: QC Check Points and Frequency

No	Item Inspected	Test / Inspection	Frequency
1.	Cement	Verification of COA: a) Type b) Certified to MS 1227	Once / month
2.	Aggregate	Sieve analysis	Weekly
3.	Quarry dust	Sieve analysis	Weekly
4.	Sand	Sieve analysis	Weekly
5.	Mixed materials	Mixing composition of every material	Every mix
6.	Green Brick	Dimension check: a) Length b) Width c) Height Visual / Appearance	4 times / day
7.	Finished product	a) Dimension b) Density c) Compressive strength	1 day age (3 samples) 14 days and 28 days age (10 samples)

(Note: Refer to Appendix A – Product Certification by SIRIM QAS)

8.0 VALIDITY OF OPINION

8.1. Condition

The Technical Opinion Report given here was based on International and Malaysian Standard. All results and test reports were issued from Accredited Laboratories. The assessment is only focusing on the performance and quality of Proven Interlocking Brick System (PIB) product but not on the structural performance of the system.

The recommendations are based on and limited to available information provided by the applicant.

8.2. Recommendations from Technical Expert Panel

a) IBS Certificate on Modular Coordination to be applied to any certified certification body according to MS 1064 - Guide to Modular Coordination in Building.
b) Eco – Labelling certification to be applied to any certified certification body.
c) Thermal insulation test and penetration properties of the brick have to be tested.
d) Can be considered under IBS system for Innovation, if and only if pre-assembled on factory site and lifted the whole structure to the construction site.
e) Individually, the Applicant should increase the size of the brick to meet IBS specification in MS 1064 – Part 10.
f) All design submission to approving authorities must be certified by local Professional Engineers.
g) Design calculations to be verified by local Professional Engineers.

8.3. Withdrawal

In the event of non-compliance to International Standards or any other equivalent standards will lead to withdrawal of this opinion.

8.4. Term of Validity

The recommendation is valid for three (3) years from the issuance of this Technical Opinion Report subject to the validity of the existing Test Certificates. This report is valid from **May 2013 to April 2016.**

9.0 APPROVED OPINION ABSTRACT

Proven Interlocking Brick (PIB) System is manufactured and supplied by Proven Engineering Block Sdn Bhd. The product complies with the Specification of Malaysian and International Standards as stated in the report.

This approval is also based on the distinct advantages of PIB compared to the conventional cement sand brick. The advantages are:

a) PIB gives faster time in the construction of walls, columns and beams compared to the conventional brick.
b) PIB system makes it possible for unskilled workers to effectively and efficiently install this system with minimum training.
c) PIB also used less mortar consumption compared to sand brick that used a brick laying method.

(Note: For more information, refer to Appendix G – Pre- Technical Opinion Report and Appendix H – Preliminary Study of IBS)

The Technical Expert Panel is in the opinion that this Proven Interlocking Brick (PIB) System generally is suitable to be used in Malaysia provided that it complies with the terms and conditions mentioned in this report. The PIB system can be considered under IBS system for Innovation if the bricks unit are pre-assembled on factory site and lifted the whole wall structure to the construction site. Any additional tests required by the client have to meet the International Standards and specification.

Prof. Ir. Dr Zuhairi Abd. Hamid
Chairman
Technical Expert Panel

Prof. Dato' Ir. Dr Mohd Saleh bin Jaafar
Technical Expert Panel

Ar. Chan Seong Aun
Technical Expert Panel

Azmi bin Musa
Technical Expert Panel

Idrus bin Din
Technical Expert Panel

May 2013

10.0 REFERENCES

Internet

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11.0 BIBLIOGRAPHY

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APPENDIX A

PRODUCT CERTIFICATION

BY SIRIM QAS

SIRIM QAS INTERNATIONAL

No Lesen : **PC000246**
Licence No :

LESEN PENSIJILAN BARANGAN
Product Certification Licence

SIRIM

SIRIM QAS International Sdn. Bhd. dengan ini menganugerahkan kepada
SIRIM QAS International Sdn. Bhd. hereby grants to

PROVEN ENGINEERING BLOCKS SDN. BHD.
NO. 11, MEDAN SETIA SATU,
PLAZA DAMANSARA,
BUKIT DAMANSARA
50490, KUALA LUMPUR
WILAYAH PERSEKUTUAN, MALAYSIA

Lesen untuk menggunakan Tanda Pensijilan di atas barangan
a licence to use the Certification Mark on
PRECAST CONCRETE MASONRY UNIT (CEMENT BRICK)

Please refer to detail in the SCHEDULE

sebagai mematuhi keperluan
as complying with
BS 476 : PART 22 : 1987
BS 6073 : PART 1 : 1981

Khalidah Mustafa
Pengarah Urusan
Managing Director
SIRIM QAS International Sdn. Bhd.

SIRIM QAS International Sdn. Bhd.
(No. Syarikat 410334-X)
1, Persiaran Dato' Menteri
Seksyen 2, Peti Surat 7035
40700 Shah Alam
Selangor Darul Ehsan
MALAYSIA.

Tel : 60-3-55446400
Faks : 60-3-55446466

http://www.sirim.com.my
http://www.malaysiancertified.com.my

Tarikh Mula Pensijilan *Certified Since*	**: 06 July 2012**	**Tarikh Dikeluarkan** *Issue Date*	**: 22 October 2012**
Sah Sehingga *Valid Until*	**: 06 July 2013**	**No Siri** *Serial No*	: 002914

Lesen ini dianugerahkan tertakluk kepada syarat-syarat Perjanjian Pensijilan Barangan SIRIM QAS International Sdn. Bhd.
This Licence is granted subject to the provisions of the Product Certification Agreement of SIRIM QAS International Sdn. Bhd.

No Lesen : **PC000246**
Licence No :

SCHEDULE

PROVEN ENGINEERING BLOCKS SDN. BHD.

SIRIM

Brand	: ENGINEERING BLOCKS
Model	: FULL BRICK
Rating	: TWO HOURS
Type	: SOLID WITH GROOVE
Size	: NOMINAL SIZE: 200MM X 100MM X 100MM

Brand	: ENGINEERING BLOCKS
Model	: SERVICE BRICK
Rating	: TWO HOURS
Type	: SOLID WITH GROOVE
Size	: NOMINAL SIZE: 200MM X 100MM X 100MM

Brand	: ENGINEERING BLOCKS
Model	: HALF BRICK
Rating	: TWO HOURS
Type	: SOLID WITH GROOVE
Size	: NOMINAL SIZE: 100MM X 100MM X 100MM

TEST REPORT NO. : 2011FE0078, 2010CB7685

Factory Name and Location :
PROVEN ENGINEERING BLOCKS SDN. BHD.

LOT 1245, JALAN KUNDANG,
KAWASAN PERINDUSTRIAN KUNDANG,
48020, RAWANG
SELANGOR, MALAYSIA

End of page

SIRIM QAS International Sdn. Bhd.
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Tarikh Mula Pensijilan	**: 06 July 2012**	**Tarikh Dikeluarkan**	**: 22 October 2012**
Certified Since		*Issue Date*	
Sah Sehingga	**: 06 July 2013**	**No Siri**	. 002914
Valid Until		*Serial No*	

Certification Report

Product Certification Scheme

This Certification Report shall not be amended, changed, varied or modified in any manner whatsoever by the licencee or otherwise. If the Certification Report is to be furnished to any third party or to the public, each such Certification Report shall be furnished in full and its entirety. This Certification Report shall be read in conjunction with the Product Certification Agreement.

File No	:	P5-006442
Report No	:	RPT006488
Edition	:	1
Issued By	:	MOHAMMAD SHAHARIN AHMAD LATIF
Date Issued	:	20/09/2012
Applicant	:	PROVEN ENGINEERING BLOCKS SDN. BHD. NO. 11, MEDAN SETIA SATU PLAZA DAMANSARA, BUKIT DAMANSARA 50490, KUALA LUMPUR WILAYAH PERSEKUTUAN, MALAYSIA
Factory	:	PROVEN ENGINEERING BLOCKS SDN. BHD. LOT 1245, JALAN KUNDANG, KAWASAN PERINDUSTRIAN KUNDANG, 48020, RAWANG SELANGOR, MALAYSIA
Product	:	PRECAST CONCRETE MASONRY UNIT (CEMENT BRICK)
Certification Basis	:	Standard (s) : • BS 476 : PART 22 : 1987 Fire tests on building materials and structures. Methods for determination of the fire resistance of non-loadbearing elements of construction • BS 6073 : PART 1 : 1981 Precast concrete masonry units. Method for specifying precast concrete masonry units Product Certification Requirements in accordance to the Product Certification Agreement Work Instruction : NIL

Verified By :	Approved By :
AZMI MUSA	BASORI BIN HJ SELAMAT
16/04/2012	06/07/2012

Part A: Product Evaluation

Brand	Material	Type	Rating	Size	Remark
ENGINEERING BLOCKS	FULL BRICK	SOLID WITH GROOVE	TWO HOURS	NOMINAL SIZE: 200MM X 100MM X 100MM	
ENGINEERING BLOCKS	SERVICE BRICK	SOLID WITH GROOVE	TWO HOURS	NOMINAL SIZE: 200MM X 100MM X 100MM	
ENGINEERING BLOCKS	HALF BRICK	SOLID WITH GROOVE	TWO HOURS	NOMINAL SIZE: 100MM X 100MM X 100MM	

Manufacturing Process : Refer to the process flow chart

Part B: Type Test Report

Test Report No	Date	Laboratory	Type	Result	Summary
2011FE0078	09/03/2011	Fire Protection Section	Type Test Report	Pass	Tested model: FULL BRICK, Result: Integrity-130 minutes, Insulation-130 minutes
2010CB7685	23/02/2011	Civil & Construction Section	Type Test Report	Pass	Tested model: FULL BRICK, Tested for Clause 9-Dimensional deviation, Clause 10-Strength & Clause 11-Drying shrinkage of BS 6073: Part 1: 1981.

Part C: Product Marking

All Certified products shall be clearly, legibly and indelibly marked as followed:

On the Packaging	Each pallet of bricks shall be identified with the following information: 1. Manufacturer's identification, eg. PROVEN ENGINEERING BLOCKS SDN. BHD.; 2. Product name or model, eg. FULL BRICK; 3. Nominal size, eg. 200mm 100mm x 100mm; 4. Rating, i.e. 2 hours; 5. Production date; 6. Brick's minimum strength, i.e. 7 N/mm2 7. SIRIM Certification Mark (with standard numbers, i.e. BS 6073: Part 1: 1981 and BS 476: Part 22: 1987
Method of Marking	Sticker (for each pallet)

Part D: Surveillance Programme

1. Surveillance inspection shall be conducted 2 time(s) yearly.

2. Surveillance test

   During the surveillance inspection, routine testing shall be conducted and witnessed by the certification executive. When it is not possible to witness all clauses (due to longtime testing), the certification executive may witness part of the routine test.
   The tests involved are (as indicated in the QC Check Points):

   1. Mixing ratio
   2. Dimension
   3. Density
   4. Compressive strength

   For these tests, the sample shall be selected by the certification executive.

3. Re-evaluation test

   A type test shall be conducted every 5 years on the model appeared on the licence. A full type test is also required when there is significant change in the product design, raw material used and/or production facilities.

4. Full type test shall be conducted at any of the following:

   a. The licensee's facility (when it has been certified acceptable to SIRIM QAS International Sdn Bhd) witnessed by the project officer/competent personnel from SIRIM QAS International Sdn Bhd.

   b. Third party laboratories acceptable to SIRIM QAS International Sdn Bhd.

   c. SIRIM QAS International Sdn Bhd testing laboratories.

COMPONENT LIST

[illegible]	[illegible]	[illegible]
1. Cement	Type: 1. Pulverised fuel ash cement 2. Portland fly ash cement	•Certified to MS 1227: 2003 •Certified to MS 522: Part 1:2007 (CEM II/A-V 52.5 N)
2. Quarry dust	Type: Granite quarry dust	Size: <5.0mm
3. Aggregate	Type: Granite aggregate	Size: 10mm (3/8")
4. Sand	Type: mining sand	Size: <5.0mm
5. Water	Tap water	Supplied by JBA

MIX RATIO/ COMPOSITION

No	[illegible]	[illegible]
1.	Cement	80 kg
2.	Quarry dust	110 kg
3.	Aggregate	200 kg
4.	Sand	650 kg
5.	Tap water	Varies

Brick density: 1947 kg/m^3

DRAWING/SKETCH

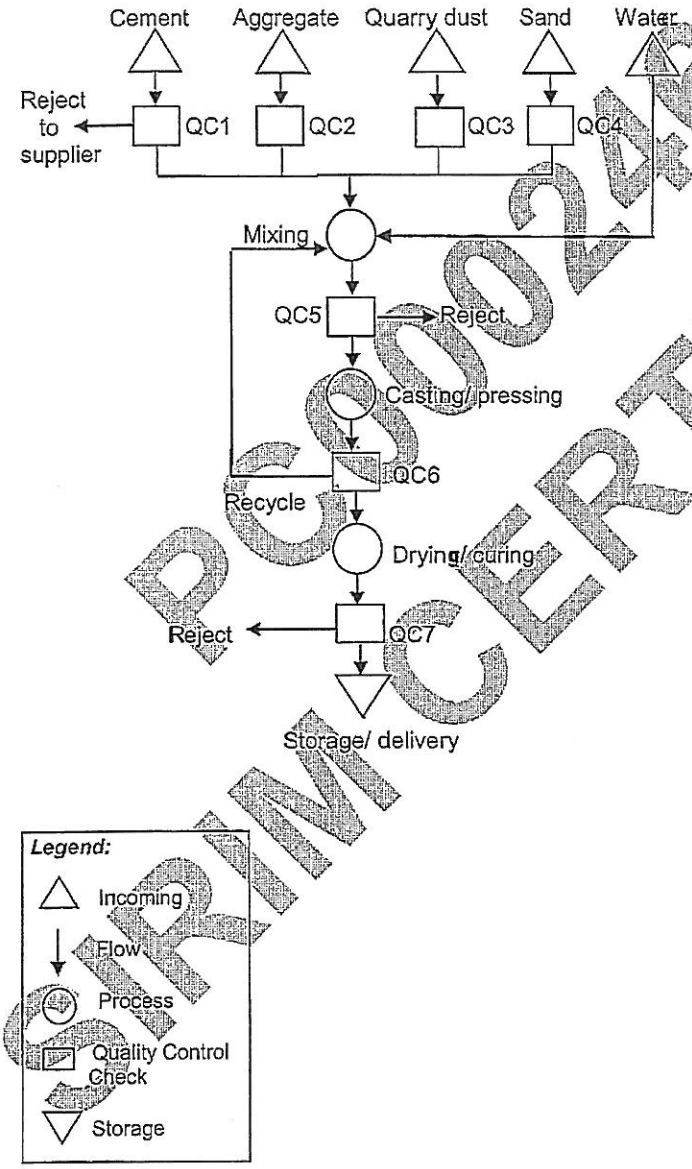
Refer to the following test report no. & page:

[illegible]	[illegible]	[illegible]	[illegible]
Drawing 1	General construction of the brickwall	2011FE0078	15/20
Drawing 2	Detail of the cement brick	2011FE0078	16/20

TYPE TEST REPORT

Date	Test Report No.	Laboratory	Results & Remarks
09/03/2011	Full test report: 2011FE0078	Fire Protection Section, Testing Services Dept., SIRIM QAS International Sdn. Bhd.	Tested to BS 476: Pt.22: 1987- Methods for determination of the fire resistance of non-load bearing elements of construction. Tested clause: Clause 5: Determination of fire resistance of partition. Result: Integrity : 130 minutes Insulation : 130 minutes Average thickness of plastering: 9.5mm
23/02/2011	Full test report: 2011CB7685	Civil & Construction Section, Testing Services Dept., SIRIM QAS International Sdn. Bhd.	Tested to BS 6073: Pt.1: 1981 for physical performance. Tested clause: • Clause 9-Dimension • Clause 10-Strength • Clause 11-Drying shrinkage Result: Full compliance

PROCESS FLOW CHART



*Note: QC1, QC2, QC3 & QC4 NG will be returned to the supplier.
Other QC will have the possibility of being recycled, rework, or reject.

QC CHECK POINTS

QC No.	Item Inspected	Test/Inspection	Frequency
1	Cement	Verification of COA: a. Type b. Certified to MS 1227	Once/ month
2	Aggregate	Sieve analysis	Weekly
3	Quarry dust	Sieve analysis	Weekly
4	Sand	Sieve analysis	Weekly
5	Mixed materials	Mixing composition of raw materials	Every mix
6	Green brick	Dimension check: a. Length b. Width c. Height Visual/ appearance	4 times/ day
7	Finished product	a. Dimension b. Density c. Compressive strength	1-day age (3 samples) 14-days & 28-days age (10samples)

TEST EQUIPMENT

The applicant undertakes to maintain (calibrate, verify or both) the following test equipment in the factory.

No.	Equipment	Range/ parameter/ caliber / etc	Frequency
1.	Weighing scale (Cement hopper)	(0 – 250) kg	Yearly
2.	Weighing scale (Aggregate, quarry dust, Sand hopper)	(0 – 1000) kg	Yearly
3.	Compression machine	(200 – 1800) kN	Yearly
4.	Spring balance	(0 – 30) kg	Yearly
5.	Steel ruler	(0 – 300) mm	Once
6.	Measuring tape	(0 – 8000) mm	Once
7.	Vernier caliper	(0 – 200) mm	Yearly
8.	Test sieve	(9.5, 4.75, 2.36, 1.18) mm & (150, 300, 600) µm	Once

MARKING

Example of SIRIM Certification Mark;

SIRIM
Certified to: BS 6073: Part 1: 1981
BS 476: Part 22: 1987
Certification No.: PCXXXXXX*

*Note : Please refer to the number printed to the license

SIRIM QAS International Sdn.Bhd. (Company No.: 410334-X)
No.1, Persiaran Dato' Menteri, P.O.Box 7035, Section 2,
40911 Shah Alam, Selangor Darul Ehsan, Malaysia
Tel. no: 03- 55445853 / 55445854
Fax. no: 03-55445886

MS ISO/IEC 17025
TESTING
SAMM NO. 085

TEST REPORT

REPORT NO.: 2010CB7685	PAGE : 1 OF 3

Applicant	:	PRODUCT CERTIFICATION SECTION PRODUCT CERTIFICATION & INSPECTION DEPARTMENT (Attn. : En. Mohd Shaharin Ahmad Latif)
Manufacturer	:	CKYJ (M) SDN. BHD. Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, 48020 Rawang, Selangor Darul Ehsan.
Product	:	Cement Brick (Solid with Groove)
Reference Standard/ Method of test	:	BS 6073 : Part 1: 1981 Precast Concrete Masonry Units Part 1. Specification for Precast Concrete Masonry Units Clause 9 - Dimensional Deviations Clause 10 - Compressive Strength Clause 11 - Drying Shrinkage
Description of sample	:	Forty (40) pieces of Cement Bricks were received for testing through Product Certification Section (Ref No : PC 045202, Dated : 18 / 10 / 2010) Nominal size : 200 mm x 100 mm x 100 mm Brand : CKY Model : Full Brick
Date received	:	30th November 2010
Job no./Ref. no.	:	J20105047685/SQAS/CCST/T.REC/CSL/04
Issued date	:	23 FEB 2011

Approved Signatories

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

(HANON NAZIR MOHD BASIR)
Senior Technical Executive

(YM RAJA NOR SIHA BT. RAJA ABD. HANAN)
Group Leader
Civil & Construction Section
Testing Services Department

TEST REPORT

REPORT NO.: 2010CB7685	PAGE : 2 OF 3

TEST RESULT :

Product	:	Cement Bricks (Solid with Groove)
Method of Test	:	BS 6073: Part 1 :1981 Precast Concrete Masonry Units. Part 1 : Specification for Precast Concrete Masonry Units
Nominal Size	:	200m x 100 mm x 100 mm

Dimensional Deviations

Clause	Specification	Test Result			Remarks
		Length (mm)	Height (mm)	Thickness (mm)	
9	Dimensional Deviations Length: + 4 mm - 2 mm Height: + 2 mm - 2 mm Thickness: + 2 mm - 2 mm	1. 200 2. 200 3. 201 4. 199 5. 200 6. 200 7. 200 8. 200 9. 200 10. 200	100 100 100 100 100 100 100 100 100 100	100 100 100 100 100 100 100 100 100 100	**Complied**
	Average	**200**	**100**	**100**	

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

23 FEB 2011

TEST REPORT

REPORT NO.: 2010CB7685	PAGE : 3 OF 3

TEST RESULT :

Product	:	Cement Bricks (Solid with Groove)
Method of Test	:	BS 6073: Part 1 :1981 Precast Concrete Masonry Units. Part 1: Specification for Precast Concrete Masonry Units
Nominal Size	:	200m x 100 mm x 100 mm

Clauses	Specifications	Test Results	Remarks
10	Strength.		
10.1	The average crushing strength of ten masonry units shall be : (a) not less than G i.e 7.0 N/mm^2 And (b) not less than 6.7 N/mm^2 as calculated from 0.9G + 0.62s	1) 11.0 N/mm^2 2) 11.0 N/mm^2 3) 10.5 N/mm^2 4) 14.0 N/mm^2 5) 12.0 N/mm^2 6) 12.0 N/mm^2 7) 13.0 N/mm^2 8) 10.5 N/mm^2 9) 12.0 N/mm^2 10) 11.5 N/mm^2 **Average : 11.8 N/mm^2**	**Complied**
11	Drying Shrinkage The average of drying shrinkage tested in accordance with appendix D shall not exceed 0.06%	**0.03%**	**Complied**

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

2 3 FEB 2011

Product Certification Section
Product Certification & Inspection Department
SIRIM QAS International Sdn. Bhd.
Block 25, SIRIM Complex
No. 1, Persiaran Dato' Menteri
P.O. Box 7035, 40911 Shah Alam
Selangor Darul Ehsan, Malaysia
Tel: 603-5544 6409 Fax: 603-55446466

SIRIM
ECO-LABEL

APPLICATION FOR SIRIM ECO-LABELLING CERTIFICATION

PART A : APPLICATION DETAILS

1. Applicant's Information

Details of applicant. Only person who has authority in relation to eco-labelling certification process, product quality and/or manufacturing process should be named as authorized representative.

Name of Company	Proven Engineering Blocks Sdn. Bhd.		
Address	No. 11, Medan Setia Satu, Plaza Damansara, Bukit Damansara, Kuala Lumpur.	Post code	50490
Business Reg. No.	820839 T		
Authorized Representative	Siti Hanum Binti Khatani	Position	Admin Executive
Phone No.	03 - 20932703 / 36 / 63	Fax No.	03 - 20932316
Email	Provenholding@gmail.com	Web Site	www.provenholding.com

2. Factory's / Manufacturer's Information

This section need to be completed if the above applicant is not manufacturing the product. Only person who has authority in relation to eco-labelling certification process, product quality and/or manufacturing process should be named as authorized representative.

