

architects' guide to joint treatment

Data for use in selecting
and specifying gypsum drywall
joint finishing systems that
provide superior performance

UNITED STATES GYPSUM

superior U.S.G. joint treatment systems provide beautiful walls and ceilings

Within the last 12 years, United States Gypsum has introduced many new products and systems for drywall construction. These systems offer specialized sound control and fire resistance together with speed of installation, strength and low cost. Their wide acceptance in commercial, industrial and institutional construction has followed the pattern of drywall's dominance in residential work.

One of the major factors in this spectacular growth is the development and improvement of joint finishing products and methods. As the originator of modern joint treatment, U.S.G. has a history of industry "firsts" (see table).

Leadership in job performance is obtained only through continuous research and development. From the U.S.G. Research Center have come dozens of engineered improvements to make the best use of gypsum panel products. They have been developed to achieve optimum results based on extensive laboratory tests and job-proven performance.

U.S.G. joint treatment products are checked repeatedly for conformance to high standards necessary for quality construction. At the plants, continuous quality control testing of raw materials and manufactured products is maintained to assure shipment of only high-performance items. Every product is thoroughly examined for conformance to ASTM Standards (check cracking, putrefaction, shrinkage, bond, edge cracking) and other research-established performance criteria. In the field, quality control audits are regularly conducted to see that products, packaging, distribution and service provide superior job performance and results.

unit responsibility

U.S.G. joint treatment products are precisely coordinated into systems that provide optimum results in interior or exterior gypsum drywall construction. Use of U.S.G. joint treatments brings the important added advantage of dealing with a single manufacturer who develops and supplies all components of the finished wall or ceiling—gypsum panels, joint compound, reinforcing tape, drywall screws and adhesives, paints, metal studs and other accessories—all made by U.S.G. to *work together*.

U.S.G.'s broad product line meets all basic functional requirements

Today's complete U.S.G. joint treatment line includes three different product groups in paste or powder form, each with its own binder and solidifying method:

Joint Compound Characteristics

product group	type	form	solidifying method
DURABOND Powder	polyindurate (vinyl)	powder	hardening
USG Ready-Mixed	vinyl	paste	drying
USG Powder	non-casein (vinyl)	powder	drying

Historic Research Developments from U.S.G.

- 1907 Plaster of Paris (first joint treatment material)
- 1920 SHEETROCK Finisher (first improved joint compound)
- 1924 USG Joint Cement (first true joint compound)
- 1925 Cloth Mesh Tape (first workable reinforcing tape)
- 1925 U.S.G. Reinforced Joint System (first true system—tape with compound)
- 1927 Metal "A" Tape (first effective reinforcing tape)
- 1927 PERF-A-TAPE Joint System (first mechanically punched paper tape)
- 1927 Low-Alkaline Joint Compound (first formulation usable with modern paints)
- 1927 Spark-Perforated PERF-A-TAPE Reinforcing Tape (unique improvement)
- 1928 The 2-Compound Joint System (first use of two specialized joint compounds)
- 1933 Ready-Mixed All Purpose Compound (first factory-mixed ready-to-use joint compound)
- 1933 DURABOND Joint Compound-Taping (first U.S.G. hardening-type compound)
- 1933 Ready-Mixed Topping Compound (providing the first two-compound Ready-Mixed System)
- 1935 COVER COAT Concrete-finishing Compound (first for drywall trade)
- 1935 DURABOND 90 Joint Compound (first multi-purpose hardening compound)
- 1957 USG Brand Joint Compounds (first major improvement in powder compounds)
- 1961 DURABOND XL Joint Compound (first joint compound formulated for use with exterior ceiling board)

Within each product group are compounds designed for specific purposes as outlined below:

Taping Compounds—used for embedding tape and for the first coat over metal corner beads, trim and fastener heads. They provide the strongest bond between tape and panel; also superior corner reinforcement. Their hardness makes them more difficult to sand and not recommended for finishing coats.

Topping Compounds—used for fill and finish coats over taping compounds to fully conceal the joint area, fastener heads, corner beads and trim. They provide the least shrinkage, best workability and smoothest finish. Their strength is less than taping compounds but sanding and finishing is easier.

