

MICHIGAN  
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COMMENTS ON  
BITUMINOUS-ROBBER  
JOINT SEALING COMPOUNDS

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Research Project 36 G-4 (6)

Research Laboratory  
Testing and Research Division  
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## COMMENTS ON BITUMINOUS-RUBBER JOINT SEALING COMPOUNDS

It has been established in Michigan and elsewhere that the incorporation of rubber into bituminous joint-sealing compounds has certain distinct advantages in imparting to these compounds properties which so far can be obtained in no other way. As an example, there can be cited the development of asphaltic oil-latex seals which maintain ductility at the colder temperatures, do not flow under summer conditions and still possess a reasonable degree of adhesion to concrete.

These oil-latex seals are not without certain disadvantages, however. They must be mixed at the site of operations in the field, the mixing is a ticklish process requiring strict control of temperature and precise timing to assure adequate pouring consistency, and the compound when once set cannot conveniently be returned to pouring consistency by reheating.

These facts have undoubtedly led to the development by commercial firms of joint seals of the hot-pour bituminous-rubber type. Such seals are mixtures of asphalt and rubber. They contain little or no water, since solid rubber instead of latex is used in their manufacture, although they may contain small amounts of inert materials as fillers. As a rule they may be reheated indefinitely without foaming until ultimate loss of volatile constituents renders further reheating impractical. They are made up ahead of time, packaged in 100 pound paper sacks, and may be used at any time after manufacture.

Hot-pour sealing compounds set rapidly after pouring and are much harder when placed than materials made with latex. They do not exhibit the enormous elasticity of the latex mixtures, but they probably do not require it. Four to five years' experience with such compounds in experimental installations

in Michigan has shown that their weathering properties are in general more satisfactory than those of any other type of seal. Bituminous-rubber seals of the hot-pour type have the additional advantage in that they may be cut back with suitable solvents to a proper consistency for filling cracks, whereas this is not true of the asphalt-latex types. It is felt that, all factors being considered, seals of the hot-pour bituminous-rubber type are the most practical to apply in the field under normal construction operations and that development of the perfect seal will possibly proceed along this line.

At present, hot-pour bituminous-rubber seals possess certain distinct shortcomings. They must be heated to temperatures of from 385 to 400°F, a process which is not only slow but which may be dangerous as well. Moreover, heating to these high temperatures causes a considerable increase in volume. The material therefore shrinks after pouring, the amount of shrinkage being difficult to control and occasionally necessitating a second pour. The consistency of the material during pouring is a function of the temperature. Although this lends itself to adequate control, it is found in practice that the limits of good pouring consistency are quite narrow. Ignition of the material during heating, due to its low flash point, has been known to occur.

Another shortcoming of bituminous-rubber seals of the hot-pour type is a result of the method of packaging used by the manufacturer. These seals are supplied in 100 pound paper bags. Before heating the material to pouring consistency, the seal must be removed from the paper container. This has been found very difficult to do in practice. The material, moreover, should not be heated in a single 100 pound lump, but should be broken up into approximately 10 pound lumps to avoid local overheating. The seal should be stirred in the

heating pot during the entire process in order to secure uniform temperatures throughout. The entire process of heating under these conditions may take considerable time, especially when only a few joints are to be poured, although the heating could be set up on a production basis by pre-heating larger quantities ahead of time.

An important impediment to its use at present is the cost factor. Recent quotations from two sources of this type of sealing compound (Servitized Products and Phillip Carey) are 15 cents and 17 cents per pound or \$300 and \$340 per ton respectively. An expansion joint 20 feet in length, 1 inch wide and 3/4 inch deep requires approximately 1 gallon of material to properly seal it allowing for waste, etc. At roughly 8 pounds per gallon, the cost is approximately \$1.20 to \$1.36 per joint as compared to about 68 cents for asphalt-latex material, or roughly double the cost of the latter. It is believed that further developments in this material and the demand will bring the price down to a reasonable level.

Certain laboratory tests have been devised for evaluating hot-pour bituminous-rubber compounds and these have been recognized in U. S. Government (Federal SS-F-336) and Civil Aeronautics Administration (P-605) specifications. These tests cover such qualities as pour point, melting time, penetration, flash point, flow and band. Recognition of the tests, for which adequate apparatus has been devised, has been general since 1942, but improved procedures will undoubtedly be forthcoming and additional qualities will eventually be tested.

