

Concrete Shrinkage and Joint Sealing

Presented by: Colin Dumais B. Sc., NABCEP, C-NRPP

Director Technical and Building Science, Radon West Ltd.
Director, Canadian National Radon Training Centre



You Saw What
in the Field?

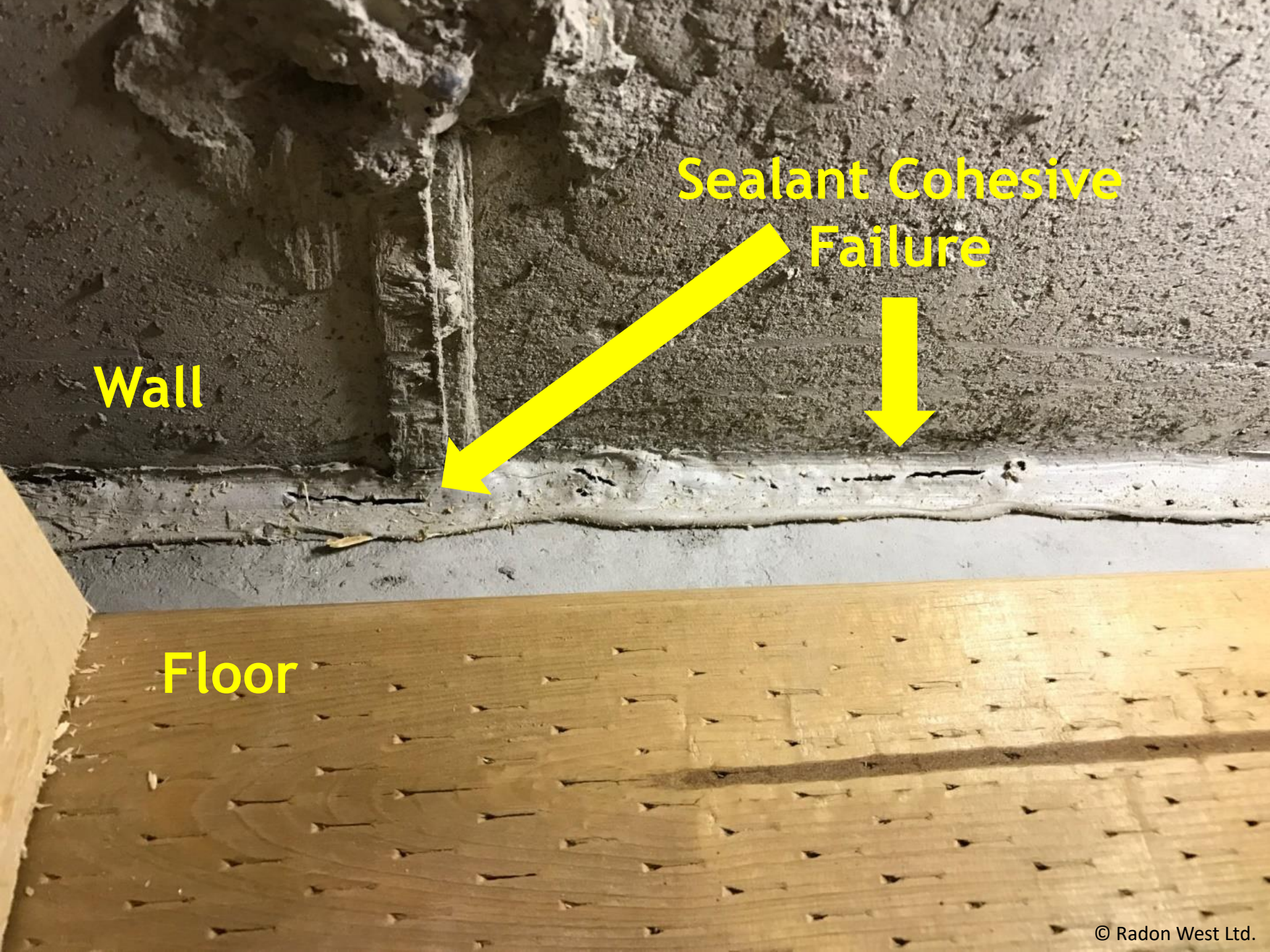


Failure Pics

Floor

Sealant Adhesive
Failure





Sealant Cohesive
Failure

Wall

Floor

Wall

Sealant Cohesive
Failure



Floor

Sealant Adhesive Failure

Wall



Floor

Perimeter
Shrinkage Crack
approx 1/8"



