

LAYING

RECOMMENDATIONS FOR INSTALLATION

Armstrong DLW Linoleum is manufactured from natural and replaceable raw materials. These provide linoleum with material properties which must be taken into account when installing. These are:

A. Reaction to moisture

Excessive humidity in the air or moisture in the substrate or adhesive can cause changes in the dimensions of the linoleum. The subsequent points concerning sub-floors and adhesives should thus be observed.

B. Veiling

The natural veiling caused during the curing process of linoleum in the drying chamber and visible as a yellowish discolouration disappears on exposure to light. Under artificial light or weak sunlight this process may take several days or even weeks. Sheets and tiles laid at the same time should thus be exposed to identical light conditions.

Installing Armstrong DLW Linoleum is simplicity itself if the following points are observed.

1 SUB-FLOOR

Armstrong DLW Linoleum can be installed on all sub-floors that are permanently smooth, firm, free of cracks and dry (see also VOB Part C, DIN 18365. Floor-covering work, together with other regulations applicable to individual cases).

Dense, non-porous sub-floors, poured asphalt, for instance, or primed screeds and wooden sub-floors must be provided with a water-resistant levelling compound of adequate thickness (minimum 2 mm); cement-bound, low-tension compounds are suitable for this purpose.

The following values for residual moisture and drying times for various sub-floors apply to substrates of normal thickness, i.e. not greatly in excess of the minimum requirements according to DIN 18560, and serve as guidelines based on experience:

Subfloors	Maximum Permitted Moisture content in CM-%
Cement floor	≤ 2,0
Anhydrite and Anhydrite flooring	≤ 0,5

2 ADHESIVES

Application of all adhesives suitable for linoleum is generally done with a B1 square-notched trowel, using approx. 400-500 g per m². Please also observe the adhesive manufacturer's recommendations. When dispersion adhesives are used for linoleum 2 mm thick on very smooth floors an A2 notched trowel and approx. 350 g of adhesive per m² is sufficient. Adequate transfer to the backing material (jute) should be checked continuously. We recommend that solvent free adhesives such as dispersion or powder adhesives should be used.

List of manufacturers

Henkel Bautechnik GmbH Erkrather Str. 230 D-40233 Düsseldorf Tel. +49 211/7379-0	UZIN UTZ AG Dieselstr. 3 D-89079 Ulm Tel. +49 731/4097-0
WULFF GmbH & Co. Wersener Str. 3 D-49504 Lotte Tel. +49 5404/8810	Kiesel Bauchemie GmbH & Co.KG Wolf-Hirth-Str. 2 D-73708 Esslingen Tel. +49 711/7 93 13 40
Wakol-Chemie GmbH Bottenbacher Str. 30 D-66954 Pirmasens Tel. +49 6331/8001-0	BOSTIK GmbH An der Bundesstr. 16 D-33829 Borgholzhausen Tel. +49 5425/80 1-0

The manufacturers listed above are merely some examples among many. Information about adhesives suitable for laying linoleum may be obtained either direct from the above-mentioned manufacturers or from the Armstrong DLW Advisory Service, telephone number (0 12 35) 44 40 10.

3 ESTIMATING REQUIREMENTS

3.1 Rolls

In order to establish requirements for material supplied in rolls, the required lengths and widths of the rolls must be determined. Before taking measurements, the direction in which the material is to be laid must be determined. Head seams are only permitted with roll lengths of more than 5 metres. Allowances must be made for rolls, which run up to door openings, recesses or similar things, to cover these. Strips can be used for covering door openings at the sides, recesses and so on.

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3.2 Tiles

Tiles are generally laid with cross-joints in an alternating pattern. But they can also be laid, if desired, in a parallel manner. With regard to the way the joints run, either parallel or diagonal layouts are possible. For measuring-up, the surface to be covered is taken as the basis, allowing an extra amount for wastage, based upon experience. The amount of waste material is greater with diagonal laying methods than with a parallel design and greater also with oblique angled or rounded surfaces than it is with straight-edged ones.

