PLAINTIFF'S EXHIBIT
UC-985

Calidria ASBESTOS

UNION CARBIDE CORPORATION • METALS DIVISION • P. O. BOX 579 • NIAGARA FALLS, N.Y. 14302 • TEL: 716-278-3376

August 26, 1977

Mr. R. Hillerman
Allied Materials, Inc.
27350 Gloede
Warren, MI 48093

Dear Mr. Hillerman:

First of all, let me thank you for the time you spent with John Myers and me earlier this week. It was profitable to us from a learning standpoint and I hope it will be financially profitable for you in the not too distant future.

Enclosed are several pieces of literature describing RG-244 and its applications in vinyl plastisol and other systems. You probably have some of this information in your files but this should be one complete set. Although we plan to do some lab work on the high-viscosity problem with sprayed plastisols, it is suggested that adding a small amount of thinner, such as Varsol, may reduce viscosity without affecting sag resistance (thixotropy).

If you use pyrogenic silica in systems that are not sprayed, I think RG-244 will save you money. It offers several advantages, including: lower cost, faster wet-out, no color, less dusting, smaller packages, less storage space, etc. I have taken the liberty of requesting our plant to send you a ten-pound bag sample of RG-244. This should give you enough of our current material for evaluation and demonstrate our typical packaging. Full pallets consit of eight 5-bag layers (400 lbs.), with glue between each layer to improve integrity. Pallets can be double-stacked and a full 50-foot boxcar holds 52 pallets, 20,800 pounds. We do not charge extra for shrink-wrap or palletizing. Rail freight from our California plant is about $0.102/lb., so your delivered price would be about $0.982/lb. If you wish to purchase less than carloads or desire additional material for evaluation, you will note on the enclosed price schedule that we warehouse RG-244 in Livonia.

Although our prime interest is RG-244, we would also like to participate more in your conventional asbestos requirements with RG-110. Enclosed is a copy of a report we have just completed for a roofing compounder. Perhaps this information may assist you in improving the efficiency of RG-110 to make it cost-competitive with Canadian asbestos. Carload prices for both RG-110 and RG-244 would apply on mixed shipments and the higher density of RG-110 would lower the freight rate for RG-244. For example, the rail freight for a car containing 26 pallets of each product would be $0.045/lb., so that your delivered price for RG-244 would be reduced to $0.925/lb.

I have not yet been able to reach Dr. Krebs at General Motors Industrial Hygiene to ask about the rumor from Fisher Body. In the interim, however, I have talked to a few people at General Motors who are actively involved in projects using asbestos as well as two of your competitors. They have told me that, as far as they know, the Fisher Body policy is unchanged. The current policy, as I understand it, is to replace asbestos only when no penalty, either cost or performance, is incurred. We will continue to pursue this with Dr. Krebs.

As a final note, I would like to reiterate our invitation to visit our plant near King City. It is readily accessible from Monterey or San Francisco and I am sure you would enjoy the surroundings. As you could tell from your conversation with John, he visits California quite frequently; and, if scheduling permits, he would like to "escort" you on a plant visit. Let us know when you will be in California and we will try to work something out.

We really appreciated the time you spent with us and if we can be of any assistance whatsoever, please let us know.

Very truly yours,

Edward J. Kleber
Midwest Sales

EJK:cjb
Enclosures

CC: Mr. J. L. Myers

Marketing Services Report
Union Carbide Corporation
Metals Division
P. O. Box 579
Niagara Falls, NY 14302

To: J. E. Walsh (2)

Date: August 16, 1977

Copies: R. E. Byrne, Jr.
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NB File No.: 2099-87-59

Comparison of "Calidria" Asbestos and Lake Asbestos in Asphaltic Roofing Compound

INTRODUCTION

recently reported that they have been unable to achieve the same degree of thickening efficiency with "Calidria" asbestos as that of Lake asbestos 7R-5. The asbestos is used in an asphaltic roofing formulation prepared in a ribbon blender. The ribbon blender is relatively low shear equipment and it was suggested that poor performance of the "Calidria" product may be related to inadequate dispersion. Samples of the formulation ingredients, including Lake 7R-5, were obtained for evaluation at Niagara Falls. The results of our investigation are reported herein.