Name of Manufacturer	Proven Engineering Blocks Sdn. Bhd.		
Address	Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, Rawang, Selangor	Post code	48020
Business Reg. No.	820839 T		
Authorized Representative	Mohd Hasnizan Bin Harun	Position	Assistant Factory Manager
Phone No.	03 – 60342513 / 2522	Fax No.	03 - 60342546
Email	hasnizur@yahoo.com.my	Web Site	www.provenholding.com

Please attach:

1. A route map to the factory
2. Company organization chart

DITERIMA
18 JAN 2015
Sales, Marketing and Business Development Section, SIRIM QAS INTERNATIONAL SDN. BHD.

SIRIM QAS International Sdn. Bhd. (410334-X)
SIRIM Complex, No. 1, Persiaran Dato' Menteri, P.O. Box 7035, 40700 Shah Alam,
Selangor Darul Ehsan, Malaysia. Tel: 603-5544 6402 Fax: 603-5544 6787
Web Site: www.sirim-qas.com.my Email: qas_marketing@sirim.my

PRODUCT / ECO-LABELLING CERTIFICATION QUESTIONNAIRE

A. APPLICANT's INFORMATION

1. Name and Address of Applicant

Only person who has authority in relation to certification process, product quality and/or process should be named as contact person for the applicant / factory / manufacturer as appropriate

Company Name	Proven Engineering Blocks Sdn. Bhd.		
Company Address	No. 11, Medan Setia Satu, Plaza Damansara, Bukit Damansara, Kuala Lumpur.	*Post code*	50490
Business Reg.	820839 T		
Contact Person 1	Siti Hanum Binti Khatani	Position	Admin Executive
Contact Person 2		Position	
Phone No.	03 - 20932703 / 36 / 63	Fax No.	03 - 20932316
Email	Provenholding@gmail.com	Web Site	www.provenholding.com

2. Factory's / Manufacturer's Information

*This section shall be completed if the factory is located at different address from the above **OR** the product is not manufactured by the applicant.*

Manufacturer Name	Proven Engineering Blocks Sdn. Bhd.		
Manufacturer Address *(if different from above)*	Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, Rawang, Selangor	Post code	48020
Business Reg.	820839 T		
Contact Person 1	Mohd Hasnizan Bin Harun	Position	Assistant Factory Manager
Contact Person 2	Nurul Ibrah Bt. Halmi	Position	QA/QC Officer
Phone No.	03 – 60342513 / 2522	Fax No.	03 - 60342546
Email	hasnizur@yahoo.com.my	Web Site	www.provenholding.com
No. of Staff	Production: Eleven persons		
	QA / QC Laboratory: Two persons		

3. Other Certification Currently Held by the Manufacturer (if any)

Please provide the type of certification and its certification body (if any).

Type of Certification	Tick (✓) if any	Name of Certification Body :
ISO 9001		N.A
ISO 14001		N.A
ISO 18001		N.A
Product Certification	✓	Product: Cement Brick Solid With Groove Standard: BS 476 : PART 22 : 1987 BS 6073 : PART 1 : 1981
Others *(Please specify)* *eg CE,HACCP, HALAL*		N.A

DITERIMA
18 JAN 2013
Sales, Marketing and Business Development Section
SIRIM QAS INTERNATIONAL SDN. BHD.

APPENDIX B

METHOD STATEMENT OF PROVEN INTERLOCKING BRICK (PIB) SYSTEM

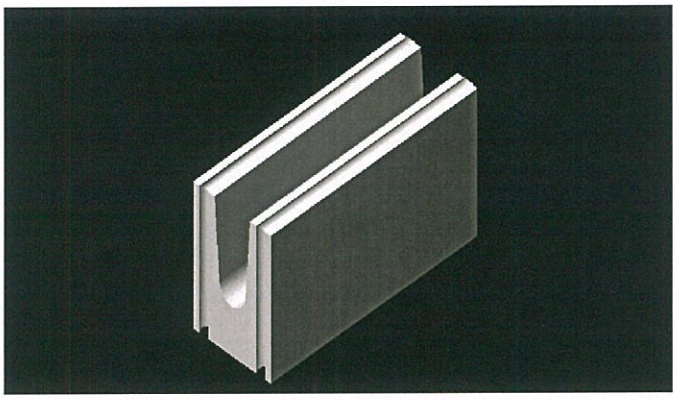
PROVEN ENGINEERING BLOCK SDN BHD

INTERLOCKING ENGINEERING BLOCK SYSTEM
Approved by CIDB IBS in Malaysia

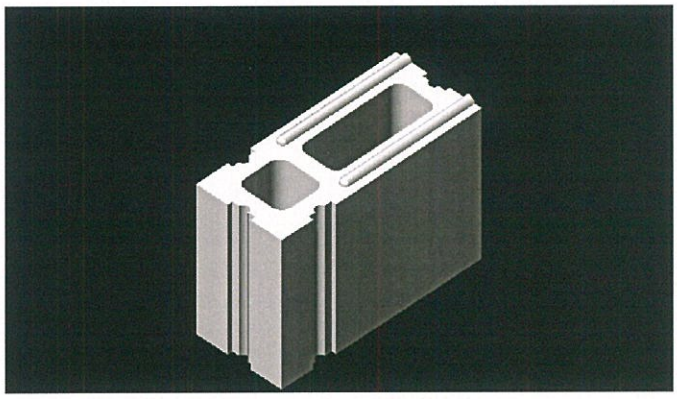
OUR INVENTION IS YOUR OPPORTUNITY

PROVEN ENGINEERING BLOCK SDN BHD

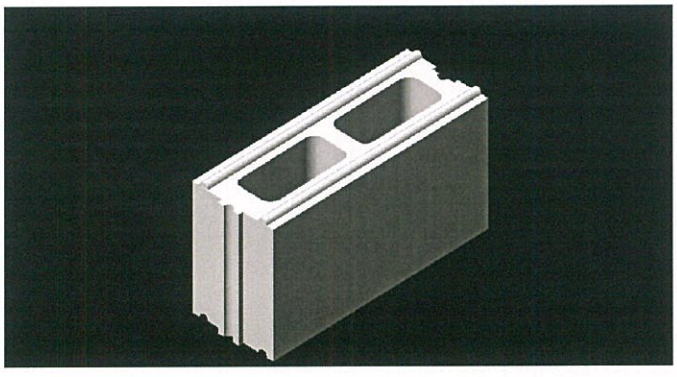
3-Dimensional View



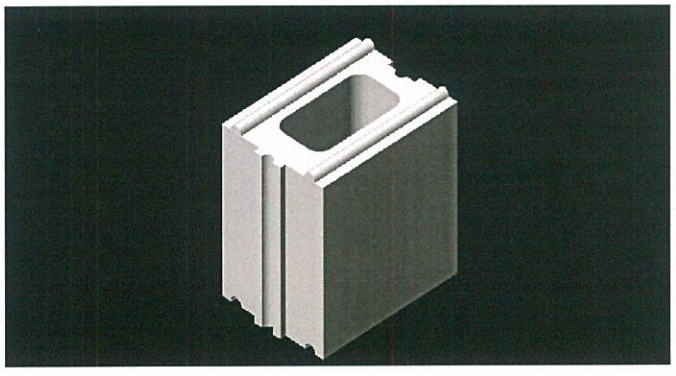
Bond Beam 200 x 400 x 142 mm



Corner 200 x 342 x 142 mm



Stretcher 200 x 400 x 142 mm



Half Block 200 x 200 x 142 mm

METHOD STATEMENTS OF PROVEN INTERLOCKING BLOCK SYSTEM (PIB)

Step 1 – Decide the house size and built up areas that you intended to built

- When you have decided to use PIB system for your project, you need to decide the dimension of the building that you intended to build on your land and compound.
- Get the architect or your self to draw out the plan based on the modular dimension of 200mm X 200mm. if you are unable to draw the required drawings, call PIB block representative to assist you.

Step 2 – Place order of blocks as per design drawings

- Order the correct number and types of blocks, door frame and piping based on the drawing of your building.

Step 3 – Cast foundation

- Cast the foundation based on the design drawings by your engineer. While casting the foundation and floor slab ensure the finishing floor level is level. The level variation should not exceed 25mm in height. Proper leveling control is highly recommended to avoid cutting 1st layer of block to match the uneven finished floor level.

Step 4 – Ensure all starter bars are place correctly

- When casting the floor slab and footing, make sure all starter bars are provided casting the floor slab.

Step 5 – Ensure all underground pipes are placed in position

- Check and ensure all underground piping and opening are provided before casting the floor slab.

Step 6 – Cast floor slab and wait for it to harden

- Wait for caste concrete floor harden for at least 3 days before laying blocks on slab.

Step 7 – Setting out of block position

- Setting out blocks location according to plan. Check the position of rebar position. If wrongly placed bar rectify before preceeding with laying the 1st course.

Step 8 – Check materials delivered at site

- Check and endure delivery of blocks required and door frame delivered at site.

Step 9 – Check completed floor level and height variance in the completed slab

- Before laying the 1st course of blocks, survey floor level where blocks are going to be laid. Study the levels variance. Take the highest level as the 1st course starting level. If level variance is greater than 30mm, then adopt the level that has the maximum of 30mm in height. For levels that are in exceed of 30mm, cut the affected block height to suit the floor level. It is recommended to cut the blocks with diamond cutter.

Step 10 – Laying 1st course using correct strength mortar mix

- Mix cement and sand mortar according to specification for the leveling 1st course of block. When laying 1st course, start at the corner and progressively lay to the other end of the building. Complete the laying in that manner. Fix door frame before continue upper blocks.
- When completed the 1st course, wait for 24 hours before continue laying the upper blocks.

Step 11- Continue with 2nd course

- When resume laying 2nd course onwards, mix the mortar adhesive according to manufacture instruction. Place adhesive in groove to receive the tongue of upper blocks. Repeat the laying blocks in layer until all required blocks lay.

Step 12 – Grouting if columns

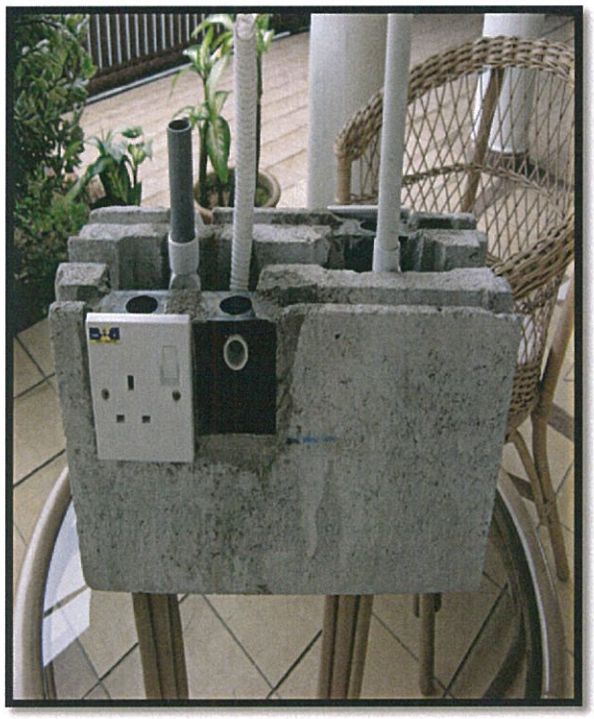
- Lay blocks up to 7th courses or half of the wall height. Than place Rebar at column and stiffner area. Concrete the required areas before proceeding upper floor.

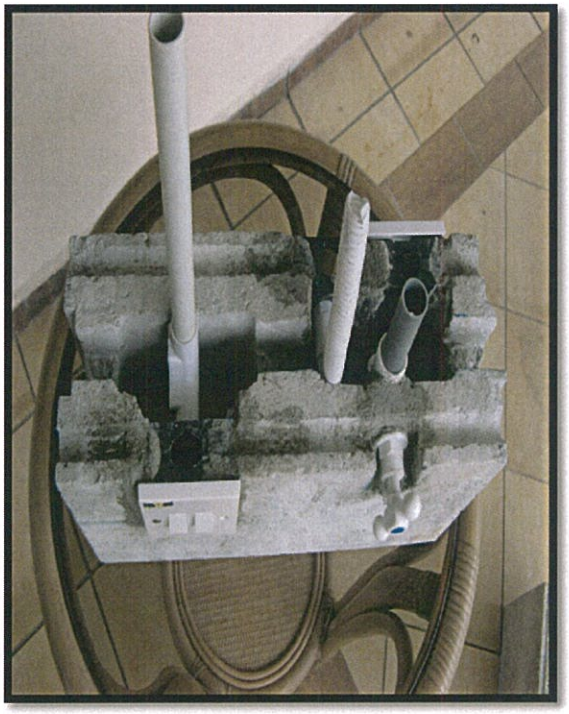
Step 13 – Bond beam construction

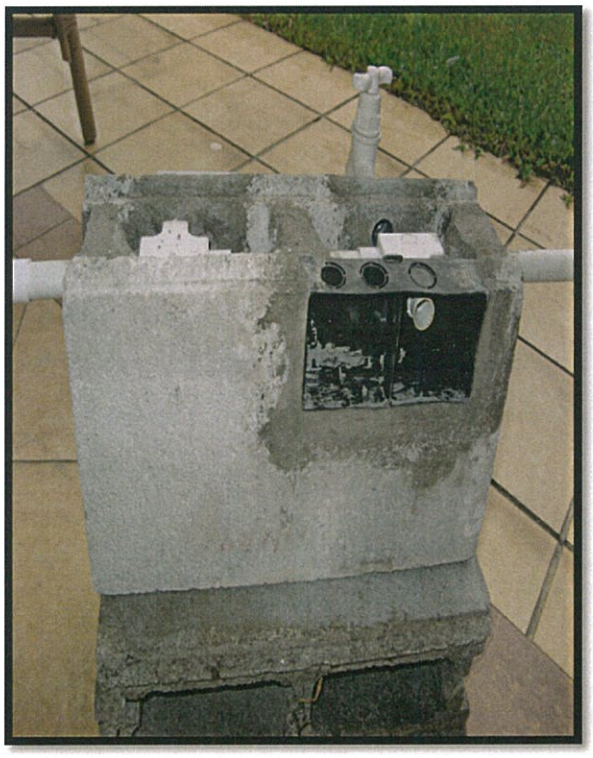
- Continue the block laying until reach the bond beam level. Place rebar and concrete the bond beam.
    - Note : if roof trusses is to sit on the bond beam. Make sure all holding down bar is in correct position.

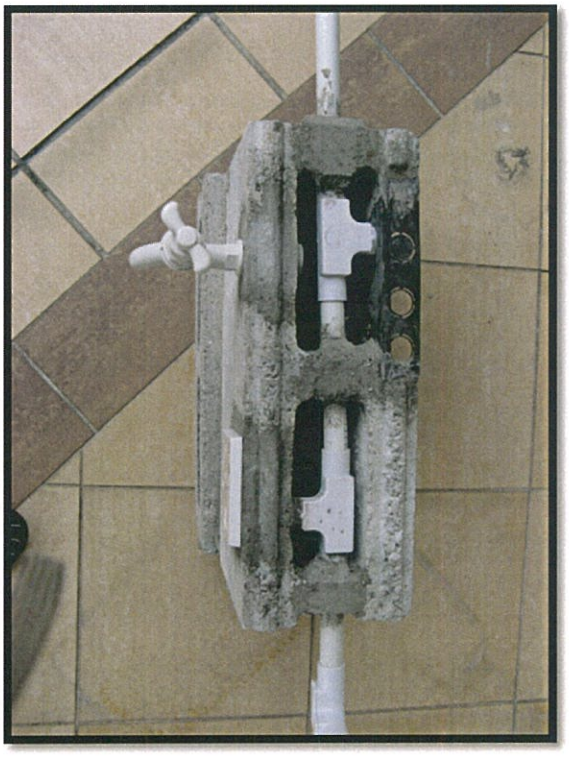
STANDARD DETAILING

PLUMBING AND ELECTRICAL SERVICES INCORPORATED IN PROVEN BLOCKS.





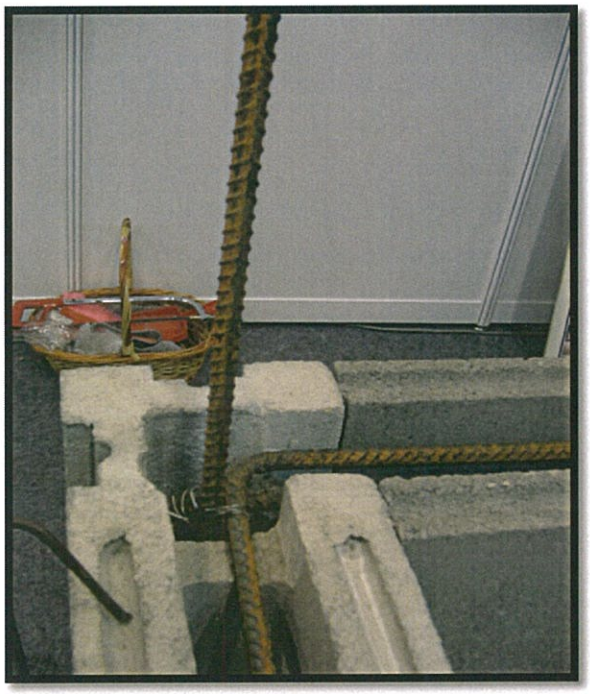


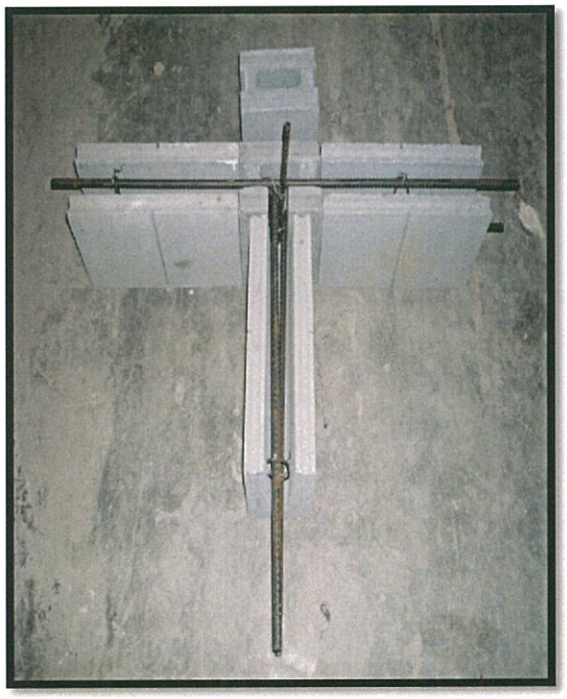


BOND BEAM WITH REINFORCEMENT DETAILS FOR BEAM, LINTOL, AND WINDOW SEAL

CORNER BLOCK FIXING DETAIL

CORNER BLOCK REINFORCEMENT ARRANGEMENT DETAIL





PROVEN HOLDING
Enhancing Construction Technology

Excavation for Raft Foundation

Preparing Wire Mash & Side Formwork

Completed Raft Foundation

PROVEN HOLDING
Enhancing Construction Technology

Installing of Engineering Block

PROVEN HOLDING
Enhancing Construction Technology

Installing Engineering Block (in mass production)

PROVEN HOLDING
Enhancing Construction Technology

Installing up to the 'roof beam'

PROVEN HOLDING
Enhancing Construction Technology

Installation of Engineering Blocks up to Roof Soffit

PROVEN HOLDING
Enhancing Construction Technology

Installation of Metal Roof Truss

PROVEN HOLDING
Enhancing Construction Technology

Partially Completed Semi-D House

PROVEN HOLDING
Enhancing Construction Technology

Completed Semi-D House

APPENDIX C

SKIM GRIP WHITE THIN BED ADHESIVE DESCRIPTION

aalborgportland
CEMENTIR HOLDING

SECTION 1- PRODUCT IDENTIFICATION

Aalborg Portland Malaysia Sdn. Bhd. (275155-P)
Lot 75244, Pinji Estate,
P.O.Box 428, 30750 Ipoh,
Perak Darul Ridzuan
Malaysia
Emergency phone # : +605-3218988
Product identity :SCI Skimgrip Thinbed Adhesive

SECTION 2- INGREDIENTS & HAZARDOUS COMPONENTS

Ingredient Name	CAS Number	Percent	Index	Risk Phrases
Portland Cement	65997-15-1	> 35	Xi	R38, R41
Calcium Carbonate	1317-65-3	> 10		
Quartz sand	14808-60-7	< 55		

SECTION 3- HAZARD IDENTIFICATION

Hazard designation : Xi Irritant
Hazard to man and environment : R38 Irritating to skin, R41 Risk of serious damage to eyes.
Particulate Dust TLV : 10 mg/m^3 of air.

SECTION 4-PHYSICAL DATA

Appearance : White sandy powder.
PH : Approximately 12 at 20 °C saturated solution.

SECTION 5- FIRE AND EXPLOSION DATA

Flash Point : N/A
Explosive Limit : N/A
Extinguishing Media : CO_2 , extinguishing powder or water spray jet.

SECTION 6 – HEALTH HAZARD DATA

Health Effects

Eyes : Short-term exposure, irritating. Long term exposure, irritating may cause inflammation of the cornea.
Skin : Irritation.

Personal Protection :Use of impervious gloves, boots and clothing to protect the skin from contact with dust and wet mixture.
In dusty environments, the use of dust mask is advised.

SECTION 10 – STABILITY AND REACTIVITY

Stable when stored correctly, no dangerous reactions or decomposition products known.

SECTION 11 – TOXICOLOGICAL INFORMATION

Strong effect for the eyes with danger of serious damage to eyes. Irritant effect on the skin and mucous membranes

SECTION 12 – ECOLOGICAL INFORMATION

Stable in soil. Slightly hazardous. Do not allow large quantities to reach the ground water, rivers, drainage and sewage systems. Soil and ground water in contact with freshly set and hardened mortar may become more alkaline. The rise in pH may be toxic to some forms of aquatic life in certain circumstances and to plants.

SECTION 13 – DISPOSAL CONSIDERATIONS

Dispose the empty bags or surplus product at a place authorized to accept builder waste. Product must be disposed of with household waste.

SECTION 14 – TRANSPORT INFORMATION

Not classified as hazardous for transport purposes.

