

## EmiratesGBC Technical Workshop

# Sustainable Weather Seal Solutions for Construction

Understand the sealant types, weather seal sealant standard & testing methods

### Facilitator

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# Agenda

- **History/Evolution**
- **Technical Properties & Sealant types**
- **Testing Standards**
- **Conclusion/Points to Remember**

# History and Evolution of Silicone Sealants



Ancient times: mud and clay

17th cent.: putty

1960s: Poly-Butyl, Poly-Urethane

1970s: Silicones

1990s: MS / STPE

to be continued.....

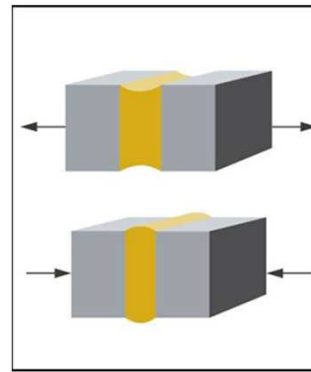
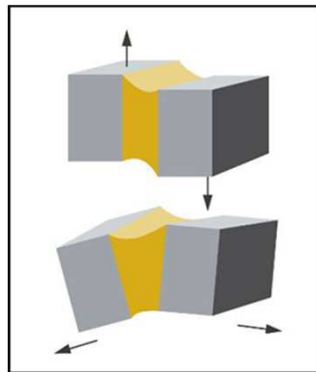


# What is the Basic use of a Sealant

- To fill gaps or holes?
  - Require optimum gap-filling functions only
- To seal two substrates together?
  - Require optimized adhesive properties
- To form protection barrier?
  - Good adhesion properties, flexible, No product degradation

# Every Modern Building needs a Sealant

- Prevent damage of structures and contents due to water
  - Water must not come in from outside
  - Water must be kept in suitable areas inside the building
- Buildings always move due to thermal expansion, contraction and seismic loads



# Other Reasons for having Sealants or Other Applications



- To conserve energy : Minimize unwanted airflow
- To improve aesthetic appearance and cleanability of interior surfaces
- To act as sound barrier: reduce sound transmission through cracks in interior and internal composite assemblies
  
- Special Applications & as Adhesives
  - Mirror Mounting
  - Aquariums
  - Fire Stopping
  - Food Contact

# Various Sealant Types used for Different Applications

**Pros**

Acrylic	Butyl	Urethane	Polysulfide	STPE / MS	Silicone
<ul style="list-style-type: none"> <li>• Easy to apply</li> <li>• Easy to clean</li> <li>• Low cost</li> <li>• Paintable</li> <li>• No harmful emission</li> </ul>	<ul style="list-style-type: none"> <li>• Very low gas / vapor permeability</li> <li>• Chemical resistance</li> <li>• Elastic properties</li> <li>• Low cost</li> </ul>	<ul style="list-style-type: none"> <li>• "Organophilic"</li> <li>• Hydrophilic</li> <li>• Paintable</li> <li>• Mechanical properties</li> <li>• Abrasion resistant</li> </ul>	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Solvent/fuel-resistant (low swelling)</li> <li>• Chemical resistance</li> <li>• Low gas permeability</li> </ul>	<ul style="list-style-type: none"> <li>• "Organophilic"</li> <li>• Hydrophilic</li> <li>• Paintable</li> <li>• Wet applicable</li> <li>• Adhesion range</li> </ul>	<ul style="list-style-type: none"> <li>• Durability</li> <li>• Weatherability</li> <li>• UV-stability</li> <li>• Heat-resistance</li> <li>• Flexible @ low temp.</li> <li>• High vapor permeability</li> </ul>

**Cons**

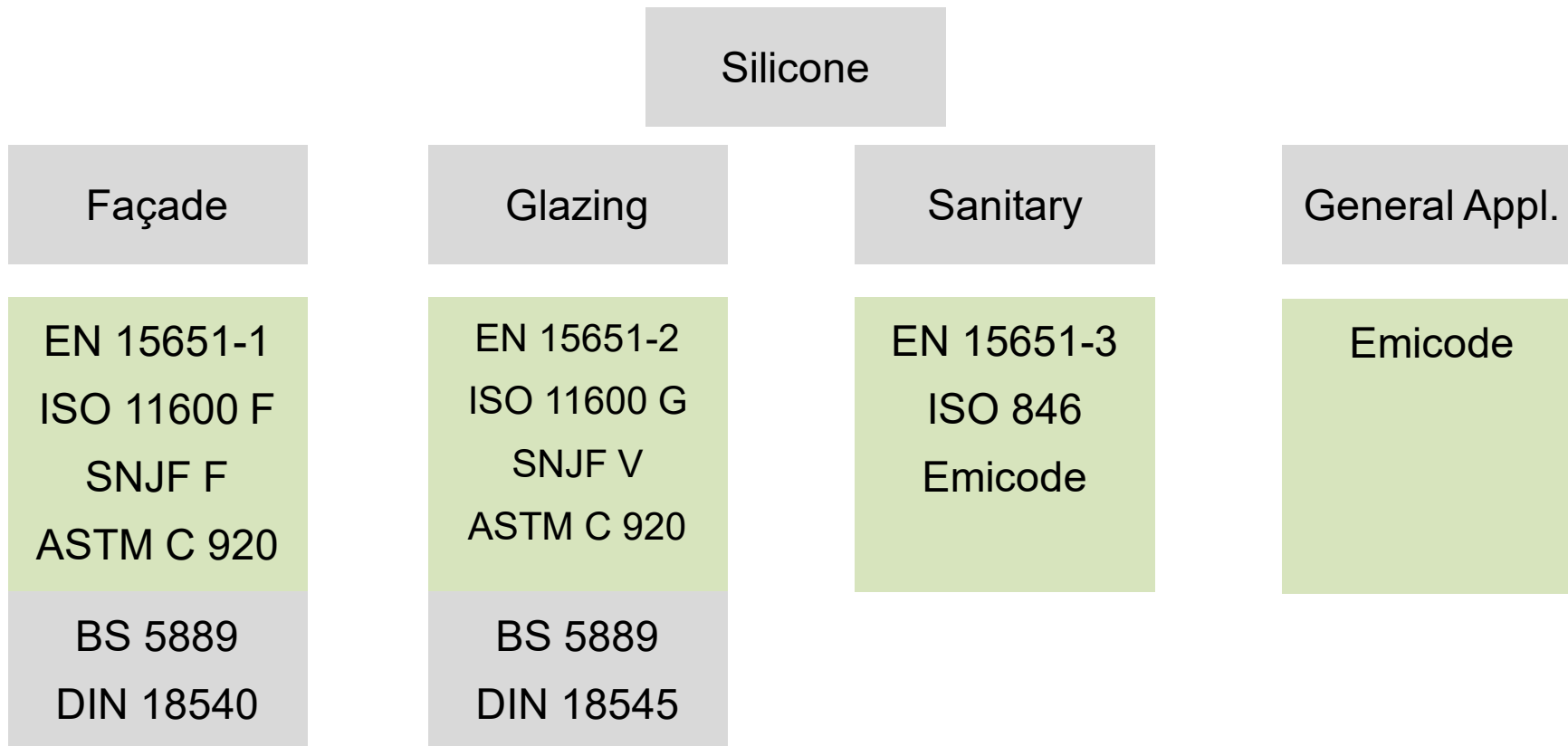
<ul style="list-style-type: none"> <li>• Dirt pick-up</li> <li>• Limited thermal &amp; hydrolytic stability</li> <li>• Plastic deformation behavior</li> <li>• Shrinkage &gt;20%</li> </ul>	<ul style="list-style-type: none"> <li>• Low movement capability</li> <li>• Limited durability</li> <li>• Black coloured</li> </ul>	<ul style="list-style-type: none"> <li>• High modulus</li> <li>• UV stability</li> <li>• Limited adhesion to metals</li> <li>• Only dry applicable</li> <li>• Health hazard</li> <li>• Cost</li> </ul>	<ul style="list-style-type: none"> <li>• Bad odor</li> <li>• Mostly 2-part</li> </ul>	<ul style="list-style-type: none"> <li>• Cost</li> <li>• UV stability</li> </ul>	<ul style="list-style-type: none"> <li>• Not solvent resistant</li> <li>• Swelling</li> <li>• Not paintable</li> </ul>
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**Appl.**

