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# Results of A Survey of the Performance of EPDM Roofing at Army Facilities

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June 1989

Prepared for:
U.S. Army Construction Engineering Research Laboratory
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U.S. DEPARTMENT OF COMMERCE
Robert Mosbacher, Secretary
NATIONAL INSTITUTE OF STANDARDS
AND TECHNOLOGY
Raymond G. Kammer, Acting Director

ABSTRACT

This report presents a summary of a survey to obtain information on the performance of EPDM roofing at Army facilities. Emphasis in the survey was on the performance of seams fabricated with unaged rubber and also patches made on existing, aged rubber. The results are intended to help provide guidelines for the maintenance of EPDM roofs at Army facilities, as well as to define research needs to overcome problems identified.

The survey was conducted by telephone of 73 installations nationwide. Facility personnel responsible for roof maintenance were asked about their personal experiences with EPDM roofs. Based on the opinions offered, the results indicated that performance of EPDM roofing has been generally satisfactory at the installations. The majority of those contacted described performance as good to excellent. The major problem experienced was unsatisfactory seam performance. Many of the described seam problems were isolated. Consequently, although problems had occurred, the individual contacted expressed general satisfaction with EPDM roofing. However, in four extreme cases, the individuals contacted stated that unsatisfactory seam performance had been experienced to such an extent that they considered the overall performance of EPDM roofing as fair to poor. The survey results provided little information on the performance of patches made on aged rubber. The reason was that most facility personnel indicated they had little experience with patches.

Based on the results of the survey, it is recommended that studies be carried out to provide the technical basis for preparing the surfaces of aged rubber membranes before making seams or patches. The effect of aging on the surface characteristics of EPDM rubber has received little attention in the roofing literature.

Key words: EPDM, low-sloped roofing, maintenance, membranes, performance, quality assurance, roofs, research needs, service-life prediction, survey

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# 1. INTRODUCTION

## 1.1 Background

Rapid growth in the use of EPDM (ethylene propylene diene terpolymer) roof systems has occurred over the last dozen years [1,2]. Recent estimates place their use at about one third of the low-sloped roof membranes now installed annually in the United States [3]. The increase in use has been attributed, in part, to the generally satisfactory performance of the EPDM membrane system [4]. The growth in use has occurred both in the public and private sectors of the building industry.

In general, roofing practices of the U.S. Army Corps of Engineers mirror those of the U.S. roofing industry. Consequently, the number of EPDM roof systems installed on Army facilities nationwide has increased considerably in recent years. While estimates on the amount of EPDM roofing at Army facilities are not available, conversations with personnel responsible for maintenance and operations at the bases indicate that many Army low-sloped roofs have EPDM membranes. To facilitate the use of EPDM systems on Army facilities, the Corps of Engineers has issued a Guide Specification for EPDM roofing [5].

EPDM is a non-polar, relatively inert rubber which makes the formation of field seams difficult. This is a critical parameter affecting the performance of EPDM systems, because delaminations of field seams result in roof leaks. Information from the National Roofing Contractors Association's (NRCA) Project Pinpoint shows that defective seams are the most often reported single-ply problem [3,8]. A number of factors impact on the performance of seams [9] including: (1) the properties of the adhesive and rubber, (2) the environmental conditions to which the seam is exposed during its fabrication as well as in service, (3) the surface condition of the rubber during adhesive application, and (4) the quality of workmanship extended during seam formation. The latter two factors are interrelated, due to the fact that roof mechanics prepare (i.e., clean) the rubber surface prior to adhesive application.

However, workmanship may not be the only factor affecting the surface condition of the rubber when the adhesive is applied. In cases where bonds (e.g., seams or patches) are made after the roof has been in place for some period of time, the effect of aging may alter the rubber's surface characteristics such that bonding of the aged rubber becomes more difficult than if the rubber surface was unexposed or relatively new. Changes in rubber surface characteristics due to aging and their effect on seam performance have received little attention in the archival or trade literature on EPDM roofing.

