Armstrong

TECHNICAL DATA 1962-63

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Technical data 1962-1963

FLOOR DIVISION Armstrong CORK COMPANY LANCASTER, PA.

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For complete and comprehensive information or recommendations on specific job requirements, contact the nearest Armstrong Floor Division Office or write to Armstrong Cork Company, Floor Division, Lancaster, Penna.

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6911 Decarie Blvd., Montreal 29, Quebec, REgent 3-9981

Armstrong manufacturing plants

Floor division

Braintree, Mass.
Custom Corlon Tile, Rubber Tile, Castilian Tile

Jackson, Miss.
Asphalt Tile, Excelon Tile

Kankakee, Ill.
Asphalt Tile, Excelon Tile

Lancaster, Pa.
Asphalt Tile, Excelon Tile, Linoleum, Linotile, Vinyl Corlon, Counter Corlon

Pittsburgh, Pa.
Cork Tile, Custom Vinyl Tile

South Gate, Calif.
Asphalt Tile, Excelon Tile

Armstrong Research and Development Center

Lancaster, Pa.

Armstrong Bureau of Interior Design

Lancaster, Pa.

Armstrong Styling Center

Lancaster, Pa.

Architects, interior designers, and engineers are invited to visit Armstrong District Offices, Manufacturing Plants, the Research and Development Center, the Bureau of Interior Design, and the Styling Center. Such visits provide opportunities to discuss flooring requirements and to observe styling and manufacturing methods.

Contents

Section 1—Technical data

Selection of resilient floors; their properties and characteristics

Installation, inspection, maintenance; methods and techniques

Specifications

Comparative data on Armstrong resilient floors for commercial and de luxe residential uses

Also for institutional, civic, industrial and other heavy traffic interiors

Type of floor	Armstrong trade name and design series	Gauges	Approximate installed price per sq. ft.*	Basic materials	Backing materials	Subfloor application (b)
Vinyl sheet flooring	Vinyl Corlon: Tessera Montina	.090"	85–90 cents 1.05–1.15	Vinyl resins	Hydrocord (asbestos fiber felt)	B·O·S
Linoleum	Plain (a) Marbelle (a) Textelle Surftone	Heavy (⅛") (.125")	40–65 cents 45–50 cents	Cork and/or wood flour and oleoresinous compounds	Burlap	S
Linotile	**Linotile**	⅛" (.125")	75–80 cents	Cork and/or wood flour and oleoresinous compounds, specially processed	None	S
Homogeneous vinyl tile	**Custom Corlon:** Plain (a) Imperial (a) Burl (a)	⅛" (.125") and 3/32" (.09375")	$.80–$1.10 90–95 cents	Vinyl resins	None	B·O·S
Homogeneous vinyl tile with translucent effects	**Castilian vinyl tile**	⅛" (.125")	$2.00–$2.10	Transparent, translucent and/or opaque vinyl resins	None	B·O·S
Rubber tile	Plain Marble Designers Imperial	⅛" (.125")	60–70 cents	Rubber compounds	None	B·O·S
Cork tile	**Cork tile**	⅛" (.125") 3/16" (.1875") and 5/16" (.3125")	60–95 cents	Raw cork and resins	None	O†·S
Cork tile, with fused vinyl coating	**Custom vinyl cork tile**	⅛" (.125")	$1.75–$1.85	Raw cork and vinyl plastic resins	None	O†·S
Vinyl-asbestos tile	**Excelon** (a): Standard Woodtone Imperial Metallic	⅛" (.125") and 3/32" (.09375")	40–45 cents	Vinyl resins and asbestos fibers	None	B·O·S
Asphalt tile	Woodtone Standard Greaseproof	⅛" (.125") ⅛" (.125") and 3/16" (.1875")	15–30 cents 35–50 cents	Resin, asphaltic compounds and asbestos fibers	None	B·O·S

a Lighter gauge(s) available for residential and other moderate to light traffic areas. See pages 6–7.

b B indicates BELOW GRADE—Partially or completely below the surrounding grade or ground level in direct contact with the ground or a fill which is in direct contact with the ground.
O indicates ON GRADE—In direct contact with ground or a fill which is in direct contact with the ground.
S indicates SUSPENDED—Above, on, or below grade level with minimum of 18" of well-ventilated air space below.

c Bearing surface—lbs. per sq. in. for computing size of furniture rests. See page 47.

d Potential underfoot comfort.

e Numerals indicate subjective ratings, 1 indicating highest; relative rank of each floor to others listed above. Ratings are not directly related to any one test; rather, they are broadly based on Armstrong tests and experience under varying conditions and circumstances.

* Median national price ranges for minimum area of 1000 sq. ft. over concrete. Variations as much as 10 per cent may result from local labor costs and job conditions. More detailed price comparisons are on page 21.

** No Federal Specifications yet evolved.

† Under certain conditions described in "Specifications. Armstrong Cork Tile and Custom Vinyl Cork Tile" F-415.

Safe load limit PSI (c)	Rating in order of resilience (d)	Relative quietness	Durability (e)	Grease resistance (e)	Surface alkali resistance (e)	Ease of maintenance (e)	Federal specifications
100	4	4	2	2	2	3	**
75	4	4	3	1	5	3	LLL-L-367 LLL-L-351b
200	5	5	1	1	5	1	**
200	2	2	1	2	1	3	L-F-00450 (COM-NBS)
200	5	5	1	2	1	2	L-F-00450 (COM-NBS)
200	2	2	2	3	3	3	ZZ-T-301A
75	1	1	5	4	4	5	Interim LLL-T-00431a(c) M-NBS
150	3	3	4	2	3	1	Interim LLL-T-00431a(c) M-NBS
25	6	6	2	2	2	2	L-T-00345 (COM-NBS) (⅛" only)
25	7	6	3	5 2	2	4	SS-T-306b SS-T-307

Selecting precisely the right resilient floor is first a matter of *engineering*. Clients serve their own interests best by permitting the specifier to designate proper *types* of floors with respect to subfloor conditions, traffic requirements, and long range maintenance costs before color, pattern, and initial costs are considered. While the third column in the above table lists only Armstrong grades, some of which are exclusive with Armstrong, the second column is representative of the resilient flooring industry because Armstrong manufactures all basic types of resilient floors. Therefore, the above data can be helpful to the specifier in his primary considerations of any manufacturer's products.

Resilient floors of lower cost for residential and other lighter duty are compared and tabulated on the next two pages.

Comparative data on Armstrong resilient floors for residential use

Also for retail shops, smaller offices and other moderate to light traffic interiors

If cost is a minor factor, heavier products listed on previous pages may also be used.

Type of floor	Armstrong trade name and design series	Gauges	Approximate installed price per sq. ft.*	Basic materials	Backing materials	Subfloor application (b)
Vinyl sheet flooring	Terrazzo	.065"	45–50 cents	Vinyl resins	Armofelt (resin-saturated rag fiber)	S
	Futuresq	.070"	70–75 cents			
	Futuresq Supreme Patrician	.070"	80–85 cents		Hydrocord (asbestos fiber felt)	B·O·S
	Palatial	.070"	$1.00–$1.10			
Embossed inlaid linoleum	Elegante	Standard (.090")	45–50 cents	Cork and/or wood flour and oleoresinous compounds	Armofelt (resin-saturated rag fiber)	S
	Embossed		40–45 cents			
Inlaid linoleum smooth surface	Spatter	Standard (.090")	40–45 cents	Cork and/or wood flour and oleoresinous compounds	Armofelt (resin-saturated rag fiber)	S
Calendered linoleum	Surftone (a) Balboa	Standard (.090")	35–40 cents	Cork and/or wood flour and oleoresinous compounds	Armofelt (resin-saturated rag fiber)	S
	Plain (a)		35–45 cents			
Cork tile	**Cork tile** (a)	1/8" (.125")	60–65 cents	Raw cork and resins	None	O†·S
Homogeneous vinyl tile	**Custom Corlon:** (a) Burl	3/32" (.09375")	80–85 cents	Vinyl resins	None	B·O·S
	Plain Imperial		90–95 cents			
Rubber tile	Plain Marble Designers Imperial	1/8" (.125")	60–70 cents	Rubber compounds	None	B·O·S
Vinyl-asbestos tile	**Excelon:** Corkstyle Spatter Styletone Woodtone	1/16" (.0625")	25–30 cents	Vinyl resins and asbestos fibers	None	B·O·S
	Standard	1/16" (.0625") and 3/32" (.09375")	25–40 cents			
	Imperial	3/32" (.09375")	35–40 cents			
	Centennial	1/16" (.0625")				
	Metallic	1/16" (.0625") and 3/32" (.09375")	35–45 cents			
	Custom	1/16" (.0625")	40–45 cents			
Asphalt tile	Corkstyle	1/8" (.125")	25–30 cents	Resin, asphaltic compounds and asbestos fibers	None	B·O·S
	Tapestry Tone		15–25 cents			
	Spatter		15–30 cents			
	Standard (a)		35–40 cents			
	Greaseproof (a)					

a Heavier gauge(s) available for deluxe residential use. See pages 4–5.

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Safe load limit PSI (c)	Rating in order of resilience (d)	Relative quietness	Durability (e)	Grease resistance (e)	Surface alkali resistance (e)	Ease of maintenance (e)	Federal specifications
75	4	4	2	2	2	3	**
75	4	4	3	1	5	3	LLL-F-471
75	4	4	3	1	5	3	LLL-F-471
75	4	4	3	1	5	3	LLL-F-471 (except Balboa; **)
75	1	1	5	4	4	5	Interim LLL-T-00431a(c) M-NBS
200	2	2	1	2	1	3	L-F-00450 (COM-NBS)
200	2	2	2	3	3	3	ZZ-T-301A
25	6	6	2	2	2	2	L-T-00345 (COM-NBS) (⅛" only)
75	5	5					
25	7	6	3	5	2	4	**
							SS-T-306b
				2			SS-T-307

Distribution—Armstrong materials are sold by flooring contractors and floor covering retailers. Names of reliable installers can be obtained from any Armstrong district office.

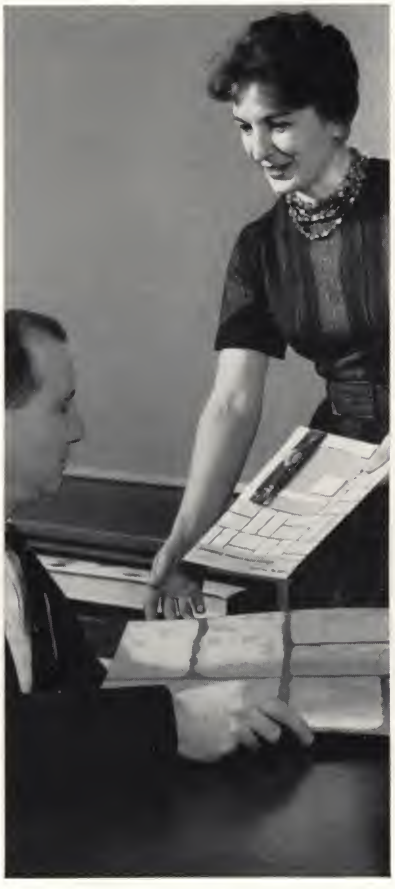
Prices—Since Armstrong materials are sold and installed by others, it is impossible for Armstrong Cork Company to furnish complete information on the installed cost. Armstrong contractors in your own locality will be glad to furnish quotations without obligation.

Specifiers for residential and other light construction work serve their clients best by selecting precisely the right type of resilient floors before becoming concerned with color, pattern, and initial costs. As with heavy duty, higher priced commercial floors on the preceding pages, selection is first a matter of *engineering* with respect to subfloor conditions, use requirements and prolonged client satisfaction.

Armstrong services to architects and designers

Architect-Builder Consultants, a special group of Armstrong representatives, have been assigned the exclusive responsibility of working directly with architects, industrial designers, and interior designers on flooring problems. All Armstrong Sales Representatives, an organization of over 170 men, devote much of their time to such consultations. This group represents an exceptional fund of experience and training in resilient flooring. Moreover, three special services, described below, are available through this staff of specialized representatives.

1. Technical problems involving chemistry, physics or specialized technology (e.g., what experimental concrete mixes do to adhesive bonds) will be referred to the scientists at the Armstrong Research and Development Center. They will study unusual installation and maintenance circumstances and provide solutions and recommendations.



2. Design counsel by the Armstrong Bureau of Interior Design. Its staff has worked extensively with the building professions in creating floor designs and color schemes. And this experienced group can suggest floor stylings to combat special problems, such as excessive indentation, or floor designs when movable partitions are involved.

3. Recommendations involving proper selection of underlayments and floors best adapted to special and unusual areas will be made by Armstrong installation specialists. And if you have flooring difficulties on the job, these experts will recommend tests to be run at the building site, help analyze their results and reach appropriate conclusions.

Armstrong a b c ARCHITECT BUILDER CONSULTANT

For any of these services, call the Armstrong Architect-Builder Consultant at the nearest Armstrong Floor Division Office listed on page 2.

New developments in resilient floors

That resilient floors are available today in such variety is the result of the needs of modern society and the changing trends in building. Factors such as lightweight concrete slabs, concrete subfloors in direct contact with the ground, radiant heating, air conditioning, decontamination, dustlessness, traffic loads, maintenance costs, styling, comfort and quietness underfoot, the amount of money budgeted for floors—all have an important bearing on the flooring selection. Since these conditions and requirements vary widely, there is a need for different floor characteristics designed to meet individual circumstances.

Today's floors are "engineered"

Modern floors must be engineered to meet these widely varying conditions. Working hand in hand with architects, builders, and designers, the staffs of the Armstrong Research and Development Center and the Armstrong Styling Center help solve new and complex flooring problems. The joint efforts of these groups have been responsible for many new types of resilient floors as well as improvements in existing materials. The primary objective of this research and styling is to develop maximum service characteristics at minimum costs. The ultimate goal is a universal flooring material combining all physical characteristics for installation over any and all types of subfloors, regardless of grade level.

Until such a millennium is achieved, Armstrong science, research, engineering, and styling facilities will continue to develop new and different materials to meet the needs as they arise.

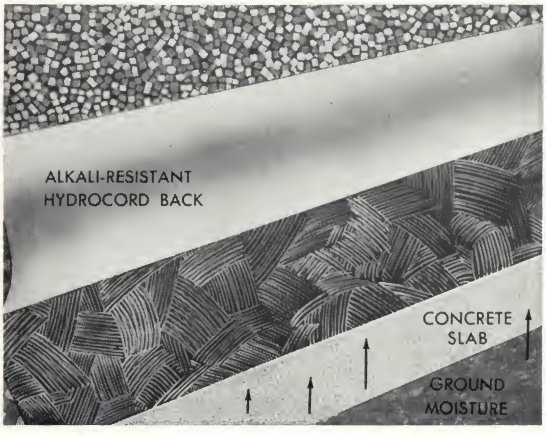
The Armstrong Research and Development Center occupies a series of modern structures totaling more than 300,000 square feet of floor space. Over 500 scientists and technicians are constantly occupied with the development of new products and improving and lowering costs on existing products. Facilities embrace physical testing and pilot manufacturing as well as basic and applied research.

Product advancements

Hydrocord Back, a recent result of Armstrong research, continues to foster new concepts of resilient floor, wall and counter top materials. It is a moisture-resistant and alkali-resistant backing of mineral composition applied directly, in the manufacturing process, to vinyl sheet goods; a marriage of materials virtually unaffected by moisture conditions most common in building structures. On walls, Hydrocord Back is a guard against deterioration from moisture, and around sinks and basins it is a protection against splashing and spilling. Most important, it permits the installation of sheet vinyl flooring directly to concrete subfloors below and on grade. Only under extremely saline soil conditions, typical of scattered regions, are precautions necessary. See page 32.

Most significant of new products on Hydrocord Back is Armstrong Wall Corlon. With commercial and institutional installations in mind, the Armstrong research and styling staffs combined the advantages of Hydrocord with those of a tough, flexible, embossed vinyl surface; a combination offering lower initial cost and, due to durability, easy care, and great long-term value. Wall Corlon is discussed in detail on pages 48–49.

In the field of non-backed materials, resilient floor tiles, the most conspicuous product advancements have been Imperial Excelon (vinyl-asbestos) Tile, Custom Vinyl Cork Tile, and Castilian (homogeneous) Vinyl Tile.



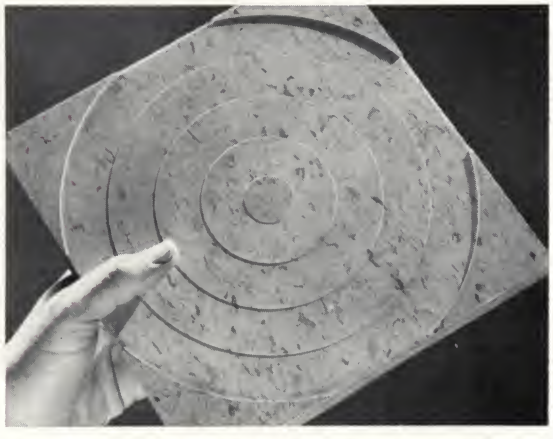
New Hydrocord Back permits the installation of sheet plastic floors, with all their beauty and practicality, over on-grade and below-grade concrete subfloors. Hydrocord is completely resistant to moisture which, rising from the ground, would cause mold and rot in wood and linoleum.

Through-graining is the outstanding feature of Imperial Excelon Tile. The pioneering of Armstrong research in this development has been a significant contribution to the pattern permanency and use-life of popular vinyl-asbestos tile in areas subjected to massive pedestrian traffic. The design in "Imperial" runs continuously through the thickness. Traffic neither obliterates nor blurs the design as long as material, even paper thin, remains. Through-graining can be simulated on standard factory equipment, but only on Armstrong engineered machinery is it truly achieved; color flecks are repeated from surface to bottom of the tile.

An extremely luxurious result of research is Armstrong Custom Vinyl Cork Tile which fuses cork particles with clear or translucent vinyl. Combining the numerous functional benefits of vinyl plastic with the natural beauty and texture of cork provides a new product with design opportunities discussed more appropriately under the following sub-heading.

Styling advancements

Of great importance to modern floor styling are the Armstrong floors which make use of translucent vinyl in a different and interesting way such as Castilian Vinyl Tile; also Montina, Tessera, and Patrician in Armstrong Vinyl Corlon which utilize the mosaic principle. Colored vinyl chips simulate the tesserae used in hand-crafted



To illustrate how the pattern runs through the tile from top to bottom, the "Imperial" Excelon Tile pictured above was milled down to different thicknesses, thus representing different stages of wear. As noted, the pattern persists at all levels, insuring uniform appearance always.

mosaics. These are embedded in translucent vinyl in very striking three-dimensional effects. While the chips appear to float, the surfaces of the floors are, in fact, almost smooth, assuring easy and economical maintenance.

The chips in Tessera and Patrician are small and closely packed, square in Tessera, random-shaped in Patrician. The over-all effect is neat, subtle, pristine. Montina, the most recent style innovation, contains large scale "stones" with correspondingly wider grout of translucent vinyl. Its appearance is orderly but, as compared with Tessera and Patrician, rugged and masculine. Intended for interiors with a special personality, Montina has the natural, informal, handcrafted look, figuratively bringing the outdoors indoors.

Dimensional stability is excellent. Montina and Tessera will perform substantially better than heavy gauge ("Battleship") linoleum. "Patrician," thinner in gauge and correspondingly lower in cost, is engineered for lighter duty. Both series come with the exclusive Hydrocord Back; can therefore be used below grade and on grade, as well as on suspended subfloors.

Other high styles in sheet material, Armstrong Futuresq and Futuresq Supreme Vinyl Corlon, combine clear, translucent and tinted vinyl chips with embedded, glittering, metallic-looking particles. Futuresq Supreme is further distinguished by rich pearlescent accents. These styles, too, have Hydrocord Back for use at all grade levels.

In Montina Vinyl Corlon, the random arrangement of "stones" of varied shapes and graining captures the natural, handcrafted look. Montina has a subtle texture which gives the floor unusual character, and tends to hide scuffs, scratches, indentations and subfloor irregularities.

Armstrong Palatial Vinyl Corlon is the most recent of sheet goods developments. "Palatial" is *inlaid* vinyl pattern goods, a significant styling breakthrough. Its basic composition and processing are quite different from other Corlon items. Designed for de luxe residential and sophisticated light-commercial interiors, its physical characteristics, gauge for gauge, are superior on practically all counts. The Palatial style, marbleized in graining, is composed of omnidirectional veins in a field of finely ground vinyl particles. The appearance is quite sumptuous. Hydrocord Back permits its installation on suspended, on-, and below-grade subfloors.

Tesserette Counter Corlon, as the name implies, is a miniature of "Tessera" Vinyl Corlon flooring. In area, the vinyl tesserae are approximately one-fourth of those in the floor material. Like all Counter Corlon styles, the back is Hydrocord for mold and mildew resistance. The advantages are obvious where walls and counter tops are pattern-correlated with floors.

