

*High performance  
water based acrylic  
resins for DIY garage  
floor paints*

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**Science  
Simplified**



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# 1K DIY waterbased systems for garage floor\* coatings

\*(walkways, patios, car ports, tiles, garden ornaments etc...)

## Market Expectations

- Ease of use (DIY Market)
- Decorative – has to look nice
- Environment – must fulfill the latest legislation (*e.g.* Eco-label 2015)
- Cost effective
- Performance – *must do the job it is designed to do!!*

✓ Easy to apply, looks good, performance, environmentally friendly and cost effective

# 1K DIY waterbased systems for garage floor\* coatings

\*(walkways, patios, car ports, tiles, garden ornaments etc...)

## State-of-the-Art

- Wide range - Pure Acrylic / styrene acrylic / PUD-acrylic blends
- Direct to concrete or together with a bonding primer
- Many products are epoxy modified
- Lower performance *versus* a 2K products

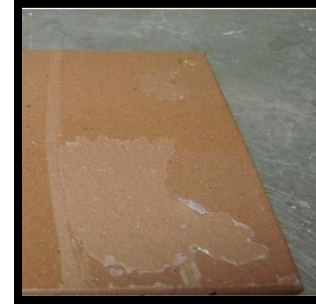
*So, what are the deficiencies in the current technology?*

# 1K DIY waterbased systems for garage floor\* coatings

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## Modes of failure

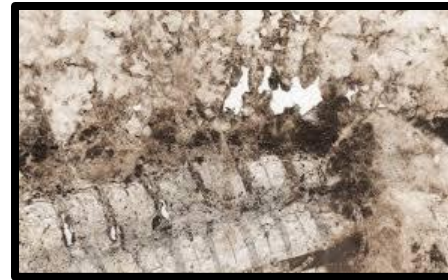
1. Delamination from standing water -



2. Hot Tyre Pick-up -



3. Staining from tyres and dirt -



4. Discoloration, softening or delamination from chemicals -



✓ **Technically challenging**

# Next Generation Polymer Design

## Acrylic

- Hydrophobic to form a chemical resistance barrier

## Proprietary adhesion monomer

- Wet and dry adhesion to concrete/ glass / tiles

## Fine particle size

- Penetrates to seal pores / aids adhesion / reduces blush

## Particle Morphology

- Balance of hardness/ flexibility / lowers MFFT / reduces blushing

## Novel x-linking technology (Adipic dihydrazide free)

- To improve both chemical & dirt resistance / hot tyre pick-up

## Careful surfactant selection

- Reduces blushing



Solids by weight:	40% ( $\pm 1\%$ )
Viscosity, 23 °C: (Brookfield, Spin # 2)	< 500 mPa.s
pH value:	8,0 – 9,0
MFFT:	+12 °C
Avg. Particle Size:	80 nm

✓ Specialty markets require specialty products

# Starting Formulations - Study

## Formula: EXP 294 EXP CS2

**Clear Wet-Look Sealer / Stain Base for Concrete - 30 g/l VOC**

*Add in order with good agitation:*

<b>EXP 294</b>	74.63	
DIW	21.17	
BYK348	0.35	Wetting Agent
BYK024	0.35	Defoamer
NH3 (25%)	0.35	pH adjustment
Mergal K20 (20%)	0.35	Biocide (BIT)
Texanol	1.73	Solvent
Propylene glycol	1.07	Solvent/ levelling

**Total 100.00**

Weight Solids (%)	30.6
Volume Solids (%)	28.0
VOC (g/L)	<30
Density (g/L)	1037
Viscosity (cP)	10 – 15
pH	8.5 – 9.5

### Recommended Application Method

Brush, Roller & Spray

✓ **Starting formulations (CS2 / FP1)**

## Formula: EXP 294 FP1 Grey Floor Paint for Concrete – 35 g/l VOC

*Add in order with good agitation:*

DIW	4.14	
Tamol 731 N	0.69	Pigment Wetting Aid
Triton CF-10	0.30	Emulsifier
Drewplus L-475	0.10	Defoamer
R902	7.38	Titanium dioxide
Minex 7	14.75	Filler/ Extender
Attagel 50	0.20	Thickening agent

*Grind*

**EXP 294 54.40**

Mergal K20 0.49

*Add Grind to letdown*

NH3(25%)	0.10	pH adjustment
Propylene glycol	0.92	Solvent/ levelling
DIW	11.89	
Texanol	2.17	Solvent
Drewplus L-475	0.20	Defoamer
<i>Add slowly (20 mins)</i>		
Acrysol RM-825	0.20	HEUR (low shear)
Acrysol RM-2020	0.79	HEUR (high shear)
<b>CCA 2491 Black Colorant</b>	0.79	Pigment
<b>CCA 2475 YOX Colorant</b>	1.07	Pigment

**Total 100.00**

Weight Solids (%)	48.0
Volume Solids (%)	36.7
VOC (g/L)	<35
Density (g/L)	1221
Viscosity (cP)	60 – 70
pH	8.5 – 9.5
Gloss (60°)	10-15

