ISSUES INVOLVED IN NON-CONVENTIONAL FLOOR TILE APPLICATIONS (WET AREAS AND CERAMIC FLOORING IN PUBLIC AND INDUSTRIAL AREAS)

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1) WET AREAS

Ceramic flooring in wet-loaded/barefoot areas must have a slip-resistant surface allowing safe walking under the moisture conditions to be expected. The surface finish of the tiles shall not only ensure slip resistance, but also facilitate the cleaning of the floor coverings.

Wet-loaded barefoot areas are floor coverings - inclusive of stairs and ladders - which normally are wet and walked on without footwear, i. e. barefoot. Typical barefoot/wet areas are, for example, swimming pools in all their different designs, washrooms and showers of sport facilities, hospitals and old people's homes. They can be found both in the public, commercial and private sector. With their slip-resistant surface finish, especially glazed and unglazed tiles, and mosaics make an essential contribution to accident prevention even if exposed to the slippery medium water. The surface finish of non-slip floor coverings should be of such a quality that safe walking for all users is possible, i. e. also for children, elderly and disabled persons.

Relevant regulations for floor coverings

Apart from the correct classification in the applicable valuation group, convenient walking is another important aspect. Even if classified in the same valuation group, the surface structure of the tiles may be processed differently. A surface laid with «rondinettes», for example, allows slightly more convenient walking than a floor covering executed with profiled tiles. At the planning and selection of non-slip floor coverings, the different manufacturers like e. g. the company Contecta (Agrob-Buchtal-Keramik) with its 'Architektenservice' provide useful assistance for planners and floor tilers.

For the execution of non-slip floor coverings two different regulations must be followed:

Non-slip floor coverings in commercial areas have to be executed in accordance with the Notice on "Floors in Workplaces and Areas with Increased Risk of Slipping" (so-called 'boot area') issued by the Main Organization of the German Trade Associations.

In public barefoot/wet areas the Code of Practice for "Floor coverings in wet barefoot areas" issued by the German National Accident Insurance Board (BAGUV) must be followed.

With regard to private areas within the competence of various insurance companies, there are no regulations on the use of non-slip floor coverings. Wet barefoot areas are not only found in the public sector, but also in commercial and industrial applications (e. g. medicinal baths, hotel pools, washrooms and showers). Information on which of the two regulations mentioned above for commercial barefoot/wet areas is applicable in each individual case must be obtained from the relevant trade association, which is the competent authority for the statutory accident insurances.

Valuation group	Minimum angle	Areas of inclination
A	12°	- Barefoot passages (nearly dry) - Individual and common dressing rooms - Pool floors in the non-swimmer areas, if the water depth is more than 80 cm
B	18°	- Barefoot passages not classified in group A - Showers - Area of desinfecting spray facilities - Pool floors in the non-swimmer areas, if the water depth is less than 80 cm in certain areas - Non-swimmer sections of wave-action pools - Movable floors - Paddling pools - Ladders leading into the water - Stairs leading into the water with a max. width of 1 m and handrails on both sides - Ladders and stairs outside the pool area
C	24°	- Stairs leading into the water, not classified in group B - Walk-through pools - Inclined pool edge designs

Table 1: Valuation groups for barefoot/wet areas

Evaluation and test methods

Depending on the various risks of slipping, the individual barefoot/wet areas are assigned to the valuation groups A, B or C. The requirements to be met with regard to slip resistance are increasing from A to C. The three different valuation groups are subject to non-slip limiting values determined by the indication of the relevant angle of inclination. As shown in table 1, the ceramic floor coverings with their different non-slip properties can be classified in the applicable valuation group.

Wet barefoot areas

Competent authority: German National Accident Insurance Board - BAGUV - Accident Prevention and Industrial Medicine Department, 80335 Munich, Marsstraße 46.

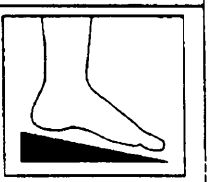
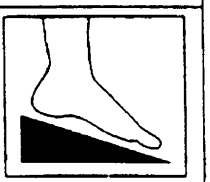
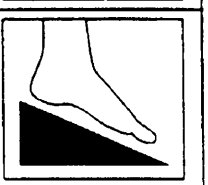
Floors in wet barefoot areas, e. g. swimming pools, hospitals as well as dressing rooms, washrooms and showers in sports and work facilities.