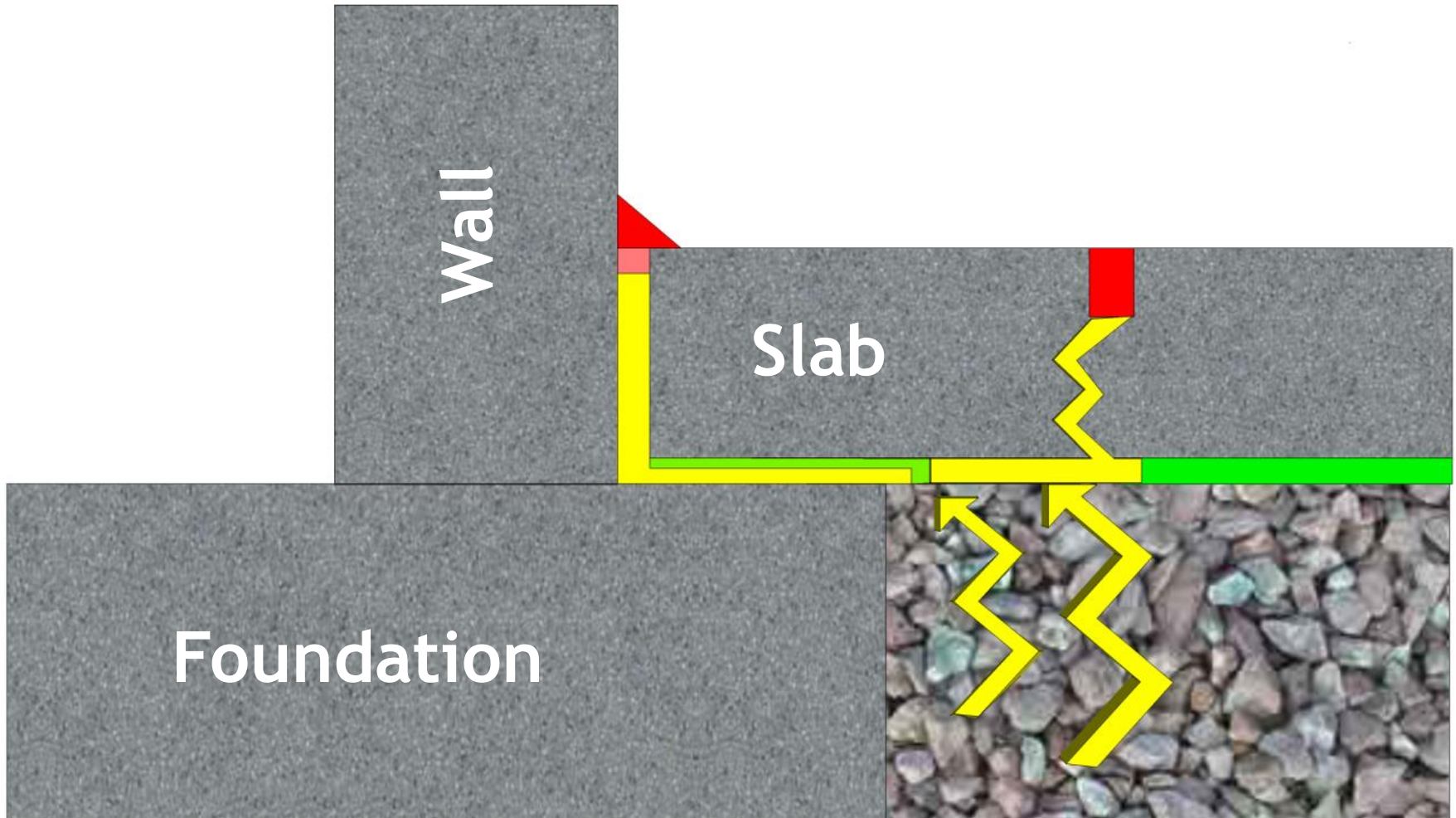
Wall

Floor

Failure of substrate



Understanding Concrete Shrinkage is Important



Where to Find Joints in Concrete

- Isolation Joints
- Control Joints
- Cold Joints



Wall

Floor

Cold Joint





Control Joints

Cut in on purpose to control random cracking

Concrete Movement

- Drying shrinkage - average 0.0006 times length
- Thermal expansion/contraction

Identify if a Joint is a Moving Joint

Age of Joint



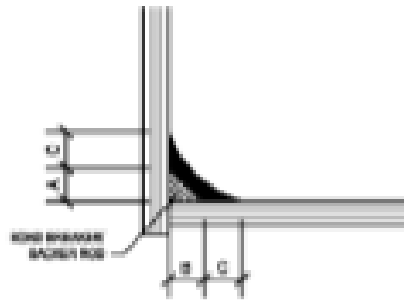
Thermal Expansion and Contraction



Design Joint to Accept Anticipated Movement

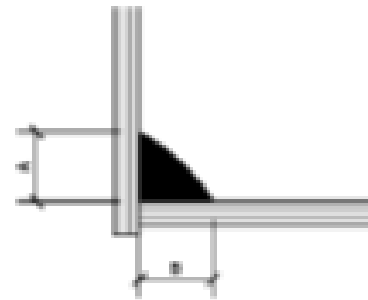
Moving Corner Joints

Good Joint Design



© Radon West Ltd.

Poor Joint Design



Good Joint Design – Key Points:

1. Dimension A and B must be at least 1/4" (6 mm).
2. A bond breaker tape or backer rod must be present if joint movement is anticipated.

**No bond breaker material therefore the joint
WILL NOT accept movement**

3. No bond breaker material; therefore, the joint will not accept movement.

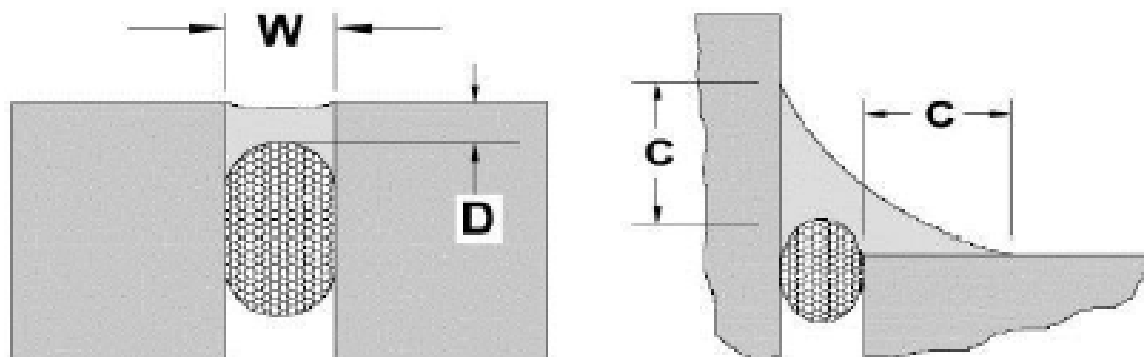
Source: Dow Corning Americas Technical Manual