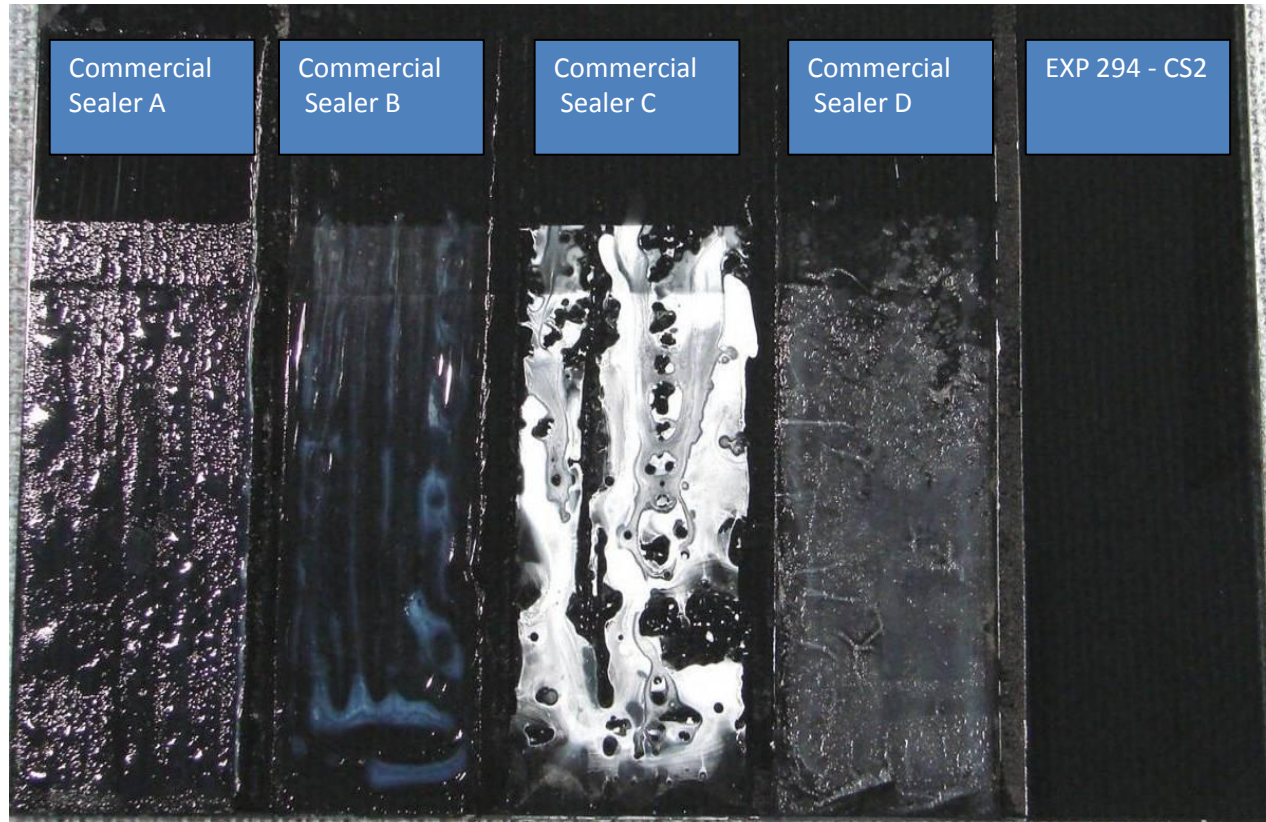
### Recommended Application Method

Brush & Roller

# 1. Delamination by Standing Water (CS2 - Wet Adhesion on Glass)

Apply + 4 hours, re-coat + 4 hours. 16 hours water soak. After recovery

After 16 hours Water Soak