Test standard: DIN 51097 Code of practice: GUV 26.17 April 1986 «Code of Practice for floor coverings in wet barefoot areas».

Testing method: inclined plane, walked on barefoot, wetting agent solution as test medium, by FB-SFV, Burgwedel. The surfaces are smooth, micro-rough or slightly profiled.

AGROB BUCHTAL non-slip and safety glazes with their micro-rough surfaces have proved excellently in practice.

The various areas are assigned to the valuation groups. Information can be obtained from the local accident insurance association and AGROB BUCHTAL.

Tests on "inclined plane"		Wet barefoot area
Valuation groups	Angle of inclination	
A	>12°	
B	>18°	
C	>24°	

A

- Barefoot passages (nearly dry)
- Individual and common dressing rooms
- Pool floors in the non-swimmer areas, if the water depth is between 80 cm and 1.35 m

B

- Barefoot passages not classified in group A
- Showers and pool surrounds
- Area of desinfecting spray facilities
- Pool floors in the non-swimmer areas, if the water depth is less than 80 cm in certain areas
- Non-swimmer sections of wave-action pools
- Movable floors and paddling pools
- Ladders leading into the water
- Stairs leading into the water with a max. width of 1 m and handrails on both sides
- Ladders and stairs outside the pool area
- Relaxation steps and underwater ledges

C

- Stairs leading into the water, not classified in group B
- Walk-through pools
- Inclined pool edge designs

For these different valuation groups the manufacturers offer quite a variety of tiles suitable for application in barefoot/wet areas due to their respective classification.

The testing of non-slip floor tiles is carried out by a special test method specified in DIN 51097, which requires an inclined plane to be walked on by a test person. The test person walks barefoot on the various slip-resistant floor coverings on the inclined plane after having applied a wetting agent solution as test medium before. The angles of inclination of the plane can be adjusted differently. The slope of the inclined plane still allowing safe walking without slipping is the evaluation criterion for the slip resistance in the fields of application A, B and C.

The non-slip properties of ceramic floor coverings are tested by the test institute of the 'Säurefliesner-Vereinigung' in Großburgwedel on behalf of the German National Accident Insurance Board (BAGUV). The slip-resistant floor coverings tested there are classified according to their areas of application and included in the "List NB" (survey of tested floor covering materials for wet barefoot areas) in regular intervals. The "List NB" is available from the 'Säurefliesner-Vereinigung' or the accident insurance carriers upon request. The current list (17th edition) appeared in July 1994 and is newly issued or updated after every year.

Selection of the slip-resistant tiles

Tiles used in barefoot/wet areas must comply with the quality standards of DIN EN 176 B 1, DIN EN 121 A 1 or DIN EN 186, part 1. The compliance with these standards guarantees - among other things - that the ceramic tiles have all the physical and chemical properties required: e. g. water absorption, resistance to frost and mechanical stress, resistance to thermal shocks, acids and alkalis as well as stain resistance. The properties guaranteed by these standards only apply to materials of the first quality grade. The required slip resistance of the tiles classified in the valuation groups A/B/C has to be proved by a test certificate or by the entry in the "List NB" upon request.

The marking of the tiles suitable for application in barefoot/wet areas in the plant catalogue is effected by indicating the valuation group and partly by symbolic representation of a bare foot together with the relevant angle of inclination.

The surfaces of the slip-resistant tiles may be executed differently by means of the valuation groups (see table 2).

Table 2:

Slip-resistant tiles - glazed/unglazed stoneware tiles DIN EN 121 A I "non-slip" glazed (special barefoot tiles micro-grained)						
Model no.	34090	32100	32080	38110	38200	38110
Nominal dim. (cm)	25 x 12,5	12,5 x 12,5	25 x 25	25 x 12,5	25 x 6,2	25 x 12,5
Work size (mm)	244x119x8	119x119x8	244x244x8	244x119x8	244x56x8	244x119x8
Pcs./m^2 /lin. m.	32/m^2	64/m^2	16/m^2	32/m^2	64/m^2	32/m^2
Weight/m^2 /lin. m.	15,4 kg/m^2	15,4 kg/m^2	16,8 kg/m^2	15,7 kg/m^2	14,7 kg/m^2	15,7 kg/m^2
Pcs./ bundle/pallet	33/2772	66/5544	14/1134	33/2772	66/6336	33/2772
Qty./ weight/pallet	86,6m^2 /1331kg	86,6m^2 /1331kg	70,9m^2 /1191kg	86,6m^2 /1358kg	89m^2 /1457kg	86,6m^2 /1358kg
Slip resistance	B/R11	B/R11	B/R11	A/R10	C/-	C/-