SECTION 15 – OTHER INFORMATION

Use only for the purposes intended. This information is based on our present state of knowledge and is intended to describe our product form the point of view of the safety requirement. It should not be construed as guaranteeing specific properties.

aalborgportland
CEMENTIR HOLDING

SKIM GRIP WHITE THIN BED ADHESIVE

PRODUCT DESCRIPTION

Skim grip white thin bed adhesive is a pre-blend of white Portland, specially sized inert aggregates and approved chemical additives. It is cement based adhesive for clay / cement bricks, cement/ light weight blocks and tiles. It has good workability and strong adhesion. It is pre packed and just by adding the required amount of water it is ready for application.

TECHNICAL DATA

Colour	: White
Density	: 1.4gm/cm^3
Thickness	: 3mm thickness
Coverage	: 3.5kg - 4.5kg /m^2 using notch trowel
Opening time	: about 20 minutes
Initial setting time	: 5 hours
Compressive Strength	: 170kg/cm^2
Bonding Strength (tensile)	: 0.20N/mm^2
Storage	: 6 months if product is stored in cool dry place.
Packing	: 40 kg per bag

INSTRUCTIONS FOR USE

Ensure surfaces are sound, clean and free from any contamination materials.

Mix the powder with about 35% to 40% of clean water for laying of bricks/blocks and 18% to 20% for laying of tiles.

Thoroughly mix using an electric drill with stirrer attachment until the mix is homogenous.

Apply onto the bricks or blocks with a notch trowel or a dispenser.

SAFTY PRECAUTION

Skim grip white thin bed adhesive contains Portland Cement and carefully selected additives. Normal safety wear such as rubber gloves, dust mask and safety glass, used to handle conventional cement based products should be worn.

FIRE RESISTANCE

The product is non combustible.

Disclaimer

All information is only intended to give a fair description of the products and their capabilities under such specific test conditions. However, it does not constitute an offer of warranty by the manufacturer not a guarantee of it's accuracy or completeness in describing the performance or suitability of the various products.

SIRIM QAS International Sdn.Bhd. (Company No : 410234-X)
No 1, Persiaran Dato' Menteri, P.O.Box 7035, Section 2,
40911 Shah Alam, Selangor Darul Ehsan, Malaysia
Tel. no: 03- 55446451
Fax. no: 03-5544646

TEST REPORT

REPORT NO.: 2006CB0700	PAGE : 1 OF 2

Applicant	:	AALBORG ASIA WHITE SDN. BHD. (SCI DIVISION) UNIT 401, LEVEL 4, UPTOWN 2, NO. 2 JLN. SS21/37, DAMANSARA UPTOWN, 47400 PETALING JAYA, SELANGOR
Manufacturer	:	AALBORG ASIA WHITE SDN. BHD. (SCI DIVISION)
Product	:	Thin Bed - Adhesive
Reference Standard/ Method of test	:	ASTM D4541 - Pull Off Strength
Description of sample	:	A 300mm x 300mm x 40mm of concrete slab with thin bed-adhesive overlay was received for testing. Brand : SCI SKIMGRIP Marking : SKIMGRIP THIN BED-ADHESIVE
Date received	:	10/05/2006
Job no./Ref. no.	:	J20065040596/SQAS/CBMT/T.REC/CSL/01
Issued date	:	02 JUN 2006

Approved Signatories

(YM RAJA NORSIHA)
Senior Technical Executive

SIRIM QAS INTERNATIONAL SDN. BHD. Construction & Building Materials Testing Section

(MOHD. FAUZI ISMAIL)
Senior Manager
Construction and Building Materials Testing Section
Testing Services Department

TEST REPORT

REPORT NO.: 2006CB0700	PAGE : 2 OF 2

Test Result:

Submittor : AALBORG ASIA WHITE SDN. BHD. (SCI DIVISION)
Product : Thin Bed - Adhesive
Method of Test : ASTM D 4541: 1995
Standard Test Method for Pull-Off strength of coatings Using Portable Adhesion Testers

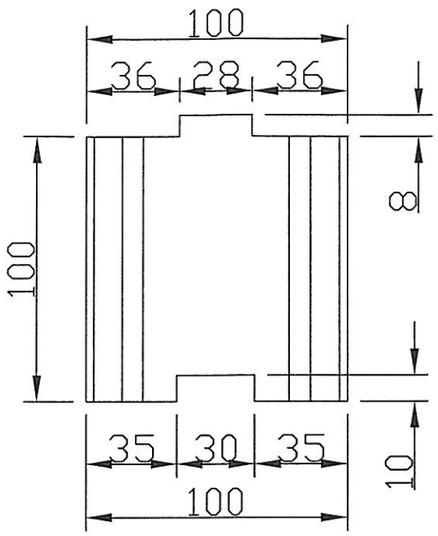
Reference	Pull Off Strength (N/mm²)
1	0.20
2	0.31
3	0.15
4	0.10
5	0.36
Mean	**0.22 N/mm²**

SIRIM QAS INTERNATIONAL SDN. BHD. Construction & Building Materials Testing Section

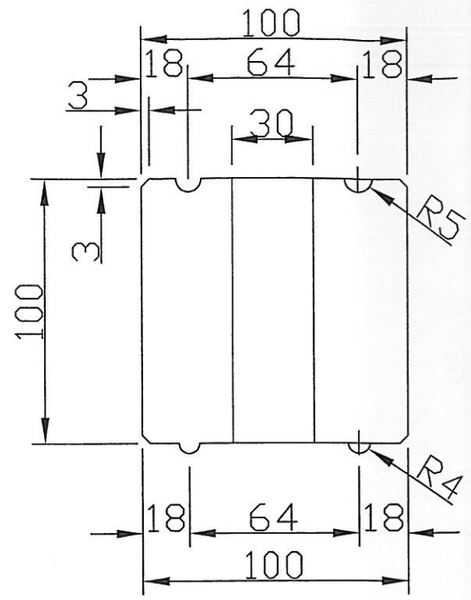
02 JUN 2006

APPENDIX D

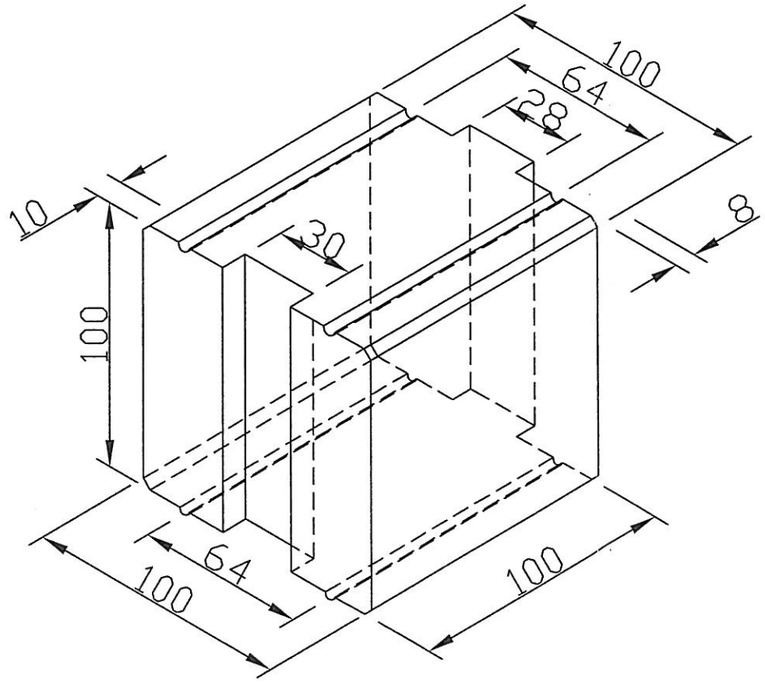
DETAILED ILLUSTRATION OF PROVEN INTERLOCKING BRICK (PIB) SYSTEM



PLAN



ELEVATION



ISOMETRIC VIEW

COP PENDAFTARAN JABATAN:

NO.SIRI:

PEMILIK PROJEK

RUJ.	TARIKH	PINDAAN

PENGARAH PROJEK

KONTRAKTOR 'DESIGN AND BUILD'

ARKITEK

KONTRAKTOR IBS

PROVEN ENGINEERING BLOCKS SDN BHD
NO. 27, MEDAN SETIA 1, PLAZA DAMANSARA,
BUKIT DAMANSARA, 50490 KUALA LUMPUR.
Tel : 603 - 2095 2703 / 2763 Fax : 603 - 2095 2316

JURUTERA AWAM & STRUKTUR

JURUTERA MEKANIKAL & ELEKTRIKAL

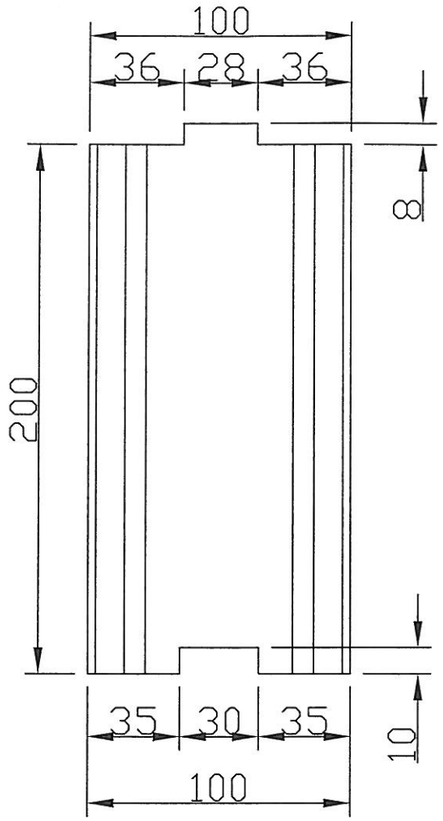
JURUUKUR BAHAN

PROJEK

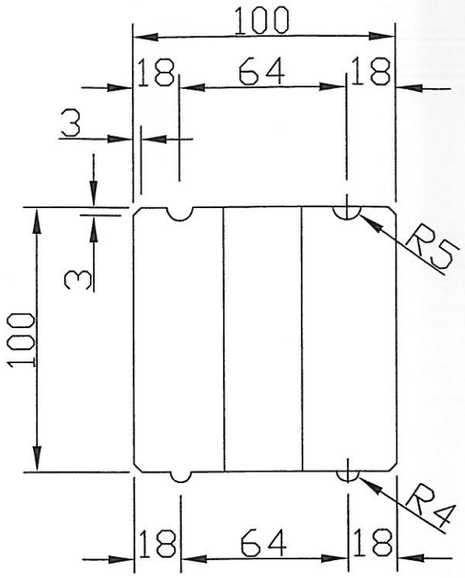
TAJUK LUKISAN

–HALF BRICK

DILUKIS OLEH : FAM	TARIKH : JAN 2013
DISEMAK OLEH : FAM	SKALA : N.T.S.
NO. PROJEK :	
NO. LUKISAN :	-



PLAN



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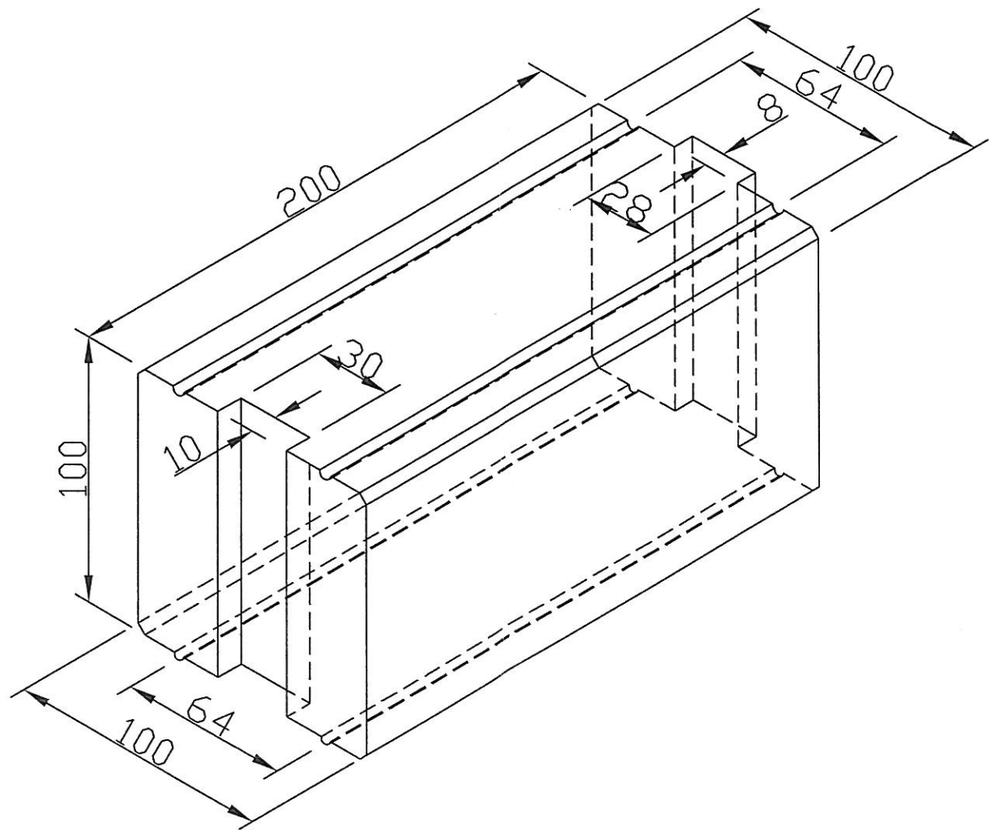


ISOMETRIC VIEW

COP PENDAFTARAN JABATAN:

NO.SIRI:

PEMILIK PROJEK

RUJ.	TARIKH	PINDAAN

PENGARAH PROJEK

KONTRAKTOR "DESIGN AND BUILD"

ARKITEK

KONTRAKTOR IBS

PROVEN ENGINEERING BLOCKS SDN BHD.
NO. 27, MEDAN SETIA 1, PLAZA DAMANSARA,
BUKIT DAMANSARA, 50490 KUALA LUMPUR.
Tel : 603 - 2095 2703 / 2763 Fax : 603 - 2095 2316

JURUTERA AWAM & STRUKTUR

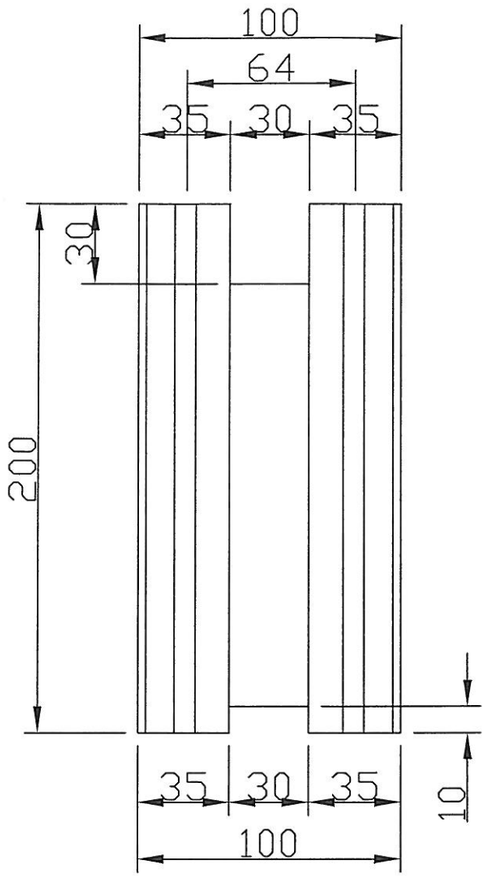
JURUTERA MEKANIKAL & ELEKTRIKAL

JURUKUR BAHAN

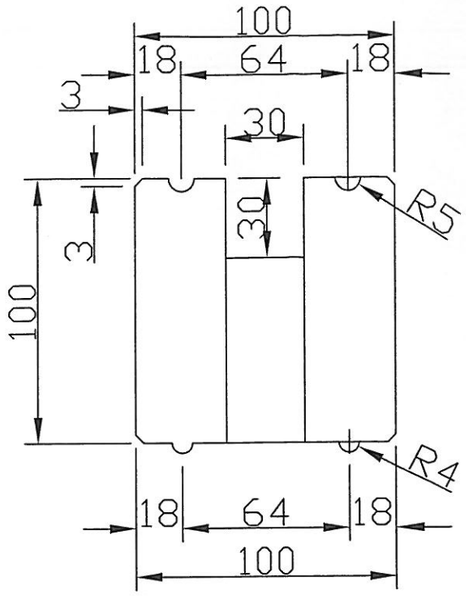
PROJEK

TAJUK LUKISAN
–FULL BRICK

DILUKIS OLEH : FAH	TARIKH : JAN 2013
DISEMAK OLEH : FAH	SKALA : N.T.S.
NO. PROJEK :	
NO. LUKISAN :	



PLAN



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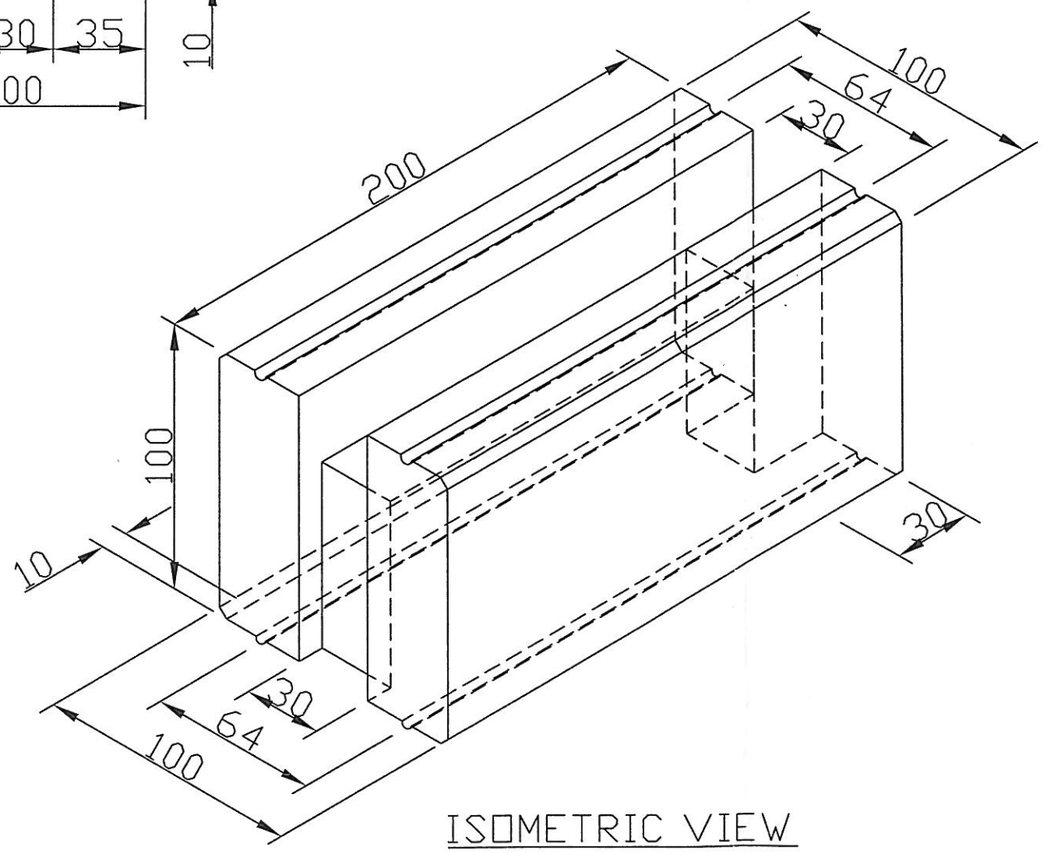


ISOMETRIC VIEW

COP PENDAFTARAN JABATAN:

NO.SIRI:

PEMILIK PROJEK

RUJ.	TARIKH	PINDAAN

PENGARAH PROJEK

KONTRAKTOR 'DESIGN AND BUILD'

ARKITEK

KONTRAKTOR IBS

PROVEN ENGINEERING BLOCKS SDN BHD.
NO. 27, MEDAN SETIA 1, PLAZA DAMANSARA,
BUKIT DAMANSARA, 50490 KUALA LUMPUR.
Tel : 603 - 2095 2703 / 2763 Fax : 603 - 2095 2316

JURUTERA AWAM & STRUKTUR

JURUTERA MEKANIKAL & ELEKTRIKAL

JURUUKUR BAHAN

PROJEK

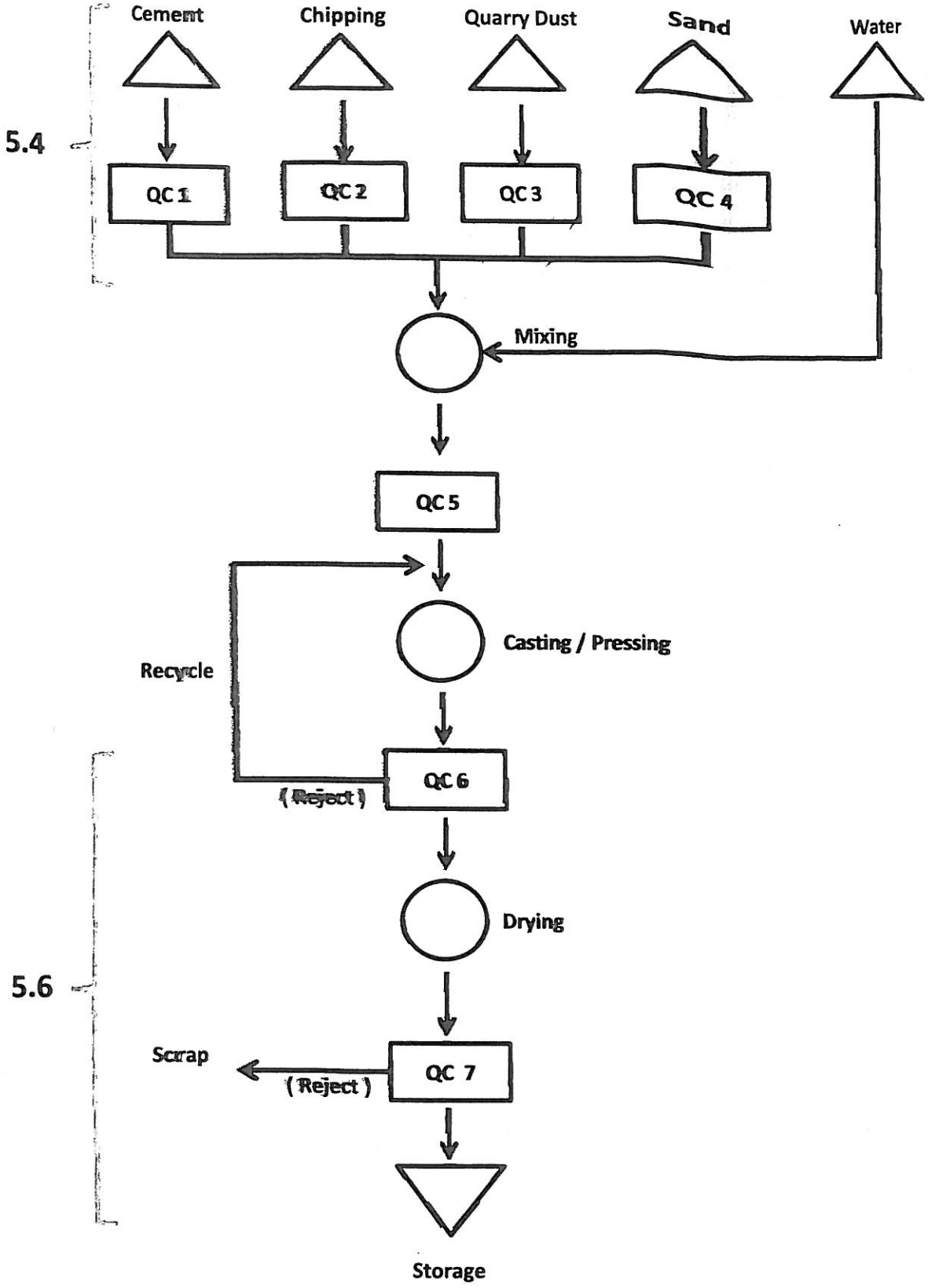
TAJUK LUKISAN
-SERVICE BRICK

DILUKIS OLEH : FAH	TARIKH : JAN 2013
DISEMAK OLEH : FAH	SKALA : N.T.S.
NO. PROJEK :	
NO. LUKISAN :	

