MEMORANDUM

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To: Eileen Dutton, Textured Coatings of America

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Subject: Supercore textured coatings energy saving calculations

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This memo includes results and methodology for calculating the energy savings of Tex Cote SuperCore Gray textured coating compared to Competitor high quality gray coating when they are applied to the outside surfaces of side walls of a residential house in two climate locations – Los Angeles and Miami.

Tex Cote SuperCore Gray coating has an absorptance of 0.497, Competitor High Quality Gray has an absorptance of 0.732. Both coatings have an emissivity of 0.88.

Summary

The analysis is done for a 45' x 45' single family, single story, detached home.

- Tex Cote SuperCore Gray shows lower cooling energy requirement than competitor high quality gray in both climate zones
- Tex Cote SuperCore Gray has a bigger impact on lowering cooling energy in Los Angeles than in Miami
- Tex Cote SuperCore Gray has a bigger impact on annual cooling energy savings when walls have less insulation. For walls that are well insulated the impact on cooling energy is small.
- Tex Cote SuperCore Gray saves 1,420 kWh (24%) in annual cooling energy in Los Angeles and 272 kWh (2.3%) in Miami compared with Competitor High Quality Gray
- Maximum energy savings occur in summer (May – September) when cooling is most required
- The difference in heating energy requirement for both coatings in Miami, Florida is insignificant.
- The annual heating energy in Los Angeles, California increases by 35 Therms (16%). If typical residential utility rate for electricity is $0.13/kWh and $0.70/Therm for gas in Los Angeles is used for calculating energy cost, the increase in annual heating energy cost is $24.50 while the reduction of annual electricity cost is $184.60, which shows annual net savings of $160.10.

Based on this analysis, the followings are also observed:

- Tex Cote SuperCore Gray is more effective in saving cooling energy in climates where cooling is required for majority of the year.
- Tex Cote SuperCore Gray is more effective in saving cooling energy when applied to walls with less insulation. If a wall is well insulated, increase in reflectance has marginal effect because the wall has a low U-value which controls the conduction heat transfer through the outside and inside surfaces of the wall.

Results

The following table summarizes the energy results for cooling and supply fan.

Table 1: Annual cooling and fan energy for both coatings in both climate zones

Case	Cooling Energy (kWh)	Fan Energy (kWh)	Total (kWh)	Percentage savings (%)
Los Angeles, California				
Competitor high quality gray	5,903	1,762	7,665	
Tex Cote SuperCore Gray	4,483	1,407	5,890	
Savings	1,420 (24%)	355	1,775	23.2%
Miami, Florida				
Competitor high quality gray	11,626	2,592	14,218	
Tex Cote SuperCore Gray	11,354	2,528	13,882	
Savings	272 (2.3%)	64	336	2.4%

Table 2: Monthly cooling and fan energy for both coatings in both climate zones

Case	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Los Angeles, California												
Competitor high quality gray	1,016	950	1,150	1,214	1,429	1,614	2,001	1,966	1,793	1,504	1,056	950
Tex Cote SuperCore Gray	922	855	1,004	1,070	1,257	1,435	1,795	1,768	1,602	1,330	953	877
Savings	94	95	146	144	172	179	206	198	191	174	103	73
Miami, Florida												
Competitor high quality gray	690	652	905	1,176	1,454	1,545	1,767	1,742	1,433	1,276	922	659
Tex Cote SuperCore Gray	665	628	879	1,149	1,425	1,513	1,736	1,712	1,403	1,246	898	635
Savings	25	24	26	27	29	32	31	30	30	30	24	24

Methodology and Model Assumptions

This analysis is done for a typical single family, single story, detached home using VisualDOE 3.1. VisualDOE 3.1 is a windows interface to the hourly building energy simulation program DOE 2.1e, developed by the Lawrence Berkeley National laboratory. DOE2.1e is a whole building energy analysis program that uses hourly weather data to calculate energy consumption due to internal and external loads. The following assumptions are made for the energy model.

Envelope

Size of dwelling unit:	45' x 45' x 10' (2,025 s.f.)
Window area:	4' x 5' x 4 for each façade
Total window area:	320 s.f. (16% of floor area)
Glazing type:	Single clear glazing with aluminum frame (U=1.25, SHGC=0.76, VT=0.74)

Wall construction: Fully grouted CMU walls with 1" stucco (Los Angeles, California)

Wood framed walls with R-11 batt insulation (Miami, Florida)

Roof construction: Wood famed roof, R-30 batt insulation, 70% absorptance.

Internal loads

Number of people: 4

Lighting Power Density: 0.60 watts/s.f.

Equipment Power Density: 0.75 watts/s.f.

Infiltration: 0.3 ACH (air changes per hour)

HVAC system

Cooling thermostat set point: 76 °F

Heating thermostat set point: 68 °F

Operating schedule: 24-hr heating/cooling

System type: Residential system

Weather data

TMY2 hourly weather data (http://rredc.nrel.gov/solar/ old_data/nsrdb/tmy2/) was used for simulation.

Los Angeles, California: California climate zone 8.

Miami, Florida: Miami weather file.