All Purpose Compounds—used for all joint compound applications, embedding, fill and finish coats. They offer convenience but are a compromise between the superior bonding quality of taping compound and the superior finishing properties of topping compound.

features of joint compounds

Joint compounds are mixtures of finely ground fillers and adhesive binders which bond the reinforcing tape to the surface paper of gypsum panels. There are two basic forms of compounds—*powder products*, which must be mixed with water before use, and *paste products*, which come factory-mixed and ready for immediate use. Some compounds achieve final hardening and full adhesion by drying; others through chemical reaction. The features of each formulation are shown below.

Casein Powder Compounds—Until the 1950's, all joint compounds were casein-based powder products. They contained alkaline reacting salts to provide solubility but these sometimes caused decorating problems and further, required a 30-minute soaking

period before use. Because improvements in non-casein products have outmoded casein products, U.S.G. discontinued its casein-type PERF-A-TAPE Joint Compounds in early 1972.

Non-casein Powder Components—These products were developed to overcome disadvantages of casein compounds, and now have replaced them. Non-casein compounds have water-soluble adhesive binders and require no alkaline solvent or soaking time. They are usable as soon as adequately mixed.

Ready-Mixed Compounds—The first improvement over casein compounds were ready-mixed paste compounds with vinyl-based binders. The manufacturer takes the responsibility of mixing the compound to a smooth, lump-free consistency. The compounds can be brought to the job and used immediately without the need for water or mixing. Ready-mixed compounds are easier working and sanding, also have better crack resistance than powder compounds with like functions.

Drying Compounds—In all casein, non-casein and ready-mixed products, the joint compound must dry by evaporation of water to become hard and develop adhesion. In drying, these compounds shrink and will continue to shrink until they are completely dry. Thus, it is extremely important that taping or embedding coats and fill coats are completely dry before another coat is applied.

Complete drying reduces the possibility of delayed shrinkage, ridging and bond failure which sometimes occur when joint compound is only surface-dry when finished. Decorating problems resulting from incompletely dried compound are also eliminated.

Drying time depends almost entirely on temperature and humidity. Little can be done by manufacturers to change the drying rate. All compounds will dry quickly on a warm, dry day and very slowly on a cold, damp day. Each coat of compound may dry in a few hours—or up to 53 days under adverse conditions. For a more complete discussion of the subject, refer to "Drying Time Guide" found in U.S.G. Booklets J-75 and WB-52.

Hardening Compounds—The inherent shrinkage characteristic of drying compounds led to the development of polyindurate powder compounds which chemically harden in 4 hours or less. After chemical hardening, they will not shrink. These compounds also have high strength, produce a superior adhesive bond and are virtually unaffected by high humidity and changes in humidity. As with all compounds, they must be protected against freezing.

The primary value of hardening compounds is the shorter time required to finish joints. After the taping compound has hardened—usually in less than 4 hours—the fill coat may be applied without waiting for the compound to dry. This brief period is especially valuable in cold, damp weather when it is often necessary to wait days—even weeks—before drying compounds are ready for another coat. With proper job scheduling and adequate manpower, the three-coat joint treatment of SHEETROCK Gypsum Panels can be completed in a single day.

The high strength and hardness of polyindurate compounds make most of them unsuitable for use as the final topping coat. Other types of topping compounds are easier to sand and touch up for final decoration (see Joint System Selector, page 6).

Exterior Joint Compound—This polyindurate powder product, DURABOND XL Joint Compound, was developed as an exterior joint system for USG Exterior Gypsum Ceiling Board. Unlike other DURABOND Compounds, DURABOND XL is specially formulated for all three joint treatment coats—embedding, filling and finishing. It is also suitable for pre-filling and finishing over metal trim and fasteners. This compound hardens in 30 to 60 min. and can be applied and dried at temperatures as low as 45°F.

compatibility of joint compounds

As described above, each joint compound is designed to provide a distinct job result. The chemistry of each line frequently differs and is sometimes incompatible with another line. The incompatibility arises when products from dissimilar lines become intermixed—either in the mixing container or on the wall. Complete loss of bond or poor application properties can result from contamination.

