

12058

MICHIGAN DEPARTMENT  
OF  
STATE HIGHWAYS AND TRANSPORTATION

INTERIM REPORT  
SYLVAX U.P.M. PATCHING MATERIAL  
1974 - 1975  
JULY 15, 1975

Maintenance Division  
Administrative Services Section  
Methods Unit  
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## FOREWORD

This is an interim report on the qualities of Sylvax U.P.M. as a cold patch mixture. The full evaluation will be reported after one year of usage. The purpose of testing the Sylvax material was to determine its qualities when used under field conditions. We were especially interested in its handling ability and workability during low temperatures and the effect in adverse weather conditions. We were also concerned with stockpile life and its ability to stay in place once installed.

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## BACKGROUND INFORMATION

The Sylvax patching material originated in the East and apparently had limited use in Maryland and in the State of New York during the early seventies. Our first exposure was a demonstration of material by Wayne County Road Commission in October of 1973. At that time, two patches were put in under adverse weather conditions on a high traffic volume route. Considering the application, conditions, and the minimum of effort required to install the patches, the results were very impressive. The original two patches installed in October of 1973 were still in place and reasonably smooth in August of 1974. At that time, the original patches were covered with bituminous concrete.

## SPECIFICATIONS

The specifications for C.P. 1 were modified for experimental purposes to cover the Sylvax additives (see Figures 1 & 2).

The intent of the specification was to obtain a binder for cold patch mixture that could be stored for a minimum of six months and remain workable at temperatures down to 15°. The binder was to have properties which would permit it to be placed under adverse and damp conditions. The aggregate was a 100% crushed stone of 31 gradation and all the bituminous material and additives were supplied directly by the Sylvax Company.

## TEST PLAN

In view of the results of the initial patches, a series of field tests were designed. The tests involved some 1,000 tons of material to be used at some 16 various garage sites. Because of limited availability of material, all test sites were established in the southern half of the Lower Peninsula.

It was intended that each garage site would establish a series of 3-5 patches during the late fall and another series in January, during adverse weather conditions. If possible, a third series would be established in early spring. Each patch was to have positive identification and a designated spot where a picture could be taken. The purpose of the picture was to provide a positive record of the results of each patch. Each patch location was identified and a record established of weather conditions and existing surfaces, together with information on surface preparation and the method of application. All of the material used at the direct county garages was manufactured by Rieth-Riley, Kalamazoo and Midland Construction, Midland, under the inspection of the Sylvax Company representative and delivered to the various drop points.

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SPECIFICATION

FOR

BITUMINOUS PATCHING MATERIALS

CP-1 MODIFIED

(for Experimental Use)

DESCRIPTION

This work shall consist of producing and delivering bituminous patching materials as specified herein to stockpiles at the sites and in the amounts described in the Proposal.

MATERIAL

The aggregate materials shall meet the requirements specified in Division 8 of the 1973 Standard Specifications for Highway Construction as follows:

Coarse Aggregate	31A or 31C . . . . .	8.02
Fine Aggregate	3FS or 3CS . . . . .	8.02

Bituminous material shall be Sylvax UPM or equal as approved by the Engineer and shall meet the following requirements for Asphalt Binder for Cold Patch Mixtures.

Description: The intent of these specifications is to obtain a binder for a cold patching mixture which can be stored for six months and remain workable at temperatures of 15° F. The binder shall have such properties as to permit the placement of the mixture under damp conditions. Failure of the mixture to perform to the satisfaction of the Engineer shall be grounds for cancellation of future deliveries. The low bidder shall supply a sample of this binder for evaluation purposes when so requested.

