F. H. Larison

TECHNICAL SERVICE REPORT

by

D. H. Reed

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# The Use of Calidria SG-210 Asbestos in Dry or Ready-Mix Tape Joint Compounds

Union Carbide Corporation
Chemicals and Plastics
Research and Development Department
South Charleston, West Virginia

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## What Asbestos Fibers Do in Tape Joint Compound

Asbestos performs a number of functions in commercial ready and dry-mix tape joint compounds. The primary function is to form the backbone or "web" for the inert fillers and film formers to associate with. Upon drying, or film cure, the asbestos adds a significant amount of dimensional strength to the applied materials. The influence of asbestos on other formulated performance properties depends upon the particle size and concentration level with respect to the other inert fillers.

Asbestos functions as a secondary bodying and thickening agent, in wet formulations, via the water absorption capacity of the fiber. In this capacity, it contributes to the reduction of product density in relationship to the concentration level employed in the formulation. This comes about as a result of the increased water demand. The water absorption efficiency is a function of the particle size and other physical properties of the asbestos.

Finally, perhaps more than any other filler, asbestos contributes significantly to the formulated compound smoothness, cratering, and "wet edge" properties. This is because of the fibrous nature of asbestos particles. In like manner, both the asbestos particle size and concentration level will determine, to a large extent, the smoothness of the feathered edges.

On the negative side, of the variety of inert fillers employed in a joint compound, asbestos and clays contribute most to the nailhole cracking problems. In the process of water absorption, asbestos particles swell. On drying, these particles shrink with the release of water. Although the swelling is necessary for good product body, asbestos at too high a level can be the single largest contributor to thick layer joint compound shrinkage cracks. Product particle size uniformity is therefore of utmost importance in regard to reproducible built-in properties of a formulated tape joint compound.

## Special Properties of "Calidria" Asbestos

Most asbestos materials, marketed commercially for use in tape joint compounds, contain rock dust and other abrasive type fillers, that have no specific desirable effects on joint compound performance. "Calidria" SG-210 and SG-130 asbestos are produced by a proprietary manufacturing process that yields essentially a pure asbestos fiber content. The SG-210 product is preferred for ready-mix smoothness and water absorption efficiency. Another feature is the unique shape and physical structure of the "Calidria" asbestos fibers. The micro-size particles are actually "fibrils" and the respective stems are hollow; hence, the fibers have a tremendous water absorption capacity. In like manner, there are more "active sites" for other inert fillers to associate with, in formulated film formation. As a result, "Calidria" asbestos generally goes twice as far, on a pound for pound basis, as the Canadian and other commercial types used in tape joint compounds. It is these physical properties that enhance the wet joint compound workability and performance properties mentioned above.

## How to Use "Calidria" Asbestos in Tape Joint Compounds

"Calidria" asbestos can be used in dry or ready-mix compounds, with very little change in formulation parameters. Since "Calidria" SG-210 will go twice as far as similar Canadian types, a good substitution starting point is



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ACL Doc 17840 · Page 2 of 8 asbestosclaims.law/library/17840/2

one-half as much. The formulation weight difference is best made up with mica or calcium carbonate dry filler.

The typical product characteristics of "Calidria" SG-210 and SG-130 are listed in Table I. The SG-130 is shown, because it can be used in formulations where surface smoothness is not as desirable as that obtained with SG-210 asbestos.

The relationship of "Calidria" asbestos fiber physical properties to subsequent oil or water demand characteristics are depicted in Figure 1. In Figure 1, these absorption characteristics are compared to typical commercial grades regularly employed in joint compounds. The data, in Figure 1, show that a good "Calidria" asbestos substitution starting point is at about 50 percent, by weight, less than other typical commercial asbestos, without changing significantly the original formulation water demand (i.e. one-half the amount of other sources). The weight differences can be made up with either additional amounts of calcium carbonate or mica fillers. The latter is preferred with respect to ready-mix water demand and good nailhole cracking resistance. No other changes are necessary in the formulation.

Three suggested tape joint compound ready-mix formulations are listed here to depict the use of Calidria SG-210 asbestos. These are listed in Tables II, III, and IV. These formulations differ in both the ratio and types of additives, to introduce desired formulation end-use properties. For example, the suggested bedding coat material, Table II, does not have as smooth a dry surface, but should fill the primary requirements of good tape adhesion and a minimum amount of thick layer cracking. The general purpose formulation, Table III, should depict good overall working properties and have better wet edge and surface smoothness than the bedding coat material. A topping coat product, Table IV, should exhibit a minimum amount of volume shrinkage,(note the higher density), have exceptional surface smoothness, and wet edge. In addition, a minimum amount of sanding is desirable for topcoat materials. In actual practice, the bedding and top-coat materials are giving away to the general purpose types.

If Canadian or other types of asbestos were used in these suggested formulations, it would be at double the concentration level indicated to achieve essentially the same water demand. In like manner, the higher asbestos level dry compound surface smoothness would not be as evident with everything else being equal.

The formulations listed here are merely suggested ones. Experienced tape joint compound formulators have their own source of fillers and usually employ other ingredients to fit particular geographic conditions and subsequent end-use requirements. In the case of asbestos, the choice is generally between the Canadian and "Calidria" types. It is a matter of grades employed, efficiency, and effect on compound workability and dry-film cratering. In these important areas, "Calidria" SG-210 asbestos shows extremely good properties in either dry or ready-mix tape joint compounds.

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ACL Doc 17840 · Page 3 of 8 asbestosclaims.law/library/17840/3

TABLE I

UNION CARBIDE CALIDRIA ASBESTOS

| Typical Product Characteristics | | |
|---|---|---|
| | SG-130 | SG-210 |
| Reflectance (G.E. Photovolt) | 68% | |
| Contained magnetite | 2% Max. | |
| Alkalinity (as % of $Na_2O$) | 0.05-0.06 | |
| pH (5% aqueous slurry) | 8.5-9.5 | |
| Surface area (BET) | 50-60 $m^2/g.$ | |
| Oil Adsorption (DOP #/100# asbestos) | 90-100 | 110-120 |
| Wet Bulk, settled vol. (ml.) 10g/250 ml./1 hr. | 200 | 220 |
| Dry Bulk (#/ft.3) | 7-8 | 5-6 |
| Water absorption (wt. % in filter cake) | 55-60 | 62-65 |
| Size distribution (Cumulative % retained) | | |
| Wet Screen mesh size | | |
| 100 | 5 | Trace |
| 200 | 17 | 3 |
| 325 | 28-32 | 10-15 |

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TABLE II

UCAR LATEX WC-130 OR 131

SUGGESTED BEDDING COAT TAPE JOINT COMPOUND

(13-DHR-18)

| Ingredients and Order of Addition(a) | Pounds | Gallons | Lbs/100 Gal | % by Wt |
|---|---|---|---|---|
| 1. Water | 1932 | 232.43 | 424.16 | 31.39 |
| 2. CELLOSIZE TJC Thickener, Union Carbide | 20 | 1.72 | 4.41 | 0.32 |
| 3. Bacteriastat "Dowicide" A or similar | 8 | 0.74 | 1.72 | 0.13 |
| 4. Dispersant, "Daxad"-30, (25% T), Dewey and Almy | 64 | 6.53 | 14.01 | 1.04 |
| 5. UCAR Latex WC-130, (58% T), Union Carbide | 414 | 44.66 | 90.94 | 6.73 |
| 6. Dibutyl Phthalate, Union Carbide | 24 | 2.75 | 5.23 | 0.39 |
| 7. Ethylene Glycol, Union Carbide | 40 | 4.30 | 8.74 | 0.65 |
| 8. Calidria Asbestos SG-210, Union Carbide | 180 | 8.45 | 39.62 | 2.92 |
| 9. Mica P-80-F, Western Mica | 840 | 36.68 | 184.34 | 13.66 |
| 10. Clay, ASP-400, Minerals and Chemicals, Phillip | 160 | 7.44 | 35.04 | 2.60 |
| 11. Calcium Carbonate, No. 1 White Thompson-Weinman | 2468 | 109.20 | 542.17 | 40.11 |
| 12. NOPCO PD #1 Antifoam Nopco Chemical Company | 4 | 0.55 | 0.88 | 0.06 |
| | 6154 | 455.45 | 1351.26 | 100.00 |

Note (a) Mixed 1.5 to 2.0 hours in a one-gallon Baker-Perkins, Sigma Blade Type Mixer, at 79 r.p.m.