APPENDIX E

QUALITY CONTROL FLOW CHART

Quality Control System



Title : Process Flow for Stacking, Labelling & Delivery

Flow	Description	Person In-charge
	Blocks & Bricks	
	Product Indication	
1	1 Receive the finish product from IBS Machine.	
	2 Erase and write down the production date at the center of rack by using chalk.	*IBS Operators*
	Process Curing (Storage)	
2	1 Carry out product to storage / curing area. (*Curing time 24 hours after production*)	*Forklift Operator*
	2 Follow by FIFO system.	
	3 Spray water at the product after 12 hours production.	QA/QC
	Process Stacking	
	1 Carry out GIP to stacking area.	*Forklift Operator*
	2 Follow by FIFO system.	
	3 Inspect and stacking the product. (*If the product is good, proceed and if the product is not good, reject.*)	*Stacking Operators*
3	4 Arrange the block with the standard quantity and arrangement on the pallete. (*STR:80pcs,CNR:91,HBM:160,HBF:160,HBS:160,BBM:80,BBF:80,SB:400,FB:400,FL:560*)	*Stacking Operators*
	5 Strapping the product with strapping film.	*Stacking Operators*
	6 Take the finish goods to temporary storage.	*Forklift Operator*
	7 Strapping the product with strapping band and metal clip by using strapping jig.	*Stacking Operators*
	8 Strapping four side of the product.	*Stacking Operators*
	9 Update the Daily Stacking Sheet and QA/QC will confirm the data.	*Stacking Operators & QA/QC*
	Process Labelling	
	1 Check and update the data in *Label books*.	*QA/QC or Admin*
	2 Key in the data in *Summary of Stacking Records* .	*Admin*
	3 Print out the label according to label wrote by QA/QC.	*QA/QC or Admin*
4	4 Scan the label and transfer the data to the computer using Optimizer software.	*QA/QC or Admin*
	6 Stick the label on top center of the pallete.	*QA/QC*
	7 Spray at top right of the pallete based on FIFO system.	*QA/QC*
	Storage	
	1 Carry out the pallete to storage area.	*Forklift Operator*
5	2 Arrange pallete follow by FIFO System.	
	3 Block ready for delivery.	
	Delivery	
	1 Receive Purchase Order from customer and make arrangement for the pallete.	*Logistic Admin*
	2 After confirmation of pallete quantity, make arrangement for loading blocks or bricks.	*Logistic Admin*
	3 Scan the bar code on the pallete before delivery and pass the scanner to Logistic Admin.	*Forklift Operator*
	4 Key in and print the delivery order using UBS System based on type of block to delivered.	*Logistic Admin*
6	5 Transfer the label number data to the *delivery* document.	*Logistic Admin*
	6 Key in the label number into *block delivery order* document.	*Logistic Admin*
	6 Print label number sheet.(*Customer Copy, Lorry Driver Copy, HQ Copy, Factory Copy*)	*Logistic Admin*
	7 Lorry driver must sign and receive the delivery order document.	*Logistic Admin*

Legend :

GIP	: Goods in Progress	STR	: Stretcher	BBM	: Bond Beam Male
FIFO	: First in- First Out	CNR	: Corner	BBF	: Bond Beam Female
IBS	: Industrialized Building System	HBM	: Half Block Male	SB	: Service Brick
		HBF	: Half Block Female	FB	: Full Brick
		HBS	: Half Block Standard	FL	: Filler

APPENDIX F (1-5)

TEST REPORT

from SIRIM QAS International Sdn Bhd

1. **Fire Resistance Test**
2. **Product Certification Test**
3. **Sound Insulation Test**
4. **Water Absorption Test**
5. **Pull – Off Strength Test**

PRIVATE AND CONFIDENTIAL

SIRIM QAS INTERNATIONAL

TEST REPORT
FOR
FIRE RESISTANCE TEST

SIRIM QAS INTERNATIONAL SDN.BHD.
Building 14, SIRIM Complex
1, Persiaran Dato' Menteri
P.O.Box 7035, Section 2
40911 Shah Alam
Selangor Darul Ehsan
MALAYSIA

SIRIM QAS International Sdn. Bhd.
No. 1, Persiaran Dato' Menteri, P.O. Box 7035, Seksyen 2, 40911 Shah Alam,
Selangor Darul Ehsan, MALAYSIA.
Tel: 03-55446465 Fax: 03-55446454 http: //www.sirim.my
(Company No: 410334-X)

TEST REPORT

REPORT NO.: 2011FE0078	PAGE: 1 OF 20

Manufacturer/ Applicant	:	**CKYJ (M) SDN. BHD.** Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, 48020 Rawang, Selangor Darul Ehsan. (Attn.: Mr. Mohd Hasnizan b. Harun)
Product	:	**Precast Concrete Masonry Unit (Cement Brick Solid with Groove)**
Reference Standard/ Method of Test	:	BS 476: Part 22: 1987 Methods for determination of the fire resistance of non-load bearing elements of construction. Clause 5 – Determination of fire resistance of partition.
Description of sample	:	A non-load bearing brick wall partition system was constructed with cement bricks (solid with groove) interlocked together and bonded by thin cement and sand mortar on the 21st December 2010. The bricks were sampled by Mr. Mohd Shaharin Ahmad Latif of Product Certification Section (Fire Group), SIRIM QAS International Sdn. Bhd. on the 7th October 2010 and the test was requested through PP2 Form – (Ref.: PC045202 dated 18th October 2010). Full description of the test specimen and construction of the brick wall are detailed in Page 4 of this report. Brand: **CKY** Model: **FULL BRICK** Rating: **2 Hours** Nominal Size: **200 mm (*l*) × 100 mm (*w*) × 100 mm (*h*)**
Date of test	:	**19th January 2011**
Date received	:	2nd December 2010
Job No./ Ref No.	:	J20105060431 / SQAS/FPS/15/1-3
Issued date	:	09 MAR 2011
Approved Signatories	:	

HANAFI MOHAMAD
Senior Testing Executive

TESTING SERVICES DEPARTMENT
FIRE PROTECTION SECTION
SIRIM QAS INTERNATIONAL SDN BHD

ZAINI AHMAD
Group Leader
Fire Protection Section
Testing Services Department
SIRIM QAS International Sdn. Bhd.

Applicant : **CKYJ (M) SDN. BHD.**

Summary : A specimen of a non-load bearing brick wall partition system has been subjected to a test in accordance with BS 476: Part 22:1987, Clause 5 to determine its fire resistance performance.

The single layer non-load bearing brick wall partition system consisted of cement bricks (solid with groove) (said to be **'CKY'** brand, model: **FULL BRICK**) , each of size 196 mm (l) × 100 mm (w) × 100 mm (h). The bricks were interlocked together and bonded by thin layer of cement and sand mortar of 1:3 ratios. Both sides of the brick wall partition were plastered to an average thickness of 9.5 mm.

The bricks were claimed to be processed from the following materials and proportioned respectively as stated :-

No.	Materials	Mix Ratio (One Mix)
1.	Cement	90 kg
2.	Aggregate (10 mm)	200 kg
3.	Quarry dust	110 kg
4.	Sand	650 kg

The density of the brick in oven-dried condition was found to be 1947 kg/m^3.

The bricks were sampled by Mr. Mohd Shaharin Ahmad Latif of Product Certification Section (Fire Group), SIRIM QAS International Sdn. Bhd. on the 7th October 2010 and the test was requested through PP2 Form – (Ref.: PC045202 dated 18th October 2010).

The overall cement brick wall partition system size was 3020 mm (h) × 3020 mm (w) × 116 mm (t) inclusive of a 30 mm wide vertical gap along one edge to provide no lateral restraint to the specimen.

The cement brick wall partition system satisfied the performance requirements specified in Clause 5 of BS 476: Part 22, for non-load bearing wall partition, for the following periods:

Integrity : 130 minutes

Insulation : 130 minutes

The test was discontinued after a period of 130 minutes.

Date of Test : 19th January 2011

TESTING SERVICES DEPARTMENT FIRE PROTECTION SECTION SIRIM QAS (INTERNATIONAL) SDN BHD

09 MAR 2011

1. PURPOSE OF TEST

To determine the fire resistance of the cement brick wall partition system when tested in accordance with BS 476: Part 22: 1987 'Methods for determination of the fire resistance of non-load bearing elements of construction: Clause 5 – Determination of the fire resistance of partition'.

2. TEST SPECIFICATION

BS 476:Part 22:1987 states that the fire resistance of the specimen is the time, expressed in minutes, to failures under the following criteria;

2.1 Integrity

2.1.1 In general, a failure of the test construction to maintain integrity shall be deemed to have occurred when collapse or sustained flaming for more than 10 s on the unexposed face.

2.1.2 Under criteria for impermeability, failure shall be deemed to have occurred when one or other of the following conditions prevail :-

a) Where cotton pad test is performed, flames and/or hot gases cause flaming and glowing of the cotton pad.

b) Where the use of cotton pad is not suitable, failure shall be deemed to have occurred when either :

- a through gap into the furnace exceeding 6 mm in width and 150 mm in length exists or developes in the specimen; or
- a through gap into the furnace exceeding 25 mm in diameter exists or develops in the specimen.

2.2 Insulation

Failure shall be deemed to have occurred when one of the following occurs :-

a) if the mean unexposed face temperature increases by more than 140° C above its initial value.

b) if the temperature recorded at any position on the unexposed face is in excess of 180° C above the initial mean unexposed face temperature.

c) when integrity failures as defined in **2.1** occur.

TESTING SERVICES DEPARTMENT FIRE PROTECTION SECTION SIRIM QAS INTERNATIONAL SDN BHD

09 MAR 2011

3. TEST SPECIMEN

3.1 Product Description

500 pieces (1 pallet) of cement bricks (solid with groove) were submitted to the Fire Protection Section on the 21st December 2010. The brick was manufactured as interlocking function consist of grooves and tongues as shown in Figure 5. The nominal size of cement brick was 200 mm (l) × 100 mm (w) × 100 mm (h). The bricks were said to be processed from the following materials and proportioned respectively as stated :-

No.	Materials	Mix Ratio (One Mix)
1.	Cement	90 kg
2.	Aggregate (10 mm)	200 kg
3.	Quarry dust	110 kg
4.	Sand	650 kg

The description of products given above has been prepared from information provided by the applicant of the test.

3.2 Description of Test Specimen

The test specimen consisted of a non-load bearing brick wall partition system constructed onto the test frame. The cement brick wall partition system was attached to the test frame with cement mortar.

The overall specimen size was 3020 mm (h) × 3020 mm (w) × 116 mm (t) inclusive of a 30 mm wide vertical gap along one edge to provide no lateral restraint to the specimen.

Inspection was carried out during the construction of the cement brick wall system to verify on its design, dimensions and materials used. The construction of the wall was arranged and carried out by the applicant and its agent. Detailed drawings of the brick wall partition system are as shown in Figure 3 to Figure 5.

4. MANUFACTURE OF THE TEST CONSTRUCTION

The non-load bearing cement brick wall partition system was constructed with the product as described in **3.1.** The average dimensions of cement bricks as measured was 196 mm (l) × 100 mm (w) × 100 mm (h) and the bulk density in oven-dried condition was found to be 1947 kg/m^3. The moisture content of the cement bricks with grooves was found to be 4.1%.

The cement bricks were laid and stretchers by interlocking together and bonded by thin layer of cement and sand mortar.

The cement brick wall partition system was plastered with a layer of cement and sand mortar on both the exposed and unexposed faces. The plastering was found to be 9.5 mm thick (average value).

The cement brick wall partition system was constructed with one vertical side free end of 30 mm width to be filled with ceramic fiber insulation.

TESTING SERVICES DEPARTMENT FIRE PROTECTION SECTION SIRIM QAS INTERNATIONAL SDN BHD

09 MAR 2011

5. CONDITIONING OF THE TEST CONSTRUCTION

Prior to test, the test construction was kept in the laboratory proper and was seasoned in ambient atmosphere for a period of 28 days.

6. FIRE RESISTANCE TEST

6.1 Date of Testing

After the cement brick wall partition system had seasoned, the fire resistance test was conducted on 19.01.2011.

6.2 Witnesses of Test

The test was witnessed by Mr. Mohd Hasnizan Harun and Mr. Faizi representative from D. Slab.

6.3 Test Method

The test was conducted in accordance with the procedure specified in Clause 5 of BS 476:Part 22: 1987.

The ambient temperature at the beginning of the test was **27.3° C** and on completion of test, the ambient temperature was **30.7° C.** The temperature and pressure conditions were controlled to the limits defined in Clause 3.1 and 3.2 of BS 476: Part 20:1987.

Throughout the test, observations were made on the exposed and unexposed faces of the test specimen. In addition, observations were made of any sustained flaming on the unexposed face of the test specimen. Gap gauges were available to evaluate compliances with the requirements for imperviousness as defined in the BS 476: Part 20:1987.

BUILDING SERVICES DEPARTMENT FIRE PROTECTION SECTION SIRIM QAS INTERNATIONAL SDN BHD

09 MAR 2011

7. TEST RESULTS

7.1 The graph in Figure 1 shows the actual temperature/time curve of the furnace heating conditions in relation to the standard temperature/time curve.

Table 1 shows the actual mean furnace temperature and of the standard furnace temperature as defined in Clause 3.1 of BS 476: Part 20:1987. In addition the table shows the percentage differences between the areas under the standard curve and the areas under the actual curve compared with the percentage tolerances allowable within the standard.

7.2 The graph in Figure 2 shows the actual temperature rise recorded on the unexposed face of the test specimen as determined by the five thermocouples which are fixed approximately at the center of the specimen and at the center of the four quarters of the specimen and two additional thermocouples to record the individual maximum temperature.

7.3 Table 2 shows individual and mean temperature of the unexposed face of the specimen. In addition, the table shows the increase in mean temperature and maximum temperature rise at various time intervals.

7.4 Table 3 shows the deflection of the brick wall measured at mid-height. Observations are made during the test on the general behavior of the test specimen and these are given in Appendix 1 to this report.

7.5 Photographs of the test are included as Photo 1 – 8.

8. EVALUATION AGAINST THE PERFORMANCE CRITERIA

The performance of the specimen was judged against the following criteria of BS 476: Part 20: 1987.

8.1 Integrity

It is required that there is no collapse of the specimen, no sustained flaming on the unexposed surface and no loss of impermeability. These requirements were satisfied for **130 minutes** after which the test was discontinued.

8.2 Insulation

It is required that the mean temperature rise of the unexposed face shall not be greater than 140° C and the maximum temperature rise shall not be greater than 180° C. At **130 minutes** of test, the mean temperature rise and maximum temperature rise above initial mean temperature on the unexposed face of the brick wall partition system were **131° C** and **145° C** respectively.

TESTING SERVICES DEPARTMENT
FIRE PROTECTION SECTION
SIRIM QAS INTERNATIONAL SDN BHD

09 MAR 2011

9. CONCLUSIONS

The cement brick wall partition system satisfied the requirements of the BS 476: Part 22: 1987 for the following period :-

Integrity : **130 minutes**

Insulation : **130 minutes**

The test was discontinued after a period of 130 minutes at the request of the applicant.

10. LIMITATIONS

10.1 The results only relate to the behavior of the specimen of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behavior in fires.

10.2 The test results relate only to the specimen tested. Appendix A of BS 476: Part 20: 1987 provides guidance information on the application of the fire resistance tests and the interpretation of test data.

Application of the results to assemblies of different dimensions or incorporating different components should be subjected to re-verification.

TESTING SERVICES DEPARTMENT
FIRE PROTECTION SECTION
SIRIM QAS INTERNATIONAL SDN BHD

09 MAR 2011

SIRIM QAS INTERNATIONAL

No Lesen : **PC000246**
Licence No :

LESEN PENSIJILAN BARANGAN
Product Certification Licence

SIRIM

SIRIM QAS International Sdn. Bhd. dengan ini menganugerahkan kepada
SIRIM QAS International Sdn. Bhd. hereby grants to

PROVEN ENGINEERING BLOCKS SDN. BHD.
NO. 11, MEDAN SETIA SATU,
PLAZA DAMANSARA,
BUKIT DAMANSARA
50490, KUALA LUMPUR
WILAYAH PERSEKUTUAN, MALAYSIA

Lesen untuk menggunakan Tanda Pensijilan di atas barangan
a licence to use the Certification Mark on
PRECAST CONCRETE MASONRY UNIT (CEMENT BRICK)

Please refer to detail in the SCHEDULE

sebagai mematuhi keperluan
as complying with
BS 476 : PART 22 : 1987
BS 6073 : PART 1 : 1981

Khalidah Mustafa
Pengarah Urusan
Managing Director
SIRIM QAS International Sdn. Bhd.

SIRIM QAS International Sdn. Bhd.
(No. Syarikat 410334-X)
1, Persiaran Dato' Menteri
Seksyen 2, Peti Surat 7035
40700 Shah Alam
Selangor Darul Ehsan
MALAYSIA.

Tel : 60-3-55446400
Faks : 60-3-55446466

http://www.sirim.com.my
http://www.malaysiancertified.com.my

Tarikh Mula Pensijilan *Certified Since*	**: 06 July 2012**	**Tarikh Dikeluarkan** *Issue Date*	**: 22 October 2012**
Sah Sehingga *Valid Until*	**: 06 July 2013**	**No Siri** *Serial No*	: 002914

Lesen ini dianugerahkan tertakluk kepada syarat-syarat Perjanjian Pensijilan Barangan SIRIM QAS International Sdn. Bhd.
This Licence is granted subject to the provisions of the Product Certification Agreement of SIRIM QAS International Sdn. Bhd.

No Lesen : **PC000246**
Licence No :

SCHEDULE

PROVEN ENGINEERING BLOCKS SDN. BHD.

SIRIM

Brand	: ENGINEERING BLOCKS
Model	: FULL BRICK
Rating	: TWO HOURS
Type	: SOLID WITH GROOVE
Size	: NOMINAL SIZE: 200MM X 100MM X 100MM

Brand	: ENGINEERING BLOCKS
Model	: SERVICE BRICK
Rating	: TWO HOURS
Type	: SOLID WITH GROOVE
Size	: NOMINAL SIZE: 200MM X 100MM X 100MM

Brand	: ENGINEERING BLOCKS
Model	: HALF BRICK
Rating	: TWO HOURS
Type	: SOLID WITH GROOVE
Size	: NOMINAL SIZE: 100MM X 100MM X 100MM

TEST REPORT NO. : 2011FE0078, 2010CB7685

Factory Name and Location :
PROVEN ENGINEERING BLOCKS SDN. BHD.

LOT 1245, JALAN KUNDANG,
KAWASAN PERINDUSTRIAN KUNDANG,
48020, RAWANG
SELANGOR, MALAYSIA

End of page

SIRIM QAS International Sdn. Bhd.
(No. Syarikat 410334-X)
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Seksyen 2, Peti Surat 7035
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Selangor Darul Ehsan
MALAYSIA.

Tel : 60-3-55446400
Faks : 60-3-55446466

http://www.sirim.com.my
http://www.malaysiancertified.com.my

Tarikh Mula Pensijilan	**: 06 July 2012**	**Tarikh Dikeluarkan**	**: 22 October 2012**
Certified Since		*Issue Date*	
Sah Sehingga	**: 06 July 2013**	**No Siri**	. 002914
Valid Until		*Serial No*	

Certification Report

Product Certification Scheme

This Certification Report shall not be amended, changed, varied or modified in any manner whatsoever by the licencee or otherwise. If the Certification Report is to be furnished to any third party or to the public, each such Certification Report shall be furnished in full and its entirety. This Certification Report shall be read in conjunction with the Product Certification Agreement.

File No	:	P5-006442
Report No	:	RPT006488
Edition	:	1
Issued By	:	MOHAMMAD SHAHARIN AHMAD LATIF
Date Issued	:	20/09/2012
Applicant	:	PROVEN ENGINEERING BLOCKS SDN. BHD. NO. 11, MEDAN SETIA SATU PLAZA DAMANSARA, BUKIT DAMANSARA 50490, KUALA LUMPUR WILAYAH PERSEKUTUAN, MALAYSIA
Factory	:	PROVEN ENGINEERING BLOCKS SDN. BHD. LOT 1245, JALAN KUNDANG, KAWASAN PERINDUSTRIAN KUNDANG, 48020, RAWANG SELANGOR, MALAYSIA
Product	:	PRECAST CONCRETE MASONRY UNIT (CEMENT BRICK)
Certification Basis	:	Standard (s) : • BS 476 : PART 22 : 1987 Fire tests on building materials and structures. Methods for determination of the fire resistance of non-loadbearing elements of construction • BS 6073 : PART 1 : 1981 Precast concrete masonry units. Method for specifying precast concrete masonry units Product Certification Requirements in accordance to the Product Certification Agreement Work Instruction : NIL

Verified By :	Approved By :
AZMI MUSA	BASORI BIN HJ SELAMAT
16/04/2012	06/07/2012

Part A: Product Evaluation

Brand	Material	Type	Rating	Size	Remark
ENGINEERING BLOCKS	FULL BRICK	SOLID WITH GROOVE	TWO HOURS	NOMINAL SIZE: 200MM X 100MM X 100MM	
ENGINEERING BLOCKS	SERVICE BRICK	SOLID WITH GROOVE	TWO HOURS	NOMINAL SIZE: 200MM X 100MM X 100MM	
ENGINEERING BLOCKS	HALF BRICK	SOLID WITH GROOVE	TWO HOURS	NOMINAL SIZE: 100MM X 100MM X 100MM	

Manufacturing Process : Refer to the process flow chart

Part B: Type Test Report

Test Report No	Date	Laboratory	Type	Result	Summary
2011FE0078	09/03/2011	Fire Protection Section	Type Test Report	Pass	Tested model: FULL BRICK, Result: Integrity-130 minutes, Insulation-130 minutes
2010CB7685	23/02/2011	Civil & Construction Section	Type Test Report	Pass	Tested model: FULL BRICK, Tested for Clause 9-Dimensional deviation, Clause 10-Strength & Clause 11-Drying shrinkage of BS 6073: Part 1: 1981.

