CONSTRUCTION INDUSTRY COUNCIL

CIC GREEN PRODUCT CERTIFICATION

Air Handling Unit

Assessment Standard

(Version 1.1)

Last updated: 23 Jul 2020

Air Handling Unit

Summary of Assessment Criteria

CORE CRITERIA

Criteria	*Requirements*	*Verification*	*Points*		*Index*
			Basic	*+Bonus*	
Product Information	Applicant shall provide the following product for compliance: • Basic product specifications • The intended use of the product • Instructions for correct use and storage to maximise the lifetime of the product • Recommended operating conditions • Recommended maintenance instructions for the product • Installation method • Instructions for consumer product disposal • Country of origin • Operation & Maintenance Manual	Documentation including but not limited to product label, product catalogue, MSDS, and written declaration with date-stamped photograph	5		*4.1.2 (Page 4)*

<table>
<tr><th rowspan="2">Criteria</th><th rowspan="2">Requirements</th><th rowspan="2">Verification</th><th colspan="2">Points</th><th rowspan="2">Index</th></tr>
<tr><th>Basic</th><th>+Bonus</th></tr>
<tr><td>Casing Performance</td><td>All products shall meet the following 5 basic requirements of casing performance including but not limited to mechanical strength, air leakage, thermal transmittance, thermal bridging and acoustic insulation.

5 bonus points will be granted if 3 out of 5 bonus criteria are met.

<table>
<tr><th>Category</th><th>Criteria</th><th>Points</th></tr>
<tr><td rowspan="2">Mechanical Strength</td><td>Class D1
Maximum relative deflection: 4 mm/m</td><td>Bonus</td></tr>
<tr><td>Class D2
Maximum relative deflection: 10 mm/m</td><td>Basic</td></tr>
<tr><td rowspan="2">Air Leakage Class L1</td><td>Maximum leakage rate (f_{400}): 0.15 l/s/m^2</td><td rowspan="2">Bonus</td></tr>
<tr><td>Maximum leakage rate (f_{700}): 0.22 l/s/m^2</td></tr>
<tr><td rowspan="2">Air Leakage Class L2</td><td>Maximum leakage rate (f_{400}): 0.44 l/s/m^2</td><td rowspan="2">Basic</td></tr>
<tr><td>Maximum leakage rate (f_{700}): 0.63 l/s/m^2</td></tr>
<tr><td rowspan="2">Thermal Transmittance (U), W/(m^2·K)</td><td>Class T1:
$U \leq 0.5$</td><td>Bonus</td></tr>
<tr><td>Class T2:
$0.5 < U \leq 1.0$</td><td>Basic</td></tr>
<tr><td rowspan="2">Thermal bridging factor (k_b)</td><td>Class TB1:
$0.75 < k_b < 1.00$</td><td>Bonus</td></tr>
<tr><td>Class TB2:
$0.60 < k_b \leq 0.75$</td><td>Basic</td></tr>
<tr><td>Filter bypass leakage</td><td>Class F9:
Maximum filter bypass leakage rate 0.5%</td><td>Bonus</td></tr>
<tr><td>Acoustic insulation</td><td>Minimum sound insertion loss through panels at 1K Hz: 10dB</td><td>Basic</td></tr>
</table>
</td><td>Documentation including but not limited to product catalogue, MSDS and test report</td><td>5</td><td>+5</td><td>4.1.3 (Page 4)</td></tr>
</table>

<table>
<tr><th rowspan="2">Criteria</th><th rowspan="2">Requirements</th><th rowspan="2">Verification</th><th colspan="2">Points</th><th rowspan="2">Index</th></tr>
<tr><th>Basic</th><th>+Bonus</th></tr>
<tr><td>Noise level</td><td>Products shall not exceed the noise levels as stated in below tables:

Airborne sound pressure level (dBA)

