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Technical guide for recycled poly-vinyl-chloride (PVC) roofing slate

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Canadian Construction Materials Centre

Technical Guide for

Recycled Poly-vinyl-chloride (PVC) Roofing Slate

Masterformat Section: **07318.3**

N.B. This Technical Guide was prepared under contract by CCMC for the evaluation of a specific product. The technical requirements and performance criteria it contains are not valid for the evaluation of other products unless verified by CCMC under separate contract.

For more information call (613) 993-6189.

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1.0 Scope

This Technical Guide describes the technical requirements and performance criteria for the assessment of polyvinyl (PVC) slate produced from industrial recycled poly vinyl chloride plastic simulating natural slates for the purpose of obtaining a CCMC Evaluation Report. The (PVC) slate is manufactured by compounding and moulding selected industrial PVC plastic regrind. This type of product cannot be assessed solely on the basis of any existing Canadian standard.

The (PVC) slate is intended for use only over a continuous roof sheathing having a minimum slope of 1 in 2, in conjunction with a layer of 30lb roof underlay felt.

The criteria and requirements referenced herein were developed to evaluate the performance of recycled plastic composite shake roofing systems with respect to their equivalency to the intent of the National Building Code of Canada (NBC) 1995 as allowed for in Section 2.5., Equivalents. Equivalency is established with respect to Part 9, Housing and Small Buildings, Article 9.26.1.1., Purpose of Roofing, and Article 9.26.2.1., Material Standards, of the NBC.

A successful evaluation conforming to this Technical Guide will result in a published CCMC Evaluation Report that is applicable only to products bearing the proper identification of CCMC's evaluation number (see Section 7.3).

2.0 Definitions

Installation manual - a document governing all aspects of transportation and installation.

Performance requirements - the actual requirements that a product must meet, which closely simulate the pattern of behaviour in the course of its intended use.

Prescriptive requirements - criteria for specific components, as well as for the individual material types.

Proponent - the party applying for a CCMC evaluation (normally the manufacturer of a product, a major component supplier or a Canadian distributor of the product).

Recognized laboratory - a laboratory complying with CCMC's Laboratory Recognition Guideline, which emphasizes laboratories accredited by the Standards Council of Canada (appended to covering letter).

Slate - a natural fine grained rock formed from clay and shale by intense metamorphism. The metamorphic process re arranges the mineral grains into parallel positions with a tendency to split in an excellent parallel cleavage.

3.0 Applicable Codes and Standards

3.1 National Building Code of Canada (NBC) 1995

Article 9.26.1.1.	Purpose of Roofing
Article 9.26.2.1.	Material Standards

3.2 Canadian General Standards Board (CGSB)

CGSB-37.58-M86	Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use In Roofing and Waterproofing
----------------	--

3.3 American Society for Testing and Materials International (ASTM)

ASTM D 570-98	Standard Test Method for Water Absorption of Plastics
ASTM D 696-03	Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
ASTM D 792-00	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 1037-99	Evaluating Properties of Wood Standard Test Methods for Base Fiber and Particle Panel Materials
ASTM D 1149-99	Standard Test Method for Rubber Deterioration-Surface Ozone Cracking in a Chamber
ASTM D3462-03	Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
ASTM D 4216-03	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds
ASTM G 155 -00ae1	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

3.4 Dade County Building Code Compliance Office

Protocol PA 100-95	Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems
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3.5 Standards and Codes Referenced Herein May Be Purchased from:

SCC	Standards Council of Canada 270 Albert Street, Suite 200 Ottawa, Ontario K1P 6N7 Tel.: (613) 238-3222 Fax: (613) 995-4564
CGSB	Canadian General Standards Board Sales Unit Place du Portage Phase III, 6B1 11 Laurier Street Hull, Quebec K1A 0S5 Tel.: (819) 956-3500 Fax: (819) 956-5644
ASTM	American Society for Testing and Materials International 100 Barr Harbor Drive West Conshohocken, Pennsylvania U.S.A. 19428-2959 Tel.: (610) 832-9585 Fax: (610) 832-9555
Dade County	Building Code Compliance Office 140 W. Flagler Street, Suite 1603 Miami, Florida U.S.A. 33130-1563 Tel.: (305) 375-2901 Fax: (305) 375-2908

The NBC May be purchased from:

NRC	Client Services Institute for Research in Construction National Research Council of Canada Building M-20, Montreal Road Ottawa, Ontario K1A 0R6 Tel.: (613) 993-2463 Fax: (613) 952-7673
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4.0 General

4.1 Development of Technical Requirements and Performance Criteria

The requirements and criteria specified in this Technical Guide have been prepared by CCMC evaluation officers in consultation with researchers and experts in construction. For this purpose, CCMC maintains an ongoing relationship with experts from NRC/IRC, other research or testing organizations, and industry.

