THE POLITICS OF ROOF CUT TESTS

By Raymond McNulty

Introduction

Over the last few decades, the diversity of views has grown on whether or not roof test cuts are beneficial. On one side are roofing contractors and their national and regional associations; on the other side are consultants, building owners, and specification writers. The purpose of this paper is to review what has been said and to propose some suggestions that might lead to finding a common ground.

Standards

There are two ASTM standards that relate to test cuts: D 2829 for existing roofs and D 3617 for new construction. Both standards provide for the removal of a 305 x 305 mm sample to determine the ply count, interply mopping weight, and insulation when part of the roof membrane system. D 3617 analysis may include top coating before aggregate application; D 2829 includes flood coat and aggregate. The substantial difference between the two standards is that D 3617 is intended for field evaluation with any sample removed being returned to the membrane (if practicable) and repaired. D 2829 involves destructive analysis in a laboratory and the repair method is, therefore, not done with the sample being replaced. The data generated by D 2829 is based on measurement of all components of the membrane; data from D 3617 may not be based on such measurement.

Figure 1: Felt lap sample as received.

The Arguments

The basic argument against is that the "... test cut is not considered to be a reliable measure of quality control or assurance..."[1] A further argument is that a small sample taken as outlined in D 2829 does not take into account variances in BUR systems.[2] NRCA states, "A thorough, continuous visual inspection by a knowledgeable person... is far preferable to test cuts as a means to monitor roof application."[3] A further argument is that the precision and accuracy of the test method are questionable.[4]

The basic argument for test cuts is that they " ...can provide quality-control information for owners, roofing manufacturers, and roofing contractors."[5]

These arguments form the basis of the controversy.

Why Test?

The asphalt, felt, and gravel used in constructing a four-ply roof have to meet certain standards. For asphalt, these are ASTM D 312 and CSA 123.4 in Canada; ASTM D 226 or CSA 123.3 for organic felts; ASTM D 2178 for glass; and ASTM D 1863 for aggregate. All these standards have ranges and/or tolerances that the materials must meet. In some instances, the tolerance value is 0.7%. Single-ply membranes are manufactured to close tolerances before being installed, as are modified bitumen sheets. In spite of all these standards for materials, we are to accept that there is to be no quality control during the on-site construction of a built-up roof.

Engineers and consultants are increasingly being required to certify that a completed roof meets all plans and specifications. Issuing a certification for a roof based solely on a visual inspection and without any hard data can incur a risk for the issuer.

Figure 2: Felt lap sample gravel and flood coat removed.

This certification requirement is one important reason for plans and specifications to call for minimum values for interply and flood coat asphalt. Consequently, tests are required to confirm application rates.

What do tests provide? They give data that indicate an adequate flood coat has been applied to ensure proper aggregate adhesion, reducing the risk of scouring and felt exposure. They show that an adequate interply mopping is provided. This is particularly important with glass felts to reduce the possibility of moisture wicking.

Who is Correct?

The National Roofing Contractors Association (NRCA) and the Canadian Roofing Contractors' Association (CRCA) publish application targets of 1.0 kilogram per square meter interply bitumen (1.2 kilograms for glass) and 3.0 kilograms per square meter flood coat bitumen. The tolerance is ± 25%. Having published application values of a specific quantity, they then assert that the only legitimate means of verifying correct application is by visual inspection. Further, by implication, they assert that regardless of a tolerance of ± 25%, it is unreasonable to use test cuts as a means of rooftop quality control. It is interesting to note that the Roofing Contractors Association of British Columbia (RCABC) in its *Roofing Practices Manual Millennium Edition 7* publishes asphalt tolerances of ± 25% *on any cut test* and ± 10% *on job total requirement* with total coverage of felts.

Ranged against this position is that of owners, architects, engineers, and consultants who are expressing a desire to verify that the specified product is delivered. At this point, the only method for obtaining empirical data is to collect and analyze test cuts.

How do we reconcile these opposing viewpoints? To do this we need education, understanding, and cooperation. It is necessary to educate those requiring test cuts as to what can reasonably be expected from them and how to interpret and use the data. I agree with the roofing associations that the use of a single or even two or three data points to condemn a roof is imprudent. I would not, and I know of no reputable laboratory that would suggest that this be done.

A sufficient sample population must be analyzed to acquire adequate data. In addition, the variables of roof construction need to be taken into account. One to three samplings on a large roof area, indicating borderline or below specification values, are not enough to condemn an entire roof. Given timely analysis and reporting, remedial action in suspect areas or agreement to monitor them will suffice. The average of all samplings is the best indication of overall roof application. Test cut analyses should not be used to indict a roofer, but rather they should assist him in applying a better roof.