Dymonic® 100

High-Performance, High Movement, Single-Component, Polyurethane Sealant

Sealant Dimensions

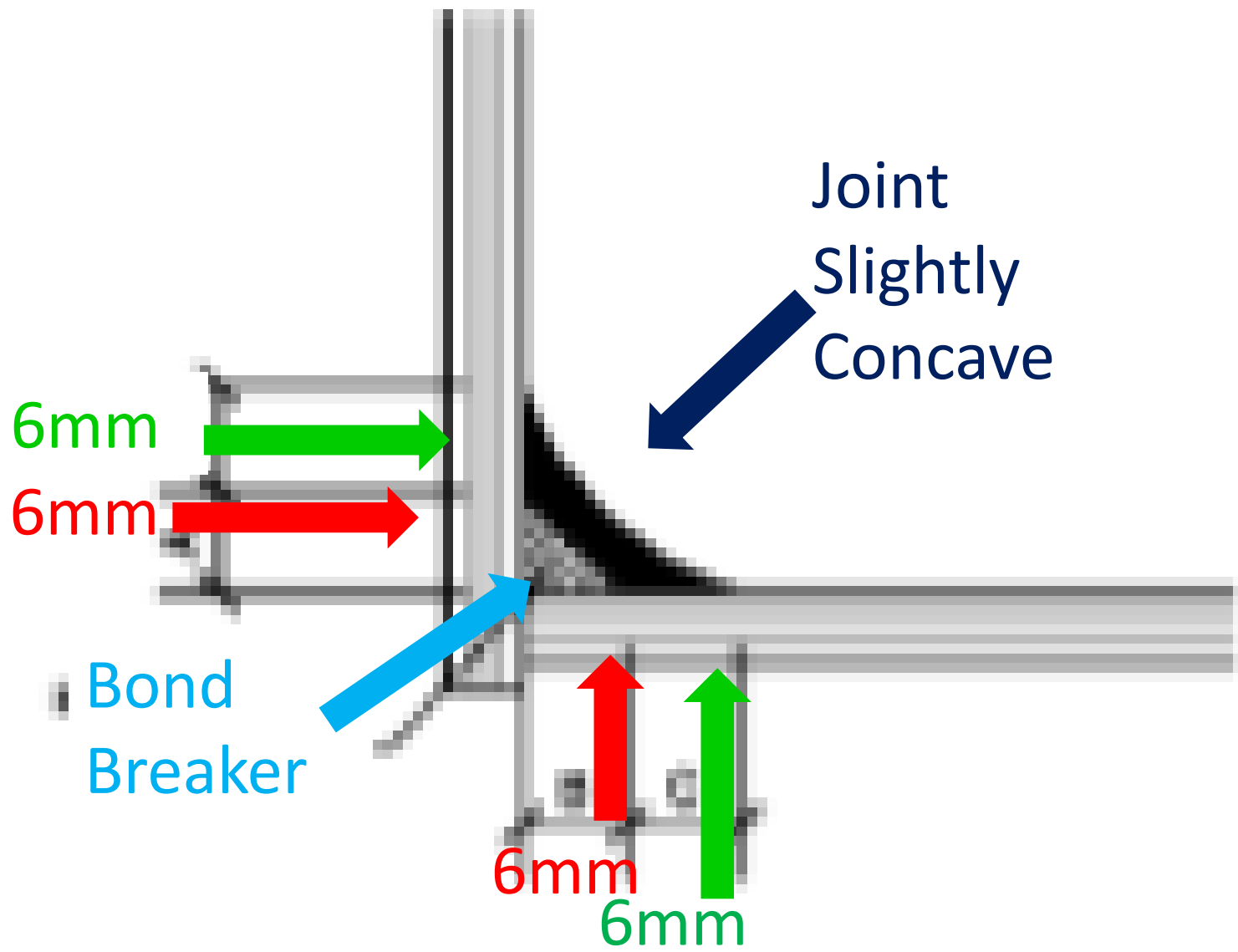
W = Sealant width, D = Sealant depth, C = Contact area.



Expansion Joints- The minimum width and depth of any sealant application should be 1/4" x 1/4" (6 mm x 6 mm). The depth (D) of sealant may be equal to width (W) of joints less than 1/2" wide. For joints from 1/2" to 1" (13 mm to 25 mm) wide, the sealant depth should be approximately one-half of the joint width. The maximum