One very important property of hot-pour bituminous-rubber type joint seals which has so far defied practical laboratory measurement is their behavior on weathering. No satisfactory accelerated weathering test has been

found which can be adequately applied to such seals, although several promising leads are available.

In order to compare the successful life of various commercial hot-pour bituminous-rubber type seals, the Testing and Research Division has sponsored several experimental field installations. The latest of these was installed from October 30 to November 9, 1945, on U. S. 16 west of Lansing on Construction Project 19-3A, CI, from station 168+35 to 179+79 inclusive, the following combinations being used: (1) Paraplastic primed, (2) Paraplastic unprimed, (3) Oil-Anode GRS latex primed, (4) Oil-Revertex latex unprimed, (5) SOA - Anode GRS latex primed, (6) SOA - Revertex latex unprimed, (7) Careylastic primed, and (8) Careylastic unprimed. See attached sketch (Figure 1).

Materials (1), (2), (7) and (8) are hot-pour bituminous-rubber compounds; materials (3), (4), (5), and (6) contain synthetic rubber latex as a substitute for natural rubber latex. The synthetic latices are identified as Anode GRS and Revertex. The words primed and unprimed indicate whether or not the joint was primed with a diluted mixture of the sealing compound prior to pouring operations.

Along with asphalt-latex seals made with both natural and prevulcanized natural latex (Vultex), SOA asphalt and a hot-pour bituminous-rubber called Thermoplastic were used in the construction of the Michigan Test Road. Of all of these today, Thermoplastic is in the best condition.

With the exception of the Michigan Test Road, all of the test installations including the latex or commercial compounds have been made on old pavements where the joints were irregular and it was difficult to clear them of the old joint seal material and seal satisfactorily. Due to these factors the results from these studies have not been satisfactory and consequently they

Miscellaneous Joint Seal Studies Project 36 G-4(3) E

Asphalt-Rubber Joint Seal Study  
Installations on U.S.-16 West of Lansing

Construction Project 19-32, C1

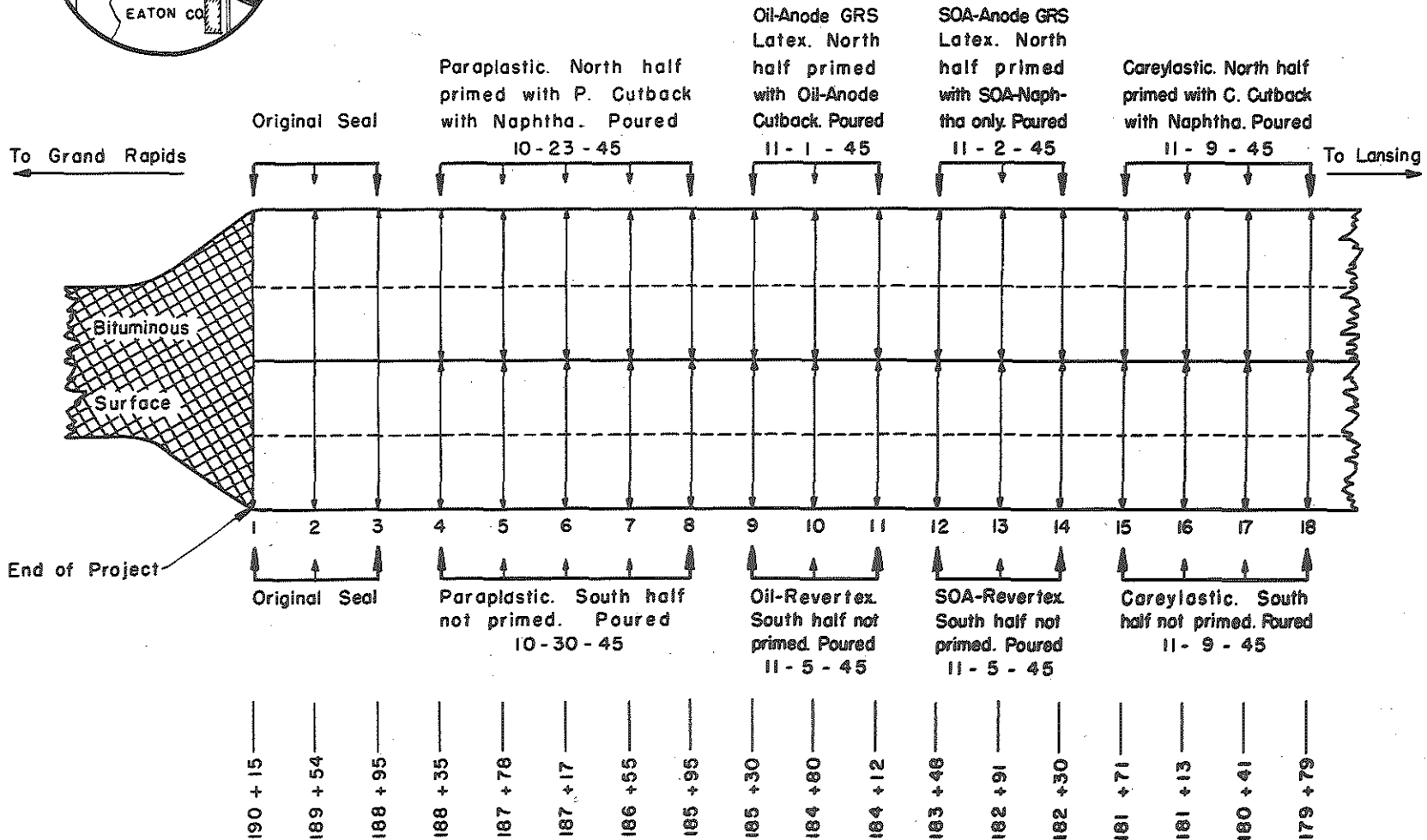
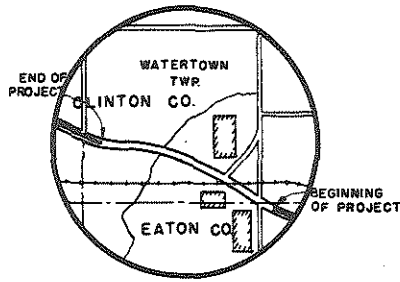