Another refreshing style developed by Armstrong is the Parquet design in Custom Vinyl Cork Tile. This new styling has wide cross sections of cork laid in bands on the face of each tile; thus, the appealing texture of cork is wedded with the orderliness of parquetry. A sheet of clear vinyl is fused onto the surface of the tile and another into the back as a moisture barrier. "Parquet" recently received an International Design Award of the American Institute of Interior Designers.

This "exploded" sample shows how the functional value of vinyl is combined with the natural beauty of cork in Custom Vinyl Cork Tile. A layer of clear vinyl is fused to the top and another, located near the back, forms a moisture barrier which makes sure that the tiles won't curl or peak.

WHICH FLOOR GOES WHERE?

Criteria for selection of resilient flooring

Consideration of the following in relation to each job will result in a few factors standing out as primary bases for selection. Even then, more than one type of resilient floor may satisfy the prime considerations. At this point, aesthetic preferences, construction budgets and other matters involving personal choice and individual option will prevail, resulting in a final selection.

		Details on page(s)
I. What is the grade level of the subfloor?	A. If below grade, five types of resilient floors are automatically eliminated. B. If on grade, three types of resilient floors are automatically eliminated. C. If suspended, all types are suitable. (In this event, selection must be based on the following considerations.)	4, 6, 14, 16, 30–33 4, 6, 14, 16, 30–33 4, 6, 14, 16, 30–33
II. Which of the following functional considerations are most important?	A. Resistance to abrasion (relative durability) B. Resistance to grease. C. Resistance to surface moisture. D. Resilience 1. Underfoot comfort. 2. Quietness (absorption of impact noises) a. Within the interior. b. In rooms beneath. E. Resistance to chemicals, solvents, reagents, etc. F. Cleanliness (importance of minimum dirt-catching joints).	5, 7, 14, 16, 18, 19 5, 7, 24, 25 13 5, 7, 22, 23 5, 7, 22, 23 22, 23 17 15
III. Which of the following cost considerations are paramount?	A. Initial cost 1. Installed cost per sq. ft. 2. Subfloor condition and preparation. 3. Subfloor drying time (importance of maintaining construction schedules). 4. Shape of floor (tile more economical than sheet material for cut up areas). B. Long range cost 1. Ease of maintenance 2. Wear-life a. Relative durability b. Gauge	 4, 6, 20, 21 34, 35, 36–39 30–33 15 5, 7, 45–47 5, 7 4, 6, 18, 19
IV. Which of the following visual and aesthetic considerations predominate?	A. Resistance to indentation 1. From static loads 2. From dynamic loads (impact) B. Dimensional stability (opening of seams and joints) C. Light fastness (resistance to fading) D. Light reflectivity E. Patching and repair F. Design (styling) 1. Pattern* 2. Color* 3. Texture* * (These factors are often permitted to be primary bases for selection. They should be last; can be last due to the availability of several types of resilient floors suitable for each job and the wide selections of styles within each type.)	 5, 7, 47 22, 23 14 26, 27 14

Your Armstrong Architect-Builder Consultant will assist you in applying these criteria for selection of resilient floors to each job for which you are preparing specifications and aid you in presenting reasons for your selections to owners, building committees and other interested persons.

Criteria for selection of resilient flooring

With the large variety of resilient flooring materials now available, some difficulty may be experienced in choosing the *right* floor for the job conditions. Even so, there are relatively few cases in which only one material will do a satisfactory job, so first it is a matter of eliminating *wrong* floors and then determining the *best* flooring material from the remainder.

The outline on the opposite page is a procedure for applying all criteria, most of which are discussed in detail on subsequent pages, so that the most important considerations are isolated from the less important. Practical factors must be considered and weighed before matters of individual option, such as cost and personal taste, inject themselves into deliberations. In fact, the optional and abstract considerations will often determine the final choice because, as stated, two or more resilient floors may be equally suitable with respect to job conditions and final utility.

Moisture conditions

Three main types of moisture conditions exist which should be taken into account in choosing a resilient floor. Due to the deleterious effects of moisture on some types of resilient floors, consideration of the grade level quickly separates wrong from right selections.

(See diagram and listing of products for grade levels on page 14)

Moisture related to concrete subfloors

The moisture content of concrete, whether suspended, on grade, or below grade, may seriously affect resilient flooring materials. The installation of resilient floors over concrete is fully discussed on pages 30–33.

Moisture related to wood subfloors

Grade level is just as important a consideration with wood subfloors as with concrete subfloors.

Wood subfloors constructed over sleepers on grade-level and below-grade concrete slabs are susceptible to moisture from the ground. Such a moisture condition usually results in the deterioration of the wood subfloor. Because of this possibility, resilient floors are not recommended for installation over this type of subfloor, not even those resilient floors that are unharmed by the alkaline moisture found on and below grade.

Wherever a wood subfloor is constructed over an inadequately ventilated crawl space, there also is danger of moisture damage and consequent warpage to the subfloor, resulting in harm to the resilient floor itself. Crawl spaces should, therefore, be at least 18″ high and cross ventilated. (This is diagrammed on page 31.) Any of the various Armstrong resilient floors may be installed over wood subfloors in good condition if adequately suspended and well cross-ventilated beneath the subfloor.

Surface moisture

Around laundry equipment, lavatory fixtures, and in other areas where excessive water is likely to be spilled on the floor, moisture may find its way through the seams in the floor and attack the adhesive. Where surface moisture is a problem, the floors recommended for on-grade installation will give satisfactory service when installed with waterproof adhesives. On above-grade floors, sheet flooring materials are least susceptible to the seepage of surface moisture because they can be installed with a minimum number of seams. Naturally, the fewer seams or joints in the floor the less opportunity exists for surface moisture to seep under the flooring.

Functional considerations

Resilient flooring materials should always be selected with service conditions and performance requirements uppermost in mind, since the variations in these from one job to another have great bearing on how long floors will retain their utility and beauty. Flooring products vary in their abilities to withstand harsh treatment and foreign matter and they possess different properties which affect their utility and performance. Most of these elements are discussed or compared elsewhere in this book (see page references on opposite page). A few, important though they are, can be covered briefly here.

Light or heavy traffic

In residential installations, wear is not usually a primary factor because most resilient flooring products are satisfactory in this respect, and the final choice is often based on price, style, or other considerations. In commercial installations, on the other hand, excessively heavy traffic makes wear a critical factor in ultimate satisfaction. Where this situation exists, the use of heavier gauge products is indicated, and it is even more important to select materials with designs which extend through the wear thickness; i.e., which are not merely surface embellishments.

Exposure to strong sunlight

The increasing use of glass curtain walls in commercial structures and schools and the enlargement of window areas in homes represent a severe test of any flooring material. Exposure to strong sunlight may affect the performance and appearance of some types of resilient floors by causing fading, shrinking, or brittleness. Resilient floors in sheet form, both linoleum and Vinyl Corlon, and Linotile are considered most resistant to such deterioration.

Pigments are, of course, the limiting factor in the fade-resistant properties of most resilient flooring materials, but great improvement in color stability has been made in recent years, especially when reds and blues are concerned.

Neutral colors such as grays and tans show the best light resistance. Pastel tones, especially yellows, reds, and pinks, give the poorest performances in retaining their colorings under prolonged exposure to the actinic rays of sunlight. Cork tile has the same tendency as natural wood to fade under strong sunlight.

Repairing damage

Occasionally, an accident may damage a portion of floor so seriously that replacement becomes necessary. If the damaged area is small, replacement is easy and inexpensive with a tile floor; however, the replacement tile can be expected to be noticeably different in color than the "old" tile. Cuts and tears in sheet Vinyl Corlon can be readily heat-sealed with metal foil and an electric iron, preferably in the hands of an expert. Linoleum can be patched with lacquer and linoleum mix.

Table showing which resilient floors are suitable for installation over the three levels of subfloors.

Suspended subfloors

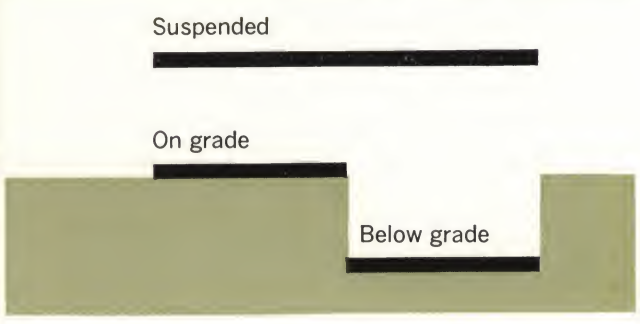
Cork tile
Custom vinyl cork tile
Sheet vinyl Corlon
Custom Corlon (vinyl) tile
Castilian vinyl tile
Excelon (vinyl-asbestos) tile
Linoleum
Linoleum tile
Linotile
Rubber tile
Asphalt tile

On-grade subfloors

Asphalt tile
Cork tile*
Sheet vinyl Corlon with Hydrocord Back
Custom Corlon vinyl tile†
Castilian vinyl tile
Custom vinyl cork tile*
Rubber tile†
Excelon (vinyl-asbestos) tile

Below-grade subfloors

Asphalt tile
Sheet vinyl Corlon with Hydrocord Back
Excelon (vinyl-asbestos) tile
Rubber tile†
Custom Corlon vinyl tile†
Castilian vinyl tile



* Subfloor surface at least 12 inches above grade level with drainage away from building.
† Installed with special adhesives as specified on pages 41–42.

An electric iron and aluminum foil in experienced hands can weld seams in vinyl sheet flooring and, by eliminating dirt traps, create a "cleaner," more cleanable floor.

By coving sheet floors up the wall, dirt-catching crevices are eliminated at the juncture of floors and walls, and thorough cleaning is fast and simple.

Sheet materials vs. tiles

Sheet flooring allows few places for accumulations of dirt. Because linoleum and sheet vinyl floors come in rolls six feet wide and up to one hundred feet long, they can be installed with a minimum number of seams. If, for example, a 48′ x 60′ area were covered with 9″ x 9″ tiles, there would be more than a mile (5,760 feet) of seams. Even with 2″ stripwood flooring, there would be a minimum of 17,280 feet of floor board joints. On the other hand, six-foot sheet flooring could be installed with only 420 feet of seams in our hypothetical 48′ x 60′ area.

Ultra-clean floors in hospitals, scientific laboratories, and "white" rooms in factories argue strongly in favor of sheet materials. It is important that "dirt traps"—cracks or crevices where germs, viruses, dust, radioactive material, etc., might accumulate—are minimized by the use of 6′ wide material. Moreover, these sheet floors provide a virtually seam free, smooth surface that is easy to clean and decontaminate. In fact, vinyl sheet floors can be heat-sealed at the seams to render them literally monolithic. Finally, they can be coved or "flashed" up the wall so as to provide a smooth, flowing surface which avoids dirt traps at the juncture of the floor and wall and permits lower wall surfaces to be cleaned in one continuous operation.

However, where hygiene and decontamination are not acute requirements, Armstrong resilient tile floors should not be automatically dismissed as unsanitary. They are also easy to maintain because precision factory cutting assures tight joints and close-fitting edges tile by tile over the entire floor area.

Moreover, resilient floors in tile form offer distinct advantages—some practical, some aesthetic. Where the floor area is unusually irregular in contour (i.e., "cut up" by juts and recesses) tiles can sometimes be installed with less waste of material than 6′ wide sheet material. Also, tiles permit an infinite variety of floor designs through placement of two or more contrasting colors in various arrangements of squares, rectangles, bands, and triangles.

Economic and aesthetic considerations

Too often, clients are influenced by initial cost and initial appearance and attempt to impose their personal preferences on specifiers. While matters of individual option are the building owner's right, all other factors being equal, it is the responsibility of architects and designers to specify the optimum in *long-range* cost and good looks and to insist upon it. As indicated on page 12, practical considerations affecting long-range satisfaction prevail over matters of personal taste and initial monetary outlay.

Basic types of vinyl floors and their common characteristics

During the past few years, architects, designers and specification writers have been subjected to a flood of data about vinyl flooring materials. This has tended to create confusion about the different types of vinyl floors. The following resume will help clear up the confusion and set the proper perspective. The chart below gives data on costs and proper uses.

Vinyl-asbestos floors

Produced in tile, they are composed of vinyl resins and asbestos fillers. Because of outstanding physical properties and relatively low cost, they are the most widely used of all vinyl floors. Exceptional durability and ease of cleaning result in low-maintenance costs. Performance is excellent over suspended subfloors, on-grade slabs, and below-grade concrete with conventional low-cost adhesives. Resistance to alkalis and grease is exceptionally good.

Vinyl sheet floors

These are more expensive than vinyl-asbestos floors because the wearing surface is formulated entirely of vinyl resin compounds. The high percentage of vinyl makes these floors particularly attractive, colorful, and gives them flexibility, more resilience, and very good resistance to wear, grease, and alkalis.

Homogeneous vinyl floors

Tiles of this type are unbacked and have uniform composition throughout. Due to the vinyl content and special manufacturing processes, this type of floor is more expensive. Armstrong makes two types. The first, Custom Corlon Tile, is very highly favored by architects when long-term aesthetic and functional considerations are foremost. Special manufacturing processes enable Armstrong to guarantee the dimensional stability of these tiles. The second is Castilian Vinyl Tile, designed for interiors where the unusual is of greater consideration than cost. Made with opaque and translucent vinyl, a special mix gives these vinyl tiles intriguing depth effects and light reflections, exceptional durability, resistance to indentation, recovery from indentation, and ease and economy of maintenance.

Armstrong vinyl floors by types	Approx. price per sq. ft. installed	Suggested use indicated by shaded areas						
		Above Grade	On Grade	Below Grade	Severe Commercial	Commercial	Light Commercial	Residential
Vinyl-asbestos tile								
Excelon tile	25¢–45¢	■	■	■	■	■	■	■
Vinyl sheet flooring								
Vinyl Corlon with Armofelt Back								
Terrazzo	45¢–50¢	■						■
Futuresq	70¢–75¢	■					■	■
with Hydrocord Back								
Futuresq Supreme	80¢–85¢	■	■	■				■
Patrician	80¢–85¢	■	■	■			■	■
Tessera	85¢–90¢	■	■	■	■	■	■	■
Palatial	$1.00–$1.10	■	■	■			■	■
Montina	$1.05–$1.15	■	■	■	■	■	■	■
Homogeneous vinyl tile								
Custom Corlon tile	80¢–$1.10	■	■	■	■	■	■	■
Castilian Vinyl tile	$1.90–$2.00	■	■	■	■	■	■	■

Other types with vinyl components

There are two other types of floors with vinyl components which have unique advantages. However, they are excluded here as vinyl floors, *per se*, for one or both of two reasons: they consist of material which is merely protected by a fused coating of clear vinyl (e.g., Armstrong Custom Vinyl Cork Tile) and/or they are laid loose as floor coverings rather than permanently installed floors (e.g., Armstrong Vinyl Accolon in which design and color are achieved with rotogravure printing).

Common characteristics of vinyl floors

A review of common traits will prove useful in explaining to clients why vinyl floors are specified instead of other, and often less expensive, resilient floors.

Unusually wide range of designs available

Vinyl, being thermoplastic, can be processed into particles of almost any shape and made to retain those shapes. As a result, all sorts of design effects can be created in vinyl floors heretofore unobtainable in other flooring materials. Moreover translucent and transparent vinyl gives floors extraordinary depth effects, light refractions, and unique decorative beauty.

Brighter, more permanent colors

The use of practically colorless vinyl as a binder permits pigments to show in superior clarity and brilliance, even to the extent of bright or burnished metallic effects. Expressed conversely, the clear vinyl does not mask or cloud the color pigments. In addition, the vinyl affords better protection for the pigments than most other resilient flooring binders; hence, greater resistance to the effects of chemical reagents and other harmful substances.

Can be used over all types of subfloors

Vinyl-asbestos and some homogeneous vinyl tiles can be installed over on-grade and below-grade, as well as suspended, subfloors. All of Armstrong's can. Also, the new alkali-resistant Armstrong Hydrocord Back permits the use of six-foot-wide sheet flooring on any grade level.

Superior surface resistance

While lighter colors are susceptible to staining from a few foreign substances, excellent surface resistance makes vinyl floors most suitable for hospitals, schools, cafeterias and commercial and residential kitchens. Armstrong Custom Corlon Tile is recommended as the best resilient floor for chemical laboratories, although not completely impervious to harm.

The thermoplastic nature of vinyl, which provides so many of the aesthetic and functional benefits, has one disadvantage. Smoldering cigarette butts, especially when ground out with the shoe, will melt or char some vinyl surfaces. The unsightly tar stain or carbon residue is difficult to remove, even with fine steel wool and other abrasives, and of course a surface depression remains. However, such types as Armstrong Custom Corlon Tile and Excelon (vinyl-asbestos) Tile are highly resistant to cigarette damage.

Ease of maintenance

Vinyl flooring materials, except when an embossed or textured face is deliberately sought, have extraordinarily smooth surfaces due to high density. This lack of porosity makes cleaning, waxing, and upkeep easy and economical.

Durability and indentation resistance also excellent

Vinyl is by nature exceptionally resistant to abrasion and high in tensile strength, so vinyl flooring materials give superior service under very demanding conditions. And most types have very good resistance to indentation from both dynamic and static loads. However, as noted on pages 5, 7, 22 and 47, tolerances can be exceeded by highly concentrated loads and suitable precautions are necessary.

What about costs?

"Raw" vinyl itself is expensive, so a general rule of thumb is that the higher the vinyl content the higher the price of the flooring material, but obviously, initial cost is not necessarily the primary consideration for all jobs. While the lowest priced commodity may provide adequate service in many interiors, in others the highest priced may be less expensive in the long run.

Gauges of resilient flooring

The most obvious significance of the gauge or thickness of a resilient floor is its effect on the length of service it will give. Prior to modern technology, gauge was the primary consideration in the selection of flooring.

Today, as a result of modern manufacturing methods and improved materials, vastly superior qualities of durability have been imparted to resilient floors—and at far greater economy. Gauges which were once regarded as being too thin now are more than adequate for most residential and light commercial areas. Furthermore, with the modern trend toward frequent redecoration, durability has become a somewhat less important consideration, as now flooring is often replaced solely to create a change in interior decoration even though the floor is far from being unsightly or worn-out.

There are, however, other properties of resilient flooring that are affected by its gauge; notably appearance and comfort. The thicker the gauge, the better the resilient floor hides subfloor irregularities, and hence the better the appearance; and, obviously, the floor's comfort value and quietness also increase with the gauge.

Resilient tiles

In the case of homogeneous (unbacked) tile floors, 1/8″ gauge is usually used in commercial installations, even where traffic conditions are extremely severe. In any flooring installation, of course, it is necessary to take into consideration factors other than gauge. The proper composition for the type of subfloor and the service it will undergo must be considered first. The gauge of that material is considered secondarily. From the standpoint of durability, the thinner gauges of the chosen composition will meet most requirements where the amount of maintenance is expected to be reasonable. But if quietness and comfort are of major importance, thicker gauges should be chosen.

For locations where poor maintenance or severe traffic conditions are involved, the thickest available gauge in the correct flooring material should be chosen. There are some compositions of tile such as Linotile, in which only one all-purpose gauge is available. Here it is safe to assume that the nature of the tile makes it applicable over a broad range of conditions.

Linoleum and sheet vinyl floors

Backings were originally used on resilient floors merely as a carrier to support the flooring materials during processing. Now they have been developed to a point where they also contribute greater resilience, comfort, and dimensional stability. Modern developments include Armstrong Armofelt, a backing saturated with resins to give superior performance. Hydrocord Back is another innovation, available on certain stylings of sheet Vinyl Corlon. Because Hydrocord, as stated earlier, is unaffected by alkaline moisture, it permits the installation of resilient sheet flooring over concrete subfloors in basements and on grade-level concrete slabs.

So, the gauge of the resilient flooring material cannot be considered without reference to both the composition of the flooring material and its backing. Some of the newer vinyl floors in their thinner gauges provide durability equal to or better than that supplied by thicker gauges of the more traditional materials.

Selection of gauge

In linoleum, Standard gauge (.090″) should be used only in areas of light traffic, or where initial cost dominates considerations of durability. Heavy gauge (.125″) linoleum should be used for commercial installations which are subjected to concentrated traffic. The durability of the new vinyl compositions permits plastic flooring materials to be manufactured in thinner gauges (.090″, .070″, .065″) with serviceability greater than or equal to that of linoleum of heavier gauges. For example, the .070″ gauge of Armstrong Vinyl Corlon can be regarded as equal to Standard .090″ gauge linoleum; .090″ Corlon equal to .125″ (battleship) linoleum.

The gauge and type of backing of resilient flooring affect its "comfort value." For a comparison of this quality, as it applies to various types of resilient floors, see page 22.