SUMMARY

The basic asphaltic formulation submitted by . was prepared using Lake 7R-5 and "Calidria" RG-110 asbestos product. The results showed "Calidria" asbestos to be approximately twice as effective as the Lake product at the recommended level of addition (17.9% based on the asphalt) when mixed with high shear equipment, i.e., Cowles mixer for 15 minutes @ 2950 rpm. However, when incorporated under conditions of low shear, such as a Sigma mixer, "Calidria" asbestos tends to be less efficient due to inadequate dispersion in the asphalt. It was found that this could be remedied by the use of nominal amounts of Aerosil OT-B, anionic surfactant, and diethylene glycol. Equal amounts of surfactant and DEG at the 0.3% level based on the asphalt, not only enhanced dispersion of the asbestos, but also improved viscosity stability and the texture of the coating. With proper dispersion, "Calidria" asbestos demonstrated higher thixotropic properties compared to Lake 7R-5 and approximately 25% less RG-110 was required to obtain viscosities equivalent to the formulation containing Lake asbestos.

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DISCUSSION

The basic formulation consisted of 56% asphalt, 34% limestone and 10% asbestos. Due to the high viscosity of the compounded material, the limestone was left out of the formulation during initial comparisons of the Lake 7R-5 and "Calidria" RG-110 asbestos products.

Initially, the two asbestos products were compared in the asphalt with high energy mixing in a Cowles @ 2950 rpm (3 inch impeller) for 15 minutes. The asbestos additions were based on a sample aliquot of 504 gms. of asphalt. As shown in Figure 1, RG-110 contributed to a sharp increase in viscosity @ 2 rpm over the range of 12.5 to 17.9% additions. The 7R-5 asbestos exhibited a viscosity of 6300 poise at the recommended level of addition, i.e., 17.9% based on the asphalt or 10 ppH based on the total formulation including limestone. RG-110 by comparison contributed to a viscosity of over 12,000 poise at the same level of addition. Approximately 14% RG-110 contributed viscosities equivalent to 17.9% 7R-5. These results more or less confirm our suspicions that the RG-110 is not being adequately dispersed with the low shear action of the ribbon blender. Referring to Table I, the results also show RG-110 to exhibit higher thixotropy than the Canadian asbestos.

The use of Aerosil OT-B, an anionic surfactant, was investigated as a means to facilitate the dispersion of RG-110 in the asphalt. Previous experience has shown Aerosil OT, a dioctyl ester of sodium sulfo-saccinic acid, to be an effective dispersant for chrysotile. As such, however, it significantly reduces the thickening potential of the asbestos. It was later discovered that a post addition of a polar additive such as diethylene glycol following surfactant and asbestos additions tends to regenerate viscosity and thixotropy of the system. There appears to be a synergistic effect with the combination of surfactant and DEG; the optimum ratio usually being in the order one to one at a level approximating 0.3% of each based on the base resin. As illustrated in Figure 2. This ratio also appears to be optimum for the asphalt system in question.

Having established a basis for comparative purposes, formulations consisting of RG-110 and 7R-5 were prepared in a Sigma mixer which more closely approximates the action of a ribbon blender. In the case of the Lake 7R-5 formulation, 1008 gm. of asphalt were added to the mixer followed by 180 gm. of 7R-5 (17.9% based asphalt) and 612 gm. of limestone. The asphalt and asbestos were mixed for 40 minutes; followed by the addition of limestone with an additional 10 minutes mixing. The "Calidria" formulation included the addition of 3 gm. Aerosil OT to 1008 gm. asphalt, mixed for 5 minutes. Then 126 gm. RG-110 (12.5% based on asphalt) were added and mixed for an additional 20 minutes. The asbestos was followed by a 3 gm. addition of DEG, mixed for 5 minutes. Limestone (612 gm.) was added last and mixed an additional 10 minutes. The total mix time for both preparations was 50 minutes. Viscosity was measured prior to and following the addition of limestone.