It is necessary for all involved in the process to understand the purpose and function of test cuts. The owner, consultant, engineer, or architect must understand what the data will indicate and how to use them. The roofer must understand that the owner has a reasonable right to verify what is on his roof and that the data will be used to assist rather than hinder him. This is part of the educational process.

All parties must enter the process with a spirit of cooperation

Figure 3: Felt lap sample scrapped.

instead of a confrontational attitude. Part of this co-operation requires all parties to know what is required, how it will be done, and how the end result will be accomplished.

Testing and Evaluation

In the late 1980s, two separate evaluations of test cuts were done. One was by ASTM,[6] the other by NRCA, called Project Perfect Square.[7] The data generated is interesting and worthy of mention. The ASTM data was the result of a clinical study. Samples were constructed in a laboratory and then sent to six different laboratories for analysis. Each laboratory received four samples. The data obtained showed remarkable consistency in the results obtained:

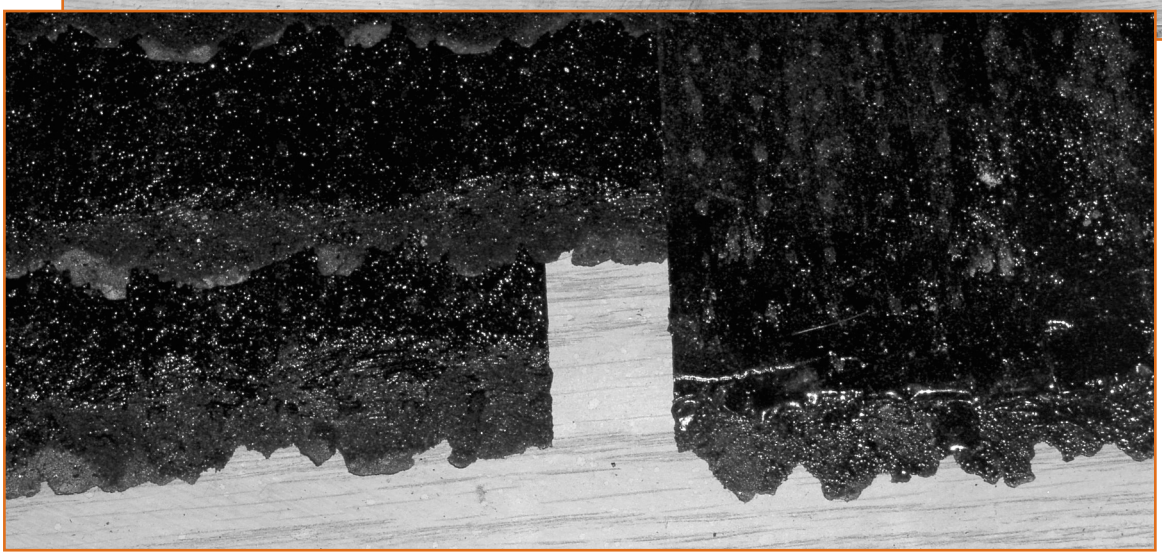

Figure 4: Example of negative (missing) headlap.

ASTM Test Data

COMPONENT	TARGET	RANGE
Sample Weight	650	647.92 - 652.08
Total Aggregate	400	390.84 - 409.16
Adhered Aggregate	200	184.30 - 215.70
Flood Coat	60	53.99 - 66.01
Interply	25	23.98 - 26.02
Felt Plies	4.17	4.15 - 4.19
Felt Headlap	2	1.78 - 2.22

Note: All values in lbs./sq. except plies and headlaps

The NRCA study used applied quantities to a 65 square foot area. Six samples were sent to a single laboratory. The data obtained are shown in the opposite table.

COMPONENT	TARGET	RANGE
Sample Weight		587 - 741.5
Total Aggregate		417.2 - 542.7
Adhered Aggregate		267.6 - 401.2
Flood Coat	45 - 75	42.6 - 75.9
Interply	18.75 - 31.25	17.5 - 23.6
Felt Plies		N/R
Felt Headlap		N/R

Note: All values are in lbs./sq.

ASTM Test Data

The target range is based on published tolerances for a specific job average, in this case 25 and 60 lbs./sq. for interply and flood coat respectively. The low interply value was from the sample that had the second highest flood coat value (62.3 lbs./sq.). The low flood coat value was from a sample that had 22.2 lbs./sq. interply mopping.