Specific Requirements:

Flash Point	65.6° C
Viscosity, Furol sec. @ 60° C	125-250

Distillation Requirements	
to 225° C	0-10% of distillate
to 260° C	15-55% of distillate
to 315.5° C	60-87% of distillate
Residue @ 360° C	67% +
Penetration of Residue	
25° C 100 g. 5 sec.	120-250
Ductility of Residue	100+
Solubility of Residue in Trichloro-ethylene	99.5%
 *Coating and Stripping Tests (ASTM D-1664)	 Passes

The binder shall not release any water when combined with the aggregate in the mixture.

\*Aggregate used in these tests shall be a crushed gravel or limestone.

MIXTURE PROPORTIONING AND PREPARATION

Bituminous Patching Mixture CP-1 Modified shall be proportioned and prepared in accordance with Bituminous Patching Mixtures, 7.11 of the Standard Specifications for Highway Construction with the following exceptions:

The mixture shall conform to the composition limits specified for Bituminous Patching Mixture CP-1 except that the bitumen content shall be 6 $\frac{1}{2}$  percent. The temperature of the bituminous material shall be not less than 175° F or more than 275° F and the temperature of the aggregates shall be not less than 90° F or more than 110° F when incorporated into the bituminous mixture.

The stripping test as specified for application to the bituminous mixture will be performed as specified under Stripping Test 7.11.06 except that it will be evaluated for 90 percent asphalt retention and in lieu of distilled water a solution of 2 ounces of Westolite (as made by West Chemical Product, Incorporated) per gallon of soft water will be used.

METHOD OF MEASUREMENT

Bituminous Patching Mixture CP-1 Modified will be measured by weight in tons.

BASIS OF PAYMENT

The completed work as measured for Bituminous Patching Mixture will be paid for at the contract unit price for the following contract item (Pay Item).

<u>Pay Item</u>	<u>Pay Unit</u>
Bituminous Patching Mixture CP-1 Modified	Ton

## EVALUATION OF TEST RESULTS

Figure 3 shows a typical preparation for a patch together with the three and six month history of the results. Figure 4 shows a similar history in concrete and a bituminous cap over concrete. Figure 5 shows documentation of the condition of several different patches after a period of six months. In a six month survey of the recorded patches, our results are as follows:

We have a total of 69 recorded patches- 82% or 57 of the original Sylvax patches are in acceptable condition. The general shape of the original patch is still in place and serving its intended purpose. The surface was considered acceptable if the settlement was less than 3/4".

18% of the original patches have failed. To determine the definite cause of failure of each of the individual patches is impractical, but additional failure of existing surfaces is a major factor. The survey shows that of the 57 Sylvax patches that are now in acceptable condition, approximately 50% of the general areas are in need of some additional attention. The failure of the existing surfaces which caused the original hole will continue. This condition will continue the need for additional patching. These failures are the result of existing surfaces and not the current patching material.

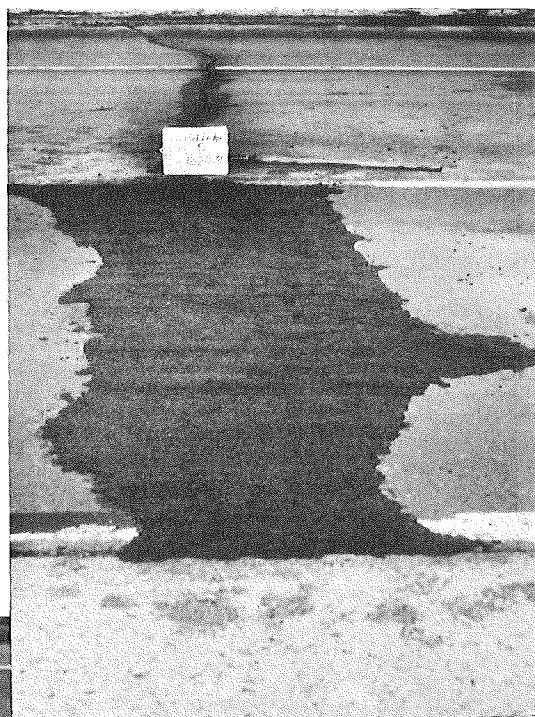
### COST EVALUATION

For cost comparison, we used data available from our management system. The costs are a statewide average for all patrol patching in our direct areas. To show the relationship of material costs in comparison to the total daily operation costs, we have substituted the actual per ton price of C.P. material with the current price of Sylvax (see Figure 6). A complete Cost/Benefit Evaluation will be included as part of the final report.