3.3 Staircases.

Coverings for steps are cut from rolls of material. When laying coverings with patterns that run lengthways, these should run parallel with the edge of the step. This applies also to platforms. The requirements are calculated from the number of steps that can be cut, respectively, from one roll. Special templates are made up to enable measurements to be taken for angled staircases.

4 STORAGE, ACCLIMATIZATION AND CONDITIONS FOR INSTALLING

Correct storage is essential to ensure that the technical laying properties of Armstrong DLW Linoleum are retained.

Basically, rolls of linoleum should be stored upright in a warm, dry area. Once cut to size, the loosely re-rolled sheets should be stood upright with the top surface facing outward for at least 24 hours in the room where they are to be installed at a temperature not less than 18°C, but not in direct sunlight (see B (Veiling)). This allows the material to acclimatize to the ambient humidity and temperature of the room. When the linoleum is being installed, it is important that the temperature not only of the room but also of the sub-floor should be at least 15°C and the maximum relative humidity 75% (ideally between 40% and 60%).

Make sure that, in each room, only one and the same factory batch number of floor covering is installed in the sequence of roll numbers. This applies both to tiles and sheets.

5 CUTTING LINOLEUM

5.1 Trimming the edges of sheets

Even if sheets are to be joined at a later stage, we recommend trimming both edges of the sheet, for cleanly-trimmed edges are a prerequisite for clean seams. The first edge is easily trimmed using a linoleum edge-cutter. The second edge may be trimmed by two methods:

- a) In the case of small rooms (before adhesive is applied)

The lower sheet is scribed with a knife along the trimmed edge of the upper sheet. The resulting strip of waste is then cut in the opposite direction with a hooked blade.

- b) In the case of large rooms (after adhesive has been applied)

The upper edge is scribed along already trimmed edge of the glued bottom sheet with an under-and-over scribe or a lino-cutter, and the resulting waste strip is then cut in the opposite direction with a hooked blade.

5.1.1 Cutting the seams

In either case, the cut should be done in such a way that a gap of about 0.5 mm is left open between the sheets. The cut should be vertical or slightly diagonal so that the joint is loose, i.e. without contact between the two sheet edges.

5.1.2 Top ends

When the seams are cut, possible alterations in the dimensions of the floor covering should be taken into account. When long sheets are being joined it is thus a good idea not to trim the top ends before the linoleum has been installed in the bed of adhesive.

5.1.3 Fitting around door thresholds, radiators etc.

Once acclimatized, the sheet is installed and cut to fit around door thresholds, radiators etc. with the help of a recess scribe. The sheets should then be rolled back and the adhesive applied.

5.2 Tiles

Linoleum tiles are manufactured to order and should be laid within a maximum of 8 weeks after delivery. The tiles should be stored in a dry area.

For recommendations regarding adhesives see under point 6.

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6 INSTALLATION

Basically, the whole surface is stuck down. With this the operational guidelines of the adhesive manufacturer should be followed. Selecting the correct notch and the timely changing over of the spatula blades as well as the basic rubbing-on are vital elements so as to ensure that the adhesive is correctly spread on the underside. Lift up the tiles to check that the adhesive is spread on the underside, when the work is being carried out.

6.1 Rolls

The rolls are to be folded back and then the adhesive is applied to the floor, The rolls are to be laid down one after the other onto the area where the adhesive has been spread, within the time that is specified by the adhesive manufacturer and then immediately rubbed or rolled on. The latest point in time when the laying can be carried out depends on the room temperature and air moisture as well as the absorbency and dampness of the base. When rolls are being laid in corridors, they are to be folded back crossways. During the laying procedure, no pockets of air should be allowed to remain and these should be pushed out of the sides. Any hollow spots found when tapping down on the covering with a hammer, can be pierced and the air then pressed out. The facings are counter-stretched to reduce the tension in the covering.

6.2 Tiles

After the adhesive has been applied, tile laying begins with the predetermined first line of tiles. With large rooms, laying of the tiles in stages is recommended in order to avoid any misalignment. When applying the adhesive to the under side, the tiles are to be carefully smoothed or pressed on. It may be necessary to repeat this process.

