



Engineering Report 42841-2

Cleaning Efficiency Test

for

Nilfisk-Advance

Prepared by

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Revision history

Revision	Total number of pages	Date	Description
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Prepared for: Nilfisk-Advance Attention: Mr. Kipp Knutson	Test dates	
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Cleaning Efficiency Test

1.0 Abstract

1.1 Object

Subject one Floor Cleaning Machine to a Cleaning Efficiency Test as specified in Nilfisk-Advance *Cleaning Efficacy Testing Protocol for Tennant ech20™ System*, Revision C, dated August 19, 2010, as requested in Nilfisk-Advance purchase order 101018371, dated July 20, 2010.

1.2 Conclusions

The test was conducted as per customer instructions. Upon completion of testing, the test unit was retained at Environ Laboratories LLC.

2.0 Unit(s) tested

Table 2-1: Units tested

Device	One (1) Floor Cleaning Machine
Model/part number	Tennant Model T5 with ech20™ system installed
Serial number	T5-10489285

The results of this test apply only to the units identified in this Engineering Report by device identifier and model / part number, or serial number.

3.0 Test requested

Subject one Floor Cleaning Machine to a Cleaning Efficiency Test as specified in Nilfisk-Advance *Cleaning Efficacy Testing Protocol for Tennant ecH2O™ System*, Revision C, dated August 19, 2010.

General requirements

- 1 Perform tests using water and ecH2O™ system before tests using chemicals to prevent possible contamination of water-only tests with residual chemical (*Cleaning Efficacy Testing Protocol for Tennant ecH2O™ System*).
- 2 After testing with chemicals, the machine solution system should be thoroughly flushed to remove any residual chemical. This should be accomplished by:
 - A Completely drain the solution tank,
 - B Flush the tank with cold water until there is no sign of chemical suds,
 - C Flush the tank with hot or warm water to remove any remaining residue,
 - D Fill the tank with approximately five gallons of hot or warm water,
 - E Run the scrubber for approximately three minutes at maximum solution flow with the ecH2O™ module OFF followed by three minutes with the ecH2O™ module on (*Cleaning Efficacy Testing Protocol for Tennant ecH2O™ System*).
- 3 Floor type and sample area
 - A Commercial vinyl tiles, smooth surface, white, 12" by 12" applied to flat substrate. Armstrong Excelon 56830 Chalk II or equivalent.
 - B Hardiebacker 500 or equivalent product is recommended for the tile mounting substrate.
 - C Each test sample area to be 24" square (4 tiles).
 - D Number of samples to test: 6 per cleaning agent (24 tiles per test).
 - E Total recommended test surface area 8' wide by 24' long, see Figure 3-1 (*Cleaning Efficacy Testing Protocol for Tennant ecH2O™ System*, Figure 2).
- 4 Machine configuration, *Cleaning Efficacy Testing Protocol for Tennant ecH2O™ System*
 - A Tennant model T5 (28" disc scrub head) with ecH2O™ option.
 - B Scrub pressure setting: 1 of 3 (light / economy scrub).
 - C Solution flow rate, conventional mode (ecH2O™ off): 1 of 3. (0.3 GPM per Tennant specifications). Verify flow rate by capturing output for 30 seconds.
 - D Solution flow rate ecH2O™ mode (ecH2O™ on): fixed. (0.22 GPM per Tennant specifications). Verify flow rate by capturing output for 30 seconds.
 - E Fill solution tank to level specified in the specific procedure. The solution flow rate on gravity-feed systems is affected by the solution level in the tank.
 - F Travel speed: 2.5 ft/sec (1.7 MPH - 0.762 m/sec). Place mark on the speed limit control knob for future reference.
 - G Pad type (two new pads for each cleaning agent test): 3M – red, 14 inch. Place pads on machine with unmarked side down.
 - H Batteries are to be fully charged prior to testing.
 - I A calibrated voltmeter with at least 0.1 volt resolution should be connected to the battery terminals of the scrubber. The voltmeter must be readable when operating the machine.

- 5 Tile Preparation
 - A Follow manufacturer's recommendations for all floor coating chemicals.
 - B Previously used tiles are to be prepared by stripping any existing coatings using Hillyard Devastator (HIL0014706) commercial floor stripping agent. This is not required if the tiles are new.
 - C New or stripped tiles should be coated with a commercial tile sealer. Hillyard Seal #341 (HIL0034106) is recommended.
 - D Tiles are to then be coated with three layers of a commercial floor finish. Hillyard Northstar (HIL0052806) floor finish recommended. Floor finish should be applied as evenly and smoothly as possible.
 - E Gloss and colorimeter readings are to be taken of the finished floor tiles prior to soiling. Refer to Figure 3-2 (*Cleaning Efficacy Testing Protocol for Tennant ecH2O™ System*, Figure 1) for sampling areas. Floor finish must be fully cured prior to taking readings.
 - F Average gloss readings per tile are to fall within a $\pm 12.0\%$ tolerance range for unsoiled tiles. This tolerance is based on the median gloss value of all unsoiled tiles used in the test. Prepared tiles should be distributed among the tests such that the average gloss value for all tiles in a particular test are within 5% of the tiles used in each of the other tests.
 - G Average colorimeter readings per tile are to fall within a $\pm 2\%$ tolerance range for unsoiled tiles. This tolerance is based on the median grayscale value of all unsoiled tiles used in the test.
 - H Soil test panels to be marked with the test name and sequence prior to executing the test.
- 6 Soil composition
 - A *ASTM D4488* (particulate and oily soil – Section A5). See also Tables 4-3 and 4-4.
- 7 Soil application
 - A Modification of *ASTM D4488* (Section A5) method is required to cover large area. Template shall have a 3.5 inch by 12 inch opening. Soil to be applied per Figure 3-2.
 - B Place 262 mg of the particulate soil on the tile inside the template cutout area.
 - C Apply 25 drops of the oily blend on the particulate soil. Mix and spread the soil evenly within the cutout area.
 - D Soil is to be applied using a 2 inch foam paint applicator.
 - E All soiled tiles should have roughly equivalent drying times before use – for example do not soil tiles on day one and then use some of these tiles on days two and three.
 - F Tiles should be allowed to air dry 24 hours prior to cleaning. Adjust drying times for low temperature or high humidity conditions.
 - G Gloss and colorimeter readings are to be taken of the soiled floor tiles prior to cleaning. Refer to Figure 3-2 for sampling areas. This should only be done after the drying period.
 - H Average gloss readings per tile are to fall within a $\pm 2\%$ tolerance range. This tolerance is based on the median gloss value of all soiled tiles used in the test.
 - I Average colorimeter readings per tile are to fall within a $\pm 7\%$ tolerance range. This tolerance is based on the median grayscale value of all soiled tiles used in the test.

- 8 Soil Removal
 - A Single pass of scrubber over test panels.
 - B Use masking tape guide marks just outside of scrub head path to assist in correct positioning of scrub head over soil sample areas.