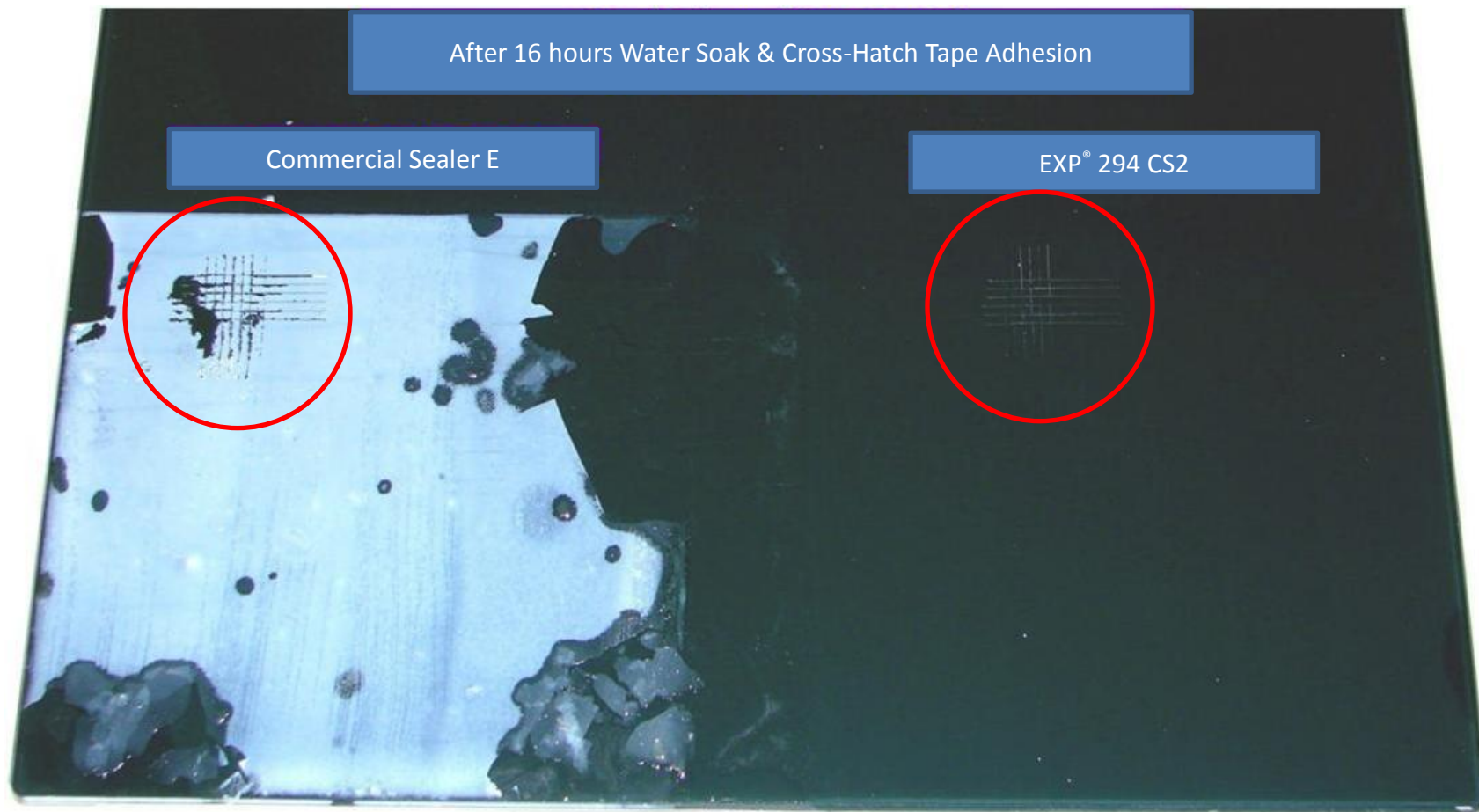


✓ little/ no blushing, blistering, or loss of adhesion



# 1. Delamination by Standing Water (CS2 - Wet Adhesion on Glass)

Apply + 4 hours, re-coat + 4 hours. 16 hours water soak. After recovery

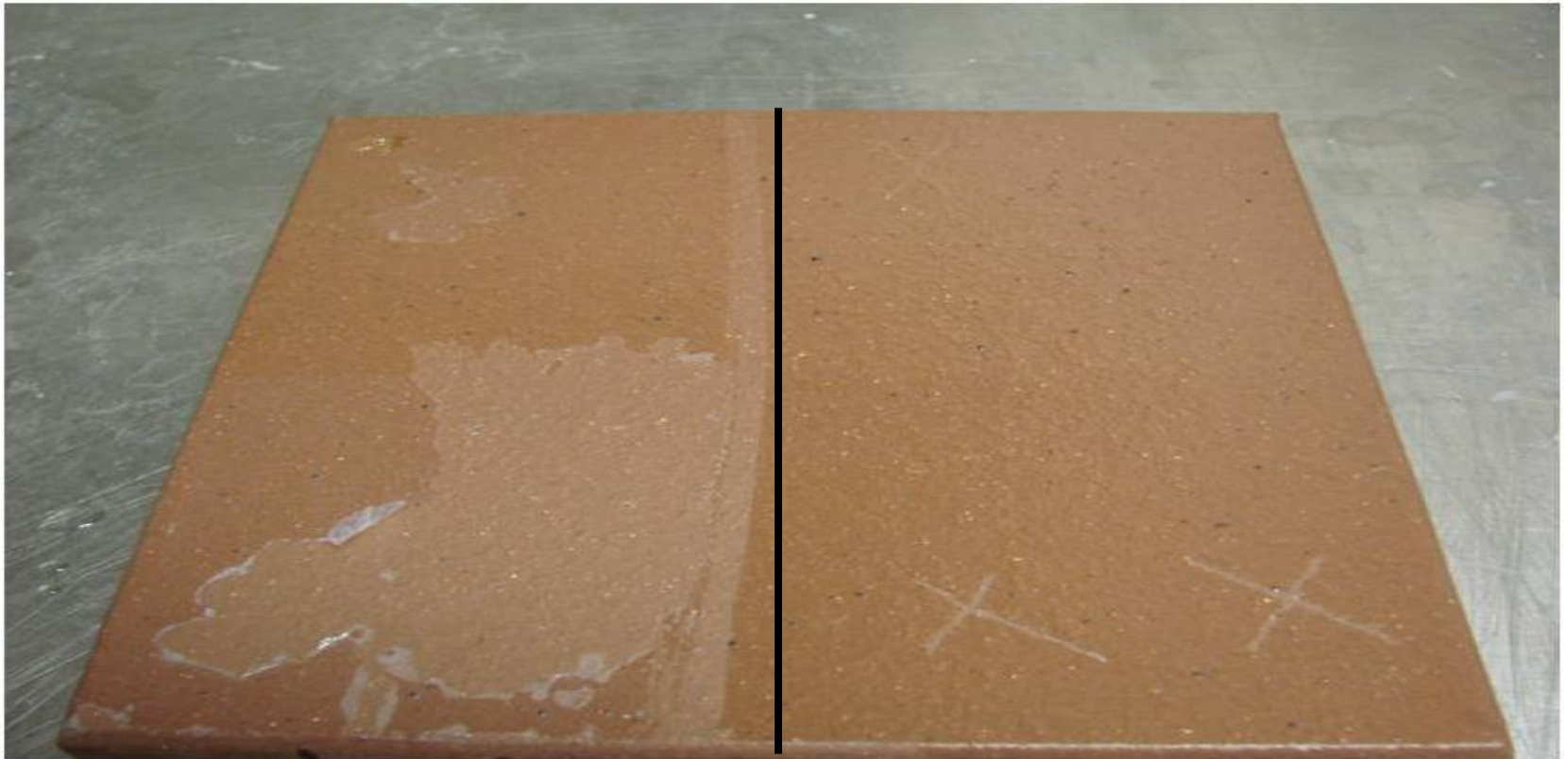