December 20, 1974

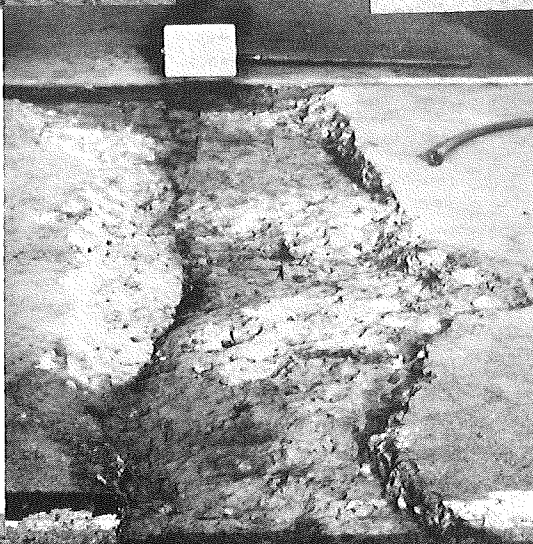


Problem



Hole Prepared

Hole Patched



Spring

Summer



Fig. 3

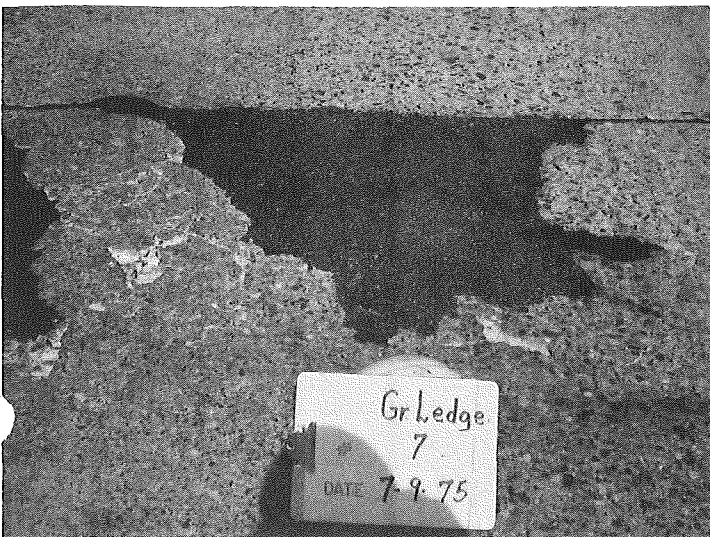
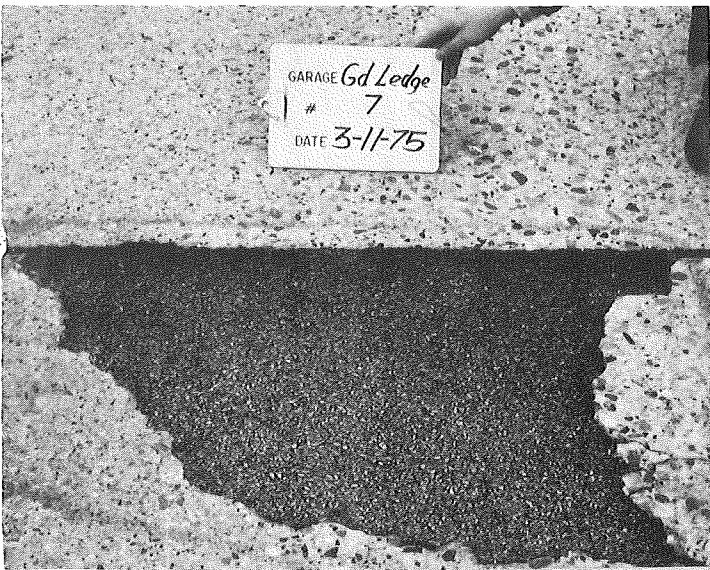