B = Tested floor tiles (critical angle > 18°) for the application fields B inclusive of A in barefoot/wet areas.
R11 = Also tested (angle of inclination 10°-19°) for the commercial 'boot area'.
C = Tested floor tile (critical angle > 24°) for the application fields C (inclusive of B in barefoot/wet areas).
Not tested for the commercial 'boot area'.

There are three different surface variants of slip-resistant tiles:

* unglazed, smooth or with profiled surface,
* glazed, however, with particularly rough special glaze (for example Non Slip or Safety)
* unglazed, in combination with a glaze; glaze only applied in the depressions of the tile surface.

As the joint arrangement of the ceramic surface makes an essential contribution to the slip resistance in barefoot/wet areas, the model size of the tiles should be selected in such a way that the area covered by joints does not fall below less than three percent per square metre. Depending on the joint width, this approximately corresponds to the rectangular model in the size of 25 x 12,5 cm. As a general rule, one can say that the slip resistance in barefoot areas is considerably increased in the case of a small model size and a larger area covered by joints. When laying small mosaics in the model sizes 20 x 20 mm or 24 x 24 mm, an area of 20 - 22 percent per square metre is covered by joints. In the case of the frequently used middle mosaics an area of approximately 7 percent is covered by joints.

With regard to unglazed small mosaics with smooth surfaces, a classification in the valuation group B or C may be possible after prior testing on the inclined plane due to the high number of joints.

The correct application of tested, non-slip ceramics in the various barefoot/wet areas has to take place as specified in table 1 of the GUV - Code of Practice.

The laying of non-slip floor coverings normally does not involve any considerable problems for floor tilers.

At the laying, however, some instructions must be followed in order to ensure the full functionality of a non-slip covering. Depending on the respective substructure and sealing variants, floor coverings can be laid both in the mortar bed according to DIN 18352 or by the thin-bed method according to DIN 18157, part 1. The relevant and successively published ZDB-Notices (all Notices are contained in the manual 'Technik für das Fliesengewerbe') as well as DIN 18195, part 5 (Sealing measures in buildings, sealing against non-pressurized water) must be complied with. In case of thin-bed laying, the combined method (Floating-Buttering) has to be applied as a principle.

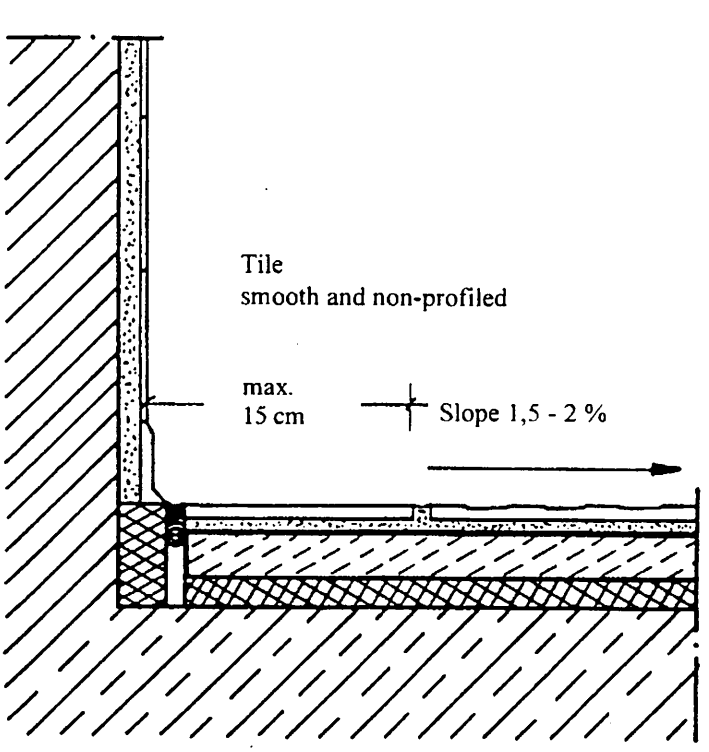
Laying and pointing

With this laying technique, a cavity-free and fully saturated bedding with almost 100% mortar coating of the tile reverse side shall be ensured. As an alternative to the combined method, the laying can also be carried out with special thin-bed mortars, the so-called pourable mortar according to DIN 18156, part 2. If this type of mortar is handled correctly, a fully saturated coating of the tile reverse side is achieved without the additional work required otherwise. This method also allows the fully saturated and cavity-free laying of small and middle mosaics.

