Project Pinpoint data reveal roof systems' strengths, limitations

Data collected from 1993 through 1995 disclose extent of problems encountered by several roof system types

by **William C. Cullen** and **Mark S. Graham**

From time to time, articles and reports are published that provide information on results from NRCA's Project Pinpoint surveys. NRCA conducts and evaluates the surveys to provide profiles of problem low-slope roof systems and describe their performance problems. The last report, "Project Pinpoint Analysis: Ten-Year Performance Experience of Commercial Roofing 1983-1992," was published by NRCA in 1993.

This article continues the practice of reporting information on low-slope (commercial) roof system performance. It covers problem job information collected from surveys on APP- and SBS-modified bitumen, EPDM, PVC and built-up roof (BUR) membrane systems from 1993 through 1995.

The data reported in this article are limited to problem jobs only; however, other data, including information on the types of roof systems currently being installed, also are compiled in Project Pinpoint.

New and improved materials, complemented by professional management, design and application practices, largely are responsible for the enhanced performance of today's low-slope roof systems. The industry's reliance on quality-control measures, updated standards and more stringent building codes also has contributed.

Nevertheless, roofing problems still persist and need to be reduced or eliminated. To do this, the problems first must be identified. NRCA's survey program, Project Pinpoint, was established about 25 years ago to do just that. It has provided NRCA-contractor members with a method for reporting data on problems that they have observed on low-slope roof systems (see "Project Pinpoint data collection," page 19). These data are kept in a computer data base for future reference and analyses.

The number of problem jobs reported is not necessarily a reliable criterion by which to judge specific membrane systems' performances. The reports must be considered proportionally—the more commonly used roof systems invariably will experience the most problem job reports. To assist the reader in placing the problem job data in perspective,

Problem information	Membrane type					
	BUR	SBS	APP	EPDM	PVC	TOTAL
Number of roof systems	118	52	89	250	62	571
Number of problems	294	88	199	574	160	1,315
Ratio: Problems/roof systems	2.5	1.7	2.2	2.3	2.6	2.3

***Table 1:** Problem job distribution.*

Membrane system	BUR	SBS	APP	EPDM	PVC
Number of defects	294	88	199	574	160
Blistering	16%	20.5%			
Embrittlement					20.6%
Flashings	12.6%		16.5%	14.8%	
Lap defects		17.1%	28.6%	22.6%	
Puncture/tear				9.2%	10.6%
Ridge/wrinkle	18.4%	13.6%	17.1%		
Shrinkage		10.2%		18.8%	23.8%
Splitting	13.6%		11.1%		16.3%

***Table 2:** Problems reported for membrane systems.*

information taken from the 1995 NRCA Annual Market Survey is used to roughly compare the number of problem jobs with roof membrane market shares (see Figure 1).

Problem job information

The problem job information addressed in this article is presented in graphical and tabular form without the authors' personal interpretations. The information is presented this way to give readers the opportunity to make their own interpretations of the data.

Reported problems

NRCA-contractor members reported that they observed 1,315 defects on 571 roofing projects from 1993 through 1995. Table 1 summarizes the problem distribution reported for BUR, SBS- and APP-modified bitumen, EPDM and PVC membrane roof system categories. In addition, it lists the average number of defects observed per roof system (expressed as a ratio). The ratios vary from 1.7 defects per roof system for SBS-modified bitumen to 2.6 for PVC.

Pie chart A in Figure 1 illustrates problem job distribution of membrane systems as reported from 1993 through 1995. In the problem job grouping, EPDM and BUR systems accounted for 44 and 20 percent of the problem jobs reported, respectively, while the APP- and SBS-modified bitumen and PVC systems followed with 16, 9 and 11 percent, respectively. In contrast, pie chart B in Figure 1 reveals the 1995 market share distribution of the same five membrane systems to be: 37 percent BUR; 31 percent EPDM; 14 percent SBS-modified bitumen; 13 percent APP-modified bitumen; and 5 percent PVC.