<table>
<tr><th rowspan="2">Rated air flow rate (m^3/hr)</th><th colspan="5">Total static pressure/Pa</th></tr>
<tr><th>350</th><th>500</th><th>750</th><th>1000</th><th>1500</th></tr>
<tr><td>2000-3000</td><td>60</td><td>63</td><td>66</td><td>69</td><td>72</td></tr>
<tr><td>5000</td><td>62</td><td>65</td><td>68</td><td>71</td><td>74</td></tr>
<tr><td>6000</td><td>63</td><td>66</td><td>69</td><td>72</td><td>75</td></tr>
<tr><td>10000</td><td>65</td><td>68</td><td>71</td><td>74</td><td>77</td></tr>
<tr><td>12000</td><td>66</td><td>69</td><td>72</td><td>75</td><td>78</td></tr>
<tr><td>20000</td><td>68</td><td>71</td><td>74</td><td>77</td><td>80</td></tr>
<tr><td>25000</td><td>69</td><td>72</td><td>75</td><td>78</td><td>81</td></tr>
<tr><td>30000</td><td>70</td><td>73</td><td>76</td><td>79</td><td>82</td></tr>
<tr><td>50000</td><td>72</td><td>75</td><td>78</td><td>81</td><td>84</td></tr>
<tr><td>80000</td><td>74</td><td>77</td><td>80</td><td>83</td><td>86</td></tr>
<tr><td>100000</td><td>75</td><td>78</td><td>81</td><td>84</td><td>87</td></tr>
<tr><td>160000</td><td>77</td><td>80</td><td>83</td><td>86</td><td>89</td></tr>
<tr><td>200000</td><td>78</td><td>81</td><td>84</td><td>87</td><td>90</td></tr>
</table></td><td>Documentation including but not limited to product catalogue, MSDS and test report</td><td>10</td><td></td><td>4.2.2 (Page 6)</td></tr>
<tr><td>Fan Efficiency</td><td>• The fan operating efficiency at all intended operating points shall not be less than 15 percentage point below the fan peak total efficiency as required in AMCA 205-12
• Product shall use forward or backward curved fan with airfoil blades
• Points are awarded according to the Fan Efficiency Grade of the fan per below:

<table>
<tr><td>Efficiency Grade</td><td>>FEG67</td><td>>FEG80</td></tr>
<tr><td>Points</td><td>15 Basic</td><td>+5 Bonus</td></tr>
</table></td><td>Documentation including but not limited to product catalogue, MSDS and test report</td><td>15</td><td>+5</td><td>4.3.1 (Page 7)</td></tr>
<tr><td>Motor Efficiency</td><td>The efficiency classified by IEC 60034-30-1 and points be awarded per below:

<table>
<tr><th>Efficiency Class</th><th>Points</th></tr>
<tr><td>IE3</td><td>15 Basic</td></tr>
<tr><td>IE4</td><td>+5 Bonus</td></tr>
</table></td><td>Documentation including but not limited to product catalogue, MSDS and test report</td><td>15</td><td>+5</td><td>4.3.2 (Page 7)</td></tr>
<tr><td></td><td></td><td>Subtotal:</td><td>50</td><td>+15</td><td></td></tr>
</table>

Non-Core Criteria

Criteria	*Requirements*	*Verification*	*Points +Bonus*	*Index*
Environmental Management System	Manufacturers shall possess valid certificates of ISO 14001, EU Eco-Management and Audit Scheme (EMAS) or Cradle-to-Cradle.	A valid certificate issued by local or overseas accredited certification bodies	+5	*4.1.1 (Page 3)*
Paint Used	Paints used on the products including but not limited to the corrosion resistant coatings and protective coatings shall not contain the following heavy metals or their compounds. If the paints used on the products contain the following heavy metal or their compounds, the concentration shall be less than 0.01% by weight of the product. • Cadmium • Lead • Chromium VI • Mercury If the paints used on the products contain the barium (excluding barium sulfate) or its compounds, the concentration shall be less than 0.1% by weight of the product. Volatile organic compound content of the paint used on the products shall be equal to or less than 500g/L minus water. Alternative No paint used on the products	Laboratory test report(s), MSDS, self-declaration letter and production documentation	+5	*4.2.1 (Page 5)*
Heat recovery	All heat exchangers shall be fitted with seals to minimise air leakage; the heat recovery classes at balanced mass flow conditions (1:1) shall be fulfilled the following requirements of $\eta_{e\ 1:1}$ min [%] $\geq$ 71 with η_e values based on calculation according to DIN EN 13053 or equivalent.	Documentation including but not limited to product catalogue, MSDS and test report	+5	*4.3.3 (Page 8)*

