UPGRADING EXISTING ROOFS

Glenn Langer
Langer Roofing & Sheet Metal Co., Milwaukee, Wisc.

When I recently learned that Sweden requires a maximum conductance (C factor) of .03 for most buildings' roofs, I realized the inadequacy of my efforts to sell increased roof insulation these past years. A roofer, architect, or mechanical engineer can substantiate the economies achieved by proposing more roof insulation when reroofing a building. However, it is the owner who must pay for it, to say nothing about the cost of reroofing work, which he usually considers already exorbitant. It is this owner we must convince.

With charts prepared prior to making a roof replacement quotation, this owner must be informed about the savings effected over a short number of years, especially when taking into account ever rising energy costs. With N.R.C.A.'s manual, "Good Roofs Save Energy," or such services as Owens-Corning's EMS Computer, a contractor has the tools to offer several types of roof insulation and thicknesses. Ten years from now, many of our roofs with a Thermal Resistance of 10, which I regret is presently considered sufficient insulation, will prove hopelessly inefficient and require upgrading. Selfishly viewed, this might be good future business.

The initial cost of adequate roof insulation in new construction can generally be justified, when compared with the over-all cost of a new building. Improving a roof's thermal resistance from R = 5 (°F/BTU/sq. ft.) to 10 would raise insulation cost by about $0.25 psf (from $0.50 psf to $0.75 psf). In a new manufacturing building costing $15 psf, that doubling of insulating value adds less than 1-½% to the building's initial cost. But when reroofing costing $2 psf, that same $0.25 psf R-value improvement would raise inital cost by 12½%. That requires salesmanship!

Apart from costs, there are still other deterrents. What for example is the total roof area in relation to the square foot area of the occupied floor space? A small roof area/floor area sometimes invites apathy about roof heat loss. I often find an office building owner more willing to pay for improved roof insulation, because the owner himself often occupies the top floor. He observes, first hand, the benefits of a well insulated roof assembly, in personal comfort during heating or cooling seasons. Does the tenant or owner pay for energy usage? This is many times a big factor. What is the occupancy? Office, factory, warehouse, the ultimate use of the building? How often have you seen a warehouse, requiring little heating or cooling, become a manufacturing facility? A new type of occupancy!

Now that we have discussed the reasoning for upgrading insulation, one must determine the type of insulation best suited for the building and its present and future occupancy: Is a fire rating required? If so, F.M., U.L., F.I.A.? Is perimeter nailing required? Will foot traffic be excessive? Will a great number of roof openings be added over the expected roof membrane life? Is a vapor barrier required? This may affect the type of roof insulation employed. The type of roof demanded by the owner or suggested by the roofer will often eliminate various roof insulations.

Considerable thought must be given to roof membranes applied over these insulations. Experience has shown that 1 inch insulation thickness over a metal or possibly other type deck, allows the application of a marginal roof system without experiencing many roof problems. Apply 2 inches of perlite or fiberboard insulation, the marginal roof will prematurely split, crack, shrink, rot and generally become unservicable. With the use of more thermally efficient insulation, these problems can be magnified. As insulation thickness increases, (increasing the distance between deck and membrane) adhesion between the deck and between layers of insulation becomes more important, to resist shearing deformation. The "real world" (job conditions such as deck surfaces and weather conditions) make it impossible to rely on the assumption that "roofs properly restrained, do not split themselves." Consideration must be given to these suggestions:

1. Mechanical attachment of the insulation.
2. Additional roof control joints.
3. Light colored surfaces.
4. Multiple-layered insulation.
   a. Allows breaking of joints.
   b. Insures level roof application surface.
5. Taping of insulation joints where practical.
6. Stronger roof membranes (e.g. through additional plies)
7. Loose-laid systems.

The loose-laid roof membrane concept should not be ignored. I am not here to necessarily promote the use of such products. Increased thermal values of roof insulation suggest that these systems might be the answer, especially where adequate attachment of the roof insulation is difficult or almost impossible to obtain, for example, an irregular precast deck. The structure must be designed to carry the additional loads of ballast on these loose-laid, one-ply systems. Surprisingly, the majority of structures will not take this added weight. Many buildings were not designed to even accomodate a second ordinary gravel-surfaced roof, much less a heavy ballasted one. Have a structural engineer check the roof structure's load-carrying capacity. You will be amazed. Take exceptions in writing prior to beginning any such job and have the owner acknowledge this responsibility.

