HAC-TU CHANNEL

Technical Data

July 2022

HAC-TU CAST IN CHANNELS

Hilti Cast-in Inverted Anchor Channel (HAC-TU) is ideal for fastening windows and door frames. HAC-TU channels are cast into the concrete slabs offering a cost effective, reliable, and faster fixing of windows or door frames without drilling into the concrete.

The HAC-TU is made of a 3 mm thick (0.118 in) “C” shaped steel profile with rounded head anchors welded at the front and back.

Advantages

- Two-dimensional adjustability (perpendicular and longitudinal)
- Easy installation in the existing reinforcement
- Load-bearing capacity in all three directions
- Increased foam thickness provides additional tolerance for screws when shims are required.
- Polystyrene filler enables the use of self-tapping screws

The HAC-TU channels are hot-dip galvanized with a zinc coating ≥ 50 µm and supplied with an integrated polystyrene filler.

HAC-TU comes with an extra-thick foam filler that provides additional tolerance when installing self-tapping and/or selfdrilling screws without hitting the concrete or when dealing with shims.

Versatility in Two Axis

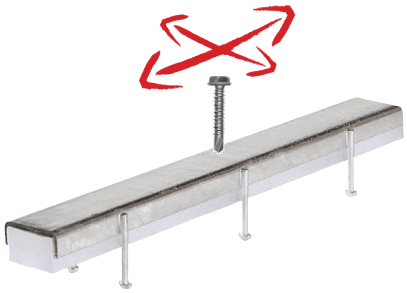
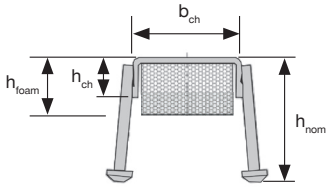


Figure 1 — HAC-TU in window wall applications

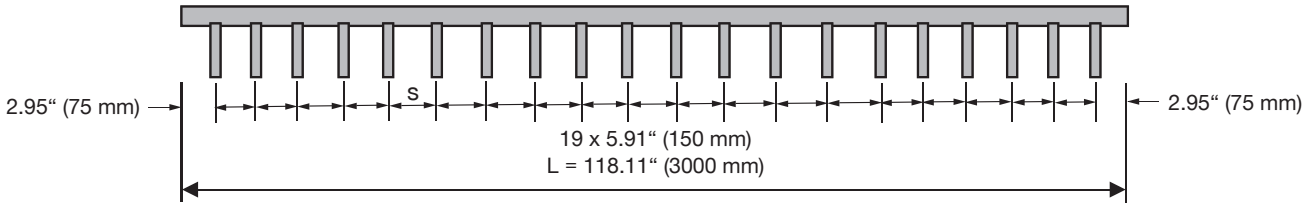
TECHNICAL INFORMATION

Table 1 — Anchor channel properties

Profile Dimensions	Units	HAC-TU 60/22/3-C3 F			
					
Profile dimensions	in (mm)	b_{ch}	h_{ch}	h_{nom}	h_{foam}
		2-3/8 (60)	7/8 (22)	2-5/8 (68)	1-5/16 (33)
Cross-sectional area	in² (cm²)	0.43 (2.81)			
Profile thickness, t	in (cm)	0.118 (3) 11 gauge			
Section modulus S_y	in³ (cm³)	0.04 (0.71)			
Moment of inertia I_y	in⁴ (cm⁴)	0.03 (1.13)			
Plastic section modulus Z_y	in³ (cm³)	0.08 (1.33)			
Profile material	-	Steel according to DIN EN 10025: S235JR (1.0038)			
Anchor bearing area	in² (cm²)	0.090 (56.0)			
Connecting screws	-	e.g. Hilti self-tapping screws			

Anchor Spacing

HAC-TU cast-in channels are supplied in 118.11“ (3 m) lengths. Shorter custom-length channels can also be provided upon request. The anchor spacing S = 5.91“ (150 mm)



DESIGN OF HAC-TU CHANNEL

The façade industry is becoming increasingly technical, sophisticated, and regulated by the day. Driving the use of model code compliant embeds has been a consistent trend in the industry over the last several years.