Part C: Product Marking

All Certified products shall be clearly, legibly and indelibly marked as followed:

On the Packaging	Each pallet of bricks shall be identified with the following information: 1. Manufacturer's identification, eg. PROVEN ENGINEERING BLOCKS SDN. BHD.; 2. Product name or model, eg. FULL BRICK; 3. Nominal size, eg. 200mm 100mm x 100mm; 4. Rating, i.e. 2 hours; 5. Production date; 6. Brick's minimum strength, i.e. 7 N/mm2 7. SIRIM Certification Mark (with standard numbers, i.e. BS 6073: Part 1: 1981 and BS 476: Part 22: 1987
Method of Marking	Sticker (for each pallet)

Part D: Surveillance Programme

1. Surveillance inspection shall be conducted 2 time(s) yearly.

2. Surveillance test

   During the surveillance inspection, routine testing shall be conducted and witnessed by the certification executive. When it is not possible to witness all clauses (due to longtime testing), the certification executive may witness part of the routine test.
   The tests involved are (as indicated in the QC Check Points):

   1. Mixing ratio
   2. Dimension
   3. Density
   4. Compressive strength

   For these tests, the sample shall be selected by the certification executive.

3. Re-evaluation test

   A type test shall be conducted every 5 years on the model appeared on the licence. A full type test is also required when there is significant change in the product design, raw material used and/or production facilities.

4. Full type test shall be conducted at any of the following:

   a. The licensee's facility (when it has been certified acceptable to SIRIM QAS International Sdn Bhd) witnessed by the project officer/competent personnel from SIRIM QAS International Sdn Bhd.

   b. Third party laboratories acceptable to SIRIM QAS International Sdn Bhd.

   c. SIRIM QAS International Sdn Bhd testing laboratories.

COMPONENT LIST

[illegible]	[illegible]	[illegible]
1. Cement	Type: 1. Pulverised fuel ash cement 2. Portland fly ash cement	•Certified to MS 1227: 2003 •Certified to MS 522: Part 1:2007 (CEM II/A-V 52.5 N)
2. Quarry dust	Type: Granite quarry dust	Size: <5.0mm
3. Aggregate	Type: Granite aggregate	Size: 10mm (3/8")
4. Sand	Type: mining sand	Size: <5.0mm
5. Water	Tap water	Supplied by JBA

MIX RATIO/ COMPOSITION

No	[illegible]	[illegible]
1.	Cement	80 kg
2.	Quarry dust	110 kg
3.	Aggregate	200 kg
4.	Sand	650 kg
5.	Tap water	Varies

Brick density: 1947 kg/m^3

DRAWING/SKETCH

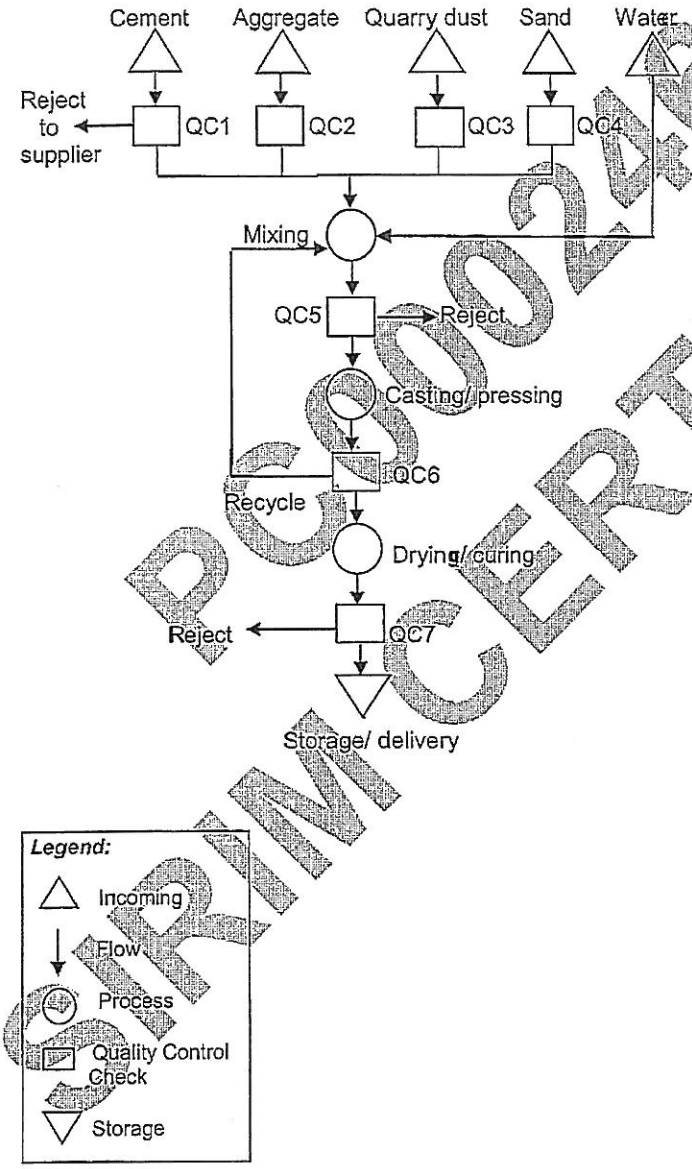
Refer to the following test report no. & page:

[illegible]	[illegible]	[illegible]	[illegible]
Drawing 1	General construction of the brickwall	2011FE0078	15/20
Drawing 2	Detail of the cement brick	2011FE0078	16/20

TYPE TEST REPORT

Date	Test Report No.	Laboratory	Results & Remarks
09/03/2011	Full test report: 2011FE0078	Fire Protection Section, Testing Services Dept., SIRIM QAS International Sdn. Bhd.	Tested to BS 476: Pt.22: 1987- Methods for determination of the fire resistance of non-load bearing elements of construction. Tested clause: Clause 5: Determination of fire resistance of partition. Result: Integrity : 130 minutes Insulation : 130 minutes Average thickness of plastering: 9.5mm
23/02/2011	Full test report: 2011CB7685	Civil & Construction Section, Testing Services Dept., SIRIM QAS International Sdn. Bhd.	Tested to BS 6073: Pt.1: 1981 for physical performance. Tested clause: • Clause 9-Dimension • Clause 10-Strength • Clause 11-Drying shrinkage Result: Full compliance

PROCESS FLOW CHART



*Note: QC1, QC2, QC3 & QC4 NG will be returned to the supplier.
Other QC will have the possibility of being recycled, rework, or reject.

QC CHECK POINTS

QC No.	Item Inspected	Test/Inspection	Frequency
1	Cement	Verification of COA: a. Type b. Certified to MS 1227	Once/ month
2	Aggregate	Sieve analysis	Weekly
3	Quarry dust	Sieve analysis	Weekly
4	Sand	Sieve analysis	Weekly
5	Mixed materials	Mixing composition of raw materials	Every mix
6	Green brick	Dimension check: a. Length b. Width c. Height Visual/ appearance	4 times/ day
7	Finished product	a. Dimension b. Density c. Compressive strength	1-day age (3 samples) 14-days & 28-days age (10samples)

TEST EQUIPMENT

The applicant undertakes to maintain (calibrate, verify or both) the following test equipment in the factory.

No.	Equipment	Range/ parameter/ caliber / etc	Frequency
1.	Weighing scale (Cement hopper)	(0 – 250) kg	Yearly
2.	Weighing scale (Aggregate, quarry dust, Sand hopper)	(0 – 1000) kg	Yearly
3.	Compression machine	(200 – 1800) kN	Yearly
4.	Spring balance	(0 – 30) kg	Yearly
5.	Steel ruler	(0 – 300) mm	Once
6.	Measuring tape	(0 – 8000) mm	Once
7.	Vernier caliper	(0 – 200) mm	Yearly
8.	Test sieve	(9.5, 4.75, 2.36, 1.18) mm & (150, 300, 600) µm	Once

MARKING

Example of SIRIM Certification Mark;

SIRIM
Certified to: BS 6073: Part 1: 1981
BS 476: Part 22: 1987
Certification No.: PCXXXXXX*

*Note : Please refer to the number printed to the license

SIRIM QAS International Sdn.Bhd. (Company No.: 410334-X)
No.1, Persiaran Dato' Menteri, P.O.Box 7035, Section 2,
40911 Shah Alam, Selangor Darul Ehsan, Malaysia
Tel. no: 03- 55445853 / 55445854
Fax. no: 03-55445886

MS ISO/IEC 17025
TESTING
SAMM NO. 085

TEST REPORT

REPORT NO.: 2010CB7685	PAGE : 1 OF 3

Applicant	:	PRODUCT CERTIFICATION SECTION PRODUCT CERTIFICATION & INSPECTION DEPARTMENT (Attn. : En. Mohd Shaharin Ahmad Latif)
Manufacturer	:	CKYJ (M) SDN. BHD. Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, 48020 Rawang, Selangor Darul Ehsan.
Product	:	Cement Brick (Solid with Groove)
Reference Standard/ Method of test	:	BS 6073 : Part 1: 1981 Precast Concrete Masonry Units Part 1. Specification for Precast Concrete Masonry Units Clause 9 - Dimensional Deviations Clause 10 - Compressive Strength Clause 11 - Drying Shrinkage
Description of sample	:	Forty (40) pieces of Cement Bricks were received for testing through Product Certification Section (Ref No : PC 045202, Dated : 18 / 10 / 2010) Nominal size : 200 mm x 100 mm x 100 mm Brand : CKY Model : Full Brick
Date received	:	30th November 2010
Job no./Ref. no.	:	J20105047685/SQAS/CCST/T.REC/CSL/04
Issued date	:	23 FEB 2011

Approved Signatories

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

(HANON NAZIR MOHD BASIR)
Senior Technical Executive

(YM RAJA NOR SIHA BT. RAJA ABD. HANAN)
Group Leader
Civil & Construction Section
Testing Services Department

TEST REPORT

REPORT NO.: 2010CB7685	PAGE : 2 OF 3

TEST RESULT :

Product	:	Cement Bricks (Solid with Groove)
Method of Test	:	BS 6073: Part 1 :1981 Precast Concrete Masonry Units. Part 1 : Specification for Precast Concrete Masonry Units
Nominal Size	:	200m x 100 mm x 100 mm

Dimensional Deviations

Clause	Specification	Test Result			Remarks
		Length (mm)	Height (mm)	Thickness (mm)	
9	Dimensional Deviations Length: + 4 mm - 2 mm Height: + 2 mm - 2 mm Thickness: + 2 mm - 2 mm	1. 200 2. 200 3. 201 4. 199 5. 200 6. 200 7. 200 8. 200 9. 200 10. 200	100 100 100 100 100 100 100 100 100 100	100 100 100 100 100 100 100 100 100 100	**Complied**
	Average	**200**	**100**	**100**	

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

23 FEB 2011

TEST REPORT

REPORT NO.: 2010CB7685	PAGE : 3 OF 3

TEST RESULT :

Product	:	Cement Bricks (Solid with Groove)
Method of Test	:	BS 6073: Part 1 :1981 Precast Concrete Masonry Units. Part 1: Specification for Precast Concrete Masonry Units
Nominal Size	:	200m x 100 mm x 100 mm

Clauses	Specifications	Test Results	Remarks
10	Strength.		
10.1	The average crushing strength of ten masonry units shall be : (a) not less than G i.e 7.0 N/mm^2 And (b) not less than 6.7 N/mm^2 as calculated from 0.9G + 0.62s	1) 11.0 N/mm^2 2) 11.0 N/mm^2 3) 10.5 N/mm^2 4) 14.0 N/mm^2 5) 12.0 N/mm^2 6) 12.0 N/mm^2 7) 13.0 N/mm^2 8) 10.5 N/mm^2 9) 12.0 N/mm^2 10) 11.5 N/mm^2 **Average : 11.8 N/mm^2**	**Complied**
11	Drying Shrinkage The average of drying shrinkage tested in accordance with appendix D shall not exceed 0.06%	**0.03%**	**Complied**

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

2 3 FEB 2011

Product Certification Section
Product Certification & Inspection Department
SIRIM QAS International Sdn. Bhd.
Block 25, SIRIM Complex
No. 1, Persiaran Dato' Menteri
P.O. Box 7035, 40911 Shah Alam
Selangor Darul Ehsan, Malaysia
Tel: 603-5544 6409 Fax: 603-55446466

SIRIM
ECO-LABEL

APPLICATION FOR SIRIM ECO-LABELLING CERTIFICATION

PART A : APPLICATION DETAILS

1. Applicant's Information

Details of applicant. Only person who has authority in relation to eco-labelling certification process, product quality and/or manufacturing process should be named as authorized representative.

Name of Company	Proven Engineering Blocks Sdn. Bhd.		
Address	No. 11, Medan Setia Satu, Plaza Damansara, Bukit Damansara, Kuala Lumpur.	Post code	50490
Business Reg. No.	820839 T		
Authorized Representative	Siti Hanum Binti Khatani	Position	Admin Executive
Phone No.	03 - 20932703 / 36 / 63	Fax No.	03 - 20932316
Email	Provenholding@gmail.com	Web Site	www.provenholding.com

2. Factory's / Manufacturer's Information

This section need to be completed if the above applicant is not manufacturing the product. Only person who has authority in relation to eco-labelling certification process, product quality and/or manufacturing process should be named as authorized representative.

Name of Manufacturer	Proven Engineering Blocks Sdn. Bhd.		
Address	Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, Rawang, Selangor	Post code	48020
Business Reg. No.	820839 T		
Authorized Representative	Mohd Hasnizan Bin Harun	Position	Assistant Factory Manager
Phone No.	03 – 60342513 / 2522	Fax No.	03 - 60342546
Email	hasnizur@yahoo.com.my	Web Site	www.provenholding.com

Please attach:

1. A route map to the factory
2. Company organization chart

DITERIMA
18 JAN 2015
Sales, Marketing and Business Development Section, SIRIM QAS INTERNATIONAL SDN. BHD.

SIRIM QAS International Sdn. Bhd. (410334-X)
SIRIM Complex, No. 1, Persiaran Dato' Menteri, P.O. Box 7035, 40700 Shah Alam,
Selangor Darul Ehsan, Malaysia. Tel: 603-5544 6402 Fax: 603-5544 6787
Web Site: www.sirim-qas.com.my Email: qas_marketing@sirim.my

PRODUCT / ECO-LABELLING CERTIFICATION QUESTIONNAIRE

A. APPLICANT's INFORMATION

1. Name and Address of Applicant

Only person who has authority in relation to certification process, product quality and/or process should be named as contact person for the applicant / factory / manufacturer as appropriate

Company Name	Proven Engineering Blocks Sdn. Bhd.		
Company Address	No. 11, Medan Setia Satu, Plaza Damansara, Bukit Damansara, Kuala Lumpur.	*Post code*	50490
Business Reg.	820839 T		
Contact Person 1	Siti Hanum Binti Khatani	Position	Admin Executive
Contact Person 2		Position	
Phone No.	03 - 20932703 / 36 / 63	Fax No.	03 - 20932316
Email	Provenholding@gmail.com	Web Site	www.provenholding.com

2. Factory's / Manufacturer's Information

*This section shall be completed if the factory is located at different address from the above **OR** the product is not manufactured by the applicant.*

Manufacturer Name	Proven Engineering Blocks Sdn. Bhd.		
Manufacturer Address *(if different from above)*	Lot 1245, Jalan Kundang, Kawasan Perindustrian Kundang, Rawang, Selangor	Post code	48020
Business Reg.	820839 T		
Contact Person 1	Mohd Hasnizan Bin Harun	Position	Assistant Factory Manager
Contact Person 2	Nurul Ibrah Bt. Halmi	Position	QA/QC Officer
Phone No.	03 – 60342513 / 2522	Fax No.	03 - 60342546
Email	hasnizur@yahoo.com.my	Web Site	www.provenholding.com
No. of Staff	Production: Eleven persons		
	QA / QC Laboratory: Two persons		

3. Other Certification Currently Held by the Manufacturer (if any)

Please provide the type of certification and its certification body (if any).

Type of Certification	Tick (✓) if any	Name of Certification Body :
ISO 9001		N.A
ISO 14001		N.A
ISO 18001		N.A
Product Certification	✓	Product: Cement Brick Solid With Groove Standard: BS 476 : PART 22 : 1987 BS 6073 : PART 1 : 1981
Others *(Please specify)* *eg CE,HACCP, HALAL*		N.A

DITERIMA
18 JAN 2013
Sales, Marketing and Business Development Section
SIRIM QAS INTERNATIONAL SDN. BHD.

SIRIM QAS International Sdn.Bhd. (Company No.: 410334-X)
No.1, Persiaran Dato' Menteri, P.O.Box 7035, Section 2,
40700 Shah Alam, Selangor Darul Ehsan, Malaysia
Tel. no: 03- 55445853/55445854
Fax. no: 03-55445886

TEST REPORT

REPORT NO.: 2012CB6686	PAGE : 1 OF 4

Applicant. : PROVEN ENGINEERING SDN BHD
No 11, Medan Setia Satu,
Plaza Damansara,
Bukit Damansara,
Kuala Lumpur.

Manufacturer : PROVEN ENGINEERING SDN BHD

Product : Precast Concrete Masonry Unit (Cement Brick – Solid with Groove)

Reference Standard/ Method of Test : ISO 140-3:1995
Acoustics-Measurement of Sound Insulation in Buildings and Of Building Elements
Part 3: Laboratory Measurements of Airborne Sound Insulation of Building Elements

Description of Sample : Precast Concrete Masonry Unit (Cement Brick – Solid with Groove) with size of 200 mm x 100 mm x 100 mm was installed to the test opening by the applicant. The installation covered the whole of test opening with the dimension of 3.60 meter in height x 2.80 meter in width. Both sides of the wall were plastered with thickness of 5 mm.

Brand	:	ENGINEERING BLOCK
Model	:	Full Brick
Density	:	2000 kg/m^3
Thickness	:	100 mm

Date Received : 25th October 2012

Job No / Ref No. : J20121266686 / SQAS / CCST / T.REC / BPL / 17

Issued Date : 20 DEC 2012

Approved Signatories

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

(FAIZ MOHD YUSUF)
Senior Technical Executive

(YM RAJA NOR SIHA RAJA ABD. HANAN)
Head
Civil & Construction Section
Testing Services Department

TEST REPORT

Test Method : ISO 140-3:1995
Acoustics-Measurement of Sound Insulation in Buildings and Of Building Elements
Part 3 : Laboratory Measurements of Airborne Sound Insulation of Building Elements

Reverberation Room : The test laboratory consists of two interconnected reverberant chambers. The source room (Chamber 1) has a volume of 202.2 m^3 and a total surface area of 209 m^2. Receiving room (chamber 2) has a normal volume of 268 m^3 and total surface area of 253 m^2.

Instrumentation :
1) B&K Sound Source Type 4224
2) B&K Rotating Microphone Boom Type 3923
3) DELL Latitude with Pulse Software
4) B&K Type 3560C Front-end
5) B&K Acoustic Calibrator Type 4231

Test Procedure : The test has been conducted in general conformance with the ISO 140–3 :1995 Acoustics-Measurement of sound insulation in buildings and of building elements. Part 3: Laboratory measurements of airborne sound insulation of building elements. ISO 717-1:1996 Acoustics-Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation.

The test specimen was installed in the opening between two reverberation rooms. An approximate diffuse sound field had been produced and measured in one room designated as the source room or transmitting room.

The sound reduction index (in dB) had been calculated in accordance with ISO 140-3: 1995 Section 3.2 Equation (5) at one-third octave centre frequency from 100 Hz to 5000 Hz. The calculated sound reduction index data was compared with the standard reference contour to obtain a single number weighted sound reduction index (R_w).

$$R = L1 - L2 + 10 \log (S/A)$$

Where,

L1 = Average sound pressure level in source chamber
L2 = Average sound pressure level in receiving chamber
S = Area of test specimen
A = Sound absorption coefficient

Test Opening : The dimension of the completed test opening for the measurement of sound transmission loss in compliance with ISO 140 Part 3, with 3.60 meter height and 2.80 meter width. The maximum test area, based on measured dimension is 10 m^2.

