Increased Importance of QA Inspections of Low-Slope Roof Assemblies

By Marc N. Boulay

The quality assurance (QA) inspection of a low-slope roof system is, in most instances, the last line of defense to ensure that a roof assembly is properly installed to allow for a maximum level of effective service, past the duration of any warranty or guarantee issued by the roof system manufacturer. The intent of the QA inspection is to ensure that the owner receives at least what he is paying for, which is the optimal scenario, as it is all too common for an installed roof assembly to have materials and details that are of a lesser quality than were specified. In order to justify the expense of QA inspections, such work must add value to the project in the form of a higher-quality installation that should allow the owner to realize long-term effective service from the roof assembly. Even a roof system installed to marginal or slightly diminished standards will work for 10 to 15 years; however, the value of an effective QA inspection is realized when the owner obtains 25 or more years of effective service life from a roofing system. Properly performed QA inspections go a long way to ensure minimum standards of the roof system manufacturer are met, as well as enhanced specifications and details that may have been designed by a roofing professional.

A series of factors combine in the current low-slope commercial roofing industry to make it difficult for an owner to obtain an optimal roof installation without a QA inspection. On the positive side, the overall quality of low-slope roofing systems and materials has continued to improve over the past few decades. Unfortunately, this is being offset by the overall lower quality of skilled labor, which continues to erode for a variety of reasons. Not since the days when most new roof systems involved field fabrication of built-up roof assemblies have QA inspections had such an influence on the overall longevity of installed roof systems. The older BUR systems required close monitoring of the bitumen temperature at the kettle and mop cart prior to mopping, and those temperatures were taken with an analog-style thermometer that required the tester to be up close to the bitumen.

Older BUR assemblies also required monitoring of the rate of interply bitumen being applied and had also to ensure that the rolled-out felts were broomed in without being walked upon and that there was an adequate amount of bitumen bleed-out on every felt. In short, QA inspections performed a very important function that had a direct correlation with the optimal length of service obtained from a roof assembly.

As the popularity and market share of single-ply roofing systems grew (with, in most cases, more comprehensive warranty coverage and use of prefabricated membrane and flashing materials), many owners elected to reduce and even eliminate the cost of QA inspections of roof installations on the premise that the roof system manufacturer performed a final inspection prior to issuing a warrantee or guarantee. Such a thought process is flawed and short-sighted, saving limited funds in the short-run but having the potential to create a significant expenditure in future years, as a poorly installed assembly requires premature replacement or repair due to widespread leakage and system component failures.

While final inspections are performed by tech reps for roof system manufacturers, in most instances, they are quick and not as comprehensive as the owner and most design professionals would like. Such quick final inspections—if performed at all—are more a function of the business side of the industry and a prerequisite to issuance of the warranty or guarantee. The tech rep inspection is typically rushed, allocated two hours or less, which is not sufficient to review each membrane seam, penetration, and perimeter flashing. This allows portions of the system to remain in service outside the designed specifications.

Such is not typically a deliberate attempt to allow the specifications to be compromised, but a result of a rushed inspection. The scenario plays itself out constantly and is allowed due to the fact that most industry professionals, including the manufacturers, know that even a marginally installed roof system will provide adequate service during the 10- to 15-year period that is covered by the warranty. Covering the repair cost for a few leaks on a less-than-optimally installed assembly is considered by some to be a function of the business and less costly than training additional tech reps to ensure they have sufficient time and training to perform a truly comprehensive final inspection—let alone periodic inspections. It is not uncommon for a recently installed low-slope roof system to be subsequently inspected well after the roof was installed, as a function of a maintenance inspection, and to find a series of substandard details and

applications that should never have been passed by any tech rep performing a final inspection. These include seam wrinkles, poorly sealed pitch pockets, cold or burnt welded thermoplastic seams, inadequate butyl tape exposed on EPDM assemblies, dry laps on modified-bitumen systems, etc.

To be fair, some of the substandard details encountered on newer roof systems after the warranty has been issued are marked on the roof for the contractor to address, but without a follow-up final inspection, we find most such items are never taken care of. Rather, the roofing contractor relies on the warranty to address the issue if leakage occurs at the substandard detail. If a leak develops within the first few years, he will repair at no cost, so there is not a huge emphasis on returning to fix a detail on a project that was closed out and with a warranty issued. Most substandard detail and installation issues will not manifest into an active leakage condition until the later portion of the service life of a roof assembly, providing limited risk to the manufacturer holding the warranty coverage, but shorting owners of the top-quality, long-term roof system they paid for and thought they were obtaining.