4.2 Evaluation Process

CCMC personnel assess the submitted product, its test results, engineering analysis and installation instructions in relation to the technical requirements and performance criteria specified herein. Where this assessment reveals performance levels below those anticipated in this Technical Guide, limitations on the use of the product may result. In-plant quality control procedures are reviewed to ensure that consistent product quality can be achieved.

5.0 Technical Requirements

5.1 General

This guide is applicable to PVC slate that may contain up to 100 % recycled PVC industrial plastic. The product must comply with the prescriptive and performance requirements contained herein.

The requirements are used to demonstrate that the roofing system provides an acceptable level of performance as intended by the NBC.

5.2 PVC Recycled Plastic Slate Prescriptive and Performance Requirements

The recycled plastic slate shall meet the physical and mechanical requirements indicated in Table 1 as well as the performance requirements indicated in Table 2.

The manufacturer shall provide the base composition of the plastic tile, details of the different manufactured profiles, the dimensions and manufacturing tolerances.

Table 1. Physical and Mechanical Properties of Recycled PVC Plastic Slate

Property	Requirements	Test Methods
PVC classification		
Impact Izod	107 J/m	ASTM D 4216
Tensile strength	45 MPa	
Modulus of elasticity in tension	2208 MPa	
Density	Report value	ASTM D 792
Thermal expansion	Min. $8.1 \times 10^{-5} \text{ }^{\circ}\text{C}^{-1}$	ASTM D696
Dimensional stability	$\pm 5.0\%$ max.	CGSB-37.58-M86, para. 7.2.3
Ozone resistance	No cracks	ASTM D 1149
Water absorption	3.0% max	ASTM D570

Table 2. Performance of the Roofing System

Property	Requirements	Test Methods
Uplift bend ¹ - load to lift 3 mm - load 3 times the tile weight	Minimum of 2 times the tile weight No crack, break or fall off specimen deck	Section 6.4.1
Wind uplift	No loss of integrity or damage	Sections 6.4.2 and 6.4.3
Dynamic pressure water infiltration	No leakage or damage to assembly	Sections 6.4.2 and 6.4.4
Nail pull -through:	440 N (min)	Section 6.4.5 ASTM D 1037 para. 54 to 60
Accelerated weathering Exposure 1000 h - Tensile strength - Pliability Exposure 2000 h - Tensile strength - Pliability	90% retention, no defects such as cracking, splitting etc. other than slight colour change 80% retention, no defects such as cracking, splitting etc. other than slight colour change	Sections 6.4.6; 6.4.6.2 and ASTM D3462 para 8.1.12
Heat ageing - Tensile strength - Pliability	$\geq 80\%$ retention of original no defects other than colour change, no cracking	Section 6.4.7 and ASTM D3462 para 8.1.12

Note 1: failure to comply with this requirement will result in a limitation as to the use of the product on vertical surfaces

6.0 Testing

6.1 General

Testing must be performed at a recognized laboratory as indicated in the covering letter. The proponent must provide copies of this Technical Guide to each laboratory performing tests. The proponent must cover the costs of testing and authorize the testing organization to forward the original test report for each sample directly to CCMC. The submitted test reports become the property of CCMC and their content remains confidential.

6.2 Sampling

The proponent must arrange with CCMC to obtain a random selection of samples from the production line or main storage facility for their identification before they are sent to the testing laboratory.

The proponent should contact the testing laboratory to obtain information regarding fees and the number of samples required for testing in accordance with this Technical Guide. The proponent must then forward the identified samples directly to the testing laboratory. If several plants manufacture this product, samples from each facility are required.

6.3 Reports from Testing Laboratories

The following information shall be provided by testing laboratories in reports intended for CCMC evaluation purposes:

- detailed information on material sampling (sampling date, method of sampling, sites where sampling was performed and sample reference number);
- the start and end date(s) of test(s);
- detailed specimen preparation methods (if other than specified in the test method, standard or Technical Guide);
- test procedure identification, including:
 - any deviations from the referenced test procedure;
 - reasons for the deviations; and
 - additional instrumentation requirements;
- all information mentioned in the reporting section of the referenced standards or standard test methods;
- test results (table format, if appropriate), including written explanations to account for any discrepancies; and

- a conclusion, including a statement on the product's performance with respect to the overall requirements of the CCMC Technical Guide.