Fig. 4



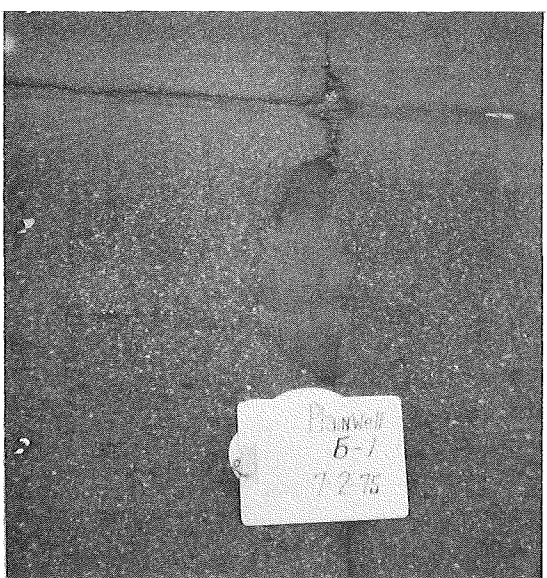
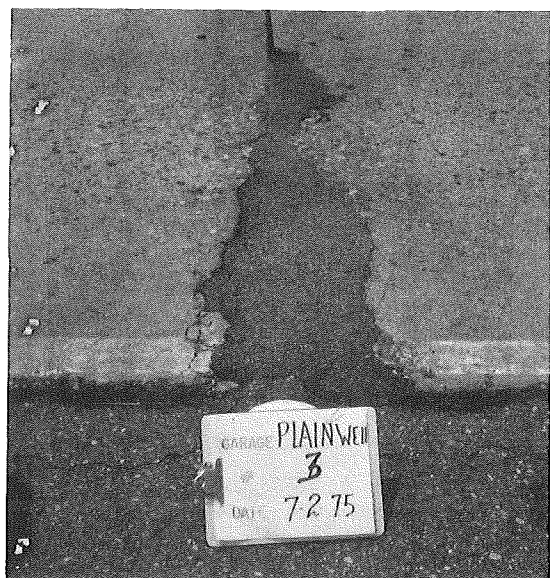
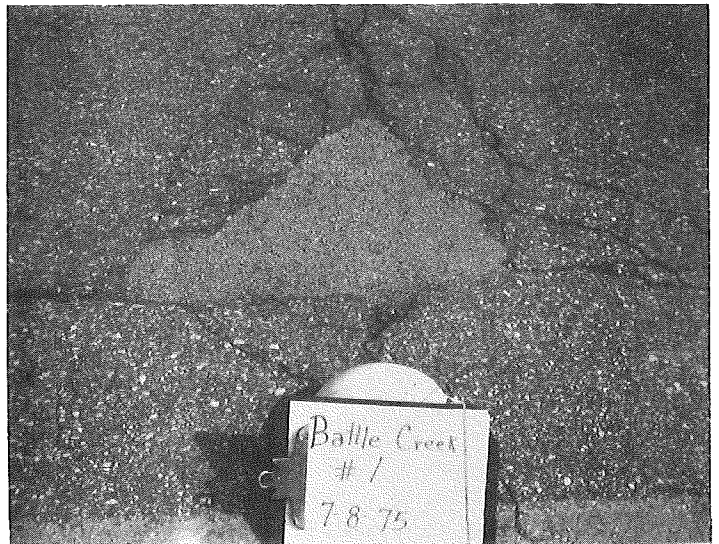