✓ Cross-hatch / tape adhesion test



# 1. Delamination by Standing Water (Wet Adhesion on Quarry Tile)

Over red floor tile – 2 hour water soak



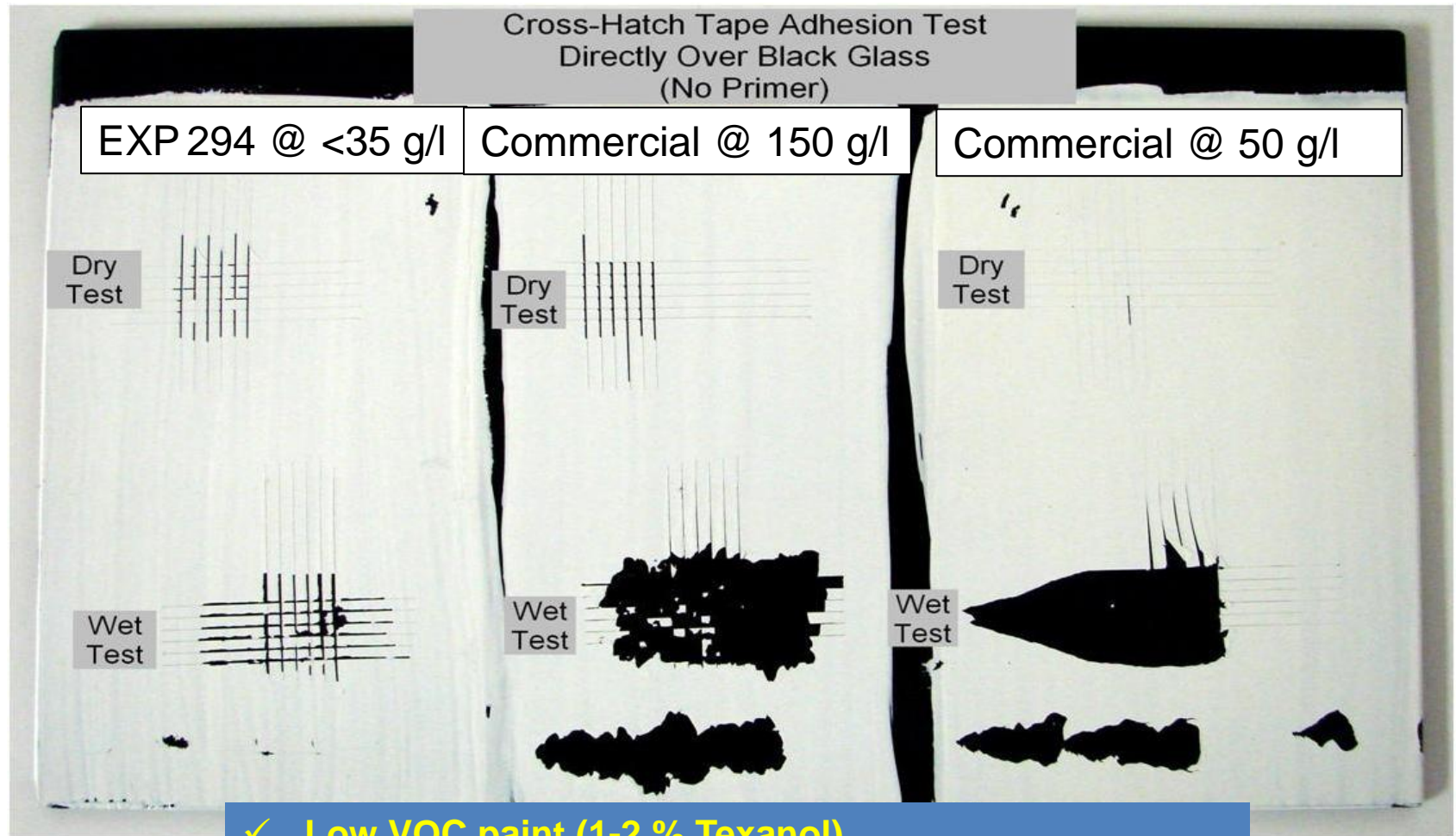
Commercial - Wet Look Sealer

EXP 294 – CS2 Sealer

