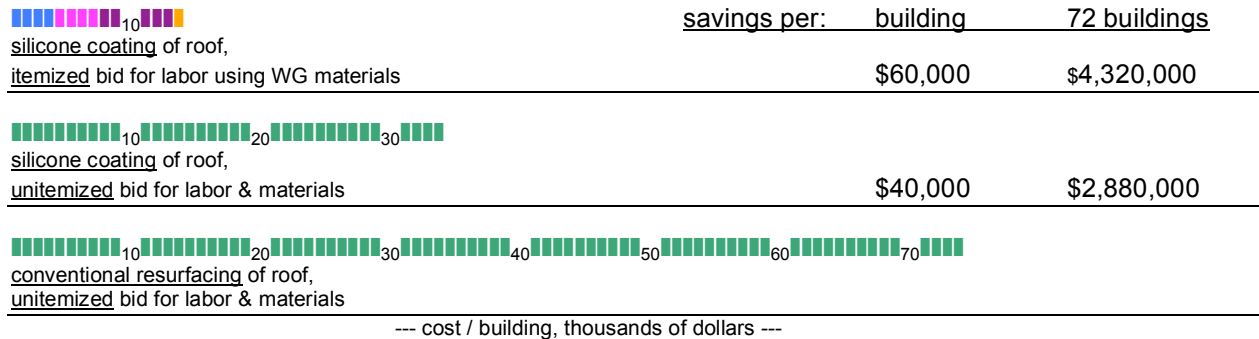


More-Efficient, Less-Expensive Alternatives to Roof Replacement

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2010 June

Defining the Project in the Bid Invitation Saves Money:



2010 June

Labor Costs:

Refurbishing roofs at WG has become a much simpler, and therefore, a much less expensive task. The job has devolved from a laborious, time-consuming construction project to a painting project. Generally speaking, contractors who in the past have received \$60,000 to \$80,000 for reroofing are quoting at about half that price for painting the same roof with a silicone emulsion coating. 50% savings, on the surface, sounds like a great deal, but is it?

Not if the costs are asked to be defended from the bottom up.

If we invite bids amounts for each task in \$ / square foot, it is very easy to analyze and compare bids. We can calculate the cost of any job using a spreadsheet, such as the one I have composed and posted in your Client Area on the RKchemist.com website (password: "Windsor Gardens" or "WG" or "Barke").

Building # _____ Roof Area = _____ sq. ft. Reinforcing Length = _____ feet

	rate	item subtotal
Gravel Removal:	\$ / sq. ft.	\$
Power Washing:	\$ / sq. ft.	\$
Applying reinforcement tape:	\$ / ft.	\$
Applying 1 coat:	\$ / sq. ft.	\$
Applying Anti-Slip media:	\$ / sq. ft.	\$
	Total:	

For greatest cost-transparency, WG should purchase and stock materials in quantity at the lowest cost:

- silicone polymer roof coating (currently HSS 535 (95% solids, 0% voc) at \$32 / gallon in 5-gallon containers from West Development Group, La Grange OH).
- glass fiber reinforcing tape (as used in drywall seams)

Materials Costs:

What do silicone polymer roof coating materials cost?
 As you may imagine, price depends on the quantity purchased and the source:

RETAIL (small quantity, for the final user, from the dealer's shelf)

<u>product</u>	<u>solids by weight</u>	<u>\$ / gallon</u>	<u>\$ / gallon (as if 95% solids)</u>	<u>\$ / 10,000 sq.ft. roof</u>
Gaco Roof	69% *	\$66	\$95 (2 coats needed)	\$19,000

WHOLESALE (larger quantity, shipped to small applicators, usually the same as dealer's cost)

<u>product</u>	<u>solids by weight</u>	<u>\$ / gallon, FOB</u>	<u>\$ / gallon (as if 95% solids)</u>	<u>\$ / 10,000 sq.ft. roof</u>
Gaco Roof	69% *	\$51	\$70 (2 coats needed)	\$14,000
Gaco S-2000	95%	\$63	\$63 (1 coat needed)	\$ 6,300

