
Minimum of Knowledge of goods Stone

- 1) Natural stone (granite)
- 2) Engineered stone
- 3) Solid surface
- 4) Ceramics
- 5) Laminate
- 6) Stone surfaces
- 7) Maintenance of stone
- 8) Other important aspects of stone business

1. Natural stone (granite)

1.1. Basic characteristics

Granites are in-depth igneous rocks. Mineralogical components of granite are above all feldspars (orthoclase and plagioclase, quartz, micas (muscovite and/or biotite) and amphibole. Granite contains also small additives of magnetite, garnet, zircon and apatite. It rarely contains also pyroxene and very rarely on iron rich olivine and fayalite. The stone must contain **no less than 20% of quartz**, so that it might be ranked among granites.

1.2. Main physical characteristics

Volume mass	2.67-2.80 g/cm ³
Hardness	5-6 according to Mohs scale (acc. to mica contents)
Flexural strength	10-30 MPa
Abrasiveness	1.7 - 2 mm
Volume absorption	0.2 – 1%
Heat resistance	180 - 250°C
Chemical resistance	very good, highly resistant to acids
Thermal expansion	8*10 ⁻⁶ cm/cm °C (room temperature)
Ecological parameters	quite natural product, thanks to closed surface it does not support bacteria growth

1.3. Advantages and disadvantages by use as surface material

Advantages:

- High heat resistance, low thermal expansion
- High hardness, chemical resistance

Disadvantages:

- Acceptable absorption, it could be increased by impregnation
- Colour heterogeneity
- Visible joints necessary on longer products (longer than 2.5m)
- Cold to the touch

2. Engineered stone

2.1. Basic characteristics

Engineered stone („quartz“) was developed by Italian company Breton in the 60ies of the 20th century. Engineered stone is composed of circa 94% natural materials (crushed quartz and granite); the rest is formed with polyester resin, additives and pigments.

2.2. Main physical characteristics

Volume mass	2.4 g/cm ³
Hardness	6-7 according to Mohs scale
Flexural strength	50-70 MPa
Abrasiveness	approximately 6 mm
Volume absorption	0.02%
Heat resistance	140°C guaranteed, 180°C achieved by kitchen tests
Chemical resistance	product will be damaged by long-lasting impact of KOH (200g/l), H ₂ SO ₄ (70%), KMnO ₄ (10g/l), HF (10%), for kitchen service quite irrelevant
Thermal expansion	21.9-28.5*10 ⁻⁶ cm/cm °C (room temperature)
Ecological parameters	meets 51 NSF/ANSI Standard for contact of the material with foodstuffs, thanks to quite closed surface it does not support bacteria growth at all

2.3. Advantages and disadvantages by use as surface material

Advantages:

- High hardness and almost zero absorption
- Practical 100% colour homogeneity

- Quite acceptable chemical resistance
- Resistance to micro organisms

Disadvantages:

- Average heat resistance
- Higher thermal expansion (for kitchen service quite irrelevant)
- Visible joints necessary on longer products (longer than 3m)

3. Solid surface

3.1. Basic characteristics

Solid surface was introduced on the market by company Dupont under the name Corian® in 1967. It is solid, non-porous, homogeneous surface material composed of circa 70% aluminium trihydrate acquired from bauxite and circa 30% acrylic resin called also polymethylmetacrylate or PMMA. Sometimes it is called also not so precisely „SolidStone®“; (trademarks of products from various manufacturers are e.g. Bitto, Brilliant, **Corian**, Dellmond, Dovae, Formica/Surell, Getaart, Getacore, Gibraltar, Goldstone (Bien), Grand Stone, Grapol, Hanex, Harmony, Hi-Macs, Huaxun, Kanger, Kerrock, Koris, Krion, Kuraray, Laminart, Leada, Lechner, Magicstone, Meganite, Mermaid, Monerte, Montelli, Opal, Ordan, Owell Stone, Plexicor, Pytron, Rehau, Schock/Sheer, Solid Top, Staron, Sunmoon, Topstone, Tristone, etc.).