Suggested resilient floor gauges for commercial (including institutional), residential, and industrial installations

Tile	Over-all Gauge (SG = Service Gauge)	Nominal Wear Layer Thickness	Suggested use indicated by shaded area: Severe Commercial	Commercial	Light Commercial	Residential
Asphalt tile						
Standard and Greaseproof	3/16"	3/16"	■	■	■	■
Standard, Greaseproof, and Woodtone	1/8"	1/8"		■	■	■
Tapestry Tone	1/8"	1/8"			■	■
Spatter	1/8"	1/8"			■	■
Corkstyle	1/8"	1/8"			■	■
Excelon (vinyl-asbestos) tile						
Standard	1/8"	1/8"	■	■	■	■
	S.G.	1/16"			■	■
Imperial	1/8"	1/8"	■	■	■	■
	3/32"	3/32"		■	■	■
Woodtone	1/8"	1/8"		■	■	■
	S.G.	1/16"			■	■
Spatter	S.G.	1/16"				■
Corkstyle	S.G.	1/16"				■
Styletone	S.G.	1/16"				■
Metallic series	3/32"	3/32"		■	■	■
	S.G.	1/16"			■	■
Centennial	S.G.	1/16"				■
Custom	S.G.	1/16"				■
Luxury Tile						
Custom Corlon (homogeneous	1/8"	1/8"	■	■	■	■
vinyl) tile	3/32"	3/32"		■	■	■
Castilian (homogeneous vinyl) tile	1/8"	1/8"	■	■	■	■
Rubber tile	1/8"	1/8"	■	■	■	■
Linotile	1/8"	1/8"	■	■	■	■
Cork tile	5/16"	5/16"		■	■	■
	3/16"	3/16"			■	■
	1/8"	1/8"				■
Custom Vinyl Cork tile	1/8"	1/8"		■	■	■
Vinyl Corlon (sheet)						
Montina (Hydrocord back)	.090"	.055"	■	■	■	■
Tessera (Hydrocord back)	.090"	.055"	■	■	■	■
Palatial (Hydrocord back)	.070"	.030"			■	■
Patrician (Hydrocord back)	.070"	.030"			■	■
Futuresq Supreme (Hydrocord back)	.070"	.030"			■	■
Futuresq (Armofelt back)	.070"	.030"			■	■
Terrazzo (Armofelt back)	.065"	.025"				■
Linoleum						
Plain, heavy gauge	.125"	.090"	■	■	■	■
standard gauge	.090"	.050"			■	■
Marbelle, heavy gauge	.125"	.090"	■	■	■	■
Textelle, heavy gauge	.125"	.090"	■	■	■	■
Surftone, heavy gauge	.125"	.090"	■	■	■	■
standard gauge, sheet and tile	.090"	.050"			■	■
service gauge, tile	.0625"	.026"				■
Balboa, standard gauge	.090"	.050"			■	■
service gauge, tile	.0625"	.026"				■
Elegante, standard gauge	.090"	.050"			■	■
Embossed & Spatter, standard gauge	.090"	.050"			■	■
Parquet, service gauge, tile	.0625"	.026"				■

Relative costs of resilient floors

Beyond the service and style variations in the many types of resilient floors, there are also wide differences in costs. They range all the way from the economy flooring materials, such as the "B" colors in asphalt tile, to the luxury floors such as Castilian Vinyl Tile and Custom Vinyl Cork Tile. In addition, costs of resilient floors can vary widely depending upon elaborateness and intricacy of the floor design. A floor in a single color or styling generally is less costly than a complex custom styled floor involving exceptional craftsmanship and extra attention to detail on the job.

The Armstrong Cork Company cannot quote exact installed prices since there are many factors that affect the cost of the floor installation beyond the price of the material. As mentioned above, the floor design alone can have an important bearing on the cost. Other items that must be taken into account include subfloor conditions, underlayments, and labor rates and efficiencies. Such factors vary from one section of the country to another as well as from job to job. Local or regional relationship of supply and demand are outside Armstrong control and result in differing competitive conditions.

Armstrong Cork Company has multiple outlets in most trading areas and exercises no control over resale prices. Therefore, an outright specification for Armstrong materials will still result in competitive bidding from a number of flooring contractors and at the same time give assurance of top-quality materials. The invitation to bid should indicate all the items which fall within the scope of the flooring contractor's work in addition to the flooring materials. The flooring contractor's ability, facilities, and reputation should then be considered in determining the best value which, obviously, is not always the lowest bid.

The approximate price relationship of the different types of Armstrong resilient flooring materials is shown on the chart on the opposite page. Price ranges are based on a common denominator of one thousand square feet installed over concrete and all other factors assumed to be equal. From this chart it will be seen that asphalt tile is considered the lowest cost resilient floor, grading up from the "B" or darker to the brighter "D" colors. Excelon (vinyl-asbestos) Tile is next in cost range followed by linoleum and then Vinyl Corlon sheet material.

Further up the price scale are cork tile, Linotile, rubber tile, Custom Corlon Tile, Custom Vinyl Cork Tile and Castilian Vinyl Tile in the order named. Differences in gauge, color, and styling within a resilient flooring line all affect the cost of the job.

When fairly accurate costs are required prior to receiving bids, your Armstrong Architectural-Builder Consultant can help you calculate a comprehensive cost of the proposed flooring that will be suitable for estimating purposes.

Custom floor designs can be achieved without greatly increasing the cost. Right angles, straight lines, and minimal waste made this striking custom floor cost very little extra.

More elaborate custom styling as in the floor above costs more than that on the left due to increased cutting and fitting. Curves and irregular shapes would cost even more.

Relative installed prices per square foot

(Minimum 1000 sq. ft. over concrete)

The following prices are approximate and are intended only to show cost relationship of the various Armstrong Resilient Floor products installed. There are many other important factors contributing to total job cost; such factors as freight expense, labor cost, special installation requirements, local job conditions, size of floor area, etc. Variations as much as ten per cent may result from these factors.

Relative installed cost per sq. ft.	Asphalt tile	Excelon (vinyl-asbestos) tile	Linoleum	Vinyl Corlon (sheet material)	Cork tile Rubber tile Linotile	Homogeneous vinyl tile
15-.20	Standard and Spatter in B colors—1/8"					
.20-.25	Standard, Spatter and Woodtone in C colors—1/8"					
.25-.30	D colors—1/8" Woodtone—1/8" Corkstyle—1/8" Tapestry Tone—1/8" B colors—3/16"	All series—1/16" (service gauge) except Metallic, Centennial and Custom				
.35-.40	C colors—3/16" D colors—3/16" Greaseproof—1/8"	Metallic and Centennial—1/16" (service gauge) Standard and Imperial—3/32"	Surftone, Balboa —.090" (standard gauge) Plain in regular colors—.090" (standard gauge)			
.40-.45		Custom 1/16" (service gauge) Metallic—3/32" Standard and Imperial—1/8"	Plain in special colors, Embossed and Spatter—.090" (standard gauge) Plain in regular colors—1/8" (heavy gauge)			
.45-.50	Greaseproof—3/16"		Elegante—.090" (standard gauge) Surftone, Marbelle, Textelle—1/8" (heavy gauge)	Terrazzo—.065"		
.60-.65					Cork—1/8" Rubber—1/8" (except Imperial)	
.70-.75				Futuresq—.070"	Imperial Rubber—1/8" Cork—3/16"	
.75-.80					Linotile—1/8"	
.80-.85				Futuresq Supreme—.070" Patrician—.070"		Custom Corlon Burl—3/32"
.85-.90				Tessera—.090"		
.90-.95					Cork—3/16"	Custom Corlon Plain and Imperial—3/32" Burl—1/8"
1.00-1.15				Palatial—.070" Montina—.090"		Custom Corlon Plain and Imperial—1/8"
1.75-1.85					Custom Vinyl Cork—1/8"	
2.00-2.10						Castilian 1/8"

The comparative resilience, underfoot comfort, and quietness of floors

Technically speaking, resilience is a property involving the elastic energy in a material which causes it to regain its original shape when an external load is withdrawn. For practical purposes, however, the resilience, in its broadest sense, consists of properties beyond recovery from indentation, important though these may be.

For the purposes of this article, resiliency is treated in a more comprehensive sense as affecting underfoot comfort and the noise generated by foot traffic, as well as the floor's resistance to or recovery from indentation.

Recovery from impact indentation

In assessing the resilience of any flooring material, the momentary indentations produced from walking traffic are those which are of primary importance. These impact pressures are quite high—often as much as several thousand pounds per square inch—and, all other factors being equal, the smaller (or "sharper") the impact area, the more damaging the indentation.

Inability of a floor to recover from indentation caused by dynamic pressure (momentary impact) will cause the floor to present an irregular and unsightly surface and to become difficult to keep clean. Especially damaging to floors, whether hard or resilient, are women's spike-heeled shoes or nails that protrude from any heel, men's or women's.

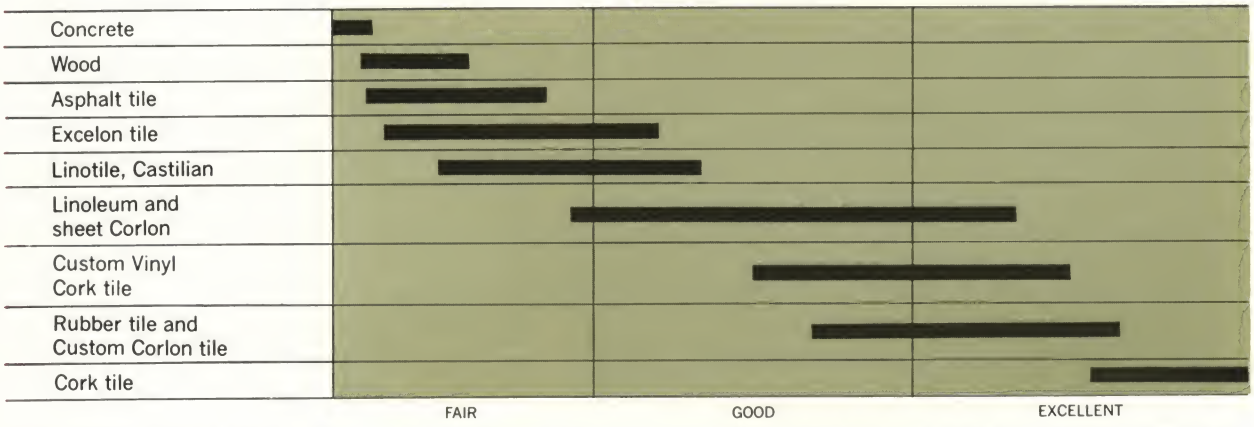
The entire weight of a person acting dynamically on three nailhead contacts of the order of .01 to .02 inch in diameter could produce pressures of from 12,000 to 60,000 pounds per square inch. Even without protruding nailheads, the spike heels of a 105-pound girl exert a pressure of approximately 2000 pounds per square inch when her heel strikes the floor. A 225-pound man, his weight spread over his 3″ x 3″ heel, exerts only 12 pounds per square inch. Such punishment from spike heels can cause some floors, such as concrete terrazzo, and ceramic, to chip or disintegrate; others such as wood, metal, and resilient, to indent. By the sheer virtue of resiliency, resilient flooring, *per se*, tends to recover from impact indentation, although initially harder floors may have more resistance to impact.

No direct numerical comparison of the short term indentation characteristics of various types of resilient flooring materials is available. There are, nevertheless, some factors which are helpful in minimizing or concealing visible effects of impact:

Selection of light, multi-colored floorings which refract light less than darker, plainer effects.

Underfoot comfort

These ratings are based on data and experience obtained in the Armstrong Research and Development Center



NOTE–The spreads shown are based on differences in gauges of flooring materials, composition of felt underlayments and the degree of hardness to which adhesives dry.

Use of patterns having swirl, marble-like graining or terrazzo, mosaic and spatterdash mottling which camouflage indentations in their random designs and pattern texture.

Choice of Castilian Vinyl Tile which, unless ruptured by extremely great, highly concentrated forces, recovers from indentation; has a "memory," figuratively speaking.

Choice of surface textures, as on Tessera Corlon and Embossed Linoleum, with relief surfaces which conceal markings fairly well.

Use of low gloss material and low gloss wax in maintenance, thus minimizing the shadows or relief caused by indentation.

Most of these factors do not solve the problem completely. They only conceal or camouflage the presence of the damage. Nevertheless, resilient floors, more than any other material except carpet, tend to recover from indentation.

Underfoot comfort

While this is an important consideration in the selection of floors, it becomes a vital factor in the many areas where prolonged periods of walking or standing tend to cause fatigue. Retail stores, hospital corridors, restaurants, and residential kitchens are obvious examples of types of locations where the efficiency of people may be seriously affected by comfort underfoot—and where the choice of the right floor may help considerably to reduce fatigue and increase efficiency. The chart on the preceding page is relative rather than absolute, since underfoot comfort of resilient floors is affected by factors other than the composition of the floor itself—such as the underlayment and adhesive used.

Quietness

The reduction of sound from floor traffic is also quite important. The impact of hard-heeled foot traffic on hard floors is a common source of annoyance—and in areas such as corridors, where sound tends to reverberate through to adjoining rooms, impact noise becomes a serious problem.

Resilient flooring materials give under the impact of footsteps, dropped objects, and rolling wheels. This cushioning effect actively reduces traffic noise. Most resilient floors rate well as "low noise producers" in comparison with wood, concrete, marble, or metal. Their relative noise-on-impact qualities are shown in the chart below. It should be remembered that, while resilient floors will soften the sound of foot traffic and other impact noises, they will not appreciably subdue reverberated noises originating from sources such as the clatter of typewriters, telephones, kitchenware, and conversation.

Relative noise produced by various floors on impact

This chart demonstrates expert opinion of the superior quietness of resilient floors in comparison with non-resilient floorings

Grease and alkali resistance of resilient floors

In commercial or residential installations, resilient floors may be subjected to three main sources of contamination from grease and alkalis. Contamination may be momentary, such as spilled grease, solvents, or alkalis, which are promptly wiped up. Such short-time contamination presents no problem if the floor has a coating of wax, the cleaning is thorough, and the grease or alkali has not seeped down between joints or seams in the floor. A greater problem is contamination that is more prolonged—generally by contact with milder concentrations of oil, grease or alkali from cooking residue, spillage, kitchen vapors, strong cleaners, or improper maintenance. A third source of contamination is alkaline moisture which migrates through on-grade and below-grade concrete and onto the backs of floors.

The problems encountered under this alkaline moisture condition are described in detail in the section, "Resilient floors over concrete," pages 30 and 31.

The Armstrong Research and Development Center devotes continuing attention to developing materials with improved grease and alkali resistance for a wide variety of conditions to which floors may be subjected. The objective is to produce flooring materials which will not soften, swell, discolor, or change their physical properties under normal, accidental, or even prolonged contact with grease and alkalis.

Immersion for 2 hours in a 2 per cent solution of sodium hydroxide determines the color permanency of pigments in tiles specified for use over-, on-, and below-grade concrete. The beaker at the right shows bleeding of colors from pigments that are not alkali resistant.

Testing

Laboratory tests are performed on resilient flooring materials with three considerations in mind. First, the tests must establish the degree of resistance to grease and alkalis of the various floorings made. Secondly, comparisons must be made of the various grades of each type of flooring. And thirdly, the information arrived at must be applied to the experimental production of new types of resilient flooring.

Although this has been a subject very important to the flooring industry and one on which much work has been done, practically no standard test has been generally accepted in the trade.

There are now, however, a number of accurately controlled testing procedures, in the development of which Armstrong has played a major part. These have given rise to the following uniform terms which can be used as a guide in the choice of a resilient floor.

Alkali resistant
Flooring for residential and commercial use, and the surface tested in strong alkaline cleaners.

Grease resistant
Flooring for residential use, and tested in vegetable oils.

Greaseproof
Flooring for residential and commercial use, and tested in mineral as well as vegetable oils.

Armstrong testing procedures

In the Armstrong Research and Development Center, the grease-and-alkali problem has been under study in the field as well as the laboratory for many years, and several tests have been developed that produce valuable results.

How well laboratory tests conducted in the Armstrong Research and Development Center have correlated with actual behavior in the field is evidenced by the fact that Armstrong has de-

veloped a number of flooring materials with good to excellent grease and alkali resistance. However, claims made during the past few years for various "plastic" floorings have accentuated the need for sharper distinctions in testing methods. In fact, some of these tests which Armstrong has used in the past are no longer precise enough to evaluate the grease and alkali resistance of the various grades of plastic-type flooring materials now being offered.

Armstrong sandpaper abrasion machine

The Armstrong Research and Development Center has developed an improved method of determining grease resistance by using the Armstrong Sandpaper Abrasion Machine (Designation D-1242-52T of the American Society for Testing Materials). The technique used with this equipment permits a quantitative determination of the grease resistance of the flooring material by measuring the abrasion resistance before and after contamination with grease or oil. For floorings with burlap or felt backing, the surface only is exposed to grease or oil for measuring their resistance. Homogeneous flooring materials, such as asphalt tile and rubber tile, however, can be totally immersed and then tested by means of the Abrasion Machine.

The Sandpaper Abrasion Machine provides a means of accurately and quantitatively assessing the effects of greases and oils. Because the machine is capable of testing eight samples of different materials at the same time, it supplies useful comparative data.

Immersion testing of Armstrong floorings

In the immersion test for color permanency of pigments under alkaline conditions, such as found in concrete subfloors below and on grade, segments of the flooring are immersed in a two per cent solution of sodium hydroxide. If after two hours the originally colorless solution is colored from bleeding of the pigments, the flooring is unsuitable for installation in basements and on concrete slabs.

More time consuming are immersion testing procedures for various types of floors measuring the effects of prolonged exposure to grease or oils. In these continuing tests, materials are immersed for periods as long as several years while being continually observed for signs of deterioration or other damage.

Armstrong Linotile, vinyl-asbestos tile, the various homogeneous tiles, and, of course, Greaseproof Asphalt Tile are virtually unaffected by the total immersion tests for grease-oil resistance, while rubber tile is only slightly softened.

Tests lead to product improvements

Armstrong Rubber Tile is now recommended for domestic kitchens. With the proper adhesive, Rubber, Castilian Vinyl, and Custom Corlon Tile may be installed on and below grade. Excelon (vinyl-asbestos) Tile provides exceptionally high resistance to both grease and alkali. Regular Asphalt Tile has low grease resistance, but is highly resistant to alkali. Sheet Vinyl Corlon, Custom Corlon (homogeneous vinyl) Tile, Castilian Vinyl Tile, and Custom Vinyl Cork Tile are exceptionally resistant to the effects of both grease and alkaline solutions. More recently developed, Sheet Vinyl Corlon (with Hydrocord Back) provides a sheet plastic flooring with excellent resistance to alkaline moisture from the subfloor as well as to surface grease and alkalis.

Qualitative ratings of the various types of Armstrong Floors are shown in the table below. (Order of ratings: *superior, excellent, good, fair, poor.)*

Relative grease-alkali resistance

	Surface grease resistance	Surface alkali resistance
Sheet vinyl Corlon	excellent	excellent
Custom Corlon tile	excellent	superior
Castilian vinyl tile	excellent	superior
Excelon (vinyl-asbestos) tile	excellent	excellent
Custom vinyl cork tile	excellent	good
Regular asphalt tile	poor	excellent
Greaseproof asphalt tile	excellent	excellent
Rubber tile	good	good
Linoleum	superior	poor
Linotile	superior	poor
Cork tile	fair	fair

Light reflectivity

Today, there is a growing awareness on the part of industrial, educational, medical, and other institutional authorities of the effects of the brightness and quality of light. As a consequence, the light reflectivity factor of resilient floors takes on additional importance. This is particularly true because the floor is usually the largest single area of decorative color in an interior.

Since the human eye is more sensitive to some colors than to others, the percentage of incident light reflected by a floor should be adjusted accordingly. A person with normal color vision is most sensitive to a wave length of about 750 millimicrons—a greenish yellow in approximately the middle of the visible spectrum—while sensitivity falls away toward both the red and violet end of the spectrum. The accompanying table of light reflectivity values is therefore weighted to take this eye-sensitivity into account.

The colors in a high-gloss waxed and polished floor will appear somewhat darker than the same colors in a material with a matte finish. For example, the black in Custom Corlon Tile 462, Imperial Black, with its high gloss, appears to be much darker than the black in Ebony Asphalt Tile B-905, which has a relatively low gloss.

Apart from its effect on the light level of the room, gloss has a considerable influence on the appearance of the finished floor. Very glossy flooring materials tend to show up minor irregularities in the subfloor surfaces. Very glossy materials, therefore, require careful subfloor preparation and inspection to insure the best appearance. Extra maintenance care also is required. Since the great majority of resilient floors are made of combinations of different colors, the light reflectance figures shown on the next page are average values based on a large area of the pattern. In rooms where the light reflectance of the floor is important, practically any value can be obtained by choosing from the various types of Armstrong resilient floors.

Lighting of schoolrooms

In schoolrooms much work is being done to reduce fatigue and promote better working conditions for both teachers and pupils. The elimination of glare combined with a balanced brightness level results in more speed and accuracy and provides a cheerful feeling of warmth. Pupils with subnormal vision are helped by adequate lighting, and accidents in corridors and stairways are greatly reduced. Good school lighting depends not only on proper lighting fixtures and the size and location of windows, but also on the reflected brightness of all surfaces in the room.

