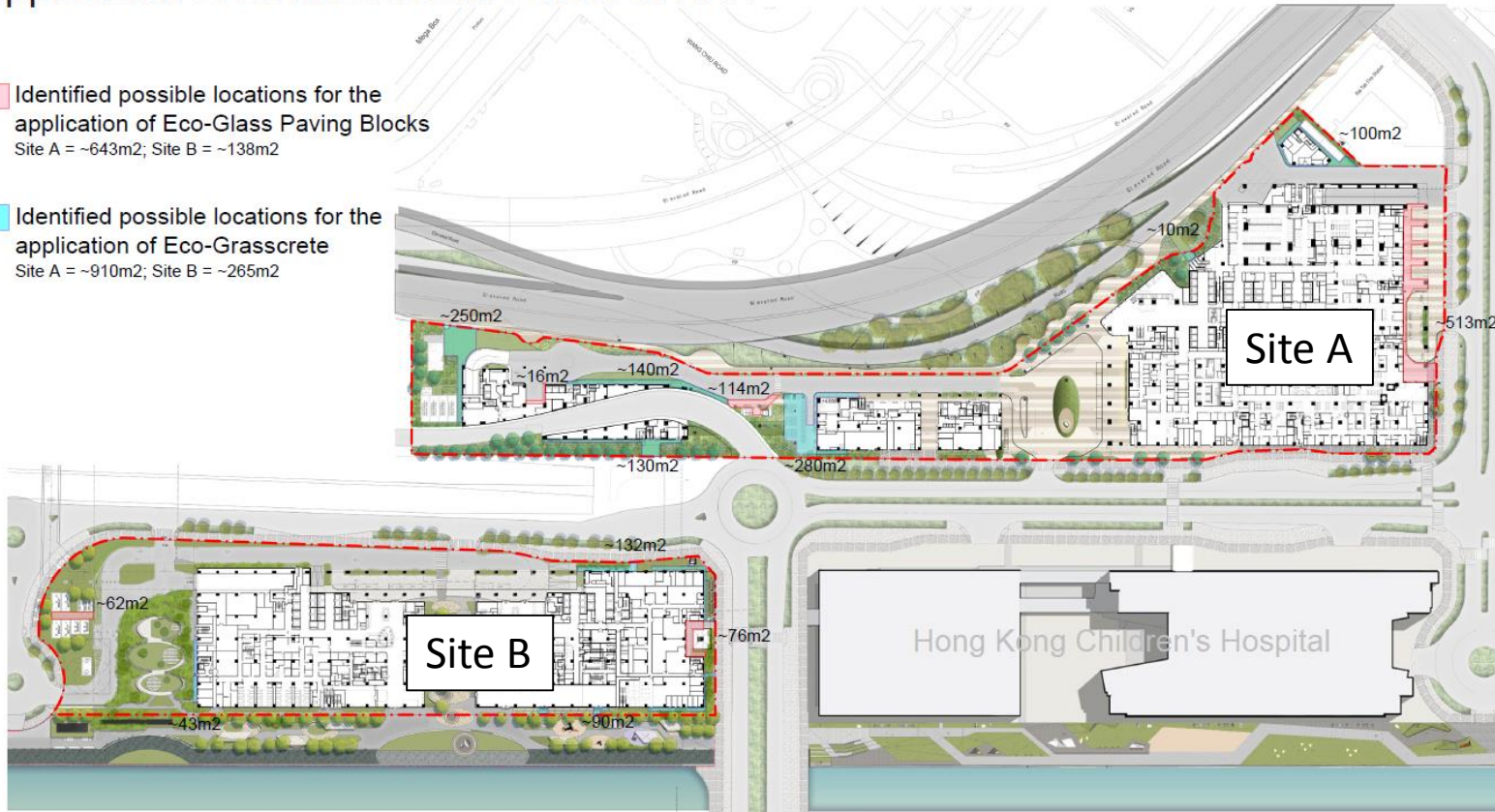


Application of Environmental Pavers at NAH

Identified possible locations for the application of Eco-Glass Paving Blocks
 Site A = ~643m²; Site B = ~138m²