Fig. 5

## AVERAGE PATROL PATCHING COST

	<u>C.P. - 1</u>	<u>Sylvax</u>
<u>Labor</u> 3 men, 8 hours	\$122.00	\$122.00
<u>Equipment</u> 1 truck	19.00	19.00
<u>Material</u> (Average 1.95 tons per day)	30.21	85.17
<u>Average Daily Cost</u>	\$171.21	\$226.17

### Premix Material Cost

C.P. - 1	Statewide average cost	\$15.49 per ton
Sylvax	Statewide average cost	\$43.68 per ton

Patrol Patching  
Average Daily Cost

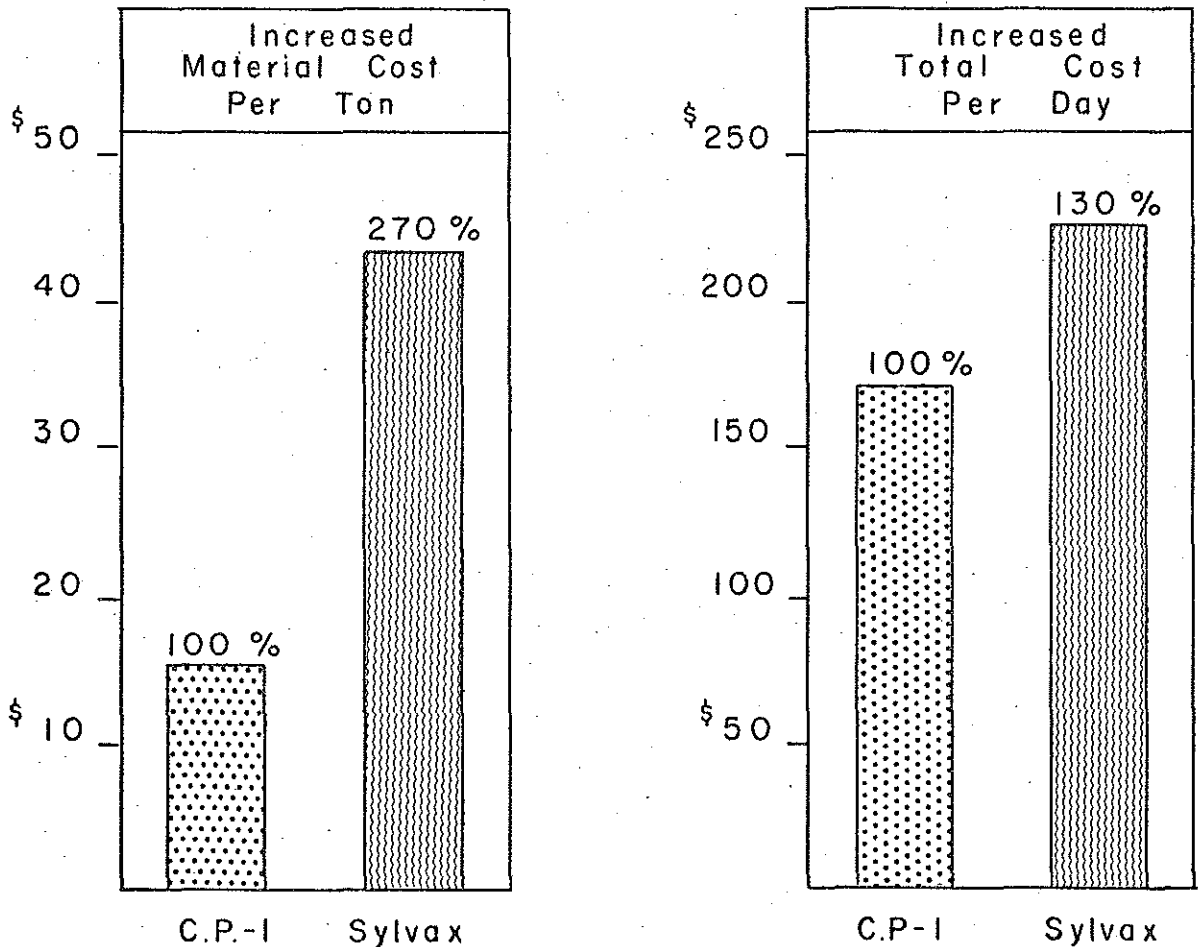


Fig. 6

## APPLICATION OBSERVATIONS

Through our observation of the test patches and examination of our installation records, we have found that Sylvax material will serve well for emergency patching during adverse weather conditions; it will adhere to an existing clean surface that is moist or slightly wet. Free water in a hole or excessive moisture seeping into a freshly applied material will cause failure.

The material when applied to a reasonably dry hole does not require a vertical edge. It may be applied to a depressed area and the edges tapered. It will taper to approximately 3/8" or the maximum size of the aggregate. The hole or area to be patched must be sound and free of dust or loose material. Loose material or unsound existing surface will result in failure--the same as with any other cold patching material. Priming of the hole is not necessary or, to our knowledge, even desirable.

Sylvax, the same as other premix patching materials, should be applied in maximum of 2" layers. All of our patching experience has been with one size aggregate. It is logical that if a quantity of holes greater than 2" were to be repaired, larger maximum size stone would be desirable.

