ASTM C236 GUARDED HOT BOX · VTEC LABORATORIES INC., BRONX, NEW YORK · BOMBARDIER TRANSPORTATION PROGRAM · REPORT FILES NCTL-110-8373 · 31 OCTOBER 2002

Super Therm® sprayed directly on a 3-inch fiberglass panel: 10 mils on one face cut heat flow 40%; both faces, 60% — in a dark hot box, no sun

Substrate: bare 3-inch fiberglass insulation panels, 24 × 48 in — coating applied straight onto the fiberglass face, no metal skin or facing · Guarded hot box, conductance excluding air films · Letter to Bombardier Transportation, signed Neil Schultz

Control, 3-inch fiberglass, no coating: conductance **0.52**. Same panel with 10 mils of Super Therm on one face: **0.31** — the laboratory reports a **68% increase** in thermal performance over the control. With 10 mils on both faces: **0.21** — a **148% increase**.

— VTEC Laboratories, "Comparison of completed ASTM C236 Tests," 31 Oct 2002: "The percentages listed for the 'Sample' fiberglass panels are compared to the 'Control' panel... For specific test specimen data and test conditions please refer to the appropriate test report."

VTEC
Independent laboratory
Bronx, New York
Heat flow, not reflectance

−40%
Heat flow, one face coated
Conductance 0.52 → 0.31 with 10 mils of Super Therm

−60%
Heat flow, both faces coated
Conductance 0.52 → 0.21 — the lab's "148% increase"

−46%
With 50 mils Hot Therm + 10 mils Super Therm
Conductance 0.52 → 0.28 — the thick-plus-thin system

HEAT FLOW THROUGH THE SAME 3" FIBERGLASS PANEL, BARE VS COATED ON ITS FACE(S) — LOWER IS BETTER



AS REPORTED — VTEC SUMMARY TABLE, 31 OCTOBER 2002

REPORT (NCTL-110-)	TEST SPECIMEN (24" × 48")	THERMAL CONDUCTANCE	R-VALUE PER INCH	INCREASE FROM CONTROL
8373-01	Control — 3" fiberglass with no coatings	0.52	1.92	—
8373-02	System 2 — 3" fiberglass with 10 mil Super Therm on interior	0.31	3.23	68%
8373-05	System 4 — 3" fiberglass with 50 mil Hot Therm and 10 mil Super Therm on interior	0.28	3.57	86%
8373-03	System 1 — 3" fiberglass with 10 mil Super Therm on both sides	0.21	4.76	148%
8373-06	Plywood laminate with 50 mil Hot Therm and 10 mil Super Therm on interior	0.79	1.27	no control

Values as printed in the VTEC letter; conductance excludes air films, R-value per inch of thickness. The plywood laminate had no uncoated control.

What was coated, how it was measured

Coating went directly onto the fiberglass face — "interior" is the warm-side face. The panel sat between a warm and a cold chamber and the heat crossing it was metered. No sun, no sky, no metal: not a reflectance result.

Why 10 mils on fiberglass moves the number

Ten mils adds almost nothing by thickness. In low-density fiberglass much of the heat crosses as infrared radiated fiber to fiber; a film on the face intercepts that path. One face −40%, both −60%.

Thick plus thin, other substrates

System 4: 50 mils Hot Therm (SPI's thick ceramic coating) under 10 mils Super Therm on one fiberglass face — 0.28. Same pair on plywood laminate: 0.79. A stainless-steel panel was run without an uncoated control, so no comparison is reported.

WHO AND HOW

Laboratory: VTEC Laboratories Inc., 212 Manida Street, Bronx, New York 10474. Results letter signed by Neil Schultz.

Client: Bombardier Transportation, Ciudad Sahagún, Hidalgo, Mexico — Francisco Morales Véliz.

Method: ASTM C236 guarded hot box, steady-state; 24 × 48 in specimens: bare fiberglass control, coated fiberglass, coated plywood; files NCTL-110-8373-01 to -06.

Source: VTEC Laboratories, "Comparison of completed ASTM C236 Tests," 31 Oct 2002 (NCTL-110-8373). Heat-flow reductions computed from reported conductances. Full reports on request.

VTEC Laboratories Inc.

October 31, 2002

Mr. Francisco Morales Véliz
Bombardier Transportation
Domicilio Conocido, Zona Industrial
Cd. Sahagún, Edo. De Hgo C.P. 43990 México

RE: Comparison of completed ASTM C236 Tests

Dear Mr. Véliz,

Below is the summary of the results from the referenced job files. The percentages listed for the "Sample" fiberglass panels are compared to the "Control" panel; the "Plywood Laminate" and "Stainless Steel" panels did not have a "control" sample available for comparison. For specific test specimen data and test conditions please refer to the appropriate test report.

Report Number (NCTL-110-)	Test Specimen (24" x 48")	Thermal Conductance (Excluding Air Films)	R-Value (Per inch of thickness)	Percent Increase (from Control)
8373-01	Control – 3" Fiberglass with no coatings.	0.52	1.92	-
8373-02	System 2 – 3" Fiberglass with 10 mil Super Therm coating on interior	0.31	3.23	68%
8373-05	System 4 – 3" Fiberglass with 50 mil Hot Therm and 10 mil Super Therm coating on interior	0.28	3.57	86%
8373-03	System 1 – 3" Fiberglass with 10 mil Super Therm coating on both sides	0.21	4.76	148%
8373-06	Plywood laminate with 50 mil Hot Therm and 10 mil Super Therm coating on interior	0.79	1.27	

If you have any questions, please contact me at your convenience.

Neil Schultz

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4/ ceramic coating - Insulation Coating
SUPER THERM

##General_information	
#Database	vtech-078
#Instrument	#I.FA_447
#Identity	2d2q4102 05.08.30
#Date	8/30/2005
#Material	sunshield
#Ref_temperature /°C	25
#Ref_density /(g/cm^3)	1.419
#Sample	supertherm
#Type	#Single_layer
#Thickness_RT/mm	0.4293
#Diameter/mm	12.7
#Sensor	InSb
#Operator	rdc
#Remark_mment	Vtech
#Cp_table	supertherm
#Expansion_table	dL_const

(+/- 7%)

10.7 DRY mils

268 DRY MICRONS

BTU / hr. / sq ft. / F

##Results

Shot_number	Temperature/°C	Diffusivity/(mm^2/s)	Conductivity/(W/(m*K))	Cp/(J/g/K)
1	24.9	0.273	0.415	1.074
2	24.9	0.275	0.417	1.080
3	24.9	0.274	0.416	1.074
4	24.9	0.275	0.418	1.083
5	24.9	0.273	0.414	1.065
6	25.0	0.274	0.416	1.046
7	25.0	0.275	0.418	1.073
Mean	24.9	0.274	0.416	1.071
Std_Dev		0.001	0.0015	0.015

"U" Value

CERTIFIED

JULIANN PRITCHETT
NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp.