Concrete Canada

Concrete Floors

The Sustainable Floor Solution

CFLRA

Geoff Kinney
Cement Finishing Labour Relations Association
Concrete Floor Contractors Association

THE Sustainable Floor Solution

- Concrete floors are already part of every building.
- Concrete floors are often covered with applied finishes.
- Concrete is economical, very hard and long lasting (low maintenance).

What is the CFCA ?

- The CFCA is the technical and promotional voice of the concrete floor industry.
- CFCA provides assistance to specifiers and owners.
- *Our goal is to assist you to obtain high quality results and avoid problems !*
- CFCA contractor and materials suppliers are quality leaders.

Specification Issues

- Specifications define the framework for success – but they do not build good floors.
- A separate concrete floor specification is necessary that includes all related concrete floor mixes, tolerances and finishes.
- The selection of materials and specialty trade contractors is critical for success.

Why Prequalify ?

poor materials + good workmanship

good materials + poor workmanship

= quality and performance problems

Two Types of Floor Crews

The Cowboys

- Hard working but don't read specifications or CSA standards.
- Choose materials and methods that are cheapest.
- Good to have around in a bar fight.
- Only care if they get paid.
- Left town yesterday !

The Professionals

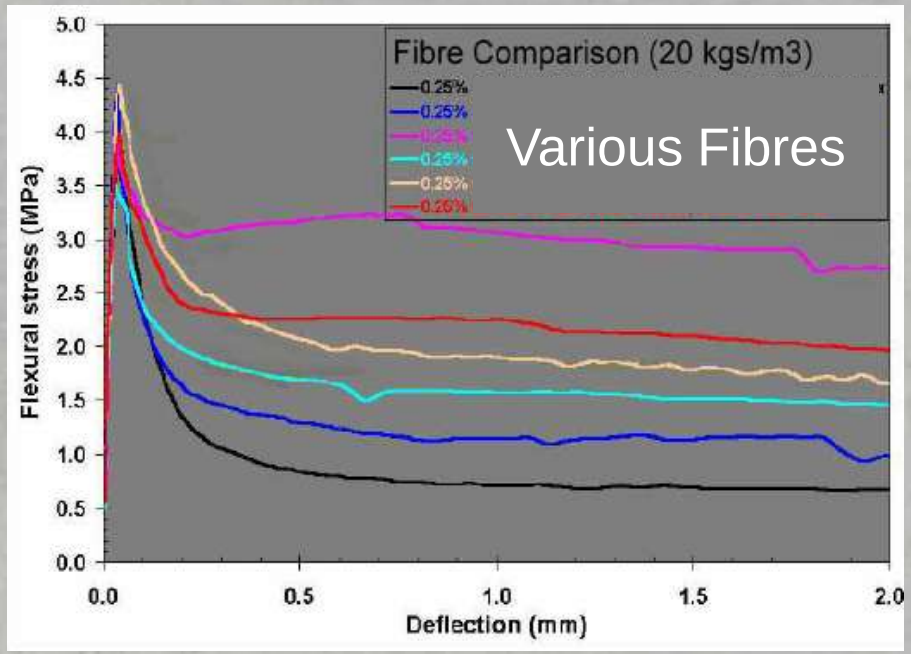
- Skilled and technically proficient.
- Use good quality materials and follow specifications.
- Good to have around when you want a good floor.
- Stand behind their product with pride.
- Provide a written guarantee.

Materials

- High quality materials are essential inputs in durable construction (which is sustainable).
- All materials are not equal in cost or performance and require careful consideration.
- CFCA materials suppliers are concrete floor industry quality leaders.

Steel & Synthetic Fibres

- All fibres are not equal in performance – do not swap without a design review !
- Steel fibres must be supplied with a “certificate of conformance” and “test reports” as per ASTM A820.