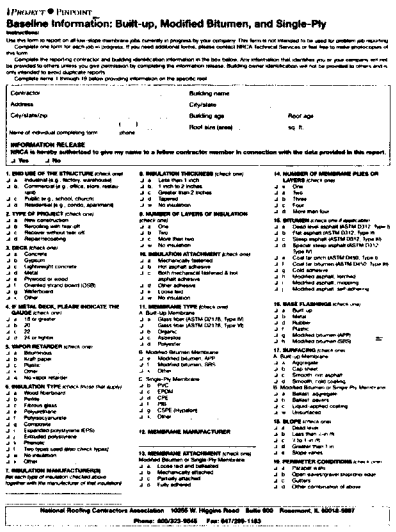
The 1,315 defects reported on the 571 roofing projects were spread among 15 specific problem categories. Table 2 lists the most prominent problems reported for each of the five generic membrane systems. The values listed under each membrane system account for more than 60 percent of all problems reported for that system. Table 2 demonstrates how the primary defects were distributed among each membrane system.

The remaining problems were caused by fasteners and thermal insulations, deck corrosion, membrane slippage and wind-related defects. The problems that commonly appeared among these categories involved fastener deficiencies, insulation cupping, and wind damage or blow-offs. Fasteners accounted for

Project Pinpoint data collection

Data for NRCA's Project Pinpoint are collected through the efforts of NRCA-contractor members. NRCA queries its contractor members quarterly about projects on which they are working, as well as existing roof systems that are experiencing problems.

NRCA-contractor members are requested to complete three separate surveys. The "Baseline Information: Built-Up, Modified Bitumen, and Single-Ply" survey asks contractors for specific data on projects they are performing. The "Problem Job Report: Built-Up and Modified Bitumen" and "Problem Job Report: Single-Ply" surveys request detailed information about the type of roof assemblies used and nature of problems with specific roof systems.


Baseline Information: Built-up, Modified Bitumen, and Single-Ply

Data collection of Project Pinpoint information is limited to low-slope membrane roof systems; however, NRCA is considering expanding data collection to include other roof system types.

If roofing professionals have questions regarding Project Pinpoint, they should contact NRCA's Technical Services Department at (847) 299-9070. Project Pinpoint survey forms are available to NRCA-contractor members via NRCA's Fax-on-Demand at 1-888-455-NRCA (6722).

Membrane system	BUR	SBS	APP	EPDM	PVC
Problem jobs	116	52	88	247	61
Severe	38.8%	25%	39.8%	49.8%	67.2%
Moderate	45.7%	50%	46.6%	34.4%	26.2%
Minor	15.5%	25%	13.6%	15.8%	6.6%

Table 3: *Rankings of problem roof systems in terms of problem severity.*

Membrane system	BUR	SBS	APP	EPDM	PVC
Number of problem jobs	115	50	88	246	62
Yes	3.5%	2%	5.7%	2.4%	3.2%
Anticipated	7%	8%	5.7%	7.7%	9.7%
Not anticipated	60.9%	72%	61.4%	65.9%	67.7%
Don't know	28.7%	18%	27.3%	24%	19.4%

Table 4: *Litigation status of problem roof systems.*

6.8 percent of EPDM problems and about 4 percent each of APP-modified bitumen and PVC problems. Respondents identified insulation cupping as responsible for 3.4 percent of BUR and 4.2 percent of EPDM problems. In addition, wind-related problems occurred in all five membrane types, varying between 1 and 3 percent.

Problem severity

Respondents' replies to a question about problem severity is an element used in the Project Pinpoint questionnaire to appraise the observed defects' impacts on roof performances. The respondents are asked to rank the problems as minor, moderate or severe.

Table 3 gives the cumulative rankings assigned by the respondents. It indicates that 67.2 percent of the PVC problems and 49.8 percent of the EPDM problems were "severe." About 40 percent of the APP-modified bitumen and BUR problems and 25 percent of the SBS-modified bitumen problems also were severe.