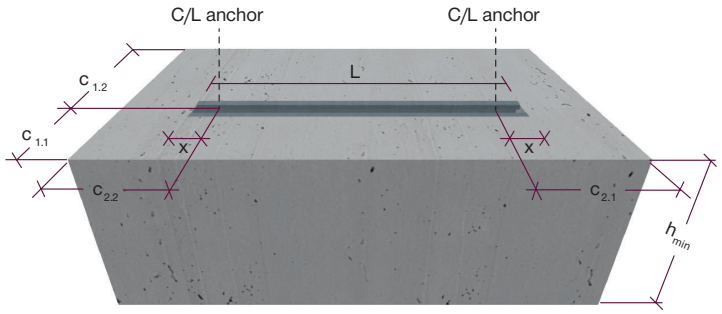
The International Building Code (IBC) allows the use of Evaluation Research Reports to demonstrate IBC compliance. In lieu of an Acceptance Criteria for specialty inserts, Hilti has tested HAC-TU following the fundamentals and applicable provisions of Acceptance Criteria for Cast-in Anchor Channels and ACI 318.

ACI 318 excludes specialty inserts from its scope. Therefore, solutions such as the HAC-TU and steel tubes cannot demonstrate compliance via calculations.

Hilti has conducted additional testing to develop a design model.

The local verification of the self-tapping screw is excluded from the scope of this document.

Table 2 — Minimum concrete member dimensions



Minimum edge distance $c_{1.1}$, $c_{1.2}$	in (mm)	3.125 (80) (measured to the center of the C-shaped channel profile)
Minimum edge distance $c_{2.1}$, $c_{2.2}$	in (mm)	4.50 (115) (measured to the center of the outer most anchor)
Reference slab thickness h_{min}	in (mm)	5.91 (150)
Min. end distance x in	in (mm)	1.00 (25)
Maximum channel length L	in (mm)	118.11 (3,000)

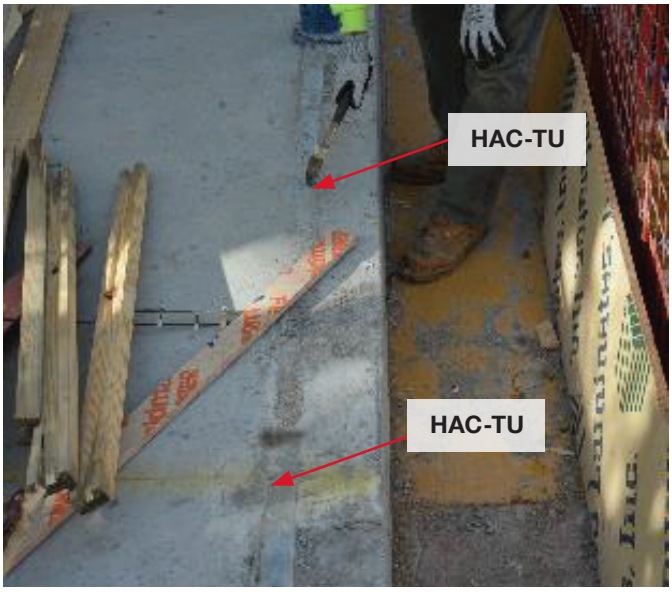


Figure 2 — HAC-TU cast-in concrete

Figure 3 — Window wall sill connected via HAC-TU

DESIGN STRENGTH BASED ON PRINCIPLES OF STATE-OF-THE-ART STANDARDS

All possible failure modes and relative capacity parameters are provided in Table 3 and 4 for tension and perpendicular shear, respectively. The minimum concrete member dimensions as per table 2 should be considered. The HAC-TU anchor channels must be installed as per the installation instructions provided in this document

Concrete failure modes shall be calculated following the provisions of ICC Evaluation Services Acceptance Criteria for Cast-in Anchor Channels (AC232).

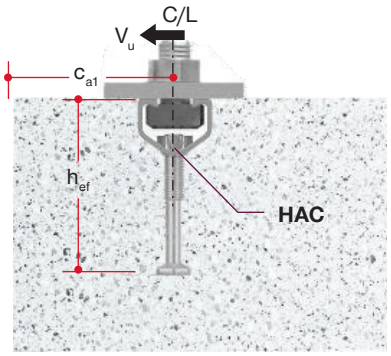


Figure 4a — Edge distance (C_{a1}) of a cast-in anchor channel such as HAC (figure for illustration purposes only)

The design is based on a simplified model that assumes a fictitious anchor channel with the same edge distance, embedment depth, and anchor bearing area of the outer HAC-TU anchor row; see Figures 4a and 4b. The positive influence of the second row of anchors is neglected for concrete verifications.