Figure 1

do not constitute a reliable or fair test of the materials under observation. The materials should be compared for performance only when installed on new projects. Tests made on new pavements show remarkable serviceability of these materials.

There is no question but that the bituminous-rubber joint sealing compounds are greatly superior to any used in highway construction to date. Irrespective of cost, a material of this type should be required on all new construction as now specified in the Department's current specification. The government requires this type of sealing compound to be used on all airport work. The problem before Highway Departments now is the unification of their specifications and requirements in order that better bituminous-rubber compounds may be produced commercially at lower costs. To this end several suggestions are in order. They are:

1. Recognition by AASHTO and ASTM of specifications and acceptance tests for bituminous-rubber joint sealing compounds.
2. Perfection of standard specifications and acceptance tests by recognized research agencies.
3. Development of special tests for evaluating performance of bituminous-rubber sealing compounds relative to bond, cohesion, durability and performance under continued service.
4. Cooperation between Highway Departments and commercial organizations for further improvement of bituminous-rubber joint sealing compounds.
5. Development of methods for applying sealing compounds to joints in the field to insure positive adhesion under normal construction conditions.

6. Development of efficient equipment for handling and applying sealing compounds in the field.
7. Development of methods of handling materials between producer and contractor.

At the present time the Research Laboratory is working on these problems.

Illustrative material including types of joint seals and method of preparing and sealing joints has been appended to this report. See Figures 2, 3, 4 and 5.