From our observations, proper compaction is a crucial factor. Without adequate compaction, the patches will settle 10% to 20%. Low patches are common throughout the test program. Patches that have settled to the point that they require a wedging can be corrected with the addition of more Sylvax. The edge will adhere well and blend in with the original patch. The best results have been obtained when the patches have been rolled with truck tires. The combination of pneumatic rolling and repeated luting will result in a smooth surface and well compacted patch. It is our impression that the slow constant pressure of the rubber tired wheel is advantageous to the sharp impact caused by a hand tamp or compact with a shovel.

## STOCKPILING

To evaluate Sylvax abilities to be stored during the winter season, a stockpile was placed at Battle Creek garage on December 11, 1974. Shortly after, the height of the pile was measured to determine the degree of settlement. This measurement was checked at various times throughout the winter with little or no change of height. Apparently no settlement had taken place or the pile had not spread out. The original pile remained intact throughout the winter months with little change in general appearance. The slight crust which formed on the outside is only about 1" in depth, and while it has lost its outside gloss, it is still flexible and can be shoveled with a minimum of effort.

On January 31, 1975, an inspection was made to evaluate the material's workability below freezing temperatures (see Figure 7). In 30° weather and bright sunshine the square point shovel can be thrust into the material in a matter of a few seconds. This permits hand-loading of an exposed pile if desired. In the direct sunlight, the material feels soft under foot and with a little pressure and with a rotating motion, the material will appear to move easily.

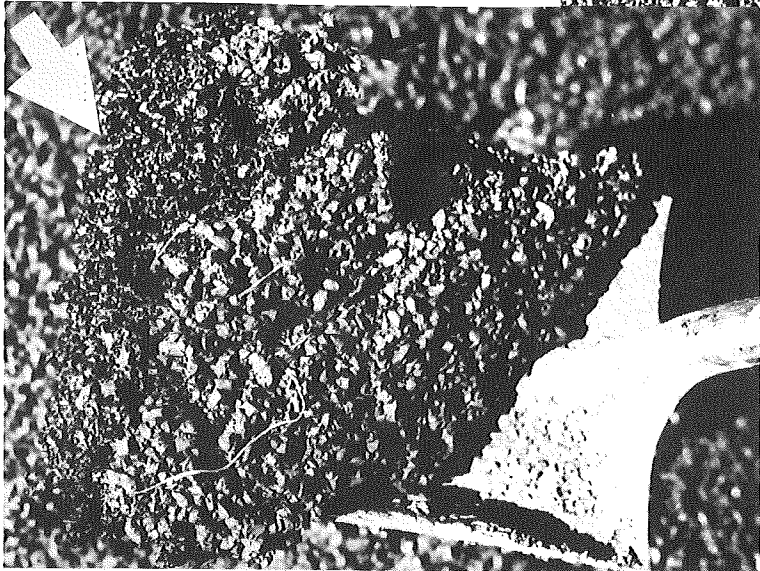
Under these conditions, a front end loader can also be used and can pick up a full bucket by exerting a little pressure and operating slowly. At lower temperatures and without the direct sun, the action is the same but material is firmer and requires a little more time to get the same reaction.