Casein compounds generally are not compatible with non-casein compounds and with hardening compounds. While casein formulas are fairly tolerant of ready-mixed formulations, the two lines should never be mixed together.

compliance with recognized standards

U.S.G. joint treatment products meet ASTM Standards C474-64 and C475-64 and Federal Specification SS-J-570a—Type I for joint compound only, Type II for tape only, and Type III for joint compound and tape.

hand vs. machine application

Hand tool application, suitable for drying or hardening compounds, adapts readily to all conditions but especially to curved surfaces and other unusual situations. The hand tools are low cost, require little maintenance and are easily cleaned. Generally, a heavier-consistency compound is used with hand tools which results in less shrinkage. Skilled mechanics apply joint treatment with hand tools at about the same cost as operators working with mechanical tools.

Mechanical tool application is ideal for use with drying-type compounds in straight-run, large-volume production where continuous use of the tools will justify their cost. This method is especially suitable for 8 to 9-foot high ceilings where scaffolding is required for hand tool application.

The tools combine operations and disperse the proper amount of joint compound regardless of operating speed. They increase operator efficiency, speed application, eliminate waste and produce uniform quality joint treatment.

To flow properly in mechanical tools, joint compounds are mixed to a thinner consistency which may result in greater shrinkage. With DURABOND Compounds, tools must be cleaned thoroughly before hardening action occurs. Without this cleaning, compounds cake up to cause tool damage and contaminations of future batches that will affect hardening time and properties of the compound.

general limitations

1. For interior use only (except for USG Exterior Ceiling Board application—see DURABOND XL Joint Compound below).
2. Not intended for use on wood or wood fiber products (except in certain lamination applications—see DURABOND Joint Compound below).
3. Protect bagged and cartoned products against wetting.
4. Protect all mixed compounds from freezing.
5. Each compound coat must be dry before next is applied (except for DURABOND Compounds—see below).
6. Completed joint treatment must be dry before proceeding with decoration.

U.S.G. Joint Compounds

Your choice of products and systems for

- ☐ fast, one-day finishing
- ☐ simple, labor-saving convenience
- ☐ proven superior quality
- ☐ finishing exterior joints

READY-MIXED COMPOUNDS

USG Ready-Mixed Compounds offer excellent slip and handling on tools—save job time and money. Pre-mixed for uniform factory controlled quality—ready to use when opened—no need for water.

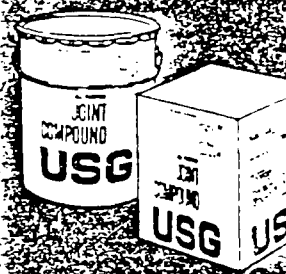
Specify USG Ready-Mixed Joint Compound-All Purpose for taping, topping, texturing; USG Ready-Mixed Joint Compound-Topping for second and third coats.



TOPPING



ALL PURPOSE



USG Ready-Mixed Joint Compound-All Purpose

POWDER COMPOUNDS

USG joint compounds

For those who demand the very finest—a family of superior non-casein formulations that mix faster, stay mixed better, apply smoother with machine or hand tools.

The crisp white bag tells users it's U.S.G.'s finest quality, drying-type powder compound.



USG Joint Compound-Taping

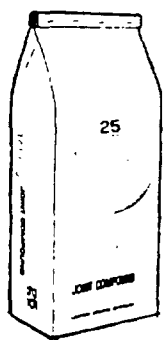


USG Joint Compound-All Purpose

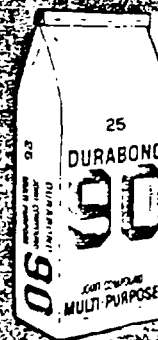
DURABOND joint compounds

Hardness and minimum shrinkage make these compounds first choice for fast, smooth finishing. Interior DURABOND Compounds harden quickly under all humidity conditions—offer excellent bond strength and resistance to edge cracking. Also excellent as laminating adhesive in fire-rated assemblies.

Select DURABOND Compound-Taping for embedding, filling, spotting fasteners; DURABOND 90 for pre-filling SHEETROCK SW Panel joints. The tan bag identifies this unique family of joint compounds.



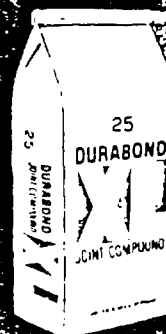
DURABOND Joint Compound-Taping



DURABOND 90 Joint Compound

DURABOND XL

Joint Compound specially formulated for exterior use. This quick-setting, high strength, weather-resistant compound is designed for all joint finishing coats with USG Exterior Ceiling Board.