Soil removal test 1 – Tap water – ech2O™ unit OFF, (*Cleaning Efficacy Testing Protocol for Tennant ech2O™ System*)

- 1 Verify that there are approximately 11 gallons (40 to 43 liters) of tap water in the solution tank. Water temperature should be between 60° to 75°F (15° to 24°C).
- 2 Drain approximately 1/4 gallon (1 liter) from tank via solution drain hose.
- 3 Take water sample measurements from the solution in the tank – draw from solution drain hose. Record measurements in Table 3-1 (*Cleaning Efficacy Testing Protocol for Tennant ech2O™ System*, Table 1).
- 4 Verify that the speed limit control is set to the predetermined position for the required travel speed.
- 5 Install new 3M red scrub pads on the machine.
- 6 Install new soil test panel(s) in the scrub path.
- 7 Position machine in the start area.
- 8 Verify that ech2O™ system is **OFF**.
- 9 Activate the scrub system by pressing the green scrub on/off button.
- 10 Verify that scrub pressure is set to 1 of 3 (economy - light pressure).
- 11 Verify that the solution flow is set for 1 of 3 (economy – low flow).
- 12 Lower the squeegee.
- 13 Pull the control handle bail all the way rearward and scrub the open area for at least 20 seconds prior to scrubbing the sample areas. This is to insure that the desired solution is reaching the scrub head.
- 14 At the start of this 20 second period, record the battery voltage.
- 15 With the machine up to speed, run the machine over the test area(s).
- 16 Perform the next two steps for each remaining sample in test:
 - 16.1 Install new soil test panel / tiles.
 - 16.2 Repeat from step 15 until all 6 samples have been completed.
- 17 Deactivate the scrub system by pressing the green scrub on / off button.
- 18 Retrieve any remaining solution on the floor using the machine.
- 19 Raise the squeegee.
- 20 Wipe squeegee blade to remove any residual soil.

Soil removal test 2 – Tap water – ech2O™ unit on, (*Cleaning Efficacy Testing Protocol for Tennant ech2O™ System*)

- 1 If immediately following test 1 then skip to step 5.
- 2 Verify that there are approximately 11 gallons (40 to 43 liters) of tap water in the solution tank. Water temperature should be between 60° to 75°F (15° to 24°C).
- 3 Drain approximately 1/4 gallon (1 liter) from tank via solution drain hose.

- 4 Take water sample measurements from the solution in the tank – draw from solution drain hose. Record measurements in Table 3-1.
- 5 Verify that the speed limit control is set to the predetermined position for the required travel speed.
- 6 Install new 3M red scrub pads on the machine.
- 7 Install new soil test panel(s) in the scrub path.
- 8 Position machine in the start area.
- 9 Verify that echH₂O™ system is **ON**.
- 10 Activate the scrub system by pressing the green scrub on / off button.
- 11 Verify that scrub pressure is set to 1 of 3 (economy - light pressure).
- 12 The solution flow rate is controlled by the echH₂O™ system. No adjustment required.
- 13 Lower the squeegee.
- 14 Pull the control handle bail all the way rearward and scrub the open area for at least 20 seconds prior to scrubbing the sample areas. This is to insure that the desired solution is reaching the scrub head.
- 15 At the start of this 20 second period, record the battery voltage.
- 16 With the machine up to speed, run the machine over the test area(s).
- 17 Perform the next two steps for each remaining sample in test:
 - 17.1 Install new soil test panel / tiles.
 - 17.2 Repeat from step 16 until all 6 samples have been completed.
- 18 Deactivate the scrub system by pressing the green scrub on / off button.
- 19 Retrieve any remaining solution on the floor using the machine.
- 20 Raise the squeegee.
- 21 Wipe squeegee blade to remove any residual soil.
- 22 At the front of the machine, disconnect the quick coupling in the echH₂O™ solution supply line and draw approximately 200 mL of fluid from the system. The echH₂O™ system and scrub system needs to be turned on. Use this sample to take the water property data for the 'tap water – echH₂O™ on' portion of the data table in Table 3-3 (*Cleaning Efficacy Testing Protocol for Tennant echH₂O™ System, Table 2*).
- 23 Reconnect the solution line.

Soil removal test 3 – Cleaner / degreaser – echH₂O unit off, (*Cleaning Efficacy Testing Protocol for Tennant echH₂O™ System*)

- 1 Verify that there are approximately 11 gallons (40 to 43 liters) of tap water and cleaner / degreaser mixture in the solution tank. Solution temperature should be between 60° to 75°F (15° to 24°C). Mix chemical according to manufacturer's recommendations for low-flow or heavy cleaning. Record the mix ratio used. Chemical to use: Hillyard Arsenal #17 degreaser at 6 oz. per gallon (30 oz. for 5 gallons).
- 2 Drain approximately 1/4 gallon (1 liter) from tank via solution drain hose.
- 3 Take water sample measurements from the solution in the tank – draw from solution drain hose. Record measurements in Table 3-1.
- 4 Verify that the speed limit control is set to the predetermined position for the required travel speed.

- 5 Install new 3M red scrub pads on the machine.
- 6 Install new soil test panel(s) in the scrub path.
- 7 Position machine in the start area.
- 8 Verify that eCH2O™ system is **OFF**.
- 9 Activate the scrub system by pressing the green scrub on / off button.
- 10 Verify that scrub pressure is set to 1 of 3 (economy - light pressure).
- 11 Verify that the solution flow is set for 1 of 3 (economy – low flow).
- 12 Lower the squeegee.
- 13 Pull the control handle bail all the way rearward and scrub the open area for at least 20 seconds prior to scrubbing the sample areas. This is to insure that the desired solution is reaching the scrub head.
- 14 At the start of this 20 second period, record the battery voltage.
- 15 With the machine up to speed, run the machine over the test area(s).
- 16 Perform the next two steps for each remaining sample in test.
 - 16.1 Install new soil test panel / tiles.
 - 16.2 Repeat from step 15 until all 6 samples have been completed.
- 17 Deactivate the scrub system by pressing the green scrub on / off button.
- 18 Retrieve any remaining solution on the floor using the machine.
- 19 Raise the squeegee.
- 20 Wipe squeegee blade to remove any residual soil.
- 21 Completely drain and flush the solution tank with warm water.
- 22 Flush the solutions lines by running machine for 30 seconds with warm water in the solution tank.

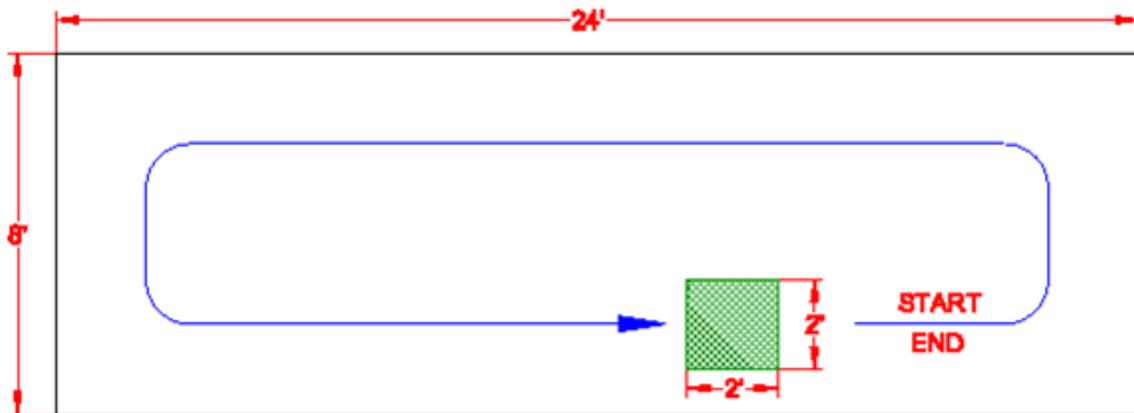


Figure 3-1: Test track configuration (*Cleaning Efficacy Testing Protocol for Tennant eCH2O™ System, Figure 2*)