Lighting specialists have arbitrarily selected the working surface (books, papers, etc.) as the reference point. They also have established that this reference point should have a reflectance factor of 70%. For ideal conditions then, the floors and all other major surfaces should have reflectance values not greater than 70% and not less than 22-23%. (Values for current Armstrong patterns are tabulated on next page.) These conditions apply not only to schools but also to all places where people work. Proper lighting combined with a proper balance of reflectance levels assures a more relaxed and better satisfied worker.

Matte surface

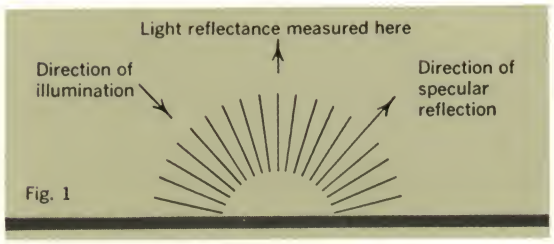


Fig. 1

High gloss surface

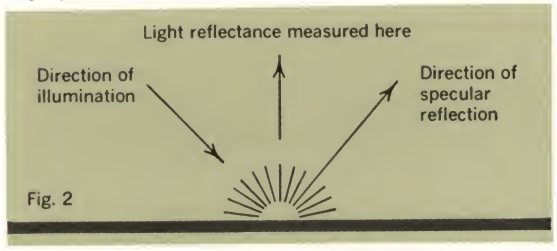


Fig. 2

In addition to color, gloss also has some effect on light reflectivity—a high gloss will have a lower light reflectance. This is illustrated above. In Fig. 1, a matte surface reflects light in all directions but, as shown in Fig. 2, a high gloss surface reflects most of the light in the direction of specular reflection and a relatively small amount in the direction in which the light reflectance measurement is made. If this material is viewed at the angle of specular reflection, it appears very bright, but what is seen is a more or less distinct image of the source of illumination combined with light reflected by pigment particles of the material.

Light reflectivity values of Armstrong resilient floors and walls

Light reflectivity in %	Linoleum and linoleum tile				Sheet vinyl	Tile				Vinyl tile		Walls
	Plain No.	Balboa, Surftone, Parquet No.	Marbelle, Textelle No.	Elegante, Embossed, Spatter No.	Vinyl Corlon No.	Asphalt Tile No.	Linotile No.	Rubber Tile No.	Cork Tile and Custom Vinyl Cork Tile No.	Castilian Vinyl, Custom Corlon Tile No.	Excelon Tile No.	Counter Corlon Wall Corlon
70 to 50	23	1686 1689 1700 1702 1704	1556	5029 5241	6202 86535 6214 86539 6219 86541 6222 86542 6225 86545 6226 86546 6227 86549 6809 86703 6813 86850 6814 86851 6815 86853 86001 86855 86002 87000 86004 87001 86005 87003 86009 87005 86010 87006 86011 87007			608 672 674 676 680		475 480 489 1400 1407 1441 1460	356 818 713 820 714 821 728 833 729 838 731 861 759 876 801 1100 814 1102	8601 10118 8604 10121 8660 10122 8662 10124 8663 10127 8664 10210 8667 10218 8690 10221 8691 10222 8693 10224 8700 10227 8701 10310 8702 10318 8710 10321 8711 10322 8712 10324 10110 10327
50 to 45		1682 1701		5000 5200 5211 5240 5660	6220 86540 6221 86544 6808 87004 86006	D-914	191	609		460 476 481 483 1418 1440 1445	706 869 712 870 766 1101 800 1103 802 1104 839	8606 10214 8661 10217 8665 10223 8692 10314 10114 10317 10117 10323 10123
45 to 40		1681 1683 1684 1685		5202 5231 5210 5390 5212 5394 5221 5571 5230 5652	86003 86537 86538 86700	D-904 D-987 1024 1028				487 1413 1419 1443 1447	352 863 719 868 735 1101 830 1103 837 1104	8666 10226 10112 10312 10120 10320 10126 10326 10212 10328 10220
40 to 35		1680 1703 1705 1706	030 1557	5220 5512 5531 5650	6205 6803 6812 86531 86543	D-911 C-912 C-913 D-967 1021 1027	168 178	673 675 678 682 686		472 474 1403 1405 1409 1444	749 832 767 850 770 1105 816	10111 10219 10119 10228 10128 10311 10211 10319
35 to 30		1688 1800	09 1553	5026 5028 5350 5353 5510 5590	86008 86533 86548 86550	D-900 C-920 C-921 C-926 D-970 C-989 974 1020 1023 1025 1026 1040	176 183	632 633 688	1008	1442	700 815 702 831 747 834 761 865 762 872 771 874 782 879 788	10113 10229 10125 10313 10129 10325 10213 10329 10225
30 to 25	24	1707	014 018 1552	5300 5351	86012 86702	C-901 D-953 C-962 D-968 C-993 1041		610 656		469 1408	717 783 760 840 779 871 780 878	
25 to 20			1550 1558	5201 5310	86530 86532 86701	C-910 C-944 C-947 D-969 1042	173 185 187 193	670 677	410	486 1404 1406	763 841 851	10116 10216 10316
20 to 15		1801	1551	5530 5570	86536 86704	C-902 C-908 C-946 C-971			1005 1006	1416	711 777 715 842 765 852 768 864 769 877	10115 10215 10315
15 to 10	22 39			5352		C-907 D-964	172	679	1011	477		
10 to 05	20 25				86547 86705	B-905 B-915 B-919 C-924 B-986 B-988		671	1007 1009	1401 1446	732 772 784 817 867 1106	
05 to 00	21 27				87002	B-918	180	695	411	462 1461		

The effects of radiant heating on resilient flooring

It is logical to ask what effects heat radiated from the surface of a concrete slab has on the resilient flooring materials and adhesives covering the slab, since some are thermoplastic and others might, presumably, be harmed by being "over heated." It is likewise reasonable to inquire if possible insulating properties of resilient flooring materials might not reduce the effectiveness of a floor system of radiant heating or increase the consumption of fuel.

In order to provide specific and unbiased recommendations for resilient flooring installations over radiant-heated floors, the Armstrong Research and Development Center has conducted a series of extensive tests to determine the effects of normal and severe floor temperatures on the hardness, composition, and indentation properties of all Armstrong Resilient Floors.

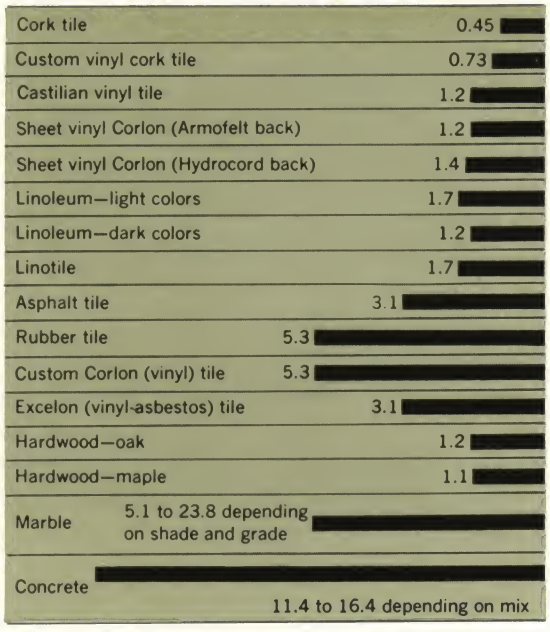
No loss of heating efficiency

The results of these tests show that there is virtually no loss of heating efficiency through the use of resilient flooring materials. With almost all Armstrong Floors, the temperature difference between the surface of concrete subfloors and the resilient flooring surface is about 2.5 degrees F. With floors of Cork Tile, which has a thermal conductivity or "k" factor lower than the other resilient flooring materials, the difference is appreciably greater. None of these temperature variations, however, is great enough to result in significantly increased fuel consumption since the time lag required to bring resilient flooring to the operating temperature of radiant heating systems is unimportant.

No harmful effects

Observations of the Armstrong Research and Development Center have also shown that floor heat, within the limits commonly recommended for radiant heating, has no harmful effect on either the resilient flooring or the adhesives used in installation, provided that the temperature of the floor does not exceed 85 degrees F. Moreover, it is advantageous to have the subfloor heated (say, 72° F.) during the installation in severely cold weather to permit the proper working and setting time of the adhesives and for easier handling of the flooring material.

Thermal conductivity BTU/HR./Sq. Ft./°F for 1" thickness* at 90°F mean temperature (K90)



* "K" values do not include lining felt.

Conductance is the working value desired for calculation of heat flow. To obtain conductance, divide thermal conductivity by thickness of material. Thus, .125" white Linotile, with a "K-90" factor of 2.1, will conduct 16 BTU's/hour/sq. ft./deg. F. Thermal conductivity of resilient flooring materials varies according to type, color, and installation method. Contact the Armstrong Cork Company for specific recommendations when thermal conductivity is of special importance. The temperature difference between the surface of a radiant-heated subfloor and the surface of the resilient floor (except Cork Tile) will average 2.5°. With Cork Tile floors, the difference is from 9° to 15°.

Special considerations unnecessary

Both laboratory tests and actual field experience indicate that resilient flooring materials can be chosen for radiant-heated subfloors by exactly the same standards as those where other types of heating are employed. Each type of resilient flooring material is installed over a radiant-heated subfloor with the same adhesives and in the same manner as recommended for conventional floors.

The influence of air conditioning on resilient flooring

The increased use of air conditioning, especially year-round air conditioning, can be an important factor in the installation and selection of resilient flooring and the planning of the building in which it is to be used. Now and then, in new air-conditioned buildings, installation problems crop up with resilient floors. While these are usually minor problems—caused by temporary conditions—they sometimes happen after the building is completed—giving the owner some trouble and cause for concern.

A properly functioning air conditioning system controls the temperature and usually controls the humidity. In sections of the country where the relative humidity is normally low, there may be no necessity for humidity control. And for certain manufacturing and other operations, the humidity requirements may be more precisely controlled. Because drying rates of concrete subfloors and the bond, as well as drying, of water based adhesives are directly related to relative humidity, it follows that air conditioning can have adverse effects or at least delay schedules.

Usually an air conditioning system will favorably affect drying of subfloors because, particularly in the summer months, large quantities of water are removed from the air by such systems. The effect of any given system on drying of subfloors or adhesives may be quickly ascertained by learning whether the system is removing water from, or adding it to, the air. The latter circumstance is likely during the winter months for most systems. Even so, these should not be unfavorable drying conditions, for normally the relative humidity would be controlled at 50% or less.

Pre-installation precautions

In air-conditioned structures, consideration of the following before resilient flooring installation will minimize the possibility of the work being affected by the moisture conditions:

As explained on page 30, the concrete subfloor must be given adequate drying time before resilient flooring is installed. It is recommended that, before air conditioning is put into operation, the subfloor be allowed to dry normally, or preferably that the air conditioning system be adjusted to withdraw, rather than add, moisture. Then (subject to the moisture tests on page 33) the subfloor will become sufficiently dry to permit safe installation of the resilient flooring.

Construction precautions

But the specifier must look further ahead than installation. Air conditioning which lowers the temperature of an interior below adjacent exteriors tends to introduce moisture problems.

If surface condensation occurs, adjustments should be made in the air conditioning system. Condensation in the slab is possible where there is a humid area below the subfloor; for example, moist subsoil, an unusually humid room or damp plenum chambers.

The moisture in a damp plenum chamber, or humid room, will often be drawn up into the subfloor by an air-conditioned room above. The resulting moisture conditions are similar to those in on-grade and below-grade concrete. Ideally, a moisture barrier should be used to prevent this moisture from rising to the surface of the slab.

Specifiers should provide for a polyethylene sheet or other moisture-impregnable material just below or within the concrete subfloor to prevent this occurrence. However, as this is often unfeasible due to cost or construction considerations and patently impossible in most remodeling work, a perfectly satisfactory alternative is to use those floors mentioned on page 14 as being safe for installation below grade and on grade.

When the air space between a suspended ceiling and the subfloor above is used as part of the exhaust system, this area becomes in effect a plenum chamber, full of moist air. So the subfloor itself is subjected to great amounts of moisture. Again, the precautions mentioned in the previous paragraph should be followed.

The characteristics of resilient flooring and air conditioning are compatible or fully reconcilable if anticipated in the building specifications.

Resilient floors over concrete

Today, awareness of the problems related to the use of resilient floors over concrete is more important than it was several years ago. Modern construction techniques have created new considerations and the use of concrete in direct contact with the ground has vastly increased, especially in residential construction. Armstrong, therefore, has given considerable attention to concrete construction because of its direct effect on the behavior of resilient flooring installations. In the course of these studies, certain basic information has come to light which may be generally useful to specifiers; specifically useful in connection with the installation and selection of resilient flooring.

Even though reconcilable, there is basically a conflict between concrete subfloors and resilient floor surfacing. On the one hand, concrete is very wet when placed and it dries very slowly; *never* dries out completely in certain environments. On the other hand, moisture is deleterious to some resilient floors, or the bond of some adhesives used to install them. Impatience to meet building schedules can aggravate the situation. Therefore, proper preparation and testing (see page 33) of subfloors and careful selection of resilient flooring materials and adhesives are essential.

The drying of suspended concrete

The drying of concrete is a slow process and the loss of water is a direct function of the surface area. As will be explained, slow evaporation is desirable the first several days; thereafter a tedious but necessary wait.

Usually, suspended concrete is protected from all sources of moisture except the moisture initially in the mix and water vapor in the atmosphere. However, it should be kept damp for some time to permit chemical reaction to cure the concrete. It may be kept damp by the use of concrete curing compounds sprayed on the top, by asphalt saturated felt, or by other coverings. If kept damp for approximately two weeks (this can vary according to atmospheric conditions) the surface of the conventionally mixed concrete will have sufficient strength for proper utility, including the bonding of resilient flooring.

There is no specific information on the drying rates of lightweight aggregate concretes, because of wide variations in the densities of the mixes and the drying characteristics of the aggregates used. It can be stated, however, that because they are mixed with relatively large proportions of water, they will probably require more time to dry than regular concrete. If the lightweight aggregate mix is sufficiently dense at the surface to support the bonding of resilient flooring, it may be considered in exactly the same way as other concrete. It will be wet when placed and will eventually reach equilibrium with the relative humidity of the environment.

When resilient floors susceptible to moisture are to be installed, suspended concrete should be permitted to dry thoroughly for several months. If a concrete curing compound has been used, poor bonding of resilient flooring adhesives may (see page 34) result. The conditions are similar to those brought about by "breaker compounds" used in hydraulic-lift and tilt-slab construction discussed on pages 34-35. When suspended concrete is known by test (see page 33) to be sufficiently dry, then a resilient floor may be installed.

The drying of on- and below-grade concrete

Although, inherently, the concrete used for slabs on and below grade and for suspended concrete floors may be identical, certain differences are important as they influence the drying. Slabs in contact with the ground are exposed to ground moisture unless protected by a barrier. When covered with a flooring material, such a slab without a membrane will attain ultimately the same moisture condition as the soil on which it is placed. In some instances this condition may approximate 100% relative humidity. In short, a concrete slab on or below grade is *never* completely dry without a perfect moisture barrier.

Under uniform, favorable drying conditions thick concrete slabs will lose about as much water in the first 30 days (after approximately two weeks curing) as in the next 270 days. The percentage of water lost in 30 days from 4″ slabs is somewhat greater. Measurements of drying rates of concrete 12″ thick were made at the Bureau of Standards a number of years ago. From the tests

run at 50% relative humidity and 100° F., it was observed that half the water lost in 300 days was lost in the first 30 days. After 100 days the relative humidity was down to about 75-80%. These drying conditions would be described as very favorable; much more favorable than with some floors encountered in field experience which did not dry at all in as much as a year because of excessive moisture conditions in the building. However, it is conservative to say that a 12″ slab can be ready for installation of resilient flooring in an absolute minimum of four months after placing under optimum drying conditions consisting of low humidity and high temperature.

The appearance of a slab can be deceiving when there is concern as to its dryness. It is never safe to assume that a concrete floor which looks dry *is* dry. Rapid evaporation at the surface will make it look dry, but below the surface the concrete may be too saturated for the installation of resilient flooring at that time. Eventually equilibrium will be reached where the rate of evaporation from the surface equals the rate of absorption of moisture from the soil, and there will be a gradation of moisture ranging from 100% humidity at the soil level to a figure determined by the atmospheric conditions at the surface. When that state of equilibrium has been reached, there are a variety of Armstrong flooring materials suitable for on- and below-grade installations. These suitable materials are designated on pages 4, 6, and 14.

The effects of moisture on resilient floor installations

Subsequent to the curing of concrete, the interests of flooring contractors are directed to its drying. This drying, to the extent of the elimination of free liquid water, is essential for the formation of a bond between the adhesives and the inorganic materials of concrete. In the presence of any liquid water in concrete, water-based adhesives will not set up. In the case of asphaltic adhesives, already bonded to dry concrete, the asphalt will eventually be displaced by water if the availability of water is sustained.

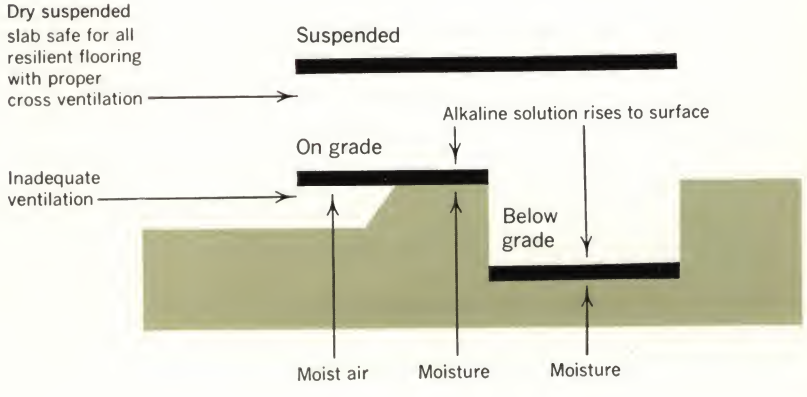
Aside from the requirements of the bonding of flooring materials to the concrete, certain flooring products which contain oleoresinous binders or cellulosic fibers need sufficiently dry conditions to prevent mold growth and "after-softening." Specifically, these products are Linoleum, Linotile, Cork Tile and Custom Vinyl Cork Tile. Even sheet Vinyl Corlon with Armofelt Back will encourage mold growth due to the cotton and/or wood fibers and other organic components in the felt backing.

The alkaline salts in solution with moisture which exude from drying cement or, more particularly, which work their way up from the earth in concrete on and below grade, have, in addition to deteriorating effects, a tendency to prevent or destroy satisfactory bonding of adhesives by sheer physical displacement; or to leave unsightly, annoying salt deposits at the seams of sheet materials and joints of tiles.

The use of membrane vapor barriers

Excessive amounts of ground moisture can, of course, create problems for on- and below-grade areas of commercial and residential buildings

This drawing shows how moisture from the ground or from an inadequately ventilated air space below penetrates the concrete slab, bringing alkali to the surface in solution. This solution attacks the oil binders of some resilient flooring materials, causing a chemical change. For grade-level and below-grade floors which contain ground moisture, asphalt tile, Excelon (vinyl-asbestos) tile, rubber tile, Custom Corlon Tile, Castilian Vinyl Tile, and sheet Vinyl Corlon with Hydrocord Back may be installed. These resilient flooring materials are not harmed by alkaline moisture. (Cork tile and Custom Vinyl Cork Tile also may be installed on grade by following the recommendations above and the adhesives chart on page 42.)



over and beyond those relating to the installation and use of resilient flooring. These problems vary from merely slight, but unpleasant, dampness to actual structural damage. Moisture in a concrete slab is a variable, dependent upon weather changes, and, as previously stated, the relative humidity of the slab usually approximates the dampness of the subsoil. Again, what may be a relatively dry slab at one time can be quite different at another.

Exterior methods of inhibiting moisture

For the most part, problems of excessive moisture are not encountered when proper precautions are taken outside the structure. Appropriate drainage systems will usually minimize, if not eliminate, the effects of local weather conditions, terrain, water-table levels and soil types. This is an area in which architects, engineers and building contractors are already experienced and skilled, and therefore it would be superfluous to discuss it in detail here. It is mentioned only as an earnest recommendation to inhibit moisture from external sources by all possible means if any organic surfacing materials or adhesives are to be placed on the concrete slab.

If a concrete slab is sealed by a surfacing material on the top, evaporation of water is retarded and the slab will be just as damp as the soil on which it is placed. It will be wetter when placed, of course, but if sealed on top, it will dry to be no dryer than the subsoil. It necessarily follows that slabs on ground on poorly drained sites or on ground with a water table near the surface are poor bases for any floor—unless shielded from the water source.