Identified possible locations for the application of Eco-Grasscrete
 Site A = ~910m²; Site B = ~265m²



Rev	Amendment	By	Chk.	App.	Date
Client					
 醫院管理局 HOSPITAL AUTHORITY					
Project					
WONG TUNG & PARTNERS LIMITED ARCHITECTS & PLANNERS  18th Floor, Cityplaza 3, Taikoo Shing, Hong Kong T 852-2893 9888 F 852-2513 1728 www.wongtung.com					
 Meinhardt Infrastructure and Environment Limited 邁達基環境保工程顧問有限公司					
Title					
A ROOFTOP HELIPAD AT NEW ACUTE HOSPITAL AT KAI TAK DEVELOPMENT AREA					
Site					
Location of Environmental Pavers					
Status					
Drawn	Checked	Approved			
Scale	Not to Scale	CAD File Name	Print Issue		
© Copyright Meinhardt		Drawing No.	Appendix 3D		Rev.

Eco-Glass Paving Blocks is for pedestrian walkway, while **Eco-Grasscrete** provides a hard-pavement to grass.

Identified possible locations for the application of Eco-Glass Paving Blocks

Site A = ~643m²; Site B = ~138m²

Identified possible locations for the application of Eco-Grasscrete

Site A = ~910m²; Site B = ~265m²



No.	Amendment	By	Chk.	App.	Date

Client



醫院管理局
HOSPITAL
AUTHORITY

Project

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邁達基環境工程顧問有限公司

Project

A ROOFTOP HELIPAD AT
NEW ACUTE HOSPITAL AT
KAI TAK DEVELOPMENT AREA

Title

Location of
Environmental Pavers
– Site A

Drawings

Drawn	Checked	Approved
Scale	Not to Scale	Print Issue
Scale	Not to Scale	Print Issue
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Identified possible locations for the application of Eco-Glass Paving Blocks

Site A = ~643m²; Site B = ~138m²

Identified possible locations for the application of Eco-Grasscrete

Site A = ~910m²; Site B = ~265m²



No.	Amendment	By	Chk.	App.	Date

Client



醫院管理局
HOSPITAL
AUTHORITY

Architect

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A ROOFTOP HELIPAD AT
NEW ACUTE HOSPITAL AT
KAI TAK DEVELOPMENT AREA

Title

Location of
Environmental Pavers
– Site B

Status

Drawn	Checked	Approved
Scale	CAD File Name	Print Issue

Scale

Not to Scale

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Drawing No.

Appendix 3D

Tio² Air-Pollutant Removal (APR) Eco - Grasscrete

TIOSTONE Air-Pollutant Removal (APR) Eco-Grasscrete is a concrete grasscrete which contains recycled aggregates, recycled glass cement and titanium dioxide (powder form) which can effectively enhance air quality and reduce construction waste in Hong Kong landfills. This technology effectively uses recycled aggregates and recycled glass as the major constituents in the production of the grasscrete to reduce the disposal of construction waste and recycled glass cullet as well as preserves the use of natural materials such as virgin aggregates and river sand. It also incorporates an air cleaning agent, titanium dioxide (**Tio²**) in the paving block to remove air pollutants such as nitrous oxides (**NO_x**). With the air-purifying agent titanium dioxide (**Tio²**) in the surface layer, our pavers can **decompose air-pollutants** by approximately 15 %¹.



Car park area

Suitable areas:

Walkways, Car parks and Emergency Vehicular Access roads.

Applicable Standard:

BS 6717:2001

Performance Properties:

Compressive Strength: > 30 MPa for pedestrian grasscrete;
> 45 MPa for car park grasscrete.

