

LABORATORY REPORT

Objectives:

Compare Interpolymer's recommended floor finish formula F-41-38-01 based on Megatran 220 to a leading national competitive brand "workhorse" floor finish. These workhorse products are designed to provide the end user a consistent high gloss, durable floor polish for maintenance programs where the frequency and type of burnishing will vary.

Tests Conducted:

1. ASTM bench test
2. Stress recoat testing
3. Floor test burnish at 1500 RPM with a soft synthetic pad.
4. Floor test burnish at 2000 RPM with a natural hair pad

Materials:

- Competitive national brand floor finish
- F-41-38-01 floor finish based on Megatran 220

Bench Test & Stress Recoat Testing Procedure:

The above listed finishes were evaluated side by side with the following procedures and conditions:

- The finishes were applied at the rate of 2 ml per 6" x 12" tile, for a total of seven coats.
- The finishes were applied to black vinyl and black vinyl composition tiles at 30-minute intervals.
- Tack was evaluated at 10-minute intervals by applying an angled aluminum tester with a 1-kg weight to the recently applied finish. After 10 seconds dwell time, the weight was removed. If the tester fell over, the coating was considered to be tack-free.
- Tack was evaluated at every coat.
- Applications were tested with 30-minute dry times between coats, however under 85%RH conditions dry times had to be extended by a few minutes.
- Slight variations of the 60° gloss values measured in the bench test are due to the variation in the vinyl tile substrate

A. Bench Test Results

Applied at 70°F and 45% RH - Tested at 70°F and 70%RH

TEST SAMPLES	F-41-38-01	NATIONAL BRAND
60° SPECULAR GLOSS ASTM D1455	50	42
5 Coats on BVT ASTM D1436	30,67,86,90,91	24,62,82,88,90
DEPTH OF GLOSS*	Excellent 80	Very Good 70
RUBBER HEEL MARK RESISTANCE ASTM D3714	Excellent 1.01	Good 1.04
POWDER RESISTANCE ASTM D2048	Excellent	Excellent
GARDNER SCRUB SOILING	Excellent	Good
SOILING DRUM	Very Good	Fair
TABER ABRASION TESTING	Excellent 3% wear factor	Good 7% wear factor
CRAZING	None	None
LEVELING ASTM D1436	Excellent	Excellent
RECOATABILITY ASTM D3153	Initial Final Excellent Excellent	Very Good Very Good
WATER SPOT RESISTANCE ASTMD1793	Initial Final Very Good Excellent	Good Good
DETERGENT RESISTANCE ASTM D3207	Excellent	Good
REMOVABILITY ASTM D1792	Very Good	Very Good
SLIP INDEX ASTM D2047	0.56	0.55
PENCIL HARDNESS** ASTM D3363 on glass plate	3H	3H
SNELL CAPSULE	Very Good 1.2	Good 1.3
SOLIDS ASTM D2834	25.0	25.3
VISCOSITY (cps) LVF @ 22°C	7.5	6.5
SWARD ROCKER HARDNESS ASTM D2134	26	22
pH ASTM E70	8.7	8.8

*Depth of gloss is determined by using Model GB 11-8GM Glow-Box. The method is officially known as General Motor's Engineering Standard: Test for Evaluating Distinctness of Image: GM 9101B. The higher the value the clearer the image. Values range in increments of 10, from 10-100.

***Pencil Hardness Scale*

6B-5B-4B-3B-2B-B-HB-F-H-2H-3H-4H-5H-6H

B. Tack and Haze Test Results

Five coats of finish were applied and tested. If a coat showed any degree of tack, the result was recorded. Any subsequent coats were not recorded since tack progressively increased.

Note: Tack is on a scale of 1 to 4

1=very slight
 2=slight
 3=moderate
 4=severe

70° F/ 40% RH	Haze	10 Min. Tack	20 Min. Tack	30 Min. Tack
National Brand	None	2 on 3 rd coat	None	None
F-41-38-01	None	1 on 4 th coat	None	None

70° F/ 60% RH	Haze	10 Min. Tack	20 Min. Tack	30 Min. Tack
National Brand	None	3 on 2 nd coat	2 on 2 nd coat	None
F-41-38-01	None	2 on 3 rd coat	1 on 3 rd coat	None

75° F/ 85% RH	Haze	10 Min. Tack	20 Min. Tack	30 Min. Tack
National Brand	3 rd coat	Wet	3 on 1 st coat	2 on 2 nd coat
F-41-38-01	5 th coat	Wet	2 on 1 st coat	1 on 2 nd coat

90° F/ 30% RH	Haze	10 Min. Tack	20 Min. Tack	30 Min. Tack
National Brand	None	None	None	None
F-41-38-01	None	None	None	None

90° F/ 60% RH	Haze	10 Min. Tack	20 Min. Tack	30 Min. Tack
National Brand	4 th coat	3 on 3 rd coat	2 on 3 rd coat	Slight
F-41-38-01	None	2 on 4 th coat	2 on 4 th coat	None

90° F/ 85% RH	Haze	10 Min. Tack	20 Min. Tack	30 Min. Tack
National Brand	3 rd coat	Wet	Wet	2 on 2 nd coat
F-41-38-01	5 th coat	Wet	Wet	2 on 3 rd coat

NOTE: There will always be environmental conditions under which floor finishes will behave adversely. This is not due to formulation or polymer issues, but simply an effect of temperature and humidity on the drying process. While formulations can be designed to alleviate some of these problems, there is a point at which the formulation adjustments for environmental factors will subsequently affect the floor finish performance.