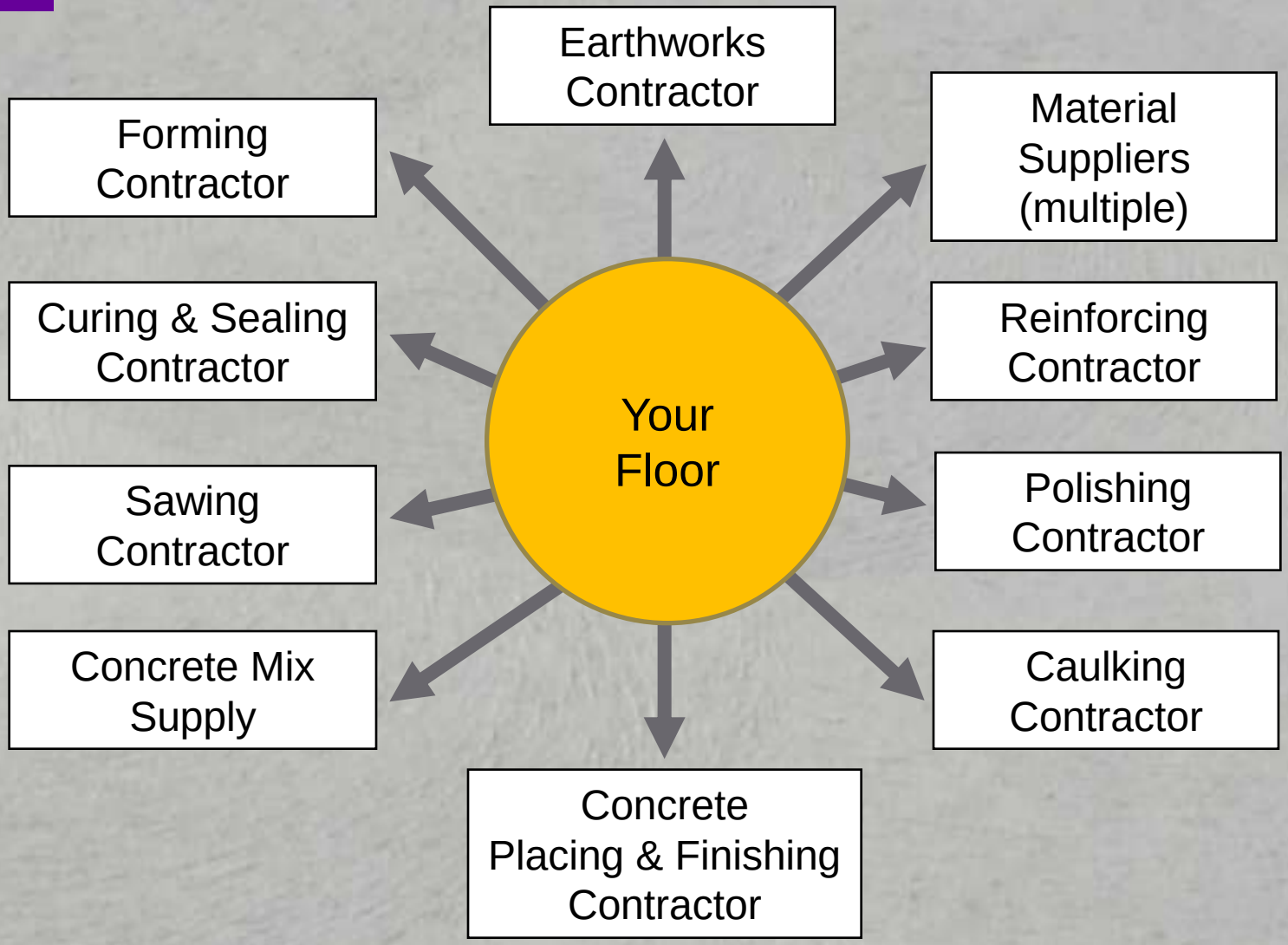


ArcelorMittal BEKAERT better together MACCAFERRI Optimet PROPEX CONCRETE SYSTEMS

Coordination

- Schedules are short.
- Planning time is almost non existent due to last minute awards of trade work.
- Site conditions vary significantly.
- Coordination efforts vary significantly.
- Specification and standards requirements may not be well understood (those damned cowboys).
- Division of responsibilities create problems.

