CONSTRUCTION INDUSTRY COUNCIL
建造業議會

# CONSTRUCTION INDUSTRY COUNCIL

## CIC GREEN PRODUCT CERTIFICATION

# CERAMIC TILE
# (Version 1.0a)

## *Assessment Standard*



Last updated: 11 June 2020

# CERAMIC TILE

## *Summary of Assessment Criteria*

**CORE CRITERIA**

| *Criteria* | *Requirements* | *Verification* | *Points* | | *Index* |
|---|---|---|---|---|---|
| | | | *Basic* | *+Bonus* | |
| Product Information | ○ Provide the following product information:<br>▪ Instructions for use / installation<br>▪ Possible toxicity or health hazards imposed by the chemical components<br>▪ Methods of cleaning / maintenance | Documentation related to the label and relevant information | **5** | | *4.1.3 (page 4)* |
| Radioactivity | ○ The effective concentration of potassium isotope $K_{40}$ ($C_K$), radium isotope $Ra_{226}$ ($C_{Ra}$) and thorium isotope $Th_{232}$ ($C_{Th}$) shall fulfil the following requirements:<br>External Hazard Index, $H_{ex}$: $H_{ex} = \frac{C_K}{4200} + \frac{C_{Ra}}{370} + \frac{C_{Th}}{260}$<br>Internal Hazard Index, $H_{in}$: $H_{in} = \frac{C_{Ra}}{200}$<br>where $H_{ex}$ shall be ≤1.3 and $H_{in}$ shall be ≤ 1.0 | Laboratory report(s) | **10** | | *4.2.4 (page 6)* |
| Heavy Metals | ○ Unglazed tile: Product shall contain < 0.1% (by weight of the product) of heavy metals, including lead (Pb), copper (Cu), cadmium (Cd), mercury (Hg), tin (Sn), hexavalent chromium (Cr(VI)), arsenic (As), and antimony (Sb).<br>○ Glazed tile: Heavy metals used during the glazing process are exempted subjected to the following limits:<br>***Heavy metal*** / ***% by weight of glaze*** / ***OR*** / ***Release rate (mg/m²)***<br>Lead / < 0.5 / ***OR*** / < 80<br>Cadmium / < 0.1 / < 7<br>Antimony / < 0.25 / N.A. | Laboratory test report(s), MSDS and production documentation | **10** | | *4.2.3 (page 6)* |
| Particulate Matters | ○ Total particulate matters during the manufacturing process: < 30mg/m$^3$ | Detailed testing report(s) of air emission of particulate matters under | **10** | | *4.4.1 (page 7)* |

| | | | | | |
|---|---|---|---|---|---|
| | | EN, ISO, or USEPA test methods | | | |
| Discharge of Waste Water | ○ Waste water discharged to water shall not contain the following substances subjected to the following maximum allowable limit:<br>▪ Suspended solids: < 40 mg/L<br>▪ Cadmium: < 0.015 mg/L<br>▪ Chromium (VI): < 0.15 mg/L<br>▪ Iron: < 1.5 mg/L<br>▪ Lead: < 0.15 mg/L | Detailed report(s) of the amount of hazardous substances in waste water discharged from the manufacturing plant | **5** | | *4.4.2 (page 8)* |
| Acidification | ○ $SO_2$ and $NO_x$ emissions shall not exceed the following limits:<br>**Limit ($mg/m^3$)**<br>$NO_x$ 200<br>$SO_2$ 300 | Detailed testing report(s) of acidifying emissions | **10** | | *4.4.3 (page 8)* |
| | | | **Subtotal:** | **50** | | |

**NON-CORE CRITERIA**

| **Criteria** | **Requirements** | **Verification** | ***Points*** ***+Bonus*** | ***Index*** |
|---|---|---|---|---|
| Environmental Management System | ○ Valid certification of ISO14001 or the EU Eco-Management and Audit Scheme (EMAS) | ISO14001 or EMAS certificate issued by accredited certification body | +5 | *4.1.1 (page 3)* |
| Packaging requirement | ○ Product packaging shall not contain halogenated plastics<br>○ All packaging materials shall be either comprised of 100% recycled material or readily recyclable | Documentation on the packaging materials used | +5 | *4.1.2 (page 3)* |
| Serviceability | ○ Product shall meet the durability requirements including abrasion resistance, frost resistance, water absorption, chemical resistance, break strength, stain resistance | Laboratory test report(s), MSDS and production documentation | +5 | *4.1.4 (page 4)* |
| Carcinogenic Substances | o Substances listed in IARC Group 1, 2A and 2B shall be < 0.1% by weight of the product | Laboratory test report(s), MSDS, self-declaration letter and production documentation. | +10 | *4.2.1 (page 5)* |