✓ **Good adhesion on various cementitious substrates**

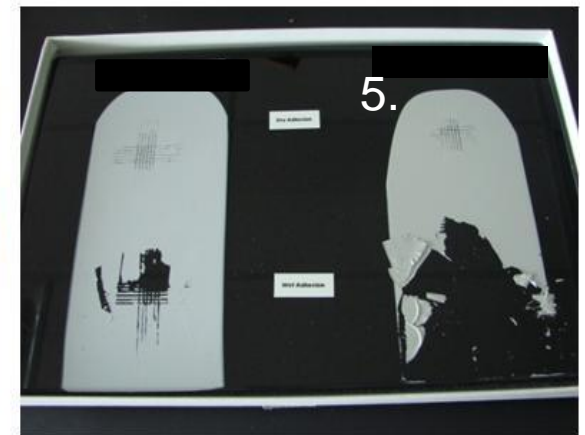
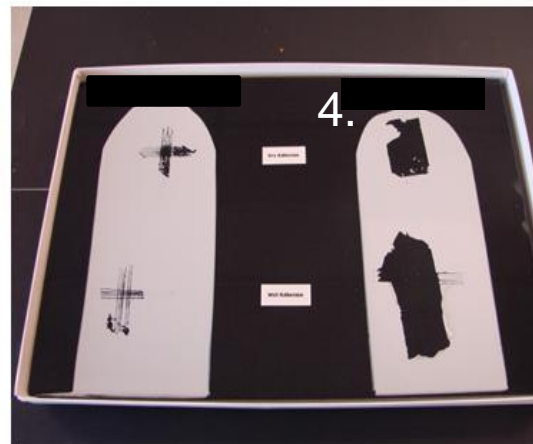
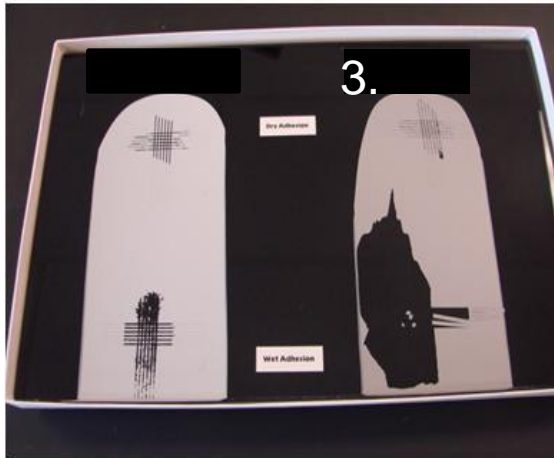
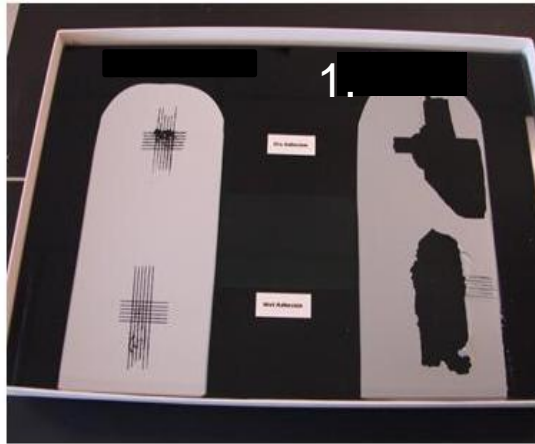
# 1. Delamination by Standing Water (FP1 Garage Floor Paints)