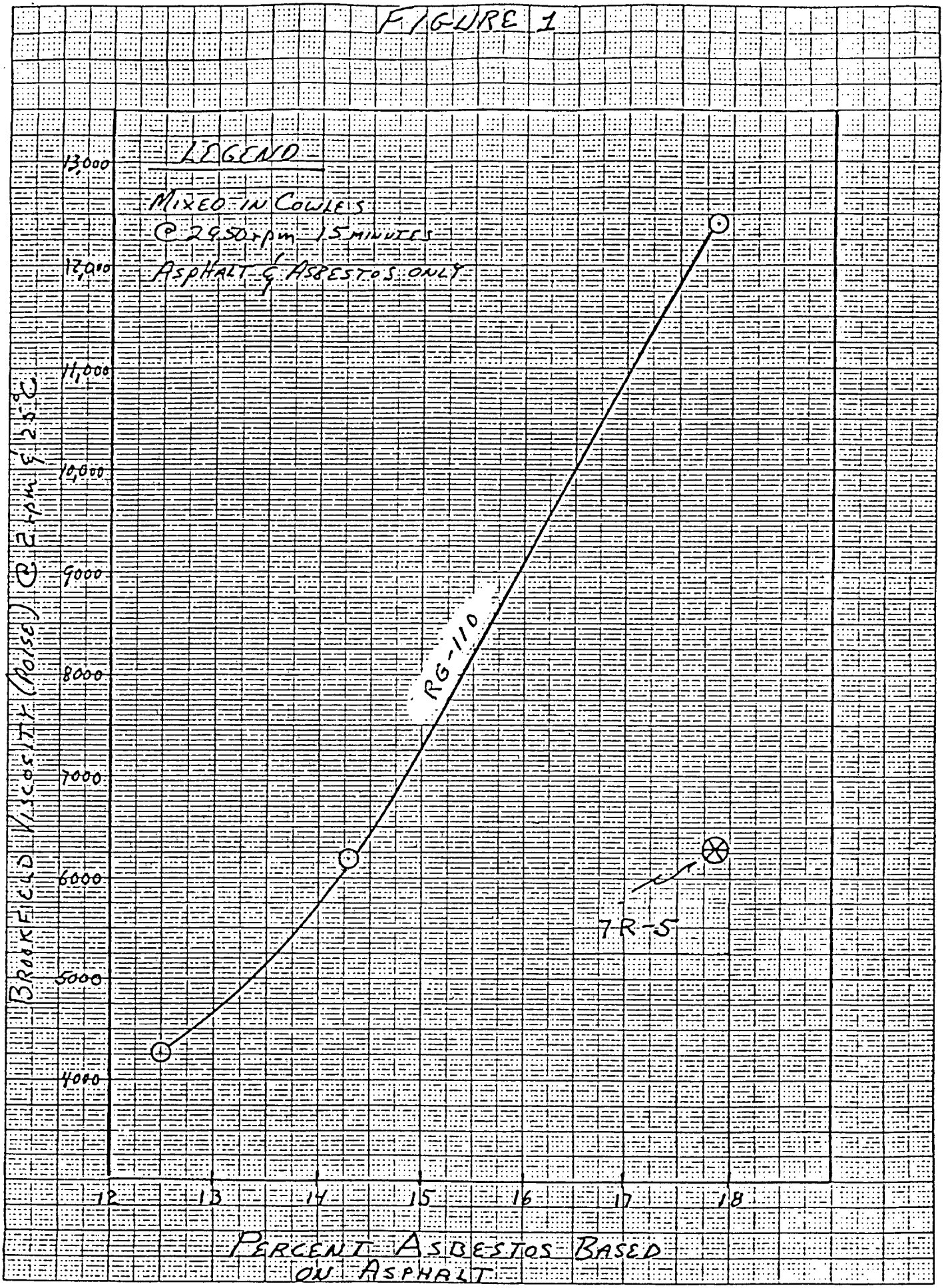
A comparison of the two systems is shown in Table II. The viscosities of both formulations were off scale @ 20 rpm after the addition of limestone. At 2 rpm, the formulation containing 17.9% 7R-5 was somewhat higher compared to the 12.5% loading of RG-110. Measurements obtained just prior to the addition of limestone demonstrated similar results, however, RG-110 exhibited a much higher thixotropic index.

The shelf stability of the two systems over a period of two weeks is shown in Table III. The samples were hand stirred with a spatula for one minute prior to measuring viscosity. The RG-110/surfactant system exhibited superior stability compared to 7R-5.