The customary procedure is to pick up a bucket or a truckload of the material, which is stored outside, dump this material in a storage shed near a heater, and use the slightly warmer material for emergency patching. This is the practice which is followed in all of the test areas. Repeated handling does not cause it to set up nor does the material cause excessive stain on the storage shed floor. The storage and workability of the material are two points which have drawn favorable comment from all the test locations. There has been limited complaint from operators using the material that the "stuff" sticks to the shovel and is difficult to really throw in a hole but, once it's placed on the surface, it can then be worked into and wedged on the outside edges with little effort.

One other frequent comment from observers at the test sites is that it does take reasonable care to get a satisfactory patch. It cannot be thrown into a pothole without cleaning, and it cannot be left to traffic for compaction. Under these conditions, it will fail as soon as or sooner than our regular cold patch material.

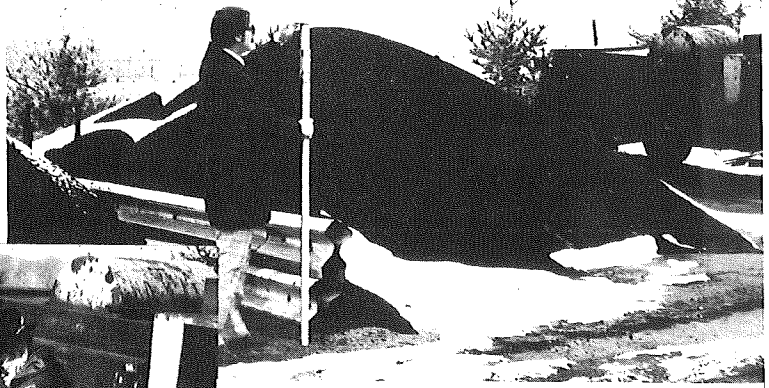
# STOCK PILE

Pliable  
Under  
Pressure



Little Change  
in Appearance

No Settling



Easily Loaded

Fig. 7

## OPINION OF OTHERS

The opinion of Sylvax qualities by other agencies varies considerably. Wayne County Road Commission, which originally had good results with their initial supply, has since had complete failure of later deliveries and as of this date had discontinued its use entirely. Other counties and municipalities that have received delivery of Sylvax have had mixed opinions. Some have had excellent results and will continue the use, and others cannot justify the increased cost in material. In one incident, the material stripped out in the stockpile and was deemed unusable. The pattern of satisfied and unsatisfied users was usually traceable back to the supplier. There is obviously a variation in individual batches. Of all the experimenting done by others, we are not aware of any controlled or documented results. Usually the opinions were formed from information relayed by operators or from casual observations. All of our testing has been conducted with material produced by two manufacturers, and both using specification limestone. The material was mixed and delivered to the various drop points about December 1, 1974.

## CONCLUSION

The results of the test patches indicate that Sylvax, when properly manufactured, is a desirable patching material. If applied with reasonable care, it is an excellent emergency patching material that can be used during adverse weather conditions. Its ability to remain pliable and workable after six months in a stockpile is a definite advantage. Sylvax material will also serve well for larger patches when applied under normal working conditions. The experimenting should continue with additional material for one more season. This would permit an opportunity to stabilize any problems in production and to establish specifications for a compatible aggregate. A complete report together with final recommendations will be assembled after the additional season of data.