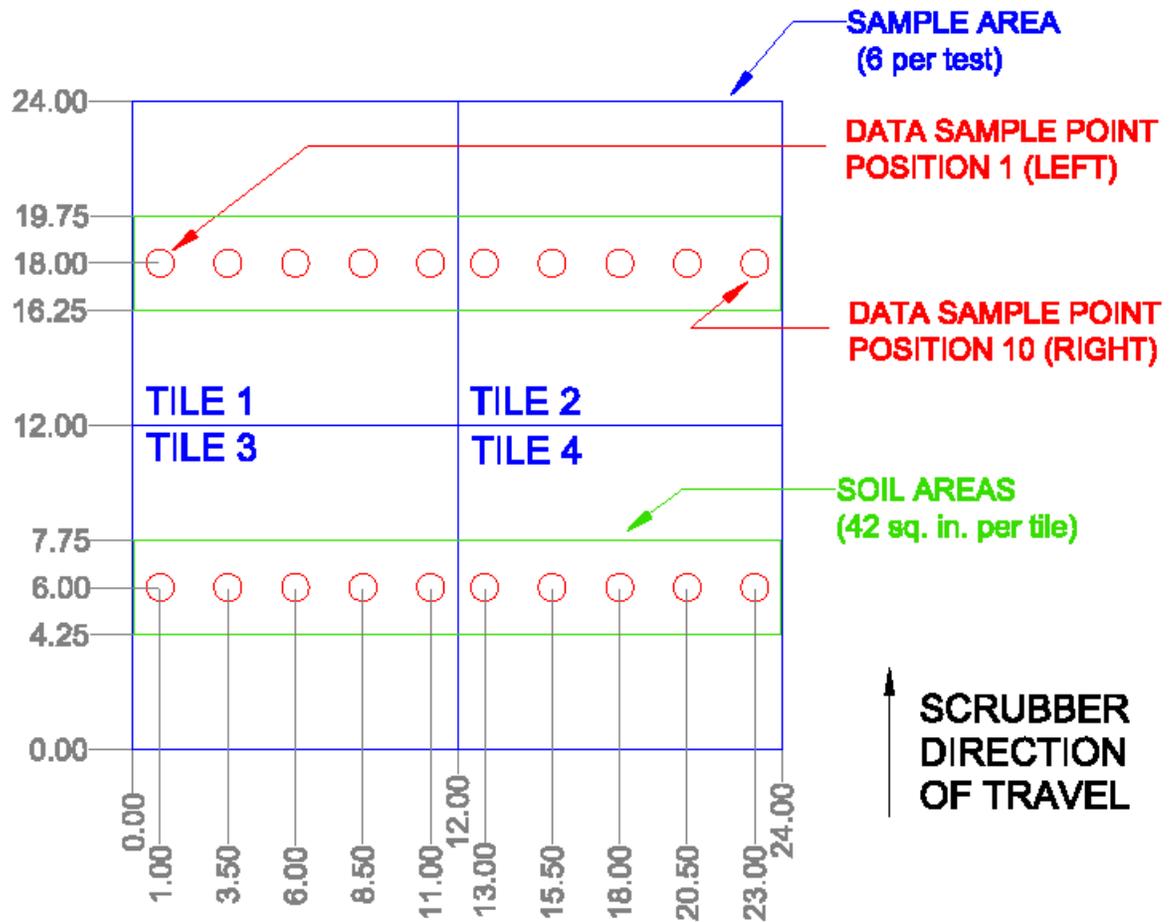


Figure 3-2: Soil application and data sampling area (*Cleaning Efficacy Testing Protocol for Tennant ech20™ System, Figure 1*)

Table 3-1: Input water measurements (Cleaning Efficacy Testing Protocol for Tennant ech20™ System, Table 1)

Input water measurements	Tap water – ech20™ off	Tap water – ech20™ on
Total dissolved solids (TDS) [ppm]		
Free chlorine [ppm]		
Total chlorine [ppm]		
pH		
Temperature [°C]		

Table 3-2: Output water measurements (Cleaning Efficacy Testing Protocol for Tennant ech20™ System, Table 2)

Output water measurements	Tap water – ech20™ off	Tap water – ech20™ on
Total dissolved solids (TDS) [ppm]		
Free chlorine [ppm]		
Total chlorine [ppm]		
pH		
Temperature [°C]		

Table 3-3: Measured solution flow rates, Tennant T5

Measured solution flow rates [mL/min]	ech20™ off	ech20™ on

4.0 Instrumentation, procedure, and results

4.1 Instrumentation

All instrumentation is calibrated regularly by instruments directly traceable to the National Institute of Standards and Technology, and in accordance with MIL-I-45208A, ANSI/NCSL Z540.3-2006, and ISO/IEC 17025: 2005.

Table 4-1: Environ instrumentation list

Equipment Number	Description	Manufacturer	Model Number	Last Calibration	Due Calibration	Range
120-005	Novo-Gloss Calibration Tile	Rhpoint Instruments	B2000-345/NG60	3/30/2010	3/30/2011	60 Degrees; 0 to 100
200-230	Digital Thermometer	Fluke	52 II	7/8/2010	7/8/2011	-250° to +400°C
210-068	Digital Multimeter	Fluke	87 III	4/29/2010	4/29/2011	0 to 40 VDC
400-047	Stopwatch	Extech Instruments	365510	11/23/2009	11/23/2010	0 to 23 hrs 59 mins 59 sec
490-044	pH-ISE METER	Orion	290A	8/5/2010	8/5/2011	pH -2.0 to +19.999
730-019	AT Balance	Mettler	AT400	6/24/2010	6/24/2011	0 to 405g
770-049	Measuring Tape	Lufkin	HW226	8/26/2010	8/26/2011	0 to 100 feet

Table 4-2: Additional instrumentation list

Equipment Number	Description	Manufacturer	Model Number	Serial Number	Due Calibration
R120-001	Spectrophotometer	Xrite	SP60	003109	5/20/2011
R490-001	Chlorine measurement photometer	Industrial Test Systems	Exact micro 7+	M00001372	N/A
R186-015A	DPD-1 Free chlorine test strips	Industrial Test Systems	N/A	N/A	N/A
R186-015B	DPD-3 Total chlorine test strips	Industrial Test Systems	N/A	N/A	N/A
R490-002	Total dissolved solids (TDS) and temperature meter	Hanna Instruments combination meter	HI98129	N/A	N/A

4.2 Procedure

Three test sequences were performed in accordance with the customer instructions in Section 3.0 of this report. A floor scrubbing machine was tested; the Tennant T5 with eCH₂O™ system installed (henceforth referred to as Tennant T5).

White commercial vinyl tiles, measuring 12-inches by 12-inches, were purchased for this test. Each of the three test sequences used 24 tiles. Prior to testing, the tiles were coated with a commercial tile sealer. The tiles were then coated with three layers of a commercial floor finish. Gloss and colorimeter readings were taken of the finished floor tiles prior to soiling.

The test samples were soiled with particle and oil blend mixtures prepared in accordance with *ASTM D 4488*, Section A5. The ingredients were precisely calculated and measured prior to testing.

Table 4-3: Soil calculator used for soil particulate soil

Component	Weight %	Grams	
		Desired	Actual
Natural humus	38.0	33.516	33.538
Used crankcase motor oil	1.5	1.323	1.352
Portland cement	17.7	15.611	15.613
Silica	18.0	15.876	15.900
Iron Oxide	0.3	0.265	0.271
Stearic acid	2.0	1.764	1.756
Oleic acid	2.0	1.764	1.777
Paraffin oil	1.0	0.882	0.915
Carbon, lampblack	1.5	1.323	1.334
Bandy black clay (black charm clay – Spinks Co.)	18.0	15.876	15.874

Table 4-4: Soil calculator used for oil blend

Component	Parts	Quantity using pipet (0.5 to 5 mL)		
		Weight / Pipet Setting	Repeat X times	Actual mL
Vegetable shortening	1	2.537 grams	1	2.5404 grams
SEA 10 motor oil	1	2.760	1	2.760
Paraffin oil	1	2.760	1	2.760
Olive oil	3	4.135	2	8.270
Linoleic acid	3	4.135	2	8.270
1-octadecene	3	4.135	2	8.270
Squalene	3	4.135	2	8.270
Kerosene	12	4.730	7	33.110
Stoddard solvent	12	4.730	7	33.110

After preparing the particulate soil, 262 mg was placed on each tile within the designated area. Next, 0.64 mL (equivalent to 25 drops) of the oily blend was applied to the particulate soil. The contaminants were mixed and spread evenly over the test area. The soil was applied using a 2-inch foam paint applicator. The tiles were then given a 24-hour drying period. Gloss and colorimeter readings were taken of the soiled tiles prior to cleaning.