Polyester resin as binder is here used in significantly smaller scale (Avonite, Polystone).

3.2. Main physical characteristics

Volume mass	1.7 g/cm ³
Hardness	2-3 according to Mohs scale
Flexural strength	57-74 MPa
Abrasiveness	approximately 60 mm ³ /100 rev. acc.to DIN ISO 4586 T6
Volume absorption	0.6%
Heat resistance	100-110°C. A pad for putting away hot objects is necessary.
Chemical resistance	product will be damaged by impact of HNO ₃ , HCl, CH ₂ Cl ₂
Thermal expansion	1 mm/m by temperature change by 30°C (30.5*10 ⁻⁶ K ⁻¹ DIN 51045)

Ecological parameters meets Standard 51 NSF/ANSI for contact of the material with foodstuffs, thanks to quite closed surface it does not support bacteria growth at all. Meets the standard GreenGuard Indoor Air Quality Certificate.

3.3. Advantages and disadvantages by use as surface material

Advantages:

- Invisible joints on longer products (jointless technology)
- 100% colour homogeneity
- Possibility of repairs of the surface
- Possibility of rounded forms, sinks of the same material/colour as worktop (thermoforming)
- Translucent effect on some colours, possibility to insert the LED diodes in the surface
- Resistance to micro organisms
- Warm to the touch

Disadvantages:

- Low hardness and higher absorption
- Sufficient chemical resistance
- Lower heat resistance (damage by cigarette)
- Higher thermal expansion (for common kitchen service quite irrelevant)

4. Ceramics

4.1. Basic characteristics

Large-format ceramics is a 100% natural material sintered under very high temperature. Composition: clay, quartz, feldspar + ev. other additives. Commercial names are e.g. Dekton, Laminam, Lapitec, Neolith, Techlam, XLight. Available on the market since 2006. In the commercial terminology are the porcelain and ceramics flooring considered as being the same but the porcelain flooring is of higher quality, of higher density and the main difference against the ceramics is its lower absorption. Large-format ceramics is therefore as a matter of fact „porcelain“.

4.2. Main physical characteristics

Volume mass	2.5 g/cm ³
Hardness	7-8 according to Mohs scale
Flexural strength	50 MPa ISO 10545-4
Abrasiveness	90-175 mm ³ according to EN ISO 10545-6,7
Volume absorption	0.3% ISO 10545-3
Heat resistance	500-800°C according to type
Chemical resistance	excellent, it drops a little by the polished surface, it does not resist HF acid only
Thermal expansion	7*10 ⁻⁶ cm/cm °C ISO 10545-8
Ecological parameters	meets 51 NSF/ANSI Standard for contact of the material with the foodstuffs, thanks to quite closed surface it does not support bacteria growth at all. Meets the standard GreenGuard Indoor Air Quality Certificate.

4.3. Advantages and disadvantages by use as surface material

Advantages:

- Excellent utility parameters especially hardness and heat resistance
- 100% natural material

Disadvantages:

- Visible joints on longer products (longer than 3.2m)
- Impossibility of rounded edges and forms
- Insignificantly higher absorption than by engineered stone

5. Laminate

5.1. Basic characteristics

Under the term **Laminate** there is the entire line of chipboard materials of different types and composition. Basically it is wood-fibre board with usual width of 28-38mm with pressed-on, multi-layer, usually 0.7mm thick high-pressure laminate (decoration paper and more layers of anti-pull papers interspersed with resin, pressed under high pressure). The front laminate edge is usually rounded – „postforming“. Laminate types are named with English abbreviations as MDF (Medium Density Fibre), HPL (High Pressure Laminate) etc. The trademarks are mainly names of the manufacturers: Kronospan, Egger and other.

