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TECHNICAL UPDATE

Impact of California's "Title 24" Building Energy Code On Commercial Roofing Products & Systems

Effective Oct. 1, 2005, "Title 24", California's new building energy code, will become law. It will require *new* non-residential buildings, new high-rise residential, new hotel/motel occupancies (described here as "commercial" buildings), or similar types of *existing* buildings undergoing a *significant roof tear-off*, to meet strict energy conservation standards, using an "Energy Use Budget" concept for the entire building envelope. Requirements for steep slope roofs won't be included until July 1, 2008. Roofing is just one portion of the building envelope. When Title 24 becomes effective on Oct. 1, a portion of it will address "commercial" low-slope roofs -- these roofs will be targeted (*not required*) to meet a baseline minimum solar reflectance (SR) of 0.70 (70%) and a baseline minimum thermal emittance (TE) of 0.75 (75%). Meeting these values is *not required*, because if a roofing system's SR and/or TE values don't meet the baseline minimums, the designer can still comply by "trading off" with other conservation methods, such as using a little more insulation and/or more energy-efficient windows, etc. The issue of "Title 24" ("T-24") is complex and developing, and both CertainTeed and ARMA are monitoring the effect of its implementation on the roofing industry. The Q&A below addresses some of the critical topics involved. This document will be updated as new information is received.

What is "Title 24" and How Does it Work? "Title 24" is shorthand for "Title 24, California Code of Regulations, Part 6." "T-24" is California's building energy code, which is designed to legislate the incorporation of cost-effective energy-efficient measures into buildings, doing so, in part, by providing building energy efficiency standards for commercial buildings based on an "energy usage budget".⁽¹⁾ A number of building components were given target prescriptive values for potential use in the budget. T-24 will *not* cover all roofing situations, nor will its requirements be the same in all climatic regions of California (16 regions). Roofs over unconditioned (no heating or A/C) are *not* regulated. Also, when T-24 becomes law, and enforcement begins on 10/1/2005, it will cover only:

- New "commercial" roofs and
- Re-roofs of "commercial" buildings (involving more than a 50% tear off of the existing roof, or more than 2,000 square feet, whichever is less.)

As an example, when a building is newly constructed, its full building envelope is evaluated for maximum total energy use, and the building's "Energy Budget" is calculated. To meet this energy budget, the designer can specify more insulation, more efficient lighting systems, more efficient window or wall design, the use of passive solar elements, or roofing that is highly reflectant. As you can see, there are many options that will lower energy use, so it is not at all necessary to modify the roofing portion of the building envelope in order to achieve the required energy-use reduction. Doing so is simply one option for the building designer.

What is a "Cool Roof Material?" T-24 defines a "cool roof" as a roofing surface with high thermal emittance and high solar reflectance, or, alternatively, a roofing surface with lower thermal emittance but exceptionally high solar reflectance (values specified in the code). In the 2005 Title 24, the baseline budget assumption is a "cool roof." The expectation is that either combination of radiative properties will reduce heat gain through the roof system. In order to "automatically" qualify for a "cool roof" compliance credit, the roofing material's radiative properties must be "CRRC" certified and labeled accordingly, and must meet conditions #1 or #2 below. For liquid-applied roofing products, conditions #1&3 or #2&3, below, must be met.

- 1) A material with an initial thermal emittance ≥ 0.75 shall have a minimum initial solar reflectance of 0.70.
- 2) A material with an initial thermal emittance, $\epsilon_{\text{initial}}$, < 0.75 (typical of metallic surfaces) shall have an initial solar reflectance of $\geq 0.70 + 0.34 * (0.75 - \epsilon_{\text{initial}})$.
- 3) Field-applied roof coatings must be installed at a minimum dry mil thickness of 20 mils across the entire roof surface, and meet specified performance requirements⁽²⁾

How does the Performance “Energy Budget” Process Work (Title 24, Sec. 141)? Energy budgets vary by region and are calculated based on climate (16 different climate zones in CA), building type, and building components used (fenestration, wall construction, lighting system, A/C, and roofing). Approved computer software is available that can be used to establish the overall baseline budget using anticipated values. Each *building* gets an energy budget for its anticipated “building envelope” construction, based on its climate zone and the building components used (lighting, fenestration, heating/cooling, wall construction). Each *component* gets a “baseline” or “neutral” value assigned. If the budget is exceeded due to one component, the other component(s) must be specified differently to stay within budget; otherwise no building permit is issued.