The first test was soil removal using the Tennant T5 unit with tap water and the ecH2O™ turned off. Eleven gallons of tap water was poured into the solution tank. The water was between 60° and 75°F (15° to 24°C). Next, approximately 1/4 gallon water was drained from the tank via the drain hose. Water samples were taken and recorded in Table 3-1. 3M red scrub pads were installed on the Tennant T5. The ecH2O™ system remained off while the scrub system was activated. The scrub pressure was set to 1 (of 3) and the solution flow was set to 1 (of 3). The actual flow rates were recorded (see Table 4-9). Prior to scrubbing the tiles, the T5 scrubbed an open area for 20 seconds to insure the desired solution was reaching the scrub head. At the start of the 20-second period the battery voltage was recorded. The T5 was then run over the floor tile sample area. The floor tile sample area consisted of 4 tiles. The T5 was run over the sample area six times for a total of 24 soiled tiles. The scrub system was then deactivated. Between each test, the entire test area was scrubbed. The scrub pads were flipped over and the floor surface was scrubbed until it looked clean.

The second test was soil removal using the Tennant T5 unit with tap water and the ecH2O™ turned on. The above procedure was followed with the exception that when the scrub system was activated the ecH2O™ system was also turned on. After finishing the test and deactivating the scrub system the quick coupling in the T5 solution supply line was disconnected. Approximately 200 mL of fluid was drawn from the system. The water sample property data was entered in the “Tap water - ecH2O™ on” portion of Table 3-1. The solution line was reconnected. With each new test, new 3M red scrub pads were installed on the machine.

The third test was soil removal using the Tennant T5 unit with detergent (Hillyard Arsenal #17 degreaser) and the ecH2O™ turned off. Prior to beginning the test, a cleaner / degreaser mixture was combined with the 11 gallons of tap water in the Tennant T5 solution tank. In accordance with the manufacturer’s instructions, the solution temperature was between 60° and 75°F (15° to 24°C). The procedure from the previous two tests was then followed.

4.3 Results

The test was conducted as per customer instructions. Upon completion of testing, the test units were retained at Environ Laboratories, LLC.

Cleaning efficiencies were calculated using the formula from *ASTM D 4488*, Section A5:

$$\% \text{ cleaning efficiency} = \frac{(\text{data value of cleaned tile} - \text{data value of soiled tile})}{(\text{data value of tile before soiling} - \text{data value of soiled tile})}$$

Table 4-5: Soil removal test summary, Tennant T5, Gloss meter data

Test	Cleaning Efficiency Sample						Cleaning Efficiency		Average Gloss Readings		
	1	2	3	4	5	6	Average	Median	Initial	Soiled	Cleaned
Tennant T5, tap water, echH2O™ off	40	24	19	18	14	12	21.2	18.1	86	2	20
Tennant T5, tap water, echH2O™ on	32	22	9	9	8	9	14.7	9.0	87	2	15
Tennant T5, detergent, echH2O™ off	59	46	35	34	31	28	38.9	34.2	86	3	35

Table 4-6: Soil removal test summary, Tennant T5, Average cleaning efficiency by position – gloss method

Test	Position										
	1	2	3	4	5	6	7	8	9	10	
Tennant T5, tap water, echH2O™ off	21	21	21	21	21	21	21	21	21	21	21
Tennant T5, tap water, echH2O™ on	15	15	15	15	15	15	15	15	15	15	15
Tennant T5, detergent, echH2O™ off	39	39	39	39	39	39	39	39	39	39	39

Table 4-7: Soil removal test summary, Tennant T5, Spectrophotometer (color meter) data

Test	Cleaning Efficiency Sample						Cleaning Efficiency		Average Color Readings		
	1	2	3	4	5	6	Average	Median	Initial	Soiled	Cleaned
Tennant T5, tap water, echH2O™ off	93	86	81	80	75	72	81.0	80.4	91	48	83
Tennant T5, tap water, echH2O™ on	90	83	67	63	65	63	71.9	65.9	91	48	79
Tennant T5, detergent, echH2O™ off	96	93	87	86	86	84	88.7	86.6	91	48	86

Table 4-8: Soil removal test summary, Tennant T5, Average cleaning efficiency by position – color method

Test	Position									
	1	2	3	4	5	6	7	8	9	10
Tennant T5, tap water, ecH2O™ off	81	81	81	81	81	81	81	81	81	81
Tennant T5, tap water, ecH2O™ on	72	72	72	72	72	72	72	72	72	72
Tennant T5, detergent, ecH2O™ off	89	89	89	89	89	89	89	89	89	89



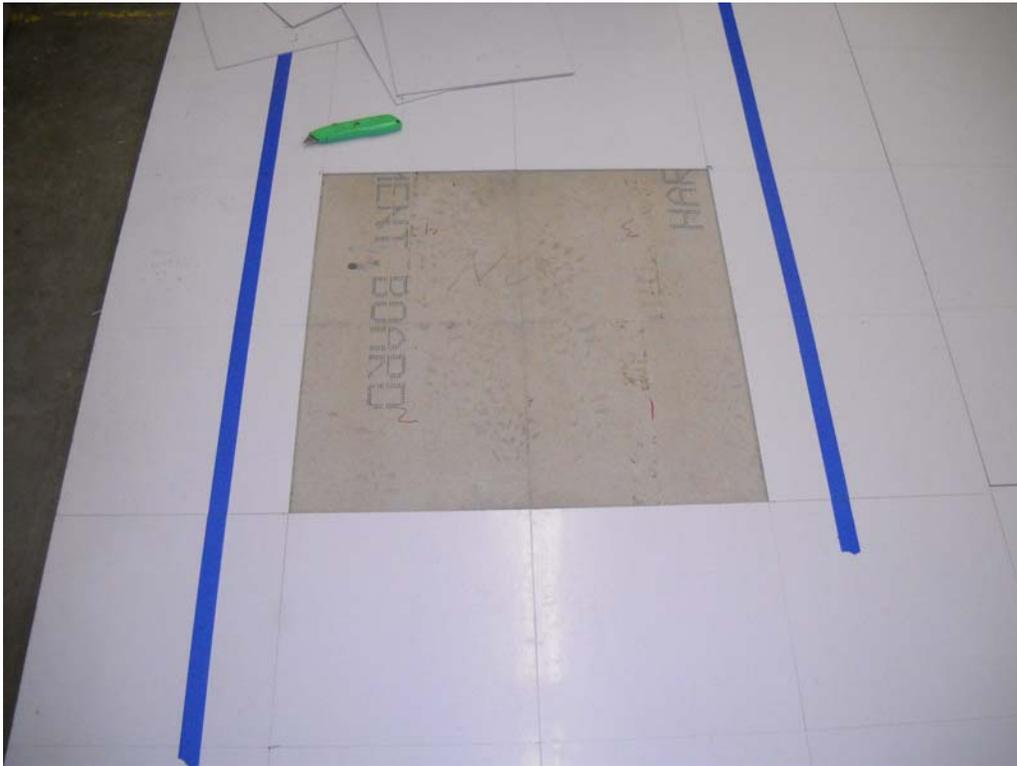
Photograph 4-1: Test unit identification for Tennant ech2O™