Criteria	*Requirements*	*Verification*	*Points* *+Bonus*	*Index*
Regional Manufactured Equipment	Encourage the use of equipment manufactured locally so as to reduce the environmental impacts arising from transportation. The manufacturing location should be located within a radius of 800km of Hong Kong.	Documentation including but not limited to product catalogue and MSDS	+5	*4.3.4 (page 8)*
Waste Management	Manufacturers shall implement effective waste management policies, procedures and/or a waste management programs covering manufacturing operations. Documentation should include but not limited to the following information: • Initiatives taken to reduce waste generation and improve recovery/recycling of waste; • Initiatives implemented for recovery of post-consumer and/or pre-consumer waste that can be re-introduced into the manufacturing process; and • Other environmental benefits or constraints associated with waste minimisation objectives and processes.	Documentation including but not limited to detailed plan and report	+5	*4.3.5 (Page 8)*
Energy Management	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; and • Initiatives or requirements for suppliers or contract manufacturers.	Documentation including but not limited to detailed plan and report	+5	*4.3.6 (Page 9)*
Automation System	Products shall be able to communicate with Building Management System (BMS) via an open standard communication interface including but not limited to BACnet, Modbus, ZigBee and LonWorks for controlling and monitoring from BMS.	Documentation including but not limited to product catalogue, MSDS	+5	*4.4.1 (Page 9)*
		Subtotal:	**+35**	

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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 to as the "Standard") sets out the assessment criteria and their benchmarks for air handling unit 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

Air handling unit (AHU) is a device that regulates and circulates the air supplied into the buildings. It may be designed to supply constant or variable air volume for low-, medium- or high-velocity air distribution. The air delivered into the building will normally undergo thermo-hygrometric and indoor air quality treatment specified by each project. AHUs collect and mix outdoor air with that returning air from building spaces. Before discharging to the buildings, AHUs treat the air by filtering, cooling and/or heating, humidifying and/or dehumidifying. AHUs can provide functions of ventilation, removal of dust, gas, outdoor and microorganisms, heating, cooling, humidification and dehumidification, heat recovery and regeneration.

Air handling unit can place a significant burden on the environment. With increasing environmental claims of air handling unit in the market, a more comprehensive and systematic approach to assess the environmental impacts of the air handling unit shall be developed. The aim of this Standard is to help designers and end-users choosing greener products by conserving resources, reducing the amount of waste disposal in landfills and reducing the impact to human health throughout the life cycle of air handling unit. The development of the assessment criteria in this Standard has made references to worldwide relevant eco-labelling schemes and some existing life cycle assessment (LCA) studies.

2. SCOPE

ONE application is only eligible for **ONE** product series. All the related products have to be listed on the submitted documents.

Note:
Each application should specify the product code / serial number.

The CIC or an appointed third party would conduct a random check of the labelled product during the validity period of the label. One of the laboratory tests listed below would be selected and performed to verify the compliancy of the product with the criteria stated in the Standard.

3. DEFINITIONS

Applicant: Organisation which apply for the label under the CIC Green Product Certification of the Construction Industry Council

ASTM: American Society for Testing and Materials

AMCA: Air Movement and Control Association International, Inc.

GB: Chinese National Standards

BS: British Standards

CIC: Construction Industry Council

CNAS: China National Accreditation Service for Conformity Assessment

DIN: German institute for standardisation

EN: European Standard

HKAS: Hong Kong Accreditation Service

HKGBC: Hong Kong Green Building Council

HOKLAS: The Hong Kong Laboratory Accreditation Scheme

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

4. EVALUATION CRITERIA

A product to be assessed shall 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 documentation shall be endorsed by the Chief Executive Officer or other authorised persons of the Applicant to demonstrate conformance to the assessment criteria. All certifications, laboratory reports and documentations must be valid during the assessment process and labelling period. All laboratory reports and documentation shall be within 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. CIC or an appointed third party would conduct a random check of the labelled product during the period of validity of the label, through laboratory test to verify the compliance with the criteria as stated in the Standard.

4.1 GENERAL REQUIREMENTS

4.1.1 Environmental Management System

5 Points (Non-core Criterion)

Manufactures shall possess valid certificates of ISO 14001, EU Eco-Management and Audit Scheme (EMAS) or Cradle-to-Cradle.

Note:

BS EN ISO 14001 is the international standard which provides an outline of how to meet the environmental policy and objectives for the business of the applicant.