The question of proper techniques for preparing patches on aged rubber membranes was brought to the increased attention of research staff members of the U.S. Army Construction Engineering Research Laboratory (CERL) during their study of non-conventional roofing systems [10]. Periodically, specimens of an EPDM membrane were cut by base facility personnel from a roof at Fort Benning, GA, to characterize changes in material properties over time. The areas from which the specimens were cut had, of course, to be patched. Difficulties were experienced by base personnel in making patches that remained watertight. A key reason suspected for the poor performance of these patches was the use of improper adhesives and application methods during their application. This suspicion highlighted to CERL a need to have available for base personnel guidelines concerning the proper methods (including surface preparation) for preparing satisfactory patches on aged rubber membranes.

Because of the increased use of EPDM roof systems at Army facilities, the Corps of Engineers considered it beneficial to review their performance to date, particularly with regard to seams fabricated during installation and patches made after the system had been in place for some period of time. The intent of the review was to obtain feedback on in-service performance that would help provide the basis of guidelines on proper maintenance of EPDM roofing at Army facilities. Thus, the U.S. Army Construction Engineering Research Laboratory (CERL) requested the

National Institute of Standards and Technology[1] (NIST) to undertake a survey of the performance of repair patches on aged EPDM membrane systems at Army facilities. This report presents the results of the study.

The study was beneficial to NIST because it provided information on factors affecting in-service performance complementary to laboratory research on test methods for evaluating seams in vulcanized rubber roof membranes. The study was an opportunity to obtain from a large number of installations qualitative feedback on the performance of seams in service. The development of field data on elastomeric and thermoplastic membrane materials was considered to be a key roof industry need by the participants of the Round Table Seminar on "Roofing Research: The Challenge and the Opportunity" [11].

## 1.2 Objectives and Scope of the Study

One objective of the study was to conduct and summarize the results of the survey on the performance of seams and patches of EPDM roof systems at Army facilities. Based on the results of the survey, a second objective was to provide recommendations for research needed to overcome problems, if any were identified.

The scope of the study was generally limited to obtaining information on EPDM roof performance through discussions with Army base personnel responsible for roof performance and maintenance. In a related task, contact was made with a few selected roofing contractors who install considerable amounts of EPDM roofing to discuss seam performance and techniques for making patches. No laboratory research was conducted during the course of the survey.

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[1]formerly National Bureau of Standards (NBS).

## 2. INFORMATION REQUESTED DURING THE STUDY

As indicated, the major source of information during the survey was direct contact with Army facility personnel. Those contacted were asked questions regarding their own experiences with the performance of EPDM roofing and, specifically, seams and patches. In most cases, the contact was made by telephone, although in some cases, visits were made to Army facilities.

To focus the questioning, a data recording form was prepared. A copy of the form is given in the Appendix. Use of the form allowed relatively uniform recording of the responses provided by the base personnel contacted. Not all questions were asked of all contacts. The direction of the questioning, to a large part, depended on the experience of the individual contacted.

At the request of CERL, NIST research staff contacted individual installations that comprise three major ARMY Commands: the Army Material Command (AMC), the Army Forces Command (FORSCOM), and the Training and Doctrine Command (TRADOC). Each Command has a large number of installations across the country with many buildings at each location.

The number of installations contacted for each Command were:

- AMC -- 26 installations
- FORSCOM -- 26 installations
- TRADOC -- 21 installations

This represented more than 80 percent of the installations under the three commands.

Contact with facility personnel at each installation was accomplished by initially telephoning the main office of the Director of Engineering and Housing (DEH), explaining the reason for the call, and asking the name and phone number of the individual on the base responsible for roof maintenance. Follow-up calls were made until the proper person was reached.