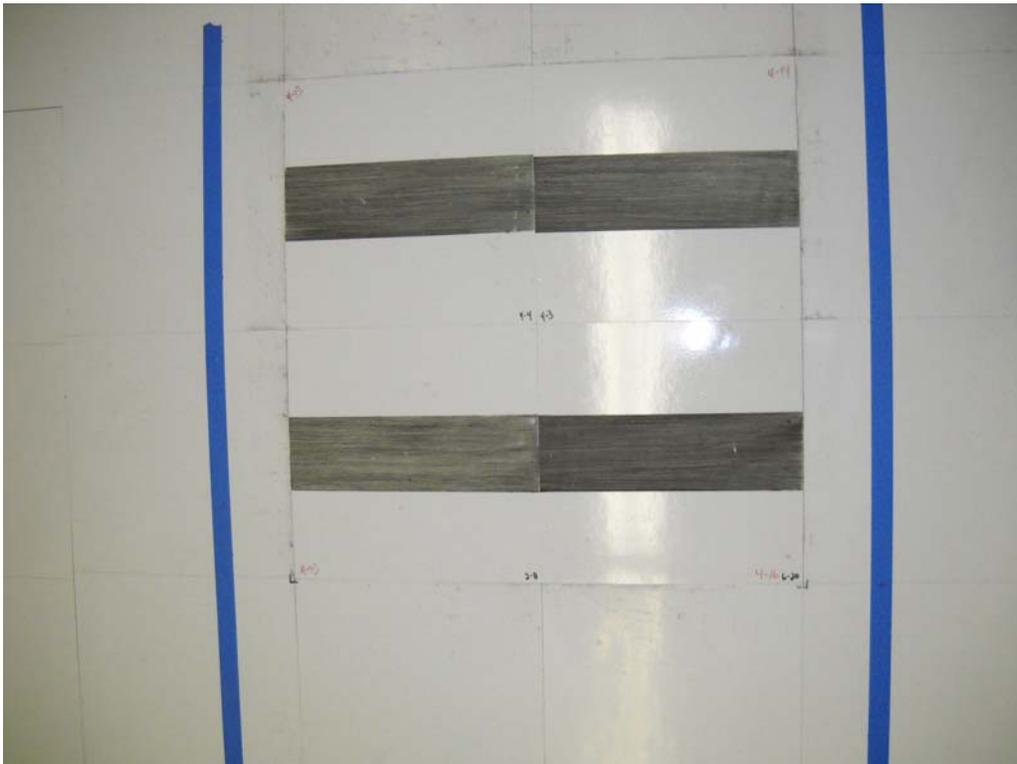
Photograph 4-2: Typical water flow measurement setup



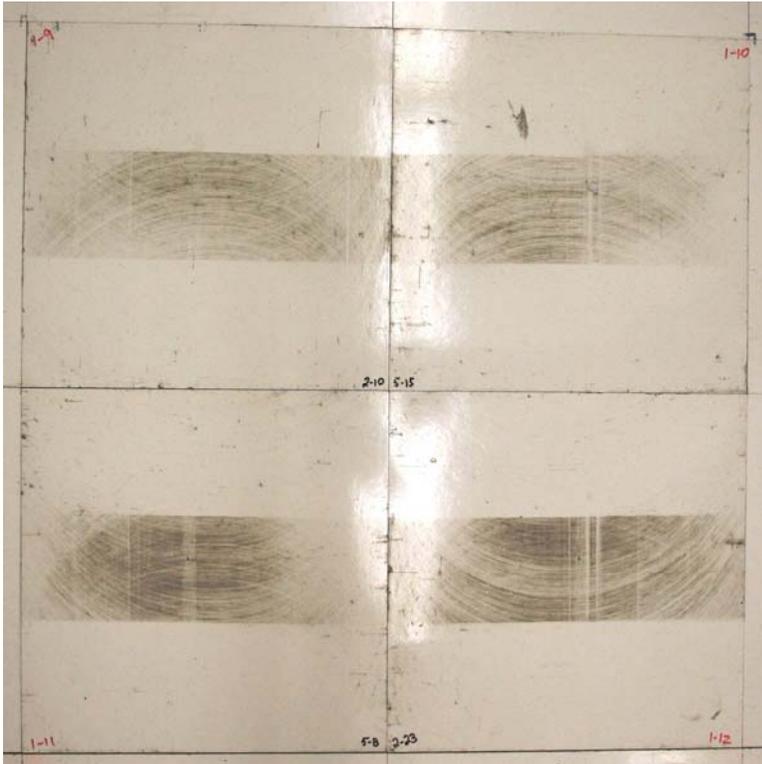
Photograph 4-3: Test area



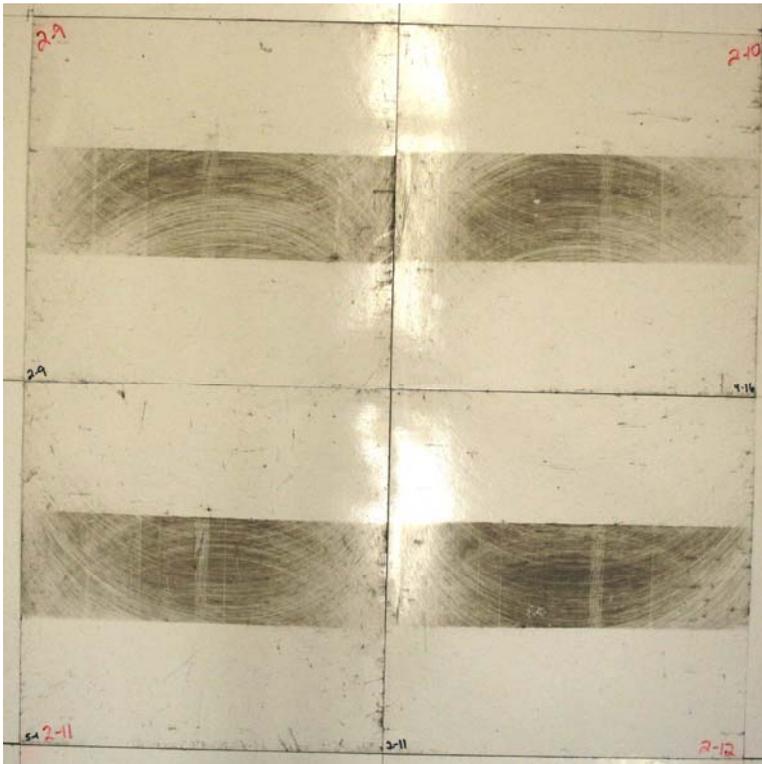
Photograph 4-4: Test area, tiles removed