The report should include the statement: "Tested for CCMC Evaluation Purposes."

6.4 Testing Procedures

6.4.1 Uplift Bend Test

The test specimen shall be four courses high and four slates, assembled as per the manufacturer's instructions.

The test roof shall be erected and secured in the vertical position for testing. The horizontal load is applied at the centre of the butt edge of an inner slates in the second course from the bottom of the test specimen. The loads required to lift the butt a distance of 3 mm and 51 mm are to be recorded. The same procedure is repeated for the butt edge of an inner slate of the top course of the structure. Record the same loads. The test is continued until a load equal to three times the tile weight has been applied horizontally outward and vertically downward at the centre of the butt edge of the inner slates in the second course from the bottom of the test deck.

If the test specimen cracks, breaks or falls off before the 51 mm movement, the product is considered to have failed and the mode of failure shall be noted.

6.4.2 Sample Preparation for Wind Uplift Resistance and Dynamic Pressure Water Infiltration Resistance Tests

These tests shall be conducted using a modification of the Dade County Protocol PA 100-95, "Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems".

Test Frame

The test frame shall consist of a 3.05-m-long x 2.44-m-wide base structure, constructed from wood or steel framing, and a wood deck, constructed from plywood sheathing. Observation windows shall be made in the sheathing at the following locations:

- 1) one at the front edge of test deck,
- 2) one at the edge of flashing adjacent to the valley, and
- 3) two openings in the test field.

Deck support joists shall be placed at 600 mm on centre. The deck slope shall be adjustable, or multiple interchangeable decks shall be available to test specimens at slopes of 1:6, 1:4, 1:3, and 1:2. The deck support shall be capable of supporting not less than 2.6 kPa of dead load.

Wind Generator

A wind generator capable of generating a constant 170-km/h wind profile over the entire width of the test specimens shall be provided. Water shall be supplied to the wind stream using a sprinkle-pipe system mounted on a movable frame capable of simulating a uniform 220 mm/h rainfall over the test specimen. Wind stream calibration and water distribution check shall be conducted according to PA 100-95, Section 7.

Test Specimen

The wood test deck shall consist of APA 50 mm span rated sheathing of 12-mm thickness installed over 50 x 150 mm perimeter support and 50 x 150 mm intermediate supports spaced 600 mm apart. The sheathing shall be attached with 8d common nails at 150-mm intervals at intermediate supports. One valley shall be constructed into the test deck, located at the deck's front edge. (Figure 1 provides an illustration of a test deck). The wood test deck shall be positioned at the minimum slope against which the roofing system is being tested.

Underlayment and prepared roof covering shall be installed in strict compliance with the manufacturer's installation instructions.

The roofing system under test shall be installed as per the manufacturer's installation instructions using the recommended placement and fastening system. The manufacturer's recommended auxiliaries should also be used if appropriate. Any deviation must be recorded in the test report.

The areas subject to the test criteria shall consist of the field area of the test deck, the eave, the valley and one rake section.

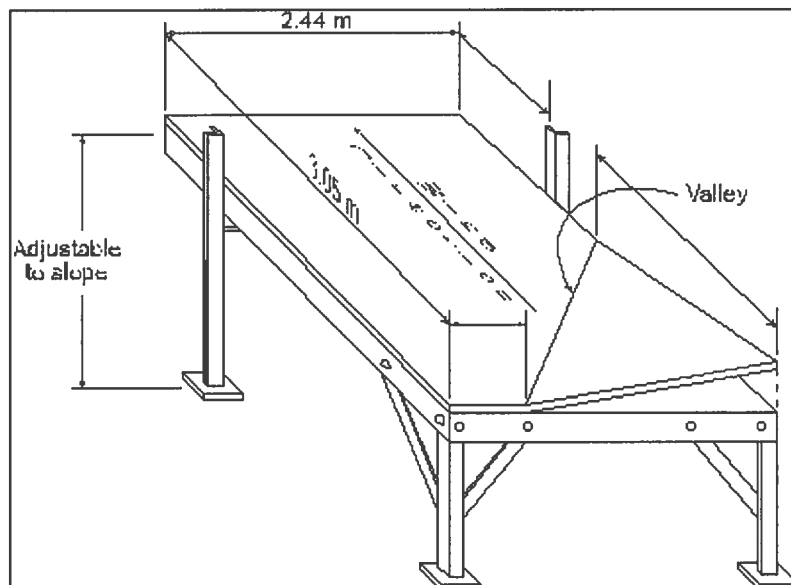


Figure 1. Dynamic Wind and Water Pressure Deck

6.4.3 Wind Uplift Resistance Test

The frame, wind generator and test specimen preparation for the wind uplift resistance test shall be in accordance with the requirements of Section 6.4.2 of this Guide.