Eco-Management and Audit Scheme (EMAS) is an environmental management tool which enables organizations to assess, manage and continuously improve their environmental performance.

Cradle-to-Cradle design is a biomimetic approach to the design of products and systems. It models human industry on nature's processes viewing materials as nutrients circulating in healthy, safe metabolisms.

Verification

A valid certificate issued by local or overseas accredited certification bodies.

4.1.2 Product Information

5 Points (Core Criterion)

Applicant shall provide the following product information for compliance:

- Basic product specifications
- The intended use of the product
- Instructions for correct use and storage to maximise the lifetime of the product
- Recommended operating conditions
- Recommended maintenance instructions for the product
- Installation method
- Instructions for consumer product disposal
- Country of origin
- Operation & Maintenance Manual

Verification

Documentation including but not limited to product label, product catalogue, MSDS, and written declaration with date-stamped photographs.

4.1.3 Casing Performance

5 Basic Points + 5 Bonus Points (Core Criterion)

All products shall meet the 5 basic requirements of casing performance as stated in Table 4.1.3, including but not limited to mechanical strength, air leakage, thermal transmittance, thermal bridging and acoustic insulation, in accordance with BS Standard including but not limited to the BS EN 1886:2007 (or latest version). Other related standards are also acceptable with justification provided by the applicant. 5 bonus points will be granted if 3 out of 5 bonus criteria are met.

Table 4.1.3 Casing Performance

Category	**Criteria**	**Points**
Mechanical Strength	Class D1: Maximum relative deflection: 4 mm/m	Bonus
	Class D2: Maximum relative deflection: 10mm.n	Basic
Air Leakage Class L1	Maximum leakage rate (f_{400}): 0.15 l/s/m^2	Bonus
	Maximum leakage rate (f_{700}): 0.22 l/s/m^2	
Air Leakage Class L2	Maximum leakage rate (f_{400}): 0.44 l/s/m^2	Basic
	Maximum leakage rate (f_{700}): 0.63 l/s/m^2	
Thermal Transmittance (U), W/(m^2·K)	Class T1: $U \leq 0.5$	Bonus
	Class T2: $0.5 < U \leq 1.0$	Basic
Thermal bridging factor (k_b)	Class TB1: $0.75 < k_b < 1.00$	Bonus
	Class TB2: $0.60 < k_b \leq 0.75$	Basic
Filter bypass leakage	Class F9: Maximum filter bypass leakage rate 0.5%	Bonus

Acoustic insulation	Minimum sound insertion loss through panels at 1K Hz : 10dB	Basic

Note:
BS EN 1886:2007 specifies the mechanical performance of an air handling unit as a whole to be utilized by all involved in ventilation and air conditioning manufacturing, design, installation and maintenance.

Verification
Documentation including but not limited to product catalogue, MSDS and test report issued by third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

4.2 HUMAN TOXICITY

4.2.1 Paint Used

5 Points (Non-core Criterion)

Paint Used

Paints used on the products including but not limited to the corrosion resistant coatings and protective coatings shall not contain the following heavy metals or their compounds. The alternative is no paint used on the products.

If the paints used on the products contain the following heavy metal or their compounds, the concentration shall be less than 0.01% by weight of the product.

- Cadmium
- Lead
- Chromium VI
- Mercury

If the paints used on the products contain the barium (excluding barium sulfate) or its compounds, the concentration shall be less than 0.1% by weight of the product.

Volatile organic compound content of the paint used on the products shall be equal to or less than 500g/L minus water.

Verification
Documentation including but not limited to product catalogue, MSDS and test report issued by third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

4.2.2 Noise Level

10 Points (Core Criterion)

Products shall not exceed the airborne sound pressure levels as stated in GB/T 14294-2008 (or latest version); other related testing methods are also acceptable with justification provided by the applicant.