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

20 DEC 2012

TEST REPORT

REPORT NO.: 2012CB6686	PAGE : 3 OF 4

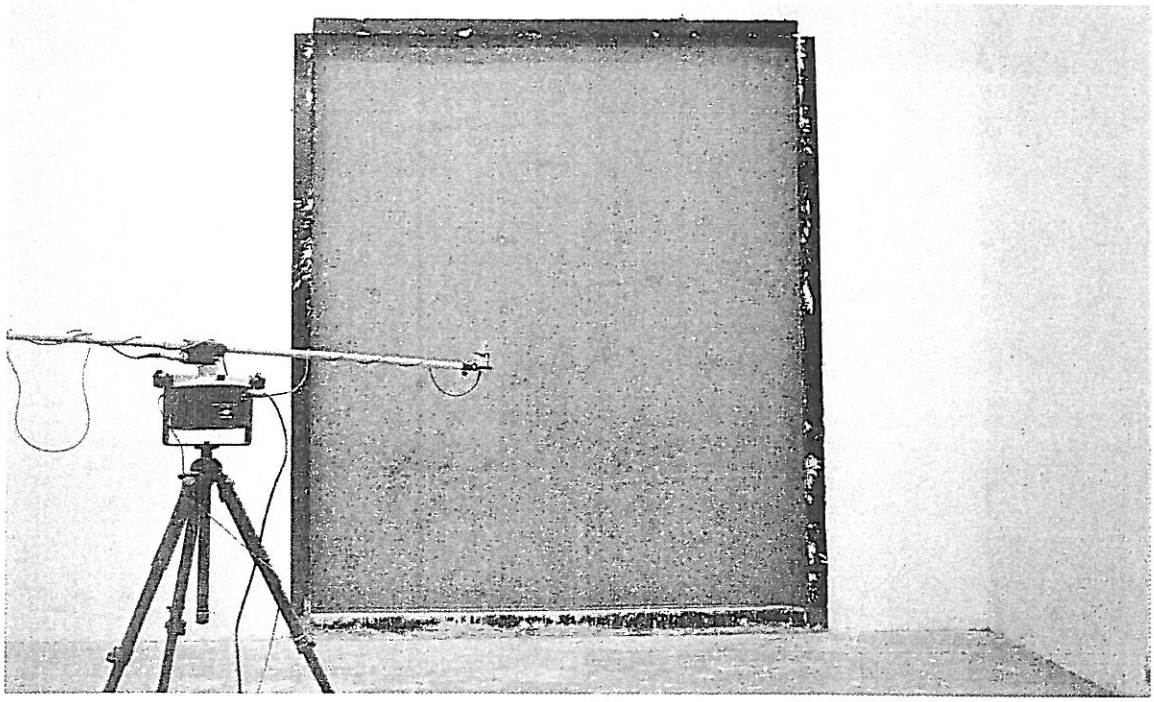


Photo 1: Test setup in Receiving Room

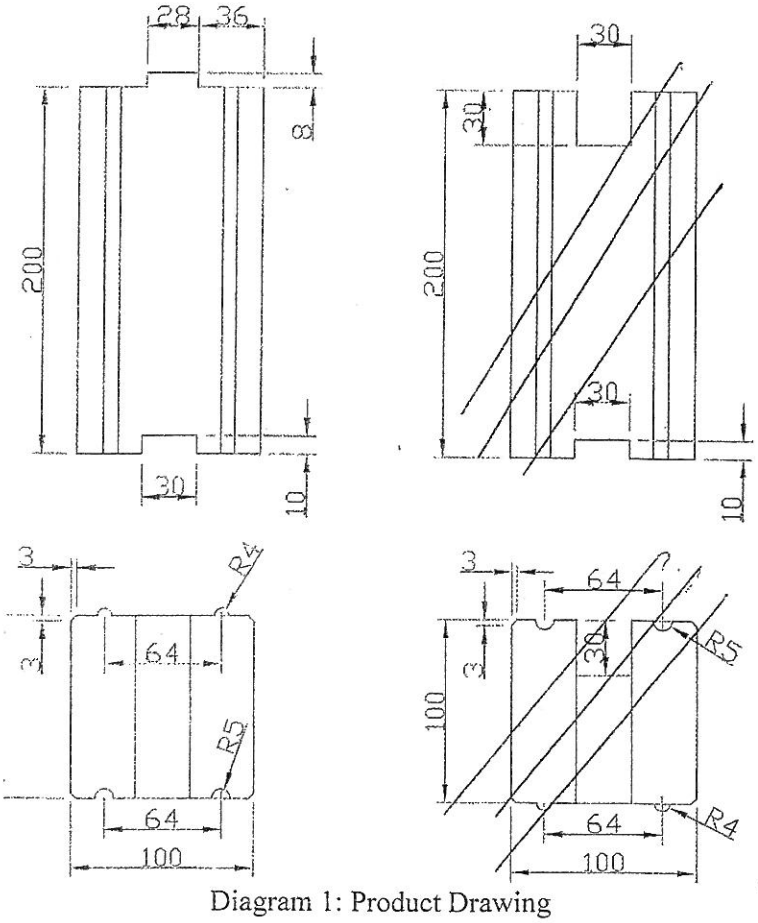


Diagram 1: Product Drawing

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

20 DEC 2012

TEST REPORT

REPORT NO.: 2012CB6686	PAGE : 4 OF 4

Sample : Precast Concrete Masonry Unit (Cement Brick – Solid with Grove)
Brand : ENGINEERING BLOCK Density : 2000 kg/m^3
Model : Full Brick Thickness : 100 mm

Test Condition : Temperature = 26.6 °C Humidity = 68 %

Table 1 : Sound Reduction Index Determination of Precast Concrete Masonry Unit (Cement Brick – Solid with Grove)

Frequency (Hz)	Sound Reduction Index (dB)	Reference (dB)
100	42.1	30
125	38.5	33
160	39.0	36
200	39.2	39
250	36.7	42
315	40.6	45
400	40.1	48
500	42.7	49
630	46.2	50
800	49.1	51
1000	52.7	52
1250	55.8	53
1600	57.4	53
2000	60.5	53
2500	62.9	53
3150	65.8	53
4000	66.0	53
5000	59.8	53
R_W	49 dB	

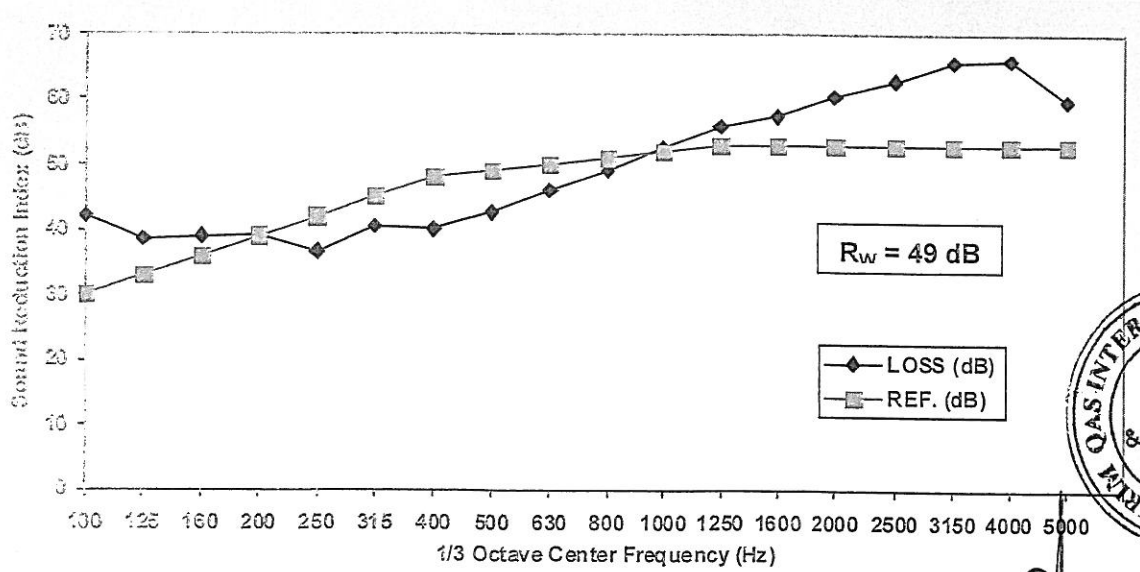


Figure 1: Sound Reduction Index for Precast Concrete Masonry Unit (Cement Brick – Solid with Grove)

SIRIM QAS INTERNATIONAL Civil & Construction Section

20 DEC 2012

QUESTION 2

APPENDIX 4

(Test Report)

SIRIM QAS International Sdn.Bhd. (Company No.: 410334-X)
No.1, Persiaran Dato' Menteri, P.O.Box 7035, Section 2,
40700 Shah Alam, Selangor Darul Ehsan, Malaysia
Tel. no: 03-5544 5853 / 5544 5854
Fax. no: 03-5544 5886

TEST REPORT

REPORT NO.: 2012CB4640	PAGE : 1 OF 2

Applicant	:	PROVEN ENGINEERING BLOCKS SDN. BHD. No: 11, Medan Setia Satu, Plaza Damansara, Bukit Damansara, 50490 Kuala Lumpur
Manufacturer	:	PROVEN ENGINEERING BLOCKS SDN. BHD. Lot 1245, Jalan Kundang Kawasan Perindustrian Kundang Mukim Gombak 48020 Rawang Selangor Darul Ehsan
Product	:	Brick
Reference Standard/ Method of test	:	AS/NZS 4456.14: 2003 Masonry Units, segmental pavers and flags – Methods of test Methods 14: Determination water absorption properties
Description of sample	:	Fifteen (15) pieces of Brick were received for testing. Brand: Engineering Block Model: Full Brick Nominal size: 200 mm × 100 mm × 100 mm
Date received	:	25th July 2012
Job no./Ref. no.	:	J20121264640/SQAS/CCST/T.REC/CSL/04
Issued date	:	07 AUG 2012

Approved Signatories

(HANON NAZIR MOHD BASIR)
Senior Technical Executive

(YM RAJA NOR SIHA BT. RAJA ABD. HANAN)
Head
Civil & Construction Section
Testing Services Department

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

TEST REPORT

REPORT NO.: 2012CB4640	PAGE : 2 OF 2

TEST RESULT:

Product	:	Brick
Brand:	:	Engineering Block
Model	:	Full Brick
Nominal size	:	200 mm × 100 mm × 100 mm
Method of Test	:	AS/NZS 4456.14: 2003 Masonry Units, segmental pavers and flags – Methods of test Methods 14: Determination water absorption properties

Standard Test Method	Test Results
Determination Water absorption properties Clause 9.2: Cold Water 24 hours immersion test	Water Absorption 1) 7.1 % 2) 7.3 % 3) 7.5 % 4) 7.3 % 5) 7.3 % 6) 6.5 % 7) 7.0 % 8) 7.2 % 9) 6.9 % 10) 7.2 % **Mean: 7.1 %**

SIRIM QAS INTERNATIONAL SDN. BHD. Civil & Construction Section

0 7 AUG 2012

aalborgportland
CEMENTIR HOLDING

SECTION 1- PRODUCT IDENTIFICATION

Aalborg Portland Malaysia Sdn. Bhd. (275155-P)
Lot 75244, Pinji Estate,
P.O.Box 428, 30750 Ipoh,
Perak Darul Ridzuan
Malaysia
Emergency phone # : +605-3218988
Product identity :SCI Skimgrip Thinbed Adhesive

SECTION 2- INGREDIENTS & HAZARDOUS COMPONENTS

Ingredient Name	CAS Number	Percent	Index	Risk Phrases
Portland Cement	65997-15-1	> 35	Xi	R38, R41
Calcium Carbonate	1317-65-3	> 10		
Quartz sand	14808-60-7	< 55		

SECTION 3- HAZARD IDENTIFICATION

Hazard designation : Xi Irritant
Hazard to man and environment : R38 Irritating to skin, R41 Risk of serious damage to eyes.
Particulate Dust TLV : 10 mg/m^3 of air.

SECTION 4-PHYSICAL DATA

Appearance : White sandy powder.
PH : Approximately 12 at 20 °C saturated solution.

SECTION 5- FIRE AND EXPLOSION DATA

Flash Point : N/A
Explosive Limit : N/A
Extinguishing Media : CO_2 , extinguishing powder or water spray jet.

SECTION 6 – HEALTH HAZARD DATA

Health Effects

Eyes : Short-term exposure, irritating. Long term exposure, irritating may cause inflammation of the cornea.
Skin : Irritation.

Personal Protection :Use of impervious gloves, boots and clothing to protect the skin from contact with dust and wet mixture.
In dusty environments, the use of dust mask is advised.

SECTION 10 – STABILITY AND REACTIVITY

Stable when stored correctly, no dangerous reactions or decomposition products known.

SECTION 11 – TOXICOLOGICAL INFORMATION

Strong effect for the eyes with danger of serious damage to eyes. Irritant effect on the skin and mucous membranes

SECTION 12 – ECOLOGICAL INFORMATION

Stable in soil. Slightly hazardous. Do not allow large quantities to reach the ground water, rivers, drainage and sewage systems. Soil and ground water in contact with freshly set and hardened mortar may become more alkaline. The rise in pH may be toxic to some forms of aquatic life in certain circumstances and to plants.

SECTION 13 – DISPOSAL CONSIDERATIONS

Dispose the empty bags or surplus product at a place authorized to accept builder waste. Product must be disposed of with household waste.

SECTION 14 – TRANSPORT INFORMATION

Not classified as hazardous for transport purposes.

SECTION 15 – OTHER INFORMATION

Use only for the purposes intended. This information is based on our present state of knowledge and is intended to describe our product form the point of view of the safety requirement. It should not be construed as guaranteeing specific properties.

aalborgportland
CEMENTIR HOLDING

SKIM GRIP WHITE THIN BED ADHESIVE

PRODUCT DESCRIPTION

Skim grip white thin bed adhesive is a pre-blend of white Portland, specially sized inert aggregates and approved chemical additives. It is cement based adhesive for clay / cement bricks, cement/ light weight blocks and tiles. It has good workability and strong adhesion. It is pre packed and just by adding the required amount of water it is ready for application.

TECHNICAL DATA

Colour	: White
Density	: 1.4gm/cm^3
Thickness	: 3mm thickness
Coverage	: 3.5kg - 4.5kg /m^2 using notch trowel
Opening time	: about 20 minutes
Initial setting time	: 5 hours
Compressive Strength	: 170kg/cm^2
Bonding Strength (tensile)	: 0.20N/mm^2
Storage	: 6 months if product is stored in cool dry place.
Packing	: 40 kg per bag

INSTRUCTIONS FOR USE

Ensure surfaces are sound, clean and free from any contamination materials.

Mix the powder with about 35% to 40% of clean water for laying of bricks/blocks and 18% to 20% for laying of tiles.

Thoroughly mix using an electric drill with stirrer attachment until the mix is homogenous.

Apply onto the bricks or blocks with a notch trowel or a dispenser.

SAFTY PRECAUTION

Skim grip white thin bed adhesive contains Portland Cement and carefully selected additives. Normal safety wear such as rubber gloves, dust mask and safety glass, used to handle conventional cement based products should be worn.

FIRE RESISTANCE

The product is non combustible.

Disclaimer

All information is only intended to give a fair description of the products and their capabilities under such specific test conditions. However, it does not constitute an offer of warranty by the manufacturer not a guarantee of it's accuracy or completeness in describing the performance or suitability of the various products.

SIRIM QAS International Sdn.Bhd. (Company No : 410234-X)
No 1, Persiaran Dato' Menteri, P.O.Box 7035, Section 2,
40911 Shah Alam, Selangor Darul Ehsan, Malaysia
Tel. no: 03- 55446451
Fax. no: 03-5544646

TEST REPORT

REPORT NO.: 2006CB0700	PAGE : 1 OF 2

Applicant	:	AALBORG ASIA WHITE SDN. BHD. (SCI DIVISION) UNIT 401, LEVEL 4, UPTOWN 2, NO. 2 JLN. SS21/37, DAMANSARA UPTOWN, 47400 PETALING JAYA, SELANGOR
Manufacturer	:	AALBORG ASIA WHITE SDN. BHD. (SCI DIVISION)
Product	:	Thin Bed - Adhesive
Reference Standard/ Method of test	:	ASTM D4541 - Pull Off Strength
Description of sample	:	A 300mm x 300mm x 40mm of concrete slab with thin bed-adhesive overlay was received for testing. Brand : SCI SKIMGRIP Marking : SKIMGRIP THIN BED-ADHESIVE
Date received	:	10/05/2006
Job no./Ref. no.	:	J20065040596/SQAS/CBMT/T.REC/CSL/01
Issued date	:	02 JUN 2006

Approved Signatories

(YM RAJA NORSIHA)
Senior Technical Executive

SIRIM QAS INTERNATIONAL SDN. BHD. Construction & Building Materials Testing Section

(MOHD. FAUZI ISMAIL)
Senior Manager
Construction and Building Materials Testing Section
Testing Services Department

TEST REPORT

REPORT NO.: 2006CB0700	PAGE : 2 OF 2

Test Result:

Submittor : AALBORG ASIA WHITE SDN. BHD. (SCI DIVISION)
Product : Thin Bed - Adhesive
Method of Test : ASTM D 4541: 1995
Standard Test Method for Pull-Off strength of coatings Using Portable Adhesion Testers

Reference	Pull Off Strength (N/mm²)
1	0.20
2	0.31
3	0.15
4	0.10
5	0.36
Mean	**0.22 N/mm²**

SIRIM QAS INTERNATIONAL SDN. BHD. Construction & Building Materials Testing Section

02 JUN 2006

APPENDIX F (6)

TEST REPORT

from Makmal Kerja Raya Malaysia

6. Compressive Strength Test

CREAM
Construction Research Institute of Malaysia

Rujukan: CREAM/06/2/56 (001)
Tarikh : 15 hb Oktober 2012

Proven Engineering Block Sdn Bhd
No. 11, Medan Setia 1,
Plaza Damansara, Bukit Damansara,
50490 Kuala Lumpur
(u/p: Miss Ivy Lee Su Foong / En Azhar Mohd Nor)

Tuan,

LAPORAN UJIAN MAKMAL KEKUATAN MAMPATAN BATA
NO. LAPORAN UJIAN: TR1/10284/PEB/01

Dengan segala hormatnya perkara di atas adalah dirujuk.

2. Bersama-sama ini disertakan laporan keputusan ujian Kekuatan Mampatan Bata yang telah dijalankan ke atas sampel pihak tuan. Pihak CREAM telah menerima sampel sebanyak 9 batu bata pada 11 Oktober 2012oleh wakil tuan (En Azhar bin Mohd Nor - 600203065137). Ujian telah dijalankan pada 11 Oktober 2012 dan mengikut prosedur BS EN 772-1:2000.

3. Untuk makluman, laporan ujian mengandungi 2 helaian (seperti yang dilampirkan). Daripada perbincangan yang telah dipersetujui berkenaan pembayaran adalah melalui bayaran tunai sahaja.

Sebarang pertanyaan dan maklumat lanjut, sila berhubung dengan pihak kami di talian **03-9281 0800** atau emel kepada syedhazni@cidb.gov.my

Sekian, terima kasih.

Yang benar,

En Ahmad Hazim bin Abd. Rahim
Pengurus Makmal Kerja Raya Malaysia
Construction Research Institute of Malaysia (CREAM)

(646889-V)
CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA (CREAM)
Makmal Kerja Raya Malaysia.
IBS Centre, 1st Floor, Block E, Lot 8, Jalan Chan Sow Lin,
55200 Kuala Lumpur, MALAYSIA
Tel • +603-9281 0800 Fax • +603-9282 4800
Website : http://www.cream.com.my

CREAM
Construction Research Institute of Malaysia

Construction Research Institute of Malaysia (CREAM),
Makmal Kerja Raya Malaysia, Lot 10 & 11, Seksyen 91,
Jalan Chan Sow Lin, 55200 Cheras, Kuala Lumpur.
Tel: +603 - 2617 0362 Fax: +603 - 4045 6828
Email: general@cream.com.my Website: http://www.cream.com.my

TEST REPORT

TR1

Type of Test : **Determination of Compressive Strength of Bricks**

Test Method : As stated on result sheet

Date of Issue : 11th October 2012

Name of Client : **Proven Engineering Block Sdn Bhd**

Address (Office) : No 11, Medan Setia, Plaza Damansara
50490 Kuala Lumpur
Tel : 013-2179464 Fax :

Address (Site) : **(u/p: En Mohd Azhar / Miss Ivy Lee Su Foong)**

Project Title : -

Detail of Tested Specimens

Job Ref. No. : **CREAM/06/2/56 (1)**

No. of Specimen : 9 unit sampel

Nominal Size of Specimen : 200 mm x 100 mm x 100 mm

Date of Delivery : 11th October 2012

Delivered By : En Azhar bin Mohd Nor

I/C No. : 600203065137

Date of Test : 11th October 2012

Tested By : Hairuddin bin Sukimin

I/C No. : 780219-08-7279

Prepared by :	Certified by :
(I/C No.: 800722-14-5523)	(I/C No.: 770624-06-6157)
Name Syed Hazni Abd Gani Test Engineer Construction Research Institute of Malaysia	Name : Ahmad Hazim Abdul Rahim Lab Manager Construction Research Institute of Malaysia (CREAM)

CREAM
Construction Research Institute of Malaysia

Construction Research Institute of Malaysia (CREAM),
Makmal Kerja Raya Malaysia, Lot 10 & 11, Seksyen 91,
Jalan Chan Sow Lin, 55200 Cheras, Kuala Lumpur.
Tel: +603 - 2617 0362 Fax: +603 - 4045 6828
Email: general@cream.com.my Website: http://www.cream.com.my

TEST REPORT | **TR1**

COMPRESSION TEST ON BRICKS

Standard References : BS EN 772-1 : 2000

Bricks Marking	Date Tested	Weight (kg)	Total area of Imposed Load (mm²)	Max. Applied Load (kN)	Comp. Strength (N/mm²)	Ave. Comp. Strength (N/mm²)
Sample 1	11/10/2012	4.528	20842.5	297.1	14.25	11.87
Sample 2	11/10/2012	4.254	20930.0	342.2	6.35	
Sample 3	11/10/2012	4.230	21070.0	295.0	14.00	
Sample 4	11/10/2012	4.166	20842.5	344.1	16.51	
Sample 5	11/10/2012	4.236	20912.5	253.5	12.12	
Sample 6	11/10/2012	4.151	20930.0	215.5	10.30	
Sample 7	11/10/2012	4.190	20877.5	294.9	14.13	
Sample 8	11/10/2012	4.174	20947.5	198.3	9.47	
Sample 9	11/10/2012	4.088	20877.5	203.3	9.74	

Description : The surface have been grinded to comply with clause 7.2.4
The frog is intended to be filled with the mortar in practice to comply with clause 7.4.2

Tested by : HAIRUDDIN SUKIMIN

Prepared by :

(I/C No.: 800722-14-5523)
Name : Syed Hazni Abd Gani
Test Engineer
Construction Research Institute of Malaysia

Certified by :

(I/C No.: 770624-06-6157)
Name : ...mad Hazim Abdul Rahim
Lab Manager
Construction Research Institute of Malaysia
(CREAM)

Report Ref. No. : TR1/10284/PEB/01

APPENDIX F (7)

TEST REPORT

from Proven Engineering Block Sdn Bhd

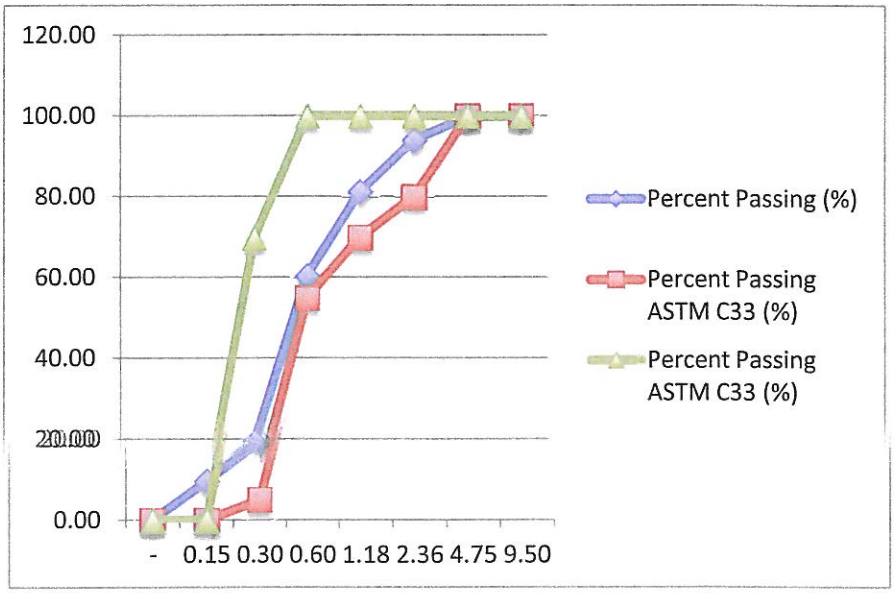
7. Sieve Test

Quality Material Approval

Sieve Analysis of Coarse Sand

Testing Date	07.01.2013
Product	Quarry Dust
Supplier	C.C.Y TRADING
General Description	
Weight	5.6