<ul style="list-style-type: none"> <li>• Gap filler</li> </ul>	<ul style="list-style-type: none"> <li>• IG (primary seal)</li> <li>• Automotive</li> <li>• Low cost housing</li> </ul>	<ul style="list-style-type: none"> <li>• Weatherseal</li> <li>• Glazing</li> <li>• Automotive</li> <li>• Construction</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel-resistant appl. (e.g. ground joint at filling stations)</li> <li>• IG (sec. seal)</li> <li>• Aircraft sealant (heat resistance!)</li> <li>• Road appl.</li> </ul>	<ul style="list-style-type: none"> <li>• Weatherseal</li> <li>• Glazing</li> <li>• Automotive</li> <li>• Construction</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• Weatherseal</li> <li>• IG (sec. seal), SG</li> <li>• Construction joints</li> <li>• Glazing</li> <li>• Sanitary area</li> </ul>
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# Silicone Sealants are Classified as per their Applications



# Standards are followed for Weathersealing

ISO 11600  
EN 15651 -1, -2, -4  
ASTM C920  
DIN 18540 / 18545  
BS 5889

EN 13501-1, -2  
DIN 4102-1  
ASTM E814  
BS 476-20

## Requirements on sealants

- Broad adhesion profile
- High flexibility
- Fire resistance
- No harmful emissions
- High stability against aging (UV)

# Mechanics - Classification Standards

## ASTM C920

Class (100/50, 50/50, 35, 25, 12½)

The classifying test is done in accordance to

## ASTM C 719 (Hockman cycle)

Repeating elongation/compression (10 times) after conditioning



## EN 15651 / ISO 11600

Class (25, 20, 12½)

ISO 7389 (100% elong. for class 25)

ISO 8339 (100% elong. for class 25)

ISO 8340

ISO 10590 (100% elong. for class 25)

ISO 11431 (100% elong. for class 25)

ISO 9047 (25% cycling)

# Mechanics - Classification Standards



## • Classification

Class (ISO 8339 / ISO 7389):

exten. recovery

12,5 25% >70%

20 60% >70%

25 100% >70%

Modulus (maximum extension)

LM <0,4 N/mm<sup>2</sup>< HM

# Mechanical Requirements and Properties

## Requirements on silicone sealants

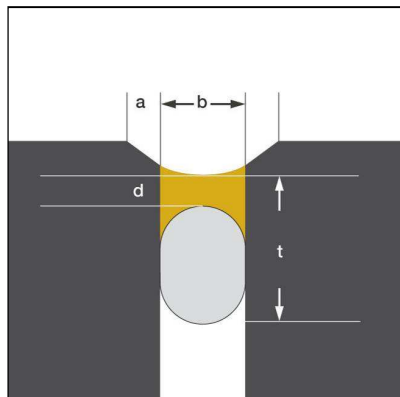
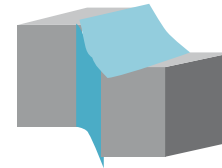
### Elongation



### Compression



### Shear



b Joint width

d Joint depth

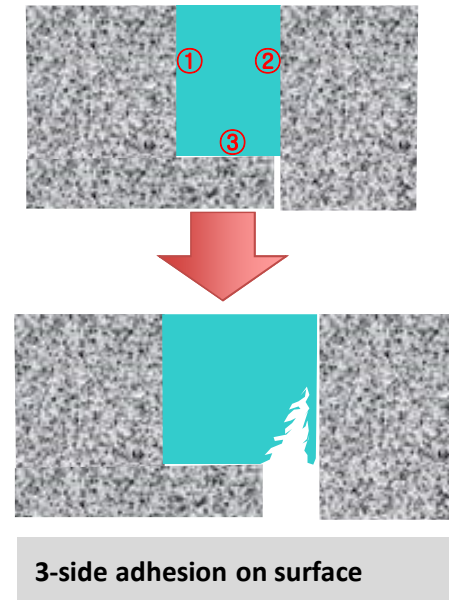
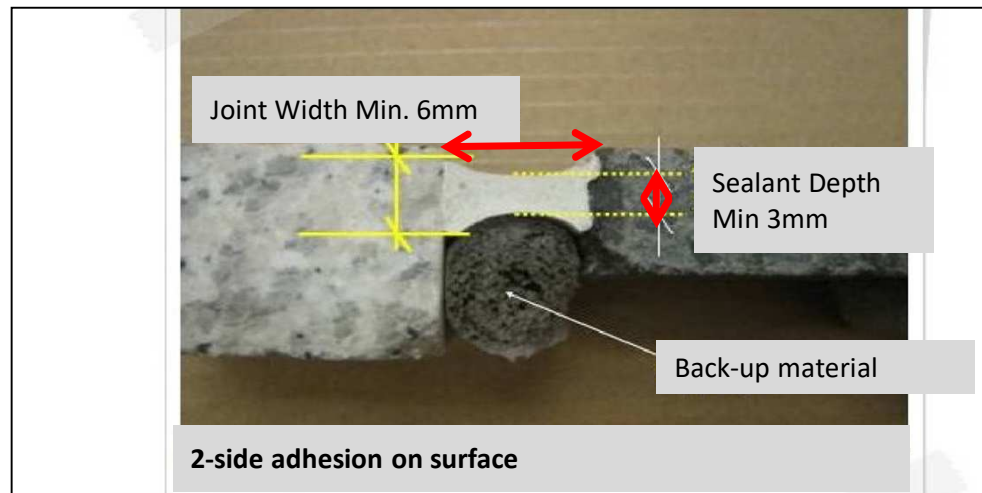
t Depth of the joint system