Moisture barriers recommended for dry interiors

In certain parts of the country, notably California and the Gulf Coast area, problems of excessive ground moisture are the rule, rather than the exception. And in some areas, problems are encountered due to the saline solution seeping through the concrete and, as previously described, harming resilient floors or the bond of the adhesive used. These highly alkaline conditions follow no geographical pattern, but, rather, result from the degree of alkaline salts peculiar to the soil or to the aggregates most commonly used in compounding concrete. Manufacturers of resilient flooring materials are not accountable for unusual conditions of salt deposit in concrete subfloors; rather, knowledge of them and suitable precautions against them are matters of local responsibility.

Regardless of the area, Armstrong feels that the use of membrane moisture barrier is advisable because it moves the dividing line between dampness and dryness 4″ or more below the flooring material rather than directly beneath the flooring material. Membrane vapor barriers, properly installed, will effectively lower the moisture content of the slab and materially enhance the comfort and livability of the area above the slab.

Obviously, where remodeling is involved, the installation of a membrane cannot, in most cases, be considered. However, Armstrong does have a variety of flooring materials, specifically mentioned on previous pages, which are suitable for on- and below-grade installations even though a membrane cannot be installed. These materials will normally perform satisfactorily, but since they are not in themselves moisture barriers, they cannot be expected to prevent the transmission of ground moisture into living areas.

Types of membranes

There are currently available three basic types of membrane vapor barriers that the Armstrong installation experts consider to be safe and commendable for use with resilient floors. These are plastic (the most generally used type being polyethylene in .004″ and .006″ gauges), butyl rubber, and 55-pound asphalt roofing paper. All three types are effective. All have unique advantages and disadvantages compared to the others. Polyethylene, for instance, is the least expensive, comes as wide as thirty-two feet, but punctures quite easily. Butyl, the most rugged and long lasting, is also the most expensive. Asphalt roofing paper sealed with hot tar provides a good barrier, but such a barrier doesn't last so long as the other types.

The barrier above, within, or below the slab?

Membrane vapor barriers installed directly on the top of the slab do not provide the stable surface needed for a satisfactory resilient floor installation. Therefore, the barrier must either be laid below the slab before it is placed, or within it,

sandwiched between two layers of concrete. (While this "sandwich" method provides a number of advantages as far as wear and preventing damage go, it is more costly—and seldom used at present.) Whenever a membrane vapor barrier is put in with concrete below grade, it is important that it also be flashed vertically up the foundation wall to above the line where the resilient floor will be laid. This will stop moisture from seeping sideways through the walls to the finished floor. Providing that the membrane is intact, untorn, thoroughly sealed, and that there is no leakage around ducts, pipes, or pilings, it will provide good protection against moisture for resilient floors used on and below grade. It is vital that the condition of the barrier be thoroughly checked just before it is covered over.

Moisture tests

As previously explained, it is never safe to assume that a new concrete subfloor is dry and, when it is in contact with the ground, that, new *or* old, it will always be dry—especially if the subfloor is not protected by a membrane from external moisture. Therefore, it is prudent, if not necessary, to conduct moisture tests before beginning installation of resilient flooring.

Mat moisture test

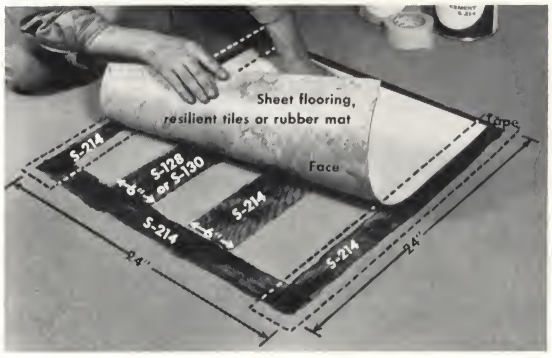
This test, illustrated below, determines if floors prescribed for on- and below-grade installations can be satisfactorily adhered—and permanently so. Lacking the availability of a relative humidity meter, discussed below, the mat moisture test is the most convenient and commonly used procedure, but it is not suitable for testing subfloors which are above grade.

The mat moisture test consists of sealing a covering such as polyethylene sheeting, resilient flooring or rubber matting, over several patches of water soluble adhesives on the concrete surface. After a suitable period of time, an inspection is made to ascertain whether or not the adhesives have set up. If the drying of the concrete prior to the test has proceeded so that the concrete can soak up the water from the adhesives and permit them to set up, a satisfactory indication will be given by the mat test. If the adhesives have not set up, more drying is needed prior to installations of floor coverings.

Relative humidity meter test

A relative humidity meter placed on a concrete surface under a polyethylene sheet, sealed at the edges with tape or adhesive, may be used to evaluate the moisture condition of suspended concrete. This is the most reliable test for suspended or above-grade subfloors. On the thickest slabs, the test should be run for 72 hours, although less time may be adequate. On thin slabs, 4 hours will probably suffice.

It is desirable to have the relative humidity as measured by this test down to 80% on a drying suspended subfloor before installation of linoleum, Linotile or Vinyl Sheet Corlon with Armofelt (organic) Back. Higher relative humidity recommends the use of those flooring materials and/or adhesives prescribed on page 42 for on- and below-grade subfloors, or additional drying until 80% RH, or lower, is reached.



This mat moisture test shows whether cork tile, rubber tile, Custom Corlon Tile, or sheet Vinyl Corlon with Hydrocord Back can be installed satisfactorily on or below grade. After 72 hours, the S-128 and S-130 adhesives should be partially set up and the S-214 adhesive well set up or dry.

A relative humidity meter, placed under polyethylene sheeting, sealed at the edges with tape or adhesive, should be used on new above-grade concrete before installing materials affected by moisture. After a suitable period, a reading of 80% RH or lower indicates satisfactory dryness.

Modern construction techniques and resilient floor installation

Concrete curing and parting compounds

New types of concrete and new techniques in hydraulic lift-slab construction have resulted in their increasing popularity with the building trades. However, with the new techniques have come new problems in resilient floor installation.

In the lift-slab method of subfloor construction, the concrete for each suspended floor is poured and allowed to harden at ground level before the slab is hydraulically lifted into place to form the upper floor. Before the concrete can be poured, however, special oily, resinous or waxy parting (breaker) compounds are applied to the top surface of each slab to prevent it from adhering to the slab above it.

While the breaker does prevent the slabs from sticking together, the resin or waxy film of the breaker coating keeps the flooring adhesive from making a firm bond to the slab. The same problem arises from coating-type curing or hardening compounds used to slow down drying and aging of concrete so that strength is greater and surface cracks are fewer. The problem may not be acute in all installations, but the only way to insure a permanent bond for any resilient flooring is to completely remove the film.

Four removal methods can be used. One method is sanding. This is seldom completely successful because it will not abrade deeply enough to get at film that has soaked into the concrete.

Another method is sandblasting. This will remove the film, but it may also roughen the concrete or pit it if the air pressure is too great or the concrete is too porous.

A common and frequently effective method is thoroughly scarifying the slab with a wire-brushing machine. But the best method of removal is grinding the slab with a concrete or terrazzo grinder. Grinding will remove film both on the surface and in the surface pores, and it will cut a new surface on the concrete. In addition, grinding insures a smooth, level floor. A simple bond test, described above right, should be employed after grinding to check its effectiveness.

Bond test

To determine the compatibility of resilient flooring adhesives to concrete subfloors after removal of curing agents, breaker compounds, dust inhibitors, oil, grease, paint, varnish, and other special surface treatments and conditions:

Using the flooring material prescribed in the building specifications, install 3′ x 3′ panels spaced approximately 50 feet apart throughout the subfloor area. According to the grade level of the subfloor, install the panels with the adhesives indicated in the table below.

	Below Grade	On Grade	Suspended
Asphalt Tile Excelon (vinyl-asbestos) Tile	S-90	S-90	S-90
Vinyl Corlon with Hydrocord Back	S-235	S-235	S-250 or S-235
Custom Corlon (homogeneous vinyl) Tile Rubber Tile	S-237	S-237	S-237 or S-130
Castilian Vinyl Tile	S-237	S-237	S-237
Cork Tile Custom Vinyl Cork Tile		S-214	S-214
Vinyl Corlon with Armofelt Back Linoleum Linotile			S-128, S-235, S-237 or S-214

If the panels are securely bonded after a period of two weeks, it may be concluded that the subfloor surface is sufficiently clean of foreign material for satisfactory installation of the specified resilient flooring. Material can be considered "securely bonded" if unusual force is required to lift it from the subfloor and if, after doing so, adhesive clings to both the subfloor and the back of the material.

Lightweight concrete

Two problems may be encountered where lightweight concrete is used. These problems are merely temporary obstacles to the installation of resilient floors.

The first concerns the tendency of lightweight concrete to retain moisture longer than usual drying time. This results from three factors: there is much more water in the mix, there is greater porosity to imprison the water, and the aggregates themselves have special slow drying characteristics. As moisture rises to the surface of above-grade subfloor slabs it creates conditions typical of concrete which is in direct contact with the ground.

To determine whether such a condition exists, moisture tests as outlined on page 33 should always be made throughout the entire area of the slab to make sure it is sufficiently dry for the safe installation of resilient floors. If excessive amounts of moisture are present, the use of resilient floors must be questioned.

In most cases, those Armstrong adhesives which are recommended for use with the various Armstrong floors over on-grade slabs should be used over approved lightweight concrete. If special conditions call for a different adhesive, Armstrong Architectural-Builder Consultants will give specific recommendations.

Only those floors unaffected by alkaline moisture should be considered for use over lightweight concrete subfloors; Asphalt, Excelon (vinyl-asbestos), Rubber, Custom Corlon, Castilian Vinyl Tiles, sheet Vinyl Corlon with Hydrocord Back, and sometimes Cork and Custom Vinyl Cork Tiles.

The second problem concerning installation of resilient flooring over lightweight concrete subfloors has to do with their low density. Such density is of great advantage in building construction due to lightness and to thermal insulation. Obviously, these properties result from the high degree of porosity or the compounding of light ingredients relatively weaker than the sand, gravel, and stone in conventional concrete. Therefore, lightweight concrete strong enough for a prescribed floor load may be too weak on its surface for adhesion of resilient flooring; the face may be inherently dusty or crumbly, tending not to hold an adhesive bond.

It is not intended here that the advantages of lightweight concrete should be foregone for the sake of resilient flooring, nor that resilient flooring need be sacrificed to the peculiarities of lightweight concrete. Rather, the two can be reconciled, a view shared by Armstrong and the Portland Cement Association, providing the use of resilient flooring is anticipated.

It appears that lightweight concrete containing perlite or vermiculite is compounded in densities ranging from 20 to 40 pounds per cubic foot. Since, as described above, density has a direct relation to strength, the surface of this type of lightweight slab is structurally weak—at least, too weak to support the bond of the adhesives for resilient flooring. Therefore, concrete slabs of this type should have a finish or topping at least 1″ thick of standard gravel or stone concrete mix.

Lightweight concrete consisting of expanded slag, shale, or clay and having a density of 60 to 90 pounds per cubic foot is also too light for direct installation of resilient flooring. It, too, should be topped off with a 1″ finish of standard concrete. When, however, the density ranges from 90 to 120 pounds per cubic foot, the installation of resilient flooring is recommended—providing the surface of the slab is trowelled to a smooth, even finish.

For easy reference, concrete subfloors are tabulated at the left in three classifications of density: light, medium, and heavy. Special questions about the use of resilient floors on lightweight concrete should be directed to the Armstrong Architect-Builder Consultant in the nearest Armstrong District Office—or to Armstrong Cork Company, Floor Division, Lancaster, Pennsylvania.

The architect's or specifier's responsibility with respect to resilient flooring on lightweight concrete subfloors can be defined as: (1) the specifier must anticipate the use of resilient flooring in order to take certain precautions and make special provisions, (2) the specifier must have foreknowledge of expected subfloor drying time in order to schedule building time, and (3) the specifier must have definite information on the density of the concrete as it determines the structural strength of the upper surface.

Density classification of concrete slabs by weight

Density	Pounds per cu. ft.	Type of concrete	Recommendations
Light	20 to 40	Expanded perlite, vermiculite, and others	Top with 1″ thickness of standard concrete mix
Medium	60 to 90	Expanded slag, shale, and clay	Top with 1″ thickness of standard concrete mix
	90 to 120	Expanded slag, shale, and clay	Approved for use of resilient flooring if trowelled smooth and even
Heavy	140 to 150	Standard concrete of sand, gravel, or stone	Approved for use of resilient flooring. See pages 46–48, "Which resilient floor over concrete?"

Providing proper subsurfaces for resilient flooring

Preparing old subfloors

With the continuing importance of renovation projects, resilient flooring materials offer the simplest means of utilizing the existing floor construction. However, no resilient floor is better than the subfloor over which it is installed, and satisfactory results depend to a great degree on correct preparatory work.

The installation of resilient floors in an old structure usually involves the conversion of what was once a walking surface into a subfloor. Two conditions must be met before such a floor forms a satisfactory base for resilient flooring. First, it is necessary to have a relatively smooth-surfaced subfloor free from serious irregularities which would "telegraph" through the material and mar the appearance of the floor. Second, since resilient floorings are applied with adhesives, the old floor must be prepared so as to provide a satisfactory bonding surface for the adhesive.

Wood floors

The preparation of old suspended wood floors for the installation of resilient flooring depends on the type of construction:

Single wood floors, not tongue-and-groove or tongue-and-groove flooring having more than 3″ face width, should be covered with 25/32″ flooring or 1/2″ or heavier plywood of the Douglas Fir Plywood Association grades recommended on page 40.

Single wood floors, tongue-and-groove (not over 3″ face width) should be covered with hardboard, such as Armstrong Temboard Underlayment or 1/4″ plywood in the grades approved on page 40.

Double wood floors: If boards are 3″ wide or more, proceed as paragraph above. If less than

Preparing old wood subfloors

Type of subfloor		Cover with
Single wood floor	Tongue-and-groove	Hardboard or plywood, ¼″ or heavier
	Not Tongue-and-groove	Plywood, ½″ or heavier
Double wood floor	Strips 3″ or more	Hardboard or plywood, ¼″ or heavier
	Strips less than 3″	Renail or replace loose boards. Remove surface irregularities.

Floors too uneven to be sanded smooth should be covered with plywood, hardboard, or ¼″ or heavier plywood, or asphalt underlayment.

See text on page 38 for recommended types of plywood.

Wood floors, which are too uneven to be sanded smooth, should be covered either with hardboard, ¼″ or heavier plywood, or a mastic-type floor fill made with Armstrong No. S-170 Flormastic.

Surface defects in old double wood floors often damage or mar the finished resilient floor. This can be prevented by carefully renailing loose boards and sanding or planing warped areas to floor level. All badly damaged floor boards should be replaced. Sanded areas should be treated with No. S-140 Floor Size.

Another method of resurfacing damaged wood and concrete subfloors is the use of a cold mastic floor fill. It can be laid directly over the old floor. Wood screeds and a straightedge may be used to maintain the thickness necessary for leveling. Cold mastic fills will not adhere to subfloors treated with oil. See illustration page 39, top left.

3″, renail loose boards and replace defective or badly worn boards with new material. Fill cracks and holes with plastic wood or snugly fitting wood pieces. Remove surface irregularities (such as cupping) by sanding.

Old wood floors to which paint or oil has previously been applied present a special problem. Such treatments tend to prevent the penetration of the adhesive into the wood and deprive it of bonding strength. All traces of oil or paint should be removed by sanding, scraping, or covering with approved hardboard or plywood.

When the pores of any wood floor have been opened by sanding, penetration of moisture from the adhesive and other humid conditions cause cupping of the floor boards. Immediately after sanding, therefore, a sealing compound such as Armstrong S-140 Floor and Wall Size should be applied and allowed to dry before spreading adhesive. Wood floors built on sleepers over concrete (on and below grade) are not satisfactory for installation of resilient flooring. See explanation on page 13.

Concrete floors

The problem of securing proper adhesion to old concrete subfloors usually arises from dampness, or from dusty, chalky, or flaky concrete surfaces, or from previous treatment with oils or other solutions. Dampness should be checked as described on page 33. Dusty, chalky, and flaky surfaces can usually be overcome by thorough sweeping with a wire brush to remove all loose particles, followed by priming or sizing.

An underlayment, consisting of four-by-four sheets of approved hardboard or plywood, is advised for rough wood subfloor areas which cannot readily be corrected by sanding. When laid over a tongue-and-groove floor, these underlayments provide a sound and economical base for all types of resilient flooring.

Grease, oil, and/or other surface coating such as paint, varnish, or wax can be removed by using paint and varnish remover, blowtorch, paint burner, by sanding, steaming, or applying a strong solution of tri-sodium phosphate and water followed by thorough rinsing and drying. A bond test, as described on page 34, should be made, over all subfloors where oil, grease and other foreign agents were removed.

When asphalt or vinyl-asbestos tile is to be installed, the sealer should be Armstrong No. S-80 Asphalt Primer. For all other resilient flooring materials on suspended concrete floors, apply Armstrong S-140 Floor and Wall Size.

All cracks, minor holes, and crevices should be filled with Armstrong Crack Filler, or a filler of equal quality. If the concrete floor surface is rough, irregular, and needs to be filled, the entire floor may be resurfaced with an asphaltic underlayment fill containing Armstrong S-170 Flormastic, a latex-type underlayment, or a concrete topping, secured to the old surface with a concrete bonding agent. Fill, underlayment and topping, like new concrete floors, must be adequately dried and cured before installing resilient floors.

The above comments cover the most common conditions encountered with old subfloors of wood and concrete. Other subfloors such as metal, terrazzo, and magnesite require special treatment which is dependent on individual circumstances. In such cases Armstrong will be glad to offer specific assistance.

Although resilient flooring adhesives will fill minor cracks and crevices in concrete subfloors, it is best that all conspicuous holes, cracks, and crevices be filled with a reliable cement crack filler before installation is started. It is important that all concrete subfloors be allowed adequate drying time before installing flooring.

Selecting the right type of underlayment

All resilient flooring materials tend to mold themselves somewhat to irregularities of the surface over which they are installed. This tendency, in addition to the more or less severe seasonal expansion and contraction of stripwood subfloors, makes it extremely important that the proper type of underlayment for the particular conditions is used. It is equally important that the underlayment is properly installed. Otherwise, the resilient floor may lose some of its attractiveness and may even split.

Two main types of subfloors should be considered —concrete (or other monolithic floors, such as terrazzo, ceramic tile, or steel) and wood—and two main types of underlayment—mastic and board. Mastic-type underlayments are used to level concrete subfloors. Board-type underlayments are generally used to resurface wood floors, both old and new.

Mastic-type underlayments

Mastic underlayments are of several kinds. The best contain a binder of latex, asphalt or polyvinyl-acetate resins in the mix. Those which consist simply of a powdered mixture (cement, gypsum, and sand) to which only water is added, all too often break down under traffic when applied in thin coats or featheredges. For some installations, either type will be satisfactory, but the mastic type is best where a thin film is required; moreover, Portland cement can be made mastic by commercially available additives of polyvinyl-acetate. For best results, the maximum thickness of latex underlayments is up to, but not more than, 1/8". Any thickness greater than 1/8" should be applied in two or more applications.

Latex-type underlayments

Latex underlayments are easily troweled and can be featheredged very satisfactorily. However, they should not be used when a solvent-type asphalt adhesive such as Armstrong S-80 and S-90 will be used to install the resilient floor. Armstrong S-160 Emulsion and Armstrong S-700 Brushing Cement are perfectly suitable adhesives to use on all latex-type underlayments.

Asphaltic-type underlayments

Armstrong Flormastic S-170, an asphalt compound mixed with Lumnite cement and aggregates, is both inexpensive and satisfactory under normal conditions. Except for occasional spots to be featheredged, the fill should be at least 3/8" in thickness. As with latex-type underlayments, asphalt type should not be used with installations involving solvent-type formulations such as Armstrong Asphalt Primer S-80 and Asphalt Cement S-90; Armstrong Emulsion S-160 or S-700 Brushing Cement is preferable. It is important that the subfloor be free from paint, oil, and varnish.

Polyvinyl-acetate underlayments

Polyvinyl-acetate resins are the main ingredient of concrete bonding compounds for securing concrete topping to old concrete, terrazzo, marble, concrete block, brick, ceramic tile and painted or non-porous surfaces such as metal, or other materials providing no suction or absorption. They eliminate the costly, time-consuming practices of chipping, drilling, roughening, acid-washing, or scarifying old surfaces.

However, the concrete topping cannot be less than 1/2" in thickness. In order to achieve a thinner topping ranging from 1/8" to an absolute featheredge, the bonding compounds are used as an additive to Portland cement, the polyvinyl acetate resins providing the necessary mastic properties. A prime coat of the concrete bonding compound must still be applied to the old surfaces.

Board-type underlayments

The basic choice here is between approved hardboard and plywood. In most cases, it has proved satisfactory to use hardboard on remodeling work and plywood on new construction. The main reason for this is that the thinner hardboard type of underlayment avoids excessive building up of old subfloors. In new construction, on the other hand, it is often desirable to build up the thickness of subfloors, and plywood serves this additional purpose well.