Test Procedure

The test specimen shall be positioned on the test frame at the minimum slope proposed for installation.

The test specimen shall be positioned so that the exposed edge of the 2.44-m eave is facing the wind generator. The set-up should facilitate observer access. The topside and underside conditions of the test specimen shall be recorded prior to starting the test.

The wind stream shall be delivered as noted below:

Interval #	Wind Speed (km/h)	Time (minutes)
1	80	15
2	0	15
3	100	15
4	0	15
5	120	15
6	0	15
7	140	15
8	0	15
9	170	15
10	0	15

The test set-up should be inspected 15 minutes after the wind speed has been reduced to 0 km/h. Photographs shall be taken of the top side and underside of the test specimen 30 seconds prior to the completion of each interval and at the inspection time (i.e. 15 minutes after the wind has been reduced to 0 km/h). The specimen shall be inspected for any damage to the slate tile. Loss of integrity above the test deck must be noted, and photographs of any observed defects shall be taken.

The test report shall contain the following information:

- 1- a description of the roof system, including the manufacturer and type of underlayment, slope, etc.;
- 2- sketches of the test specimen, photographs of the top side and underside of the test specimen immediately prior and after each interval and after termination of testing;
- 3- wind stream calibration data; and
- 4- detailed observation of any damage to the slate tile.

Any test specimen, which has the slate, or any portion thereof, "blow off" tear or blow upward without re-seating during the test shall be considered as failing the wind uplift test.

6.4.4 *Dynamic Pressure Water Infiltration Resistance Test*

The frame, wind generator and test specimen preparation for the dynamic pressure water infiltration resistance test shall be in accordance with the requirements of Section 6.4.2 of this Guide.

Test Procedure

The test specimen shall be positioned on the test frame at the minimum slope proposed for the test.

The test specimen shall be positioned so that the exposed edge of the 2.44-m eave is facing the wind generator. The set-up should facilitate observer access.

The topside and underside conditions of the test specimen shall be recorded prior to starting the test.

The wind stream shall be delivered as noted below:

Interval #	Wind Speed (km/h)	Time (minutes)
1	50	15
2	0	10
3	100	15
4	0	10
5	140	5
6	0	10
7	170	5
8	0	10

Water shall be added to the windstream upon commencement of the initial wind speed, upwind from the test deck, in an even spray, at a rate that simulates 200 mm/h of rainfall over the test specimen. The flow of water shall be measured with a calibrated flow meter during the test procedure to confirm water flow. Water flow shall be stopped and started in conjunction with the air flow noted in the table above. The test set-up should be inspected 10 minutes after the wind speed has been reduced to 0 km/h. Photographs shall be taken of the top side and underside of the test specimen 30 seconds prior to the completion of each interval and at the inspection time (i.e. 10 minutes after the wind has been reduced to 0 km/h). The specimen shall be inspected for any water infiltration from the underside of the deck, recording approximate quantities penetrating the deck structure during the test period. Should the volume of water increase to a steady dripping in three or more places during the test period, the test shall be terminated prior to the maximum wind speed. Water penetrating the test specimen shall be

contained and measured if practical. Loss of integrity above and below the test deck must be noted, and photographs of any observed defects shall be taken.

The test report shall contain the following information:

- 1- a description of the roof system, including the manufacturer's name, the type of underlayment, slope, etc.;
- 2- sketches of the test specimen, photographs of the top side and underside of the test specimen immediately prior and after each interval and after termination of testing;
- 3- wind stream and flow meter calibration data;
- 4- detailed observation of water infiltration through the sheathing and the times and locations of water infiltration;
- 5- the volume of water, if any, which infiltrated the sheathing;
- 6- observation of water penetration after dismantling at the end of the test.

Any test specimen that exhibits water infiltration through the sheathing shall be considered as having failed the wind-driven rain test.