| | | | | |
|---|---|---|---|---|
| Hazardous Substances | ○ Product shall contain < 0.1% by weight of the following:<br>▪ Materials that give rise to dioxins;<br>▪ Halogenated organic flame retardants (e.g., decaBDE, chlorinated paraffins, etc);<br>▪ Flaming additives for natural products;<br>▪ Halogenated organic solvents;<br>▪ Aniline-based amines;<br>▪ Aziridine or polyaziridines;<br>▪ Phthalates, including DEHP, DBP, DAP, BBP, DMP, DMT, DEP, DMEP and DIBP;<br>▪ Alkylphenolethoxylates (APEO) or derivatives (APDs);<br>▪ 1,3 butadiene;<br>▪ Tar oils (benzo(α)pyrene)<br>▪ Pentachlorophenol (PCP)<br>▪ Asbestos<br>▪ 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD, dioxin) | Laboratory test report(s), MSDS, self-declaration letter and production documentation. | +10 | *4.2.2 (page 5)* |
| Energy Management | Manufactures shall implement effective energy management policies and procedures and / or an energy management programme, including but not limited to the following items:<br>• Initiatives taken to reduce energy use and improve energy efficiency<br>• Initiatives or requirements for suppliers or contract manufacturers | Detailed plan(s) of energy consumption and reduction programme | +5 | *4.3.1 (page 7)* |
| Emission of Fluorides | ○ Emission of fluorides during the firing stage: ≤ 3mg/$m^3$ | Detailed testing report(s) of the fluorides emission | +10 | *4.4.4 (page 10)* |
| | | **Subtotal:** | **+50** | |

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# 1. INTRODUCTION

## 1.1 PURPOSE

The CIC Green Product Certification *(formerly known as HKGBC Green Product Accreditation and Standards [HK G-PASS])* (herein after referred as the "Scheme") is an environmental labelling scheme owned by the Construction Industry Council (CIC) and implemented by the Hong Kong Green Building Council (HKGBC) which aims to help consumers, building professionals and policy makers identify environmentally preferable building materials and products. This Assessment Standard (hereafter referred as the "Standard") sets out the assessment criteria and their benchmarks for ceramic tile products to govern the application and award of a label under the Scheme. The Standard also defines the verification methods to determine which labelling grade should be awarded to the product according to the assessment criteria.

This Standard neither modifies nor supersedes laws and regulations. Compliance with this Standard is not a substitute for, and does not assure, compliance with any applicable laws or regulations. Compliance with all applicable laws and regulations is a prerequisite for the manufacturing and marketing of the product.

## 1.2 BACKGROUND

Ceramic tiles are widely used as floor and wall coverings in all types of buildings. While ceramic tiles can be classified into single-fired glazed, double-fired glazed and unglazed (BS EN 14411:2006), their major environmental impacts arise from the energy consumption during the pre-production and firing stages. The operation temperature of the firing process could reach about 1,150 to 1,200°C. Studies found that ceramics are the second highest embodied energy material after concrete, which accounts for 14% of the total embodied energy for buildings. In addition, the manufacturing of ceramic tiles uses different types of chemicals and thus generate significant amount of hazardous pollutants and wastes. With an increasing demand for sophisticated ceramic tile products around the globe, higher firing temperatures and more chemicals are required.

The key environmental evaluation criteria should, therefore, be on global warming, human toxicity and acidification. The purposes of the assessment criteria developed for ceramic tiles are indeed to conserve resources and energy consumption, to minimise the environmental impact through stringent assessment criteria on the production process and use of materials.