Steel capacities of HAC-TU were established based on applicable testing protocols and design equations of AC232. The provided technical data considers the critical screw position in the perpendicular (y) axis.

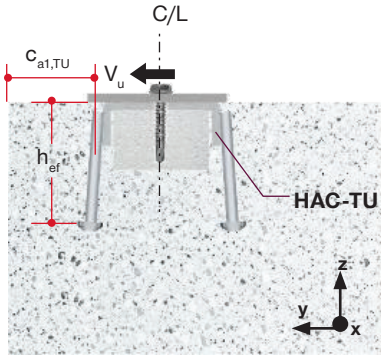
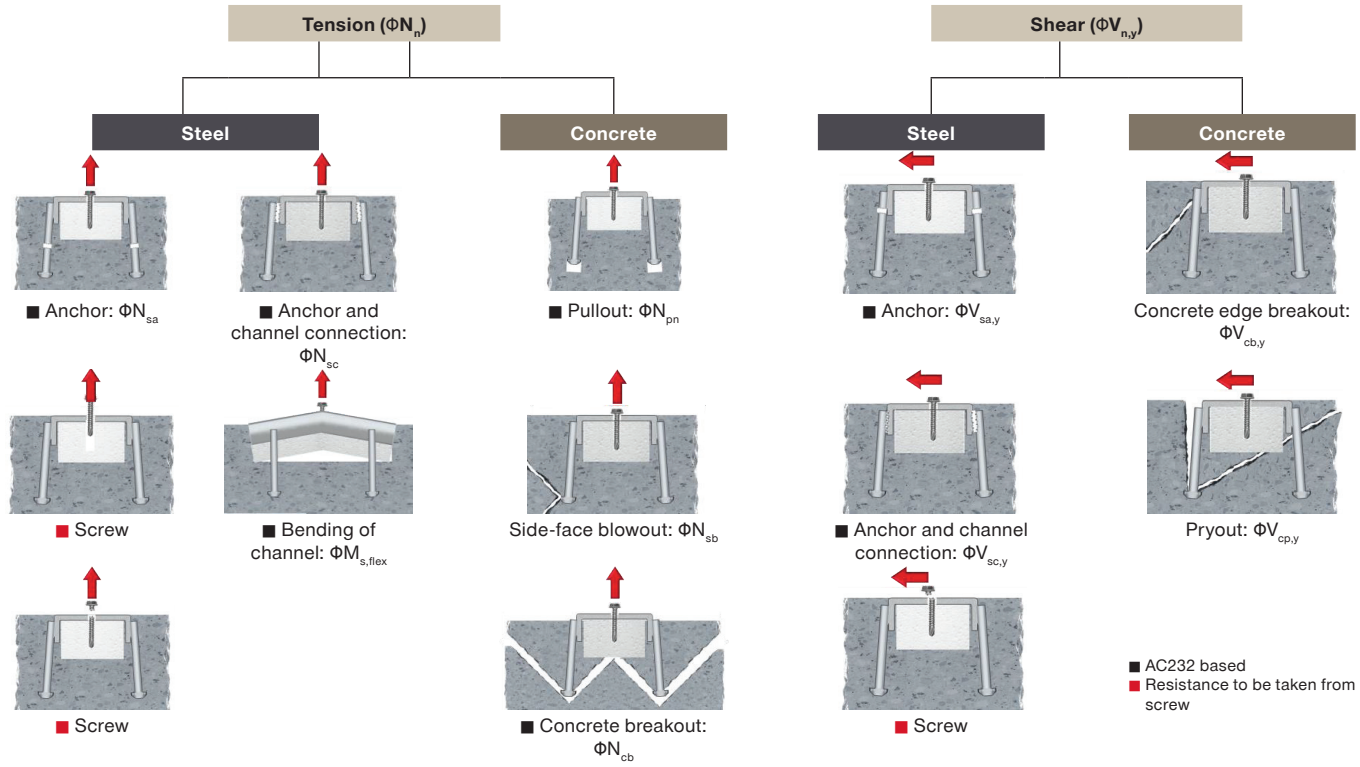