Backing material

⇒ ratio of width : depth ca. 2 : 1

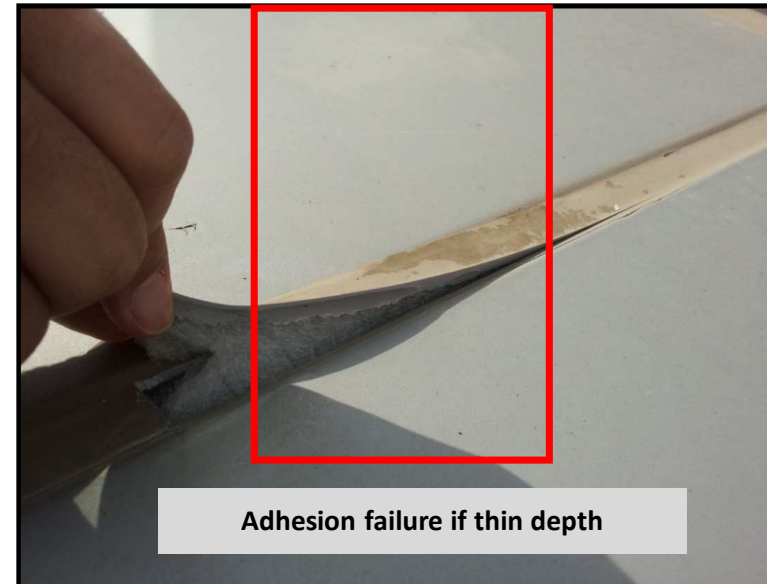
# Complaint: Sealant has cracked

Back-up material should be used to prevent 3-side adhesion on surface



# Complaint: Sealant is peeling off or having a slump

Back-up material should be used to prevent 3-side adhesion on surface



# Sealant Failure: Natural Stone & Tiles have stained



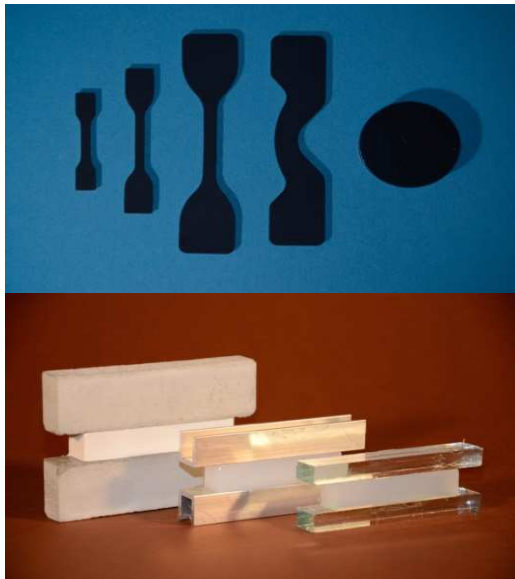
Staining of a non-porous substrate



Staining of natural stone



# Asking the right questions is very crucial!!



	2 mm dumbbell (DIN 53504)	H-Specimen (ISO 8339)
Modulus 100%	0,31	0,37
Tensile Strength	1,98	0,77
Elongation at Break	693	327

- Compare the values taken from the same measuring methods!
- Different test method will give different test results
- Right sealant for the right application!

Thank you for your attention!