# 2. SCOPE

The scope of this Standard is applicable to all ceramic tiles products applied both to the floor and wall covering for internal use only, without structural function, defined in accordance with BS EN 14411:2012 *Ceramic tiles – Definitions, Classification, Characteristics, Evaluation of*

*Conformity and Marking*, which includes tiles produced by extrusion and dry-pressing

techniques, decorative pieces, trims and mosaics (i.e. any piece that can fit into a 7cm x 7cm area, see custom nomenclature).

Ceramic tiles are classified with respect to shaping (production method) and level of water absorption. The shaping and water absorption level shall be clearly indicated in the application. **ONE** application is only for **ONE** product series with same water absorption ratio (E) as listed, Type 1: $E \leq 0.5\%$; Type 2: $0.5 < E \leq 3\%$; Type: $3 < E \leq 6\%$. All the related products have to be listed on the submitted documents. Additives or pigments that could alter the environmental performance of tiles shall also be described in the application.

## 3. DEFINITIONS

*Applicant:* Organisations which apply for the label of the CIC Green Product Certification of the Construction Industry Council

*Ceramic tile:* A mixture of clays or other inorganic raw materials extruded or pressed into shape and fired at high temperatures to develop the required properties. The tile may then be glazed or left unglazed depending on its use

*CIC:* Construction Industry Council

*CNAS:* China National Accreditation Service for Conformity Assessment

*Dry-pressed tile*: A type of tile which is shaped by pressing

*Extruded tile:* A type of tile which is shaped in an extruder to form its shape which is then cut into tiles of predetermined dimensions

*Glaze:* A vitrified covering on the tile product

*HKAS:* Hong Kong Accreditation Service

*HKGBC:* The Hong Kong Green Building Council Limited

*HOKLAS:* The Hong Kong Laboratory Accreditation Scheme

*IARC:* International Agency for Research on Cancer

*ISO:* International Organisation for Standardisation

*MSDS:* Material safety data sheet. To qualify as suitable, MSDS and information therein must not be more than 5-years old

*Third-party:* An entity without any financial interest or stake in the sales of the product or

service being evaluated or other conflict of interest

# 4. EVALUATION CRITERIA

A product to be assessed should meet all the minimum requirements of the "Core Criteria" in order to be awarded a "Green" (i.e. a "pass" grade) Label under the Scheme. Bonus points may be awarded if the product meets the "Non-core Criteria" and a "Bronze", "Silver", "Gold" or "Platinum" Label will be awarded according to the total points accumulated (see Section 5 for details). All submissions and documentations shall be endorsed by the Chief Executive Officer or other authorised persons of the Applicant to demonstrate conformance to the assessment criteria. All certification, laboratory report and documentation must be valid during the assessment process and labelling period. The validity of all laboratory report and documentation shall be 5 years from the date of issue. The chemical tests should be conducted by either a third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

## 4.1 GENERAL REQUIREMENTS

### *4.1.1 Environmental Management System*

5 Points (Non-Core Criterion)
Manufacturer of the product shall possess valid ISO14001 or the EU Eco-Management and Audit Scheme (EMAS) certificates. Targets shall be set to reduce the environmental impacts during the manufacturing process which include but not limited to the reduction of hazardous substance emissions, energy consumption, $CO_2$ emissions, secondary environmental load, waste management, water management, etc.

Verification
A valid ISO14001 or EMAS Certificate issued by local or overseas accredited certification bodies.

### *4.1.2 Packaging requirements*

The packaging requirements are relevant to all primary packaging materials, i.e. those being used to envelop the product and hold it. The primary packaging materials are usually in direct contact with the contents and shall be in the minimal amount of distribution and/or use as they may eventually be disposed by the consumers.

5 Points (Non-Core Criterion)
The packaging materials shall:

- Not contain chlorinated or halogenated plastics; and
- Be comprised of 100% recycled material or be readily recyclable, decomposable, or contain no coatings, impregnated chemicals or other materials that would prevent recycling or decomposition.

Verification
Documentation that describes the packaging and the materials used.

### *4.1.3 Product Information*

5 Points (Core Criterion)
The following information shall be supplied with the product or made available to the public to help users using the products in a sustainable manner:

- Instructions for use / installation;
- Possible toxicity or health hazards imposed by the chemical components; and
- Methods of cleaning / maintenance.

Verification
Documentation related to the product labels, care instructions and other information provided with the product, material safety data sheets (MSDS), web pages and any other information shall be freely available to customers or the public.