Adhesive	Trowel notching	Amount required
2 component dispersion adhesive	B1	400-500 g/m ²

7 WELDING OF SEAMS

As per Code of practice 2/93 of the Technical Committee for Architectural Adhesives (TKB) in the Trade Association of the Adhesives Industry in Düsseldorf, the sealing up of joints with welding rod is always to be recommended. This is particularly applicable for areas where wet cleaning and/or basic cleaning is

carried out frequently and with flooring bases that are sensitive to damp, for example with tension tiles. The welding operation itself is carried out either with a hand-welding device or automatic welder. This is done basically after the adhesive has bonded, e.g. 48 hours after laying (see recommendations of the adhesive manufacturer). If bonding of the joints is carried out too early, it can cause variations in the adhesive in the area of the join and this may impair adhesion due to the effects of heat.

Note: With linoleum that is not exposed to light (see B → veiling), there can be differences in colour between the rolls and the welding rod. The colour of the covering should be compared with that of the welding rod after the veiling has stopped developing.

8 ARMSTRONG DLW KORKMENT AS AN UNDERLAY

Korkment is the only insulation underlay recommended for Armstrong DLW Linoleum. Armstrong DLW Korkment can be installed on all prepared substrates. The direction of the sheet can be the same as that of the main floor covering. Seams should be offset by at least 50 cm. Korkment may also be installed at right angles to the linoleum sheet. Seams may be formed by a so-called double-cut, using a hooked blade run along a straight-edge. Linoleum dispersion adhesive or 2K dispersion adhesives are used for glueing down. The amount of adhesive required depends on the thickness of the floor covering and its subsequent use. The floor covering should only be installed after sufficient time has elapsed to allow the adhesive to bond fully. For floors subjected to heavy wear (in hospitals, for example), Korkment can be installed with the jute backing facing upwards.

Recommended adhesives for Armstrong DLW Korkment

Adhesive	Trowel notching	Amount required
Powder adhesive	B1/B2	400 – 600 g/m ²
2 component dispersion adhesive	B1	400 – 500 g/m ²
Dispersion adhesive	B1	300 – 400 g/m ²

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9 ARMSTRONG DLW LINOLEUM WITH UNDERFLOOR HEATING

Armstrong DLW Linoleum is suitable for installing on substrates above underfloor heating systems (see the leaflet "Resilient floor coverings and parquet flooring on heated floor constructions" issued by the Central Association for the German Building Industry).

9.1 Dry constructions

Dry constructions can consist of anhydrous gypsum or brick plates. The floor covering can be installed once the joints have been skimmed over with levelling compound.

9.2 Wet constructions

With wet constructions, the heating pipes or cables are bedded into a floating cement or anhydrous gypsum screed. Before the floor covering is installed, care must be taken to ensure that any residual moisture generated by the heated elements is removed. This is generally the responsibility of the heating engineer, who should issue a report on the required heating-up and cooling-down measures undertaken. This report replaces the moisture tests required of the flooring installer, who may not carry out these tests where there is underfloor heating systems installed unless the sub-floor installer has left marked measuring points.

10 INSTALLATION OF ARMSTRONG DLW CONDUCTIVE LINOLEUM

The requirement for floors with a maximum electrical resistance to earth of 1×10^8 ohms is fulfilled by the installation of Armstrong DLW conductive Linoleum LCH. The earthing of the conductive flooring is a matter for an electrical installation engineer, who must observe the corresponding VDE regulations.

The adhesive used must be homogeneously conductive. This requirement is not generally fulfilled by light conductive adhesives with fibre additives. Inquiries about the type of adhesive to be used and the conduction system which is to be employed may be obtained direct from the manufacturers or from the Armstrong DLW Advisory Service, telephone number (012 35) 44 40 10.

10.1 Installing on copper strips

A continuous copper strip is run under each row of tiles or sheet of linoleum. These copper strips are connected via two strips running at right angles. For the installation of Armstrong DLW conductive Linoleum LHC, DLW offers copper strips as follows:

Supplied as: 50 m rolls

Amount required: As a rough guide for ordering, about one 50 m roll is needed for 80 m² of floor covering or 25 m² of tiles.