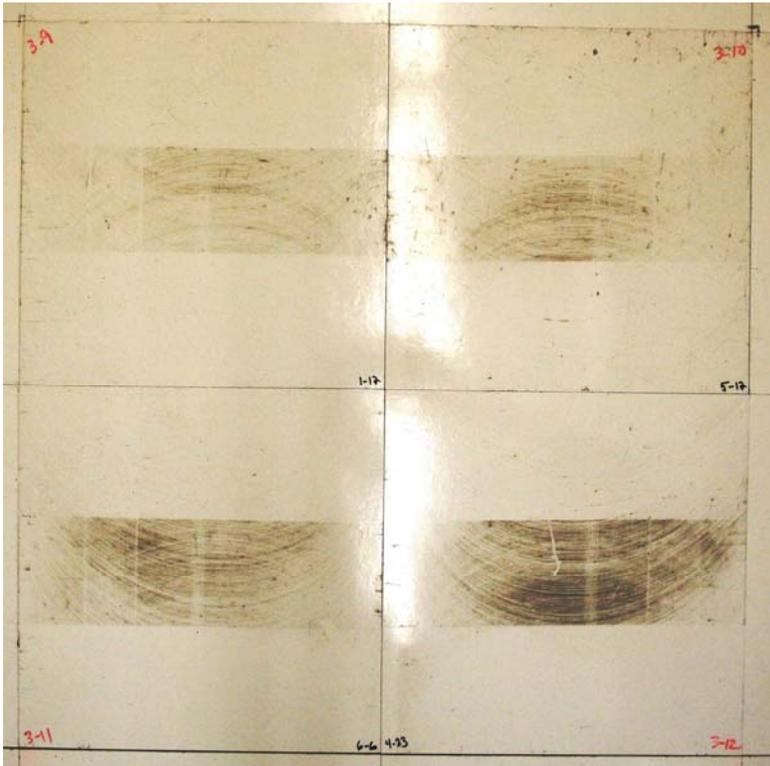
Photograph 4-5: Typical test area before test



Photograph 4-6: Representative photo of test 1, post cleaning



Photograph 4-7: Representative photo of test 2, post cleaning



Photograph 4-8: Representative photo of test 3, post cleaning

Table 4-9: Input water measurements, results (Cleaning Efficacy Testing Protocol for Tennant ech20™ System, Table 1)

Input water measurements	Tap water – ech20™ off	Tap water – ech20™ on	Cleaner / degreaser
Total dissolved solids (TDS) [ppm]	110	110	--
Free chlorine [ppm]	0.16	0.16	--
Total chlorine [ppm]	1.58	1.58	--
pH	8.18	8.18	11.31
Temperature [°C]	18.3	18.3	20.7

Table 4-10: Output water measurements, results (Cleaning Efficacy Testing Protocol for Tennant ech20™ System, Table 2)

Output water measurements	Tap water – ech20™ off	Tap water – ech20™ on	Cleaner / degreaser
Total dissolved solids (TDS) [ppm]	--	116	--
Free chlorine [ppm]	--	0.22	--
Total chlorine [ppm]	--	1.37	--
pH	--	8.35	--
Temperature [°C]	--	21.0	--

Table 4-11: Measured solution flow rates, Tennant T5

Measured solution flow rates [mL/min]	ech20™ off	ech20™ on
	1285	850

Table 4-12: Measured battery voltage, Tennant T5

	Tap water – ech20™ off	Tap water – ech20™ on	Cleaner / degreaser
Measured battery voltage [volts]	24.3	24.2	24.17

Table 4-13: Soil removal test 1 – Gloss and color meter readings for the Tennant T5, tap water, ech2O™ off