Sieve Opening		Weight of Sieve (kg)	Weight of Sieve + Sand (kg)	Mass Retained (kg)	Percent Retained (%)	Percent Acc Retained (%)	Percent Passing (%)	Percent Passing ASTM C33 (%)
No	mm							
Pan	-	0.480	1.020	0.54	9.64	100	0.00	-
100	0.15	0.570	1.115	0.55	9.73	90.3571	9.64	0 - 0
50	0.30	0.570	2.875	2.31	41.16	80.625	19.38	5 - 70
30	0.60	0.580	1.745	1.17	20.80	39.4643	60.54	55 - 100
16	1.18	0.595	1.305	0.71	12.68	18.6607	81.34	70 - 100
8	2.36	0.805	1.125	0.32	5.71	5.98214	94.02	80 - 100
4	4.75	0.670	0.685	0.02	0.27	0.26786	99.73	100 - 100
3/8"	9.50	0.650	0.650	0.00	0.00	0.00	100.00	100
Total		4.920	10.520	5.60				



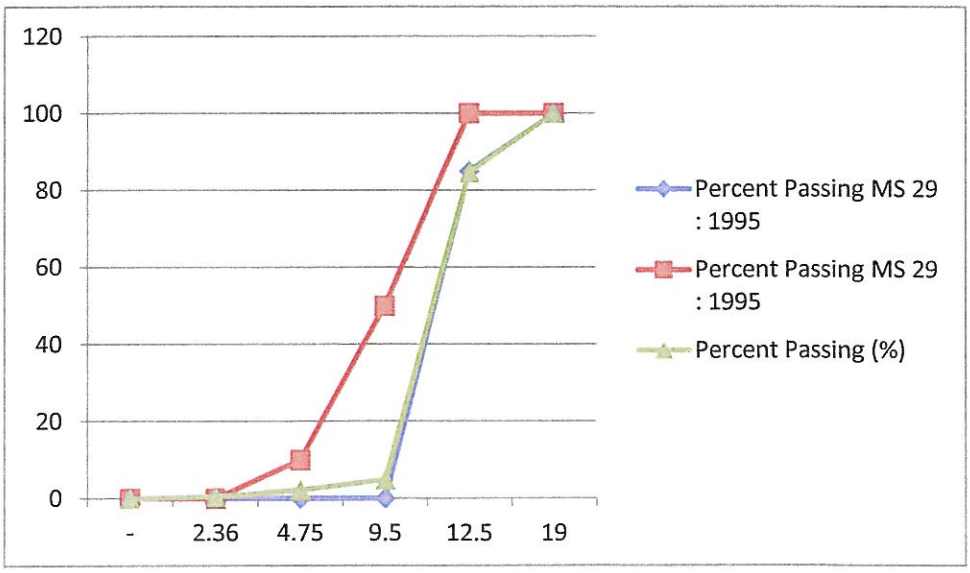
Prepared by	Checked by	Date
Nurul Ibrah Halmi	Azha Mohd Noor	7/1/2013

Quality Material Approval

Sieve Analysis of Aggregate 14 mm (Block & Brick)

Testing Date	09.01.2013
Product	Aggregate 14 mm
Supplier	C.C.Y TRADING
General Description	
Weight	6.14

Sieve Opening		**Weight of Sieve (kg)**	**Weight of Sieve + Sand (kg)**	**Mass Retained (kg)**	**Percent Retained (%)**	**Percent Acc Retained (%)**	**Percent Passing (%)**	**Percent Passing MS 29 : 1995**
No	**mm**							
Pan	-	0.480	0.510	0.03	0.49	100.00	0.00	-
#8	2.36	0.805	0.915	0.11	1.79	99.51	0.49	0 - 0
#4	4.75	0.670	0.830	0.16	2.61	97.72	2.28	0 - 10
3/8"	9.5	0.650	5.545	4.895	79.72	95.11	4.89	0 - 50
1/2"	12.5	0.650	1.595	0.945	15.39	15.39	84.61	85 - 100
3/4"	19	0.700	0.700	0	0.00	0.00	100.00	100
Total		3.955	10.095	6.14				



Prepared by Checked by Date

Nurul Ibrah Halmi

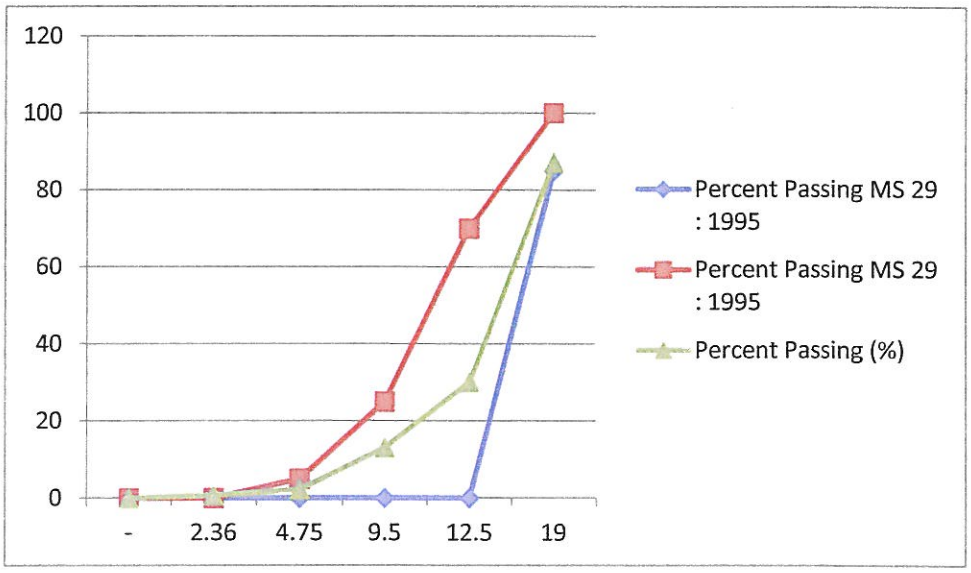
Azha Mohd Noor

Quality Material Approval

Sieve Analysis of Aggregate 20 mm (Slab)

Testing Date	09.01.2013
Product	Aggregate 20 mm (Slab)
Supplier	C.C.Y TRADING
General Description	
Weight	5.87
Standart	MS 29 : 1995

Sieve Opening		Weight of Sieve (kg)	Weight of Sieve + Sand (kg)	Mass Retained (kg)	Percent Retained (%)	Percent Acc Retained (%)	Percent Passing (%)	Percent Passing MS 29 : 1995
No	mm							
Pan	-	0.480	0.525	0.045	0.77	100.00	0.00	-
#8	2.36	0.805	0.895	0.090	1.53	99.23	0.77	0 - 0
#4	4.75	0.670	1.305	0.635	10.82	97.70	2.30	0 - 5
3/8"	9.5	0.650	1.645	0.995	16.95	86.88	13.12	0 - 25
1/2"	12.5	0.650	4.005	3.355	57.16	69.93	30.07	0 - 70
3/4"	19	0.700	1.450	0.750	12.78	12.78	87.22	85-100
Total		3.955	9.825	5.870				



Prepared by

Nurul Ibrah Halmi

Checked by

Azha Mohd Noor

Date

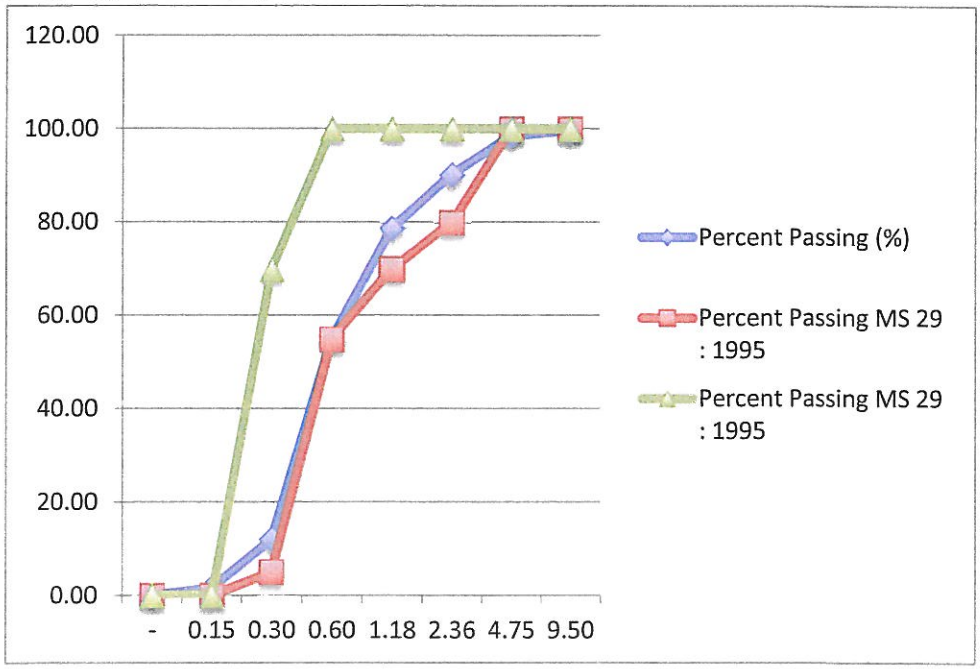
10/1/2013

Quality Material Approval

Sieve Analysis of Sand

Testing Date	07.01.2013
Product	Coarse Sand
Supplier	C.C.Y Trading
General Descriptio	
Weight	5.36
Standart	MS 29 : 1995

Sieve Opening		Weight of Sieve (kg)	Weight of Sieve + Sand (kg)	Mass Retained (kg)	Percent Retained (%)	Percent Acc Retained (%)	Percent Passing (%)	Percent Passing MS 29 : 1995
No	mm							
Pan	-	0.480	0.565	0.085	1.59	100	0.00	-
100	0.15	0.570	1.130	0.560	10.45	98.4142	1.59	-
50	0.30	0.570	2.875	2.305	43.00	87.9664	12.03	5 - 70
30	0.60	0.580	1.850	1.270	23.69	44.9627	55.04	55 - 100
16	1.18	0.595	1.215	0.620	11.57	21.2687	78.73	70 - 100
8	2.36	0.805	1.245	0.440	8.21	9.70149	90.30	80 - 100
4	4.75	0.670	0.730	0.060	1.12	1.49	98.51	100
3/8"	9.50	0.650	0.670	0.020	0.37	0.37	99.63	100
Total		4.920	10.280	5.360				



Prepared by

Nurul Ibrah Halmi

Checked by

Azha Mohd Noor

Date

7/1/2013

COMPRESSIVE STRENGTH TEST (BLOCKS / BRICKS)

31.10.2012

Full Brick

No.	Testing Date	Testing Time	Produced (Days)	Size of Sample (mm)			Weight of Sample	Strenght Test			Note
				Length	Width	Height		Load kN	Compress N/mm²	Density (kg/m³)	
1	2.11.12	3.15 pm	2	200	100	100	4.025	113.44	5.67	2012.50	
2				200	100	100	3.975	106.10	5.31	1987.50	Average = 5.94
3				200	100	100	4.010	136.65	6.83	2005.00	
1	14.11.12	4.15 pm	14	200	100	100	4.020	199.84	9.99	2010.00	
2				200	100	100	4.135	211.13	10.56	2067.50	
3				200	100	100	4.120	178.95	8.95	2060.00	
4				200	100	100	4.130	158.80	7.94	2065.00	
5				200	100	100	4.115	177.82	8.89	2057.50	
6				200	100	100	4.115	178.52	8.93	2057.50	Average = 9.32
7				200	100	100	4.110	173.81	8.69	2055.00	
8				200	100	100	4.165	214.83	10.74	2082.50	
9				200	100	100	4.175	174.29	8.71	2087.50	
10				200	100	100	4.180	196.02	9.80	2090.00	
1	28.11.12	3.30 pm	28	200	100	100	3.985	232.26	11.61	1992.50	
2				200	100	100	4.080	258.19	12.91	2040.00	
3				200	100	100	4.095	270.49	13.52	2047.50	
4				200	100	100	4.065	243.34	12.17	2032.50	
5				200	100	100	3.970	220.84	11.04	1985.00	
6				200	100	100	4.085	249.90	12.50	2042.50	Average = 12.23
7				200	100	100	3.975	223.93	11.20	1987.50	
8				200	100	100	4.095	259.57	12.98	2047.50	
9				200	100	100	3.980	236.00	11.80	1990.00	
10				200	100	100	4.045	252.03	12.60	2022.50	

Formula Strenght Test Calculation :

Load (kN) ⇒ Refer To Actual Result

Compress (N/mm²) ⇒ $\frac{\text{(kN) x 1,000N}}{\text{Length x Width}}$ = N/mm²

Density (kg/mm³) ⇒ $\frac{\text{Weight (kg)}}{\text{Length x Width x Height}}$ = kg/mm³

Change From mm to meter

Checked by	Approved by

COMPRESSIVE TEST (BLOCK)

DATE PRODUCE : 31.10.2012

(> 2 Day)	(> 14 Days)	(> 28 Days)
DATE TEST : 2.11.12	DATE TEST : 14.11.12	DATE TEST : 28.11.12
TEST BY : Faizi	TEST BY : Faizi	TEST BY : Faizi
0113.44kN	0196.02kN	0252.03kN
0106.10kN 31.10.12	0174.29kN	0236.00kN
0136.65kN	0214.83kN	0259.57kN
	0173.81kN	0223.93kN
	0178.52kN 31.10.12	0249.90kN
	0177.82kN	0220.84kN
	0158.80kN	0243.34kN
	0178.85kN	0270.49kN
	0211.13kN	0258.19kN
	0199.84kN	0232.26kN
Note :	Note :	Note :

APPENDIX F (8)

TEST REPORT

from LAFARGE Cement Sdn. Bhd

8. Physical and Chemical Properties of Portland - Fly Ash Cement

LAFARGE
CEMENT

Malaysia

Our ref: LCSB/TS/C-2321

January 7, 2013

Proven Engineering Blocks S/B
No. 11, Medan Setia Satu
Plaza Damansara, Bukit Damansara
50490 Kuala Lumpur
Malaysia

Attention: En. Azha (Factory Manager)

Dear En. Azha

RE: INFORMATION ON BLENDED CEMENT (MASCRETE PRO) AND TESTING METHODOLOGY

With reference to the above subject, Lafarge Mascrete Pro cement is classified under the Malaysia standard, MS EN 197, class CEM II/A–V 52.5N, which contains pulverize fuel ash (PFA) in the range of 6 to 20% (Appendix 1: SIRIM Certificate).

In accordance with the Malaysian standard, MS EN 197: Part3: Determination of Strength (Appendix 2), the compressive strength of the cement mortar cured at 20°C is determined at 2 and 28 days.

The cement mortar proportions are as listed below and please refer to the Appendix 2 for further discourse on the above, specifically on the mixing, compaction, curing, and testing methodology.

Cement:	450 +/- 2 g
CEN Standard Sand:	1350 +/- 2 g
Water:	225 +/- 1 g

If you require any further information, please do not hesitate to contact us.

Thank you.

Yours faithfully,

TAN SOON KIEN
Manager, Technical Support

LAFARGE CEMENT
Malaysia

ASSOCIATED PAN MALAYSIA CEMENT SDN. BERHAD (7129-X)
RAWANG PLANT
48000 Rawang, Selangor, Malaysia
Tel: 03-60916711/4
Fax No.: 03-60919361

CERT. NO. : RW - MPR - 01940
TEST CERTIFICATE

CMCM PERNIAGAAN SDN BHD
LEVEL 12. BANGUNAN TH UPTOWN 3
NO.3. JALAN SS 21/39
47400 PETALING JAYA
SELANGOR DE

TYPE : **Portland-Fly Ash Cement - Mascrete Pro (CEM II/A-V 52.5N)** Fax No.: 03-77221090
IDENTIFICATION : **Daily Despatch Cement from 07/09/2012 - 136/09/2012**
DATE OF TEST : **3rd October 2012**

The results relate only to the item tested.

Att. : Goh Chien Chien

TEST ITEMS	MS 522:Part 1:2007 CEM II/A-V 52.5N SPECIFICATIONS	TEST METHOD	TEST RESULTS	REMARKS
A. PHYSICAL PROPERTIES (IPQC13)				
1. Setting Time (minutes) Initial	Clause 7.2.1 Not less than 45	MS 522:Part 5:2007 Clause 6	120	
2. Soundness : Expansion (mm)	Clause 7.2.2 Not more than 10	MS 522:Part 5:2007 Clause 7	1.0	
3. Compressive Strength (N/ mm²) EN Mortar Prisms 2 days	Clause 7.1.1 Not less than 20.0	MS 522:Part 3:2007	23.6	
28 days	Clause 7.1.1 Not less than 52.5	MS 522:Part 3:2007	62.0	Desp.date 10/08 to 16/08
B. CHEMICAL COMPOSITION (IPQC13)				
1. % Chloride	Clause 7.3 Not more than 0.1	MS 522:Part 4:2007 Clause 14	0.02	
2. % Sulphate	Clause 7.3 Not more than 3.5	In-house Test Method SOPLAB 125 Rev. 0 (XRF Analysis)	2.85	
3. % Proportion of PFA	Clause 6 6 to 20	MS 1227:2003 Appendix A 3.2	11	

ASSOCIATED PAN MALAYSIA CEMENT SDN BHD

Date Issued
20-Oct-12

Name : HAFIZ YUSOF
Designation : Quality Control Manager
Qualifications : BSc.(Hons). A.M.I.C

MS ISO/IEC 17025 TESTING NO: SAMM 038

LAFARGE CEMENT
Malaysia

ASSOCIATED PAN MALAYSIA CEMENT SDN. BERHAD (7129-X)
RAWANG PLANT
48000 Rawang, Selangor, Malaysia
Tel: 03-60916711/4
Fax No.: 03-60919361

CERT. NO. : RW - MPR - 01931
TEST CERTIFICATE

CMCM PERNIAGAAN SDN BHD
LEVEL 12, BANGUNAN TH UPTOWN 3
NO.3, JALAN SS 21/39
47400 PETALING JAYA
SELANGOR DE

TYPE : **Portland-Fly Ash Cement - Mascrete Pro (CEM II/A-V 52.5N)** Fax No.: 03-77221090
IDENTIFICATION : **Daily Despatch Cement from 31/08/2012 - 06/09/2012**
DATE OF TEST : **3rd October 2012**

The results relate only to the item tested. Att. : Goh Chien Chien

TEST ITEMS	MS 522:Part 1:2007 CEM II/A-V 52.5N SPECIFICATIONS	TEST METHOD	TEST RESULTS	REMARKS
A. PHYSICAL PROPERTIES (IPQC13)				
1. Setting Time (minutes) Initial	Clause 7.2.1 Not less than 45	MS 522:Part 5:2007 Clause 6	120	
2. Soundness : Expansion (mm)	Clause 7.2.2 Not more than 10	MS 522:Part 5:2007 Clause 7	1.0	
3. Compressive Strength (N/ mm²) EN Mortar Prisms 2 days	Clause 7.1.1 Not less than 20.0	MS 522:Part 3:2007	25.1	
28 days	Clause 7.1.1 Not less than 52.5	MS 522:Part 3:2007	61.6	Desp.date 03/08 to 09/08
B. CHEMICAL COMPOSITION (IPQC13)				
1. % Chloride	Clause 7.3 Not more than 0.1	MS 522:Part 4:2007 Clause 14	0.02	
2. % Sulphate	Clause 7.3 Not more than 3.5	In-house Test Method SOPLAB 125 Rev. 0 (XRF Analysis)	2.98	
3. % Proportion of PFA	Clause 6 6 to 20	MS 1227:2003 Appendix A 3.2	10	

Date Issued
20-Oct-12

ASSOCIATED PAN MALAYSIA CEMENT SDN BHD

Name : HAFIZ YUSOF
Designation : Quality Control Manager
Qualifications : BSc.(Hons), A.M.I.C

STANDARDS MALAYSIA ACCREDITED LABORATORY
MS ISO/IEC 17025
TESTING
NO: SAMM 038

No Lesen : PA009722
Licence No :

SCHEDULE

ASSOCIATED PAN MALAYSIA CEMENT SDN. BHD.

SIRIM

Brand	: MASCRETE PRO
Model	: PORTLAND-FLY ASH CEMENT
Rating	: CEM II / A - V 52.5N
Brand	: MASCRETE I H
Model	: PORTLAND-FLY ASH CEMENT
Rating	: CEM II / B - V 32.5N

End of page

SIRIM QAS International Sdn. Bhd.
(No. Syarikat 410334-X)
1, Persiaran Dato' Menteri
Seksyen 2, Peti Surat 7035
40700 Shah Alam
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http://www.sirim.com.my
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Tarikh Mula Pensijilan : 18 February 2011
Certified Since

Sah Sehingga : 03 August 2013
Valid Until

Tarikh Dikeluarkan : 13 September 2012
Issue Date

No Siri : 002850
Serial No

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APPENDIX G

PRE – TECHNICAL OPINION REPORT

PRELIMINARY TECHNICAL OPINION
ASSESSMENT REPORT

Performed by:

Construction Institute of Malaysia

at Makmal Kerja Raya Malaysia

Assessment Performed for:

Proven Holding Sdn. Bhd.