Applied over glass – overnight water soak – tape adhesion



- ✓ Low VOC paint (1-2 % Texanol)
- ✓ Excellent adhesion in formulated paint

# 1. Delamination by Standing Water (other commercial products)

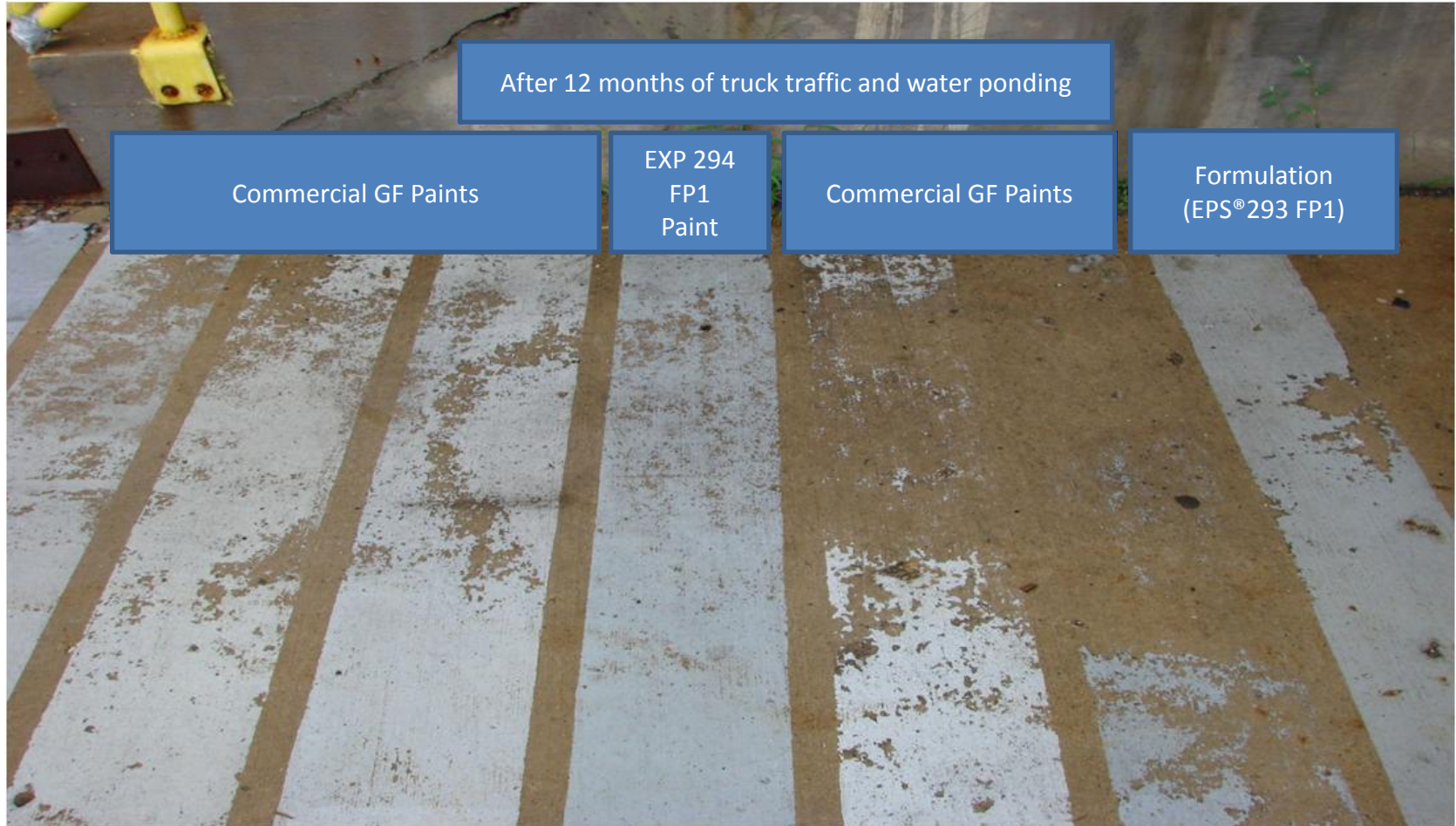


Four-hour cure, overnight water soak, cross hatch adhesion (dry/wet)

✓ EXP 294 – FP1 (left draw down)



# 1. Delamination by Standing Water – Exterior



- ✓ Exterior durability
- ✓ Exposed to standing water (pond)

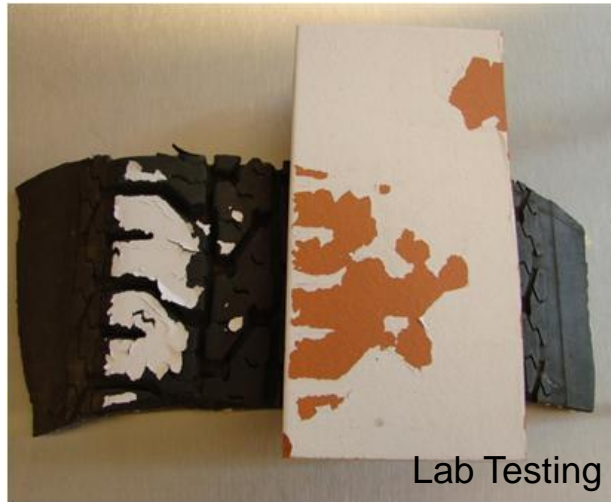
## 2. Hot Tyre Pick-Up (causes)

- Existing Surface
  - Previous coating
  - Grease, dirt
  - Smooth, low porosity substrate
  - Residue from acid etching



- Excessive sticking of tyre to coating (high performance tyres)
- Adhesion disruption of coating to substrate by water
  - Via penetration from surface (standing water)
  - Via water from below (hydrostatic pressure)

## 2. Hot Tyre Pick-up Lab. Tests - Pigmented Garage Floor Paints



### Lab. Testing

- Coating dried for 7 days at RT.
- Heat car tyre to 50 °C in hot water.
- Place tyre and coated substrate in a carver press and apply 2 N/mm<sup>2</sup> for 2 hours.
- Repeat above with increasing press times until coating failure 2, 4, 6, 8, 12 hours.