### *4.1.4 Serviceability*

5 Points (Non-Core Criterion)
The product shall meet the quality and durability requirements (including abrasion resistance, frost resistance, water absorption, chemical resistance, break strength, stain resistance) according to related standards of International Organisation for Standardisation (ISO), American Society for Testing and Materials (ASTM), Chinese National Standard (GB).

*Table 1: Related standards for tests of servicability*

| Test | ASTM | ISO | GB |
|---|---|---|---|
| Abrasion Resistance | ASTM C 1027 | ISO 10545 | GB/T3810 |
| Frost Resistance | ASTM C 1026 | | |
| Water Absorption | ASTM C 373 | | |
| Chemical Resistance | ASTM C 650 | | |
| Break Strength | ASTM C 648 | | |
| Stain Resistance | ASTM C 1378 | | |

Verification
Laboratory test report(s), MSDS and relevant production documentation shall be provided.

## 4.2 HUMAN TOXICITY

### *4.2.1 Carcinogenic Substances*

10 Points (Non-Core Criterion)
Hazardous substances listed in the International Agency for Research on Cancer's (IARC) Groups 1, 2A and 2B Classifications (details can be found in website: http://monographs.iarc.fr/ENG/Classification/) shall be avoided during the production process or present in the final product. Any such carcinogens which are known to be present as contaminants shall be less than 0.1% by weight of the product.

Verification
Laboratory test report(s), MSDS, self-declaration letter and production documentation shall be provided.

### *4.2.2 Hazardous Substances*

10 Points (Non-core Criterion)
The following compounds, their functional derivatives or in-situ precursors shall be < 0.1% by weight of the ceramic tile products:

- Materials that give rise to dioxins;
- Halogenated organic flame retardants (e.g., decaBDE, chlorinated paraffins, etc);
- Flaming additives for natural products;
- Halogenated organic solvents;
- Aniline-based amines;
- Aziridine or polyaziridines;
- Phthalates, including DEHP, DBP, DAP, BBP, DMP, DMT, DEP, DMEP and DIBP;
- Alkylphenolethoxylates (APEO) or derivatives (APDs); and
- 1,3 butadiene.
- Tar oils (benzo(α)pyrene);
- Pentachlorophenol (PCP);
- Asbestos; and
- 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD, Dioxin).

Verification
Laboratory test report(s), MSDS, self-declaration letter and production documentation shall be provided.

### *4.2.3 Heavy Metals*

10 Points (Core Criterion)

The unglazed tile products shall contain less than 0.1% (by weight of the product) of heavy metals, including lead (Pb), copper (Cu), cadmium (Cd), mercury (Hg), tin (Sn), hexavalent chromium (Cr(VI)), arsenic (As), and antimony (Sb).

Lead, cadmium or antimony can be used in additives for glazing if the total content or release rates of these heavy metals are within the limits listed in Table 1.

*Table 2: Limits of heavy metals for glazing*

| ***Heavy metal*** | ***% by weight of glaze*** | ***Release rate (mg/m$^2$)*** |
|---|---|---|
| Lead (Pb) | < 0.5 | < 80 |
| Cadmium (Cd) | < 0.1 | < 7 |
| Antimony (Sb) | < 0.25 | N.A. |

Verification

Laboratory test report(s), MSDS and relevant production documentation. Release rate tests shall be compiled according to the National and International test methods including but limited to BS EN ISO 10545-15 or equivalent international standards.

### *4.2.4 Radioactivity*

10 Points (Core Criterion)

The effective concentration of potassium isotope $K_{40}$ ($C_K$), radium isotope $Ra_{226}$ ($C_{Ra}$) and thorium isotope $Th_{232}$ ($C_{Th}$) shall satisfy the following requirements:

External Hazard Index, $H_{ex}$:

Internal Hazard Index, $H_{in}$:

$$H_{in} = \frac{C_{Ra}}{200}$$

where $H_{ex}$ shall be ≤ 1.3 and $H_{in}$ shall be ≤ 1.0

Verification

A detail laboratory report(s) shall be provided. The raw materials of the product have to be crushed during the preparation and gamma spectroscopy shall be used to measure the effective concentration of the raw materials of product.