# BITUMINOUS TYPE JOINT SEAL

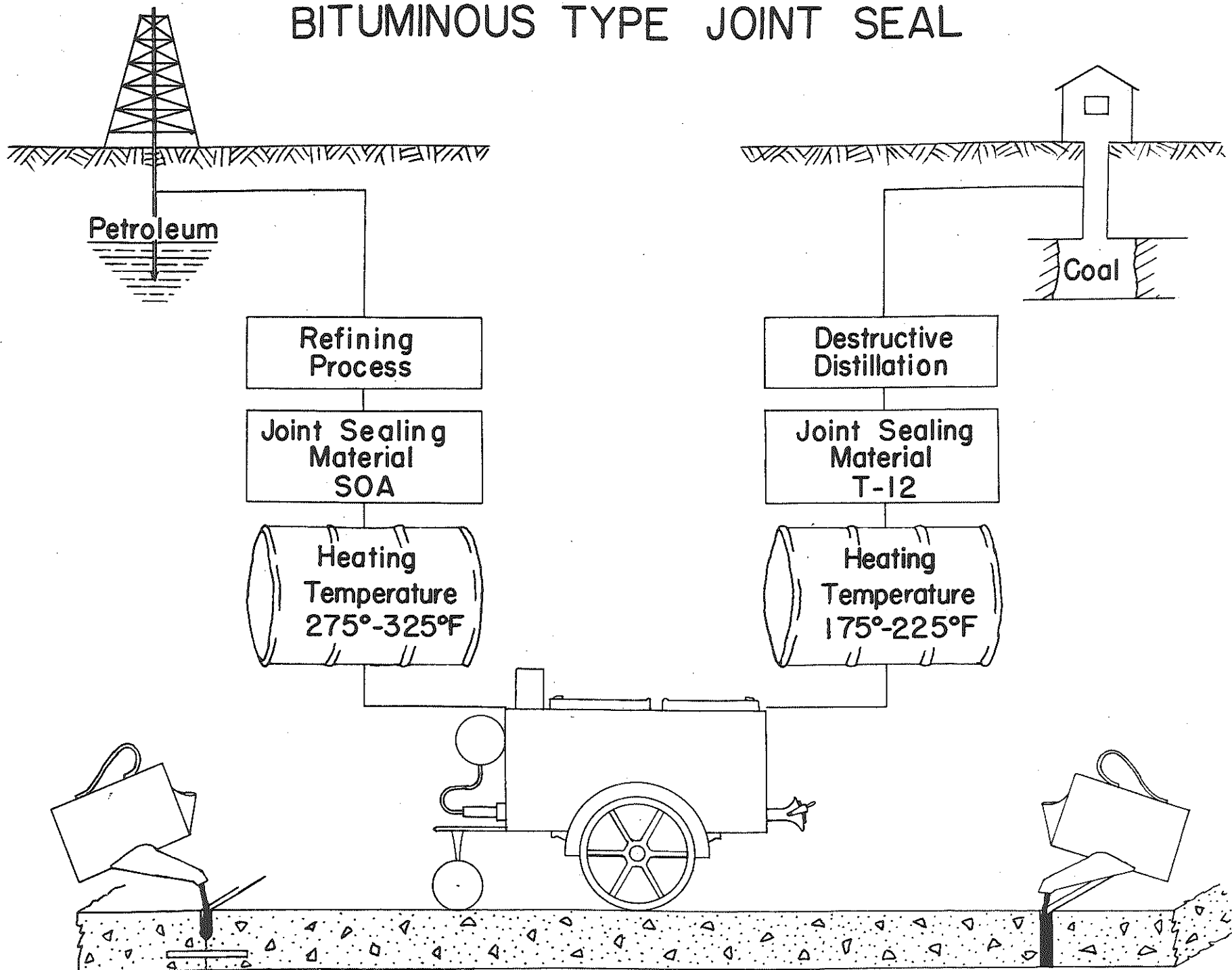


Figure 2

# ASPHALT-LATEX JOINT SEAL