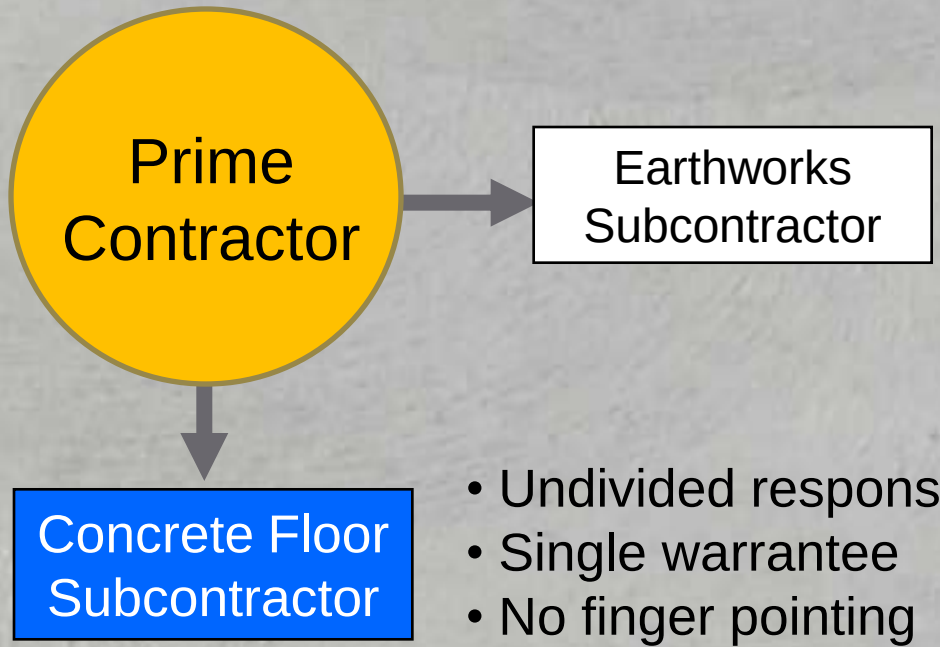
Divisions of Responsibility



Divided responsibilities = multiple opportunities for coordination problems

“Single Source” Undivided Scope

For all critical surfaces:
- *Architectural finishes*
- *Superflat floors*
- *Rink slabs*
- *Higher quality anything*



- Undivided responsibility
- Single warrantee
- No finger pointing

Forming
Reinforcing
Placing & Finishing

Material Suppliers (multiple) Including Concrete Mix

Jointing
Curing & Sealing
Caulking
Polishing

Pre-Construction Meetings

= Avoid Problems !

- Ensures the Owner's/specifiers expectations are understood.
- Held on-site.
- Review the building envelope and ambient conditions.
- Reference the limits of the scope of work.
- Review the specified methods & materials.
- Review mock-ups.
- Review the joint details and layout.
- Review the QA inspection procedures.
- Review the associated work of other trades (including applied finishes).
- Provides an opportunity to express concerns prior to construction.

Minimum 1 month prior to pouring

Mock-ups

- Must be representative of the final product (not too small).
- *Are co$tly and must be specified.*
- Samples are required to ensure that expectations of the Owner/specifier are understood.
- No architectural work should proceed until this critical step is completed.

Shop Drawings

Shall be submitted at the preconstruction meeting for discussion.

- Construction
- Isolation
- Contraction
- Expansion (exterior)

Inspection is Critical

- *INSPECTION IS CRITICAL TO SUCCESS !!!*
- Inspectors are part of the quality team.
- Full time inspection on pour days is an investment in quality – not an optional expense.
- Inspect and record the quantity and source of all materials being used (fibres, sealers, plasticizer, hardeners, concrete etc.).
- Site inspection letters can be requested from major materials suppliers.
- *Inspection stops mistakes, last minute substitutions and ensures value for your money !*

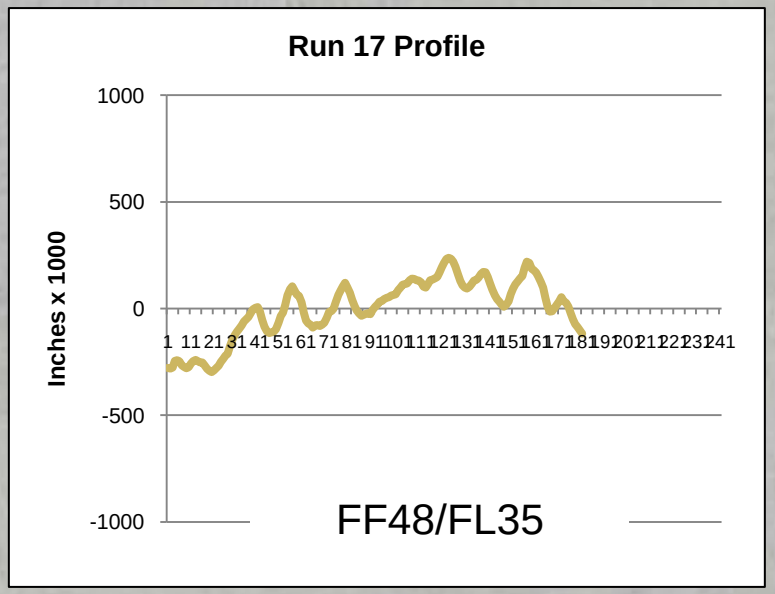
If you don't check it – you may not get it !

CSA A23.1-2009

- Our national mandatory concrete standard.
- 2009 standard update includes:
  - A new maximum 0.55 water:cement requirement for concrete mixes for floors (Clause 8.12).
  - Mandatory supply of compliance test reports for fibre reinforcing.
  - Greater emphasis on F Number floor tolerances.

Floor Tolerances

- Must be measured within 72 hours of placing to confirm the “as built” tolerances.
- Significant tolerance losses can occur through normal drying shrinkage of the concrete. Specifiers need to take tolerance losses caused by curling into consideration (eg: add restraining reinforcing).
- Use the F Number system for detailed analysis.



The Concrete Finish Revolution

Surface Colouring

- Ideal for interior applications.
- A mixture of pigments and hard aggregates.
- Increased surface wear resistance over plain concrete (2-8 times).
- Many colours to choose from including light reflective.