How does the Prescriptive “Energy Budget” Process Work (Title 24, Sec. 143)? A building “prescriptively” complies by having either (1) envelope components that all comply with each of the requirements in Subsection (a) for each individual component, or (2) an envelope system that complies with the overall requirements in Subsection (b).

What are the Requirements of Title 24 for Commercial/Low Slope Roofing? The “baseline” or budget target values for Solar Reflectance (SR) and Thermal Emittance (TE) are 0.70 and 0.75 respectively. If a product has no CRRC-certified reflectance value, the material’s SR value defaults to 0.10 (vs baseline of 0.70). As mentioned above, when roofing products with low SR values are used, the energy budget will be “penalized”, such that other components of the energy budget will need to be more energy efficient. The use of reflective roofing to fulfill the budget is expected to be less costly than other materials, such that roofing products having higher SR and TE will benefit from greater demand. Again, a product with a low value is not “prohibited”.

Must All Commercial Roofing Products Sold in California be Title 24 Compliant by 10/1/2005? No. Compliance to Title 24 is only required when the commercial low-slope roofing is applied in new construction or in a re-roof involving more than a 50% tear off of the existing roof, or more than 2,000 square feet, whichever is less, and only when the roof is installed over a conditioned space. Also, for roofing systems, compliance relates only to the exposed surface of the roof system (cap sheets, roof coatings, etc.), so base sheets and ply sheets are *totally* unaffected.

Which CertainTeed Products/Systems Will Comply With Title 24 Requirements on 10/1/05? In one sense, all roofing products “comply.” It’s just that those with higher values of Solar Reflectance and Thermal Emittance will be sought after by the designers looking to meet their energy budget more easily. CertainTeed’s “FlintCoat” roof coating products and its Flintlastic and Flintglas series of roll roofing products (white only) are “CRRC-rated”. The listed products can be found at... http://www.coolroofs.org/pdf/productlisting_0205.pdf Those roofing products having exposed surfaces meeting the baseline budget values of SR > 0.70 and TE > 0.75 can be directly plugged into the Energy Budget calculation, providing maximum benefit to the designer. Products like white cap sheets having SR values of 0.25 – 0.32 will provide a *partial* benefit in the Energy Budget calculation.

Must Rated Products be Labeled? Yes, every roofing product installed to take a compliance credit for its “high” reflectance and emittance must have a clearly visible label on its packaging that lists CRRC-certified values of SR and TE. CRRC is the “Cool Roof Ratings Council” (see www.coolroofs.org). CRRC is the sole “Supervisory Entity” recognized by the California Energy Commission, and radiative values determined by a CRRC-approved “third-party” independent test laboratory are the *only* ones that can be used for calculating Title 24 (building code) compliance.

Are there penalties for non-compliance? The “penalty” for non-compliance is that no building permit is issued until the building’s projected energy usage is less than or equal to its calculated allowable budget. But, remember that the *entire building envelope* is evaluated for compliance to its energy usage budget -- no component, including the roofing materials, must individually meet any pass/fail criteria. If the budget is exceeded due to one component, then other components can compensate (E.g., can use more window area by insulating more or using reflective roofing).

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Footnotes:

- (1) For details, see sections 10-113, 118(i), 141, 143, and 149 of the 2005 Title 24 Standard at: <http://www.energy.ca.gov/title24/2005standards/index.html>
- (2) Exceptions --Aluminum-pigmented asphalt roof coatings shall meet the requirements of ASTM D2824 and be installed as specified by ASTM D3805. Cement-based roof coatings shall be applied at a minimum dry mil thickness of 30 mils when installed over a cap sheet surface, or 40 dry mils when installed over a metal surface, and 200 dry mils when installed over a rock or gravel surface. Cement-based roof coatings shall contain a minimum of 20% cement, and shall meet the requirements of ASTM D822.