C. Soiling Drum Dirt and Abrasion Resistance Testing

Substrate Preparation: Applied 3 coats of finish at 72°F and 50% RH aging 48 hours before testing

	F-41-38-01	National Brand
60° Specular Gloss reading before drum roll	90	88
60° Specular Gloss reading after drum roll	78	70
60° Specular Gloss loss	12	18
X-Rite Spectrophotometer reading before drum roll	L* 91.47 a* -.22 b* +1.65	L* 89.42 a* -.43 b* +1.88
X-Rite Spectrophotometer reading after drum roll	L* 86.96 a* +.08 b* +2.01	L* 81.62 a* +.31 b* +2.66
Abrasion rated on visual appearance and reduction in 60° specular gloss.	Very Good	Fair
Δ E	4.5	6.7

C. FLOOR TEST

PURPOSE:

Conduct floor applications under two different atmospheric conditions to determine floor finish performance characteristics.

MATERIALS TESTED:

1. National Brand
2. F-41-38-01 Floor Finish based on Megatran 220

TESTS CONDUCTED:

- Floor test evaluation with burnishing using a 1500 RPM electric machine and a soft synthetic pad
- Floor test evaluation with burnishing using a 2000 RPM propane machine and a natural hair pad

FLOOR TEST PARAMETERS:

Location: Test floor at Interpolymer Corporation in Canton, MA

Conditions of Test: June 16, 2005 (70° F / 60% RH)
June 20, 2005 (60° F / 80% RH)

Flooring: 12" x 12" Black vinyl composition tiles
12" x 12" White vinyl composition tiles
12" x 12" Black solid vinyl tiles

Floor Preparation: The floor was machine stripped with a commercial stripper and rinsed twice with water using a mop and pail.

Application of Finish: Seven coats of the finish were applied to the tile at a rate of ~1500 ft²/gallon using large orange cotton blend mops with 30 minutes drying time between coats. The first test was performed at atmospheric conditions of 70°F with a relative humidity of 60%. Air circulation was poor.

TEST RESULTS AND OBSERVATIONS:

60° Specular Gloss Build

(Measurements were taken on vinyl composition tiles)

70°F and 60% Relative Humidity:

Coats	F-41-38-01 60° Specular Gloss	National Brand 60° Specular Gloss
0	3	3
1	29	22
2	55	50
3	72	67
4	88	83
5	91	89
6	92*	90*
7	92*	91*

** 6th and 7th coat gloss is at upper end of gloss meter measuring ability. Although the gloss value did not increase appreciably, the depth of gloss and appearance did improve with the additional coats.*

Additional Floor Test Application Information at Low Temperature (60°F) and High Humidity (80% RH)

A separate application study was conducted under more adverse environmental conditions. The floor was coated on a cool humid day in early morning to take advantage of the necessary environmental conditions. Under these adverse conditions, floor finishes required 15-20 minutes longer than expected to dry. The National Brand exhibited signs of recoat issue on the 4th coat, and tack up to 25 minutes after touch dry. The F-41-38-01 did not show any recoat issue and required only 12 minutes to be tack-free. During the same day the temperature increased to 90°F with relative humidity of 85% RH. The F-41-38-01 floor finish tested well under these conditions for leveling and gloss. The National Brand also performed acceptably but did not provide the same gloss levels as the F41-38-01 finish and showed some minor recoat issues on applications subsequent to the 3rd coat.

Results of Burnishing and Observations

The results are summarized in the following tables.
 (Measurements are taken on the vinyl composition tiles)

Burnished with Blue All Purpose Pad

Conditions: 77°F and 77%RH	F-41-38-01	National Brand
Initial gloss after 1 week and before burnishing	81	80
After burnishing	91	87
Comments	No swirling; excellent rubber heel mark removal; and scuff repair	No swirling; good rubber heel mark removal; good scuff repair
Conditions: 70°F and 67%RH		
Initial gloss after 2 weeks and before burnishing	78	75
After burnishing	88	84
Comments	No swirling very good repair, and excellent removal	Slight swirling, fair repair with good removal

Burnished with Natural Hair Pad

Conditions: 77°F and 77%RH	F-41-38-01	National Brand
Initial gloss after 1 week and before burnishing	80	78
After burnishing	87	84
Comments	No swirling; excellent rubber heel mark removal; and scuff repair	Slight swirling; good rubber heel mark removal; fair scuff repair
Conditions: 70°F and 67%RH		
Initial gloss after 2 weeks and before burnishing	78	74
After burnishing	88	82
Comments	No swirling, very good repair, excellent removal of rubber heel marks	Slight swirling, fair repair, very good removal of rubber heel marks

FLOOR FINISH BASED ON MEGATRAN® 220

Formulation F-41-038-01 @ 25% N.V.

Mix in Order Listed:

	<u>Pounds</u>	<u>Weight %</u>
Water	277.61	32.28
Bactericide	Q.S.	Q.S.
Premixed:		
Tributoxyethyl Phosphate	26.39	3.07
Diethylene Glycol Ethyl Ether (low gravity)	52.78	6.14
1% Masurf FS230	6.28	0.73
Megatran 220 @ 38% N.V.	446.41	51.91
Syntran 6160 @ 35% N.V.	26.93	3.13
Syntran PA-1445 @ 40% N.V.	23.60	2.74
Defoamer	Q.S.	Q.S.
YIELD:	860.00	100.00%

pH: 8.6 ± 0.2

Polymer/Resin/Wax Ratio: 90 / 0 / 10

2005