While less-than-thorough inspections and absence of follow-up work or inspections on most warranted roof systems is an issue, it pales in comparison to the largest threat to an optimally installed low-slope roof assembly: untrained roofing labor.

A major component of this scenario is the all-too-common and apparently increasing practice of subcontracting installation labor to unskilled, untrained, and inexperienced installers of low-slope systems. While the overall integrity of the materials used in low-slope roof systems has routinely improved, they require a dedicated skill set to properly install to assure that the assembly will achieve the optimal ~25-year level of effective service.

Such untrained labor places a high degree of pressure on the QA inspector to monitor the activity and work product of numerous personnel at once. In some cases, workers are not cognizant of even why they are performing a certain work function. Such a scenario is all too common and results in the QA inspector either becoming an instructor or a project manager, neither of which is his or her responsibility. One way to curtail this practice is for the roof system designer to mandate a percentage or number of roofers on each project who have attended the training program for the respective roof system being installed and to verify this at the onset of construction. Roof system manufacturers themselves can also mandate such but are unlikely to do so, as this would stretch their tech department resources and actually place them at a slight disadvantage in competing with other manufacturers when the roofer is selecting a system for use on a project.

The importance of QA inspections extends past the roof system and can have an effect on future work of RCI professionals. The following scenario provides an example.

A building owner decides to replace the roof due to age and condition and to halt leakage interruptions that continue to plague the building's operation. He does not hire a roofing professional for the specifications but simply calls a few local roofers and obtains pricing. Once he settles on a roofer, a contract is signed and the roofer schedules the work. Knowing that this is a significant expenditure on a roof assembly with which he has no expertise or experience, the building owner decides to hire a roof inspector to ensure he is getting his money's worth and a top-quality assembly.

The building owner does a bit of homework and online searching and ends up at the RCI website, where he finds a local roof consultant who offers QA inspections. The quality of the inspection and the actual reports that he will receive subsequent to each inspection are important to the owner. If the professionalism of either the QA inspections or the reports is not up to high standards, chances of that building owner ever hiring a roofing professional again are very slim.

Most roofing professionals provide a high level of proficient service, to which I can attest as a function of receiving and reviewing copies of daily QA reports from a large number of firms on hundreds of projects all over the U.S. and Canada. But the news is not all good; there are a few roofing professionals who pay less attention to their QA inspections than they should. While the use of an improperly trained inspector is not common, the emphasis on providing a comprehensive written assessment of the daily work effort in a condensed format is lacking and the weak link in the QA inspection chain. Roof inspections should be performed by persons who are properly trained and with a working knowledge of the system being installed, as well as whatever

