

TECH TRANSFER

Steel decks: Issues for the 1990s

by Thomas L. Smith, AIA, CRC

Steel roof decks have enjoyed widespread use for many years. In the 1970s and early 1980s, there were two primary issues concerning them: the difficulty in obtaining good insulation attachment with adhesives, and excessive deflections. In the 1990s, the three primary issues may be deck corrosion, excessive deflections brought about by application practices related to single-ply and special considerations when reroofing.

Attachment problems associated with adhesives have essentially disappeared, thanks to the industry's movement to the use of mechanical fasteners with steel decks. Deflection problems have also been minimized, thanks to a 1976 steel deck deflection study.

The study was sponsored by the Asphalt Roofing Manufacturers Association (ARMA), with testing performed at Factory Mutual (FM). However, that study was based on construction loads routinely associated with built-up roofing (BUR) application. Follow-up studies have not been conducted on construction loads associated with single-ply.

In the study, the recommendation for maximum deck deflection is $L/240$ when loaded with a 300-pound load concentrated over an area of one square foot. The 300-pound criteria is suitable for equipment used for BUR application. However, with single-ply ballast buggies, wheel loads may approach 500 pounds. Also, equipment used to move large rolls of single-ply material can have wheel

loads in excess of 300 pounds.

To compound the problem, the 300-pound load criteria is not used in the Steel Deck Institute's (SDI) *Design Manual*. The manual uses the same deflection limit ($L/240$), but gives a construction load of only 200 pounds. While it advises the designer to decrease the deck span or increase the deck thickness if greater loads are contemplated, how often is the designer aware of these loads?

The design construction load criteria for BUR application should be 300 pounds, and new criteria needs to be established for the higher loads that are associated with many of the single-ply jobs.

Deck corrosion

Steel decks commonly have a prime coat of paint or they are galvanized. Recent concerns have been expressed regarding the adequacy of the painted finishes. The SDI manual states, "Primer coat is intended to protect the steel for only a short period of exposure in ordinary atmospheric conditions

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and shall be considered an impermanent and provisional coating." It adds, "Field painting of prime painted deck is recommended especially where the deck is exposed."

While steel roof decks are normally exposed to the weather for only a short time after installation, the deck may be exposed to water from leakage, inadequate condensation control or from entrapment during (or prior to) construction. If the deck corrosion protection is inadequate, structural degradation of the deck may occur.

Recognizing these realities, SDI's

advice that the prime coat is only temporary is of concern. Obviously, a more conservative design approach for new construction would be to specify galvanized protection. Although in Canada galvanized decks are required, the U.S. roofing industry does not have recommendations concerning corrosion protection; however, in light of reported corrosion problems and the SDI position on primer coat, it is time to consider formulating one.

Deck corrosion related to phenolic insulation has been reported (see "NRCA News," Page 63). While wet phenolic may be more corrosive than other types of wet insulation, some types of wet insulation may also be more corrosive than just water itself. And even if the insulation does not contribute to corrosion, water alone can be very detrimental to the deck if it does not have an adequate protective finish. The finish should provide protection not only until the roof covering is in place, but also afterward. Minor leakage or water entrapment should not result in the need for deck replacement.

Reroofing

As reroofing continues to dominate the roofing market, many of the steel decks that are encountered present special challenges. These will be discussed in a future article.

Steel decks have given the industry problems in the past, but by understanding their weaknesses, solutions were found to overcome them. It is time to look again at steel decks, in terms of increased construction loads for some systems and corrosion protection. While many older decks present future reroofing challenges, the current generation of steel decks should serve well. Steel decks can be an excellent substrate when designed correctly with suitable criteria, and when properly installed by the deck contractor. PR

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