Figure 4b — Edge distance (C_{a1}) for analysis purposes of an inverted cast-in channel such as HAC-TU, for analysis purposes

Possible failure modes of HAC-TU

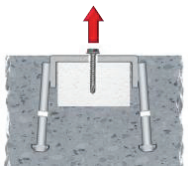
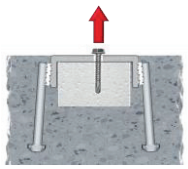
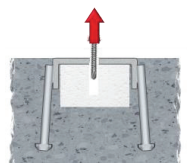
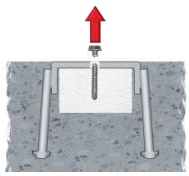
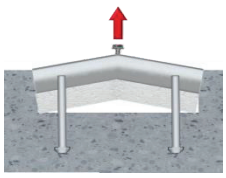
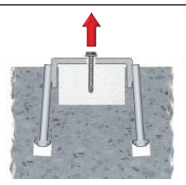
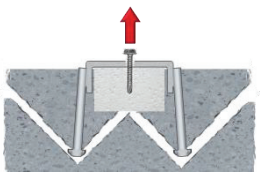
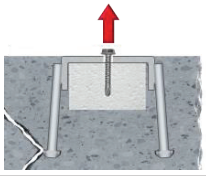


Verification of superposition of tension and shear loads must be verified

Figure 5 — Possible failures of HAC-TU

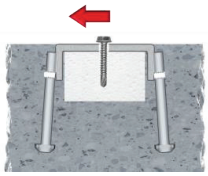
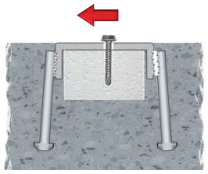
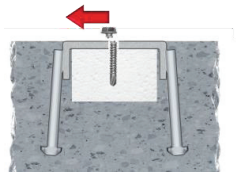
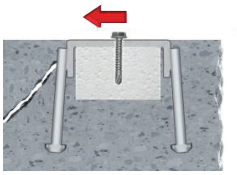
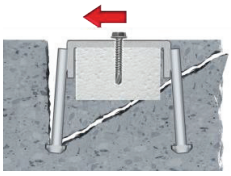
DESIGN STRENGTH BASED ON PRINCIPLES OF STATE-OF-THE-ART STANDARDS

Table 3 — Tension failure modes and design parameters of HAC-TU

	Verification	Comments	Symbol	Units	HAC-TU 60/22/3
	Nominal tensile steel strength of anchor	AC232 verification, with calculated resistances	N_{sa}	lb [kN]	3,150 [14.0]
		Strength reduction factor	Φ	-	0.75
	Nominal tensile steel strength of connection between anchor and C-shaped profile	Tested per AC232	N_{sc}	lb [kN]	3,150 [14.0]
		Strength reduction factor	Φ	-	0.75
	Nominal tensile streel strength of connection between C-shaped profile and screw	Resistance to be taken from the screw for 3mm S235 steel	-	-	-
	Nominal tensile steel strength of screw	Resistance to be taken from the relevant screw for 3mm S235 steel	-	-	-
	Nominal bending strength of the C-shaped profile	Verification as a C steel profile with simple support beam (Z21.4-1886 with anchor spacing s=150mm)	$M_{s,flex}$	lb-in (Nm)	14,767 (1,668)
		Strength reduction factor	Φ	-	0.85
	Anchor pull-out	Calculated per AC232	N_{pn}	lb [kN]	-
		Strength reduction factor[2]	Φ	-	0.70
	Concrete breakout capacity[1]	Calculated per AC232	N_{cb}	lb [kN]	-
		Strength reduction factor[2]	Φ	-	0.70
	Concrete side-face blowout[1]	Calculated per AC232	N_{sb}	lb [kN]	-
		Strength reduction factor[2]	Φ	-	0.70

1 Concrete failure modes shall be calculated following the provisions of AC232. The design is based on a simplified model that assumes a fictitious anchor channel with the same edge distance, embedment depth, and anchor bearing area of the outer HAC-TU anchor row. The positive influence of the second row of anchors is neglected for concrete verifications.
2 The tabulated value of φ applies when both the load combinations of Section 1605.1 of the 2021 IBC, ACI 318-19 Section 5.3 are used and the requirements of ACI 318-19 17.5.3, as applicable, for Condition B Condition applies where supplementary reinforcement i provided.