Ready-Mixed Compounds

—the key to simplicity in quality joint treatment

The most versatile, fastest-growing line of compounds in the industry are ready-mixed compounds which are mixed by the manufacturer to a smooth, lump-free consistency. Ready-Mixed Compounds have superior crack resistance and ease of handling. They are all-purpose type products having excellent adhesion without excessive hardness for sanding. Vinyl-type binders give ready-mixes many of these properties.

USG Ready-Mixed Joint Compound-All Purpose is a drying-type formulation widely used for embedding and finishing because of its uniform high quality. It protects against edge cracking, eliminates contamination from dirty mixing water and has a creamy lump-free plasticity that produces excellent slip and bond. Available in either machine or hand tool consistency;

on-the-wall cost averages the same as, or even less than, that of powder compounds. Recommended for finishing over DURABOND 90 pre-fill coat and DURABOND Taping Compound; also used in repairing cracks in interior plaster and masonry not subject to moisture. *Limitations:* must protect wet joints and container from freezing; not recommended for laminating.

USG Ready-Mixed Joint Compound-Topping is a vinyl-base finishing material with uniform high quality and workable consistency. May be used as a first coat over metal corners, trim and fasteners; produces smoother finish with less shrinkage and sanding than Ready-Mixed All Purpose Compound. *Limitation:* protect wet joints and container from freezing.

USG brand Joint Compounds

—the ultimate in powder compounds that mix faster, apply easier

These non-casein powder compounds retain all the desirable features of conventional casein-bound products. But because of better performance characteristics, including greater consistency and savings in mixing time, they have replaced casein-type compounds. They require a drying period after application. *Limitation:* not compatible with casein-type joint compounds, but they may be used with DURABOND Compounds and USG Ready-Mixed Compounds.

USG Joint Compound-Taping is designed for embedding tape and for first fill coat on metal corner beads, trim and fasteners; also used for patching plaster cracks. Offers outstanding bond and resistance to cracking.

USG Joint Compound-Topping is a smooth-sanding material for second and third coats over taping compound. Produces excellent feathering and superior finishing results.

USG Joint Compound-All Purpose incorporates good taping and topping characteristics in a single product, for use where finest results of the specialized compounds (above) are not necessary. Also has good texturing properties.

DURABOND joint compounds

—the top selection with engineered performance

Polyindurate powder products develop their top performance through chemical hardening as opposed to drying-type compounds. They provide faster finishing of drywall interiors even under slow drying conditions. Rapid hardening permits same-day joint finishing and usually next-day decoration. Low shrinkage and superior bond are outstanding features. All DURABOND Compounds are excellent for laminating gypsum panels to gypsum panels, to sound deadening boards or to existing above-grade surfaces. *Limitation:* not compatible with casein-type compounds.

When used with SHEETROCK SW Gypsum Panels, the system produces the strongest joint ever developed. The exclusive eased-edge design on SHEETROCK SW Panels helps compensate for framing irregularities, damaged panel edges and extremes of temperature and humidity that cause ridging or beading.

DURABOND Joint Compound-Finishing is a hardening-type material for embedding tape fasteners and metal accessories. Also ideal for heavy fills because it chemically hardens in 3 to 4 hours. Virtually unaffected by humidity. *Limitations:* do not use as a finishing coat; always cover completely with final application of USG Ready-Mixed Joint Compound-All Purpose or Topping; USG Joint Compound-All Purpose or Topping.

DURABOND 90 Joint Compound is the required pre-fill material for SHEETROCK SW Panels, smoothing and strengthening joints between panels. Its 1 to 2-hour hardening time also makes it an ideal alternate to DURABOND Joint Compound-Taping in applications where quicker finishing is desired.

DURABOND XL Joint Compound is a distinctively superior product designed to treat joints, fasteners, drywall beads and trims, and areas requiring heavy fills in USG Exterior Gypsum Ceiling Board application. Hardens in 30 to 60 minutes; offers outstanding properties of bond, moisture resistance, edge-crack resistance and low shrinkage.

COVER COAT Drywall Compound

—a ready-mixed companion finish
for interior concrete

This vinyl-base product is designed for filling and smoothing monolithic concrete ceilings and columns located above grade—no extra bonding agent needed.

Supplied in ready-mixed form (sand can be added), easily applied with drywall tools in two or more coats.