6.4.5 *Nail Pull-Through Test*

Perform the test as per ASTM D 1037, paragraphs 54 to 60, with the following changes:

- A minimum of three tests shall be performed.
- Manufacturer's supplied fasteners shall be used.
- Only dry test conditions shall be performed.
- The maximum load to pull the fastener through the sample for each test shall be reported.

6.4.6 *Accelerated Weathering Resistance and Recovery Test*

6.4.6.1 *Sample Preparation for Accelerated Weathering and Heat Ageing Tests*

In cases where the product does not have a uniform thickness, the test sample should be prepared using either method a or b:

- a) Prepare test coupons from production slates by machining excess material from the back of the slate to obtain a uniform thickness; or
- b) Prepare test coupons using the same formulation and processing conditions to obtain an equivalent test specimen. The sample produced should be of a uniform thickness of 6.5 mm and be of sufficient dimensions that all the required test specimens can be obtained from the same batch.

6.4.6.2 *Weathering Test*

Subject the test coupons to 2 000 h xenon arc exposure in accordance with ASTM G 155, using Cycle 1 from Table X3.1 for the exposure conditions use a minimum of ten coupons.

The relative humidity is to be maintained at $35 \pm 5\%$.

Determine the tensile strength as per ASTM D 4216 and pliability as per procedure in ASTM D3462 paragraph 8.1.12, after 2 000 h exposure. Record any observations made with the naked eye.

6.4.6 Heat Ageing Resistance Test

6.4.7.1 Sample preparation:

Prepare samples as per 6.4.6.1

6.4.7.2 Heat Ageing Test

Prepare sufficient samples to perform three tests for each requirement. Expose the specimens to a temperature of 90°C in an air-circulating oven for 60 days. After allowing the specimens to recover for an 18 hour period at 20 C and 50% RH determine the tensile strength and pliability as per ASTM D 4216 and pliability as per procedure in ASTM D3462 paragraph 8.1.12. Record any observations made with the naked eye.

7.0 Quality Assurance Program

The proponent must demonstrate that the production process is governed by a quality assurance program, which ensures consistent quality at least to the level represented by the sample being tested and evaluated. CCMC requests that quality control procedures be applied to incoming materials, processes, and finished products.

7.1 Purpose

The purpose of the quality assurance program is to provide guidelines for the control of quality. CCMC must be confident that the submitted samples are representative of the products manufactured at the plant. It remains the proponent's responsibility to ensure that the manufactured products meet or exceed the quality of the samples submitted for testing and evaluation. (See Section 6.0 for information on product testing.)

7.2 Documentation

The proponent shall provide documentation on its quality assurance program, which will be reviewed by an evaluation officer prior to the issuance of an evaluation number. Other documents deemed necessary to demonstrate compliance at the time of application for an evaluation shall be submitted by the proponent upon request.

The documentation must be prepared by the proponent or by a third party, and signed by an authorized officer of the company to confer legitimacy to the document.

The documentation must have provisions that allow for representatives of CCMC or its authorized agents to enter the specified premises for the purpose of inspecting the manufacturing facilities or designating samples for testing.

7.3 Identification

Quality control procedures for finished products must include details on how the product will be identified with the CCMC evaluation number, in the form of "CCMC # XXXXX-R," which shall be both visible and legible. Where permanently identifying a product is not possible, other forms and methods of identification may be allowed pending review and approval by a CCMC evaluation officer.

7.4 Requirements

Quality assurance may be demonstrated by the proponent either through registration by an accredited quality assurance agency that its production process conforms to ISO 9001:2000, "Quality management systems – Requirements" (see Sections 7.5 and 7.6), or by providing a copy of its quality control manual directly to CCMC.

The Quality Control Manual (QCM) shall contain the following information:

- the company's quality control policies;
- provisions for keeping the manual current, e.g., updates and revisions;
- a production flow chart indicating points of quality control, with an explanation of the control at each point, the frequency of controls, and a summary of the production methods;
- production specifications and process tolerances;
- a clear delineation of what constitutes major and minor defects;
- corrective measures for major and minor defects;
- a list of main production equipment;
- a list of manufacturer's specifications and quality control arrangements for raw materials and equipment;
- measuring equipment: type, model, range, accuracy, frequency of calibration, and calibration agency; and,
- a statement by the proponent that CCMC will be notified, in writing, when major deviations have been discovered.