Product: Interlocking Brick

Full Interlocking Brick: 100 x 100 x 200mm

Manufacturer/ Applicant	:	**Proven Engineering Block Sdn. Bhd** No. 11 Medan Setia 1, Plaza Damansara, Bukit Damansara, 50490 Kuala Lumpur.
Product	:	**Precast Concrete Masonry Unit (Cement Brick Solid with Groove)**
Method	:	Comparison through visual observation for the construction of 2sqm of wall using interlocking brick against common brick in terms of time duration.
Description of sample	:	A non-load bearing wall partition system was constructed with cement bricks (solid with groove) interlocked together and bonded by thin cement and sand mortar on the 23/4/2012. The bricks were sampled by Construction research Institute of Malaysia (CREAM) on 19/4/2012. Full description of test specimen and construction of the brick wall are detailed in Page 4 of this report. Brand: **PROVEN ENGINEERING** Model: **FULL BRICK** Nominal size: **200mm (*l*) x 100mm (*w*) x 100mm (*h*)**
Date of assessment	:	23rd April 2012
Approved by	:	

……..
SYED HAZNI ABD. GANI
Test Engineer
Construction Research Institute of Malaysia

Applicant : **Proven Engineering Block Sdn. Bhd**

Summary : A specimen of a full interlocking brick has been subjected accordance the construction speed test through observation method by recording the speed of construction using the interlocking brick compared with sand brick to build a $2m^2$ non-load bearing wall.

The non-load bearing brick wall partition system consisted of cement bricks (solid with groove); each size of interlocking brick is 196mm (l) x 100mm (w) x 100mm (h). The bricks were interlocked together and bonded by thin layer of cement and sand mortar at 1:3 ratios.

The bricklaying work was conducted by semi-skilled student from Akademi Binaan Malaysia (ABM) at Makmal Kerja Raya Malaysia (MKRM), and was observed by representative from Proven Holding Sdn. Bhd. and researchers from CREAM.

The test was started at 11.29 am and was concluded after the 12.42 pm.

1. PURPOSE OF TEST

To compare the speed of construction for 2m^2 non-load bearing wall between of Proven Engineering interlocking brick and common sand brick.

2. TEST SPECIMEN

2.1 Product Description

500 pieces (1 pallet) of cement bricks (solid with groove) were submitted to CREAM on 20th April 2012. The brick was manufactured with interlocking function consist of male and female joint as shown in Figure 1.0. The nominal size of cement brick was 200mm (*l*) x 100mm (*w*) x 100mm (*h*). The bricks were said to be processed from the following materials and proportioned respectively as stated:

No.	Materials	Mix Ratio (One Mix)
1.	Cement	90 kg
2.	Aggregate (10mm)	200 kg
3.	Quarry dust	110 kg
4.	Sand	650 kg

The above descriptions of the products were provided by the applicant.

Figure 1.0: Full Interlocking Brick
200mm (l) x 100mm (w) x 100mm (h)

2.3 Description of Test Specimen

The test specimen of 2x1m non-load bearing wall was constructed consist of full interlocking brick as illustrate on Figure 2. The brick was interlocked and slot in using cement mortar.

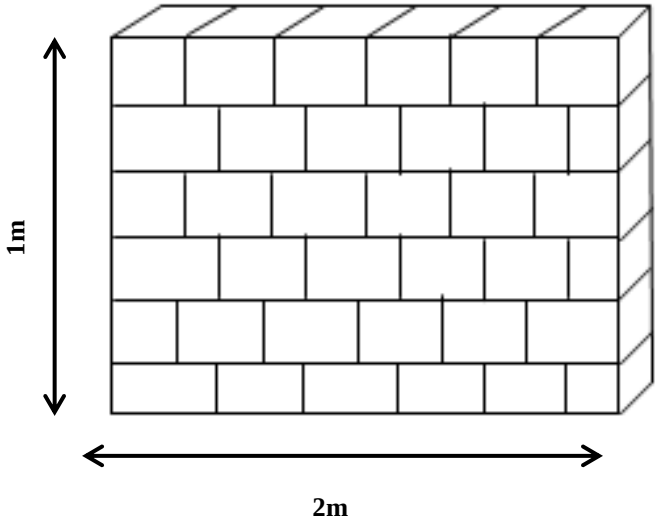

Figure 2.0: Illustration of 2x1m Non-Load Bearing Wall

For interlocking brick, a half brick provided by applicant was used for the edge of the non-load bearing wall when required as it was part of the applicant product, but for common sand brick, there is no half brick is used for the edge of non-load bearing wall.

Inspection was carried out during the construction of the non-load bearing brick wall system to verify on interlocking brick speed of construction compared to conventional bricks. The construction of both interlocking brick and sand brick wall arranged and carried out by two Akademi Binaan Malaysia's (ABM) student.

3.0 THE WALL CONSTRUCTION TEST

3.1 Conditioning of the Construction

The construction was conducted outside of the laboratory during a normal weather (hot & humid)

3.2 Date of assessment

23rd April 2012

3.3 Witnesses of the Test

i. Representative from Proven Holding. Sdn. Bhd.
   - *Mr. Azha bin Mohd Noor*

ii. Representative from CREAM
   - Mr. Syed Hazni Abd. Gani (Test Engineer)
   - Mr. Mohd Rahimi bin A. Rahman (Researcher)

3.4 Construction

The following procedure depict the wall construction program

i. Briefing on the method of installment for the interlocking brick by applicant representative to the bricklayers.

ii. Preparation of the cement and mortar as required for each specimen

iii. Mark one line on the ground as reference for the bricklayer to ensure the walls parallels to each other.

iv. The construction of the two walls was started simultaneously. The time and the process were recorded with a video camera.

v. The time for the construction is stopped when one of the 2x1m non-load bearing wall specimens is constructed completely. The time duration to complete the construction is recorded.

4.0 RESULTS

Figure 3.0: Construction progress for 2x1m of non-load bearing wall after completed observed in 73 minutes

4.1 The time taken to complete the construction of non-load bearing by interlocking brick is 1 hour 13 minutes and height of wall for each of specimen was recorded and the result show on the following Table 1.0:

Interlocking Brick	Sand Brick
104 cm	50cm

Table 1.0: Height of non-load bearing wall for each of specimen after wall for interlocking brick completed construct in 1 hour 13 minutes

4.2 It was observed that the use of mortar to bond the interlocking brick is less compared the used of mortar for sand brick.

4.3 It was observed that, although the installer for interlocking brick is semi-skilled, he was able to carry out and construct the wall faster than installer for the sand brick wall

4.4 It was observed that the slot in and interlocking construction process using the interlocking brick is much easier compared with sand brick.

4.5 The availability of interlocking half brick product allows the construction of the wall faster as it eliminates the brick cutting process.

5.0 CONCLUSIONS

The construction of wall using interlocking brick product is much faster compared to sand brick. The interlocking brick also used less mortar consumption compared to sand brick that used a brick laying method. The slot in and interlocking system allow the construction process much easier and can be carried even by a layman.

6.0 LIMITATIONS

The construction process will be governed by the skills and experienced of the bricklayers.

8.0 APPENDIX

APPENDIX H

PRELIMINARY STUDY OF INDUSTRIALIZED BUILDING SYSTEM (IBS)

PRELIMINARY STUDY

1.0 THE SCOPE OF THIS STUDY

1.1 The scope of this preliminary study is to determine the characteristics, benefits and innovative features of *interlocking bricks*

2.0 INTRODUCTION

2.1 The term Industrialised Building System (IBS) is defined by the Construction Industry Development Board (CIDB) as construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site works. The term is however, cover very wide scope which include the application of onsite systems and one can not distinguished it properly with conventional practice. Many IBS technologies coexist with onsite work in hybrid construction and so demarcating what constitutes IBS practice is problematic.

2.2 While other terms used globally to represent construction industrialisation (offsite construction, offsite manufacturing and Modern Method of Construction) are often relates to innovative solution, current definition by CIDB includes low-tech solutions and other of practices which already become common and not substituting conventional practices. The terms and classifications provided by the CIDB were also misinterpreted as a system limited only for construction of buildings, while IBS can be interpreted as an approach or process used in making construction less labour-oriented and faster as well as fulfilling quality concern.

2.3 Furthermore, the broader view of IBS could be about the changing of conventional mindset, championing human capital development, developing better cooperation and trust, promoting transparency and integrity.

2.4 Worthnoting, IBS is also not about sizing and dimension. The use of Modular Coordination (MC) nonetheless is encouraged to improve constructability and standardisation.

2.5 There is a consensus among the practitioners and researchers alike, that the definition and classification need to be evolved and incorporates with global views and understanding. The definition and classification of offsite, offsite construction, modern method of construction, offsite manufacturing, offsite production, pre-assembly and prefabrication, therefore are need to be

examined. It gives a different perspective and enriches one understanding on IBS concept as whole. One should also need to understand the level of industrialisation (mechanisation, automation and robotics) to define IBS.

2.6 In this case, the definition on certain system should be revised and improvised as the new innovation are keeping evolved time to time. It is time for the industry to accept the new innovation product which has same or better advantages with other IBS products.

3.0 EXISTING DEFINITION ON IBS

3.1 To redefine IBS, one should look into the existing definitions and other definitions within the context of IBS.

3.2 To date, there has been no one commonly-accepted or agreed definition of IBS worldwide. However, there are a few definitions by researchers who studied in this area previously were found through literature. The report has compiled the definition of IBS from 20 literatures of local and international researchers from 1971 – 2009. The definitions are listed and analysed in **Appendix A.**

3.3 In general, IBS definitions had been classified into two categories;

3.3.1 Method, approach and process
3.3.2 Product, system and technology

3.4 Fifteen authors have defined IBS as a method, approach and process. Only five authors defined IBS as a product, system and technology. The preliminary analysis revealed that IBS is not necessarily restricting its scope to the final product which is a system but it could involve the processes which lead to the production of the system and its construction application.

3.5 From IBS definitions compiled in **Appendix A**, one can observe that the definitions are consisting of six different characteristics of IBS which are:

3.5.1 Industrialised in production
3.5.2 Transportation and assembly technique
3.5.3 Fabrication and mass-production
3.5.4 Structured planning and standardisation
3.5.5 Process integration

4.0 INTERLOCKING BRICKS

4.1 *Interlocking bricks* - as the name suggests locks itself with other bricks and it is these interlocks which give strength to the wall. They are designed in such a way that each piece connects with its adjacent one, so that structurally they are all dependent on each other and able to stay in place. This makes these bricks much longer lasting, and often they can be interlocked without the use of any bonding agents. The system incorporated tongue and groove technology into the building components as a means to reduce the need of skilled construction workers. *Interlocking brick* is a proven solution to construct affordable housing worldwide particularly in India and Africa.

4.2 In term of characteristics*, interlocking bricks* has several advantages compared to normal bricks:

4.2.1 *Interlocking bricks* use modular sizing. The use of modular coordination and standard sizing allow flexibility to integrate with other IBS system thus encourage participation from manufactures and assemblers to enter the market, thus reducing the price of IBS components

4.2.2 As oppose to normal brick, *interlocking bricks* has interlocking system comparable to LEGO system. The tedious and time-consuming traditional brick-laying tasks are greatly simplified by the usage of these effective alternative solutions. It also allows accuracy up to ± 1.5 mm

4.3 Method, approach and process of constructing building *using interlocking bricks* has similarity to IBS product which has same or better advantages with other IBS product. Based on the characteristics of IBS, the preliminary analysis of *interlocking bricks* are as follows:

4.3.1 *Industrialised production* – Interlocking brick is produce offsite using the machineries. This is in line with government aspiration to move our industry towards mechanisation. The production of interlocking brick uses the following machineries:

- Automatic Block Machine – QT4-15 (Jiangsu Tengyu Manufacturing Co. Ltd)
- Automatic Block Machine – QT4-15 (Jiangsu Tengyu Manufacturing Co. Ltd)

4.3.2 *Transportation and assembly* – It can be manufactured and assemble at site, which can contribute to save transportation cost. It also can be pre-assembled at factory and transported to the site in small

interlocking brick form or in wall panel form, which give advantages of flexibility to suit with transportation capability.

4.3.3 *Cost effectiveness* – The interlocking bricks are simply lock into each other and there is no need to further use adhesives such as cement and sand which contribute to 3 to 4 times faster in project completion and save the project overhead and project financing

4.3.4 *Fabrication and mass-production* – Produce in a factory or offsite with superior quality control, accuracy in manufacture provides speed of construction & job site accuracy. Dimension accuracy up to ± 1.5 mm

4.3.5 *Structured planning and standardisation* - The use of engineering brick was in line with MC is a concept of coordination of dimensions and space where buildings and components are dimensioned and positioned in a basic unit or module known as 1M which is equivalent to 100 mm, as stipulated in MS 1064.

4.3.6 *Progress integration* - The use of modular coordination and standard sizing allow flexibility to integrate with other IBS system thus encourage participation from manufactures and assemblers to enter the market, thus reducing the price of IBS components

4.3.7 *Adaptability & Flexibility* – Interlocking bricks eliminate disadvantages of IBS due the limitation for future renovation works as required by the end user. With interlocking bricks, the renovation work can be carried out and does not required heavy machine like crane to operate it which enable 'Do it Yourself' (DIY) construction and this was in line with Open System concept promoting by IBS Centre. It also can be manufactured at factory into required form (customization), either in brick form or as wall panel in combination form at factory which will have more IBS Score compared in block form.

5.0 INNOVATION FEATURES OF INTERLOCKING BLOCK

5.1 The construction method of using conventional bricks has been revolutionised by the development and usage of interlocking system. The tedious and time-consuming traditional brick-laying tasks are greatly simplified by the usage of these effective alternative solutions.

5.2 Interchangability concepts towards the adoption plug & play concepts which offers flexibility for the products to integrate with other IBS system

5.3 The processes of producing the material incorporates the concept of mechanisation

5.4 The process of production promotes the adoption of sustainable construction with generate only minimal material wastage mean less clean up at site**.**

5.5 The final product gives excellent heat and sound insulation contribute to environmental friendly and energy saving

5.6 Ease of renovation (DIY concept) construction and house extension works (not required crane).

5.7 The bricks can act as wall panel in combination form to be pre-assemble at factory or offsite (this is stipulated as an attribute of IBS in IBS Score)

6.0 BENEFITS OF THE INCLUSION OF *INTERLOCKING BRICK* AS IBS TO THE OVERALL EFFORT BY CIDB TO PROMOTE IBS

6.1 The construction industry is an established industry with many deep-seated and culturally-embedded practices, so the introduction of anything perceived as new or different faces barriers. Small players lack financial backup and not able to set up in-house manufacturing plants as it involves very intensive capital investment. The contractors need to cover the amortised cost of setting up a prefabrication yard, as well as the variable costs of manufacturing components and of their on-site assembly.

6.2 Therefore, IBS system in Malaysia shall not be limited to high advanced technologies and mass-production concept. The engineering brick system is one of the simplest, flexible and most versatile systems that can be used by many in the industry. The followings are benefits of encouraging engineered interlocking bricks as part of IBS:

6.2.1 In applying pre-cast construction, enormous capital cost would involve which include set up the plant, supplying machinery and moulds. The *interlocking bricks* offer some sort of low cost IBS with low capital investment, where many contractors and manufactures *(especially Bumiputera)* can be involved in the industry.

6.2.2 *Interlocking bricks* is the easiest way of adopting IBS and can easily penetrating construction market. However, there is need for skilled designers to design engineering brick than can capitalise the benefit of IBS. The engineering brick system depends on modular dimension at design stage, is also comparable to LEGO system.

6.2.3 The use of modular coordination and standard sizing allow flexibility to integrate with other IBS system thus encourage participation from

manufactures and assemblers to enter the market, thus reducing the price of IBS components

6.2.4 *Interlocking bricks* applies load bearing wall by incorporating the columns and beams as integral part of the wall for all types of houses (up to 5-storey in high). The amount that can be saved on a wall can range from 10% to 30% as compared to conventional with additional less foundation cost. The save in cost is in line with one of the IBS Roadmap 2011-2015 pillars which is to create a financially sustainable IBS industry that balances users' affordability and manufacturers' viability. Suitable for mass- produced, affordable housing program.

6.2.5 *Interlocking bricks* give up to 3 times faster in construction of walls, columns & beams compared to conventional method. Faster construction give a major advantage to commercial clients and sopporting government policy to build 10,000 affordable housing in 2012.

6.2.6 The system makes it possible for unskilled workers to effectively and efficiently install this system with as little as a week's training.

7.0 RECOMMENDATION

7.1 The definition of IBS on certain systems should be revised and improvised as the new innovation are keeping evolved time to time. It is time for the industry to accept new innovative product which has same or better advantages with other IBS product.

7.2 This preliminary report recommends that based on its characterisation, benefits and innovation potential of *interlocking bricks*, it should be given consideration by CIDB to be included as one of IBS product under innovation/hybrid cluster.

7.3 However, *interlocking bricks* products in the market that would like to be listed as IBS products by CIDB, it shall need to undergo Technical Opinion (TO) programme. The evaluation under the TO shall considers the followings:

7.3.1 Level of innovation
7.3.2 Processes involve from design to assembly
7.3.3 Level of industrialisation (the process of producing the bricks shall incorporate the concept of mechanisation)
7.3.4 Overall benefits to the construction industry
7.3.5 Sustainability attributes

7.3.6 The ability of the brick to act as a wall panel and to be preassemble offsite (as stipulated in IBS Score as IBS)

8.0 ADDITIONAL REMARKS

8.1 There is still no specific definition or standard in Malaysia to represent IBS block work system produced by the CIDB. There are various systems that can be categorize as block works which have been proven give an advantages reducing cost, ease installation, fast and reduce labour by replacing tedious and time consuming traditional bricklaying.

8.2 The dimension and sizing issue can be neglected and as depends on the design as long as the brick is measure using modular coordination (MC) and as long as the process give benefits to the users.

Prepared by
Construction Research Institute of Malaysia (CREAM)

APPENDIX A

Authors	Definition	Method, Approach & Process	Product , System & Technology	Industrialised production	Transportation & Assembly Technique	On-site fabrication	Mass-Production	Structured Planning & Standardisation	Integration
Dietz (1971)	IBS is a total integration of all subsystem and components into overall process fully utilising industrialised production, transportation and assembly techniques.	x		x	x				x
Junid (1986)	IBS is a process by which components of building are conceived, planned and fabricated, transport and erected at site	x		x	x			x	x
Parid (1997)	IBS is a system which use industrialised production techniques either in production of component or assembly of the building		x	x	x				
Esa & Nurudin (1998)	IBS is continuum beginning from utilising craftsmen for every aspect of construction to a system that make use of manufacturing production in order to minimise resource wastage and enhance value end users	x		x					x
Trikha (1999)	IBS is a process in which all building components such as wall, floor slab, beam, column and staircase are mass produced either in factory or at site under strict quality control and minimal on site activities	x		x			x	x	
Warszawski (1999)	IBS is a set of interrelated element that act together to enable the designated performance of building.		x						x
CIDB Malaysia (2003), Hamid et al (2008), Kamar et al (2009)	IBS is a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site works.	x		x	x	x			
Lessing (2005)	IBS is an integrated manufacturing and construction process with well planned organisation for efficient mgt, prepared, control over resources used, activities and results supported by the used of highly developed components	x		x				x	x
Rahman & Omar (2006)	IBS is a construction system that is built using prefabricated component. The manufacturing of the components is systematically done using machine, formworks and other forms of mechanical equipment. The components are manufactured offsite and once completed will be delivered to construction sites for assembly and erection		x	x	x			x	
Chung (2006)	IBS is a process in which all building components are mass produced either in a factory or at site factory according to specifications with standardise shapes and dimensions and transported to the construction projects site to be rearrange with certain standard to form a building.	x		x	x	x	x	x	
Abdullah & Egbu (2009)	IBS is a method of construction developed due to human investment in innovation and on rethinking the best ways of work deliveries. It was developed based on categories which can be classified as pre-building system, modern construction, advance automation and volumetric construction	x		x					
Shaari and Ismail (2003)	IBS can be defined as product, system and technology used in making construction less labour oriented faster as well as fulfilling its quality concern		x	x		x			
MIGHT (2004)	IBS an alternative approach to construction of systematic mass production of construction materials. And prefabricated components of buildings which are conceived, planned, and fabricated from factories will be transported and erected on site	x		x	x		x	x	
Marsono et al (2006)	IBS is a production of the off-site prefabricated components at factories with highly structured planning and operation system to manage the production	x		x				x	
Hong (2006)	IBS in the construction industry includes the industrialised process by which components of a building are manufactured transported and erected on site and managed to produce lean construction	x		x	x			x	
Hassim et al (2009)	IBS is as an organisational process-continuity of production implying a steedy flow of demand, standerdisation, integration of the different stages of the whole production process, a high degree of organisation of work, mechanisation to replace human labour wherever possible	x		x				x	x
Haron et al (2005)	IBS is new construction method that can increase the productivity and quality of work trough the use of better construction machineries, equipments, materials, and extensive project planning	x		x				x	
CIDB (2007)	IBS is a construction process that utilised components or building systems which involve prefabricated components and on-site installation	x		x	x				
Badir et al (2002)	IBS is a concept of mass production of quality building by using new building systems and factory produced building components	x		x				x	
Sarja (1998)	IBS is a set of building part which are mass-produced		x					x	

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APPENDIX I

COMPANIES COMMISSION OF MALAYSIA' S CERTIFICATE

SURUHANJAYA SYARIKAT MALAYSIA
COMPANIES COMMISSION OF MALAYSIA

CERTIFIED TRUE COPY
FONG PHOI SHAN
MAICSA 7014620
Secretary
Date: 10 JAN 2013

BORANG 13
AKTA SYARIKAT 1965 [Seksyen 23(2)]

No. Syarikat

820839	T

PERAKUAN PEMERBADANAN ATAS PERTUKARAN NAMA SYARIKAT

Dengan ini diperakui bahawa

CKYJ (M) SDN. BHD.

yang telah diperbadankan di bawah Akta Syarikat 1965, pada 09 haribulan Jun 2008, sebagai sebuah syarikat persendirian, pada 15 haribulan Mac 2011 telah menukar namanya kepada

PROVEN ENGINEERING BLOCKS SDN. BHD.

dan bahawa syarikat ini adalah sebuah syarikat persendirian dan adalah sebuah syarikat berhad menurut syer.

Diberi di bawah tandatangan dan meterai saya di Shah Alam pada 15 haribulan Mac 2011.

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ZAMRI BIN KAMALUDDIN
PENOLONG PENDAFTAR SYARIKAT
MALAYSIA

APPENDIX J

SITE VISIT PHOTOS

Date : 23rd January 2013

Factory Site: Kawasan Perindustrian Kundang, Rawang, Selangor

Company : Proven Engineering Block Sdn. Bhd.

APPENDIX J: SITE VISIT PICTURE

Picture 1:
Proven Interlocking Block Sdn Bhd factory site at Rawang, Selangor.

Picture 2:
Raw materials are transferred into hopper before they are mixed.

Picture 3:
The bricks are produced using highly automated machine.

Picture 4:
A worker is stacking the finished product.

Picture 5:
The bricks are stacked on rows of rack for drying.

Picture 6:
Finished products are wrapped in plastic.

Picture 7:
One of the machines used in the factory.

Picture 7:
Group photo with Tn. Hj. Mohd Sufian Hashim, Corporate Director of Proven Holding