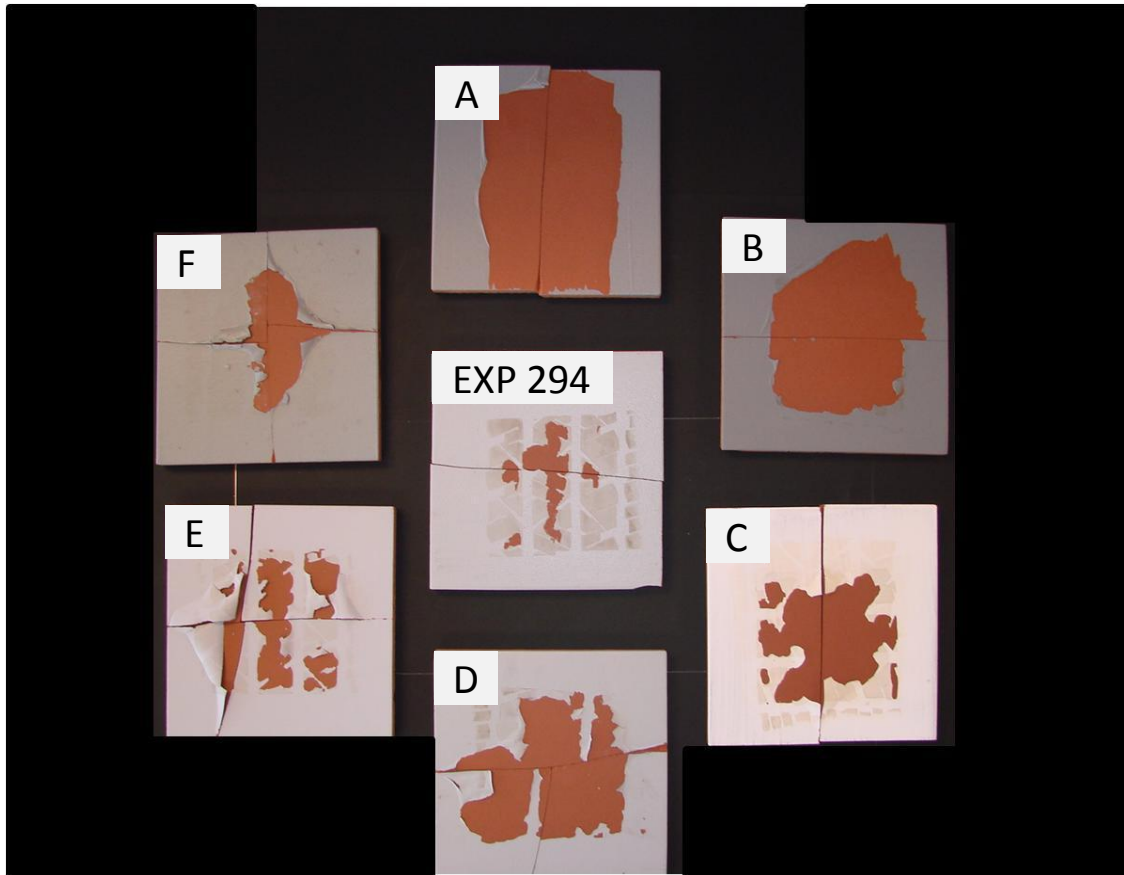
### Garage Floor Simulation

- Painted floor sections
- Park a car on it every day (drive on/ off)
- Variation in cars & tyres used

- ✓ Adhesion loss mimics the pattern of the tyre tread
- ✓ Good correlation (Test Garage)



## 2. Hot Tyre Pick-up Lab. Tests - Pigmented Garage Floor Coatings



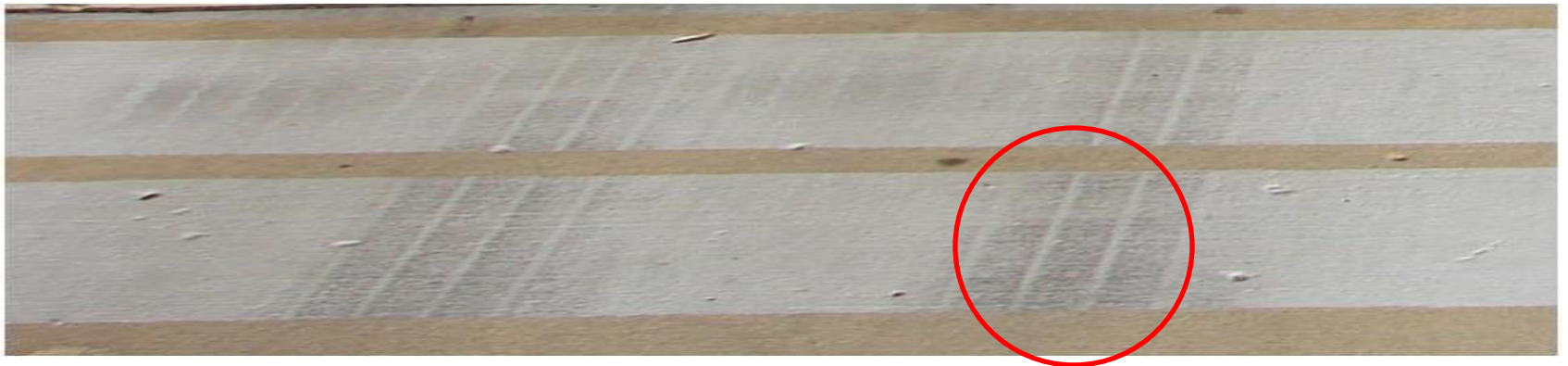
Sample	Time to Failure (hour)
A	2*
B	2*
C	4
D	6
E	4
F	2*
EXP 294 - FP1	8

Note: \* Fail dry test garage within 12 months

- ✓ <4 hour in lab test. fail test garage in less than 12 months
- ✓ EXP 294 no issues under normal daily use in a garage – 12 months data (so far)

### 3. Staining from Tyres and Dirt

- Discoloration caused by:
  - Carbon transfer from the tyre to the coating
  - Oils and plasticizers migrating from the tyre to the coating
  - Oils may darken over time
  - Dirt embedding into the surface of the coating



### 3. Dirt Resistance – Lab. Screening (ROx Slurry – 24 hour)

EXP 294 @ <35 g/L

Commercial @ 50 g/L



- Coating dried for 7 days at RT.
- After 10 mins, the material is rinsed off.