The Euclid Chemical Company

Sika

Light Reflective Floors

- Originally developed for aircraft hangers to improve light levels.
- Can reduce energy costs by increasing light spacing.
- Increased surface wear resistance too.

The Euclid Chemical Company

Sika

Dry Shake Hardeners

Industry Standard

60 lbs / 100 sf
[3.0 kgs/m2]

Ideal

100 lbs / 100 sf
[5.0 kgs/m2]

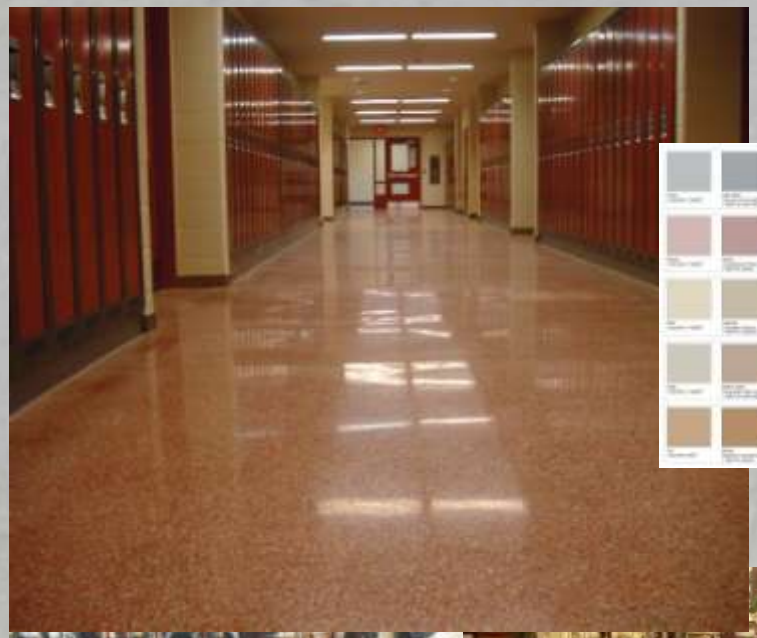
For Colours

150 lbs / 100 sf
[7.0 kgs/m2]

Increased density = longer life

Integral Colouring

- Coloured throughout the entire slab thickness.
- Ideal for concrete terrazzo, exposed aggregate and exterior applications.
- Does not increase wear resistance.



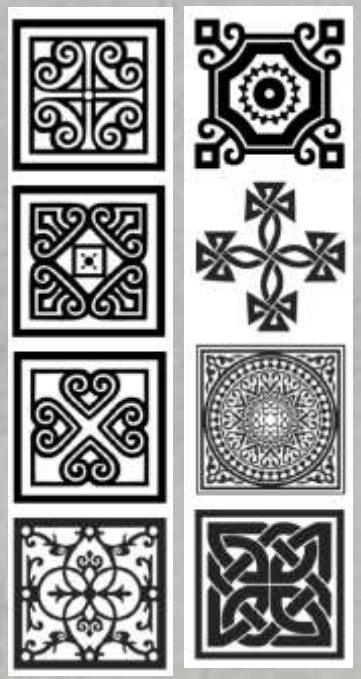
Stained / Dyed Concrete

- Stains are non-uniform.
- Dyes are opaque.
- Can be combined with a polishing or an acrylic sealer.
- Multiple colours.
- New or existing surfaces.

Stencils

Medallions

Borders



Tiles

Re-surfacing Overlays

6mm thin cementitious overlays to cover existing concrete surfaces.

Can be pigmented, stamped and stained.

Non-slip Textures

- Broom finish (sidewalks &non-slip areas)
- Hand swirl float finish (walks & decorative pavements)
- Machine float finish (pavements)

Trowel Finish

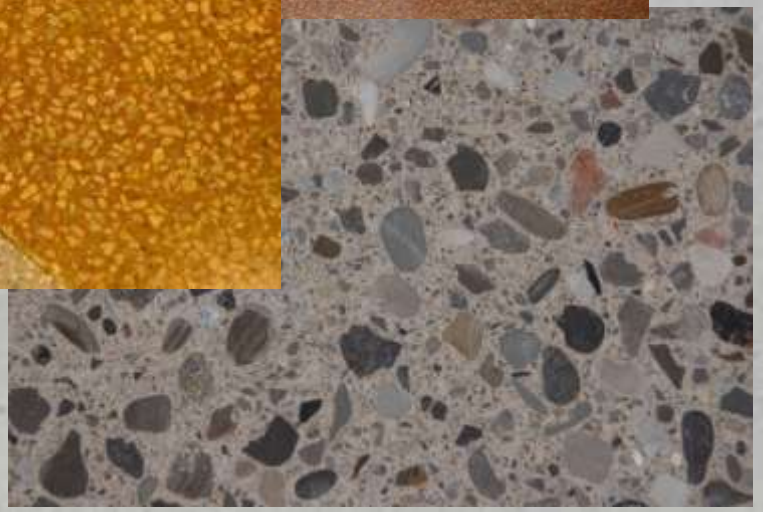
- The conventional exposed floor finish.
- Very dense wear resistance finish.
- Varying degrees of floor flatness available based upon the intended usage.