A limitation inherent in the procedure of requesting information of the facility personnel was the experience of the individuals responsible for the roofing at the installations. It was found that their experience covered a wide range from a few weeks on the job to many years. In cases where experience was limited, the individuals generally were aware of the number of EPDM roofs at the installation. They were not always familiar with the specific performance of each EPDM roof on base. Nevertheless, in these cases, they indicated that lack of any "cries of alarm" from the building occupants was evidence that the roofing was generally performing satisfactorily. In other words, they felt that, if major problems were occurring, they would have heard about them.

## 3. RESULTS AND DISCUSSION

### 3.1 Discussions with Army Facility Personnel

This section of the report presents the summary of the information obtained during the discussions with the Army facility personnel. It is emphasized that the information is subjective, i.e., based on the opinions of the individuals contacted at the Army installations. Nevertheless, when viewed broadly, the opinions of the contacts indicate some trends regarding the use of EPDM roofing at the Army facilities.

Tables 1, 2, and 3 present summaries of opinions of those at the AMC, FORSCOM, and TRADOC installations, respectively. About the same number of individuals were reached for the three Commands and, in general, the information obtained was similar. Thus, in discussing the survey findings, no distinction is made between Commands.

In summarizing the findings, the discussions are divided into the following topics:

- number of installations using EPDM roofing,
- general comments on EPDM roofing performance,
- comments on seam performance,
- comments on patch performance, and
- concerns raised by Army facility personnel.

3.1.1 Number of installations using EPDM roofing. About 80% of the AMC, FORSCOM, and TRADOC installations have installed EPDM roofing. In a few cases where it has not been used, the individual contacted informed NIST staff that plans were underway for the first installation to go in place this year. The installations using the systems are located across the continental United States and Alaska.

On the basis of the information supplied, it may be roughly estimated that the three Commands have a minimum of 800 buildings with EPDM roofs on the installations surveyed. The extent to which the system is used varies considerably from installation to installation. In many locations, the use is about 10 to 15

buildings. In the extremes, at least two bases have more than 100 buildings with EPDM roofs, whereas a number have only one or two buildings.

The ages of the buildings with EPDM systems range from just completed to having been installed in the late 1970s. It was beyond the scope of the survey to obtain statistical data. Nevertheless, it appeared that most of the Army's EPDM roofs have been installed since the early 80s.

3.1.2 General comments on EPDM roofing performance. The general opinion regarding EPDM roofing performance was favorable. For the three Commands, about 80% of the facilities personnel contacted (46 individuals) having experience with EPDM described the performance of the roofs as excellent or good. In many cases, these individuals had few specific comments to relay, because they considered the roofs to be trouble-free. Four contacts indicated that they found the performance to be fair to poor. Seven individuals did not care to comment because they did not consider themselves as having sufficient experience.

The majority of the problems relayed in the conversations concerned seams (see discussion that follows, Section 3.1.3). In four cases where the contacts described roof performance as fair to poor, unsatisfactory seam performance was the underlying reason for the opinion. Usually, considerable leaking through the seams had taken place and recurred over an extended period of time. Other isolated problems mentioned during the phone conversations were puncturing, pinholes, wind damage, and flashing leaks.

3.1.3 Comments on Seam Performance. The majority of comments regarding seam performance were generally favorable. Most individuals stated that they either had experienced no problems with seams, or did not comment on performance. In the latter case, one interpretation of the lack of comments on the question of seam performance from some facility personnel may be that they

had little to say that was negative. As a consequence, they did not remark at all.

Most of the contacts who told of instances of seam problems further relayed that the occurrences were isolated. For example, one individual stated that, on his facility, one building out of 24 having EPDM membranes had leaks through seams. Another said that one out of 12 buildings had experienced leaks. In such cases, the leaks were usually repaired by contractors to the satisfaction of facility personnel. Moreover, the leaks were isolated to the extent that the contacts were satisfied with the overall performance of EPDM roofing at their facility. Consequently, they gave, as their opinion on performance, the description of excellent or good.