MANUFACTURER (large quantity, shipped to large applicators, lowest cost possible)

<u>product</u>	<u>solids by weight</u>	<u>\$ / gallon, FOB</u>	<u>\$ / gallon (as if 95% solids)</u>	<u>\$ / 10,000 sq.ft. roof</u>
American WeatherStar #412	95%	\$39	\$39 (1 coat needed)	\$ 3,900
BASF Spraycoat High Solids	96%	\$33	\$33 "	\$ 3,300
WDG HSS 535	95%	\$32	\$32 "	\$ 3,200

- * Thinned silicone polymer (69% polymer in 31% solvent)
 - Is flammable.
 - Requires two coats (almost twice the time and labor) to achieve 25-mil final thickness.
 - Requires 150% more shipping, storing, man-handling, mixing and container disposal.



There are now available silicone polymer roof coatings which are superior to the acrylic polymer coatings we have studied thus far.

Unlike acrylics, silicone polymers do not have carbon as part of their backbone structure. Silicones have alternating silicon–oxygen bonding (-Si-O-Si-O-) as the basic structure. Such chemical anatomy is found in many rocks and minerals - including common sand. Silicones are water repellent, heat stable and very resistant to chemical attack, so do not degrade or wear away.

How does a silicone coating compare to an acrylic roof coating?

- A silicone coating will last as long as the substrate to which it is applied.
- An acrylic coating normally lasts around 5 years before recoating is required.
- A silicone coating withstands permanent ponding water.
- An acrylic coating does not stand up to ponding water without adhesive failure.
- A silicone coating can be applied over a wide temperature range (32°-120° F).
- An acrylic coating cannot be applied at temperatures below 55° F or above 90° F.
- A silicone coating does not require any primer, sealer or patch compound.
- Acrylics may require a primer coat, sealer and patching.

2010 January

Procedure for Not Allowing a Roof to Heat on a Bright Summer Day

Manufacturers recommend a roof with a surface temperature greater than 90°F not be painted.

This stipulation creates a real problem in the summer when most of our painting will occur. On a sunny summer day roof temperatures rise to over 90°F by 10 am and near 180°F by noon.

However, if a roof section to be painted is covered with an aluminum tarpaulin when the roof is cool, the covered roof temperature never exceeds a few degrees above ambient.

Energy Efficient Solutions (energyefficientsolutions.com)

Radiant Barrier reinforced aluminum foil material

a 4 ft. x 250 ft. roll is about \$125

The procedure is to:

- Cover the roof when it is cool (or hot and allowed to cool).
- Uncover an area which will be painted in about 20 minutes.
- Paint the newly uncovered area before it gets hot.

Once painted, the roof will be reflective and not overheat and interfere with paint curing.

2009 December

Pigment Color and Saturation Determine Roof Temperature

195°	180°	175°
170°	160°	155°
145°	140°	135°
120°	105°	110°
95°	95°	95°



Pigments are inert inorganic powders made of metal oxides. They are usually mined earth minerals, but may be manufactured.

Pigments may be added to latex or oil-based products because inorganic pigments are inert and do not react with other materials.

Cool roof coatings are tinted by adding a weighed amount of dry pigment to the base white coating and mixing thoroughly. Pigment added to an opaque white roof coating will provide a tint (lighter version) of the pigment color. The amount of pigment to add to a base depends upon the saturation of the color desired.

The Earth Pigments Co. (earthpigments.com)

A wide variety of colors cost about \$8 / pound.

What are Hollow Microspheres

Hollow microspheres are small, spherical particles whose size ranges from 12 to 300 microns in diameter; wall thickness can vary from several microns to as low as 0.1 micron. Microspheres may be composed of plastics or glass or ceramic. The true density of microspheres is lower than that of other non-soluble additives and ranges from 0.60 g/cc to 0.025 g/cc. A sphere has the lowest surface area to volume ratio of any geometric shape. It is the optimal form for occupying **the most space with the least material**. It is an excellent filler.