Exposed Aggregate

- Typically an exterior finish.
- Can be either seeded or integrally mixed into the concrete.
- Many aggregate colours.
- Concrete can also be integrally coloured.

Concrete Terrazzo

- Deeply ground to exposed the concrete aggregates.
- Aggregates may be coloured or include broadcast glass.
- Requires careful planning and execution.
- Concrete can be plain, stained/dyed or integrally coloured.
- Various aggregate exposures: fine sand or pea gravel aggregates.



Imprinted Concrete

Imprinted, “INCRETE” ™, “Patterned” ™, “Bomanite” ™

- Many patterns and shapes.
- Many colour options including accent colours.
- Looks very much like real stone, but it is has the durability and economy of concrete.

Polished Concrete

- High shine, low maintenance finish.
- Concrete can be plain, stained/dyed or pigmented.
- Eliminates an applied finish and associated future maintenance costs.
- Must be liquid silicate densified to reduce porosity.
- Various aggregate exposures.

ASHFORD FORMULA RETRO PLATE

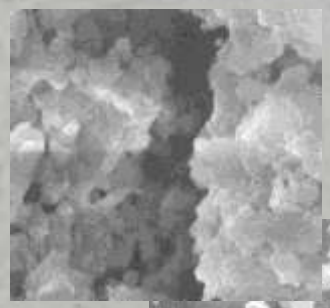
The Euclid Chemical Company

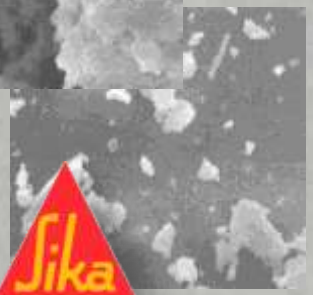
W. R. MEADOWS SEALTIGHT

Sika

Liquid Hardeners

- Chemically reacts over a period of months with the cement to densify and dustproof the surface of concrete.
- Does not wear off with traffic = maintenance free.
- Will develop a sheen with power scrubbing.
- Inexpensive compared to coatings.





ASHFORD FORMULA RETRO PLATE

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Sika

LEED & Exposed Concrete

Leadership in Energy & Environmental Design

- Alternative to carpet, tile and other floor covering.
- Adhesives not required.
- Exceptional durability and low-maintenance.
- Reduces impact on demolition – preserves the recyclability of concrete.
- *LEED* Building Reuse Credit
- Reduces airborne dust particulates, does not off gas contain any VOC's.

GREEN Concrete Floors

How ?

- Designing a concrete floor as a final finish.
- Optimizing the floor thickness and mix design.
- Reducing lighting energy costs with light reflective floors.
- Designing for performance and not just lowest cost (improving durability = reduced maintenance).
- Eliminating solvents and waste.

Green Concerns

- Changes are occurring VERY quickly.
- Properties of GREEN concrete are significantly different than “normal concrete”.
- There is no measurement of actual performance (eg: durability, repairs and maintenance).
- “Green-washing” is a major problem (eg: coal byproduct = green cement / bleached recycled paper / deleting reinforcing).
- LEED is reducing the wear resistance of concrete for floors !?

Problems & Opportunities

- Shrinkage Cracking
- Moisture delaminations
- Slab Thickness
- Plastic Shrinkage Cracks
- Freezing
- Bumpiness
- Curling
- Spalled Joints
- Joint faulting
- Delaminations
- Scaling
- Pop-outs
- Mortar Flaking
- Crazing
- Dusting
- Corrosion of steel
- And more …

Careful planning and execution are the solution

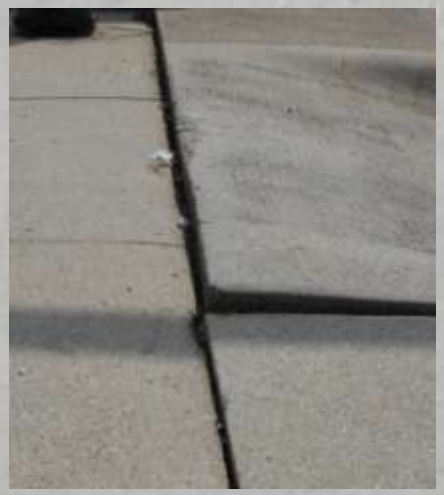
Concrete Mixes

- There is no such thing as “normal” concrete anymore.
- Cement & concrete constituents are changing rapidly to reduce the carbon footprint.
- New GUL (portland limestone cement) being introduced.
- The need for the concrete floor contractor to supply the concrete is becoming essential - these new materials require special protection and handling.
- High water:cement ratios have lower wear resistance and create longer drying periods for applied finishes
- *New CSA requirement of a maximum 0.55 w/c for trowel finished floors.*