Table 4 — Perpendicular shear failure modes and design parameters of HAC-TU

	Verification	Comments	Symbol	Units	HAC-TU 60/22/3
	Nominal shear steel strength of anchor	Calculated per AC232	V_{sa}	lb [kN]	3,150 [14.0]
		Strength reduction factor	Φ	-	0.75
	Nominal shear steel strength of connection between anchor and C-shaped profile	Tested per AC232	V_{sc}	lb [kN]	3,150 [14.0]
		Strength reduction factor	Φ	-	0.75
	Nominal shear steel strength of screw	Resistance to be taken from the screw approval	-	-	-
	Concrete edge breakout[1]	Calculated per AC232	$V_{cb,y}$	lb [kN]	-
			Φ	-	0.70
	Concrete pry out[1]	Calculated per AC232	$V_{cp,y}$	lb [kN]	-
			Φ	lb [kN]	0.70

1 Concrete failure modes shall be calculated following the provisions of AC232. The design is based on a simplified model that assumes a fictitious anchor channel with the same edge distance, embedment depth, and anchor bearing area of the outer HAC-TU anchor row. The positive influence of the second row of anchors is neglected for concrete verifications.
2 The tabulated value of φ applies when both the load combinations of Section 1605.1 of the 2021 IBC, ACI 318-19 Section 5.3 are used and the requirements of ACI 318-19 17.5.3, as applicable, for Condition met. Condition applies where supplementary reinforcement provided.

Table 5 — Perpendicular shear failure modes and design parameters of HAC-TU

Criteria	Symbol	Units	HAC-TU 60/22/3
Factor to account for the influence of channel size and anchor diameter on concrete edge breakout strength in shear	$\alpha_{ch,V}$	$lb^{1/2}/in^{1/3}$ ($N^{1/2}/mm^{1/3}$)	10.5 (7.50)
Coefficient for pryout strength	k_{cp}	-	2.00

HAC-TU TOLERANCE

One of the key benefits of HAC-TU its versatility. HAC-TU can provide tolerance in two directions longitudinally and perpendicularly making it ideal for applications such as window wall façades.

Figures 6 and 7 illustrate the level of adjustability provided by HAC-TU. Screws can be installed along the entire length of the HAC-TU except at the cantilever sections (beyond the exterior anchor) of HAC-TU.

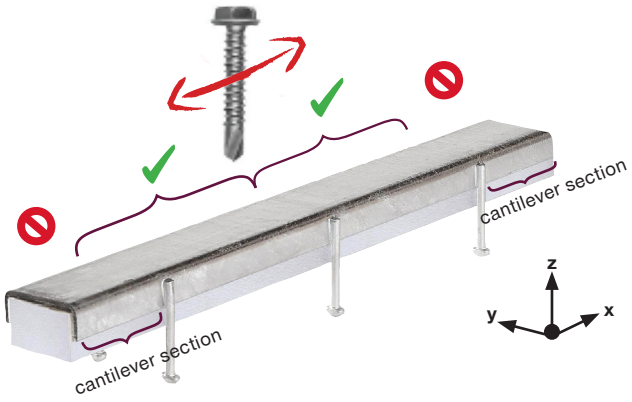


Figure 6 — Allowed screws position on HAC-TU along the longitudinal x) axis

Regarding the perpendicular (y axis) tolerance, screws can be installed +/- 3/4” from the center line of the C-shaped profile.

At the cantilever sections of the HAC-TU, screws can be installed to secure HAC-TU to the formwork.

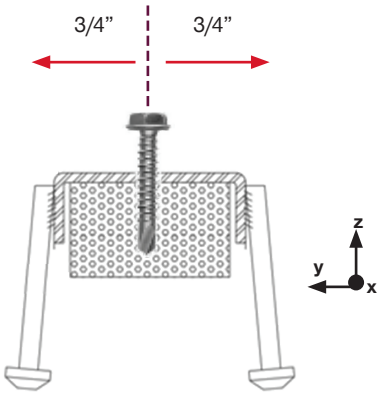


Figure 7 — Allowed screws position on HAC-TU along the perpendicular (y) axis

HAC-TU SCREW INFORMATION

Any part of the system — the channel, the screw and/or the fastened part — may become the limiting factor of your design considerations.