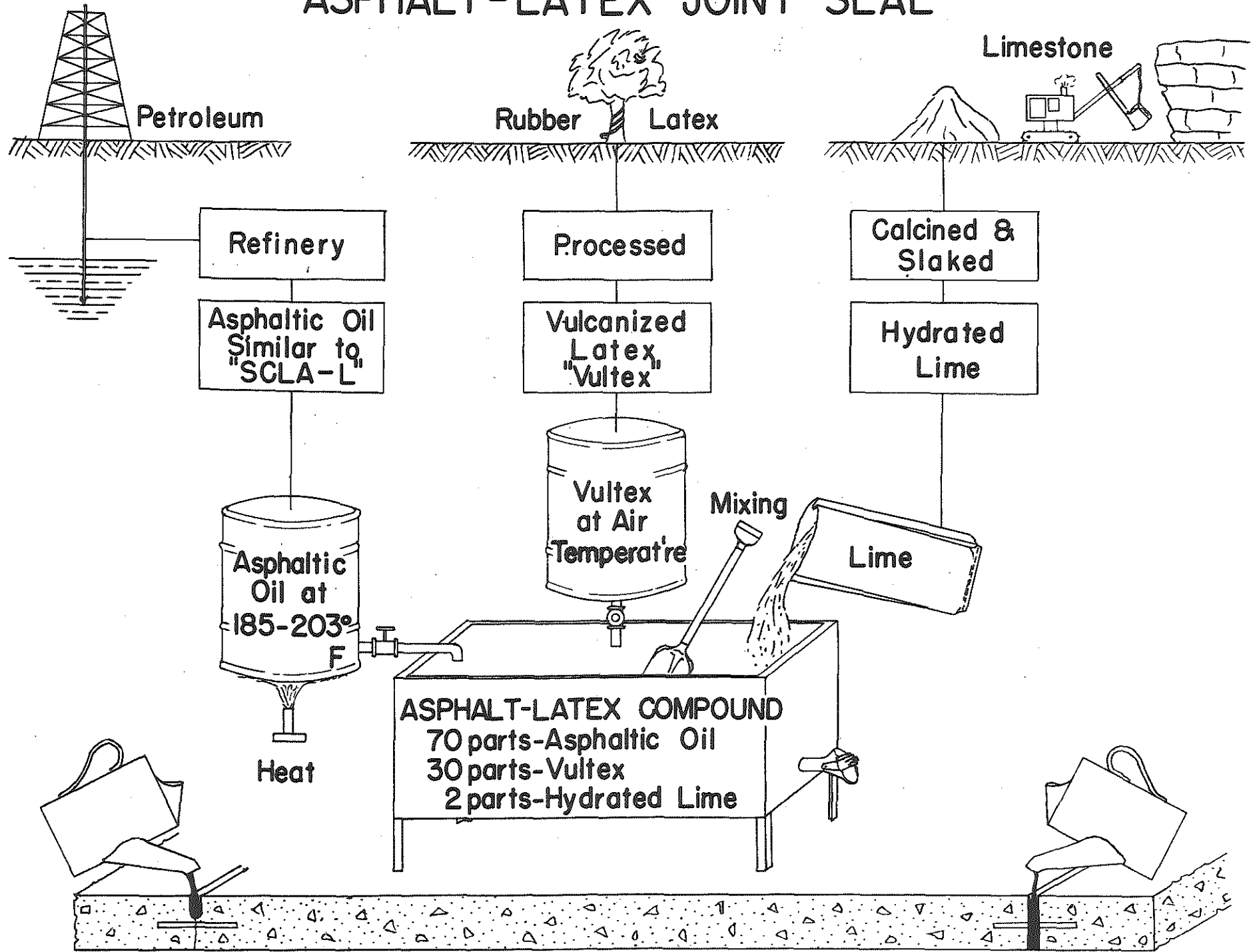


Figure 3

# HOT-POURED BITUMINOUS-RUBBER JOINT SEAL