Hardboard

The most suitable type of hardboard underlayment for wood subfloors is Armstrong Temboard Underlayment. This hardboard has been in use

Over wood subfloors, galvanized chicken wire or expanded metal lath should be nailed to the floor to reinforce asphaltic-type underlayments. The wire mesh allows the wood floor to expand and contract without damaging the floor fill.

Latex-type underlayments may be troweled to a thin "featheredge" in leveling worn or damaged areas of concrete subfloors. This often eliminates the need for grinding or a complete new concrete topping.

for many years and has proved satisfactory as an underlayment for resilient floors. Tempered hardboards should never be specified as underlayments for resilient flooring.

Plywood

This material has long been used satisfactorily as an underlayment. The general term "plywood," however, should always be qualified in underlayment specifications. Only certain types of plywood made to DFPA ratings are suitable as underlayment. (See chart on page 40.)

Where excessive water spillage occurs, such as around drinking fountains and entryways, and on counter tops, exterior plywoods are recommended. A minimum thickness of ¼″ should be used in all cases.

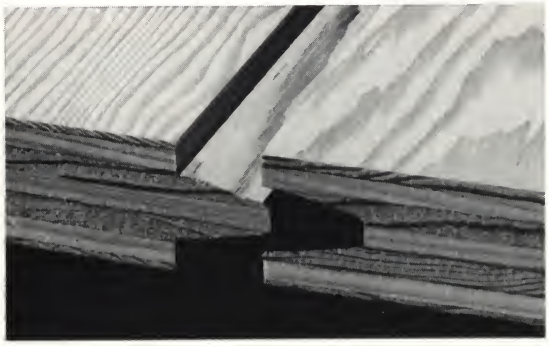
In new construction where resilient flooring is to be used, there are advantages in specifying plywood subfloors instead of stripwood. Labor included, ⅝″ plywood nailed directly to joists costs less than a tongue-and-groove subfloor plus ¼″ plywood underlayment. This comparison is true in spite of the necessity of cross-blocking the joists before the ⅝″ plywood subfloor goes down on them.

Hardboard or plywood (joint spacing of 1/32″) should be fastened to the subfloor with coated or ring-grooved nails or approved staplers. Fasteners must not be over 4″ o.c. in all directions and at edges and driven flush or 1/32″ below the underlayment surface.

Plywood subflooring known as 2-4-1, as specified by DFPA, is the most suitable as a base for resilient floors from the standpoint of cost and performance. Surface irregularities should be smoothed out with plastic wood filler and sanded as required. Especially significant, insofar as resilient floors are involved, is 2-4-1 T & G, a 1⅛″ combination subfloor and underlayment Because it is available with tongue and grooving on the sides or tongue and grooving on both sides and ends, it can be applied directly to joists with great convenience, speed, and economy. The tongue-and-groove feature eliminates the need for cross-blocking of joists, required when square edged plywood is installed directly to joists.

Particle board

Particle board (or "chipboard," "flakeboard"), is currently being offered as an underlayment for resilient flooring. There are many manufacturers of particle board and their products vary widely with respect to their performance under resilient flooring. While some particle boards are probably suitable as underlayments for resilient flooring, Armstrong cannot assume the responsibility for endorsing a class of underlayment materials of unknown and/or widely varying performance characteristics.



Cross section of 2-4-1 T & G Plywood, DFPA, 1⅛" thick, combination subfloor and underlayment for resilient floors. Applied directly to joists, this tongue-and-groove plywood eliminates need for cross-blocks between joists and generally cuts down floor construction costs.

Among the advantages of 2-4-1 T & G Plywood are: fewer individual pieces to handle, register holes can be cut without framing, fewer joints for air drafts, less labor and material costs, uncluttered basement ceilings, and no underlayment needed beneath resilient flooring.

Douglas Fir Plywood Association grades recommended as underlayments for resilient floors

Western Softwood Plywood CS 122-60 of same grades also recommended

UNDERLAYMENT ®
STRUC.-INT
DOUGLAS FIR
CS 45-60
DFPA TESTED QUALITY

EXT—DFPA
C-C ®
PLUGGED
DOUGLAS FIR
CS 45-60
DFPA TESTED QUALITY

2·4·1 ®
STRUC.—INT
DOUGLAS FIR
CS 45-60
DFPA TESTED QUALITY

2·4·1 ®
STRUC.—INT
DOUGLAS FIR
CS 45-60
TONGUE AND GROOVE
DFPA TESTED QUALITY

EXT—DFPA
B-C ®
DOUGLAS FIR
CS 45-60
DFPA TESTED QUALITY

EXT—DFPA
A-C ®
DOUGLAS FIR
CS 45-60
DFPA TESTED QUALITY

Adhesives for resilient floors, walls and counter tops

The life and serviceability of any resilient flooring installation depend greatly upon the selection of the proper adhesive which is as important as the selection of the floor itself. The bond must be strong enough to prevent separation from the subfloor under slightly greater than normal stresses, but it must not be so strong that it will be too tedious and expensive to remove the flooring later if desired.

The type of subfloor, its condition, and the kind of resilient flooring material to be installed are important factors in the selection of the adhesive. Below-grade subfloors, for example, may require a different type adhesive than above-grade subfloors, and asphalt tile requires a different adhesive than linoleum.

The adhesive selected should be easy to handle and apply. It should develop and retain the correct "tack" or gripping power throughout the desired working period. The adhesive must have correct viscosity. If it is too thick, spreading may be slow and uneven. More importantly, if it is too thin, it will penetrate too deeply into the subfloor and then there will be insufficient adhesive at the surface. As a guide in the proper selection of adhesives, Armstrong has prepared the chart shown on page 42.

S-128 Paste (water soluble) is an all-purpose adhesive developed for the installation of lining felt, linoleum, linoleum tile, and sheet Vinyl Corlon. It should be used only on dry, suspended subfloors.

S-130 Paste (water soluble) was formulated especially to simplify and speed the installation of Linotile, rubber tile, linoleum tile, and Custom Corlon Tile over dry, suspended subfloors. It develops a quick tack and keeps tiles from sliding or moving while mechanics work over finished areas.

S-235 Cement is a latex-type cement which is both alkali and moisture resistant. It is especially formulated for sheet Vinyl Corlon with Hydrocord Back over on- and below-grade concrete subfloors.

S-237 Cement is a latex-type cement which is both alkali and moisture resistant. It is especially formulated for the installation of Rubber, Custom Corlon, and Castilian Vinyl Tile on on-grade and below-grade subfloors.

S-80 Primer (solvent type) is used to minimize moisture and seal porous, dusty concrete subfloors for asphalt and vinyl-asbestos tile installations, thus preparing subfloors for the proper adhesive.

S-90 Cement (cut-back type) is recommended for above-, on-, and below-grade installation of asphalt and vinyl-asbestos tile, especially if the concrete subfloor is not fully cured or there are traces of dampness. It resists alkaline moisture.

S-160 Emulsion (clay and asphalt base) is an all-purpose adhesive for asphalt tile and vinyl-asbestos tile over above-grade, on-grade, and below-grade subfloors. It is resistant to both alkali and moisture.

S-700 Brushing Cement (asphalt and rubber base) can be used for asphalt and vinyl-asbestos tile on all types of subfloors. When used for Service (1/16″) gauge Excelon (vinyl-asbestos) Tile, it also eliminates the need for lining felt.

S-214 Cement (resin base) is recommended for cork tile and Custom Vinyl Cork Tile over on-grade and above-grade floors. It is also recommended for all resilient floors, except asphalt and vinyl-asbestos tile, and Castilian Vinyl Tile where spillage of water on the surface is a problem.

S-127 Cement is a latex-type cement which is both alkali and moisture resistant. It is especially formulated for the installation of Armstrong Counter Corlon on walls, counter tops, and other non-floor surfaces.

S-250 Cement (water-soluble) is expressly formulated for the installation of Vinyl Corlon with Hydrocord Back on dry, suspended subfloors.

S-120 Cement (water-soluble) is an alternate choice in the installation of Wall Corlon, recommended when trowelling is the preferred method of spreading.

S-220 Brushing Cement (water-soluble) is the other choice in installing Wall Corlon, intended for mechanics who prefer brushing the cement onto the back of the material in the technique employed in the hanging of wallpaper.

Recommended adhesives for Armstrong resilient floors and lining felts

See Note A. When two or more adhesives are recommended, they are listed in order of preference

Type of Resilient Floor ↓ / Type of Subfloor Surface →	Stripwood, Suspended (Note B)	Temboard and Plywood, Underlayment Grades, Suspended	Concrete, Suspended (Note C)	Concrete, On Grade (Note C)	Concrete, Below Grade (Note C)	Ceramic Tile, Terrazzo, Or Marble, Suspended	Ceramic Tile, Terrazzo, Or Marble, On Grade	Steel, Suspended (Note D)	Magnesite, Suspended (Note E)	Mastic Underlayment: Asphalt Type, Suspended (Note F)	Mastic Underlayment: Latex Type, Suspended (Note G)
Corlon sheet vinyl (with Armofelt Back) and linoleum	S-128; or S-128 over S-150 Felt	S-128; or S-128 over S-150 Felt	S-128	Don't install	Don't install	S-235 or S-214; or S-128 over S-150 Felt	Don't install	S-214 or S-235; or S-128 over S-150 Felt	S-214 or S-235; or S-128 over S-150 Felt	S-235 or S-214; or S-128 over S-150 Felt	S-128, S-214, or S-235; or S-128 over S-150 Felt
Corlon sheet vinyl (with Hydrocord Back)	S-235 or S-250; or S-250 over S-150 Felt	S-235 or S-250; or S-250 over S-150 Felt	S-235	S-235	S-235	S-235	S-235	S-235	S-235; or S-250 over S-150 Felt	S-235	S-235
Linotile	S-130 over S-149 Felt	S-130 over S-149 Felt	S-130 or S-214	Don't install	Don't install	S-214 or S-237	Don't install	S-214 or S-237	First install lining felt with S-235 or S-237. Then: For Linotile, Custom Corlon Tile, rubber tile, and linoleum tile, install tile with S-130, S-214, or S-237 For Castilian Vinyl Tile, install tile with S-237. For cork tile and Custom Vinyl Cork Tile, install tile with S-214		S-214, S-237, or S-130
Custom Corlon Tile and rubber tile	S-130 over S-149 Felt	S-130 over S-149 Felt	S-130, S-237, or S-214	S-237	S-237	S-237 or S-214	S-237	S-237 or S-214			S-237, S-214, or S-130
Castilian Vinyl Tile	S-237 over S-149 Felt	S-237 over S-149 Felt	S-237	S-237	S-237	S-237	S-237	S-237			S-237
Cork Tile and Custom Vinyl Cork Tile	S-214 over S-149 Felt	S-214 over S-149 Felt	S-214	S-214 (Note H)	Don't install	S-214	S-214 (Note H)	S-214			S-214
Linoleum tile	S-130 or S-128; over S-150 Felt	S-130 or S-128; over S-150 Felt	S-130 or S-128	Don't install	Don't install	S-214 or S-237	Don't install	S-214 or S-237			S-130, S-128, or S-214
Excelon Tile (1/8" and 3/32") and asphalt tile	S-700 or S-160; over S-150 Felt	S-700; or S-80 Primer and S-160 or S-90 (Note I)	S-90, S-700, or S-160	S-90, S-160, or S-700	S-90, S-160, or S-700	S-90, S-160, or S-700	S-90, S-160, or S-700	S-90	S-80 Primer; and S-160 or S-700	S-700 or S-160	S-700 or S-160
Excelon Tile (Service Gauge)	S-700; or S-700 over S-150 Felt	S-700; or S-80 Primer and S-90	S-700 or S-90	S-90 or S-700	S-90 or S-700	S-700 or S-90	S-90 or S-700	S-700 or S-90	S-80 Primer and S-700	S-700	S-700
Lining felt S-149 (heavy duty) and S-150 (Note J)	A *must* for 1/8" burlap back linoleum and all resilient tiles except Service Gauge Excelon Tile. *Optional* for all other sheet linoleum, Corlon, and Service Gauge Excelon Tile. Install felt with S-128.	A *must* for 1/8" burlap back linoleum and most resilient tiles. *Optional* for all other sheet linoleum, Corlon, Excelon Tile and asphalt tile. Install felt with S-128.	Optional for all floors. Install with S-128.	Don't install	Don't install	Optional for all floors. Install with S-235, S-237, or S-214.	Don't install	Optional for all floors. Install with S-235, S-237, or S-214.	Recommended for all resilient tile except Excelon Tile and asphalt tile. Install with S-235 or S-237.		Optional for all floors. Install with S-128.

NOTES

A - (1) Never use S-214 both under and over lining felt on the same installation.

(2) Definitions of subfloor locations:
Suspended - With a minimum of 18 inches of well ventilated air space below.
On grade - At ground level in direct contact with ground; or above ground level, with fill which is in direct contact with ground.
Below grade - Partially or completely below the surrounding ground level in direct contact either with the ground or with fill which is in direct contact with the ground.
(Armstrong resilient floors should never be installed over sleeper constructed subfloors on or below grade.)

(3) Resilient floors subjected to frequent washings and excessive surface moisture may be installed with any applicable adhesive except S-128 or S-130 Paste.

(4) Rubber cove base should be installed with S-1200 Contact Bond Cement or S-275 Top-Set Cove Base Cement.

B - Where seams in sheet goods run parallel to the floor boards, S-96 Seam Protector is recommended. It is advisable to install all resilient tiles on the diagonal over stripwood subfloors.

C - For leveling concrete subfloors, use a latex-type underlayment or an asphalt fill made with S-170 Flormastic. Dusty and porous concrete subfloors should be primed with S-80 Primer prior to the installation of asphalt tile or Excelon Tile with S-90 or S-160. Dusty and porous suspended concrete subfloors should be sized with S-140 Size for other types of resilient flooring. S-80 Primer should not be used with lining felt.

D - For application over metal subfloors other than steel, refer to your Armstrong office.

E - Before installation, size magnesite with solution of equal parts Bakelite (or other phenolic resin), varnish and turpentine. Let dry 24 hours. S-149 or S-150 Lining Felt is recommended. No type of resilient floor is recommended over magnesite subfloor on or below grade.

F - For asphalt tile and Excelon Tile over on-grade or below-grade asphalt type underlayment, use S-160 Emulsion or S-700 Brushing Cement. For sheet Corlon with Hydrocord Back over on-grade or below-grade asphalt type underlayment, use S-235 Cement. Castilian Vinyl Tile, rubber tile, Custom Corlon Tile, cork tile, and Custom Vinyl Cork Tile are not recommended over asphalt type floor fill on or below grade.

G - For Castilian Vinyl Tile, rubber tile and Custom Corlon Tile over on-grade or below-grade latex underlayment, use S-237 Cement. For Asphalt Tile and Excelon Tile over on-grade or below-grade latex underlayment, use S-700 Brushing Cement or S-160 Emulsion.

H - Cork tile and Custom Vinyl Cork Tile may be specified for certain on-grade installations where the floor surface of the concrete slab is at least 12 inches above grade level and the ground slope is away from the building. The subfloor should be well cured and visibly dry. The tile should be installed with S-214 Cement.

I - Where Excelon Tile (1/8" or 3/32") or asphalt tile is installed direct to plywood or hardwood with S-160 or S-90, it is necessary to use S-80 Primer.

J - Over wood-type subfloors, when lining felt is used: S-149 is a must with Linotile, rubber tile, Custom Corlon Tile, Castilian Vinyl Tile, cork tile, and Custom Vinyl Cork Tile; S-150 is recommended with asphalt tile, Excelon Tile, sheet Corlon, and linoleum; S-150 is a must with linoleum tile.

Inspecting resilient floor installations

The chart on the next page summarizes special factors requiring attention for various types of subfloors and finished floors. These criteria for inspection have been compiled as an index rather than a standard procedure, because their application to each resilient flooring installation is a matter of choice and judgment.

While it is the right of building owners, contractors and/or specifiers to inspect every facet of the job, the degree of inspection is a matter of confidence in the flooring sub-contractor selected. Just as there must be trust in the manufacturer of the flooring materials, there must be faith in the sub-contractor who will install them. In fact, a reliable flooring sub-contractor will automatically apply these inspection criteria to his own work as well as that of trades over which he has no direct control.

Pre-installation inspection

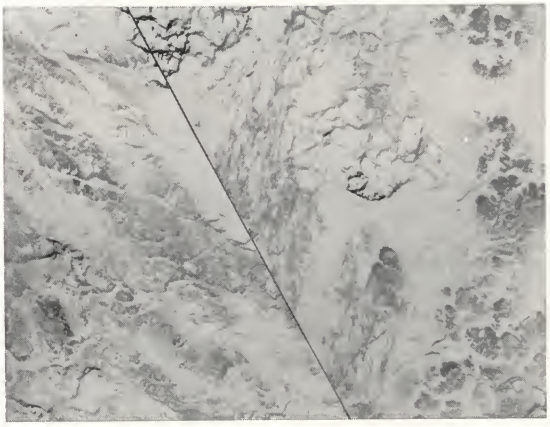
Of primary concern to the flooring contractor, no less than other interested parties, is the condition of the subfloor which fundamentally affects the appearance, life and serviceability of the finished floor. As explained on previous pages, it must be adequately dry, clean and cured to a hard, non-powdery surface. Dampness, powderyness, weakness and foreign matter interfere with proper bonding. The subfloor should also be free of expansion joints, trowel marks and other imperfections. A smooth subfloor is important. Roughness not only mars appearance, but may create high points which will receive concentrated abrasion and hence wear out sooner.

Before the flooring contractor starts the job, all resilient flooring materials to be used should be inspected for quality, color, and type as specified in the flooring contract. Particular attention should be given to the types of lining felts, underlayment materials, and adhesives to be used, especially if the contract agreement or the architectural specifications permit the use of underlayments and adhesives other than those specifically recommended by the manufacturer.

Inspection during installation

Improper cutting, fitting and other types of poor workmanship are best corrected early in the job, thus avoiding costly repair and correction later.

One of the most important operations in the installation of linoleum, vinyl sheet flooring, and the majority of resilient tiles is the rolling process. This should insure a smooth, even bond to the subfloor by getting rid of all air bubbles, ripples, and uneven areas. The time required for proper rolling should not be shortened in order to speed the completion of the job, as this operation is vital to a satisfactory installation.



Proper installation of non-geometric patterns in linoleum and Vinyl Corlon requires that the sheets be "reversed" or turned end for end. This gives a continuous flow to the graining and shading; also eliminates the illusion of raised seams, shown above, or of off-color between the pieces.

All joints or seam lines should be symmetrical. Uneven lines, such as illustrated above, are more likely to occur in tile installations. Armstrong resilient tiles are die-cut to a perfect square to avoid this condition providing the flooring mechanic squares the room and lays the tiles carefully.

Post-installation inspection

The dividends of inspections before and during installation are realized in appearance immediately after installation—and ultimately they will accrue in proper performance and economical maintenance. Final inspection should determine that the floor is smooth, seams in sheet materials are tight and pattern-matched, and joint lines in tiles are symmetrical and even. Damaged areas should be repaired before any maintenance materials are used.

Last appraisal should be directed to cleanliness; absence of soil, dust, scuff marks, scraps, excess adhesive, and other blemishes. If included in the contractor's bid, has the floor been waxed and buffed or a self-polishing floor finish applied?

Inspection of special installations

The preceding paragraphs cover inspection details ordinarily encountered in checking resilient floor installations over wood and concrete subfloors. Individual circumstances govern the inspection of resilient floors over special types of subfloors—such as magnesite and metal—and of floors employing special techniques—such as the use of metal strips and inlays for decorative effect. In such cases, where the foregoing general instructions are not adequate, ask for the advice of an Armstrong Architect-Builder Consultant.

Factors important in resilient floor inspection

Pre-installation inspection

Type of subfloor	Inspect for	Floor should be
New concrete	Proper curing and drying. Moisture or dampness.	Smooth; free of expansion joints, trowel marks, and other imperfections. Free of grease, dirt, foreign matter and curing and breaking compounds. Hard, dry, and non-powdery.
New wood	Compliance with specifications of maker as to proper materials and procedures for single, double, tongue-and-groove flooring or board-type underlayment.	Smooth, dry, and free of grease, paint, dirt, old adhesive film, and foreign matter.
Old concrete terrazzo ceramic tile	Soundness, dryness, and necessary repair.	Smooth; free of cracks and holes. Free of paint, grease, varnish, and other finishes; also oil, dirt, and other foreign matter.
Old wood	Renailing of loose boards and replacement of worn or damaged boards. Necessary filling of holes and cracks.	Sanded smooth and sized. Free of paint, varnish, oil, old adhesive film, or other foreign matter.