Overall, the roof was fine. The sample with low flood coat had 62.2% adhered surfacing, so surfacing loss should not be a problem. The sample with a low interply mopping had more than enough flood coat. The roof should be monitored but not rejected.

The ASTM study shows that accurate, reproducible results can be obtained.

The NRCA study confirms application variables and, if anything, underscores the need for empirical quality control during application.

Other Areas

Roofers in general do not have the facilities to conduct material testing. The roofer, therefore, has to blindly accept what has been shipped to the job site. Testing laboratories can be of assistance in confirming that the materials being used meet the relevant standards.

This can take the form of pre-qualifying materials on site prior to use and/or ongoing analysis to monitor material quality. Ongoing analysis is also beneficial in that it provides data relating to the felts that can be utilized in the test cut analysis. Asphalt analysis, particularly of bulk product, will verify that the roofer received Type II not Type I or Type III or even flux. By conducting ongoing analysis, the roofer has confidence that the materials used are as required by the plans and specifications.

Conclusion

Test cuts can be useful in several ways. To the owner, architect, specification writer, and consultant, the results offer useful data on the membrane construction. Used properly, data can pinpoint deficiencies and facilitate corrective action on new construction. Optimally, the data offer proof that the membrane was installed to specification. The roofer benefits as well. Analysis results coupled with material evaluation give proof that the materials used meet specification. This proof of compliance at the time of installation can reduce or eliminate future disputes. Timely reporting of deficiencies should allow remedial action to be carried out within a reasonable time, reducing any additional costs. Test cut data should be regarded as a tool, not a weapon.

Instead of the posturing currently in vogue, roofing associations, consultants, specification writers, and testing facilities should come together to develop accepted protocols and interpretations. If we have consensus, then we should have uniformity, and the roofing industry will benefit.

References

1. Graham, Mark S., "Test Cuts are Not Quality Assurance," *Professional Roofing,* August 1998.
2. Ibid.
3. NRCA, *Quality Control in the Application of Built-Up Roofing,* page 10.
4. LaCosse, Bob, "Studies Show Questionable Nature of Test Cuts," *Professional Roofing,* October 1989.
5. Koontz, Jim D., Letter to the Editor, *Professional Roofing,* December 1998.
6. Koontz, Jim D., "Cutting Up On The Job," *Roofer Magazine,* October 1987.
7. Cullen, William, "The Perfect Square: Can it be Built?" *Roofing Spec,* Feb. 1987.

Figure 5: Felt exposure of 9.5 inches.

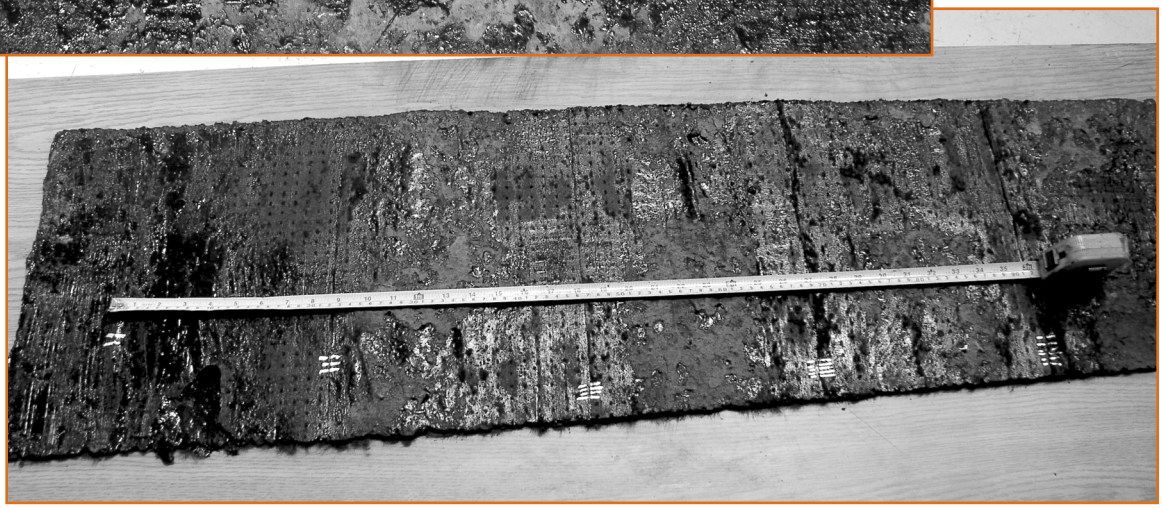

Figure 6: Measuring felt exposure.

About the Author

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