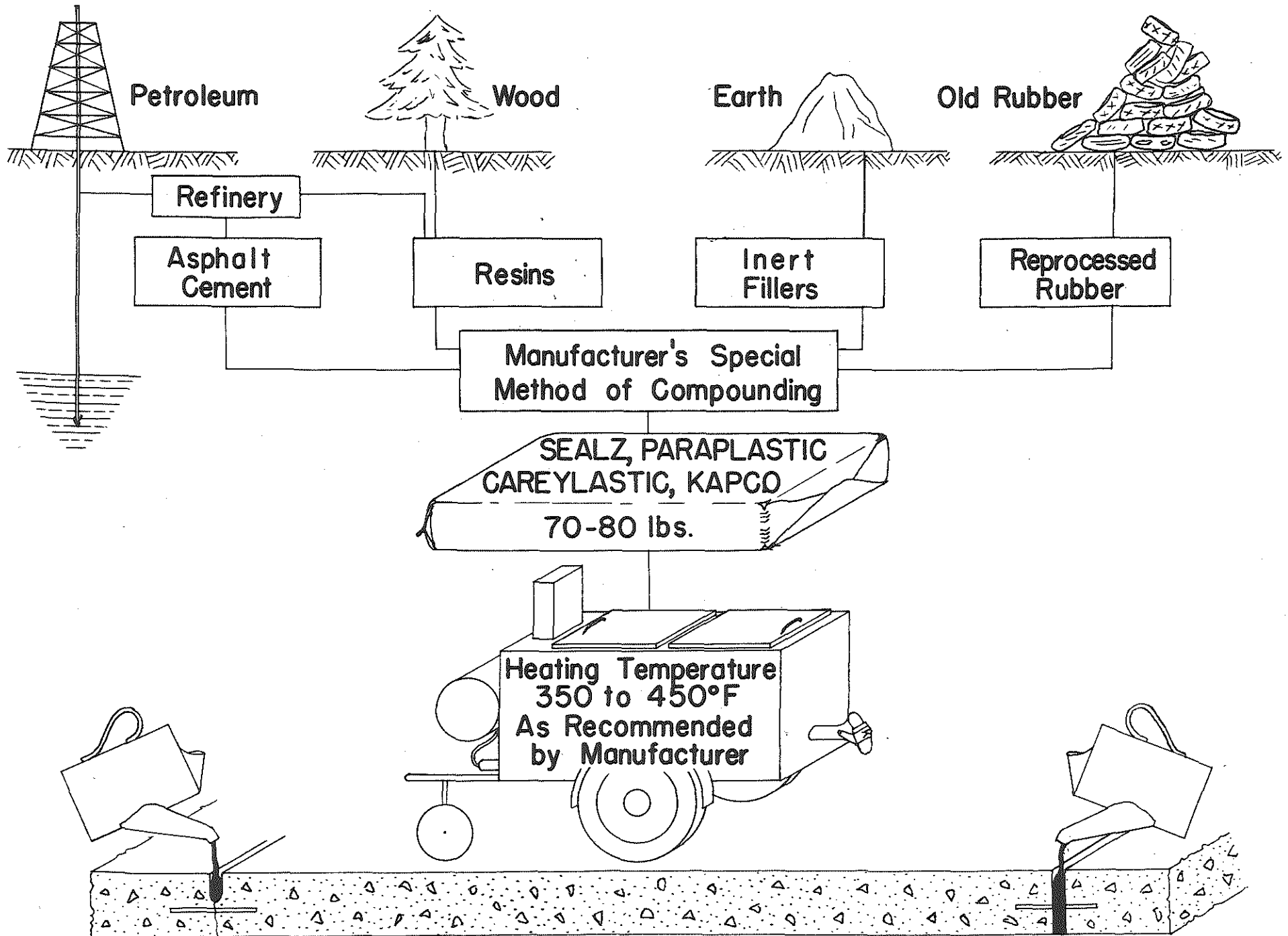
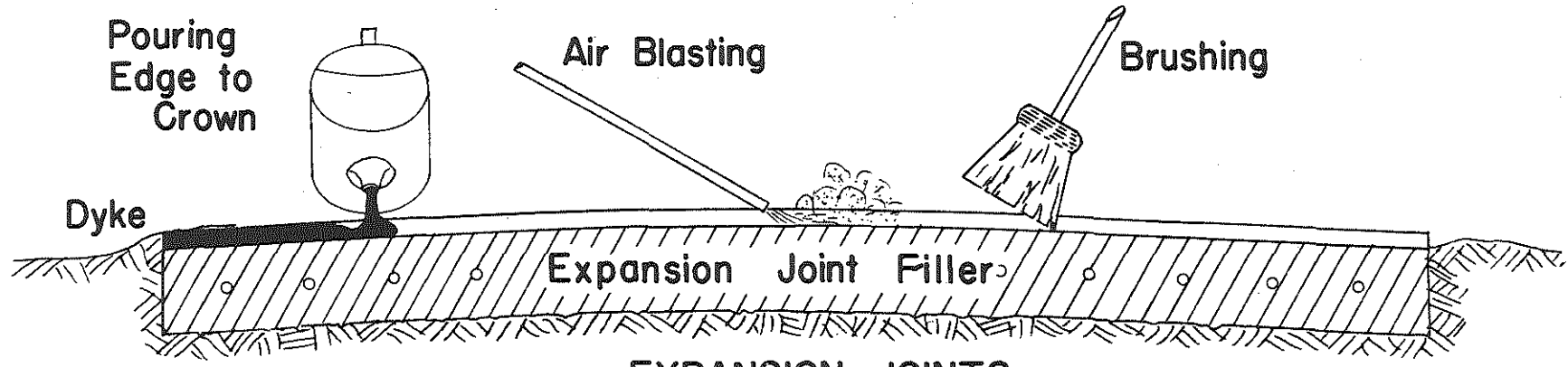
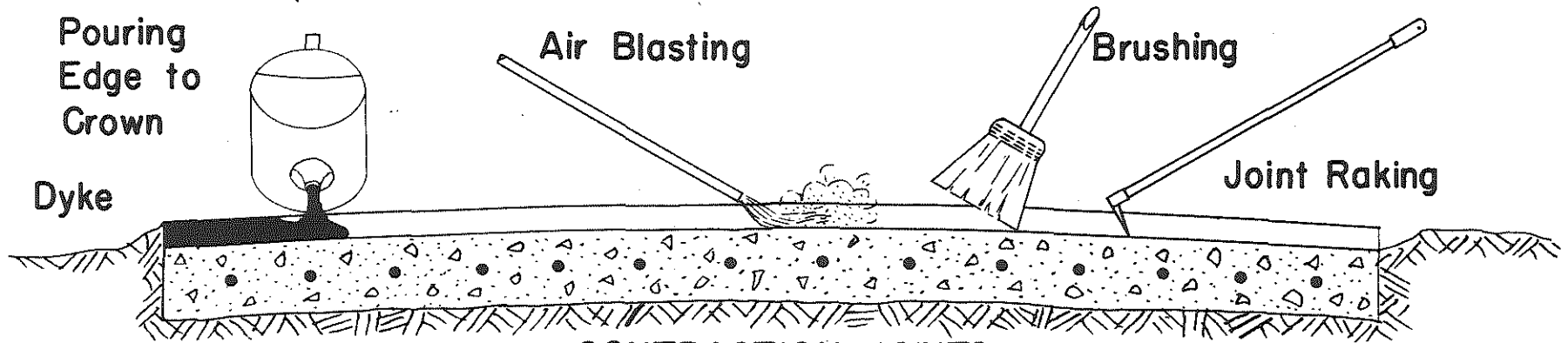