Where seam problems had occurred, the contacts were asked if they knew the cause. In general, they were not sure. Some responded that poor workmanship was responsible. In one case, it was noted that sections of the seam were found to be missing adhesive. In another case, it was indicated that several problems had occurred with membranes having neoprene-based adhesives, whereas no problems had been experienced with butyl-based adhesives. As a final example, it was reported from one installation that an EPDM roof had been installed directly over a built-up system that was extremely wet. Extensive delamination of the seams occurred, and even patches would not stay watertight. This roof has been entirely replaced including removal of the original wet system.

As a final note regarding seam performance, it was reported that roofing contractors are usually the ones to perform repairs. The few base personnel who discussed seam leaks were not generally aware of the specific repair techniques used. They indicated that they rely on contractors to follow methods prescribed by manufacturers.

3.1.4 Comments on Patch Performance. A major reason for conducting the survey of Army facilities was to obtain information on the performance of patches (or seams made with aged rubber, i.e., addition of roof-top equipment), as based on the experiences of facility personnel. Unfortunately, little information was obtained on this question. Few contacts had comments to give when asked how well patches had been performing at their installation (Tables 1, 2, & 3). They explained that the roofs at the installation had not experienced problems (or other reasons to form seams using the existing membrane) and, consequently, patches had not been made.

In the very few instances where patches or new seams using the aged rubber had been installed, the contacts reported, with one exception, that the patches and seams were performing satisfactorily. The exception was the case of the wet built-up roof (mentioned above) which was covered with an EPDM system and subsequently experienced extensive leaks, even through repair patches.

3.1.5 Concerns Raised by Army Facility Personnel. Many of the facility personnel contacted during the survey were pleased that CERL had sponsored the survey to obtain information of seam performance and repair techniques for EPDM roofing. A number voiced concerns that a need exists for information on maintenance and repair methods for EPDM roofing. A key concern was guidelines on methods for patching the membrane, if circumstances warrant it. They considered that the information they have available now is insufficient. Many indicated that, as time passes, more EPDM roofing may be installed at their bases. In addition, they pointed out that the existing roofs are, of course, aging as time passes. These two factors were seen by facility personnel as contributing to increased maintenance requirements for EPDM roofing at the installations.

## 3.2 Discussions with Selected Roofing Contractors

Because little information on the performance of patches was obtained from the Army facilities contacted, it was decided to ask a few selected roofing contractors about their experiences. Thus, 10 contractors, suggested by the National Roofing Contractors Association (NRCA) as being very experienced with EPDM application, were contacted by telephone. This section summarizes the information they provided. This information was empirical, based on their experiences with materials and systems that they have installed.

The contractors generally indicated that fabricating patches or seams with aged rubber is a difficult procedure. They further indicated that the resulting seams will perform well provided the application is performed properly. Most pointed out two key aspects of the application, which are consistent with sound adhesive-application practice. First, the rubber must be well cleaned to remove all dirt and other contaminants that may have accumulated on the roof surface over time. Dirt removal may be more difficult for ballasted roofs (which can trap dirt and other matter in the ballast) than with adhered or mechanically fastened systems (whereby the surface may wash clean if the roof does not pond water). Second, the roof surface must be dry when the patch is fabricated. In inclement weather, patches made to keep water out of the building should only be considered as temporary -- to be replaced as soon as dry conditions permit. In addition to surface dryness, many of the contractors contacted mentioned that, based on their experiences, patches have not performed well when made over wet insulation (and other materials). Consequently, they emphasized that any wet materials below the section to be patched should be removed. In practice, this is not always carried out, particularly when minor leaks are repaired. In these cases, patches may be put in place without removing any of the existing system.