depth (D) of any sealant application should be 1/2" (13 mm). For Joints that are wider than 1" (25 mm) contact Tremco Technical Services or your local Tremco Sales Representative.

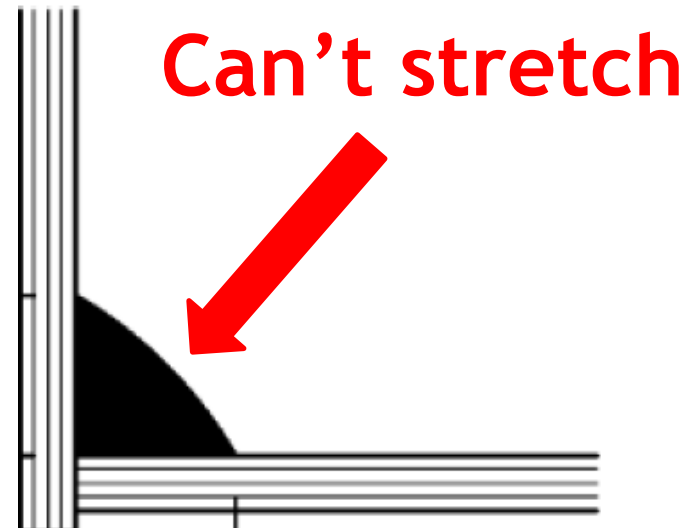
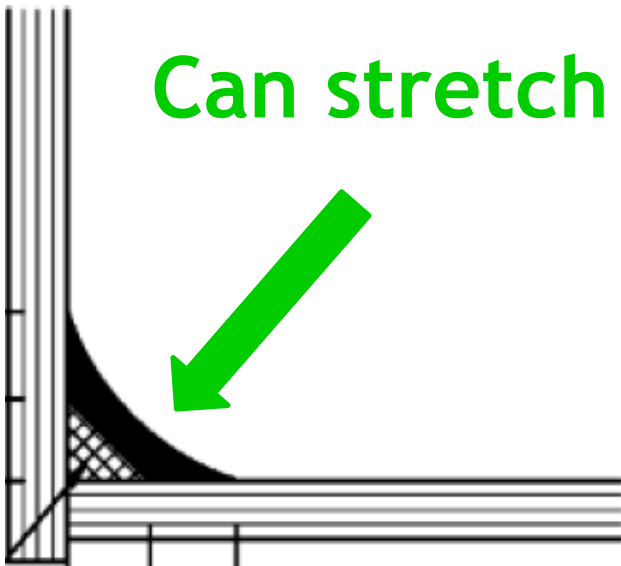
Window Perimeter- For fillet beads, or angle beads around windows and doors, the sealant should exhibit a minimum surface contact area [C] of 1/4" (6 mm) onto each substrate, with provisions for release at the heel of the angle using backer rod or bond breaker tape.