Figure 4

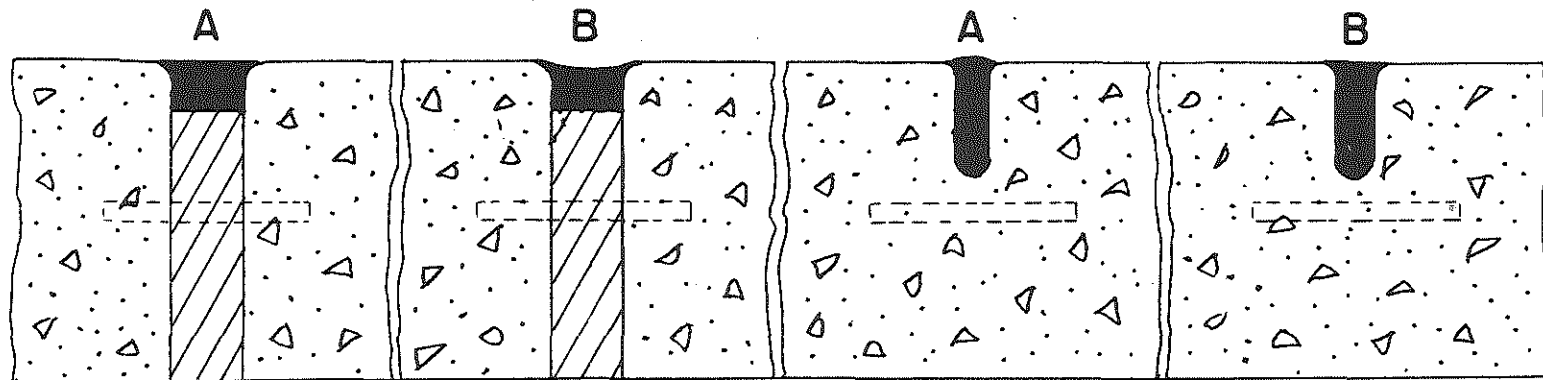
# PREPARING AND SEALING JOINTS



EXPANSION JOINTS



CONTRACTION JOINTS



SEALING EXPANSION JOINTS

FILLING CONTRACTION JOINT GROOVE