✓ Very good dirt resistance at low VOC

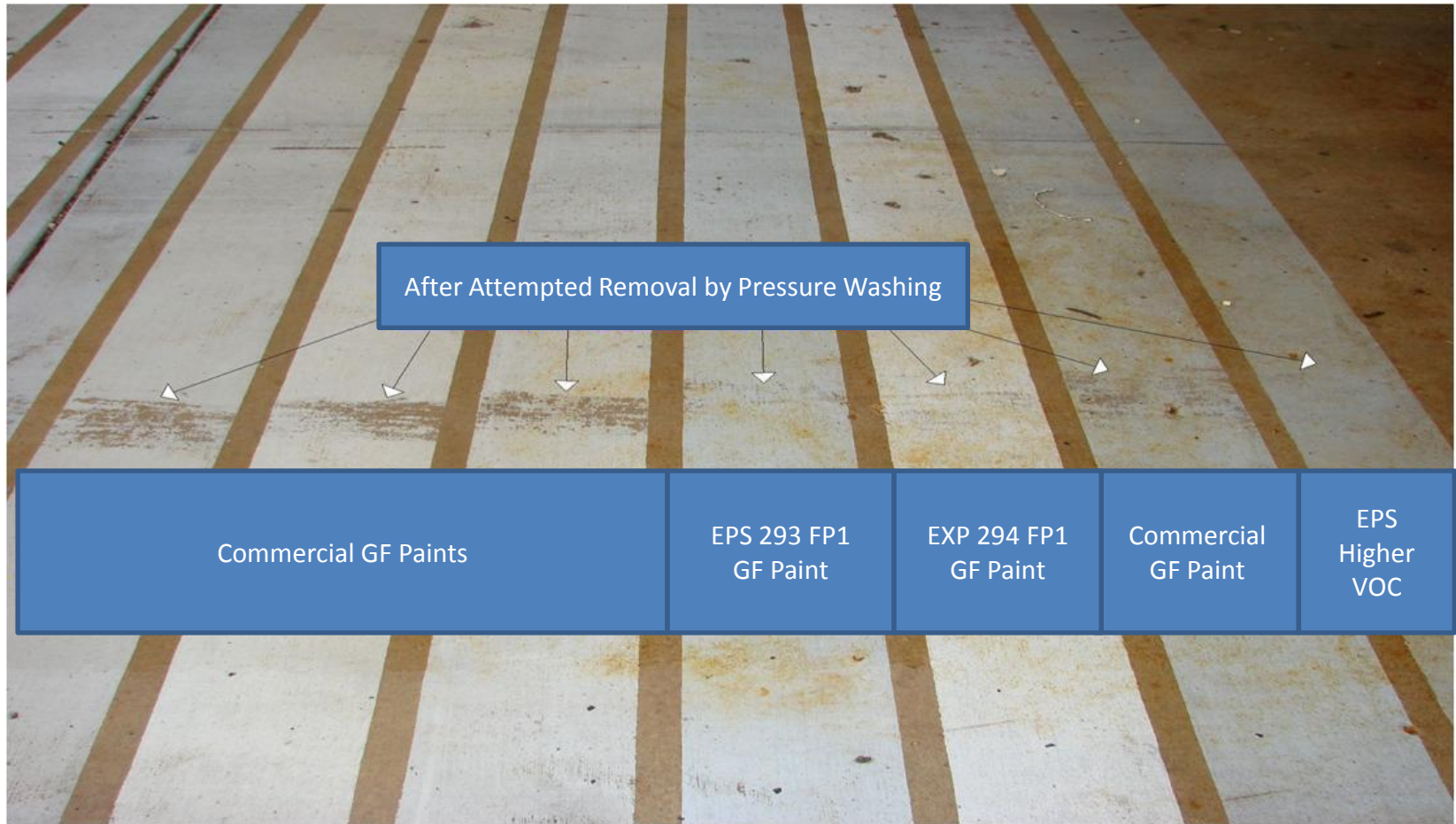
### 3. Field Study - Carbon and Dirt Transfer



✓ EXP 294 shows less dirt pick-up / staining vs. all other commercial 1K w/b paints



### 3. Cleaning - Pressure Washer Testing



✓ excellent adhesion/ erosion resistance

## 4. Discoloration, softening and delamination from Chemicals

- Prolonged exposure to chemicals may:
  - Stain the coating
  - Cause the coating to soften
  - Which may cause a change in gloss or may increase dirt pick-up
- Cause the coating to blister/ de-bond



De-bonding due to chemical exposure



## 4. Garage Chemicals - Resistance

Chemical	1 Day on Mylar	3 Days on Mylar	7 Days on Mylar	7 Days on Concrete
5% KOH	9	10	9	10
TSP/H <sub>2</sub> O	10	10	10	10
10% Acetic Acid	10	10	10	10
5% Sodium Phosphate	10	10	9	10
Floor Cleaner	9	10	9	9
5% HCL	6	6	7	9
Bleach and Water	10	10	10	10
Lysol Daily Shower	3	6	6	8
Windex	10	10	10	10
The Works Cleaner	9	9	8	9
G3 Janitorial Glass Cleaner	8	10	9	10
95 Janitorial Sink Cleaner	8	8	9	9
Windex Multi Surface	6	6	9	10
Denatured Alcohol	7	8	9	10
409	0	3	5	9
Unleaded Gasoline	6	6	9	9
Power Steering Fluid	9	10	10	10
Motor Oil	9	10	10	10
Brake Fluid	1	3	9	9
Transmission Fluid	9	10	9	10
5% Salt Solution	10	10	10	10
Antifreeze/Water 50:50	9	10	10	10

24 h spot test (10 is the best)

✓ Very good chemical resistance on concrete after 7 days drying

# Conclusions

## Next Gen. Resin for Garage Floor Paints “EXP 294”

- ✓ 1K Acrylic
- ✓ Application – brush, roller or spray
- ✓ Excellent re-coatability after short drying periods.
- ✓ Eco-label 2015 – Formulation Capable
- ✓ Low VOC capability (< 35 g/l)
- ✓ ADH Free x-linker technology
- ✓ Excellent adhesion – wet & dry
- ✓ Excellent clarity in clears & very low blush
- ✓ Excellent chemical resistance
- ✓ Suitable to apply on “green” concrete

# Thanks for your attention

Come visit us at Stand 356 in Hall 7 to find out more.....



Note: EXP 294 is now commercially available (sold under EPS® 294)  
and samples / starting formulations