Installation inspection

Type of resilient floor	Inspect during installation for	Check finished floor for
Linoleum Vinyl Corlon (Sheet type, all backings)	Proper installation of lining felt when required. Proper adhesives. Proper matching of pattern at seams. Neat cutting and fitting around pipes and fixtures. Thorough rolling.	Over-all appearance. Air bubbles caused by inadequate rolling. Open seams. Proper cleaning and waxing.
Asphalt tile Excelon tile Rubber tile Custom Corlon tile Castilian vinyl tile Cork tile Custom vinyl cork tile Linotile Linoleum tile	Symmetrical joint lines. Open joints. Tile corners and edges tight to floor. Poor tile laying such as adhesive between tile joints. Thorough rolling of rubber tile, Custom Corlon tile, Castilian vinyl tile, Cork tile, Custom Vinyl cork tile, linoleum tile and Linotile. Neat cutting and fitting.	Over-all appearance. Raised joints. Open joints. Loose tile. Proper cleaning and waxing.

Maintenance of resilient floors

Although the care of resilient floors often is believed to be outside the province of the architect or building contractor, serious problems can arise when maintenance is not taken into consideration in the selection of the flooring material. This is particularly true when the owner of a building is uninformed and proceeds with his own ideas of floor maintenance to the point where the floor is impaired or ruined. Also, maintenance requirements and characteristics should be considered along with the type and amount of traffic to which the floor will be subjected. Excessive, uneconomical maintenance may result if an unsuitable floor is installed and the life-time cost (the *true* cost of floor is not its initial cost) will be greatly inflated.

Armstrong representatives will offer any aid to make certain owners of new floors understand the maintenance required for the most satisfactory service.

Apart from their handsome appearance, one of the main reasons for the popularity of resilient floors is their ease of cleaning. They never need costly refinishing. Occasional washing and waxing, along with regular sweeping, are all the maintenance they normally require. However, resilient floors vary in the amount of care they need, and the "easiest-to-maintain" floors should be selected for areas where service conditions are most severe.

Since the maintenance characteristics of the different types of resilient floors overlap, and maintenance is also affected by the color and pattern of the flooring selected, the following ranking is intended as an approximate guide to the maintenance required by various Armstrong Floors. Those rated "Superior" normally require the least care.

Superior

Linotile
Custom Vinyl Cork Tile
Linotile is considered the easiest to maintain of all the Armstrong floors. Its dense, tough composition makes it an excellent choice for heavy traffic areas. Minimum maintenance is required for Armstrong Custom Vinyl Cork Tile because of its vinyl covered wearing surface.

Excellent

Excelon Tile (vinyl-asbestos)
Castilian Vinyl Tile
Excelon Tile and Castilian Vinyl Tile have exceptional maintenance advantages. They provide unusual resistance to harsh cleaners which are often used in spite of manufacturers' warnings.

Very good

Custom Corlon Tile
Linoleum
Sheet Vinyl Corlon
Rubber Tile
The smooth plate finish of Custom Corlon Tile and Rubber Tile requires slightly more frequent maintenance than the preceding floors to retain the high gloss which adds so much to their beauty.

Linoleum perhaps best typifies the years of popularity which resilient flooring materials have enjoyed for their ease and economy of maintenance. Regular sweeping and occasional washing and waxing are all that are required to keep linoleum in good condition. Armstrong Vinyl Corlon, a sheet flooring, offers the additional advantage of excellent resistance to common chemical reagents.

Good

Asphalt Tile
For its low cost, Asphalt Tile provides a floor that is remarkably economical to maintain. Proper cleaning and waxing, especially in the first months after installation, will fill the surface pores and prevent dirt and grit from being embedded, thus preserving good looks and simplifying maintenance.

Fair

Cork Tile
Regular Cork Tile, without the vinyl protection as in Vinyl Cork Tile, is not ordinarily recommended for heavy traffic areas and should not be installed where it will be subjected directly to tracked-in dirt. In areas of less severe traffic, Cork Tile is readily maintained by daily sweeping and occasional washing and waxing. Water should be used sparingly. In cases of excessive soiling, machine

scrubbing or sanding and refinishing may be necessary.

Recommendations for floor care

Sweeping

Dirt tends to slip off easily from the smooth, lustrous surface of any resilient flooring. Daily sweeping with a soft broom, treated cloth or treated mop will keep this type of flooring clean for long periods. The use of treated cloths or mops will facilitate dirt and dust pickup, but it is imperative that the treatment be properly applied so that no residual film of oil or other treatment is left on the floor covering. Prolonged use of oil- or solvent-treated mops and cloths on asphalt tile may eventually be detrimental.

Washing

Unless they are subjected to unusual amounts of dirt, resilient floors require thorough scrubbing or "wax stripping" only once or twice a year. However, a light-duty cleaning should be performed as required to remove surface soil and to prepare the floor for re-waxing. It is not necessary to remove all the wax from the floor during the light-duty cleaning step; clean just enough to remove the dirt. For this purpose, use Armstrong Commercial Floor Cleaner C-410 or Armstrong Cleaner S-320 (for residential floors) diluted one cup of cleaner per pail of warm water. These cleaners, manufactured especially for resilient floors, are recommended for all types of floors. New resilient floors should not be washed until the adhesive has had time to set thoroughly—a period of at least four or five days is recommended.

Between light-duty cleanings and re-waxings, or as needed, resilient floors may be damp mopped to remove spills, food stains, and light surface soils as this will reduce the frequency of cleaning and re-waxing.

Once or twice a year, the floor should be stripped of old wax, using a more concentrated solution of cleaner (4 to 5 parts of water to one part of Armstrong Cleaner or 20 parts of water to one part of Armstrong Commercial Floor Cleaner) followed by a thorough rinsing. On commercial installations, steel wool or synthetic fiber pads (nylon, etc.) are often used to facilitate the cleaning or the wax stripping operations. Grades 0 and 00 of steel wool are satisfactory for this purpose. The synthetic fiber pads are available in three grades: coarse, medium and fine. The coarse grade and medium grade are considered too harsh for satisfactory use on smooth surface resilient floor coverings and therefore only the fine pads should be used.

Waxing

The terms "waxing" and "wax stripping" are used here in a broad sense to include both waxy and polymeric (latex) coatings.

After wax stripping, or as often as needed after the light-duty cleaning step, the floor should be waxed. It is preferable to apply a thin coat so that the wax film can dry properly in a reasonable length of time. Ideal for all resilient floorings are water emulsion polishes such as the Armstrong products described below. Armstrong Heavy Duty Commercial Wax C-400 and Armstrong Linogloss S-310 (for residential floors) are waxy products which dry in about 20 minutes to a rich, lustrous finish with minimum change in the floor color. They can be buffed to a very high shine, if such is desired.

Armstrong Commercial Floor Finish C-405 and Armstrong Vinaflos Floor Finish S-340 (for residences) are polymeric or latex formulations especially designed to yield maximum gloss without buffing. They deposit a harder finish than the above waxes, but do not refurbish when buffed. All are high quality floor polishes and the one to be used depends on traffic and the preference of the user for a buffable or nonbuffable finish.

Paste waxes or liquid solvent waxes, which contain solvents such as naphtha or turpentine, should not be used on asphalt tile or rubber tile. Resilient floors should never be treated with lacquers, varnishes or similar finishes, since it is very difficult to remove them satisfactorily.

Stain removal

The chart at right shows suggested methods of removing stains from all types of Armstrong resilient floors. It does not cover all types of blemishes, and the methods outlined may not remove all stains. Armstrong will gladly advise on any stain problem for which these methods do not prove fully effective. For more detailed information, write for pamphlet, "A Guide to the Armstrong Commercial Floor Maintenance System."

Type of stain	Type of floor				
	Vinyl Corlon, Custom vinyl cork tile	Linotile, Linoleum	Asphalt tile, Excelon tile	Rubber tile, Custom Corlon tile, Castilian vinyl tile	Cork tile
Alcohol	2	3	3	3	3
Alkali-Lye Drain cleaners	1	6	6	6	6
Rubber heel marks	5	5	3	3	5
Coffee stains Alcoholic beverages Fruit juice Ink-Iodine Mercurochrome Mustard-Catsup	7	7	7	7	7
Tar-Asphalt Grease-Oil Candle wax Chewing gum	8	8	4	4	8
Paint Varnish Solvents Shoe polish Nail polish	9	9	9	9	9

Methods of removal

Keyed to numbers in chart above

1. Wash with Armstrong Cleaner, rinse, dry and wax.
2. Rub with #0 dry steel wool, rinse, dry and wax.
3. Rub with #0 steel wool dipped in Armstrong Cleaner, rinse, dry and wax.
4. Remove excess with putty knife, rub with #0 steel wool dipped in Armstrong Cleaner, rinse, dry and wax. If this does not remove the stain, repeat the procedure, sprinkling the area with an abrasive cleanser, and make sure that the area is well rinsed following the cleaning action. Let dry and wax.
5. Rub lightly with a clean cloth to which solvent paste wax or solvent liquid wax has been applied. Wipe clean with a fresh cloth, let dry, then buff.
6. Wash with Armstrong Cleaner full strength and rinse. Apply a dilute solution of vinegar and let stand for several minutes. Rinse, let dry and wax.
7. Rub with #0 steel wool dipped in Armstrong Cleaner. If stain still remains, wet with a solution of bleaching agent (Clorox diluted one to one with water) and let stand for 10–15 minutes. Rinse well, let dry and wax.
8. Remove excess with a putty knife. Rub with a clean cloth to which liquid solvent wax has been applied. If needed, wet #0 steel wool with liquid solvent wax and rub the area briskly until the stain has been removed. Wipe clean with a fresh cloth, let dry and buff.
9. Mop up freshly spilled liquids immediately by blotting. Scrub the area with #0 steel wool dipped in Armstrong Cleaner (full strength). Rinse well and wax when dry. If the liquid has dried to a solid, scrape off the excess with a putty knife and rub spot with #0 steel wool dipped in Armstrong Cleaner (full strength). If spot remains, dust with a mild household abrasive cleanser and rub with #0 steel wool dipped in Armstrong Cleaner. Rinse well, let dry and wax.

Protection

An element in the care of resilient floors which is often overlooked, but which is absolutely necessary to retain the floor's beauty, is the use of furniture rests. The function of a furniture rest is to protect resilient floors against indentations caused by the concentrated weight of heavy furniture by simply extending the area over which the weight of furniture loads is distributed. They are made of tough plastic in four styles and seventeen sizes. All are made in dark wood color; NT Type also in brass, chrome, light oak and white.

Recommendations for the selection of Armstrong furniture rests

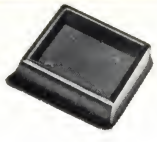
Letters indicate style; numerals size

Weight of fully loaded furniture	Excelon and Asphalt tile	Sheet Vinyl Corlon and Linoleum	Linotile, Custom Corlon, Castilian Vinyl & Rubber tile	Cork and Custom Vinyl Cork tile	Weight of fully loaded furniture	Excelon and Asphalt tile	Sheet Vinyl Corlon and Linoleum	Linotile, Custom Corlon, Castilian Vinyl & Rubber tile	Cork and Custom Vinyl Cork tile
Up to 50 lbs. per leg	NT-20 NT-120 CT-200 CFT-400 CFT-401	NT-10 NT-110 CT-100 CFT-300 CFT-301	NT-10 NT-110 CT-100 CFT-300 CFT-301	NT-20 NT-120 CT-200 CFT-400 CFT-401	150-200 lbs. per leg	NDC-325	NT-35 CT-350 NDC-6	NT-10 NT-110 CT-100 CFT-300 CFT-301 NDC-6	NT-50 CT-500 NDC-225
50-100 lbs. per leg	NT-50 CT-500 NDC-7	NT-20 NT-120 CT-200 CFT-400 CFT-401 NDC-6	NT-10 NT-110 CT-100 CFT-300 CFT-301 NDC-6	NT-35 CT-350 NDC-6	200-250 lbs per leg	NDC-325	NT-35 CT-350 NDC-6	NT-10 NT-110 CT-100 CFT-400 CFT-401 NDC-6	NDC-225
100-150 lbs. per leg	NDC-225	NT-20 NT-120 CT-200 CFT-400 CFT-401 NDC-6	NT-10 NT-110 CT-100 CFT-300 CFT-301 NDC-6	NT-50 CT-500 NDC-7	250-300 lbs. per leg	NDC-325	NT-50 CT-500 NDC-7 NDC-125	NT-10 NT-110 CT-200 CFT-400 CFT-401 NDC-7 NDC-125	NDC-325

CFT Chrome Furniture Type

NT Nail Type

CT Cotter Type



NDC Cup Type

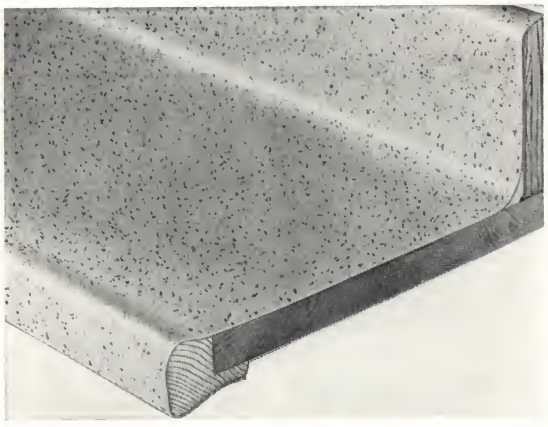
Counter and wall surfacings

Almost all of the advantages of vinyl resins found in sheet flooring can be extended to surfaces above the floor—with particular benefits accruing from the flexibility feature. Combining decorative beauty and practicality, vinyl materials for work surfaces and walls are popular companions to resilient floors. They add durable color and keep maintenance costs at a minimum. In rooms and corridors of schools, hospitals, laboratories and many business establishments—residences, too, of course—these surfacing materials are easily kept clean from smudges and stains. On walls they resist abrasion and scraping and they meet fire code requirements of most states.

Counter surfacing

Armstrong Counter Corlon

Counter Corlon is a flexible sheet vinyl material of unusual eye-appeal available in four widths in long continuous rolls for almost any work surface with a minimum of waste. It provides excellent resistance to boiling water, abrasion, staining, and is not harmed by strong soaps, concentrated detergents, or other normal reagents. Its Hydrocord Back is impervious to damage from mildew and mold. Colors and designs extend all the way through the vinyl wearing surface except for Gravure Counter Corlon which consists of photographic designs printed on a vinyl base with vinyl inks and then protected by a wear surface of clear vinyl.



This cross section illustrates how Counter Corlon can be formed into roll-type counter edges and wall flashing to eliminate seams and moisture problems. In most installations, no metal trim is necessary, a definite cost advantage and, other than the sink rim, a decorating advantage.

Because the surfaces of all Counter Corlon patterns "give" slightly, the clatter of utensils, tools and other hard objects is greatly reduced. Accidental cuts, which *are* possible with unusual force or impact, can be sealed with a soldering or welding technique. Before installation, the cost is about 65 cents per square foot; "gravure" about 50 cents. Counter Corlon is used widely as wall covering as well as counter top material.

Flooring suitable for counters

Armstrong Vinyl Corlon, with Hydrocord Back, even though primarily a flooring material, has much to offer as counter covering, especially when styles not obtainable in Counter Corlon are desired.

Installation

In any areas where water is splashed, satisfaction depends almost entirely upon making seams and edges tight and waterproof so that moisture does not get under the material and loosen the adhesive bond. Armstrong Counter Corlon eliminates this problem because it can be rolled around the front and flashed up the back of the counter top and thus present a seamless installation. (Good construction at the basin also requires the use of T-type compression-type sink rims.) Counter Corlon's flexibility makes fabrication extremely easy —and at a lower cost.

Applied with post-forming equipment, it requires less heat, pressure and processing time than high-pressure laminates; these, added to easier handling and less waste, result in lower fabrication costs. It can be applied by hand on the site, with ease and economy.

Preparation of surfaces

The base surface must be absolutely clean and free of paint, varnish, felt, and old adhesives. Holes and cracks should be filled and sanded smooth. Where existing counter tops are to be re-covered, badly warped or decayed wood and delaminated plywood should be replaced with 3/4″ exterior plywood, DFPA grade C-C (plugged).

Wall surfacing

Armstrong Counter Corlon, as stated, is entirely satisfactory and widely used as wall covering. Because of styling and coordination with floors, it is preferred for residential walls. For commercial walls, it is exceptionally rugged.

Armstrong Wall Corlon is a new vinyl sheet material for commercial and institutional interiors. A panel of approximately two hundred architects, designers and end-users assisted in its development. The surface is a long-wearing organosol composition with unusual fade resistant, stain resistant and easy-cleaning properties.

Like Counter Corlon, one of the major sources of Wall Corlon's attributes is the Hydrocord Back. Hydrocord provides dimensional stability; prevents opened or peaked seams—a pronounced improvement over most vinyl wall materials. The latex-asbestos composition, through a cushioning effect, also provides more resilience; reduces the possibility of damage from impact. And being unaffected by moisture, Hydrocord permits installation of Wall Corlon on new, reasonably dry plaster walls—an exclusive feature among vinyl wall materials. Finally, the backing gives a superior initial bond, because it absorbs moisture, blotter-like, drawing the wall covering against the wall as it dries. The savings in time and labor are obvious.

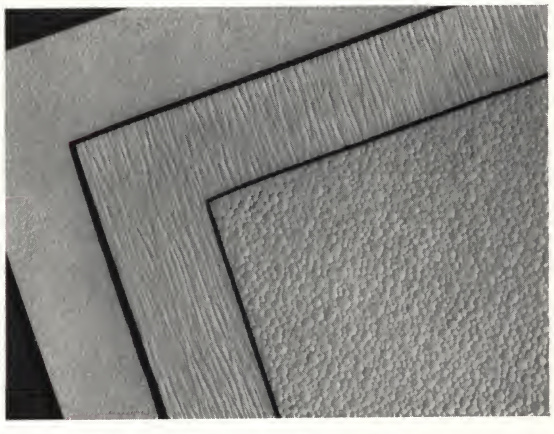
Wall Corlon is a thicker, heavier material than most vinyl wall surfacings. There are two thicknesses: "30-gauge," (.030″), containing a vinyl wearing surface of .012″; "40-gauge," (.040″), with a vinyl face of .021″. The lighter gauge is recommended for offices, banks and lighter duty areas, whereas the heavier gauge finds its best application in hospital corridors, elevators, school halls and other interiors where treatment is especially rugged.

The styling of Wall Corlon represents a consensus of architects, designers, building managers and various persons involved in the commercial-institutional field. Three designs, each in twenty colors, are offered in rolls 54″ wide and approximately 80′ long. The designs are roller embossed in fine scale and the colors are solid—preferred styling for nonresidential work. The monochromatic texture is the most apparent differentiation from Counter Corlon which is panchromatic and either smooth or, as in Tesserette, only subtly textured.

Two adhesives have been formulated by Armstrong chemists explicitly for application of Wall Corlon. S-120 Wall Corlon Cement is applied with a trowel and S-220 Wall Corlon Cement is put on with a brush. The choice is the mechanic's.

According to Armstrong market research, the cost of painting interior walls has greatly increased, principally because of higher on-the-job labor. Expenditures for this method of decorating are, of course, only the initial cost. Maintenance and redecorating must also be calculated to determine true cost. So, cost-minded specifiers and their clients find easier-to-maintain, more permanent wall finishes, such as Wall Corlon, economically desirable.

Apart from long range cost considerations, the demand for style and design in commercial wall finishes is growing. Interior designers have a wide choice of textures and patterns in flooring and ceiling materials for business and institutional uses, but feel limited in the selection of wall finishes. Ceramic tile, wallpaper, various fabrics seem to satisfy aesthetic requirements for limited areas, but usually are too costly, too impractical or both, for widespread use. Paint, on the other hand, lacks design and texture. Wall Corlon meets the functional, economic and style demands of today's non-residential walls.



Shown here in full scale are the three designs in Wall Corlon. They were selected expressly for commercial and institutional interiors after a survey of persons most concerned with wall decoration and maintenance. Designs are roller-embossed in the thick vinyl surface.

How to write clear specifications for resilient floors

In writing specifications for resilient floors, it is important that the specifier understand, in general, the complexities of installation, labor, and material costs. Also that he be able to correctly classify the materials and work to be done so that all bidding contractors will base their estimates on the same standards. The misunderstandings that occasionally arise on a project stem from the incomplete details of the specifications. Because of the variety of materials, it is impractical for the specification writer to become familiar with each and every detail. However, if he has a working knowledge of variations in cost of materials, labor, and subfloor preparation, he should have little trouble in developing clear and concise resilient flooring specifications.

Price variations in flooring materials

Resilient flooring materials are manufactured in several types and gauges to meet various service requirements. In many cases, each type is made in a number of stylings to permit greater freedom of selection. These factors affect cost:

Type and style of the resilient flooring
Type of backing
Gauge or thickness of the material
Color and graining
Standard or special sizes

One of the items often omitted from resilient flooring specifications is the naming of the particular flooring style and color group. This part of the specification is a very important factor in figuring costs. For example, linoleum falls into several price groupings according to gauge, style, and backing as explained on pages 20–21.

Asphalt tile prices vary according to color. The "B" or darkest colors are the lowest in cost and grade up in price to the "D" or lightest colors. In other grades and types of Armstrong floors there is no price differential between colors in the same design or product series.