Based on the conversations with the selected contractors, the authors identified the following steps as being contained in a generalized procedure for making patches:

1. Sweeping -- All loose dirt and similar debris should be swept from the area to be patched or seamed.

2. Scrubbing -- The surface to be bonded should be scrubbed with water and a detergent. Most contractors suggested a stiff bristle brush, although a couple stated that they use only rags. The various contractors prefer different scrubbing techniques, and there was no general consensus expressed on this point by those contacted. Most commonly, hand brushes were the method of choice, although mechanical action using an electric floor scrubber was indicated as being routinely used (by necessity) by a couple of contractors. In some other cases, the contractors said they only use mechanical scrubbing if the surface is extremely dirty. The detergent most often indicated in the conversations was trisodium phosphate (TSP), with some household-type products that are commonly available in supermarkets also being mentioned.

3. Rinsing -- Thorough rinsing of the scrubbed rubber surface was also a common step stated by the contractors. Some emphasized that "lots of water should be used." One contractor explained that he washes the surface using a hose if the area being worked on is not leaking. Another indicated that, during the rinsing step, clean cotton rags are used to soak up the grime created by the scrubbing.

4. Drying -- After rinsing, the rubber surface is allowed to dry thoroughly.

5. Adhesive Application -- After the rubber surface is dried, the seam is formed using the manufacturer's prescribed method. Depending on the manufacturer, this would include further surface preparation of the rubber by use of a primer, solvent, or a proprietary wash solution.

## 4. SUMMARY AND CONCLUSIONS

This report presents a summary of a survey to assess the performance of EPDM roofing at Army facilities across the United States. It was conducted at the request of CERL, because of the increased use of EPDM at these facilities. Emphasis in the survey was on the performance of seams fabricated with new rubber and patches made with existing aged rubber. The results are intended to help provide guidelines for the maintenance of EPDM roofs at Army facilities, as well as to define research needs to overcome problems identified.

The survey was conducted by telephone of 73 installations nationwide representing the AMC, FORSCOM, and TRADOC Commands. The information was obtained from facility personnel responsible for performance and maintenance of roofs at the bases. These people often voiced concern that they did not have available sufficient information or guidelines on the proper maintenance of EPDM roofing.

The facility personnel contacted were asked questions of their personal experiences with EPDM roofs. Based on the opinions offered, the results indicated that performance of EPDM roofing has been generally satisfactory at the installations. The majority of the facility personnel contacted described performance as good to excellent. The major problem experienced was unsatisfactory seam performance. According to those interviewed, many of the seam problems were isolated. Consequently, in these cases, the individuals contacted expressed general satisfaction with EPDM roofing. However, in four cases, the individual contacted stated that unsatisfactory seam performance had been experienced to the extent that performance was described as fair to poor.

The survey results provided little information on the performance of patches made on aged rubber at Army facilities. Most facility personnel indicated that they had little experience with patches, because roof performance to date had not required patches to be

made. Moreover, few modifications of the buildings in question had occurred that would have required seams being made with the existing membrane.

Ten roofing contractors, whose work involves installation of a considerable amount of EPDM roofing, were asked their experiences with the performance of patches made to existing membranes. They indicated that patches will perform well, provided they are properly installed. They emphasized that making patches is a difficult task, and that the rubber surface must be properly cleaned and cannot be wet. In addition, some stated that any wet materials below the area to be patched should be removed before patching.

Based on the results of the survey, it is recommended that studies be continued to provide the technical basis for preparing the surfaces of aged rubber membranes before making seams or patches. The effect of aging on the surface characteristics of EPDM rubber has received little attention in the roofing literature. Although many contractors who install EPDM roofing attest that patches can perform well, they also indicate that patching is difficult. Moreover, their suggested techniques for surface preparation are empirical, based on their personal experiences and not on systematic laboratory evaluation. Army facility personnel contacted during the study expressed a need to have available additional information and guidelines on maintenance of EPDM roofing, including methods of patching. Many foresee an increase in use of EPDM at their facilities which, they believe, will result in greater maintenance activities. In addition, the aging of existing roofs should also increase maintenance requirements in the future.

## 5. ACKNOWLEDGMENTS

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Special thanks are extended to those individuals, both Army facility personnel and roofing contractors, who freely gave of their time to discuss the performance of EPDM roofing. This report was based on the experiences which these individuals related to the authors during the discussions.