Dries to a fine white surface usually making further decoration unnecessary—if desired, COVER COAT is followed with SHEETROCK Sealer or TEXOLITE Primer-Sealer.

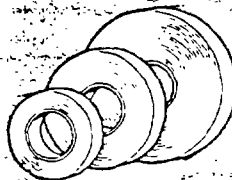


Limitations: not to be applied over damp surfaces or surfaces likely to become moist (by condensation or otherwise), on ceiling areas below grade, on surfaces which project outside the building, or on areas subject to freezing, efflorescence, pitting or popping.

PERF-A-TAPE Reinforcing Tape

—unmatched standard of the industry

This strong fiber tape has specially designed chamfered edges feathered thin. Its special cross-fibered paper has great strength both with and across the grain of paper. Many small random perforations allow rapid air escape during embedding, and speed drying of compound. It has exceptional wet strength to resist stretching, wrinkling and tearing under tools. Lightly precreased for folding in corner application.



In manufacture, daily quality control tests are made. Comparative testing and proven field usage have established other performance advantages of PERF-A-TAPE Reinforcement:

Strength—the tape's cross-tensile strength produces joints as strong as the board itself.

Crack Resistance—water-thin edges permit easy embedding, with greater holding power to resist edge cracking.

Natural Bond—tape truly adheres to compound; unique spark perforations minimize photographing; tape has least longitudinal stretch.

Joint System Selector

First Coat:

embedding tape; first coat
over beads; spotting fasteners

Second Coat:

filling over tape,
beads and fasteners

Third Coat:

finishing over tape,
beads and fasteners

Interior Applications

1. DURABOND Compound-Taping	DURABOND Compound-Taping	USG Ready-Mixed Compound-Topping or USG Compound-Topping
2. USG Ready-Mixed Compound-All Purpose	USG Ready-Mixed Compound-Topping or All Purpose	USG Ready-Mixed Compound-Topping or All Purpose
3. USG Compound-Taping	USG Compound-Topping	USG Compound-Topping
4. USG Compound-All Purpose	USG Compound-All Purpose	USG Compound-All Purpose
5. DURABOND 90 Compound	DURABOND 90 Compound	USG Ready-Mixed Compound-Topping or USG Compound-Topping

Exterior Applications

DURABOND XL Compound

DURABOND XL Compound

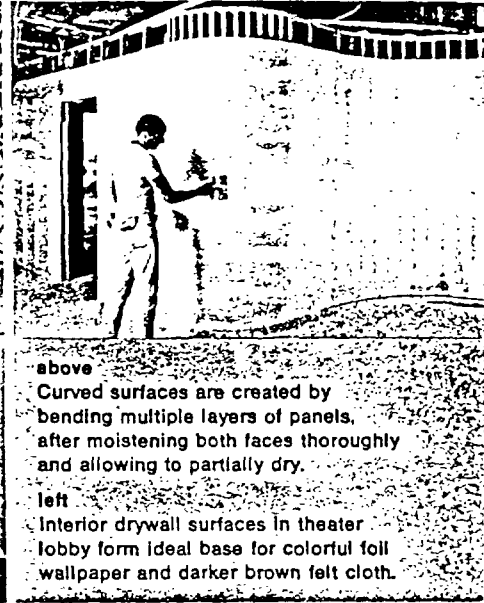
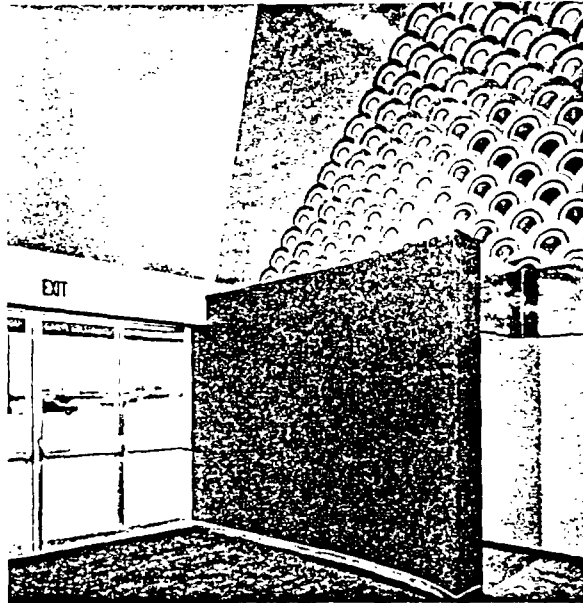
DURABOND XL Compound

To select the proper drywall joint system, the specific requirements (time allowed), drying conditions (temperature and humidity) and performance desired should be determined. After these factors are weighed, the proper system can then be

selected from the above table. Recommendations are listed in order of preference—No. 1 in each case can be expected to provide the highest quality results.