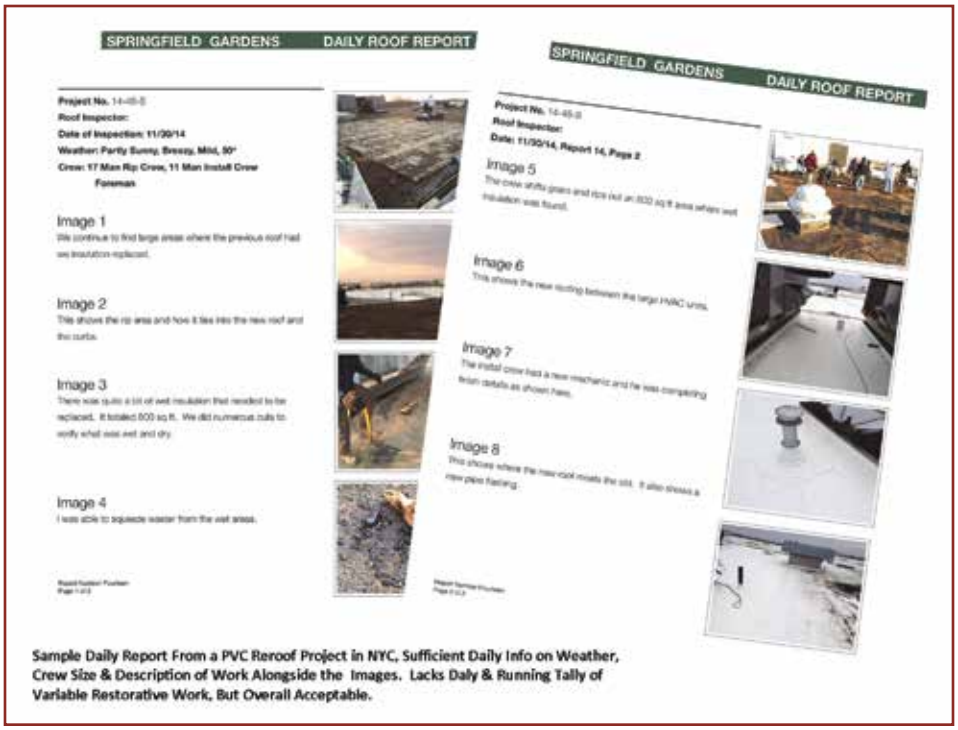

Figure 1 – Sample daily report from a PVC reroof project in New York City. Sufficient daily information on weather, crew size, and a description of work accompany the images. Lacks daily and running tally of variable restorative work, but acceptable overall.

design enhancements may be applicable for each particular project. A full copy of the specifications, roof plan, and details should be on site and available for the QA inspector to reference during construction.

The inspector should possess diplomacy skills, as that is an integral part of the job. In the event of a dispute, the QA inspector should provide adequate information to the parties who will review the data and render a decision, not attempt to overstep his or her function as an observer. The QA inspector should not argue with the roofing personnel but take up contentious issues with the designer, system manufacturer, contractor office, and/or owner. Roof inspectors should properly represent themselves in a professional manner and appearance that serves as a contrast to the roofing workers.

Any contentious detail or application should be photographed with a smartphone and forwarded to the appropriate office for a timely determination that does not slow the progress of the roofing effort. As for the daily observation reports themselves, they should be provided to an owner on at least a weekly basis for hard copies; and soft copies should

Figure 2 – A more complete report with a scaled, color-coded roof plan, text documentation, and a tally of the variable work items, as well as color images with work descriptions.

be provided as soon as possible—within three days maximum.

Reports should clearly list all pertinent roof project data and include a concise review of the work effort; daily and running tallies of variable work items such as wet insulation, replacement, and deck remediation work; and the number of roofers, visitors, and the daily progress. A roof plan showing the area involved on a given day may be included, providing such information is integrated into the daily report and is not a separate file. The same holds for the set of color images taken each day. Resolution of images should be adjusted to be sufficiently clear to allow for close-up expansion on a monitor without a loss of clarity. High-resolution digital images also have a penalty, and that is excessive file size. Some owners (in particular, select large corporations) have size restrictions on their e-mail accounts that will preclude larger-sized files from being accepted. When combining written report text, color images, and possibly a roof plan diagram, such should be converted into a single condensed Adobe PDF file with a clear number and date to allow for ease of saving and reference. Digital images should be at least 2 x 3 inches in the report, as smaller-sized images are difficult to review, and the point of a report to the owner is to make it as easy as possible for review and reference. An example of a condensed but effective daily QA report is shown in *Figure 1*.

An example of a more complete report is provided in *Figure 2*, with a scaled, color-coded roof plan, written text documenting the work effort, a running and complete tally of the variable work items, and upwards of 12 pages of color images along with work descriptions. This type of daily report is optimal, provides the most complete documentation, and is substantial enough in size to satisfy even the most discerning owner. Daily QA inspection reports that start out with five or six pages of form fields and checklists can and should be culled to a one- or two-page document listing only pertinent data for that project, followed by the series of color images that are easier for the owner to read.

Following these recommendations and guidelines should collectively elevate the QA inspections and reporting process to a standard that the industry can remain proud of while providing the added value to a roof project in the form of a higher-quality, long-term low-slope roof installation which, in the final analysis, is the real objective.

Marc Boulay

Marc Boulay is the chief engineer with Northridge Consulting Engineers, Inc., based in Massachusetts. He has been involved with commercial low-slope roofing for 34 years. Boulay has authored numerous articles and manuals and has lectured at seminars on commercial roofing, masonry, and pavement assemblies. He is an active member of ASCE and RCI and serves on the Editorial Board for Interface *journal.*