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Table 1. Summary of the discussions held with AMC facility personnel

1. Number of Installations Contacted: 26

2. Number of Installations Using EPDM Systems: 18 (69%)[a]

3. Number of Buildings at the Installations With EPDM Roofing:

   Largest Number at a Single Location: 30
   Smallest Number at a Single Location: 1

4. General Comments on EPDM System Performance:

   Excellent/Good: 14 (78%)[b]
   Fair/Poor: 2 (11%)
   Not Enough Experience to Comment: 2 (11%)

5. General Comments on Seam Performance:

   No Problems: 13 (72%)[b]
   Problems: 4 (22%)
   No Comment: 1 (6%)

6. General Comments on Patch Performance:

   No Problems: 4 (22%)[b]
   Problems: 0
   No Comment: 14 (78%)

[a]Percent based on the number of installations contacted.
[b]Percent based on the number of installations using EPDM roofing.

Table 2. Summary of the discussions held with FORSCOM facility personnel

1. Number of Installations Contacted: 26

2. Number of Installations Using EPDM Systems: 20 (77%)[a]

3. Number of Buildings at the Installations With EPDM Roofing:

   Largest Number at a Single Location: over 100
   Smallest Number at a Single Location: 1

4. General Comments on EPDM System Performance:

   Excellent/Good: 16 (80%)[b]
   Fair/Poor: 1 (5%)
   Not Enough Experience to Comment: 3 (15%)

5. General Comments on Seam Performance:

   No Problems: 12 (60%)[b]
   Problems: 4 (20%)
   No Comment: 4 (20%)

6. General Comments on Patch Performance:

   No Problems: 1 (5%)[b]
   Problems: 1 (5%)
   No Comment: 18 (90%)

[a]Percent based on the number of installations contacted.
[b]Percent based on the number of installations using EPDM roofing.

Table 3. Summary of the discussions held with TRADOC facility personnel

| | | |
|---|---|---|
| 1. Number of Installations Contacted: | 21 | |
| 2. Number of Installations Using EPDM Systems: | 19 | (91%)[a] |
| 3. Number of Buildings at the Installations With EPDM Roofing: | | |
| Largest Number at a Single Location: | 100 | |
| Smallest Number at a Single Location: | 2 | |
| 4. General Comments on EPDM System Performance: | | |
| Excellent/Good: | 16 | (84%)[b] |
| Fair/Poor: | 1 | (5%) |
| Not Enough Experience to Comment: | 2 | (11%) |
| 5. General Comments on Seam Performance: | | |
| No Problems: | 11 | (58%)[b] |
| Problems: | 5 | (26%) |
| No Comment: | 3 | (16%) |
| 6. General Comments on Patch Performance: | | |
| No Problems: | 2 | (11%)[b] |
| Problems: | 0 | |
| No Comment: | 17 | (89%) |

[a]Percent based on the number of installations contacted.
[b]Percent based on the number of installations using EPDM roofing.

APPENDIX A. DATA RECORDING FORM USED IN DISCUSSIONS WITH ARMY FACILITY PERSONNEL

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1. Report No. _____ Date of Report: _____

2. DEH Installation: _____ Phone No: _____

3. DEH Contact: _____ Job Title: _____

---

4. Does your installation have EPDM roofing? _____
   How many buildings do you have with EPDM? _____
   How many square feet of EPDM are on the Fort? _____

---

5. What has been your general experience with the performance of these roofing systems? (e.g., excellent, good, fair, poor)
   What manufacturers?

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6. Have you had problems with the seams? Describe please!
   What manufacturers? What adhesives?

---

7. What was (were) the age(s) of the seam(s) that leaked?

8. Did you have a contractor or consultant advise you in repairing the leaks? To what causes were the leaks attributed, if any?