Typical Properties

| | |
|---|---|
| Water Content | 35.1% |
| Pounds/Gallon | 13.51 |
| Brabender Viscosity | 700 B.U. |
| Adhesion to Wallboard Tape | 100% |
| Nailhole Cracking Resistance | 99% |
| Sandability | Good |

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TABLE III

UCAR LATES WC-130 OR 131

SUGGESTED GENERAL PURPOSE TAPE JOINT COMPOUND

(13-DHR-68)

| Ingredients and Order of Addition(a) | Pounds | Gallons | Lbs/100 Gal | % by Wt |
|---|---|---|---|---|
| 1. Water | 1932 | 232.43 | 421.67 | 31.35 |
| 2. CELLOSIZE TJC Grade Thickener, Union Carbide | 20 | 1.72 | 4.41 | 0.32 |
| 3. "Dowicide" A, or similar bacteriastat | 8 | 0.74 | 1.73 | 0.13 |
| 4. "Daxad"-30, dispersant (25% T) | 64 | 6.53 | 14.01 | 1.04 |
| 5. UCAR Latex 131 preplasticized (59% T), Union Carbide | 447 | 48.48 | 97.55 | 7.25 |
| 6. Ethylene Glycol, Union Carbide | 40 | 4.30 | 8.74 | 0.65 |
| 7. Calidria SG-210 Asbestos, Union Carbide | 180 | 8.45 | 39.19 | 2.92 |
| 8. Mica, AA, Thompson-Weinman | 420 | 18.34 | 91.60 | 6.81 |
| 9. Mica, P-80-F, Western Mica | 420 | 18.34 | 91.60 | 6.81 |
| 10. Clay, ASP-400 | 100 | 4.65 | 21.71 | 1.62 |
| 11. Calgon, Water Conditioner | 20 | 3.12 | 4.35 | 0.32 |
| 12. Talc, Asbestol or A-200 | 40 | 1.69 | 8.77 | 0.65 |
| 13. No. 1 White Calcium Carbonate | 2472 | 109.38 | 539.69 | 40.13 |
| | 6163 | 458.17 | 1345.02 | 100.00 |

Note: (a) Mixed 1.5 to 2.0 hours in a one-gallon Baker-Perkins, Sigma Blade Type Mixer, at 79 r.p.m.

Typical Properties

| | |
|---|---|
| Water Content | 35.1% |
| Pounds/Gallon | 13.45 |
| Adhesion to Wallboard Tape | 100% |
| Brabender Viscosity | 600 F |
| Nailhole Cracking Resistance | 95% |
| Sandability | Good |

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TABLE IV

## SUGGESTED TAPE JOINT TOPPING COMPOUND
## (13-DHR-48)

| Ingredients and Order of Addition[a] | Pounds | Gallons | Lbs/100 Gal. | % by Wt. |
|---|---|---|---|---|
| Water | 1714 | 206.21 | 399.81 | 28.27 |
| CELLOSIZE TJC Grade | 30 | 2.59 | 6.96 | 0.49 |
| Dowicide "A", Bacteriastat | 8 | 0.74 | 1.84 | 0.13 |
| UCAR Latex WC-130 (58% S) | 345 | 37.26 | 80.47 | 5.69 |
| Dibutyl Phthalate | 20 | 2.29 | 4.62 | 0.33 |
| Ethylene Glycol | 40 | 4.30 | 9.39 | 0.66 |
| Calidria SG-210 Asbestos | 180 | 8.45 | 42.17 | 2.97 |
| Mica (P-80-F) | 100 | 4.37 | 23.36 | 1.65 |
| Mica (Ser-X) | 400 | 17.47 | 93.20 | 6.60 |
| Clay, ASP-400 | 40 | 1.86 | 9.24 | 0.66 |
| No. 1 White Calcium Carbonate | 3127 | 138.36 | 729.53 | 51.56 |
| Talcum Powder (Mallinkrodt) | 40 | 1.69 | 9.24 | 0.66 |
| Calgon, Regular | 20 | 3.12 | 4.67 | 0.33 |
| | 6064 | 428.71 | 1414.50 | 100.00 |

