

GENERAL
HEADING:

UNIT NO.

REPLACES NO.



**SIERRA TALC &
CLAY COMPANY**

P. O. BOX 390
1605 HUNTINGTON DRIVE
SOUTH PASADENA, CALIF.

Subject: **GRADES, TYPES, PROPERTIES
AND RECOMMENDATIONS**

June 1, 1954

The selection of the proper talc for a specific use is an important function of the paint formulator. Talc differ widely chemically and physically. Properties of finished paints can be altered or controlled by the type and quantity of talc used.

Talc occur in four basic types as follows:

- Fibrous or foliated
- Tremolitic or acicular
- Platey or micaceous
- Granular

Only Sierra Talc & Clay Company produces all four of these types. Each, due to its particular particle structure, contributes certain specific properties to paint. All talcs are magnesium silicates and, although Sierra talcs differ somewhat in their chemical analyses, it is the physical properties, such as particle shape and size, texture and color, which are important in their effect on paint.

Particle size is affected by the natural crystal grain size of the raw talc. It is controlled by the degree and type of milling in Sierra's four mills. Milling consists of two types:

1. Roller mill grinds with air separation to conventional 200 and 325 mesh.
2. Micronization in high speed mills to ultra-fine and sub-sieve particle size.

The first ten talcs listed in the tables are standard roller mill grinds. Sierra's standard ground paint talcs are graded for every paint use where Hegman finenesses of 1-4 are sufficient. They have the following outstanding properties:

- a. They are soft and non-abrasive. Tremolitic talcs are slightly abrasive.
- b. They are controlled to definite particle size.
- c. They wet quickly and easily.
- d. They flow and brush easily and prevent "ropiness".
- e. They contribute to film strength.
- f. They have proven exterior durability properties.
- g. They promote can stability - do not harden in the can.
- h. They are snow-white.

Sierra's ultra-fine talcs are sold under the registered trade name of "MISTRON". They are graded to Hegman finenesses of 5-7. Sierra Mistron talcs are opening new vistas in paint formulation. Their interesting and exclusive properties are as shown on page 2. The four basic types shown above have their counterpart in one or more Mistron talcs with the exception of the tremolitic type.

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The information contained herein is an expression of opinion based on careful facts and investigations, but is not a warranty. It is recommended that trial tests be conducted before a final decision is made on any particular product.

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Properties of Sierra Mistron Talcs:

- a. They can be stirred in - require NO further grinding.
- b. They are outstanding for film smoothness.
- c. They are non-settling and non-hardening in the can.
- d. They promote pigment dispersion.
- e. In certain formulae they promote hiding power and can reduce cost by permitting a reduction in hiding pigment content.
- f. They quickly reduce gloss, hence are excellent for flattening or control of gloss.
- g. They promote viscosity increases.
- h. They improve ease of brushing and tend to prevent "sag."
- i. They are controlled to definite top particle sizes.
- j. They are compatible with water emulsion resins.

Descriptions of Sierra paint talcs by type follow. They are listed in the order of their fineness of grind from coarsest to finest.

FIBROUS OR FOLIATED: Sierra's fibrous or foliated talcs differ from those produced in other parts of the country. They are extremely soft in texture, snow-white, and consist of short, soft fibres, interspersed with platy particles. This combination of short fibres and platelets makes them the ideal type for adding strength to the paint film for promoting durability and for non-settling.

Sierra grades:	Fibrene C-300	Mistron 139
	Fibrene M-300	Mistron F-128
	Fibrene C-400	Mistron T-076
	Fibrene C-500	Mistron MSC

Suggested uses: House paints, industrial paints, government specification paints, flat enamels.

Mistron MSC paint talc is distinctive in that it is stearate coated while being ground. It has superior non-settling properties to any paint talc on the market. Its reduction in oil absorption permits it to be used in gloss enamels. For lacquer sealers and synthetic enamel finishes it is unexcelled.

Fibrene M-300 is produced only at our Grand Island, Nebraska, mill from Montana talcs. It is similar to the other Fibrene talcs except that it contains a portion of granular particles for slightly higher consistency in paints.

TREMOLITIC OR ACICULAR: These talcs are similar to those produced in New York State and are altered from the mineral tremolite, a calcium magnesium silicate. They are characterized by their long, needle-like crystals and are considerably harder than the fibrous or foliated talcs.

Sierra grades:	NS SILVER	IS SILVER
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Suggested uses: Floor and deck paints, traffic paints and for any other use where greater hardness of film and lower oil absorption is needed.