10.2 Installation on a primed conductive subfloor

The sub-floor is first primed with a conductive primer in accordance with the manufacturer's instructions for use. A one-metre length of copper strip is glued to the prescribed earth connection on the substrate.

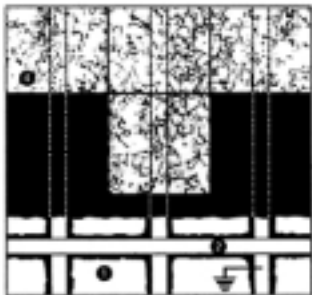
Frequency of earth connection points:

At two points in the room - more in the case of rooms over 40 m² in size. The maximum distance from an earth connection point may not exceed 10 m.

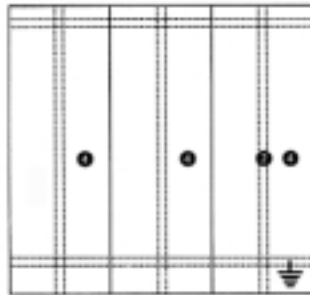
10.3 Installing in dual requirement areas

Armstrong DLW Linoleum LCH is discharge capable and at the same time meets the location insulation requirements as per DIN 57100/VDE 0100 T410. Because of the overall difficulty, it is basically recommended to obtain information from the Armstrong DLW Advisory Service on telephone number +49 (0) 7142/71-8 45

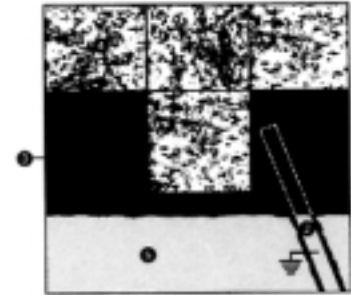
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Tiles on copper strip



Sheets on copper strip



Tiles on conductive subfloor
(Frequency of earth connection points)

- 1 Subfloor
- 2 Copper strip
- 3 Conductive adhesive
- 4 Conductive flooring
- 5 Earthing strip

11 SPECIAL NOTES

11.1 Office castor chairs

Office castor chairs for use on resilient floor coverings must be fitted with Type W castors in accordance with EN 12529 (DIN 68131), i.e. with soft castors. This should be taken into account when new castor chairs are purchased when castor chairs are used or before they are purchased.

For technical information:

Volker Weismann Tel. +49 71 42/71-2 55
 Stephan Brendel Tel. +49 71 42/71-7 35
 Fax +49 71 42/71-1 46

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One of the most important preconditions for successful installation is careful work according to plan.



Testing the moisture content of the substrate and checking temperature and relative humidity in the room.



The sheets are cut to size, marked, loosely re-rolled and placed upright to acclimatize to conditions in the room.



The loosely-laid sheets are cut in, around a radiator in this case.



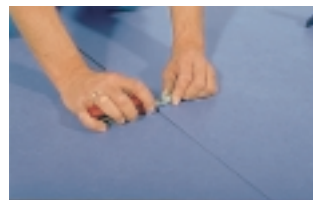
Transferring the shape of a doorpost to the linoleum with the help of a bevel.



The covering is cut along the scored contours.



Cutting the first edge of the sheet is best done with a linoleum edge cutter or strip trimmer.



The safest way of cutting a seam: mark the top sheet with an under and over scriber guided along the trimmed edge.



Trimming the top edge with a hooked knife.



The seam should never fit too tightly. There should be a space of approx. 0.5 mm between adjoining edges when sealing.



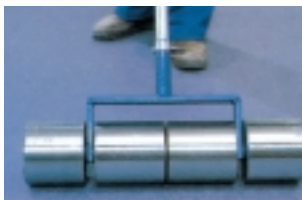
Folding back the trimmed sheets, either half-way back in the case of rooms or lengthways in the case of corridors etc...



Adhesive must be applied in such a way that the strips of adhesive cover the entire backing of the floor covering.



Rubbing down the sheets with a rubbing iron, a device covered with needle felt...



