Fireproofing of Painted or Lock-Down Coated Steel

By Gray Winey

Of the many job-site issues facing the fireproofing contractor today, perhaps none is as important, or as confusing, as how to treat primed, similarly painted or lock-down encapsulated steel. This issue is particularly important due to the growth of the replacement segment of the fireproofing business. To address the issue of primed or painted steel in new construction, or lock-down encapsulated steel on a respray job site, the contractor needs to be aware of the steps necessary to maintain the fire rating.

The procedures for applications of spray fireproofing were implemented with the publication of the 1989 Underwriters Laboratories (UL) Fire Resistance Directory. These procedures call for the ASTM E-119 fire testing of primers, paints and encapsulants. The procedures also detail the conditions of acceptance of non-fire tested primers, paints and post removal lock-down encapsulants. The adoption of these criteria has had an especially important effect on the respray fireproofing job site where post removal lock-down encapsulants are used.

Post removal lock-down encapsulants are used in the asbestos abatement industry to lock down or seal residual fibers after the removal process. While the encapsulants help in obtaining "clean air" on a removal project, they may interfere with the spray fireproofing and the fire rating of the structure. The major fireproofing manufacturers have historically specified that their materials be applied over bare unprimed or galvanized steel, and all their fire testing at UL has historically been accomplished on steel in these conditions. The major concern with the use of primer, paints or lock-downs on steel to be fireproofed is that the coating may interfere with the adherence of the fireproofing to the steel. The adherence (bond strength) of fireproofing to substrate is important at both ambient temperature and at the elevated temperature experienced during a fire.

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The fireproofing material must remain in place before and during a fire. Even when properly applied, primers or lock-downs may prevent the fireproofing from adhering to the substrate and doing the critical job of protecting the structure and enhancing the life safety of the building occupants.

A committee was formed in early 1988 to address the use of primers, paints and encapsulants applied to steel that was to be fireproofed. The committee was made up of representatives of fireproofing material manufacturers, paint and coating manufacturers, the American Iron and Steel Institute (AISI) and UL. Two areas of concern were targeted by the committee: (1) development of a fire test program in accordance with ASTM E-119 to determine which specific coatings are compatible with specific fireproofing materials and (2) development of a procedure for when fireproofing is to be applied over an unknown or untested primer or lock-down, without jeopardizing the fire rating.

The first issue, development of a fire test program for compatibility of these coatings with fireproofing materials, was a relatively easy task as the test equipment, standards and historical test data were already in place; the ASTM E-119 fire test is the "standard fire test" to which fireproofing materials and building components are subjected. The hourly fire-resistant ratings obtained from the fire test are a measure of the ability of the tested components--steel, concrete and fireproofing--to work together as an assembly to resist damage by fire for a specified period of time. To successfully pass the fire test, the structural steel and deck temperatures must be kept below a limiting point; deflection of the assembly must be kept to less than 12 inches, and the fireproofing must remain adhered to the element it is protecting for a specified period of time.

In the fire tests for determining the high temperature compatibility of the coatings with the fireproofing, the adherence of the fireproofing to the
coated assembly for a specified time period is the critical factor. Historical fire test data shows that the fireproofing bonds well to bare and galvanized steel. It is the presence of the primer, paint or lock-down encapsulant in these tests which most affects the success or failure of the fire protection of the assembly. To test and obtain approvals over the widest possible range of substrates, fire tests are typically performed on assemblies consisting of a beam and fluted and/or cellular steel decking.

Upon successful completion of a fire test series, the specific primer, paint or encapsulant is entered into the UL follow-up service, and is classified by UL for use in fire-rated assemblies with the specific fireproofing material with which it was tested. At this writing, no paints or primers have been tested with the various fireproofing products; approximately 12 different lock-down encapsulants have been tested with various fireproofing products. It is important to understand that only the specific tested primer or encapsulant is issued a UL classification, and the tested encapsulant is listed for use only with the specific fireproofing material.

The second issue addressed by the UL committee was the development of a procedure to allow fireproofing materials to be applied to unknown or non classified, non-fire tested primers, paints and lock-down encapsulants. This procedure addresses the situation which arises when a fireproofing contractor arrives on a job site and finds an unknown or non-fire tested (with the specific fireproofing material to be used) coating. The procedure to handle these situations can be found on page 10 and 11, “Sprayed Material,” in the 1990 UL Fire Resistance Directory.

This procedure states that fireproofing material may be applied without modification to unknown, non-fire tested primed or similarly painted structural steel providing that all the following conditions are met:

1. the beam flange width does not exceed 12 inches;
2. the column flange width does not exceed 26 inches;
3. the web depth of beam or column does not exceed 16 inches; and
4. a bond test run according to ASTM E-736, to measure the ambient bond strength between the fireproofing and the unknown primer or lock-down, indicates a minimum average bond strength of 80% of the bond developed by the specific fireproofing applied to bare uncoated steel. A bonding agent may be used if the average bond strength is below the 80% criteria.

If any of the conditions specified in 1, 2, 3 or 4 are not met, a mechanical bonding aid must be used. Typically in this situation metal lath is wrapped around the beams or columns which do not meet the conditions above prior to the application of fireproofing.

For beams and columns whose widths and depths are greater than the limits listed above, a mechanical break must be used to divide (or break) the steel surface into smaller areas.
Typically, a piece of metal lath is welded to the steel in such a way as to divide the steel surface into areas of a size that meets the criteria above. This procedure is applicable only to structural beams and columns, not to deck. Floor and roof decking coated with unclassified products must have metal lath attached over their entire surfaces prior to the application of fireproofing.

Implementation of the fire test method and the approval procedure for primers, paints and post removal lock-down encapsulants has added a new and complicating factor for the contractor and the architect. On the job site, the use of field bond testing and possibly the use of metal lath or other means of mechanical attachment, prior to the application of fireproofing, may be necessary. To cost effectively ensure that the respray project obtains the proper fire ratings and meets lock building code, only those encapsulants that have been fire-tested with the fireproofing to be applied can be used. For new construction, remember that no fire tests have been performed with any paints coating structural beams or columns, and no fire rating exists unless the procedures detailed above from the UL directory are followed.

As a contractor, the best way to keep yourself informed about any potential problem with painted or lock-down coated steel is to contact your local fireproofing manufacturer representative before the job starts. By taking early action, you will eliminate costly headaches, and keep from getting burned.

About the Author:
Gray Winey is assistant product manager of fire protection products for W. R. Grace & Company, Connecticut.