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PLATY OR MICACEOUS: The platy particle shape of these talcs imparts superior flow, brushability and smoothness of film because the particles tend to align themselves in the same plane. They are similar to the better water-washed micas in these respects. They are the best for the promotion of hiding power. They add "slip" to paints and printing inks. They are pure chemically, completely inert and extremely low in water solubles.

Sierra grades: No. 7 Sagger
Trinity Superfine
Mistron HGO-75
Mistron HGO-55

Suggested uses: Water emulsion paints, casein, latex, polyvinyl acetate, acrylic and also automotive lacquers, furniture finishes and enamellized house paints.

GRANULAR: This type of talc is also commonly known as steatite. It is characterized by its dense, massive structure and uniformity of particle shape, which approaches the spherical. It is soft and sands readily without roughing or gumming. It promotes excellent adhesion.

Sierra grades: Sierra White #111
Sierra Cloud
Mistron HG-75

Suggested uses: Sanding sealers and surfacers. Nitro-cellulose and synthetic automotive and furniture finishes.

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We realize that the paint manufacturer will wish to formulate with as few grades of talc as possible. Therefore, the recommendations listed for the four different types are not necessarily rigid. With proper selection and formulation two or three talcs should serve all the needs of the paint plant.

PAINT PROPERTIES AFFECTED BY TALC SELECTION

The following paragraphs indicate how paint properties can be altered or controlled by selecting the proper talcs.

GLOSS (60°) The Mistron talcs are particularly effective for quick reduction and control of gloss in semi-gloss, egg-shell and flat enamels. They can be stirred in to a gloss paint to obtain any degree of flatness desired. Selection of a particular Mistron talc for this purpose depends on the quantity limitations of the extender content and upon limitations as to viscosity.

SHEEN Commonly called "angular sheen" and rated as 85° gloss, sheen can be enhanced by the selection of a Mistron talc or almost eliminated by using a coarser ground talc such as the Fibrenes and Silver talcs. Coarser particle size extenders promote a rougher film surface which diffuses light rather than reflecting it.

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OIL ABSORPTION Oil absorption has a bearing on the viscosity, gloss and working properties of a paint, but it has been exaggerated in its importance. The degree of oil absorption of a talc is affected by its particle size and particle shape. Oil absorption increases as the fineness of the talc is increased. Granular talcs yield the highest oil absorptions followed by platy, fibrous and tremolitic talcs in that order.

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VISCOSITY Viscosity effects are indicated but not completely controlled by oil absorption. Generally speaking the platy and granular talcs yield the highest consistency in paint. Viscosity also increases as the fineness of the talc is increased. The Mistron talcs are handy tools for increasing viscosity and this again is often done by merely stirring in the Mistron. Mistron MSC yields the lowest viscosity of any of the Mistrons and thus is valuable where larger quantities of talc are desired in the formula without too great a consistency increase.

FINENESS The fineness of a paint as determined on the Hegman gauge can be no greater than the micron size of the largest particle present in the paint pigments. Therefore, control of the top particle size of the talc is by far the most important single factor determining paint fineness. If the finer grinds of 4 to 7 are required, and coarser extenders are used, particle size reduction has to take place in the paint mill. The Mistron talcs overcome this difficulty by coming ready for use WITHOUT further grinding to yield fineness as high as Hegman 7. Selection of the talc to give a desired fineness can be determined by consulting the tables. Fineness of grind is becoming more important with the increased use of high speed paint mills and dispersion mills.

HIDING POWER The index of refraction of talc being about the same as the oils and resins commonly used, talc does not by itself have appreciable hiding power. However, their great ability to disperse the hiding pigments and keep them dispersed does result in a significant increase in dry hide when the Mistron talcs are used. In research work done in our laboratories on flat wall paints, it was found that hiding power increase is relative to the specific surface of the talc. The Mistron talcs, due to their very great surface area, result in a rapid increase of dry hide whereas little or no increase results when the coarser talcs are used. With the Mistron talcs it is possible to decrease the amount of hiding pigments and thus decrease costs.

PENETRATION AND COLOR STABILITY Talcs are superior to other extenders in preventing flooding or floating of color pigments, particularly in the deep tones. Because they tend to retard penetration, the Mistron talcs are particularly effective in color uniformity over both sealed and unsealed surfaces. The platy talcs are superior in retarding penetration.

CAN STABILITY Talc is one of the very best extenders for prevention and/or retarding of settling. The fibrous or foliated types are the most effective for non-settling. Mistron MSC is the best of all talcs in suspension properties. When settling does occur in paints formulated with Sierra talcs, the settled portion remains soft and can be readily redispersed.