In order to ensure a fast surface draining in the ceramic floor covering, a slope of at least approx. 1,5 - 2 percent should be provided. When planning the floor outlets, it has to be taken into account that they are arranged both in sufficient number and in the right size in order to avoid a backpressure of surface water. Tiles should always be laid orthogonally (with straight joints). In this way it is achieved that surface water accumulating on the floor covering is guided to the slop sink on the shortest way. The execution in barefoot/wet areas requires an absolutely perfect laying with regard to the surface planimetry in order to make sure that the laid slip-resistant tiles remain free of water accumulations. This requirement is a must, because accumulated surface water considerably increases the risk of slipping.

Especially in the critical area of the floor outlets plane laying is very important. Experience shows that this is the most problematic area due to the existing slope and the tile models used. Ridges in the tile covering must be avoided in order to prevent dangers of getting injured.

The joint widths depend on the manufacturers' instructions or have to be provided according to DIN 18352. If modular formats are used, the specified joint widths must be exactly followed. The joints must be free of mortar residues and scratched out at least down to tile thickness. This also applies to all kinds of mosaic floors. Dirt on the tile surface has to be removed immediately. In order to facilitate the subsequent cleaning of the non-slip floor coverings - especially towards the wall area - a strip of smooth, non-profiled floor tiles can be provided along the walls, in corners and under facilities solidly anchored in the floor at a distance of up to 15 cm.



If mosaics are laid in wet areas, only mosaics with papering on the face sides must be used in order to obtain optimum adhesion and fully saturated laying. Mosaics with paper-net on the reverse sides normally only provide an adhesion surface of approximately 63 - 75 percent. For this reason, a fully saturated coating of the tile reverse side as required by DIN 18157, part 1, section 7.3.3, is impossible even if applying the combined laying method.

The pointing of non-slip floor coverings with their different structures, fine-rough and moderately profiled surfaces can be carried out by the conventional grouting method. At the pointing of mosaic coverings, the joints have to be executed slightly concave. Floor joints in swimming pool areas are exposed to particularly strong mechanical, thermal and partly even chemical loads. For the pointing of these areas we recommend an artificial resin compound e. g. on epoxy resin base instead of the conventional cement-based compound. Epoxy resins especially prepared for this purpose (for example 'Objekt-Fugen-Epoxi') can be processed very easily by the grouting method and are suitable for all commercially available, slip-resistant floor tiles; excess material can be removed from the surface without problem and without leaving any residues. A thorough final cleaning of the ceramic surfaces after pointing is an absolute must. This applies above all to glazes with micro-graining.

2) FLOOR COVERINGS IN PUBLIC AND INDUSTRIAL AREAS

Areas with increased risk of slipping

Definition:

Floor coverings in areas where slipping hazards caused by slippery substances such as grease, oil, water, food and waste can not be avoided for technical reasons and which are therefore exposed to increased risk of slipping.

Workshop rules as well as accident prevention regulations require floors to be smooth, slip resistant and easy to clean.

Special protective measures against slipping are necessary where there is a risk as a result of the use of water, oil slush, grease or waste. This should be taken into consideration when choosing the surface material. This clear requirement is based on investigations carried out by the insurance companies, which proved that slipping is the primary cause of accidents.

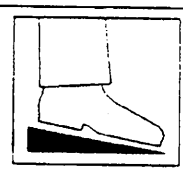
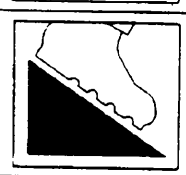
Evaluation groups «R»

The Main Organization of the Trade Associations carried out a valuation and classification of the risk of slipping in such areas according to special criteria.

5 slip-resistance valuation groups, R9 - R 13, are assigned to the different areas. Group R 9 stands for the lowest risk of slipping, group R 13 for the highest. The appropriate non-slip flooring materials are tested and classified accordingly.

