SOFF-CUT EARLY ENTRY SAWING

Ben Pevreall
Manufacturing Footprint - Machines

Huskvarna, Swe ~ 100 empl.

Xiamen, China ~100 empl.

Åsbro, Swe ~ 20 empl.

Olathe, KS, USA ~ 50 empl.
Manufacturing Footprint – Diamond Tools

Jönköping, Swe (46 empl.)

Hebei, China (620 empl.)

Columbia, SC-USA (80 empl.)

Ath & Portugal
Conclusion

- Husqvarna: currently the biggest diamond tools & machine producer and developer in the world
Soff-Cut - Early Entry Sawing Systems

Soff-Cut is the leading early entry concrete sawing system. Soff-Cut”, allows you to cut in the Green Zone as part of the finishing process.
Soff-Cut – Early Entry Sawing Systems

THE PROBLEM

Random cracking

THE SOLUTION

Soff-Cut has the only Ultra Early Entry dry-cutting system which controls random cracking through the early timing of the cut.
How it Works

As concrete hydrates and begins to set, it develops internal stresses. The objective in controlling random cracking is to relieve these stresses before they seek their own relief in the form of a random crack. Soff-Cut technology is based on the combination of the Soff-Cut blade and skid plate. The up-cutting rotation of the blade combines with the Skid Plate, which applies pressure to the surface to prevent chipping or spalling.
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**Why concreters use it ?**

- No slurry stains on finished concrete
- No slurry collection costs – less EPA problems
- No need for on site water
- No noise complaints from other workers
- No need to come back tomorrow – job completed to-day
- Risk of “late saw cut cracks” almost non existent
- Risk of unplanned and/or random cracking is minimized

**Why Engineers Specify it ?**

- Control joints are sawn before shrinkage stresses occur
- Risk of unplanned cracking is minimized
- Soff-Cut sawn joints are shallower thus providing greater aggregate interlock
- Proven system
- Sawn joints can be installed before final curing
The SOFF-CUT Ultra Early Entry™ dry-cutting system reduces the risk of random cracking by cutting control joints in the Green Zone - within zero to two hours after completion of the final finish at each control joint.
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Placing and Finishing Process

Pumping  Placing  Finishing  Soff-Cut  Final curing
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Some Key Points:

• The depth of saw cut should be greater than the depth of drying

• The earlier a cut is installed the shallower the depth of cut required

• The upper layer has the most stress therefore the cutting depth must cut through the upper layer and be deeper than the maximum aggregate size when to saw cut.
Above:

By cutting concrete at this stage, the depth of cut is less than conventional methods and the risk of random cracking is reduced significantly.
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The Results

- No chipping or spalling at control joint

- Induced crack with greater aggregate interlock

- No random cracking
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Some things to notice:

• Depth of cut is less than conventional methods
• No chipping, spalling or random cracks
• Induced cracks are vertical – “almost late” saw cut
  cracks usually descend at 45 degrees from saw cut
• Greater depth of aggregate interlock
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Some advantages of Soff-Cut:

- Soff-Cuts are installed before significant stresses occur – risk of cracking minimized.
- Shallow cuts allow for maximum aggregate interlock
- Blade is enclosed for safety, dust control and reduced noise levels
- No slurry clean up – no water is used, this means no slurry stains!
- No slurry stains collection costs – less EPA problems!
- No need to come back tomorrow – job finished today
- Cutting completed before final curing process is commenced
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HOW DO I KNOW WHEN I CAN Soff-Cut?
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• If cutting too early the concrete will chip, spall or ravel and the skid plate will leave a mark

• When cutting at the correct time there will be:
  - Minimal chipping
  - Minimal spalling
  - Minimal raveling
  - No skid plate marks
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Sawing Too Early Chipping & Raveling

Sawing Too Late Random Cracks
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Saw Cutting... Just Right

Cross section of a slab which has been Soff-Cut “correctly”
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Applications
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Husqvarna Soff-Cut Systems

When using Soff-Cut saw:

- Look for slightly damp “concrete dust” during the cutting process
- Damp “concrete dust” suggests that the depth of the cut is greater than the depth of drying
- Use “Joint Protectors” to ensure joint faces do not collapse when cross cuts are installed
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Depth of Cut - Should it be 40 or 400?
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Qualifying Customers Saw Requirements

• **Footpaths, Bikeways, Driveways**
  - Usually 30mm Cut = X150

• **Sports Facilities - Tennis & Basketball, etc**
  - Usually 30 - 40mm Cut = X150 or X2000