... or with a lino roller which, due to the gauge of the rollers, exercises sufficient pressure even where slight irregularities occur.



Hollow spots in the installation, rubbed-down linoleum covering can be „heard“ by running a hammer handle over the surface.



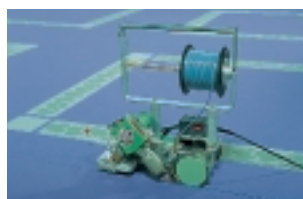
A useful tip if the trapped air cannot be forced out laterally: make a small hole with the point of a blade in a dark section of the pattern, press out the air and once again firmly rub down the covering at this point.



Milling out the joint.



Sealing with a manual welder.



For large contract projects it is worth using an automatic welding machine.



The weld rod is trimmed in two operations, first with the trimming guide fitted, then with the bare blade.

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LAYING RECOMMENDATIONS ARMSTRONG DLW LINOPLAN

Armstrong DLW Linoleum is manufactured from natural and renewable raw materials. These bring to the linoleum the following material features, which must be taken into account when carrying out the laying process:

A. Reaction to humidity

The linoleum reacts to high humidity from the air and the sub-floor or from the adhesive resulting in dimensional changes. Therefore please take care to observe the following points related to the sub-floor and to adhesives.

B. Veiling

The naturally occurring veiling, which arises during the curing in the drying chamber, which is recognisable by its yellow colouring, degenerates when the goods are exposed to the air. Under direct sunlight the degeneration takes place after quite a short time, but under artificial light or in weak sunlight this can take several days or weeks. Tiles laid at the same time are to be exposed to the same light proportions.

The laying of Armstrong DLW LINOPLAN is simple if the following points are observed:

1. BASE

All bases that are and remain even, firm and free from cracks, are suitable for the laying of Armstrong DLW LINOPLAN (see also VOB [German Contract Procedure for Building Works] Part C, DIN 18365 floor laying operations as well as the relevant regulations). Sealed and non-absorbent floor bases, for example, mastic asphalt or primed floorings must be smoothed off for using levelling compounds in sufficient thickness ($\geq 2\text{mm}$ is recommended). For the residual moisture of the different floorings the following experimental values apply with normal flooring thickness - i.e. in essence, not above the minimum requirements of DIN 18560:

Flooring	Residual Permitted in CM-%
Anhydrite floor	$\leq 0,5$
Anhydrite tile floor	$\leq 0,5$
Cement floor	$\leq 2,0$

2 ADHESIVE

We recommend adhesives, which are low in emissions and free from solvents. Please take note of the manufacturer's recommendations for adhesive suppliers. Adequate transfer of adhesive to the rear side of the floor covering is to be checked on an ongoing basis.

List of manufacturers

F. Ball & Co Ltd. Churnestide Business Park Station Road Cheddleton Leek Staffordshire United Kingdom Tel. +44 15 38 36 16 33	Laybond Products Riverside Saltney Chester United Kingdom Tel. +44 12 44 67 47 74
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Details regarding suitable adhesives for Armstrong DLW LINOPLAN are to be obtained directly from the adhesive manufacturers or from the Armstrong DLW Advisory Service on telephone number +49 (0)71 42/71-2 55 or -7 35.

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3 ESTIMATING REQUIREMENTS

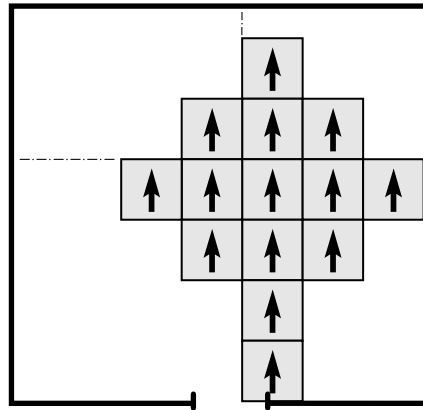
The tiles are laid generally with cross-joints in alternating moving directions. But they can also be laid in special arrangements in the same direction. With regard to the way the joints run, both parallel and diagonal laying methods are possible. For estimating, the surface that is to be covered, use the basic room measurement with an over-measurement allowing for the waste, which is based upon experience. The waste is greater in diagonal laying than in parallel laying and with obliquely angled or round surfaces than with straight ones.