Good Joint Design



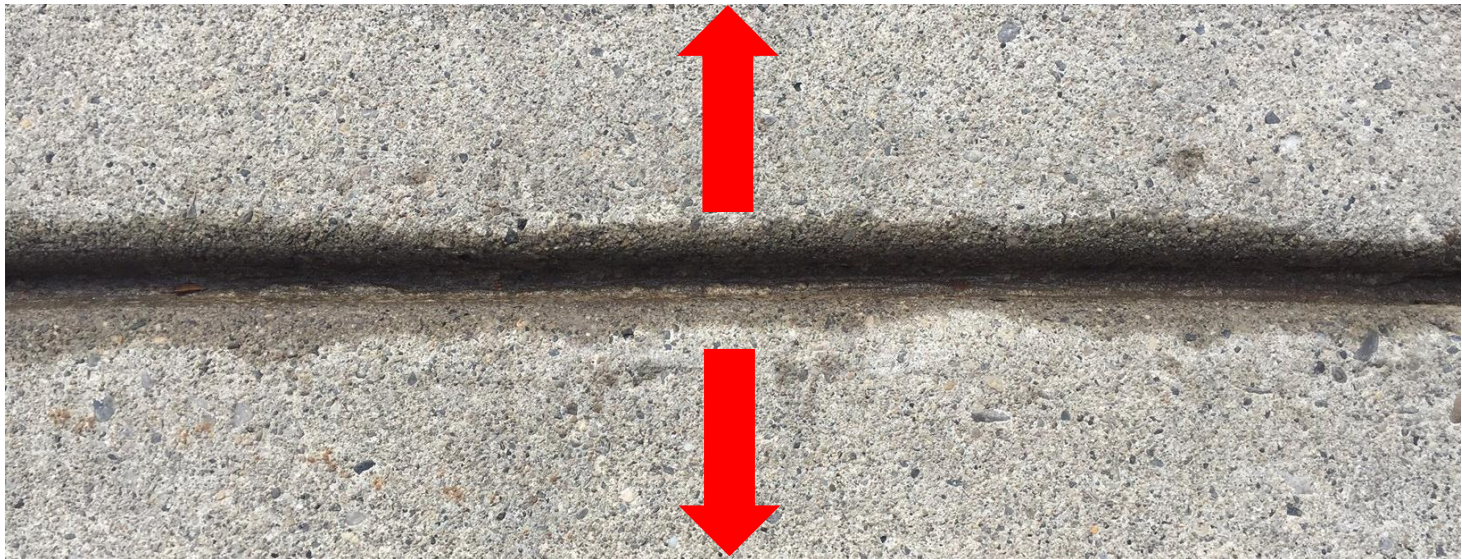
Shape is Critical

The thin parts needs to stretch



STEP 1 - Determine Joint Movement

40 feet X 0.0006 = 1/4" total
(1/8 " each side)



Step 2 - Assume min 1/4" Bond Breaker and Calculate Caulking Expansion Capability Required

E.g.

$$\% \text{ expansion} = 1/8'' / 1/4'' \times 100\% = 50\%$$

For this joint any caulk with 50% or more expansion capability will work

Understand Sealant Movement Capabilities

- Not all elastomeric sealants are the same
- Different sealants have different movement capability ratings

DAP Dynaflex 230

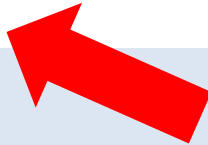
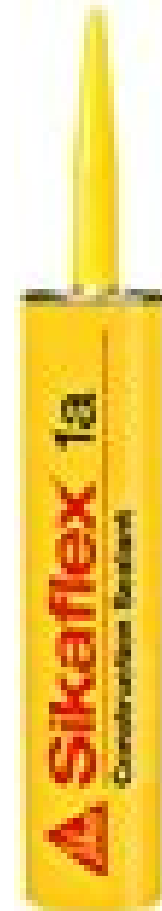