The so-called walk-on method serves for determining the degree of slip resistance of the different products. A test person walks on the material on an inclined plane with adjustable angle of inclination. The angle of inclination at which the test person reaches the limit of safe walking is determined.

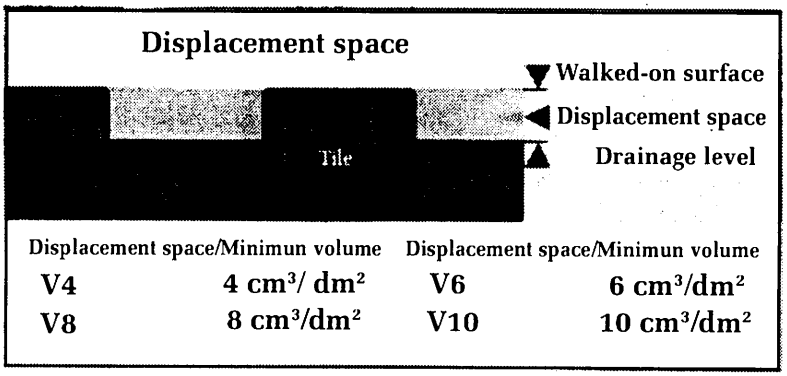
Table 3:

Tests on "inclined plane"/Industrial and commercial areas		
	Angle of inclination	
R 9	>3°-10° low static friction	
R 10	>10°-19° normal static friction	
R 11	>19°-27° increased static friction	
R 12	>27°-35° high static friction	
R 13	>35° very high static friction	

Displacement space «V»

In workrooms where slippery substances prevail, a plane, slip-resistant surface alone is not sufficient. An additional displacement space in the form of recesses below the walked-on surface is required; shoes with profiled soles provide additional safety. Such areas are classified by «V»-identification numbers, which indicate the required minimum displacement volume in cm^3/dm^2.

Table 4



Displacement space/Minimun volume		Displacement space/Minimun volume	
V4	4 cm^3/dm^2	V6	6 cm^3/dm^2
V8	8 cm^3/dm^2	V10	10 cm^3/dm^2

Competent authority:

Main Organization of the Trade Associations, Central Office for Accident Prevention and Industrial Medicine, Alte Heerstr. 111, 53574 St. Augustin, Technical Committee «Building Fittings».

Regulations:

ZH/571 October 1993 «Code of Practice for floors in workplaces and areas with high risk of slipping».

Test procedure:

According to DIN 51130 (51098), inclined plane, safety footwear worn, test medium oil, by BG-Bia, St. Augustin /SFV, Burgwedel / AGROB BUCHTAL

The surface finish can be smooth, micro-rough, rough, or profiled.

The displacement space (V4 - V10) is the open space between the upper walked-on surface and the drainage level of profiled surfaces.

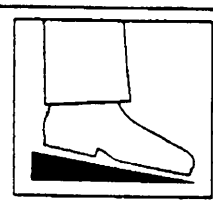
3) PRIVATE AREAS

Competent authority: various insurance companies
Regulation and testing procedure: none

Floors inside and outside residential flats/houses.

AGROB BUCHTAL recommendation with special regard to slip resistance:
Unglazed vitrified tiles, Ziegelfliesen and split tiles, glazed vitrified tiles and split tiles with matt and dull glazes as well as all tiles and pavers of valuation group R9.

Table 5

Tests on "inclined plane"		Private areas
Valuation groups	Angle of inclination	
R 9	**3°-10°**	

LIST OF ADDRESSES

- **DIN/EN standards sheets**
  Beuth Verlag GmbH
  Burggrafenstraße 6
  10787 Berlin

- **Directives for swimming pool construction/RK-list of tested cleaning agents**
  Deutsche Gesellschaft für
  das Badewesen e.V.
  Alfredistraße 32
  45127 Essen

- **Notices from the Central Association of the German Construction Industry in Bonn**
  Verlagsgesellschaft R. Müller GmbH
  Stolberger Straße 94
  50933 Köln

- **Notices on slip resistance**
  GUV 26.17, Floor Coverings for Wet Barefoot Areas
  BG ZH 1/571 E Floors in Workplaces and Areas with Increased Risk of Slipping
  Säurefliesner-Vereinigung e.V.
  Im langen Felde 4
  30938 Burgwedel

Industrieverband Keramische Fliesen und Platten e.V.
Friedrich-Ebert-Anlage 38
60325 Frankfurt

QUALITY CONTROLS

Quality controls are carried out by:

- manufacturers themselves with strict sorting

- controls and special tests by the ABK central laboratory

- individual and batch testing by external material testing institutions at home and abroad

Valuation groups

In a detailed table the required valuation groups are assigned to work areas where there is a high risk of slipping. Information is available from the trade association and AGROB BUCHTAL.