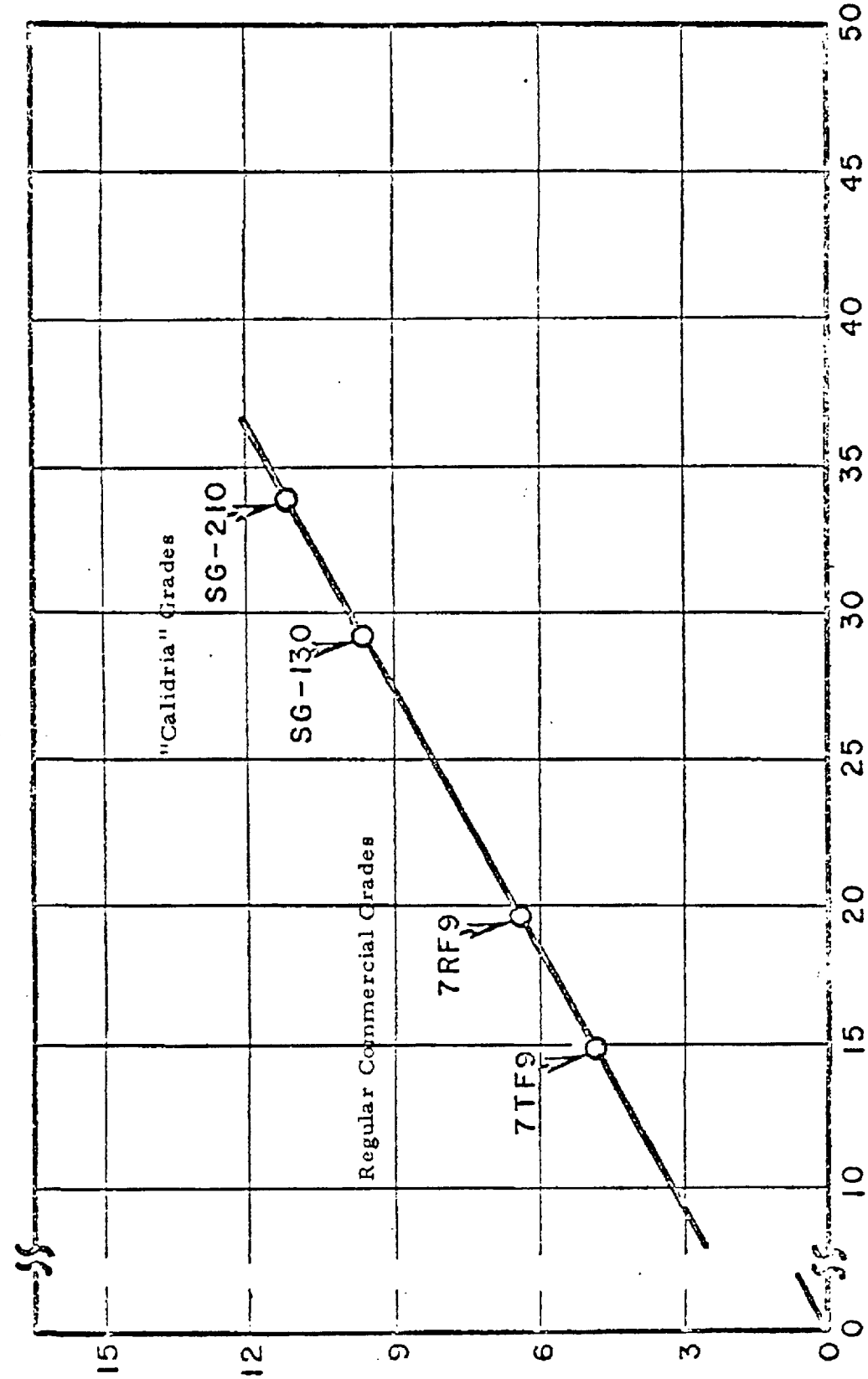
| | |
|---|---|
| Water Content | 30.66% |
| Pounds/Gallon | 14.14 |
| Brabender Viscosity | 840 B.U. |
| Adhesion to Wallboard Tape | 100% |
| Nailhole Crack Resistance | 92% |
| Sandability | Good |

NOTE: (a) Mixed 1.5-2.0 hours in a one-gallon Baker-Perkins, Sigma Blade Type Mixer, at 79 r.p.m.

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FIGURE 1




RELATIONSHIP BETWEEN WATER & OIL ADSORPTION CAPACITY OF SOME ASBESTOS PRODUCTS FOR TAPE JOINT ADHESIVE FORMULATIONS

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