Typical Physical & Chemical Characteristics:

Tooling Time:	10 Minutes
Tack-Free Time:	30 Minutes
Dynamic Joint Movement:	± 25%
Paintable:	Yes
Odor:	Very Mild
Consistency:	Smooth and Creamy
Vehicle:	Advanced Acrylic Polymer
Volatile:	Water
Flash Point:	None
Filler:	Calcium Carbonate
Density:	1.04
Solids:	59.0% by weight
Weight per Gallon:	8.7 lbs./gal. (1.04 kg/L)
Temperature Service Range:	-30°F to 180°F (-34.50 to 82.20°C)

Sikaflex 1a

- Eliminates time, effort, and equipment for mixing, filling cartridges, pre-heating or thawing, and cleaning of equipment.
- Fast tack-free and final cure times.
- High elasticity - cures to a tough, durable, flexible consistency with exceptional cut and tear-resistance.
- Stress relaxation.
- Excellent adhesion - bonds to most construction materials without a primer.
- Excellent resistance to aging, weathering.
- Proven in tough climates around the world.
- Odorless, non-staining.
- Jet fuel resistant.
- Certified to the NSF/ANSI Standard 61 for potable water.
- Urethane-based; suggested by EPA for radon reduction.
- Paintable with water-, oil- and rubber-based paints.
- Capable of $\pm 35\%$ joint movement.



Titebond Radon Sealant



Titebond
THE PRO'S ADVANTAGE

RADON SEALANT

VOC COMPLIANT

HIGH-PERFORMANCE BONDING

GREENchoice SEALANTS

Concrete Gray

entry of radon. It should be used on foundation penetrations, around foundation coatings normally used for damp proofing, and membranes surrounding the foundation. It is an extremely flexible and durable product which allows for extension and compression of at least 25%. The mold and mildew resistant formula dries quickly and contains no added ozone-depleting chemicals, making it safer for you and the environment.

Ready to Use
No mixing or primer required;
reduces labor and installation cost

Ultra Low VOC
VOC-compliant in all 50 states

Joint Movement Capability $\pm 25\%$
Remains flexible

Weather Resistant
Produces long-lasting weather-tight seals

Dymonic® 100

+100/-50% Movement, High Performance Polyurethane Sealant

... from free surface. Tool to desired finish. Dry

... structure. Appliquer sur une surface propre et sèche gel. Travailler pour obtenir le

... finish. Se aplica a una superficie limpia y seca. Trabaja para lograr el acabado deseado. Se recomienda para

... known to the State of California to cause cancer, ...
... associated respiratory ...
... permanent brain ...
... concentration ...

... (AVERTISSEMENT) Ce produit contient des produits chimiques qui, dans l'état de ...
... Californie, sont reconnus comme étant susceptibles de causer le cancer, ...
... des malformations congénitales ou d'être nocifs pour le système ...
... produit. Certains rapports ont établi qu'une exposition excessive et prolongée peut ...
... des effets sur la santé humaine. Évitez l'exposition à ce produit.

... (ADVERTENCIA) Contiene sustancias químicas ...
... reconocidas como causantes de cáncer, defectos de ...
... sistema reproductivo. Los reportes han asociado a ...
... y prolongada de los productos de este tipo ...
... efectos en la salud humana. Evite la exposición a este producto.



2010

National Building Code of Canada



CANADIAN COMMISSION ON BUILDING AND FIRE CODES

VOLUME I



Building Division
Natural Resources Canada
Construction Division
Infrastructure Canada

Canada

Appendix Notes and Illustrations

A-9.25.3.4. and 9.25.3.6. Air Leakage and Soil Gas Control in Floors-on-ground. The requirement in Sentence 9.25.3.3.(6) regarding the sealing of penetrations of the air barrier also applies to hollow metal and masonry columns penetrating the floor slab. Not only the perimeters but also the centres of such columns must be sealed or blocked.