The following list (ZH 1/571), *edition October 1993*, shows the valuation group assigned to each working area as well as any displacement space. The standard value permits deviations in individual cases. Information is available from the trade association and AGROB BUCHTAL.

0	**General workplaces and areas**
0.1	Entrance areas
0.2	Stairs *
0.3	Social facilities (e. g. toilets, washrooms)
1	**Manufacture of margarine, edible fats and oils**
1.1	Melting of fat
1.2	Cooking oil refinery
1.3	Margarine production and packaging
1.4	Cooking fat production and packing, oil bottling
2	**Milk processing, cheese production**
2.1	Fresh milk processing and butter production
2.2	Cheese production, storage and packaging
2.3	Icecream manufacturing
3	**Chocolate and confectionery production**
3.1	Sugar processing
3.2	Cocoa production
3.3	Production of raw mixtures
3.4	Fabrication of chocolate bars and shells, and filled chocolates

4	**Production of bread, cakes and pastries (bakeries, cake shops, production of long-life bakery products)**
4.1	Dough preparation
4.2	Rooms in which predominantly fats or liquid mixtures are processed
4.3	Washing-up rooms
5	**Slaughtering, meat processing**
5.1	Slaughter-house
5.2	Tripe processing room
5.3	Meat sectioning
5.4	Sausage kitchen
5.5	Boiled sausage unit
5.6	Raw sausage unit
5.7	Sausage drying room
5.8	Smoking establishments
5.9	Salting and curing rooms
5.10	Poultry processing
5.11	Gut store
5.12	Cold cuts and packaging unit
6	**Fish processing, production of delicatessen**
6.1	Fish processing
6.2	Production of delicatessen
6.3	Manufacture of mayonnaise
7	**Processing of vegetables**
7.1	Production of sauerkraut
7.2	Vegetable tinning
7.3	Sterilizing rooms
7.4	Rooms in which vegetables are prepared for processing
8	**Wet areas in food and beverage production** (if not specifically mentioned)
8.1	Storage cellars
8.2	Beverage bottling, fruit juice production
9	**Catering establishments**
9.1	Kitchens in the catering trade (restaurant kitchens, hotel kitchens)
9.1.1	up to 100 meals per day
9.1.2	more than 100 meals per day
9.2	Kitchens catering for homes, schools kindergartens, sanatoria
9.3	Kitchens catering for hospitals, clinics
9.4	Large kitchens catering for industrial and university canteens, and contract catering
9.5	Food preparation kitchens (fast food kitchens, snack bars)

9.6 Kitchens for heating up frozen meals
9.7 Coffee and tea kitchens, hotel garni kitchens and ward kitchens
9.8 Washing-up rooms
9.8.1 Washing-up rooms for 9.1, 9.4, 9.5
9.8.2 Washing-up rooms for 9.2
9.8.3 Washing-up rooms for 9.3
9.9 Dining rooms, guest rooms, canteens including serving counters

10 Cold stores, deep freeze stores
10.1 for unpacked goods
10.2 for packed goods

11 Sales outlets, shops
11.1 Reception of goods, meat
11.2 Reception of goods, fish
11.3 Serving counters for meat and sausage, unpacked
11.4 Serving counters for meat and sausage, packed
11.5 Serving counters for fish
11.6 Meat preparation rooms
11.7 Florists shops
11.8 Sales areas with stationary ovens
11.9 Sales areas with stationary chip pans or grills
11.10 Shops, customer rooms
11.11 Preparation areas for food for self-service shops
11.12 Cash register areas, packing areas
11.13 Serving counters for bread, cakes and pastries, unpacked goods
11.14 Serving counters for cheese and cheese products, unpacked goods
11.15 Serving counters, except for 11.3 to 11.5 and 11.13, 11.14