4 STORING, CONDITIONING, LAYING CONDITIONS

The appropriate storage of the tiles is the best prerequisite for ensuring that the tiles retain their technical features. The tiles are to be stored in dry but not too warm areas and above all not in heating rooms. Not more than 8 cartons should be stacked on top of one another. If the temperature is too low, a fault-free laying operation of LINOPLAN tiles cannot be guaranteed. A laying process, according to trade practice, requires a room temperature of at least 18°C, a sub-floor temperature of at least +15°C and a relative humidity of maximum 75% (ideally 40 to 60%). Also the flooring must be acclimatised at suitable temperatures before the laying process. It is recommended that the cartons should be delivered to the site a few days before the laying process. It should be noted that at any one time only one and the same number of the manufacturing batch in accordance with the serial numbers on the cartons should be laid in one room.

a) Parallel laying

Before laying begins, a marking string is fastened parallel to the main wall of the room. The distance to the wall adds up to a multiple the size of a tile minus 1 cm. In corridors this measurement can be taken instead of from the wall, but also from the deepest doorsill. The starting point is to be marked on the line, which has been determined.



Parallel / chequer board method of laying of tiles

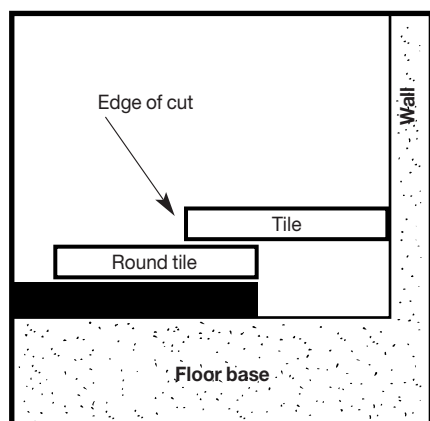
It is thus set that in certain positions, which meet the eye, e.g. at the main entrance, only more or less complete tiles are to be laid and no narrow strips are to be inset. From the starting point onwards, a row of tiles should now be loose-laid alongside the marking string and held in place with a stack of tiles or a box.

In large rooms, this row of tiles remains lying there until the bordering area is laid. With small rooms, it is sufficient to leave one tile as an indicator.

b) Diagonal laying

Next the room is partitioned symmetrically and the room axis is established with the marking string. One establishes how the tiles are to run at the main entrance and to the walls. The diagonal of a tile is the length of the side of the tile $\times 1.4$. A small triangle is now produced, thus the axis of the room is moved sideways around the fourth part of the diagonal. The same applies for the starting point. In asymmetrical rooms, the parallel line at a distance to the main front is fixed by means of the marking string and this corresponds to a multiple of the tile diagonal less around 1 cm. Also the fact has to be taken into consideration that more or less complete tiles have to be laid at the main entrance, amongst them at any one time some half, but never small triangles, should also be laid. Then a double row of tiles is loose-laid alongside the marking string, whereby the first row of tiles with the opposing corners lies on the marking string and the second row of tiles touches these with the corners.

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Edge of cut of the edging tiles

With large rooms the starting point from a diagonal row of tiles is now laid out and used as the base line for the laying operation. After the surface has been bonded down, the edging tiles are cut with a hooked or trapeze type blade.

6 BONDING

The whole surface is to be fully bonded. The operational guidelines of the adhesive manufacturer are to be followed for this. The choice of the correct trowel notch and the timely replacement of the spatula blades and rubbing on thoroughly are essential for wetting the under side. The wetting of the underside is to be continually checked by lifting up during the process.

After the adhesive has been applied, the laying of those tiles, which have been laid out as the starting point or line, begins. With large rooms the step-by-step laying method is recommended so as to reduce misalignment. The tiles are to be carefully rubbed on or pressed when wetting the rear side. This process may possibly have to be repeated.

