

TECHNICAL DATA SHEET

SEALANT JOINT DESIGN GUIDE

CONFIGURING JOINTS IN CONCRETE STRUCTURES FOR OPTIMUM SEALANT PERFORMANCE

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General Details

Movement of joints in concrete structures is caused by:

- Changes in temperature (Opening and closing)
- Concrete Shrinkage (Opening)
- Concrete Creep (Closing)

The factors that cause joints to open are the most significant when optimising joint design for sealants.

Because joints move, sealants must be elastic and flexible to avoid splitting, tearing and loss of adhesion.

A sealant's flexibility is defined by its strain capacity, expressed as a percentage change in nominal joint width.

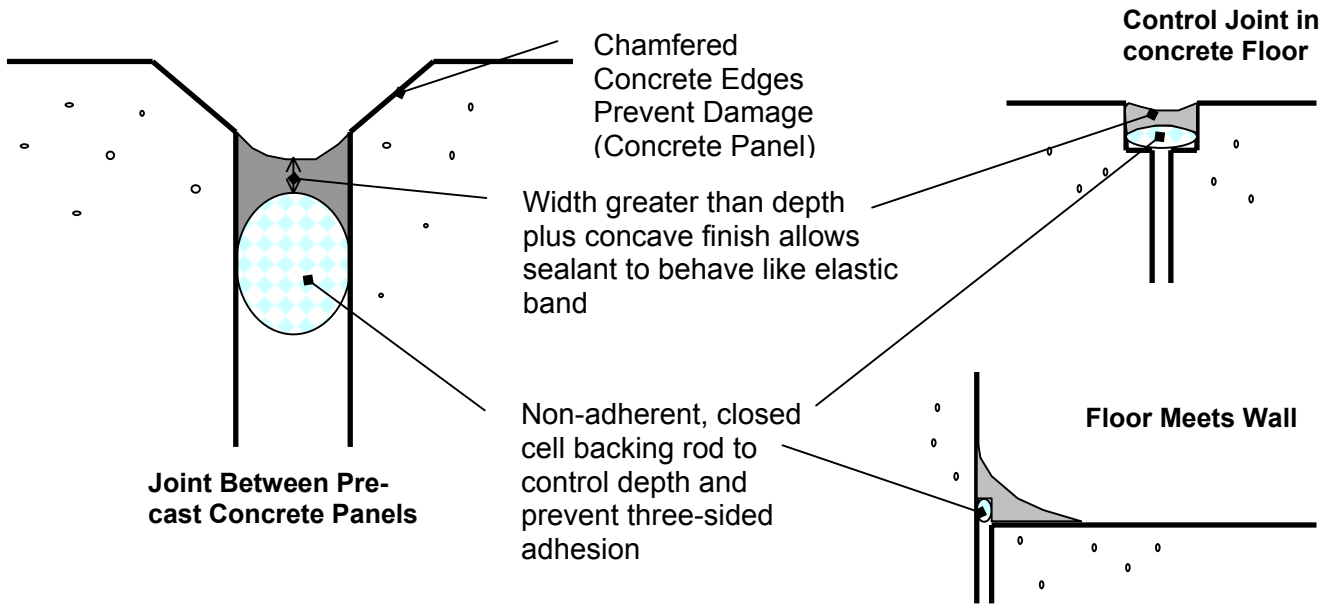
Joint Configuration

The shape of the sealant within a joint influences its ability to stretch with movement.