12 Health service rooms
12.1 Disinfection rooms (wet)
12.2 Pre-cleaning areas of sterilization
12.3 Faeces disposal rooms, discharge rooms, unclean nursing workplaces
12.4 Pathological facilities
12.5 Rooms for medical baths, hydrotherapy, fango preparation
12.6 Washrooms of operating theatres, plastering rooms
12.7 Sanitary rooms, ward bathrooms
12.8 Rooms for medical diagnosis and therapy, massage rooms

12.9 Operating theatres
12.10 Wards with hospital rooms and corridors

12.11 Medical practices, day clinics
12.12 Pharmacies
12.13 Laboratories
12.14 Hairdressing salons

13 Laundry
13.1 Rooms with washing machines for washing of linen and clothes with water
13.2 Ironing rooms

14 Fodder concentrate production
14.1 Dried fodder production
14.2 Fodder concentrate production using fat and water

15 Leather production, textiles
15.1 Wet areas in tanneries
15.2 Rooms with fleshing machines
15.3 Areas where leather scraps accumulate
15.4 Rooms for making leather impermeable by means of grease
15.5 Dye mills for textiles

16 Paint shops
16.1 Wet grinding areas

17 Ceramics industry
17.1 Wet grinding mills (processing of ceramic raw materials)
17.2 Mixers; handling of materials like tar, pitch, graphite and synthetic resins
17.3 Presses (shaping); handling of materials like tar, pitch, graphite and synthetic resins
17.4 Moulding areas
17.5 Glazing areas

18 Glass and stone processing
18.1 Stone cutting, stone grinding
18.2 Glass shaping
18.2.1 Hollow glass ware, container ware, glass for building purposes
18.3 Grinding areas
18.3.1 Hollow glass ware, flat glass
18.4 Insulating glass manufacture; handling ofdrying agents
18.5 Packaging, shipping of flat glass; handling of anti-adhesive agents
18.6 Etching and acid polishing facilities for glass

19 Cast concrete factories
19.1 Concrete washing areas

20 Storage areas
20.1 Storage areas for oils and fats

21 Chemical and thermal treatment of iron and metal
21.1 Pickling plants
21.2 Hardening shops
21.3 Laboratory rooms

22 Metal processing, metal workshops
22.1 Galvanizing shops
22.2 Grey cast iron processing
22.3 Mechanical processing areas (turnery, milling shop, etc.), punching room, pressroom, drawing shop (pipes, wires) and areas exposed to increased stress by oil and lubricants
22.4 Parts cleaning areas, exhaust steam areas

23 Vehicle repair workshops
23.1 Repair and servicing bays
23.2 Working and inspection pits
23.3 Car washing halls

24 Aircraft repair workshops
24.1 Aircraft hangars
24.2 Repair hangars
24.3 Washing halls

25 Sewage treatment plants
25.1 Pump rooms
25.2 Rooms for sludge draining facilities
25.3 Rooms for screening equipment

26 Fire brigade buildings
26.1 Vehicle parking places
26.2 Rooms for hose maintenance equipment

27 Financial institutions
27.1 Counter areas

28 Garages (with the exception of the areas specified under number 0)
28.1 Garages, car-parks

29 Schools and kindergartens
29.1 Entrance areas, corridors, assembly halls
29.2 Class rooms, group rooms
29.3 Stairs
29.4 Toilets, washrooms
29.5 Instructional kitchens in school (also see no. 9)
29.6 Kitchens in kindergartens (also see no. 9)
29.7 Machine rooms for wood processing
29.8 Special rooms for handicrafts

In connected work places with differing slip risks, where employees move from one work place to the other, the floor covering of the higher valuation group should be used for the entire area.

If floor coverings of different slip resistance are used in connected workplaces or areas, only floor coverings of two consecutive valuation groups should be used next to each other, e. g. valuation groups R10 and R11 or R11 and R12 etc.

The floors must be even to avoid stumbling and pools of water. This can be achieved by letting the floors slope gently towards the floor drains. To facilitate cleaning it may be useful to use smooth, non-profiled floor coverings along the walls up to a distance of 15 cm, in corners and under machines which are firmly fixed to the floor.

A rounded edge - carried out by a cove skirting between the walls and floor - is easier to clean than a rectangular edge.

4) SUMMARY

With the correct application of slip-resistant floor tiles in the respective non-slip areas and expert laying, floor coverings can be produced which allow safe walking for all users. Non-slip floor coverings must be cleaned thoroughly and in regular intervals above all in areas accessible to the general public in order to ensure permanent slip resistance.