Differential Joint Movement

Uneven joints are a common failure

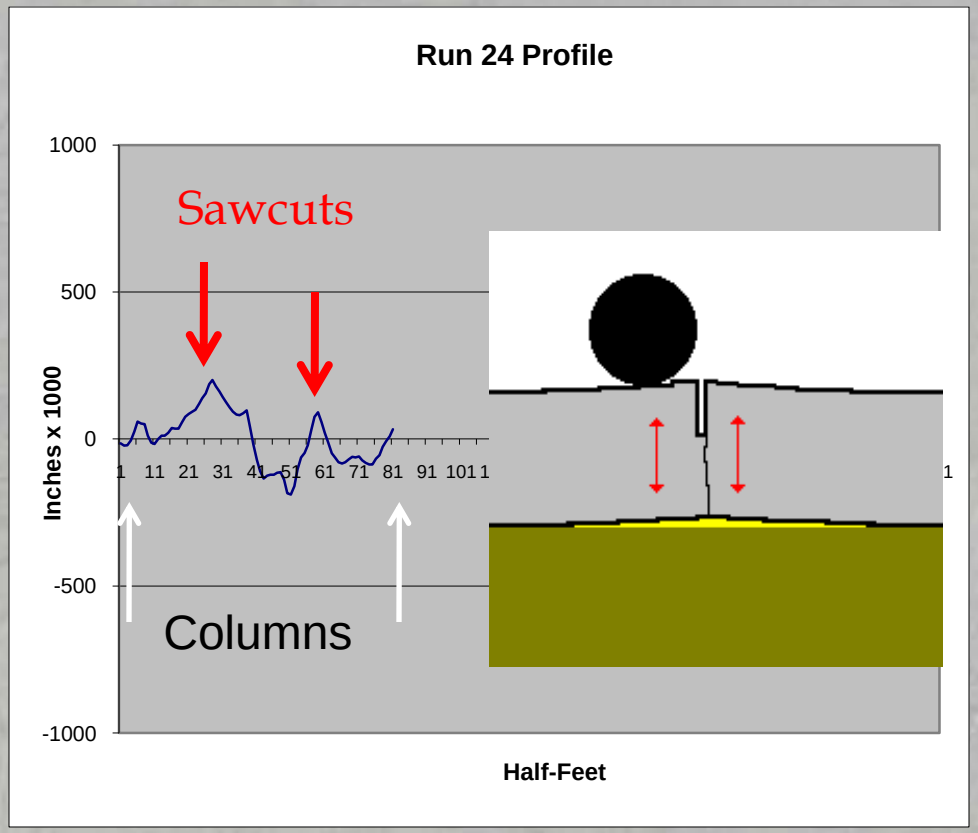
- Unreinforced concrete is problematic.
- Synthetic micro-fibres DO NOT reinforce hardened concrete against joint movement.
- *Performance must be considered in design for all exposed concrete work.*



Dowel between pours reinforce across joints

Curling

- Curling occurs at all floor joints and is created by differential drying between the top and bottom of a slab.
- Significant tolerance losses can occur.
- Difficult and costly to repair.
- Restrain your joints with reinforcing !



"Owners shall specify low-shrinkage concrete mixes, appropriate curing, or suitable reinforcing, or a combination of these, as necessary to minimize curling to suit their intended usage". (ref: CSA A23.1 Clause 6.4.2.2.3)

Slab Thickness

- Granular bases “SHALL” be within ± 10mm.
- Variations in granular base and the floor surface elevations can combine.
- Average slab thickness “SHALL” be no less than 10mm from specified and nor more than 20mm less in local areas.

Inspect granular base elevations !

Cracks

There are many causes:

- Contraction joint spacing too far apart, too late or not deep enough.
- Points of restrain not isolated with cuts.
- High shrinkage concrete.
- Conduits cast into the slab.
- Contraction joints held together by reinforcing.
- Granular base settlement.
- Concrete over-loaded.




Create a shop drawing for review !