• **Commercial**
  - Usually 35 - 40mm Cut = X-2000 or X2500

• **Industrial**
  - Usually 45 - 50mm Cut = X4000 or GX4200

• **Infrastructure**
  - Usually 75-100mm Cut = X5000
SAW CUTTING FOR CRACK CONTROL

• 3 topics for discussion to-day are:

  1. Grid Plans
  2. Depth of Saw Cuts
  3. Timing of Saw Cuts
Statements

• There is no such thing as a good day to place or cut concrete – each day has its individual problems and challenges

• What is done to concrete in the first 24 hours of its life determines future sustainability
GRID PLAN

Designed by Engineer taking into account:

• The Purpose for which the pavement was constructed
• Thickness of pavement
• Type and quality of reinforcing used
• Concrete mix design
• Position of service ducts (drains etc.)
GRID PLAN

• Concrete cracks naturally to a 4 metre grid
• The most common Grid Plans for Industrial pavements are therefore 4 metres

ENGINEERED SLABS:
• Airport Taxiways (400+ thick) are now cut to a 5.5 metre grid (previously 7 metres)
• Concrete Roads (250+ thick) have a Grid Plan of 4.2 metres
EXAMPLES OF POOR GRID PLAN

10m centre
Cuts offset from services

8m centre
Cuts too far from Services
DEPTH OF SAW CUTS

Depth of Drying
- Upper layer – drying
- Centre layer – partially saturated
- Bottom layer – fully saturated

Depth of cut must exceed depth of drying and deepest pre-existing crack or defect

• The earlier a saw cut is installed the shallower the cut required
• The later a saw cut is installed the deeper the cut needs to be
• Depth of saw cut required is directly linked to the timing of the saw cuts
DEPTH OF SAW CUTS

Depth of Cut Guidelines:

• Deeper than pre-existing cracks or defects
• Deeper than maximum aggregate size
• Cutting depth should be at least twice the maximum aggregate size
• Deeper than the depth of drying
• Depth of cut should be 25% of total slab thickness (D/4)
• Ultra Early Entry saws, cutting 8 hours after casting (under normal conditions), should be cutting to 25% of total slab thickness (D/4)
TIMING OF SAW CUTS

Cutting Window:

- The earliest a saw cut can be installed without causing excessive raveling/chipping
- The latest a saw cut can be installed before random or unplanned cracking is likely
- Minimum cutting window should be 4 hours
FIELD RESEARCH

- Shrinkage activity commences about 2 hours after casting – under normal drying conditions – and much earlier under aggressive drying conditions (wind)
- Shrinkage activity accelerates quickly
- Under “normal conditions” concrete should be cut within 8 hours of casting
TIMING OF SAW CUTS

- Depth of Drying Chart – approx timing
- 175mm thick slab
TIMING OF SAW CUTS

Skid Plates are the Answer
TIMING OF SAW CUTS

Skid Plates are the Answer

Sawn joint without skid plate – 7 hours after casting (Winter)

Soff-Cut sawn joint using skid plate – 7 hours after casting (Winter)
### Effect of Slump on Timing
(under “NORMAL” conditions)

<table>
<thead>
<tr>
<th>Type of Saw</th>
<th>40mm Slump Cutting Time After Final Finish</th>
<th>80mm Slump Cutting Time After Slip Form Paver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Entry Saw</td>
<td>Minutes to 2 hours</td>
<td>4 to 6 hours</td>
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<tr>
<td>With Metal Skid Plate UPCUT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Cut Saw Without skid plate DOWNCUT</td>
<td>6 to 8 hours</td>
<td>8 to 10 hours</td>
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RESULT OF LATE SAW CUT
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Cutting Tips

First thing after arriving on site ask the concreter where they started to pour.

Where concrete was first poured is the area where you should start to cut.

Do not put saw onto slab until you think it is ready to cut — unnecessary marks in concrete should be avoided.
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Cutting Tips

If you think a slab is ready to cut:

• Start with a “test” cut of 750mm to 1 meter
• Lift blade out of cut
• Inspect “test” cut for chipping (raveling)
• If chipping is evident wait 30 minutes and repeat “test”
• If still chipping wait another 30 minutes and repeat process until there is no visible chipping
In Summary.....

The Benefits:
- Job can be completed same day as pouring/finishing.
- Cuts can be installed much shallower improving integrity of slab
- Cutting is dry cutting – no slurry clean up
- Low noise compared to conventional sawing
- Ultra-early intervention to minimize risk of unplanned cracking.
Feedback / Questions

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