## 4.3 RESOURCE CONSUMPTION

### *4.3.1 Energy Management*

5 Points (Non-Core Criterion)

Manufacturers shall implement effective energy management policies and procedures and / or an energy management programme, including but not limited to the following items:

- Initiatives taken to reduce energy use and improve energy efficiency
- Initiatives or requirements for suppliers or contract manufacturers

Verification

Energy management policies, procedures and programmes that are written or signed by Chief Executive Officer or other authorised representative of the Applicant.

## 4.4 ECOSYSTEM IMPACT

### *4.4.1 Particulate Matters*

10 Points (Core Criterion)

The air emission of total particulate matters during the manufacturing process shall be less than 30 $mg/m^3$ .

Verification

Detailed report(s) of the air emission of particulate matters shall be compiled according to the National and International test methods including but not limited to EN 13284-1. Other related testing methods are also acceptable with justification provided by the applicant.

### *4.4.2 Discharge of Waste Water*

5 Points (Core Criterion)

Waste water discharged from the manufacturing plant shall be collected and tested. The related parameters in the waste water shall reach the following limits:

*Table 3: Limits of specific emission in waste water*

| ***Emission*** | ***Limit (mg/L)*** | ***Test method*** |
|---|---|---|
| Suspended solids | < 40 | ISO 5667-17 or equivalent |
| Cadmium | < 0.015 | ISO 8288 or equivalent |
| Chromium (VI) | < 0.15 | ISO 11083 or equivalent |
| Iron | < 1.5 | ISO 6332 or equivalent |
| Lead | < 0.15 | ISO 8288 or equivalent |

Verification

Detailed report(s) of specific emission in waste water discharged from the manufacturing plant.

### *4.4.3 Acidification*

10 Points (Core Criterion)

For the production of ceramic tiles, the $SO_2$ and $NO_x$ emissions generated from the kilning process shall not exceed the following limits.

*Table 4: Limits of nitrogen oxides and sulphur dioxides*

| **Parameter** | **Limit (mg/m$^3$)** |
|---|---|
| Nitrogen Oxides ($NO_x$) | 200 |
| Sulphur dioxides ($SO_2$) | 300 |

Verification

Detailed testing report(s) of acidifying emissions of $SO_2$ and $NO_x$ in accordance with EN 14791 (sulphur dioxides) and EN 14792 (nitrogen oxides) test methods.

### *4.4.4 Emission of Fluorides*

10 Points (Non-Core Criterion)

The emission of fluorides during the firing stage should not exceed 3 mg/m$^3$.

Verification

Laboratory test report(s), in accordance with ISO 15713: stationary source emissions – Sampling and determination of gaseous fluoride content.

# 5. SCORING AND GRADING

The points for meeting each criterion stated in Section 4 are summarised in Table 5.

*Table 5: Points to be awarded under the assessment criteria of this Standard*

| ***Evaluation Criteria*** | ***Points*** | |
|---|---|---|
| | ***Basic*** | ***+Bonus*** |
| 4.1.1 Environmental Management System | | +5 |
| 4.1.2 Packaging requirements | | +5 |
| 4.1.3 Product Information [CORE] | **5** | |
| 4.1.4 Serviceability | | +5 |
| 4.2.1 Carcinogenic Substances | | +10 |
| 4.2.2 Hazardous Substances | | +10 |
| 4.2.3 Heavy Metals [CORE] | **10** | |
| 4.2.4 Radioactivity [CORE] | **10** | |
| 4.3.1 Energy Consumption | | +5 |
| 4.4.1 Particulate Matters [CORE] | **10** | |
| 4.4.2 Discharge of Waste Water [CORE] | **5** | |
| 4.4.3 Acidification [CORE] | **10** | |
| 4.4.4 Emission of Fluorides | | +10 |
| | **50** | **+50** |
| **Total:** | **100** | |

The minimum requirement to be awarded a "Green" Label under this product category is to obtain 50 points by meeting all minimum requirements laid down in the "Core Criteria".

*Table 6: Benchmarks for grading ceramic tile*

| ***Grade to be awarded*** | ***Points required*** |
|---|---|
| Platinum | 90 or above |
| Gold | 80 - 89 |
| Silver | 70 - 79 |
| Bronze | 60 - 69 |
| Green | 50 - 59 |
| No Label | Below 50 |