SECTION 5
SANDWICH SEALS USING ASPHALT EMULSIONS

5.1 Scope

This guideline has been prepared for those engaged in chip seal construction who would like to use current equipment to expand the techniques for use in higher traffic and higher stress situations.

Before reading this section, familiarize yourself with **SECTION 4 SINGLE AND MULTIPLE CHIP SEALS USING ASPHALT EMULSIONS** and **SECTION 4 TESTING** of the AEMA's **A Basic Asphalt Emulstion Manual**. Related topics and definitions will not be duplicated here. The same recommendations as to equipment calibration, uniformity of construction practice, soundness and absence of dust in the aggregate, rolling, weather, and traffic control are equally important to the successful use of sandwich seals.

This guide will highlight the materials, application rates, and construction practices unique to sandwich seals.

5.2 Definitions

A Sandwich Seal consists of the uniform application of one course of aggregate to a prepared surface, followed by the application of an asphalt emulsion, which is then followed by the uniform application of a second course of smaller aggregate, which is then rolled.

5.3 Asphalt Emulsion

Sandwich seals are generally constructed with rapid setting high viscosity emulsions RS-2, HFRS-2, and CRS-2 (ASTM D997 and D2397).

5.3.1 Polymer Modified Asphalt Emulsion

Polymer-modified asphalt emulsions can be used, and are reported to give improved chip retention and better service life.

For best results, it is good practice to consult your asphalt emulsion supplier, and be guided by their recommendations for any sandwich seal project.

5.4 Aggregates

Aggregates have several characteristics which must be considered with respect to sandwich seals. The ideal aggregates will be a uniform size, fractured, hard, and free from dust or other foreign materials.

Hard aggregates indicate a resistance to breakage and wear. This provides the proper surface texture for longer duration. Uniformly sized aggregates make sandwich seal design easier and more accurate, reduce segregation problems, minimize construction errors, and provide a uniform wearing surface.

Suggested sizes for aggregates are given in **Table 5-1 Suggested Quantities for Sandwich Seals**.

5.5 Construction Techniques

5.5.1 Preparation of Road Surface

Any road repairs should be allowed to cure prior to the sandwich seal. The road surface should be thoroughly cleaned by brooming just prior to construction.

5.5.2 Application of 1st Aggregate

The first aggregate should be spread uniformly over the road surface so as to achieve 60 to 80% coverage. For high traffic roadways or in areas with bleeding or flushing, rolling of the uncovered aggregate will help orient and seat the large aggregate.

5.5.3 Application of Asphalt Emulsion

The selected emulsion should be uniformly applied to the uncovered aggregate with a calibrated distributor. This application rate should be based on the preliminary design quantities, and incorporate any adjustments deemed necessary due to surface condition and traffic.

5.5.4 Application of 2nd Aggregate

The second aggregate should be uniformly spread over the emulsion to achieve complete coverage of the void space remaining after the application of the first aggregate.

5.5.5 Rolling

The aggregate should be seated with pneumatic rollers. Multiple passes with two or three rollers will insure consistent operations.

5.5.6 Traffic Control

Traffic speed should be controlled over the freshly applied sandwich seal. This may be accomplished by means of a pilot vehicle. The vehicle should not track the same path with each pass, but rather guide traffic over the entire road surface as much as possible. When a pilot vehicle is not available, care should be taken to slow traffic until the aggregate is firmly seated.

5.5.7 Brooming

A light brooming may be necessary to remove any excess aggregate. Care should be taken not to damage the seal.

5.6 Advantages of Sandwich Seals

There are several advantages to the use of sandwich seals in a comprehensive maintenance program.

1. The use of larger aggregates is possible. This allows more relative aggregate wear before the surface characteristics become unacceptable.
2. Large aggregates allow better water drainage due to higher surface voids.
3. The smaller aggregates help to key the large aggregate with firm lateral support. This also dissipates the tire stress at the surface layer.
4. Large aggregates allow the use of a generous application of emulsions which provide a thicker film of asphalt to protect the surface and fill small cracks.
5. Large aggregates and generous emulsion applications reduce the effect of construction variations. This increases the success of the sandwich seal program.
6. The use of polymer modified emulsions may increase the life of the sandwich seal.
7. The life of a sandwich seal is determined by the wearing characteristics of the aggregates.
8. Sandwich seals have proven to be effective on flushed or bleeding surfaces.
9. Sandwich seals reduce minor surface irregularities.

Table 5-1 Suggested Quantities for Sandwich Seals

1st Aggregate			Asphalt Emulsion	2nd Aggregate		
Pass Sieve	But Retained by	App Rate lb/yd^2	App Rate gal/yd^2	Pass Sieve	But Retained by	App Rate lb/yd^2
5/8	1/2	17 to 22	0.55	3/8	No. 4	11 to 15
				No. 4	No. 8	7 to 11
1/2	No. 4	13 to 17	0.50			

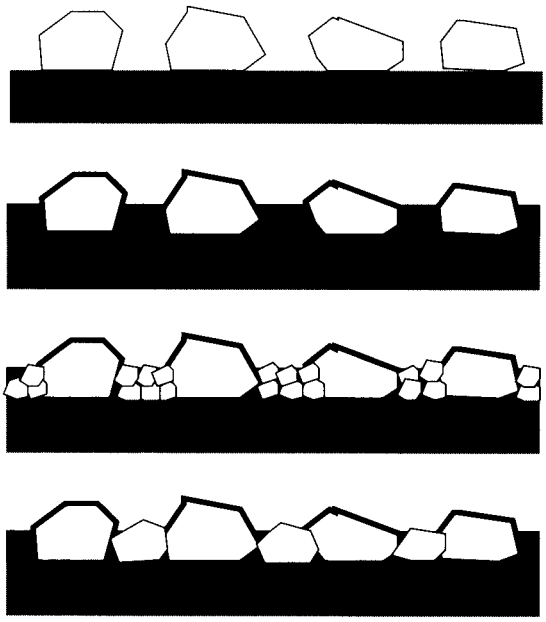

Fig. 1A
application of first aggregate at 60–80% coverage.

Fig. 1B
application of asphalt emulsion.

Fig. 1C
application of second aggregate. (1/4 the first aggregate size) RECOMMENDED

Fig. 1D
application of second aggregate. (1/2 the first aggregate size) ALTERNATE

Figure 5-1 Construction of Sandwich Seals