Litigation status

Information on litigation serves several purposes for Project Pinpoint users. It provides another criterion by which to judge the seriousness of the problems experienced. Table 4 shows the results of the respondents' replies to the question regarding litigation.

The survey indicates that the status of litigation involving specific membrane systems was either unknown or not anticipated in about 90 percent of the problem job reports.

Project variables

Another feature of the survey is a series of questions seeking information on project variables. This allows specific problem information to be cross-referenced with the systems' materials, application and design parameters, such as age, location, structural deck, and insulation and membrane materials. In addition, design considerations, such as slope, insulation thickness and attachment techniques, as well as membrane attachment and surfacings, are incorporated. The information presents wide profiles of the problems and problem roof systems.

For example, the type of roof construction is among the several variables that can profoundly affect roof system performance. Consequently, the survey asks contractors to identify the type of project on which the problems were observed. The responses are summarized in Table 5.

Table 5 indicates that roof systems placed on new decks experienced the fewest problems. APP-modified bitumen, EPDM and PVC systems experienced a relatively large percentage of problems when they were placed over existing roof coverings. BUR and SBS-modified bitumen systems, which are not as commonly used in roof re-cover applications, experienced a larger percentage of problems on jobs where the previous roof system(s) had been removed.

This article does not include all of the information on material, design and construction variables. However, the data obtained by the 1993 through 1995 surveys are contained in the Project Pinpoint data base. Having this information in the data base enables NRCA to run cross tabulations on variables to compare, for example, the nature of the problems experienced with the extent to which they occurred.

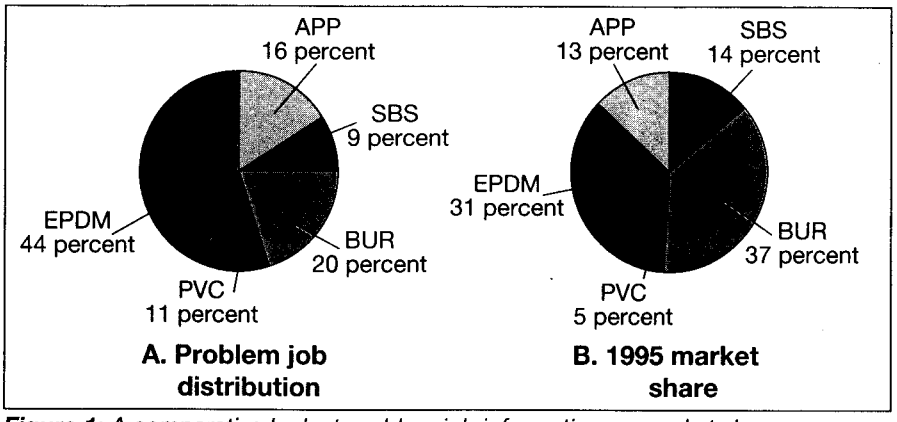


Figure 1: *A comparative look at problem job information vs. market share.*

Summary and comment

The preceding data were solicited from and contributed by NRCA-contractor members and stored in NRCA's Project Pinpoint data base. NRCA's technical staff often uses the data to complement other information sources in seeking problem identification and solutions.

In conclusion, readers should be aware that the statistical significance of the Project Pinpoint survey data has not been determined. Nevertheless, the data have the potential for revealing the strengths and limitations of several low-slope roof systems. This information will be helpful in identifying problems and seeking ways and means to reduce, avoid or eliminate them. PR

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Membrane system	BUR	SBS	APP	EPDM	PVC
Problem jobs	**118**	**51**	**89**	**248**	**62**
New	17.8%	21.6%	12.4%	24.6%	16.1%
Reroof with tear-off	54.2%	54.9%	40.5%	32.7%	33.9%
Reroof without tear-off	20.3%	23.5%	44.9%	36.3%	45.2%
Repair	7.6%	none	2.3%	6.5%	4.8%

Table 5: *Problem roof system analysis by project type.*