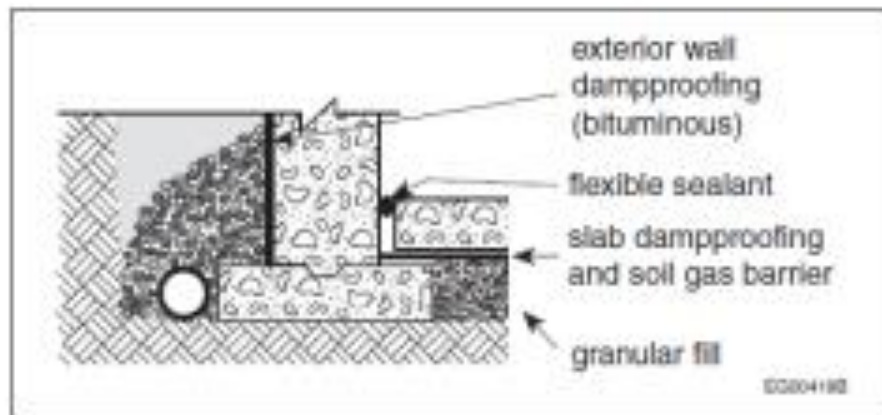
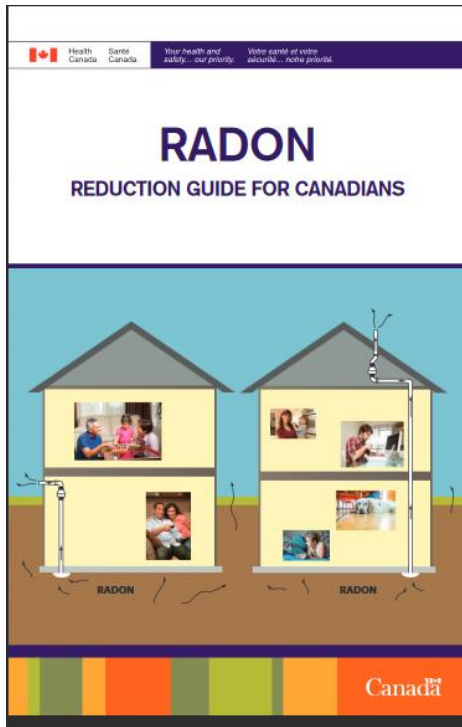


Figure A-9.25.3.4. and 9.25.3.6.-A

Dampproofing and soil gas control at foundation wall/floor junctions with solid walls

Floor Wall Joint - If accessible, the joint between the foundation wall and basement floor can be sealed. This joint can be a major contributor to the radon levels in a home.



Proper surface preparation is critical for a good seal – follow caulking manufacturer's instructions

Fill crack with polyurethane caulking

Use an Ethafoam[™] backing rod to create a more durable seal

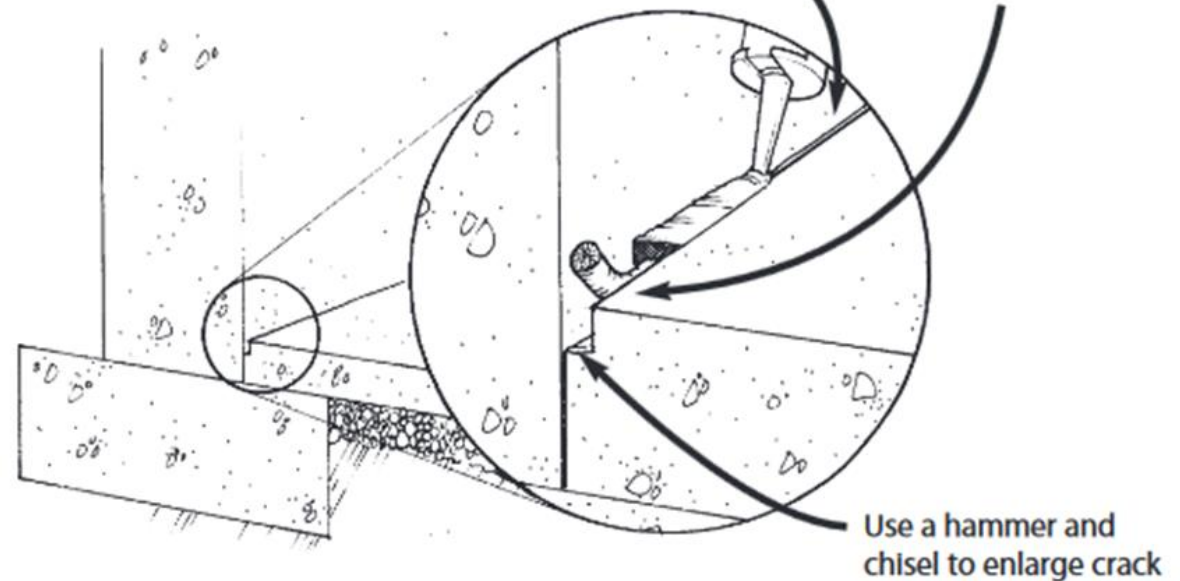


Figure 3 ↑
Sealing foundation wall and basement floor joint.