7.5 ISO 9001:2000 Quality Assurance Requirements

Evidence of quality assurance in accordance with ISO 9001:2000, "Quality management systems – Requirements," is demonstrated by the proponent through registration by an

accredited quality assurance agency that the facility is under its control. (See Section 7.6 for a list of accredited agencies.)

ISO 9001:2000 specifies the requirements for a quality management system that can be used for internal application by organizations, or for certification, or for contractual purposes. It focuses on the effectiveness of the quality management system in meeting customer requirements.

This edition of ISO 9001 replaces the second edition, ISO 9001:1994, as well as ISO 9002:1994 and ISO 9003:1994. It constitutes a technical revision of these documents. Organizations that have used ISO 9002:1994 and ISO 9003:1994 in the past may use this international standard and exclude certain requirements in accordance with Section 1.2 of ISO 9001.

ISO 9004, "Quality management systems — Guidelines for performance improvements," dated 2000-12-15, and ISO 9001:2000 were developed as a complementary pair of quality management standards. ISO 9004 gives guidance on a wider range of objectives for a quality management system than does ISO 9001, particularly with regards to the continual improvement of an organization's overall performance and efficiency, as well as its effectiveness. ISO 9004 is recommended as a guide for organizations that wish to move beyond the requirements of ISO 9001. However, it is not intended to be used for certification or contractual purposes.

7.6 Accredited Quality Assurance Agencies

The proponent may demonstrate quality assurance by submitting documentation attesting that the production process has been registered as conforming to ISO 9001:2000 by one of the following accredited quality assurance agencies. (The proponent may contact the Standards Council of Canada at (613) 238-3222 to inquire about other accredited agencies.)

Quality Management Institute
90 Burnhamthorpe Road West
Suite 300
Mississauga, Ontario
L5B 3C3
Tel.: (905) 272-3920
Fax: (905) 272-3942

Intertek Testing Services NA Ltd.
Quality Systems Division
1829, 32^e avenue
Lachine (Québec)
H8T 3J1
Tel.: (514) 631-3100
Fax: (514) 631-1133

Underwriters' Laboratories of Canada
7 Crouse Road
Scarborough, Ontario
M1R 3A9
Tel.: (416) 757-3611
Fax: (416) 757-9540

BNQ Enregistrements de systèmes
CRIQ
333, rue Franquet
Sainte-Foy (Québec)
G1P 4C7
Tel.: (418) 652-2238
(800) 386-5144
Fax: (418) 652-2221

SGS International Certification Services Canada Inc.
6275 Northam Drive, Unit 2
Mississauga, Ontario
L4V 1Y8
Tel.: (905) 676-9595
Fax: (905) 676-9362

Canadian General Standards Board
Sales Unit
Place du Portage
Phase III, 6B1
11, rue Laurier
Hull (Québec)
K1A 1G6
Tel.: (819) 956-3500
Fax: (819) 956-5644

8.0 Installation Manual

8.1 Purpose

The proponent or manufacturer shall prepare a well defined and detailed installation manual that can be used as educational material for installers and users of the product.

8.2 Content

The manual shall address the following areas:

- a description of the product, including its accessories, assembly, properties and the permissible loads;

- size and spacing method and location of attachments;
- clear installation instructions for stepped and valley flashings, ridge and hip sections, closure strips, head lap, side lap and end lap distances, and fastener spacing;
- sealant type and application if any;
- detailed drawings of typical details of installations of the system, such as ridge, hip, eaves, venting, valley and flashing details; and
- storage and handling procedures.

Other points the manufacturer deems pertinent to the installation shall also be included.

9.0 Required Documentation

A typical sample of the product and the following documentation must be submitted to CCMC:

- detailed descriptions of the different types of panels and accessories;
- a copy either of the QCM prepared as outlined in Section 7.0 or of the certificate stating that the manufacturing facility is under the control of a registered quality assurance agency;
- a copy of the installation manual;
- confirmation that the proponent is an authorized representative of a legally constituted company; and
- information demonstrating how reference is to be made to CCMC's evaluation number on the product (see Section 7.3).

Note: Lack of information or sample will delay the evaluation.

The documents and samples should be carefully packaged to avoid damage in transit and shipped prepaid, including clearance through Canadian Customs, if applicable, to:

Canadian Construction Materials Centre
Institute for Research in Construction
National Research Council of Canada
Montreal Road, Building M-24
Ottawa, Ontario
CANADA
K1A 0R6
Tel.: (613) 993-6189
Fax: (613) 952-0268