7 FINISHING OFF THE JOIN

According to leaflet TKB-4, valid at July 1998 of the Technical Building Adhesives Commission (In the Adhesive Industry Trade Association, Düsseldorf), the sealing of joins with weld-rod is always to be recommended. This applies particularly to those areas, in which frequent wet cleaning and /or basic cleaning is carried out and with sub-floors, which are sensitive to moisture as for example with chip-boards.

The welding itself is carried out either with the manual welding device or with the automatic welder, basically after the bonding of the adhesive, i. e. with dispersion adhesives around 48 hours after the laying operation (see also the recommendation of the adhesive manufacturer).

Welding the joins too early can lead to variations in the adhesive in the area of the join as a result of the effects of heat and a reduction in adhesion.

Note: With linoleum that has not been exposed to light (see B: veiling) differences in colour may occur between lengths. The shade of colour of the floor covering should be compared to that of the weld-rod after the veiling has been removed.

8 ARMSTRONG DLW CORKMENT AS UNDERLAY

Armstrong DLW corkment is exclusively recommended as an insulating underlay for Armstrong DLW LINOPLAN. Armstrong DLW corkment can be laid on all prepared sub-floors. The direction of the laying of the lengths can be the same as that for the top covering and the seams are then to be set at least 50 cm apart. The Armstrong DLW corkment can, however, also be laid transversely to the direction of the linoleum lengths. The seam cuts for cork can be made as so-called double cuts with the hooked cutter or the trapeze blade along the line of the straight edge. Linoleum-, dispersion-, or 2-K dispersion adhesives are used for gluing Armstrong DLW cork. The amount of adhesive depends on the thickness of the coating and of the later use. The laying of the top covering can only be started after the full amount of time has been allowed for the adhesive to bond.

Enquiries regarding the suitable adhesives for Armstrong DLW cork are to be directed to the adhesive manufacturers or to the Armstrong DLW Advisory Service on telephone numbers +49 (0) 71 42/71-2 55 or -7 35.

For heavy wear, e.g. in hospitals, the cork can be laid with the rear side /jute upwards.

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9 ARMSTRONG DLW LINOPLAN ON UNDERFLOOR HEATING

Armstrong DLW LINOPLAN can basically be glued down with under-floor heating; the heat resistance is so small that it is practically insignificant in terms of having any effect on the operation of the heating. (Leaflet „flexible floor coverings, textile floor coverings and parquet flooring on heated floor constructions“, published by the Central Association of the German Building Trade).

9.1 Dry construction

Dry construction can consist of anhydrite or plaster flooring tiles. After the joints have been smoothed out, Armstrong DLW LINOPLAN can be laid.

9.2 Wet construction

With wet construction the heating pipes or wiring are embedded in a floating cement or anhydrite floor. Before the laying of the floor covering, care is to be taken that the humidity, which is expelled through the effects of the heat, escapes **before** the laying is commenced. The heating constructor has to provide a report on the actions to be carried out for the prescribed switching on and off of the heating. A humidity test may only be carried out on the measuring points, which are marked by the layer of the flooring. If there are no measuring points marked, then the person laying the floor must indicate his doubts by raising an objection in writing to the client.

10 CLEANING AND MAINTENANCE

The contractor has to hand over to the client the written maintenance instructions for the floor covering as per VOB DIN 18365 part C Paragraph 3.1.4.

The following printed pamphlets are available free of charge:

- ***Cleaning and maintenance recommendations for Armstrong DLW Linoleum***
- ***Maintenance tips for continuous beautiful floor coverings (Domestic users)***

You can obtain supplies of these by phoning +49 (0) 17 42/71-3 85 or -3 40.

11 SPECIAL ADVICE

Office chairs must be equipped with castors of the type W as per EN 12529 (DIN 68 131), i.e. with soft castors in the prescribed measurements (50 mm diameter, 20 mm running surface, 100 mm concentration radius of the running surface). This is to be taken into consideration for the application of wheel chairs.

Our experts for questions related to laying techniques are:

Mr. Weismann	Tel. +49 71 42/71-2 55
Mr. Brendel	Tel. +49 71 42/71-7 35
	Fax +49 71 42/71-1 46