5.2. Main physical characteristics

Volume mass	0.6 g/cm ³
Hardness	it is not evaluated according to Mohs scale, it is not possible to cut with a knife on its surface
Flexural strength	16-22 MPa
Abrasiveness	tested according to EN 438-2, the material needs careful use
Volume absorption	high, so called "swelling" within 24 hours is tested according to EN 317 (circa 12%)
Heat resistance	80°C
Chemical resistance	low, it is tested according to EN 438, there is general instruction that the aggressive substance has to be removed from the surface within 10 minutes
Thermal expansion	it is not tested for
Ecological parameters	it meets the standards for contact with foodstuffs, it is tested if the material does not release formaldehyde

5.3. Advantages and disadvantages by use as surface material

Advantages

- Low price
- Easy reparability

Disadvantages:

- Visible joints on longer products
- Damages of the material in case of water leakage round the sink and on other similar places
- Low mechanical resistance (damaged with a knife)
- Low heat resistance (damaged with a cigarette)

6. Surfaces of stone

6.1. Gloss (polished surface)

High gloss is achieved by use of honing diamonds; they are changed one by one from the roughest to the smoothest one during the polishing. The whole production procedure has usually seven partial steps of honing and polishing. The glossy/polished surface is the mostly used one. The original colour of the stone is expressed and lowest absorption is achieved there. Use: interior flooring, wall

tiles, facades, cemetery architecture, kitchen worktops, vanity units, wash basins, window sills, staircase treads and risers.

6.2. Matt, honed

It is used by 1-2 honing steps less than by glossy surface according to matt grade required. It does not reflect light so much as gloss. Use: interior flooring, wall tiles, facades, staircase treads and risers.

6.3. So called leather surfaces

The surface is softly waved by used tools (diamond brushes), so that the stone is warmer to the touch evoking the leather. Commercial denominations: Leather-Touch, Silk, Antique, Matt, Egg, Touch-Me, Suede, Volcano etc. In the same time the surface is already a little opened, which will increase slightly its absorption. Also the stone colourfulness is suppressed, which could be solved by colour enhancers. Use: kitchen worktops.

6.4. Other less frequently used surfaces

ANTI-K (flamed+brushed)

- It is combination of two surface treatments. At first the slab is flamed and then it is brushed with diamond brushes. The surface is plastic but in contrary to flamed surface treatment it remains soft and pleasant to the touch. It is very popular surface treatment now and especially for production of kitchen worktops.

BRUSHED

- The stone surface is softened with diamond brushes. Use: wall claddings, flooring.

PINE-APPLED

- It is rather a cleaning method. It is mostly used by sandstones. The stone is treated with needle shaker. Use: cleaning of the surface of natural stone.

FLAMED

- The stone surface is treated with a flame. As by sand blasted surface it is rough to the touch but impresses more plastic as the flame leaves on the surface small scales. The surface treatment shows good anti-slip characteristics. Use: exterior flooring, staircase treads and risers, wall cladding, facades.

BUSH-HAMMERED

- It is a very rough surface treatment. The surface is banged with a special stone hammer and a surface with regular perforation will arise. Use: exterior flooring, wall cladding.

SLATE

- Wavy surface of engineered stone. Use: kitchen worktops, tiles.

POINTED (bossed)

- It is a rough surface treatment caused with hits of a pickaxe with sharp steel point. Use: wall cladding.

SPLITTED (cleft)

- Cleft surface treatment is done on cleft machine. The stone is here divided by a fierce hit on the machine and an irregular surface is arisen in this way, it has a plastic and “careless” look. Use: road cubes, mosaics, exterior and interior flooring, wall cladding, facades.

IMPACT FINISHING

- Impact surface is achieved by mechanical or manual treatment of the stone with a tool having several points. This method creates rugged surface with abrasions and hollows while the stone colour becomes lighter. The surface shows good anti-slip characteristics. Use: tiles.

SAND BLASTED

- The stone is sanded under atmospheric pressure in sanding machine by means of abrasive particles. The surface is then rough to the touch and shows good anti-slip characteristics. Use: exterior flooring, wall cladding, facades.