INITIAL TILE READINGS											SOILED TILE READINGS											CLEANED TILE READINGS											Average Cleaning Efficiency %								
Initial Gloss Readings - Overall Average = 86											Soiled Gloss Readings - Overall Average = 2											Cleaned Gloss Readings - Overall Average = 20											Overall Average All Tiles = 21								
Position Number											Position Number											Position Number																			
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10												
Sample Area 1 - Gloss Average = 86											Sample Area 1 - Gloss Average = 2											Sample Area 1 - Gloss Average = 36											Sample Area 1 = 40								
Tile 1 Avg = 87	88.2	87.4	83.8	88.2	86.2	84.9	86.4	86.4	85.2	86.7	Tile 1 Avg = 3	2.8	2.9	2.7	2.6	2.6	2.2	1.8	1.7	1.8	1.7	Tile 1 Avg = 37	51.9	40.2	31.3	27.6	32.8	42.5	30.4	29.6	37.3	49.2	Tile 1 = 41								
Tile 2 Avg = 86											Tile 2 Avg = 2												Tile 2 Avg = 38											Tile 2 = 43							
Tile 3 Avg = 87	87.1	85.8	87.8	86.8	86.2	85.8	86.0	86.7	86.2	83.2	Tile 3 Avg = 2	2.1	2.1	2.1	2.1	2.0	2.2	2.5	2.5	2.1	2.2	Tile 3 Avg = 39	51.5	26.5	31.9	28.9	54.9	56.3	26.3	13.7	16.5	45.8	Tile 3 = 43								
Tile 4 Avg = 86											Tile 4 Avg = 2												Tile 4 Avg = 32											Tile 4 = 35							
Sample Area 2 - Gloss Average = 87											Sample Area 2 - Gloss Average = 3											Sample Area 2 - Gloss Average = 23											Sample Area 2 = 24								
Tile 5 Avg = 87	87.8	88.4	85.8	87.2	88.2	89.2	89.9	88.5	88.5	89.0	Tile 5 Avg = 2	1.7	1.7	1.7	1.7	1.9	2.9	3.2	3.2	3.1	3.2	Tile 5 Avg = 26	37.5	25.5	16.6	15.3	33.5	33.4	25.2	14.7	27.1	43.8	Tile 5 = 28								
Tile 6 Avg = 89											Tile 6 Avg = 3												Tile 6 Avg = 29											Tile 6 = 30							
Tile 7 Avg = 85	86.5	84.8	85.9	86.0	83.2	86.0	89.2	81.8	88.8	79.0	Tile 7 Avg = 3	3.2	3.4	3.4	3.1	2.8	2.1	2.2	2.2	2.4	2.2	Tile 7 Avg = 19	21.0	10.2	11.2	15.2	35.9	37.5	18.4	8.1	13.5	18.1	Tile 7 = 19								
Tile 8 Avg = 85											Tile 8 Avg = 2												Tile 8 Avg = 19											Tile 8 = 20							
Sample Area 3 - Gloss Average = 86											Sample Area 3 - Gloss Average = 2											Sample Area 3 - Gloss Average = 18											Sample Area 3 = 19								
Tile 9 Avg = 86	85.8	86.3	87.1	87.5	85.2	88.6	88.1	86.5	86.9	88.1	Tile 9 Avg = 3	2.7	2.9	2.7	2.3	2.3	1.9	2.1	2.1	2.1	2.0	Tile 9 Avg = 16	21.8	17.0	12.1	12.4	18.7	31.7	11.8	15.5	12.6	39.9	Tile 9 = 16								
Tile 10 Avg = 88											Tile 10 Avg = 2												Tile 10 Avg = 22											Tile 10 = 24							
Tile 11 Avg = 84	85.0	84.0	81.9	86.0	82.7	85.9	88.5	89.0	88.7	85.6	Tile 11 Avg = 2	2.3	2.1	2.0	2.0	2.0	2.8	2.9	3.0	2.7	2.4	Tile 11 Avg = 17	18.4	8.0	7.1	12.3	38.2	31.2	12.6	11.6	13.8	16.0	Tile 11 = 18								
Tile 12 Avg = 88											Tile 12 Avg = 3												Tile 12 Avg = 17											Tile 12 = 17							
Sample Area 4 - Gloss Average = 88											Sample Area 4 - Gloss Average = 3											Sample Area 4 - Gloss Average = 17											Sample Area 4 = 18								
Tile 13 Avg = 89	87.6	89.8	90.0	89.8	86.3	88.0	88.2	87.4	86.9	89.3	Tile 13 Avg = 3	2.7	2.8	2.8	2.7	2.9	2.0	2.5	2.7	2.7	2.6	Tile 13 Avg = 18	27.0	18.0	19.5	12.1	11.0	34.7	11.1	9.2	15.2	23.8	Tile 13 = 17								
Tile 14 Avg = 88											Tile 14 Avg = 3												Tile 14 Avg = 19											Tile 14 = 19							
Tile 15 Avg = 87	87.5	88.5	87.4	87.3	86.7	84.0	85.3	88.1	87.6	87.8	Tile 15 Avg = 3	2.4	2.9	3.0	3.4	3.3	2.1	2.0	1.8	1.8	1.7	Tile 15 Avg = 21	27.2	9.7	14.1	15.6	36.3	35.4	7.5	6.9	6.8	8.8	Tile 15 = 21								
Tile 16 Avg = 87											Tile 16 Avg = 2												Tile 16 Avg = 13											Tile 16 = 13							
Sample Area 5 - Gloss Average = 86											Sample Area 5 - Gloss Average = 3											Sample Area 5 - Gloss Average = 14											Sample Area 5 = 13								
Tile 17 Avg = 87	84.1	87.2	87.8	87.5	86.8	76.6	85.3	82.7	86.3	87.9	Tile 17 Avg = 3	2.4	2.7	3.0	2.9	2.5	2.0	2.0	2.0	2.1	1.7	Tile 17 Avg = 14	18.9	12.1	10.0	9.5	19.4	16.7	10.3	8.6	12.0	22.5	Tile 17 = 13								
Tile 18 Avg = 84											Tile 18 Avg = 2												Tile 18 Avg = 14											Tile 18 = 15							
Tile 19 Avg = 88	89.5	88.8	88.1	85.8	89.2	83.6	87.2	85.6	85.4	86.0	Tile 19 Avg = 3	2.7	3.0	3.2	3.1	2.8	3.1	3.1	3.2	3.2	2.8	Tile 19 Avg = 16	13.3	7.3	13.4	9.0	37.1	25.3	8.3	6.4	6.8	10.7	Tile 19 = 15								
Tile 20 Avg = 86											Tile 20 Avg = 3												Tile 20 Avg = 12											Tile 20 = 10							
Sample Area 6 - Gloss Average = 85											Sample Area 6 - Gloss Average = 3											Sample Area 6 - Gloss Average = 13											Sample Area 6 = 12								
Tile 21 Avg = 85	80.7	84.8	84.8	87.7	87.1	85.3	84.5	85.9	85.5	83.9	Tile 21 Avg = 2	1.8	2.1	2.1	2.1	1.9	3.1	3.4	3.1	3.0	2.8	Tile 21 Avg = 12	13.5	11.4	10.0	7.6	19.7	18.7	7.7	7.0	8.5	21.7	Tile 21 = 13								
Tile 22 Avg = 85											Tile 22 Avg = 3												Tile 22 Avg = 13											Tile 22 = 12							
Tile 23 Avg = 84	83.6	85.3	85.4	85.6	79.9	86.8	86.4	86.5	85.0	87.0	Tile 23 Avg = 2	2.6	2.6	2.6	2.6	2.0	2.4	2.9	3.0	3.0	2.9	Tile 23 Avg = 15	22.1	6.5	11.1	9.0	24.9	25.2	6.8	7.0	6.4	11.2	Tile 23 = 15								
Tile 24 Avg = 86											Tile 24 Avg = 3												Tile 24 Avg = 11											Tile 24 = 10							
86	87	86	87	86	85	87	86	87	86	86	2	3	3	3	2	2	3	3	3	2	2	27	16	16	15	30	32	15	12	15	26	29	16	16	14	33	36	14	11	14	28
◀ Gloss Averages by Position											◀ Gloss Averages by Position											◀ Gloss Averages by Position											◀ Cleaning Efficiency by Position								
Initial Colorimeter Grayscale Readings - Overall Average = 91											Soiled Colorimeter Grayscale Readings - Overall Average = 48											Cleaned Colorimeter Grayscale Readings - Overall Average = 83											Overall Average All Tiles = 81								
Position Number											Position Number											Position Number																			
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10												
Sample Area 1 - Grayscale Average = 91											Sample Area 1 - Grayscale Average = 46											Sample Area 1 - Grayscale Average = 88											Sample Area 1 = 93								
Tile 1 Avg = 91	90.50	90.51	90.54	90.47	90.63	90.57	90.50	90.60	90.74	90.65	Tile 1 Avg = 48	48.81	50.10	48.77	46.36	48.00	43.02	36.06	36.18	37.88	38.45	Tile 1 Avg = 88	89.81	88.87	87.31	87.16	88.43	88.93	87.89	87.87	88.92	89.84	Tile 1 = 95								
Tile 2 Avg = 91											Tile 2 Avg = 38												Tile 2 Avg = 89											Tile 2 = 96							
Tile 3 Avg = 90	90.57	90.57	90.35	90.42	90.47	90.58	90.55	90.70	90.63	90.65	Tile 3 Avg = 45	46.76	45.78	45.24	45.68	43.25	50.90	51.72	51.77	49.23	52.51	Tile 3 Avg = 88	89.61	85.85	86.86	87.13	89.81	89.54	86.71	79.97	83.57	89.17	Tile 3 = 94								
Tile 4 Avg = 91											Tile 4 Avg = 51												Tile 4 Avg = 86											Tile 4 = 88							
Sample Area 2 - Grayscale Average = 91											Sample Area 2 - Grayscale Average = 47											Sample Area 2 - Grayscale Average = 84											Sample Area 2 = 86								
Tile 5 Avg = 91	90.61	90.70	90.47	90.55	90.57	90.73	90.60	90.51	90.52	90.46	Tile 5 Avg = 41	40.38	40.33	40.78	39.36	44.39	49.07	53.14	52.10	51.04	54.70	Tile 5 Avg = 86	88.54	86.75	83.14	82.53	87.85	87.43	85.92	81.25	85.76	88.97	Tile 5 = 90								
Tile 6 Avg = 91											Tile 6 Avg = 52												Tile 6 Avg = 86											Tile 6 = 88							
Tile 7 Avg = 90	90.52	90.71	90.28	90.50	90.45	90.60	90.49	90.36	90.51	90.25	Tile 7 Avg = 49	46.99	48.25	52.66	47.41	48.17	44.32	46.62	44.51	44.52	47.65	Tile 7 Avg = 83	85.63	79.34	77.76	82.41	87.88	88.46	84.88	74.76	81.12	84.34	Tile 7 = 81								
Tile 8 Avg = 90											Tile 8 Avg = 46												Tile 8 Avg = 83											Tile 8 = 83							
Sample Area 3 - Grayscale Average = 91											Sample Area 3 - Grayscale Average = 47											Sample Area 3 - Grayscale Average = 82											Sample Area 3 = 81								
Tile 9 Avg = 91	90.67	90.57	90.67	90.59	90.40	90.71	90.68	90.55	90.64	90.57	Tile 9 Avg = 52	53.43	54.53	53.20	48.84	52.02	43.56	46.62	46.90	46.39	47.66	Tile 9 Avg = 83	85.59	83.95	81.93	81.50	83.74	87.41	82.40	80.42	81.48	88.37	Tile 9 = 81								
Tile 10 Avg = 91											Tile 10 Avg = 46												Tile 10 Avg = 84											Tile 10 = 85							
Tile 11 Avg = 90	90.55	90.42	90.45	90.39	90.33	90.41	90.56	90.64	90.67	90.50	Tile 11 Avg = 42	44.92	41.81	39.94	39.62	43.78	51.28	49.97	51.86	48.44	43.74	Tile 11 Avg = 80	85.17	74.37	73.83	81.15	87.66	86.63	80.48	77.43	81.84	82.97	Tile 11 = 79								
Tile 12 Avg = 91											Tile 12 Avg = 49												Tile 12 Avg = 82											Tile 12 = 79							
Sample Area 4 - Grayscale Average = 91											Sample Area 4 - Grayscale Average = 48											Sample Area 4 - Grayscale Average = 82											Sample Area 4 = 80								
Tile 13 Avg = 91	90.58	90.54	90.68	90.65	90.57	90.65	90.62	90.85	90.56	90.76	Tile 13 Avg = 47	45.06	47.70	46.65	46.28	48.50	45.57	50.35	51.77	49.08	50.28	Tile 13 Avg = 83	87.09	82.93	84.13	81.84	80.93	86.99	81.36	78.04	82.83	85.88	Tile 13 = 84								
Tile 14 Avg = 91											Tile 14 Avg = 49												Tile 14 Avg = 83											Tile 14 = 81							
Tile 15 Avg = 91	90.57	90.66	90.68	90.63	90.64	90.46	90.60	90.65	90.54	90.60	Tile 15 Avg = 53	50.81	52.18	52.94	55.93	54.58	46.31	41.35	42.47	42.17	40.93	Tile 15 Avg = 83	86.46	78.25	80.76	83.89	87.36	88.14	75.41	73.18	73.61	77.85	Tile 1								