Advantages of TIOSTONE Air-Pollutant Removal (APR) Eco-Grasscrete:

- 1) Uses **recycled materials** to reduce construction waste in landfills.
- 2) Unlike Clay Pavers, **greenhouse gas** is **NOT** generated during production.
- 3) Iron oxide colour pigment is used to ensure sharp and stable colour.
- 4) **TIOSTONE Air-Pollutant Removal (APR) Eco-Grasscrete** is manufactured by a fully automatic German MASA concrete block- making machine to ensure excellent quality products.
- 5) Local products have a reliable production lead time and economical transportation cost.
- 6) **Tiostone Eco-Grasscrete** reduces Heat Island Effect.
- 7) Using **TIOSTONE Air-Pollutant Removal (APR) Eco-Grasscrete** is subject to the **BEAM** and **LEED** credit points.



Walkway

Sizes:

500 x 250 x 80 mm is for Emergency Vehicular Access. 500 x 250 x 60mm or 240 x 160 x 60 mm is for walkways. Custom-made sizes are available upon request depending on the quantity. All relevant references of the product are available upon request.

Remarks:

Efflorescence is a natural phenomenon of cement-based products and **NOT a defect in the product**. Due to the variation of raw materials like cement and sand, the colour and surface texture of the submitted samples or colour chips serve ONLY as a reference and the delivered product may **slightly deviate** from the sample. The delivered bulk order stands as the final appearance.

¹ The air-pollutant removal function can be tested in the laboratory of the Hong Kong Polytechnic University before laying. The air-pollutant removal function shall be affected if the Tio² APR Paving Blocks paving block is partially or fully covered by other materials like road marking, sand, soil and/or dust etc. that Tiostone can NOT guarantee the performance of air-pollutant removal function after laying.

Tio² Air-Pollutant Removal (APR) Eco-Glass Paving Blocks

TIOSTONE Tio² APR Paving Blocks are concrete paving blocks that contain recycled aggregates with recycled glass sand (this combination is not less than 70% of weight for total aggregates), recycled glass cement and titanium dioxide (powder form) which can effectively enhance air quality. **TIOSTONE Tio² APR Paving Blocks** were developed by Professor C. S. Poon of the Hong Kong Polytechnic University. This technology incorporates an air cleaning agent, titanium dioxide (**Tio²**) in the paving block to remove air pollutants such as nitrous oxides (**NO_x**). With the air-purifying agent titanium dioxide (**Tio²**) in the surface layer, our pavers can **decompose air-pollutants** by approximately 15 %¹.



Suitable areas:

Walkways, Car parks, Emergency Vehicular Access roads, Slopes

Applicable Standard:

BS 6717:2001, AS/NZS4456.14:2003, BS 6677:1986

General Specification for Civil Engineering Works 2006 Edition Appendix 11.1

G.S. 11.65 Concrete & Use of Recycled Aggregates and 11.68 Particulars of Paving Units

HKHA Specification Library 2004 Edition EXT3.M130 Interlocking concrete blocks

Performance Properties:

Compressive Strength: >30 MPa (60 mm thick for walkways),
>45 MPa (80 mm thick for vehicular access).

Degree of abrasion resistance: < 23 mm.

Unpolished Skid Resistance Value (USRV): > 60

Water Absorption: < 6%

Advantages of **TIOSTONE Tio² APR Paving Blocks**:

1. **Reduced air-pollutants** and **enhance air-quality** since **greenhouse gas** is NOT generated during production.
2. **Recycled materials** reduce construction waste in landfills.
3. German iron oxide colour or chrome oxide pigment is used to ensure sharp and stable colour.

4. **Tio² APR Paving Blocks** are manufactured by a German MASA concrete block-making machine that ensures excellent quality goods.
5. Regionally-made products provide reliable delivery and economical transportation cost.
6. **Tio² APR Paving Blocks** reduce Heat Island Effect.
7. Using **Tio² APR Pavers** is subject to the **BEAM** and **LEED** credit points.

4 Major Series:

Natural Series – Natural looking paving blocks with true-to-the-touch stone surface.

Motif Series – Multitude of shapes, from regular to custom-made patterns.