Vapour ~~Barriers~~ ~~Retarders~~

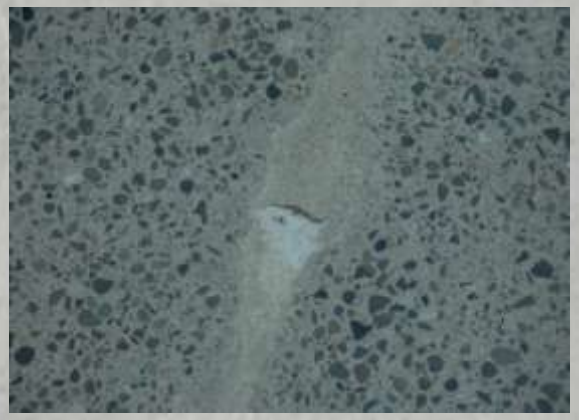
- To reduce future delaminations of non-breathing finishes due to vapour movement.
- Located directly under the concrete slab.
- Will aggravate curling and shrinkage.
- The concrete mix needs to be modified to reduce water content and by adding a plasticizer.
- Add reinforcing to restrain curling forces.
- Review schedule of applied finishes at the pre-construction meeting.

Drying Time for Applied Finishes

- Excess concrete mix water equals 1 litre/sf @ 6” thick.
- Drying time for a 100mm SOG to reach 3lb/000sf/24hrs :
  - 0.4 w/c: 60 days
  - 0.5 w/c: 180 days
  - 0.6 w/c: > 365 days
- Thickness factor (0.5w/c):
  - 100mm: 1 x w/c
  - 150mm: 2 x w/c
  - 200mm: 2.7 x w/c

Finishing and Polishing

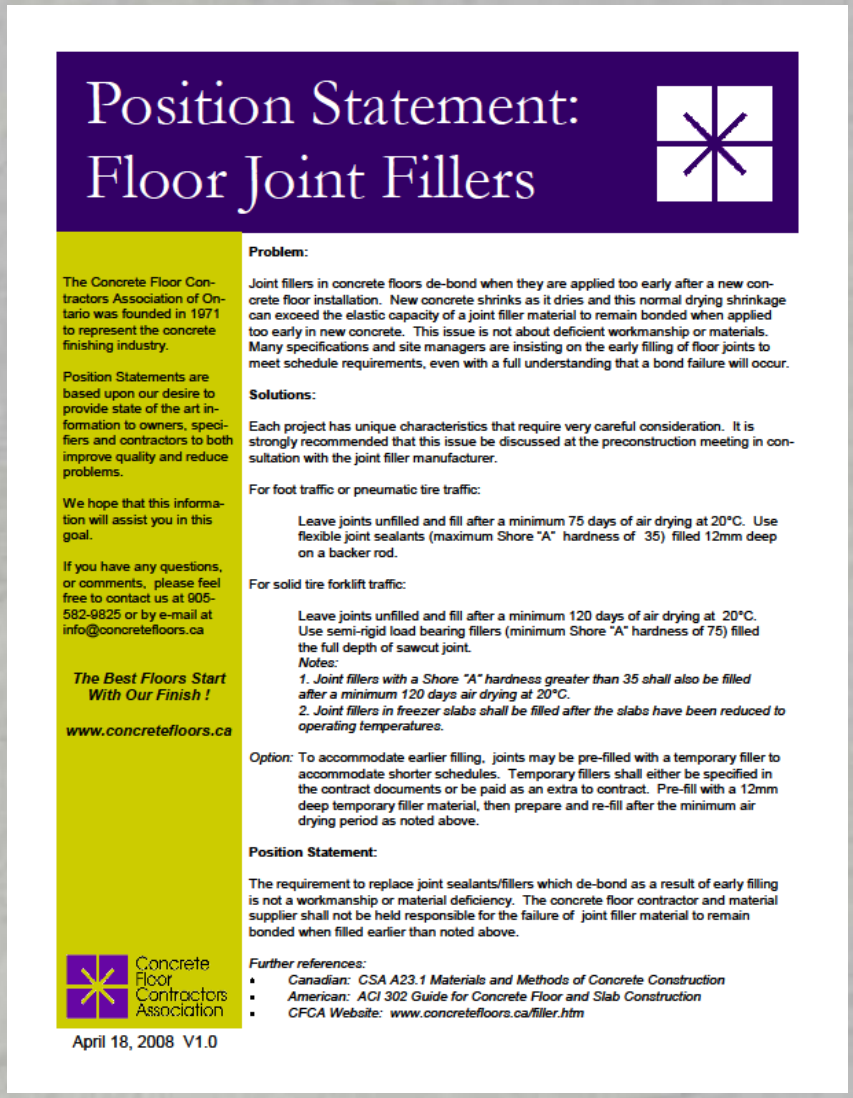
- The concrete floor installation and polishing operations need to be coordinated by the concrete floor contractor for the best results.
- Dividing these operations can result in significant problems.



Position Statements

Promote responsibilities and awareness of major issues to reduce problems:

- Concrete Purchasing
- Granular Base Elevations
- Timing of Sawcut Filling
- Timing of Tolerance Measurements



Position Statement: Floor Joint Fillers

The Concrete Floor Contractors Association of Ontario was founded in 1971 to represent the concrete finishing industry.

Position Statements are based upon our desire to provide state of the art information to owners, specifiers and contractors to both improve quality and reduce problems.