In conclusion, the results show RG-110 to be more thixotropic and in the order of 25% more efficient than the L[illegible] asbestos product in the range of viscosities specified by . The relatively low shearing action of a ribbon blender is not sufficient for proper dispersion of "Calidria" asbestos. However, an addition of 0.3% Aerosil OT-B (based on the asphalt) prior to the addition of asbestos and followed by an equal amount of DEG will facilitate the dispersion of RG-110. The surfactant system also contributes to better viscosity stability and the general appearance of the compound.

B. L. Ingalls

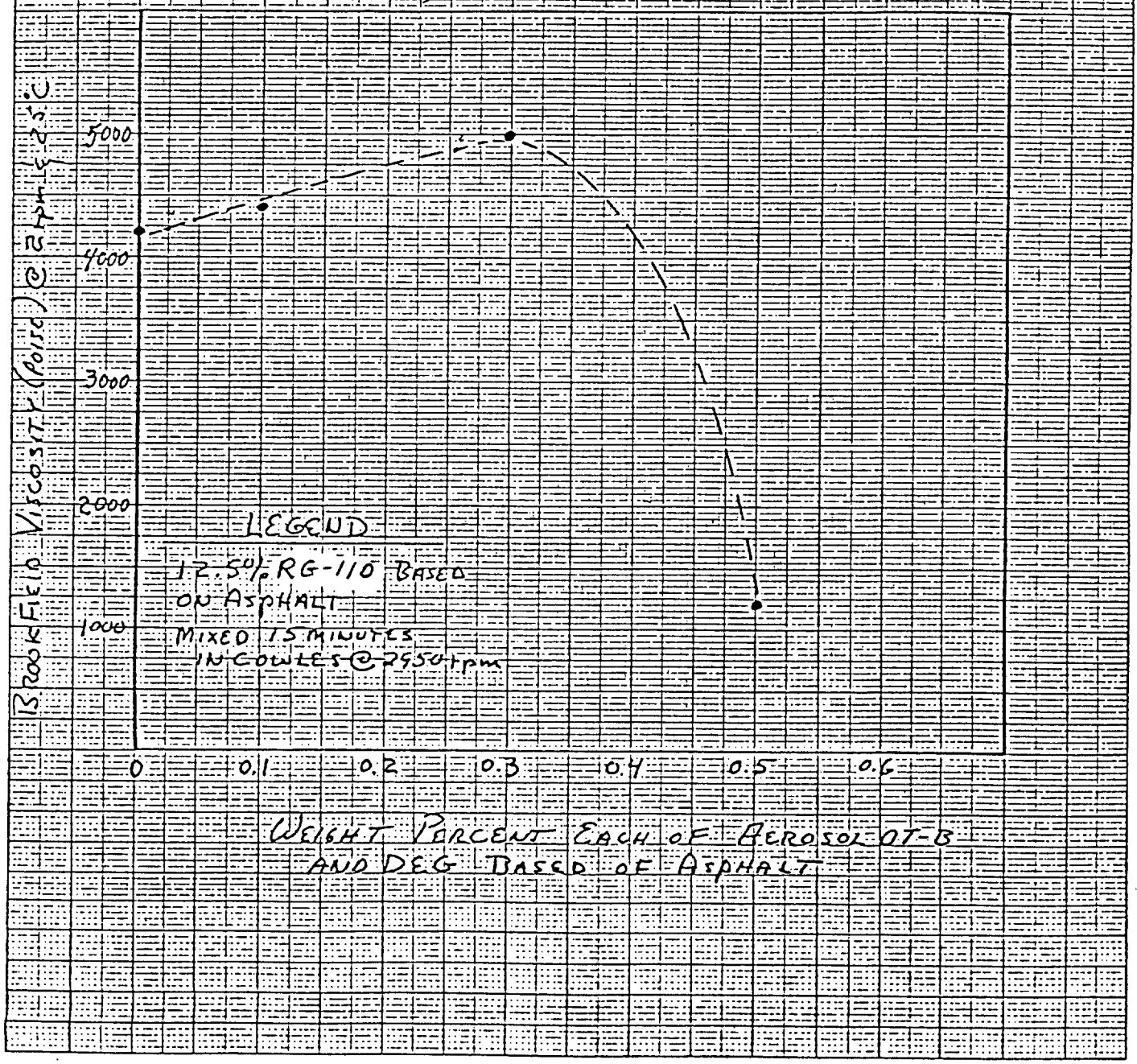
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FIGURE 2