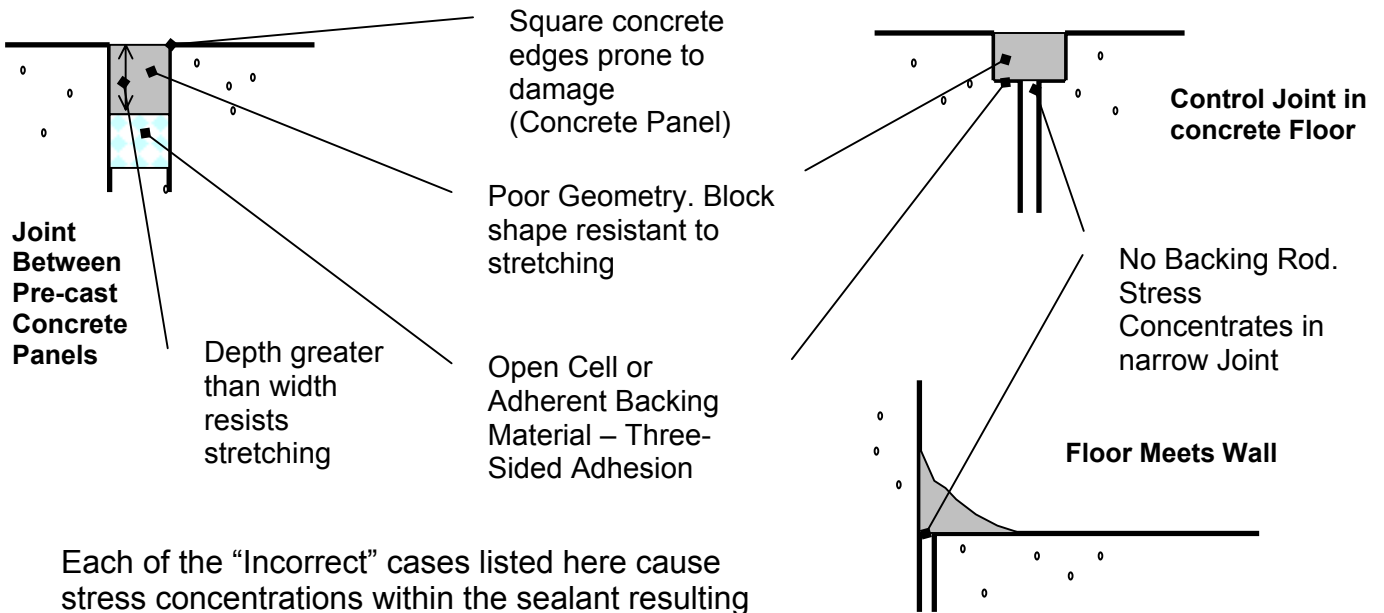
Correct Width to Depth Ratio

Joint Width	Joint Depth
6 mm to 10 mm	Equal to Joint Width
10 mm to 20 mm	10 mm
20 mm to 50 mm	Equal to ½ x Joint Width

Correct Joint Configuration



Incorrect Joint Configurations



Each of the “Incorrect” cases listed here cause stress concentrations within the sealant resulting in splitting or tearing, or at interfaces resulting loss of adhesion.

Joint Design

Following is a simple, conservative method for calculating minimum joint width. For more accurate and rigorous treatment, consult the references listed on the last page of this document.

- Calculation of Joint Width

$$\text{Minimum Joint Width, } b_{\min} = 100 / \text{Sealant Strain Capacity} \times \Sigma\Delta L \dots (1)$$

$\Sigma\Delta L$ = Anticipated joint movement

$$\Sigma\Delta L = \Delta L_t + \Delta L_{cs} \dots (2)$$

ΔL_t = Change in Joint Width due to Temperature Change (mm)

ΔL_{cs} = Change in Joint Width due to Concrete Shrinkage (mm)

- Changes in Temperature

$$\Delta L_t = L \times \alpha_{c,temp} \times \Delta T \dots (3)$$

L = Joint Spacing (mm)

$\alpha_{c,temp}$ = Coefficient of Concrete Thermal Expansion (mm/mm°C)

ΔT = Change in Temperature (°C)

- Concrete Shrinkage

$$\Delta L_{cs} = L \times \epsilon_{cs} \dots (4)$$

L = Joint Spacing (mm)

ϵ_{cs} = Concrete Shrinkage Strain = 850×10^{-6} mm (Conservative. Refer AS3600 Clause 6.1.7 for accurate values)

In this simple method, effects that cause joints to close are ignored, as they do not impart tensile strain on the sealant. For example concrete creep and temperature increase cause joints to close resulting in compression of the sealant.

Worked Example:

Concrete Panel Width = L = 4 m, Thickness = 150 mm, Installation Temperature = 30°C, Minimum Temperature = 5°C.

Sealant = Ramset HiSeal, Strain Capacity = ± 25%, $\alpha_{c,temp} = 12 \times 10^{-6}$ mm/mm°C, $\epsilon_{cs} = 850 \times 10^{-6}$ mm

$$\Delta L_t = 4 \times 1000 \times 12 \times 10^{-6} \times (30 - 5^\circ\text{C}) = 1.2 \text{ mm}$$

$$\Delta L_{cs} = 4 \times 1000 \times 850 \times 10^{-6} = 3.4 \text{ mm}$$

$$b_{min} = 100 / 25 \times (1.2 + 3.4) = 18.4 \text{ mm}$$

Strain Capacities of Ramset Sealants

Sealant	Description	Strain Capacity
HiSeal	1-Part Polyurethane Construction Sealant	± 25%
HiSeal TG	2-Part Polyurethane Traffic Grade Sealant	± 25%
Roof Seal	1-Part Neutral Cure Silicone Roofing Sealant	± 25%
Joint Seal	1-Part Neutral Cure Silicone Construction Sealant	± 25%
Glass Seal	1-Part Acetic Cure Silicone Glazing Sealant	± 25%
Water Seal	1-Part Acetic Cure Silicone Mould Resistant Sealant	± 25%
Blazebrake 201	1-Part Fire and Acoustic Rated Acrylic Sealant	± 20%
Dynaseal	1-Part Urethane-Acrylic Construction Sealant	± 20%
Gap Seal	1-Part Acrylic Painters Sealant	± 6%

References

AS3600 – 2001, *Concrete Structures Standards Australia*

Precast Concrete Handbook National Precast Concrete Association Australia 2002

Warner et al 1998 *Concrete Structures*, Addison Wesley Longman Australia

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