DURABILITY The Fibrene talcs, due to their combination of fibrous and platy particles, contribute greatly to exterior durability. The platy talcs contribute to film smoothness and result in less dirt accumulation. Mistron HGO-75 has been proven superior in promotion of durability in water emulsion exterior paints. In paints having to withstand severe salt spray tests, Fibrene C-400 is outstanding. The same is true of marine paints.

TEST METHODS AND REFERENCES

ACID SOLUBLES are determined as follows: Boil 1 gm. of talc with 50 cc. of 1/10 N sulfuric acid and about 50 cc. of distilled water. Then titrate to a faint pink with 1/10 N sodium hydroxide using a few drops of phenolphthalein as indicator. The difference between the volume of acid and the required volume of sodium hydroxide multiplied by 0.28 equals the % of acid soluble substances calculated as CaO.

SURFACE MEAN DIAMETER is determined in the Fisher Sub-sieve Particle Size Analyzer by the air permeability method of E. L. Gooden and C. M. Smith, Ind. Eng. Chem., Anal. Ed. 12 479-82 (1940). Specific surface values are expressed as square meters per gram.

SPECIFIC SURFACE is calculated from surface mean diameter according to the following:

$$S_w = \frac{6 \times 10^4}{d_m p}$$

where S_w = specific surface in cm^2/g .
 d_m = surface mean diameter in microns
 p = specific gravity of sample

PARTICLE SIZE DISTRIBUTION: For complete particle size analyses in the full range of micron sizes, consult Sierra's Talc Portfolio. Method: The turbidimetric method of Musgrave and Harner. See Sierra's Technical Report No. 21-T.

OIL ABSORPTION is reported by both the Gardner-Coleman and the spatula rub-out methods. Spencer-Kellogg's "SUPERIOR" linseed oil was used. Rub-out methods for oil absorption were run to the Azam end-point. See M. A. Azam "Oil Absorption of Pigments" Ind. Eng. Chem., Anal. Ed. 14, 545 (1942)

CONSISTENCY RATINGS are made on the Krebs modification of the Stormer Viscosimeter using a 40% suspension of talc in linseed oil at 25° C., agitated for 10 minutes and consistency measured by ASTM Method D 562-44.

FLATTING AND HIDING POWER are determined by results obtained in a gloss alkyd enamel. Efficiency of the various talcs should be relatively the same for other finishes. For complete results consult Sierra's Technical Report No. 22-T dated October 6, 1953. Talcs are rated in the order of their efficiency. No. 1 for instance gives the quickest and greatest reduction of gloss, No. 16, the least reduction, both determined at 40% pigment volume concentration. For reduction of angular sheen, measurements at 60% P.V.C. were used because this PVC accentuated to the greatest degree the true difference between the various talcs. Hiding power determinations were rated at 70% P.V.C., the point at which dry hide differences could be best accentuated.

For complete chemical analyses and physical properties, consult Sierra's Talc Portfolio and published Technical Reports.

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CHEMICAL AND PHYSICAL PROPERTIES OF TYPICAL SAMPLES OF SIERRA PAINT TALCS