9. Have you made patches to the EPDM rubber for reasons such as fixing leaks, or placing equipment on the roof?

10. Have the patches held in place and remained watertight? Please describe!

11. Do you know the cleaning technique used to prepare the rubber surface? What adhesives? Were primers used?

12. In cases where patches leaked, do you know their age when leaking began?

13. Could we visit your facility to inspect the rubber roofs?
Would it be possible to take cuts of the rubber?
Would it be possible to place some patches on the rubber?

14. May we call you again if we have further questions ?
Thanks for your assistance!

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10. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

This report presents a summary of a survey to obtain information on the performance of EPDM roofing at Army facilities. Emphasis in the survey was on the performance of seams fabricated with unaged rubber and also patches made on existing, aged rubber. The results are intended to help provide guidelines for the maintenance of EPDM roofs at Army facilities, as well as to define research needs to overcome problems identified.

The survey was conducted by telephone of 73 installations nationwide. Facility personnel responsible for roof maintenance were asked about their personal experiences with EPDM roofs. Based on the opinions offered, the results indicated that performance of EPDM roofing has been generally satisfactory at the installations. The majority of those contacted described performance as good to excellent. The major problem experienced was unsatisfactory seam performance. Many of the described seam problems were isolated. Consequently, although problems had occurred, the individual contacted expressed general satisfaction with EPDM roofing. However, in four extreme cases, the individuals contacted stated that unsatisfactory seam performance had been experienced to such an extent that they considered the overall performance of EPDM roofing as fair to poor. The survey results provided little information on the performance of patches made on aged rubber. The reason was that most facility personnel indicated they had little experience with patches.

Based on the results of the survey, it is recommended that studies be carried out to provide the technical basis for preparing the surfaces of aged rubber membranes before making seams or patches. The effect of aging on the surface characteristics of EPDM rubber has received little attention in the roofing literature.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

Low-sloped roofing; membranes; performance; quality assurance; roofs; research needs; service - life prediction.

13. AVAILABILITY

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13. Could we visit your facility to inspect the rubber roofs?
Would it be possible to take cuts of the rubber?
Would it be possible to place some patches on the rubber?

14. May we call you again if we have further questions ?
Thanks for your assistance!

FORM NBS-114A (REV. 11-84)

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**4. TITLE AND SUBTITLE**

Results of a Survey of the Performance of EPDM Roofing at Army Facilities


**5. AUTHOR(S)**

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**6. PERFORMING ORGANIZATION** (If joint or other than NBS, see instructions)

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**10. SUPPLEMENTARY NOTES**

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

**11. ABSTRACT** (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)


This report presents a summary of a survey to obtain information on the performance of EPDM roofing at Army facilities. Emphasis in the survey was on the performance of seams fabricated with unaged rubber and also patches made on existing, aged rubber. The results are intended to help provide guidelines for the maintenance of EPDM roofs at Army facilities, as well as to define research needs to overcome problems identified.

The survey was conducted by telephone of 73 installations nationwide. Facility personnel responsible for roof maintenance were asked about their personal experiences with EPDM roofs. Based on the opinions offered, the results indicated that performance of EPDM roofing has been generally satisfactory at the installations. The majority of those contacted described performance as good to excellent. The major problem experienced was unsatisfactory seam performance. Many of the described seam problems were isolated. Consequently, although problems had occurred, the individual contacted expressed general satisfaction with EPDM roofing. However, in four extreme cases, the individuals contacted stated that unsatisfactory seam performance had been experienced to such an extent that they considered the overall performance of EPDM roofing as fair to poor. The survey results provided little information on the performance of patches made on aged rubber. The reason was that most facility personnel indicated they had little experience with patches.

Based on the results of the survey, it is recommended that studies be carried out to provide the technical basis for preparing the surfaces of aged rubber membranes before making seams or patches. The effect of aging on the surface characteristics of EPDM rubber has received little attention in the roofing literature.



**12. KEY WORDS** (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

low-sloped roofing; membranes; performance; quality assurance; roofs; research needs; service - life prediction.


**13. AVAILABILITY**

☒ Unlimited

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