Table 3: Weather data summary for California climate zone 8

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
AVG. TEMP. (F) (DRYBULB)	54.7	56.2	57.6	60.6	63.6	67.4	70.9	70.8	70.1	65.4	59.4	55.7	62.7
AVG. TEMP. (F) (WETBULB)	46.5	50.0	51.5	51.8	57.2	62.0	63.6	64.0	59.6	59.9	52.6	46.5	55.5
AVG. DAILY MAX. TEMP.	67.5	69.0	69.1	72.3	74.2	78.4	82.9	84.0	83.2	79.0	73.4	68.4	75.2
AVG. DAILY MIN. TEMP.	45.0	46.5	48.2	50.3	55.0	58.6	61.4	62.0	60.5	55.7	48.9	44.7	53.1
AVG. DAILY DIRECT NORMAL SOLAR (Btu/sf/day)	1,663.2	1,701.5	1,978.3	1,916.2	1,828.4	2,050.0	2,337.8	2,102.7	1,710.9	1,593.0	1,486.3	1,405.6	1,815.7
AVG. DAILY TOTAL HORIZNTL SOLAR (Btu/sf/day)	993.1	1,232.9	1,626.4	1,922.2	2,113.1	2,224.8	2,369.0	2,143.2	1,719.6	1,375.1	1,039.6	872.5	1,638.3
MAX. DAILY DIRECT NORMAL SOLAR (Btu/sf/day)	2,308.0	2,495.0	2,853.0	3,044.0	2,999.0	3,041.0	2,932.0	2,646.0	2,490.0	2,299.0	1,995.0	2,062.0	3,044.0
MAX. DAILY TOTAL HORIZNTL SOLAR (Btu/sf/day)	1,215.0	1,644.0	2,082.0	2,393.0	2,610.0	2,661.0	2,619.0	2,410.0	2,087.0	1,617.0	1,251.0	1,024.0	2,661.0
MIN. DAILY DIRECT NORMAL SOLAR (Btu/sf/day)	70.0	38.0	86.0	59.0	86.0	64.0	387.0	1,007.0	47.0	495.0	22.0	2.0	2.0
MIN. DAILY TOTAL HORIZNTL SOLAR (Btu/sf/day)	498.0	477.0	601.0	1,016.0	1,168.0	1,014.0	1,239.0	1,744.0	797.0	936.0	391.0	280.0	280.0

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Table 4: Weather data summary for Miami, Florida

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
AVG. TEMP. (F) (DRYBULB)	68.0	69.4	70.9	76.1	78.4	81.1	82.3	82.2	80.4	77.1	73.8	69.1	75.8
AVG. TEMP. (F) (WETBULB)	62.6	63.1	63.7	67.0	72.3	73.8	76.0	75.3	74.8	71.4	66.7	62.4	69.1
AVG. DAILY MAX. TEMP.	75.7	75.8	77.3	82.1	84.6	87.2	87.8	87.3	86.8	82.6	79.6	76.0	81.9
AVG. DAILY MIN. TEMP.	60.4	62.8	64.2	70.0	73.1	76.3	77.3	77.6	75.2	72.2	68.0	61.8	69.9
AVG. DAILY DIRECT NORMAL SOLAR (Btu/sf/day)	1,271.0	1,489.5	1,529.7	1,684.0	1,469.5	1,155.8	1,254.9	1,152.6	1,115.8	1,208.3	1,165.4	1,201.0	1,306.9
AVG. DAILY TOTAL HORIZNTL SOLAR (Btu/sf/day)	1,107.7	1,403.5	1,634.7	1,954.1	1,911.3	1,826.5	1,900.0	1,797.1	1,557.9	1,385.6	1,131.2	1,065.6	1,556.8
MAX. DAILY DIRECT NORMAL SOLAR (Btu/sf/day)	2,637.0	3,047.0	3,185.0	2,898.0	3,005.0	2,031.0	2,202.0	1,800.0	2,256.0	2,775.0	2,075.0	2,510.0	3,185.0
MAX. DAILY TOTAL HORIZNTL SOLAR (Btu/sf/day)	1,603.0	2,029.0	2,238.0	2,427.0	2,485.0	2,378.0	2,380.0	2,325.0	2,112.0	1,968.0	1,506.0	1,381.0	2,485.0
MIN. DAILY DIRECT NORMAL SOLAR (Btu/sf/day)	23.0	90.0	25.0	114.0	4.0	236.0	115.0	285.0	17.0	-	140.0	174.0	-
MIN. DAILY TOTAL HORIZNTL SOLAR (Btu/sf/day)	346.0	621.0	805.0	930.0	999.0	981.0	1,125.0	864.0	590.0	626.0	646.0	636.0	346.0

Why coatings of walls have impact on cooling energy of a house

The cooling loads of a house comes from the internal loads like lighting, equipment and occupants, and the external loads due to air infiltration, solar heat gains through windows, heat conduction through windows, walls, roofs and floors. The solar radiation on the walls are partly reflected and partly absorbed. The higher the reflectance, the lower the absorptance. With the same location and orientation of a wall, when coatings with lower absorptance are applied to exterior surface of the wall, it will absorb less solar energy and have a lower surface temperature, which lowers the heat transfer through the wall, and thus lower the cooling loads of the space.