Swimming Pool Water Conditions and the Selection of Tile Grouts

INTRODUCTION

Tile grouts conforming to BS EN 13888 should be specified and selected for their suitability to meet the demands of the pool water supply and those chemicals selected for the treatment of the pool water. This is to ensure durability and long-term performance in service

The main factors which influence tile adhesive and grout selection in swimming pools include:

- Tile type
- Mains water supply (Hard or soft).
- Pool chemicals & water balance.
- Chemicals used for cleaning & maintenance.
- Pool design e.g. wave making equipment.

MAIN WATER SUPPLY

The chemistry of pool water is quite complex and is largely dependent upon whether the water supplied into the swimming pool is hard or soft water or is variable, dependant upon where the water is supplied from.

Hard water contains a high mineral content as it filters through limestone or chalk deposits.

In the UK, soft water has a total hardness (calcium and magnesium hardness) of <100 mg/l

Soft water is deficient in calcium or magnesium ions. It is, therefore, naturally aggressive towards cementitious based materials and can leach calcium ions from cement. In cementitious grouts, this weaken the structure of the cement resulting in a softening or erosion of the grout from between the tile joints.

POOL WATER CONDITIONS

In order to facilitate long term performance of the tiling installation, the pool water should be maintained in a balanced condition.

As a general guide, a calcium hardness of at least 250 mg/l expressed as $CaCO_3$ or a total alkalinity of at least 80 mg/l expressed as $CaCO_3$, is required where pool water is in contact with cementitious based grouts.

The use of sulfate based chemicals such as alum, sodium hydrogen sulfate or sodium bisulfate (dry acid) should be avoided if possible. This is to reduce the risk of sulfate attack on cementitious based grouts, tile adhesives, screeds, rendering and concrete.
BS 5385: Part 4 2015 advises in clause ***7.3.2.9 Pool water conditions;***

"NOTE The durability of the grouting depends on the nature of the pool water supply and the chemicals used in the treatment of the water and the cleaning of the tiling.
Cementitious grouts should only be used where the pool water has adequate calcium hardness and alkalinity so that balanced water conditions can be consistently maintained at the recommended pH level".

LANGELIER SATURATION INDEX

The Langelier Saturation Index (LSI) is a calculation to designed to assess the water balance. It indicative only but will provide an overview of the water conditions at the time of testing and includes pH, calcium hardness, total alkalinity, temperature and total dissolved solids (TDS).

The calculation requires the following values determined from testing of the pool water;

LSI = pH+ CF + AF + TF – TDS (Typically -12.1)

- pH is the actual value
- CF is the Calcium Hardness factor (Range = 0.3 – 2.5)
- AF is the Total Alkalinity Factor (Range = 0.7 – 2.9
- TF is the Temperature in °C e.g. 28°C = 0.7
- TDS -12.1 to -12.3 (1000mg/l to 3000mg/l)

LANGELIER INDEX TABLE

Temperature °C	TF	Calcium Hardness mg/l $CaCO_3$	CF	Total Alkalinity mg/l $CaCO_3$	AF	Total Dissolved Solids TDS	
19	0.5	75	1.5	50	1.7	1000 mg/l	-12.1
24	0.6	100	1.6	100	2.0	2000 mg/l	-12.2
29	0.7	150	1.8	125	2.1	3000 mg/l	-12.3
34	0.8	200	1.9	150	2.2		
39	0.9	250	2.0	200	2.3		
		300	2.1	300	2.6		
		400	2.3				

CALCULATION

e.g. Pool A has a pH of 6.9, a calcium hardness of 300mg/l, Total Alkalinity of 100 mg/l, a water temperature of 24°C and a TDS of 1000mg/l.

Example calculation**:** LSI = 6.9 + 2.1 + 2.0 +0.6 -12.1. ***LSI = -0.5 e.g. the pool water is currently in a corrosive condition***

LSI = 0.0 to + 0.5 Ideal (slightly scale forming)

A negative value indicates corrosive water conditions which, if not addressed, could have a cumulative effect on metal components within the pool, cause cementitious based grout loss etc. A positive value indicates the water tends to form scale. Consistently high values can result in precipitation of salts which can block pipework and equipment with calcium deposits.

GROUT SELECTION

As defined in BS EN 13888, there are three basic types of tile grouts;

CG1 = Normal cementitious based grout

CG2 = Improved cementitious based grout

RG = Reaction grout

Additional Characteristics W= Reduced water absorption A = Higher abrasion resistance
BAL recommends the following grouts;

Type of Water/Pool Type	BAL Grout	Comments
Hard water area	BAL Superflex Wide Joint Grout –(CG2 WA) for 3-12mm joints BAL Superflex Grout – (CG2 WA) For 1-4mm joints or BAL Easypoxy AG	Pool water should be maintained in a balanced condition, and; >250mg/l Calcium hardness >80mg/l Total alkalinity
Soft Water Area	BAL Easypoxy AG – (RG) 2-12mm joints	Soft water more difficult to maintain in a balanced condition long-term.
Transient aggressive water conditions	BAL Easypoxy AG – (RG) 2-12mm joints	Mosaics should be fixed and grouted with BAL Easypoxy AG.
Pool with wave machines/ Rapids/Beaches etc	BAL Easypoxy AG – (RG) 2-12mm joints	High abrasion resistance required for grout when in contact with fast moving/circulating water.

For cleaning and maintenance of pools, acidic-based cleaners should be avoided with cementitious based grouts. If frequent use of a diluted proprietary acidic based cleaners is deemed to be necessary, the grout between the tiles should be an epoxy grout e.g. BAL Easypoxy AG or BAL Floor Epoxy

TECHNICAL ADVISORY SERVICE

For free expert guidance on the use of BAL products, or any aspect of ceramic tiling with BAL products, contact the BAL TECHNICAL ADVISORY SERVICE on 01782 591120.

THE BAL 25 YEAR GUARANTEE

BAL products are supplied with a 25-year product guarantee. For further details and/or copies please contact the Company's marketing department.

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