Curving, flat and sloping walls of different heights are rapidly constructed with gypsum panels. Joint treatment provides smooth, crack-resistant surfaces for later decoration in theater lobby at right.



above
Curved surfaces are created by bending multiple layers of panels, after moistening both faces thoroughly and allowing to partially dry.

left
Interior drywall surfaces in theater lobby form ideal base for colorful foil wallpaper and darker brown felt cloth.

architectural specifications

notes to architect

Specific areas to receive joint treatment and related job conditions should be covered in the plans, details and specifications. Local trade practices, climatic and job conditions should be considered in specifying the appropriate joint compounds. It is recommended that only one line of compounds be selected for any given job. All of the compounds indicated in this specification are designed to be compatible. However, caution must be applied to prevent a specific compound being used in an operation for which it is not designed (i.e., a Topping Compound for Taping).

The SHEETROCK SW Gypsum Panel System (Panel and Joint Treatment) was designed to function as a unit. Substitution for any of the procedures and/or products in this specification is not recommended.

Drywall surfaces are readily decorated with paint, wallpaper, texture or glazing. Textures are readily used for walls as well as ceilings to provide interest and variety in decoration while covering minor defects in base surface. For more information, refer to U.S.G. Drywall Construction Handbook, WB-52.

Before decorating, joint compound should be allowed to dry thoroughly. For smooth walls, seal surface with SHEETROCK Sealer or TEXOLITE Primer-Sealer as a base coat for GRAND PRIZE or TAL Acrylic Latex Paint, wallpaper, vinyl fabric or other quality interior finishes. For IMPERIAL QT Texture Finish on ceilings, seal surface with PRO-KYD Alkyd Flat Paint before texture application. Most other textures require no sealer but should be painted when dry.

Part 1: general

1.1 scope—Specify to meet project requirements.

1.2 qualifications

All materials, unless otherwise indicated, shall be manufactured by United States Gypsum Company, and shall be installed in accordance with its current printed directions.

1.3 delivery and storage of materials

All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.4 environmental conditions

In cold weather during joint finishing, temperatures within building shall be maintained within range of 55° to 70°F. Adequate ventilation shall be provided to carry off excess moisture.

Part 2: products

2.1 materials

a. Pre-fill Material: DURABOND 90 Joint Compound.

b. Joint Reinforcement: PERF-A-TAPE Reinforcing Tape.

c. Joint Compounds: Select from table, page 6.

(1) DURABOND Joint Compound-(Taping, 90, XL).

(2) USG Ready-Mixed Joint Compound-(All Purpose, Topping).

(3) USG Joint Compound-(Taping, Topping, All Purpose).

d. Concrete Finishing Compound: COVER COAT Drywall Compound (as ready-mixed) (with sand additive).

Part 3: execution

3.1 pre-fill application

a. Mix DURABOND 90 Joint Compound according to directions on bag. Do not overmix, or use extremely cold water or cold joint compound.

b. Pre-fill all "V"-grooves formed by abutting rounded edges of SHEETROCK SW Gypsum Panels with DURABOND 90 Joint Compound using a flexible 5" or 6" joint finishing knife or Ames Pre-Fill Tool. Fill "V" joint flush and wipe off excess compound beyond the "V" groove, leaving a clear depression to receive tape. Allow pre-fill to harden prior to the next application (taping or embedding coat).

3.2 joint treatment application

a. Mix joint compound according to manufacturer's recommendations.

b. Apply taping or embedding compound in a thin uniform layer to all joints and angles to be reinforced. Immediately apply PERF-A-TAPE Reinforcing Tape centered over joint and seated into compound. Sufficient compound—approx. $\frac{1}{4}$ " to $\frac{1}{2}$ "—must remain under the tape to provide proper bond. Follow immediately with a thin skim coat to embed tape, but not to function as a second coat. Fold and embed tape properly in all