Antique Series – Natural “aged” appearance creates a weathered, “worn-out” look.

Classic Series - Numerous shapes and patterns for walkways and vehicular roadways.



TIOSTONE Eco-Pavers with a multicoloured effect

Sizes:

Classic Series – (Type B) 200 x 100 x 60 mm, 200 x 100 x 80 mm,
(Type A) 225 x 112.5 x 60 mm & 225 x 112.5 x 80 mm.

Custom-made sizes are available upon request depending on the quantity.

All relevant references to the product are available upon request.

Remarks:

Efflorescence is a natural phenomenon of cement-based products and **NOT a defect in the product**. Due to the variation of raw materials like cement and sand, the colour and surface texture of the submitted samples or colour chips serve **ONLY** as a reference and the delivered product may **slightly deviate** from the sample. The delivered bulk order stands as the final appearance.

¹ The air-pollutant removal function can be tested in the laboratory of the Hong Kong Polytechnic University before laying. The air-pollutant removal function shall be affected if the Tio² APR Paving Blocks paving block is partially or fully covered by other materials like road marking, sand, soil and/or dust etc. that Tio² can NOT guarantee the performance of air-pollutant removal function after laying.

Conditional Warranty:

Tio² Stone warrants its Air-Pollutant Removal Pavers to the original purchaser to be free from defects in materials and manufacturing. The warranty covers normal wear and tear for a period of 1 year and up to 5 years upon receipt of premium from the date of purchase. If the Air-Pollutant Removal Pavers have been properly installed and then are removed and re-installed due to underground repairs, notify **Tio² Stone** before such work is undertaken. However, Air-Pollutant Removal Pavers adjacent to manholes, kerbs and edges will not be covered by this warranty.



Nitric Oxide Removal Test of Photocatalytic Paving Blocks
Prepared by
Research Centre for Environmental Technology and Management
The Hong Kong Polytechnic University
For
TioStone Environmental Ltd
Dec 2015

1. Samples to the tested

The samples to be tested were provided by **TioStone Environmental Ltd**

Two paving blocks/stones (with nominal dimensions: 200x100x60 mm) were delivered to HK PolyU. According to the information provided by the manufacturer, the paving blocks/stones are to be used in Lotus Towers, Kwun Tong Garden Estate.

According to TioStone, the surface layers of the paving blocks/stones were fabricated with the incorporation of TiO_2 . Figure 1 shows the samples of the stones.



Figure 1. Photos of the paving blocks/stones used for testing



2. Equipment and Methodology

The equipment and testing method followed the specifications and procedures of JIS R 1701-1 [1] with some modifications [2]. Figures 2 to 5 show the testing set-up and equipment used.

