

Shingle cracking: Cause/effect relationships must be overcome

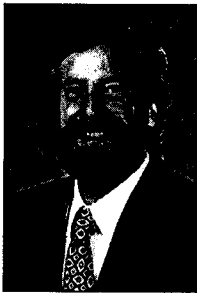
by Jim Carlson

Q: *We are worried about a three-tab, fiberglass shingle roof we installed about three years ago. This job is developing cracking problems with the shingles. The cracks are not severe enough to cause the roof to leak. However, the owner is very frustrated, and it does not appear we are going to get much assistance from the manufacturer, who believes the cracking is related to the manner in which the structure is framed.*

The engineer we hired to examine the framing states that the framing is satisfactory. He also did ventilation calculations and says the ratio of net free air space to roof cavity space is fine. What we need to know is: Are the cracks going to worsen and shorten the life of the roof, and what may have caused the shingles to crack?

A: First of all, judging from your description of the roof assembly, I am inclined to agree with the engineer who believes the cracking is not directly related to the framing. Although shingle cracking can be related to how a structure is framed and the resultant structural loading and thermal movement dynamics, these horizontal cracks are not patterned in a way that suggests correspondence to the building's structural framing assembly. But to answer your questions: Yes, the cracking may become more pronounced over time as the shingles thermally cycle, weather and age. And, as to cause, there may be several related causes of the cracking.

To determine the cause(s) of the



cracking, some tests would need to be done on numerous samples of the material taken from different areas of the roof that exhibit various degrees of cracking. Short of results from testing (tensile, elongation, tear and bend or flex), and simply considering thermal movement of the shingles combined with freeze-thaw cycling in your northern climate, the cracks may become more evident, widen slightly and elongate, and contribute to premature degradation of the roof.

Cracking of various asphalt shingle products has been a problem the steep-slope roofing industry has been concerned with for some time now, and despite what some may think, it has not been exclusively associated with lighter-weight, three-tab fiberglass shingles. In the past, there have been isolated cracking problems with a few heavier-weight shingles, as well. Although, in the last few years, cracking reports have been mostly related to light-weight, square-tab strip shingles.

There are different types of shingle cracking and splitting problems that are attributed to different causes. Generally, cracking is a non-linear separation of a material, and splitting is linear. The cracking you have described sounds like a preliminary stage of what may be technically referred to as "horizontal splitting."

However, to more precisely answer your question regarding the causes of this cracking, again some testing may assist by determining the actual composition of the shingle's components. If the framing and sheathing applications are correct (e.g., proper truss dimensions, spacing and anchorage, and the sheathing is properly gapped, clipped and fastened) and you are sure there is thorough cross-flow ventilation in the entire roof cavity, this leads one to suspect the cracking may be a material problem.

When splitting or cracking is assumed to be just a material problem, that is all other aspects of

the roof assembly are correct, there are several factors that may be directly related to the shingle's problem. These factors include: low strength reinforcements, (such as too "light" or weak of a glass mat reinforcement), that may be combined with a seal-strip adhesive that is very tenacious, and possibly too high of an asphalt filler content. Also attributed to the cause may be a poor quality asphalt.

In other words, too much "filler" in a shingle's asphalt mix combined with too weak of a reinforcement mat and a seal-strip adhesive that is so strong it may limit the shingle's ability to move with temperature change, may actually allow the shingle to "tear" itself apart.

Research should continue to determine acceptable thresholds for shingle reinforcement strengths, percentages and types of filler, and qualities and quantities of asphalts. Most likely, weak reinforcements will need to be upgraded, and percentages of fillers limited so that strong seal-strip adhesives can continue to be used. Strong seal-strip adhesives that seal relatively quickly are needed in locales with demanding wind-uplift criteria.

Do not take this out of context. Although there have been some problems, asphalt composition shingles are generally an excellent performing product that have proven their valuable worthiness over time. But shingle manufacturing specifications must be maintained at a high enough standard to offset the "component cause" and "cracking effect" relationship. **PR**

Each month in this column, one of NRCA's deputy directors of technology and research, Donald A. Berg, PE, or James Carlson, will answer readers' technical questions. If you have a specific question you would like answered in this column, send it to Q&A, Professional Roofing, O'Hare International Center, 10255 W. Higgins Road, Suite 600, Rosemont, Ill. 60018-5607.