One of the clearest ways to specify resilient flooring materials is to indicate the manufacturer's name and color number. When this is not possible, or if a floor design cannot be selected in advance, it is important that a clear understanding be given of the percentage of each material to be used. For example,

". . . 1/8" Asphalt tile design to be composed of color groups: B—25%, C—50%, D—25%, . . ." or,

". . . Linoleum in rooms 110 and 112 to be 1/8" Textelle with 12" borders of 1/8" plain regular colors."

Such a specification will give each flooring contractor a standard basis for figuring his bid and avoid confusion as to materials and labor involved.

Variations in installation costs

The labor involved in laying a particular floor design is a big factor in figuring price. If the specification fails to give a clear idea of the complexity of the design, the contractor may base his bid on fewer installation man hours and underbid the job. In such cases, there is sure to be an expenditure of time and words—if not money—before the misunderstanding is settled.

To prevent such misunderstandings, it is recommended that detail drawings of at least one of the floor designs be shown when they are too complex for adequate written description in the specifications. A typical example of such a drawing is shown on the opposite page. Simplified specifications of materials, colors, gauges, and sizes supplied with the drawings will also be helpful.

Underlayment requirements in remodeling jobs

On remodeling work it is always advisable to list all necessary repairs in the specifications, such as replacing badly worn boards, sanding floors, the use of hardboard or plywood underlayments—or the type of mastic underlayment, filling cracks in concrete, etc. Never use a blanket specification such as, ". . . the old subfloor shall be repaired to provide a suitable base for resilient

flooring." Such specifications invariably invite the least expensive method of subfloor preparation, which is seldom to the advantage of the customer—or the specifier.

It is not necessary for the specifications to state how the flooring contractor should install the flooring materials. It is far safer and more exact to specify that the resilient flooring materials be "installed in accordance with the manufacturer's latest printed instructions."

"Or equal"

Specifiers who specify *"or equal"* abdicate their right to make final product selection, since it then becomes the responsibility of the general contractor to accept the lowest bid without regard to the aesthetic or functional requirements the specifier originally had in mind.

In the specifications for some public building, the use of proprietary or exclusive products is discouraged by the requirement that "or equal" follow the name of a specific maker's product. If that product has distinct and unique advantages, it is to the interest of specifiers, as well as owners, to specify it. In physical properties or performance, there may be no equal and therefore "or equal" is not only superfluous but discouraging to the ingenuity of manufacturers and heavy investment in research on improved products.

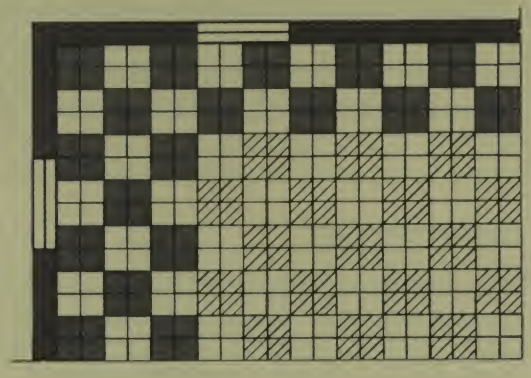
In public building, even when it is required that two or more manufacturers' products be specified, many specifiers conform with the "or equal" requirement but also inject performance specifications unique to the proprietary product and thus eliminate other products which cannot perform equally.

From specifications

Section No. 10 Resilient Flooring

Furnish and install 1/8" Armstrong Asphalt Tile and heavy gauge Armstrong Linoleum in the colors, patterns, sizes and designs shown on the drawings and in the areas listed in the schedule of finishes.
All products covered by these specifications are to be installed in accordance with the latest edition of Armstrong Installation Specifications by a qualified Armstrong flooring contractor whose bid shall include all the materials and labor required.

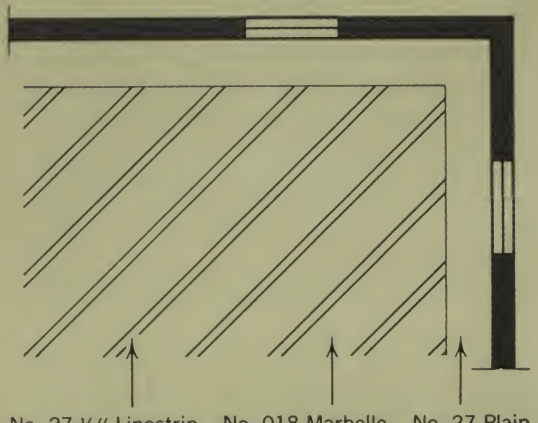
From detail drawing



■ B-905 ▨ C-946 □ D-900

Armstrong ⅛" asphalt tile all tile 9" x 9"

FLOOR DESIGN - ROOMS 6 • 10 • 13 • 14



No. 27 ½" Linostrip No. 018 Marbelle No. 27 Plain

Armstrong ⅛" gauge linoleum

FLOOR DESIGN - OFFICE ROOM 125

Simple detail drawings of the floor design with the manufacturer's color numbers indicated eliminate the need for a full description of the materials to be used. From the drawings and general specifications, the bidding contractor can quickly see the work involved in the flooring job. Installation methods approved by the manufacturer of the flooring should be specified.

Basic guide specifications

A booklet containing the following Basic Guide Specifications in multiple form for multiple jobs is available from Armstrong District Offices or Armstrong Cork Company, Floor Division, Lancaster, Pa. Desired sections may be torn along perforations and handed to typist for copying.

Comprehensive unabridged Architects' Specifications for all Armstrong floor, wall, and countersurface material (listed on page 56) may be had from any Armstrong Office.

General requirements

Only first-quality floor, base, wall and counter materials applied in strict accordance with the manufacturer's current specifications shall be furnished.

Adhesives and other application material shall be those as recommended specifically by the manufacturer of the material specified.

Products other than those listed below shall be bid only if approved in writing by the architect not later than . . . . . days prior to bid opening. Later substitutions and alternates will not be considered.

All materials and workmanship shall be guaranteed for one year after acceptance of installation.

During the normal heating season, as determined by the architect, the general contractor shall provide a constant temperature of at least 70° F. 48 hours prior to installation, during installation, and 48 hours after installation. A minimum temperature of 55° F. shall be maintained thereafter.

All surfaces to receive resilient finishes shall be dry, clean and level. Stripwood subfloors shall be tongue-and-groove double floors except where they are of ⅝″ five-ply plywood, DFPA grades Interior Underlayment, Exterior C-C (plugged) or better. Concrete subfloor tolerances shall not be over ⅛″ in ten feet in any direction. Conventional concrete curing methods shall be used, i.e., felt paper, straw, plastic sheeting, water. Where curing compounds and/or breaker compounds have been used, subcontractor cannot guarantee proper installation of resilient flooring *(see exception);* they shall be removed by the general contractor or other by sanding, sandblasting, or grinding. *(exception: Subcontractor can guarantee installation of asphalt and vinyl-asbestos tile over resin- or asphaltic-type curing and/or breaker compounds [i.e., other than wax or paraffin compound] with Armstrong S-90 Cement.)* Lightweight aggregate concrete must have a density of at least 100 pounds per cubic foot; subcontractor shall determine the acceptability of surface and construction for resilient materials specified.

Subcontractor shall indicate adverse conditions of any type by letter to the general contractor with copy to the architectural office. Starting any work shall indicate acceptance by the subcontractor.

Before installation is initiated, properly identified samples shall be submitted by the subcontractor to the general contractor and approved by the architect. Samples shall be marked with brand, size, gauge, and color.

Cleaning and waxing

It shall be the responsibility of the general contractor to have the finished resilient floors cleaned and waxed not sooner than 5 days following installation. Clean with Armstrong Cleaner S-320 or Armstrong Commercial Floor Cleaner C-410, rinse, dry thoroughly and apply one coat of Armstrong Linogloss Wax S-310, Armstrong Vinaflos Floor Finish S-340, Armstrong Heavy Duty Commercial Wax C-400, or Armstrong Commercial Floor Finish C-405. The floor shall be protected with undyed, untreated building paper or traffic control as necessary. Immediately prior to final inspection (not less than 48 hours after first waxing), dry or damp mop floors and apply one coat of water emulsion wax as above.

Top-set cove base

(4″) (6″) high, Top-Set Rubber Cove Base with preformed internal and external corner pieces in plain (black) (gray) (chocolate) (beige) as manufactured by Armstrong. Cove base shall be applied only with adhesives specified by the manufacturer.

Linoleum

⅛″ (heavy gauge) burlap back manufactured by Armstrong sufficiently dense to withstand loads

of 75 p.s.i. Price range shall be in the (Battleship) (Plain) (Special Plain) (Marbelle) (Surftone) (Textelle) series. [Note to Architect: Material shall not be installed on concrete in direct contact with the ground. For complete specifications refer to "Specifications. Armstrong Linoleum (Sheet and Tile Form), AIA File No. 23G."]

Linotile

⅛" gauge (9" x 9") (12" x 12") unbacked and sufficiently dense to withstand loads of 200 p.s.i. in colors selected from the current line manufactured by Armstrong. (Note to Architect: Material shall not be installed on any subfloor in direct contact with the ground. For complete specifications refer to "Specifications. Armstrong Linotile, AIA File No. 23G.")

Vinyl flooring—sheet form

(.090") (.070") (.065") gauge Vinyl Corlon (with Hydrocord Back in the [Tessera] [Montina] [Futuresq Supreme] [Palatial] [Patrician] series) (with Armofelt Back in the [Futuresq] [Terrazzo] series) 6 feet wide, and sufficiently dense to withstand loads of (100) (75) p.s.i. in colors selected from current range manufactured by Armstrong. (Note to Architect: Material with Hydrocord Back may be installed above, on, or below grade. .070" and .065" gauge material recommended for moderate traffic commercial areas and residential interiors only. For complete specifications refer to "Specifications. Armstrong Vinyl Corlon with Hydrocord Back, AIA File No. 23G" and "Specifications. Armstrong Vinyl Corlon with Armofelt Back, AIA File No. 23G.")

Homogeneous vinyl tile

(3/32") (⅛") gauge (9" x 9") (12" x 12") homogeneous vinyl (Castilian Vinyl Tile) (Custom Corlon Tile in the [Burl] [Imperial] [Plain] series) manufactured by Armstrong. Tile shall be flexible, sufficiently dense to withstand loads of 200 p.s.i. (Custom Corlon Tile shall be guaranteed in writing by the manufacturer to be dimensionally stable for ten years within shrinkage limitations permitted by Interim Federal Specification L-F-00450 (COM-NBS) Type I-Tile). Material shall be satisfactory for application over either below-grade, on-grade, or above-grade subfloors according to manufacturer's specifications, and colors shall be selected from colors currently manufactured by Armstrong. (Note to Architect: For complete specifications refer to "Specifications. Armstrong Rubber Tile and Custom Corlon Tile, AIA File No. 23G.")

Rubber tile

(⅛") gauge (9" x 9") (12" x 12") homogeneous Rubber Tile (Imperial) (Marble) series, guaranteed in writing by the manufacturer to be dimensionally stable and sufficiently dense to withstand loads of 200 p.s.i. The Rubber Tile shall be satisfactory for installation below grade, on grade, or on suspended floors according to the manufacturer's current specifications. Colors shall be selected from range currently manufactured by Armstrong. (Note to Architect: For complete specifications refer to current issue, "Specifications. Armstrong Rubber Tile and Custom Corlon Tile, AIA File No. 23G.")

Cork tile

(⅛") (3/16") (5/16") gauge (9" x 9") (12" x 12") (6" x 12") (beveled) (square edged). Cork Tile with homogeneous and evenly bonded resinous binder. Underside shall be treated to eliminate cupping and shall be sufficiently dense to withstand static loads of 75 p.s.i. Colors shall be selected from the standard range manufactured by Armstrong. (Note to Architect: Only above-grade installations shall be made with Cork Tile except under certain conditions where on-grade application is feasible. Consult the manufacturer, describing floor plan, location, outside grade, and water table. For complete specifications refer to "Specifications. Armstrong Cork Tile and Custom Vinyl Cork Tile, AIA File No. 23G.")

Cork tile with fused vinyl coating

⅛" gauge (9" x 9") (square edged) Custom Vinyl Cork Tile manufactured by Armstrong sufficiently dense to withstand loads of 150 p.s.i. Vinyl surface shall be fused by a heat process to assure permanent bonding of cork particles. Colors and patterns as selected from range currently manufactured by Armstrong. (Note to Architect: Material shall be installed on suspended floors only

except under certain conditions where on-grade application is feasible. Consult manufacturer, describing floor plan, location, outside grade, and water table. For complete specifications refer to "Specifications. Armstrong Cork Tile and Custom Vinyl Cork Tile, AIA File No. 23G.")

Vinyl-asbestos tile

(3/32") (1/8") gauge (9" x 9") (12" x 12") Excelon vinyl-asbestos Tile in the (Imperial) (Standard) (Woodtone) (Metallic) series as manufactured by Armstrong. Tile shall be resistant to alkali, grease and oils, and colors shall be selected from ranges currently manufactured by Armstrong in thicknesses designated. Terrazzo type vinyl-asbestos tile, such as the Imperial series in Armstrong Excelon Tile, shall have uniform dispersement of color and texture throughout the thickness of the tile as demonstrated by a milled-down sample produced and procured by the following method: One sample of each pattern of tile shall be selected at random by the construction engineer from each 25,000 square feet (or fraction thereof) of tile delivered to the job, for testing depth and uniformity of pattern graining and color. Tests will be made by an established testing laboratory by a method approved by the construction engineer, and the cost shall be paid by the contractor. Any tile failing to show uniform depth of graining or uniform pattern distribution throughout the thickness of the tile shall be cause for rejection of the lot from which the sample is taken. (Note to Architect: 12" x 12" tile available in most types only in quantities over 9000 square feet per color with an additional cost involved. For complete specifications refer to "Specifications. Armstrong Asphalt Tile and Excelon Vinyl-Asbestos Tile, AIA File No. 23G.")

Asphalt tile

(1/8") (3/16") gauge (9" x 9") (12" x 12") Asphalt Tile in the (Standard) (Spatter) (Corkstyle) (Tapestry Tone) (Greaseproof) series as manufactured by Armstrong. Tile shall be uniform in three dimensions, and joints shall be tightly butted. Where bid figures are based on the Standard Series in B colors, it shall be understood that C colors will entail a cost premium over B colors and D colors a premium over B and C colors. (Note to Architect: 12" x 12" tile available in most types in quantities over 9000 square feet per color with an additional cost involved. For complete specifications refer to "Specifications. Armstrong Asphalt Tile and Excelon Vinyl-Asbestos Tile, AIA File No. 23G.")

Sheet vinyl walls and/or counter surfaces

(.030") (.040") (.050") gauge flexible (Wall Corlon) (Counter Corlon in the [Granette] [Supreme] [Tesserette] series (Gravure Counter Corlon) composed of polyvinyl chloride resins, alkaline-resisting pigments and asbestos Hydrocord Back. The material shall be dimensionally stable so as not to open at seam junctures and shall be stain resistant. Widths of (27") (36") (45") (54") (72") as designated on the drawing shall be used. Materials shall be neatly formed around all corners in conformance with manufacturer's recommendations. Colors shall be as selected from the range currently manufactured by Armstrong. Counter work shall have wood edge mold roll front, metal edging or self-edging as detailed and/or specified. All seams shall be rolled and snugly fitted. Material shall meet the Fire Code Specifications of (Consult Armstrong representative for applicable codes) for schools, laboratories and meeting places. (Note to Architect: For detailed specifications refer to "Specifications. Armstrong Counter-Top and Wall Covering Materials, AIA File No. 23-L and AIA File No. 35-C-12." and/or "Specifications for Armstrong Wall Corlon, AIA File No. 23-G.")

Federal specifications

Federal Specifications are written to establish minimum standards for purposes of competitive bidding and to insure that various government agencies will receive quality material. They do not necessarily include provision for all products or provide for products made exclusively by a single manufacturer and protected by patent laws. An example of this is Armstrong Linotile, an exclusive Armstrong flooring material unlike anything else in its classification. Some of the new plastic flooring materials also cannot be classed under a general Federal Specification because of the broad variation of materials in the market. Armstrong Floors meet the requirements of applicable Federal Specifications pertaining to their classifications.

Federal Specification SS-T-306b

Tile floor; asphalt

Armstrong Asphalt Tile meets or exceeds the requirements of this Federal Specification for asphalt tile in ⅛" and 3/16" gauges (except Corkstyle, Spatter, and Tapestry Tone stylings which do not meet the requirements of paragraph 3—3).

Federal Specification SS-T-307

Tile floor; asphalt, grease resistant

Armstrong Greaseproof Asphalt Tile meets or exceeds the requirements of this Federal Specification for grease-resistant asphalt tile in ⅛" and 3/16" gauges.

Interim Federal Specification L-T-00345 (COM-NBS)

Tile floor; vinyl-asbestos

Armstrong Excelon Tile meets or exceeds the requirements of this Federal Specification for vinyl plastic floor tile in 0.125" (⅛") gauge.

Interim Federal Specification L-F-00450 (COM-NBS)

Flooring; vinyl plastic

(Type 1, Tile)
Armstrong Custom Corlon Tile meets the requirements of this Interim Federal Specification for flexible vinyl plastic floor tile.

Interim Federal Specification
LLL-T-00431a(c)M-NBS

Tile floor; cork

(Class 1, Cork Tile with wax, lacquer, or resin finish)
(Class 2, Cork Tile with clear plastic film finish)
Armstrong Cork Tile and Armstrong Custom Vinyl Cork Tile meet or exceed the requirements for this Federal Specification for Cork Tile in various gauges in the two classes defined above.

Federal Specification ZZ-T-301a

Tile floor; rubber

Armstrong Rubber Tile meets or exceeds the requirements of this Federal Specification for rubber tile in ⅛" and 3/16" gauges.

Federal Specification LLL-L-351b

Linoleum; battleship

The regular colors in Armstrong Plain Linoleum meet or exceed all requirements of this Federal Specification for heavy gauge, 0.125" (⅛") linoleum on burlap backing.

Federal Specification LLL-L-367

Linoleum; plain and marbleized

Armstrong Plain Linoleum, Marbelle Linoleum, Textelle Linoleum and Surftone Linoleum meet or exceed all requirements of this Federal Specification for heavy gauge, 0.125" (⅛") linoleum on burlap backing.

Federal Specification LLL-F-471

Floor covering; felt-backed

(Type 1—Linoleum Composition; Class A, Roll Form, and Class B, Tile Form; Grade B and Grade C)
All Armstrong Standard Gauge (.090") and Service Gauge (.0625") Linoleum, except Balboa, meets or exceeds the requirements of this Federal Specification for standard and service gauge linoleum on felt backing.

Interim Federal Specification
LLL-L-00354a(COM-NBS)

Linoleum; desk top

Armstrong Desk Top Linoleum meets or exceeds the requirements of this Federal Specification for desk top linoleum.

Federal Specification OP-106

Paste, Linoleum

Armstrong S-128 Paste and S-130 Resilient Tile Paste meet or exceed the requirements of this Specification.

Interim Federal Specification SS-A-00138

Asphalt, Emulsion Type

Armstrong S-160 Emulsion meets or exceeds the requirements of this Specification.

Interim Federal Specification SS-A-128

Asphalt, Cut-Back Type

Armstrong S-90 Cement meets or exceeds the requirements of this Specification.

Military Specification MIL-C-21016C

Adhesive, Linoleum and Plastic Tile

Armstrong S-235 Cement meets or exceeds the requirements of this Specification.

No federal specifications

No federal specifications have been evolved for the following materials:

Armstrong Vinyl Corlon (vinyl plastic sheet-form flooring with Armofelt or Hydrocord Back)
Armstrong Linotile (homogeneous floor tile, oil-bonded)
Armstrong Counter Corlon (vinyl plastic surfacing)
Armstrong Wall Corlon (vinyl plastic surfacing)

Comprehensive specifications available

Complete unabridged specifications for all Armstrong floor, wall, and counter-top materials may be had upon request from any Armstrong Floor Division District Office. (Use form number when ordering.)

A.I.A. File No. 23-G:

Specifications for:	Form Number
Armstrong Asphalt and Excelon (vinyl-asbestos) tile	F-777
Armstrong Cork tile and Custom Vinyl Cork tile	F-415
Armstrong sheet Vinyl Corlon with Armofelt Back	F-579
Armstrong sheet Vinyl Corlon with Hydrocord Back	F-845
Armstrong Excelon (vinyl-asbestos) tile	F-777
Armstrong Linoleum	F-59
Armstrong Linotile	F-448
Armstrong Castilian Vinyl tile, Custom Corlon tile, and Rubber tile	F-775
Armstrong counter-top and wall covering materials	F-1005
Armstrong Wall Corlon	F-1444
Armstrong basic guide specifications	F-1191

A.I.A. File No. 23-Q:

Specifications for:	
Armstrong underlayments; hardboard and asphaltic-type	F-859

A.I.A. File No. 35-C-12:

Specifications for:	
Armstrong counter-top and wall covering materials	F-1005

F-1103-262 A