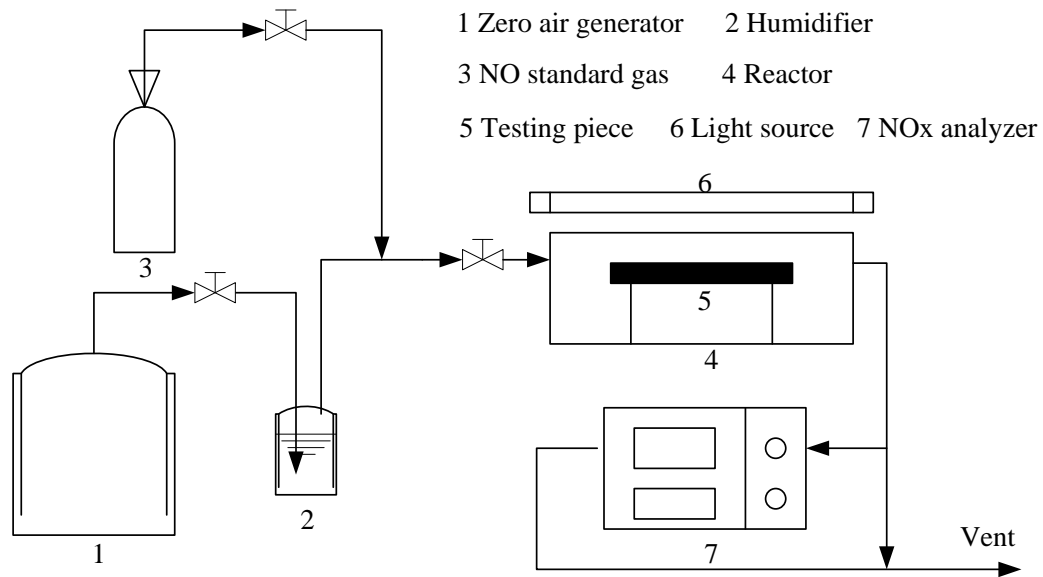


Fig.2. Schematic diagram of the testing set-up



Fig.3. Zero air supplier

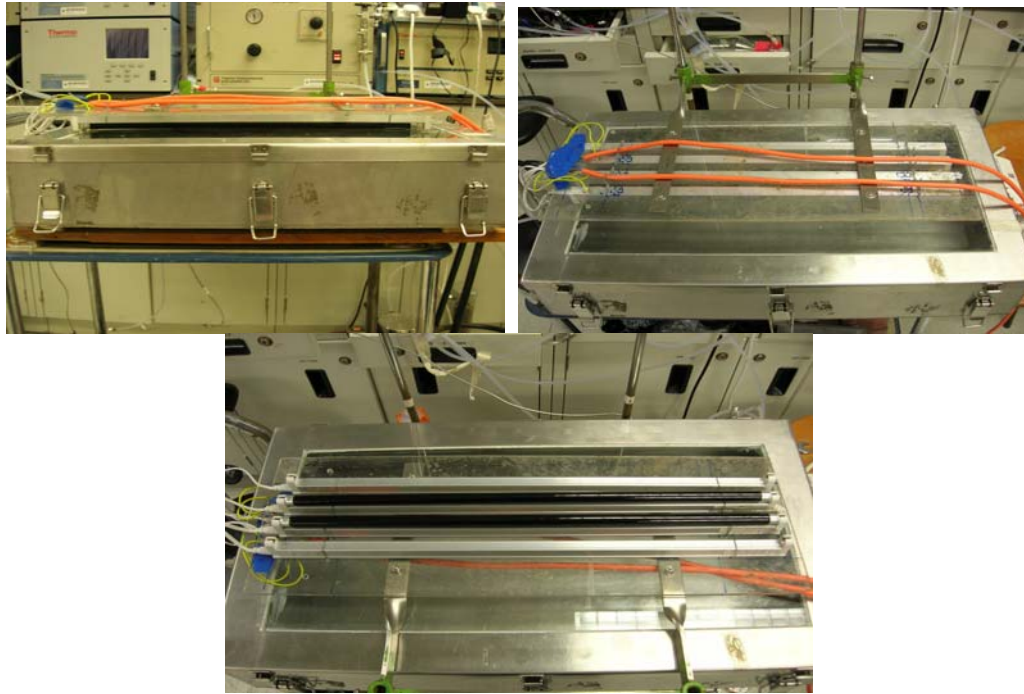


Fig.4. Reactor and UV source



Fig.5. Chemiluminescence NO analyzer



3. Results

Referent Blocks	NO removal (mg / m² /h)
CRD408-01GTH KT Garden	2.58±0.72 (30.5±7.2%)

NO removal rate : 2.58 mg / m² /hr or 30.5% at laboratory conditions

References

- [1] Japanese industrial standard. JIS R 1701-1:2004. Fine ceramics (advanced ceramics, advanced technical ceramics) – Test method for air purification performance of photocatalytic materials - Part I: Removal of nitric oxide.
- [2] Poon C.S. and Cheung. E. NO removal efficiency of photocatalytic paving blocks prepared with recycled materials. Construction and Building Materials, Vol. 21, pp. 1746-1753, (2007).