That's the
right way.

Thank you
and wishing you all low
levels of radon in your home
and workplaces.

Colin Dumais B. Sc., NABCEP, C-NRPP



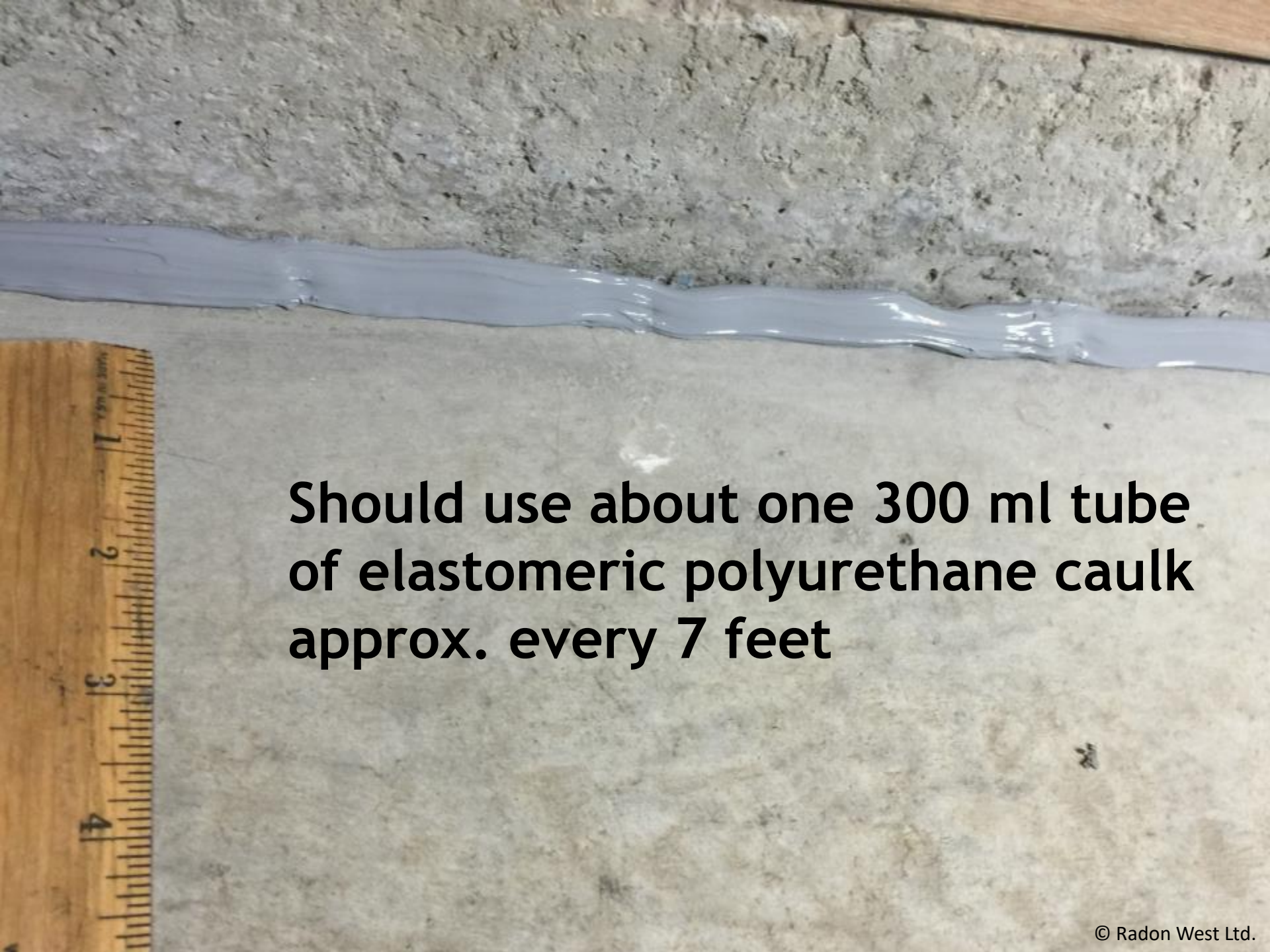
RadonWest



Prepare the Joint

Not Enough Caulk





**Should use about one 300 ml tube
of elastomeric polyurethane caulk
approx. every 7 feet**



Concrete Shrinkage

Type	Curing	Drying
Factors	Chemical reaction	Temp and moisture
Percentage		
Process Complete		18 months