EFFECTS OF AEROSOL OT-B & DEG ADDITION ON VISCOSITY OF ASPHALT/RG-110 FORMULATION



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TABLE I

VISCOSITY CHARACTERISTICS OF "CALIDRIA" RG-110 & LAKE 7R-5

IN ASPHALTIC COMPOUND PREPARED IN COWLES MIXER (15 min. @ 2950 rpm)

Asphalt Wt. in gms.	Percent Based on Asphalt					Brookfield Viscosity @ 25°C (Poise)		
	7R-5	RG-110	Aerosil OT-B[1]	DEG[2]	Limestone	@ 2 rpm	@ 20 rpm	Thix Index[3]
504	17.86%	-	-	-	-	6,300	1200	5.3
"	-	17.86%	-	-	-	12,400	1720	7.2
"	-	12.5%	0.3%	0.3%	-	5,000	820	6.1
"	-	12.5%	0.1%	0.1%	-	4,400	680	6.5
"	-	12.5%	-	-	-	4,200	660	6.4
"	-	12.5%	0.1%	0.3%	-	4,000	660	6.1
"	-	12.5%	0.5%	0.5%	-	1,200	360	3.3
"	-	14.29%	-	-	-	6,200	900	6.9
"	17.86% (recheck)	-	-	-	-	6,200	1320	4.7

1. Aerosil OT-B anionic dioctyl ester of sodium sulfo-succinic acid (American Cyanamid Co.)
2. DEG Diethylene Glycol
3. Ratio of viscosities @ 2 and 20 rpm.

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TABLE II

VISCOSITY CHARACTERISTICS OF "CALIDRIA" RG-110 & LAKE 7R-5
IN ASPHALTIC COMPOUND PREPARED IN SIGMA MIXER (1)

Asphalt Wt. in gms.	Percent Based on Asphalt					Brookfield Viscosity @ 25°C (Poise)		
	7R-5	RG-110	Aerosil OT-B[2]	DEG[3]	Limestone	@ 2 rpm	@ 20 rpm	Thix Index[4]
1008	17.9%	-	-	-	-	4,000	870	4.6
"	17.9%	-	-	-	60.7%	11,600	OS[5]	?
"	-	12.5%	0.3%	0.3%	-	3,800	620	6.1
"	-	12.5%	0.3%	0.3%	60.7%	9,800	OS	?

1. Materials blended in Sigma Mixer a total of 50 minutes - 40 minutes prior to the addition of Limestone, 10 minutes after Limestone addition.
2. Aerosil OT-B anionic dioctyl ester of sodium sulfo-succinic acid (American Cyanamid Co.)
3. DEG Diethylene Glycol
4. Ratio of viscosities @ 2 and 20 rpm.
5. OS - Off Scale

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TABLE III

VISCOSITY STABILITY OF ASPHALT COMPOUNDS
PREPARED 7.2 pph RG-110 vs. 10 pph 7R-5 (1)

	Lake 7R-5 Formulation Viscosity (Poise)			"Calidria" RG-110 Formulation Viscosity (Poise)		
	@ 2 rpm	@ 20 rpm	Thix Index	@ 2 rpm	@ 20 rpm	Thix Index
Initial	11,600	OS (2)	?	9,800	OS	?
24 hrs.	13,200	OS	?	11,100	1800	6.2
~1 wk.	18,400	OS	?	10,000	2000	5.3
~2 wks.	15,000	OS	?	11,000	1880	5.9

1. Basic Formulation:

For Lake Formulation	For Calidria Formulation
1008 gm. Asphalt	1008 gm. Asphalt
180 gm. 7R-5	3 gm. Aerosil OT-B
612 gm. Limestone	126 gm. RG-110
	3 gm. DEG
	612 gm. Limestone

Mixing Conditions: 50 minutes in Sigma Mixer.

2. OS - Off Scale