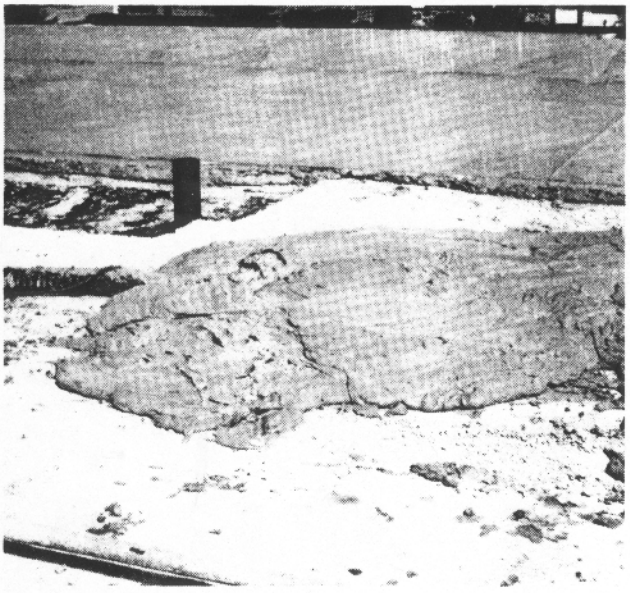
Note pictures of recently completed reroofing work operations:

1. Cellular concrete over existing gravel roofs.
2. Two layer insulation over old 2" wood deck.
3. Roof replacement over wood fiber deck.
4. Insulation over existing gravel roof.

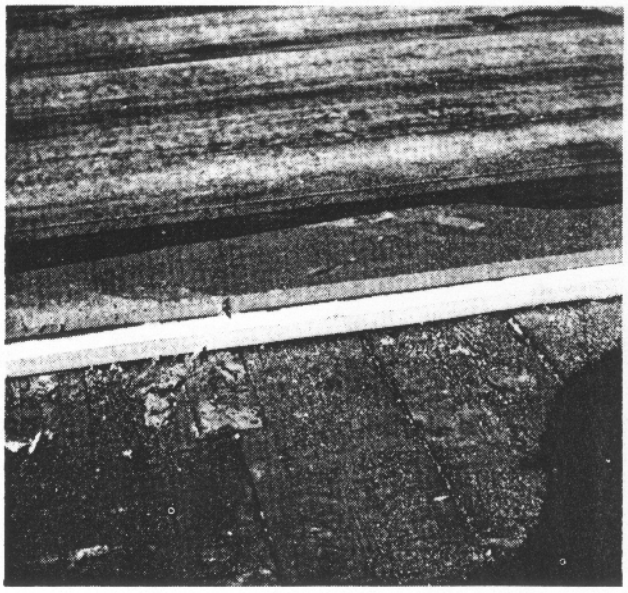
Much controversy persists about the long and short-range effects of more efficient thermal insulation on the roofing system. Some other countries have apparently overcome their dilemma by installing thermally efficient insulations with the use of fasteners and upgraded roofing specifications. By the employment of new materials, older proven materials, multiple-layer insulation applications, better roof decks and improved, but realistic, workmanship standards, this country can produce thermally efficient, but nonetheless durable roofs.

It is difficult to understand why we cannot meet this challenge!

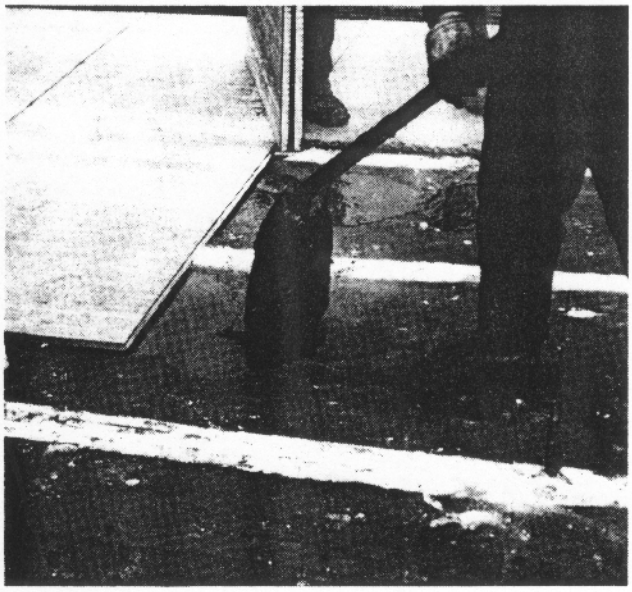
PICTURE 1



PICTURE 2



PICTURE 3



PICTURE 4