<u>CHEMICAL PROPERTIES</u>	<u>Fibrene C-300</u>	<u>Fibrene H-300</u>	<u>Fibrene C-400</u>	<u>Fibrene C-500</u>	<u>N.S. Silver</u>	<u>I.S. Silver</u>	<u>Saggar #7</u>	<u>Trinity Superfine</u>	<u>Sierra White Fill</u>	<u>Sierra Cloud</u>	<u>Mistron 139</u>	<u>Mistron F-128</u>	<u>Mistron T-076</u>	<u>Mistron M8C</u>	<u>Mistron HQ-75</u>	<u>Mistron HQ-55</u>
Combined Ca and Mg Silicates, %	81-89	90-92	88-90	90-92	89-91	89-91	54-56	91-92	85-89	89-91	90-92	90-92	90-92	90-92	91-92	91-92
Calcium Oxide, CaO, %	8-11	4-6	5-7	4-6	9-10	9-10	1-3	.75-1.5	6-10	2-3	4-6	4-6	4-6	4-6	.75-1.5	.75-1.5
Acid Solubles as CaO, %	8-11	3-5	5-7	3-5	3-5	3-5	1-3	.90-1.2	6-10	2-3	3-5	3-5	3-5	3-5	.90-1.2	.90-1.2
Loss on Ignition, %	13-14	6-7	8-9	6-7	6-7	6-7	9-10	5-6	10-11	6-7	6-7	6-7	6-7	6-7	5-6	5-6
pH Value	9.4	9.0	9.3	9.4	9.4	9.4	9.1	9.3	9.3	9.4	9.4	9.4	9.4	9.4	9.3	9.3
Specific Resistance, Ohms	4,200	14,560	7,360	12,720	5,580	5,170	12,200	15,160	3,170	4,900	7,360	7,360	7,360	5,475	15,160	15,160
<u>FINENESS</u>																
Maximum Particle Size in Microns	60	50	46.0	46.0	70	60	80	46	60	46	30	15	12	8	12	9.5
Surface Mean Dia. in Microns	2.5-2.7	2-2.4	2.3-2.5	1.8-2.0	4.9-5.0	3.5-3.9	3.4-3.6	2-2.5	3.1-3.3	2.9-3.0	1.2-1.3	1-1.2	0.8-0.9	1-1.2	0.7-0.9	0.5-0.6
Specific Surface, Sq. Meter/Gram	0.7-0.8	0.9-1.0	0.8-0.9	0.9-1.0	0.5-0.6	0.6-0.7	0.7-0.8	0.9-1.0	0.6-0.7	0.7-0.8	1.8-1.9	2.1-2.3	2.3-2.4	2.0-2.2	2.7-2.9	3.8-4.0
Screen, % through 325 Mesh	98-98.5	99-99.2	99.3-99.6	99.6-99.8	94-96	99-99.3	98-99	99.2-99.6	93-96	99.2-99.6	100	100	100	100	100	100
% Finer than Equivalent Spherical Diameter in Microns - 20	84.4	81.4	85.4	96.5	55.5	70.9	77.0	75.0	69.0	74.9	96.7	100	100	100	100	100
10	58.2	61.1	59.2	72.0	29.5	36.0	54.5	38.7	44.0	49.0	81.1	93.5	97.3	100	96.9	100
4	27.6	33.2	25.2	34.0	12.5	14.5	26.4	14.7	18.5	17.5	44.8	52.4	59.7	75.1	51.1	66.6
1	7.0	6.4	5.5	8.0	3.2	4.0	7.2	2.6	3.1	2.8	13.8	15.9	20.6	20.7	12.6	25.7
<u>OTHER PHYSICAL PROPERTIES</u>																
Specific Gravity	2.79	2.77	2.79	2.79	2.85	2.85	2.80	2.76	2.69	2.73	2.79	2.79	2.79	2.79	2.76	2.76
Weight per Solid Gallon	23.24	23.07	23.24	23.24	23.74	23.74	23.32	22.99	22.41	22.74	23.24	23.24	23.24	23.24	22.99	22.99
1 lb. Bulks/Gallons	.04303	.04335	.04303	.04303	.04212	.04212	.04288	.04350	.04462	.04227	.04303	.04303	.04303	.04303	.04350	.04350
Apparent Density																
Scott Volumeter, lbs./ft. ³	23-24	20-21	22-23	19-21	32-33	28-29	24-25	23-24	28-29	27-28	14-15	12-13	11-12	10-11	10-11	8-9
Lustrous Apparent Reflectance (Green Filter)	88	85	88	88	83	85	76	87	75	81	88	88	88	81	85	85
<u>CHARACTERISTICS IN OIL</u>																
Oil Absorption																
Spatsla Rub-Out lbs./100 lbs.	28-30	30-32	30-32	28-30	26-28	28-30	32-34	32-34	26-28	30-32	35-37	38-40	42-44	33-35	50-52	55-60
Milliliters per 20 Grams (Gardner-Colman Method)	7-8	8-9	7.5-8	7-8	6-7	6.5-7.5	7-8	8-9	8-8.5	7-8	9-10	10-10.5	10-11	8-9	13-14	15-16
Consistency in Linseed Oil																
10% Suspension, KV	68-70	70-72	70-75	71-73	55-60	60-62	65-67	70-75	64-66	62-64	87-89	89-92	94-97	66-69	116-119	130-150
Hegman Fineness in Oil	2-3	2-3	2.5-3.5	3.5-4.5	1-2	2-3	2-3	3.5-4.5	1.5-2.5	2-3	4-5	5-6	6-7	6-7	3	6-7
Flaking Efficiency - 60° Gloss	12	11	9	8	16	15	13	6	14	10	7	4	5	2	3	1
85° Sheen	3	4	6	8	1	7	10	5	2	9	11	12	13	16	14	15
Hiding Power Rating	13	12	9	8	16	11	14	7	15	10	6	5	4	3	2	1

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