We hope that this information will assist you in this goal.

If you have any questions, or comments, please feel free to contact us at 905-582-9825 or by e-mail at info@concretefloors.ca

The Best Floors Start With Our Finish !

www.concretefloors.ca

Concrete Floor Contractors Association

April 18, 2008 V1.0

Problem:

Joint fillers in concrete floors de-bond when they are applied too early after a new concrete floor installation. New concrete shrinks as it dries and this normal drying shrinkage can exceed the elastic capacity of a joint filler material to remain bonded when applied too early in new concrete. This issue is not about deficient workmanship or materials. Many specifications and site managers are insisting on the early filling of floor joints to meet schedule requirements, even with a full understanding that a bond failure will occur.

Solutions:

Each project has unique characteristics that require very careful consideration. It is strongly recommended that this issue be discussed at the preconstruction meeting in consultation with the joint filler manufacturer.

For foot traffic or pneumatic tire traffic:

Leave joints unfilled and fill after a minimum 75 days of air drying at 20°C. Use flexible joint sealants (maximum Shore "A" hardness of 35) filled 12mm deep on a backer rod.

For solid tire forklift traffic:

Leave joints unfilled and fill after a minimum 120 days of air drying at 20°C. Use semi-rigid load bearing fillers (minimum Shore "A" hardness of 75) filled the full depth of sawcut joint.

Notes:

1. Joint fillers with a Shore "A" hardness greater than 35 shall also be filled after a minimum 120 days air drying at 20°C.

2. Joint fillers in freezer slabs shall be filled after the slabs have been reduced to operating temperatures.

Option: To accommodate earlier filling, joints may be pre-filled with a temporary filler to accommodate shorter schedules. Temporary fillers shall either be specified in the contract documents or be paid as an extra to contract. Pre-fill with a 12mm deep temporary filler material, then prepare and re-fill after the minimum air drying period as noted above.

Position Statement:

The requirement to replace joint sealants/fillers which de-bond as a result of early filling is not a workmanship or material deficiency. The concrete floor contractor and material supplier shall not be held responsible for the failure of joint filler material to remain bonded when filled earlier than noted above.

Further references:

- *Canadian: CSA A23.1 Materials and Methods of Concrete Construction*
- *American: ACI 302 Guide for Concrete Floor and Slab Construction*
- *CFCA Website: www.concretefloors.ca/filler.htm*

On the Web @ concretefloors.ca

CFCA

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Technical Library

Many factors effect the quality of a new floor slab. The following is a list of reference areas recommended for consideration when designing or building a new concrete floor (product information is also available from our Product Library as well).

If you require other information, please refer to our Help Desk or submit your questions through out request for information page or send us an e-mail.

The purpose of these documents is to provide information and promote high quality concrete floors. It does not contain a full analysis of the law nor does it constitute a legal opinion. CFCAO is not liable for any damages resulting from the use of this information.

Technical Bulletins:

- Concrete Slumps
- Curling
- Crazing
- Dipstick Calibration
- Exterior Shake Hardeners
- Flyash in Concrete
- Polycarboxylate Plasticizers
- Pre-construction Meetings
- Pre-construction Checklist
- Sawcut Construction Joints
- Screeding Methods
- Sidewalk Contraction Joints
- Silicate Curing
- Sloping Floors
- "T" Sawcut Intersections

- Presentations

Materials:

- Air in Concrete
- Coloured Finishes
- Concrete Best Practices Guide
- Concrete Mixes
- Crazing
- Dry Shake Aggregate Hardeners
- CSA A23.1
- Joint Sealants & Fillers
- Liquid Densifiers
- Polished Concrete
- Steel Fibre Reinforcing

Click here for Materials Library

Information Bulletins:

- Concrete Winter Heat Premiums

Methods:

- Cold Weather
- Environmental Issues
- Exhaust Fumes
- Inspection Issues
- Maintenance Instructions
- Protection
- Superflat Floors

Position Statements:

- Concrete Purchasing
- Floor Joint Fillers
- Granular Bases
- Tolerances

Design:

- Standard Specification
- Curling of Joints
- Dock Pit Angle Detail
- Dock Pit Sawcut Layout
- Drying Time for Applied Finishes
- F Number Tolerances
- Thickness
- Unreinforced Floors

Problem Advisories:

- Bleed Water Void Delaminations

www.concretefloors.ca/cc10.pdf

Summary

- Exposed concrete floors are a very sustainable solution.
- Specify fully inclusive scopes of work including concrete supply for high quality results.
- Use pre-construction meetings to manage coordination and expectation problems.
- Inspect everything to ensure value.
- Specify CFCA members in your specification to improve the quality of concrete floors across Canada.

www.concretefloors.ca














The Best Floors Start With Our Finish !

Contact Information

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