7. Stone maintenance in interior (kitchen worktops, mainly agents of company Bellinzoni as example)

This is a *very extensive issue*, where the maintenance of kitchen worktops is different from floor tiles, staircases, wall tiles and other inventory; maintenance of polished surface is different from other surfaces. On the market there is also a lot of agents of many specialized companies; the engineered stone manufacturers offer their own agents etc. It is always necessary to follow the instructions on use of the agents and to test the agent on smaller area first. Therefore this text is limited on kitchen worktops only, on polished surfaces only and on agents of Italian company Bellinzoni as example!

7.1. Maintenance of granite

Daily maintenance

On a normally polluted worktop, a standard, on the market available, detergent type Real is sufficient. For higher pollution use then the agents Natural Stone Kit (wash, protection, polishing) or Spray RR/1 (foam polisher).

In-depth cleaning

If the worktop is heavily loaded with occurrence of oil, grease and coffee stains, it is necessary to apply agent Mangia Macchia after a certain time.

Impregnation

Once per year it is recommended to use agent Block D70 (suitable for polished areas).

7.2. Maintenance of engineered stone

Daily maintenance

On a normally polluted worktop, the detergent of type Real, available on the market, is sufficient. For higher pollution, use the cleaner and polisher L & L.

In-depth cleaning

If the worktop is heavily loaded with occurrence of oil, grease and coffee stains, it is necessary to apply agent LEM3 after a certain time.

Attention: engineered stone may be irrecoverably damaged above all by strong, not diluted agents on alkalic or acid basis!

7.3. Maintenance of solid surface

For several months after worktop installation, use a soft abrasive agent or soft cream cleaner (Ajax, CIF) once or twice per month.

Daily maintenance

It is sufficient to use a soap and water or common cleaners on ammonia basis. Smaller scrapes and scratches can be slightly honed with a Scotchbrite pad so that the treated place gets the same shade as the whole surface.

8. Other important aspects of dealing with stone

8.1. Difficulties with estimation of the price without knowledge of the order details

- In spite of the fact that some fabricators place calculators on their web sites, they declare them always as not binding.
- The proper value of material makes usually only a half of the total price, the price is substantially influenced by counting the whole raw slabs area in consumption.
- Substantial part of the price makes also costs of edge, cut-out and grooves treatment, bonding, assembly costs, transport and taking the measurements.
- It is therefore necessary to resist the temptation of quick calculation by estimation.

8.2. Overestimation of indestructibility of stone during its usage, guarantees

- Stone is not an indestructible material, it can crack by mechanical and heat load, loose its colour or gloss. It is necessary to realize these facts during negotiation with the customer and to inform him fairly about potential risks.
- The suppliers of raw stone slabs and also the fabricators grant usually longer guarantee than 2 years required by law but always it is so called limited guarantee. It is always necessary to get acquainted thoroughly with conditions limiting the guarantee. Mostly it is keeping the detailed instructions on maintenance of stone.
- Sometimes the client is obliged to register its kitchen worktop by the manufacturer or fabricator.

8.3. Esthetical defects on the stone surface

- Stone as a natural material is not entirely homogeneous in its colour and structure.
- This fact is extreme with granite where every slab is an original and where even each part of the slab is not the same. Professional fabricators invite the customer to the slabs warehouse so that the customer can select concrete raw slab from which the stone finished product will be fabricated.
- In case of engineered stone each its manufacturer sets tolerances on size and number of colour stains on the slab. It is necessary to be aware of this fact that also here some esthetical defects on the slab may occur that are within the tolerance and that were not obvious from the sample handed over.
- Solid surface is the most homogeneous surface from the esthetical point of view.

8.4. Other aspects

The fabricator has to reflect during production of stone products the fact that there are colour differences among individual production lots of raw slabs used, sometimes even within the same lot. It is extremely important to reflect this by installation of flooring.

During elaboration of this report, the company documents of companies Cosentino, Technistone, Kámen Durych, Dupont, Kronospan, Egger, Laminam and Neolith were made use of.