The technical information provided in this brochure is limited to the channel. It also provides guidance on allowable position, type and size of screws being used with the TU-Channels.

Self-Tapping Screws

Self-tapping screws are screws that can tap threads into the material. These screws require a pilot hole to be pre-drilled before installation.

Self-Drilling Screws

Self-drilling screws do not require a pilot hole, which accelerates installation time and lowers the cost and need of additional drill bits.

Maximum self-drilling screws is 5/16”, typically. Allowable diameter size is based on screw material thickness requirements.

The screw design (i.e., screw length, bending, shear, tension) is beyond the scope of this brochure. The design of screws should be based on applicable Evaluation Reports and/or applicable codes and project specific requirements.

Figure 8 — Window Wall façade frame fasted via HAC-TU and Self-drilling screws

ORDERING INFORMATION

HAC-TU 60/22/3-C3 F 3000 (10 ft long) is typically kept in stock but it is always a good practice to plan for 4-5-month lead time. **Stock levels fluctuate depending on product demand.**

This product comes with standard anchor spacing of 5.91” (150 mm) and can be cut to size. See Table 6 for additional ordering information.

HAC-TU can be supplied in custom lengths and/or custom configurations. The typical lead time for such configurations is 4–5 months.

For any inquires, please reach out to your local Hilti representative or US.CA_HAC@Hilti.com

Table 6 —HAC-TU Ordering Information

Description	Item Number[1]	Length	Nominal Channel Depth	No. of Anchors per piece	Anchor Spacing	Order multiple of	Order example
HAC-TU 60/22/3-C3 F 3000 H30foam	2336992	10 ft (3000 mm)	2.625 (68 mm	19	5.91 in (150 mm)	1	HAC-TU 60/22/3 (1) C3 (2) F (3) 3000 (4) **1** Profile type **2** Anchor configuration **3** Hot-dip galvanized **4** Length of channel (mm)
HAC-TU 300 mm	3813509	11.80 in (300 mm)	2.625 (68 mm)	2	5.91 in (150 mm)	10	
HAC-TU 450 mm	3813508	17.70 in (450 mm)	2.625 (68 mm)	3	5.91 in (150 mm)	6	
HAC-TU 600 mm	3813510	23.62 in (600 mm)	2.625 (68 mm)	4	5.91 in (150 mm)	5	

1 Item numbers may change. Contact Hilti for current ordering information.

Figure 9 — HAC-TU in Hilti Distribution Center.

HAC-TU Installation

HAC-TU does not come with nail holes. However, Hilti can add nail holes upon special request. An additional cost may be associated with it.

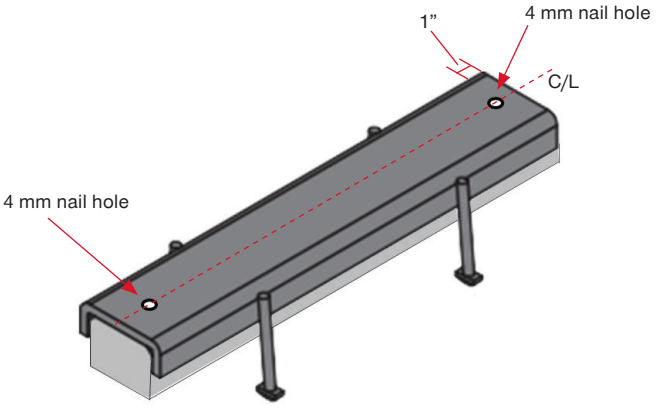


Figure 10 — HAC-TU cut in shorter sections and nail holes added

In the US:
Hilti, Inc.
7250 Dallas Parkway, Suite 1000, Plano, TX 75024
Customer Service: 1-800-879-8000
en español: 1-800-879-5000
Fax: 1-800-879-7000

www.hilti.com

In Canada:
Hilti (Canada) Corporation
2360 Meadowpine Blvd.
Customer Service:
1-800-363-4458
Fax: 1-800-363-4459

www.hilti.ca

The data contained in this literature was current as of the date of publication. Updates and changes may be made based on later testing. If verification is needed that the data is still current, please contact the Hilti Technical Support Specialists at 1 800 879 8000. All published load values contained in this literature represent the results of testing by Hilti or test organizations. Local base materials were used. Because of variations in materials, on site testing is necessary to determine performance at any specific site. Printed in United States.

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