Table 4.2.2 Maximum Sound Pressure Level dB(A) -Airborne

Rated air flow rate (m^3/hr)	Total static pressure/Pa				
	350	500	750	1000	1500
2000-3000	60	63	66	69	72
5000	62	65	68	71	74
6000	63	66	69	72	75
10000	65	68	71	74	77
12000	66	69	72	75	78
20000	68	71	74	77	80
25000	69	72	75	78	81
30000	70	73	76	79	82
50000	72	75	78	81	84
80000	74	77	80	83	86
100000	75	78	81	84	87
160000	77	80	83	86	89
200000	78	81	84	87	90

Note:

GB/T 14294-2008 specifies the terms and definition, classification and marking, materials, requirements, test methods, inspection rules, marking, packing, transporting and storing, product sample and the basic contents of product specification of air handling units

Verification

Documentation including but not limited to product catalogue, MSDS and test report issued by third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

4.3 RESOURCE CONSUMPTION

4.3.1 Fan Efficiency

15 Basic Points + 5 Bonus Points (Core Criterion)

- The fan operating efficiency at all intended operating points shall not be less than 15 percentage point below the fan peak total efficiency as required in AMCA 205-12
- Product shall use forward or backward curved fan with airfoil blades
- Points are awarded according ot the Fan Efficiency Grade of the fan per below:

Efficiency Grade	**>FEG67**	**>FEG80**
Points	15 Basic	+5 Bonus

Note:
AMCA205 defines the energy efficiency classification for fans.

Verification
Documentation including but not limited to product catalogue, MSDS and test report issued by third party or the manufacturer who has received the ISO 17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

4.3.2 Motor Efficiency

15 Basic Points + 5 Bonus Points (Core Criterion)
Motors used for the fan in the AHU shall satisfy the efficiency classification in IEC 60034-30-1.
Points will be award according to the motor efficiency class per below:

Efficiency Class	**Points**
IE3	15 Basic
IE4	+5 Bonus

Note:
IEC 60034-30 specifies energy-efficiency classes for single-speed, continuous duty), three-phase, cage-induction motors

Verification
Documentation including but not limited to product catalogue, MSDS and test reports issued by third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

4.3.3 Heat Recovery

5 Points (Non-core Criterion)
All heat exchangers shall be fitted with seals to minimise air leakage. The heat recovery classes at balanced mass flow conditions (1:1) shall fulfil the following requirements of $\eta_{e\ 1:1}$ min [%] ≥ 71 with η_e values based on calculation according to DIN EN 13053 or equivalent

Note:
BS EN 13053:2011 specifies requirements and testing for ratings and performance of air handling units as a whole. It also specifies requirements, recommendations, classification, and testing of specific components and sections of air handling units.

Verification
Documentation including but not limited to product catalogue, MSDS and test reports issued by third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc.

4.3.4 *Regionally Manufactured Equipment*

5 Points (Non-core Criterion)

- The use of equipment manufactured locally within 800 km from the default coordinates of Hong Kong.

Verification
Documentation including but not limited to product catalogue and MSDS.

4.3.5 Waste Management

5 Points (Non-core Criterion)
Manufacturer shall implement effective waste management policies, procedures and/or a waste management programs covering manufacturing operations. Documentation should include but not limited to the following information:

- Initiatives taken to reduce waste generation and improve recovery/recycling of waste;
- Initiatives implemented for recovery of post-consumer and/or pre-consumer waste that can be re-introduced into the manufacturing process; and
- Other environmental benefits or constraints associated with waste minimisation objectives and processes.

Verification
Documentation including but not limited to detailed plan and report.

4.3.6 Energy Management

5 Points (Non-core Criterion)

Manufacturer 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; and
- Initiatives or requirements for suppliers or contract manufacturers.

Verification

Documentation including but not limited to detailed plan and report.

4.4 ECOSYSTEM IMPACT

4.4.1 Automation System

5 Points (Non-core Criterion)

Products shall be able to communicate with Building Management System (BMS) via an open standard communication interface including but not limited to BACnet, Modbus, ZigBee and LonWorks for controlling and monitoring from BMS.

Verification

Documentation including but not limited to product catalogue, MSDS.

5. SCORING AND GRADING

The points for meeting each criterion stated in Section 4 are summarised in Table 1.

Table 1: 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 Product Information [CORE]	5	
4.1.3 Casing Performance [CORE]	5	+5
4.2.1 Paint Used		+5
4.2.2 Noise Level [CORE]	10	
4.3.1 Fan Efficiency [CORE]	15	+5
4.3.2 Motor Efficiency [CORE]	15	+5
4.3.3 Heat Recovery		+5
4.3.4 Regional Manufactured Materials		+5
4.3.5 Waste Management		+5
4.3.6 Energy Management		+5
4.4.1 Automation System		+5
	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 2: Benchmarks for grading

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