Microspheres:

- roll past one another, with no rough surfaces or branches to entangle
- effect viscosity only slightly when they are added to a liquid
- increase the solid content of a coating while maintaining the proper flow characteristics
- reduce volatile organic compounds (VOCs), shrinkage and drying time
- lower the density of paints
- in coatings, atomize better as a spray, roll with less spatter and sag less once applied
- improved sound dampening of materials
- **in paints, produce a tougher, easier-to-clean finishes**
- **in coatings, are less expensive to formulate, ship and easier to carry up a ladder**

Plastic microspheres added to \$20 / gal. paint (at 4% by wt.) saves about \$2 / gal.

We measured roof-top temperatures of dark asphaltic roof shingles treated with:

- no coating 170 °F
- plain white acrylic elastomeric roof coating 103 °F
- the same coating with 10% by wt. ceramic microspheres (*Hy-Tech*) 103 °F
- **the same coating with 4% by wt. plastic microspheres (*Expancel*) 100 °F**
- roof temperature under aluminum foil reflector 85 °F
- ambient air temperature 81 °F

Expancel 551 WE 40 d36
Eka Chemicals Inc.
Duluth, GA 30096 U.S.A.

Pricing of 551 WE 40 d36 grade of wet expanded thermoplastic microspheres:

minimum = one 10-kg bag = \$4.49 per kg
100-kg box (contains ten 10-kg bags) = \$4.12 per kg

Building #16 Roofs – rolled with 2 coats of *PermaKote* Brite White Elastomeric Acrylic (from Atlas Thermal Coatings of El Prado NM). This product contains ceramic microspheres.

Uncoated roof (before) = 168 °F
Coated (after) = 98 °F

2007

What Makes a Roof Coating Cool?

There are two properties of cool roof coatings which keep roof surfaces cool in the sun:

- High **reflectivity** to reflect away the sun's radiant energy instead of absorbing it.
- High **emissivity** to radiate away any heat energy they absorb.

The effect of these two properties on roof surface temperature is striking. Conventional roof surfaces, with low reflectivity and high emissivity, heat to 190 °F at midday during the summer. Cool coated roofs, with high reflectivity and high emissivity, reach approximately 100 °F.

What Are the Benefits of a Cool Coating System?

- cooler roof surface temperatures
- with proper maintenance of the coating, roof last the life of the building
- less heat is transferred to the building below
- cooler ceilings and more comfortable indoor temperatures
- 20% to 70% less air conditioning required

Ultraviolet (UV) rays from the sun break down many conventional roofing materials. A cool surface reflects the sun's ultraviolet rays and slows down roof aging.

Roofing materials also contract and expand daily as they heat up during the day and cool down at night. A roof with a cool coating doesn't experience such large daily temperature fluctuations so it undergoes less thermal fatigue.

Lower roof temperatures also reduce the rate of any chemical breakdown. A cool coating can increase roof life and significantly decrease roof maintenance and expenditures.

Your Chemist's Recommendations

My report of September 2007 stipulated that replacing the asphalt-based roof systems with the same materials would be a mistake. The process is inherently expensive, laborious, messy, noisy and odorous and results in a hot roof which ages prematurely and creates elevated attic and ceiling temperatures.

A better method is to wash the old roof, bulster vulnerable areas, then apply two coats of bright white acrylic emulsion roof coating directly over an existing roof. This process is inexpensive, much less laborious and messy, quiet, odorless and results in a cool roof, and cooler attic and ceiling temperatures. The cost is a fraction of the cost of relayering or replacing old asphaltic roofing. In fact, application of cool coatings to protect brand new roofs makes economic sense.

Recoating a cool roof as needed (perhaps every 20 yrs.) causes the roof to last indefinitely.

2005

Garage Roofs – were sprayed with Brite White Elastomeric Acrylic Roof Coating.

Uncoated roof (before) = 110 °F
Coated (after) = 70 °F (temperatures measured September 2009)