Table 4-14: Soil removal test 2 – Gloss and color meter readings for the Tennant T5, tap water, ech2O™ on

INITIAL TILE READINGS												SOILED TILE READINGS												CLEANED TILE READINGS												Average Cleaning Efficiency %
Initial Gloss Readings - Overall Average = 87												Soiled Gloss Readings - Overall Average = 2												Cleaned Gloss Readings - Overall Average = 15												Overall Average All Tiles = 15
Position Number												Position Number												Position Number												
1 2 3 4 5 6 7 8 9 10												1 2 3 4 5 6 7 8 9 10												1 2 3 4 5 6 7 8 9 10												
Sample Area 1 - Gloss Average = 87												Sample Area 1 - Gloss Average = 2												Sample Area 1 - Gloss Average = 30												Sample Area 1 = 32
Tile 1 Avg = 89	88.9	87.8	88.3	90.0	89.2	88.9	88.5	88.6	88.7	88.7	Tile 2 Avg = 89	Tile 1 Avg = 2	2.4	2.5	2.6	2.4	2.1	1.7	1.8	1.8	1.6	Tile 2 Avg = 2	Tile 1 Avg = 38	51.8	35.6	32.2	30.1	38.8	40.1	13.9	10.9	15.8	38.8	Tile 2 Avg = 24	Tile 1 = 41	
Tile 3 Avg = 85	82.5	85.0	83.1	84.7	87.3	84.6	86.9	84.6	87.1	84.5	Tile 4 Avg = 86	Tile 3 Avg = 2	2.3	2.4	2.3	2.4	2.2	2.1	3.2	3.0	2.6	2.4	Tile 4 Avg = 3	Tile 3 Avg = 35	45.9	26.2	21.4	31.2	51.5	48.5	19.2	10.2	9.5	20.0	Tile 4 Avg = 21	Tile 2 = 25
Sample Area 2 - Gloss Average = 87												Sample Area 2 - Gloss Average = 3												Sample Area 2 - Gloss Average = 21												Sample Area 2 = 22
Tile 5 Avg = 87	86.2	85.3	87.5	86.6	88.4	86.7	85.5	88.3	86.1	85.8	Tile 6 Avg = 86	Tile 5 Avg = 2	1.9	2.0	2.1	2.1	1.9	3.3	3.3	3.3	3.0	2.5	Tile 6 Avg = 3	Tile 5 Avg = 23	35.9	21.6	11.6	12.5	30.9	30.2	17.0	12.6	17.6	27.9	Tile 6 Avg = 21	Tile 5 = 24
Tile 7 Avg = 87	87.8	86.7	87.8	87.5	85.3	87.9	87.7	85.6	85.8	87.8	Tile 8 Avg = 87	Tile 7 Avg = 2	2.2	2.2	2.5	2.5	2.3	2.5	2.8	2.7	2.8	2.7	Tile 8 Avg = 3	Tile 7 Avg = 20	37.9	9.0	10.5	10.5	30.5	42.6	11.5	7.1	8.6	29.3	Tile 8 Avg = 20	Tile 6 = 22
Sample Area 3 - Gloss Average = 86												Sample Area 3 - Gloss Average = 2												Sample Area 3 - Gloss Average = 10												Sample Area 3 = 9
Tile 9 Avg = 87	84.1	87.5	88.0	86.8	88.3	86.8	88.2	82.2	87.8	83.8	Tile 10 Avg = 86	Tile 9 Avg = 3	1.9	2.7	3.1	3.1	2.9	2.4	2.5	2.4	2.6	2.2	Tile 10 Avg = 2	Tile 9 Avg = 11	21.0	5.4	6.0	8.0	12.5	11.3	6.1	9.0	8.9	11.7	Tile 10 Avg = 9	Tile 9 = 9
Tile 11 Avg = 84	79.3	83.8	86.7	83.4	84.3	86.9	87.2	85.8	88.0	86.7	Tile 12 Avg = 87	Tile 11 Avg = 2	2.0	2.1	2.0	2.1	2.0	2.1	2.4	2.3	2.4	2.3	Tile 12 Avg = 2	Tile 11 Avg = 9	9.0	6.2	8.0	6.7	16.8	27.5	5.3	4.3	4.8	13.7	Tile 12 Avg = 11	Tile 10 = 8
Sample Area 4 - Gloss Average = 89												Sample Area 4 - Gloss Average = 2												Sample Area 4 - Gloss Average = 10												Sample Area 4 = 8
Tile 13 Avg = 89	89.8	88.0	89.2	86.9	88.9	89.8	89.6	89.1	89.4	89.9	Tile 14 Avg = 90	Tile 13 Avg = 3	2.4	2.4	2.4	2.7	2.8	2.6	2.5	2.3	2.1	2.1	Tile 14 Avg = 2	Tile 13 Avg = 9	12.3	7.3	8.4	7.2	7.9	21.8	5.9	5.5	6.7	6.8	Tile 14 Avg = 9	Tile 13 = 7
Tile 15 Avg = 89	89.7	88.7	89.0	89.4	88.4	89.2	88.3	87.8	88.3	85.2	Tile 16 Avg = 88	Tile 15 Avg = 2	2.8	2.4	2.2	2.3	1.9	2.1	2.0	1.9	2.0	2.1	Tile 16 Avg = 2	Tile 15 Avg = 13	8.8	4.8	7.9	8.5	32.7	14.9	5.5	4.1	5.5	8.5	Tile 16 Avg = 8	Tile 14 = 8
Sample Area 5 - Gloss Average = 86												Sample Area 5 - Gloss Average = 2												Sample Area 5 - Gloss Average = 9												Sample Area 5 = 8
Tile 17 Avg = 87	86.7	88.2	88.0	85.1	84.8	85.9	88.2	87.5	86.5	81.5	Tile 18 Avg = 86	Tile 17 Avg = 2	1.8	2.2	2.7	2.7	2.6	1.8	2.0	1.9	1.9	1.8	Tile 18 Avg = 2	Tile 17 Avg = 7	7.9	7.5	7.1	7.0	7.2	10.2	5.3	6.1	4.9	10.6	Tile 18 Avg = 7	Tile 15 = 12
Tile 19 Avg = 88	85.2	87.9	87.6	88.4	88.4	86.0	81.8	83.2	84.2	80.8	Tile 20 Avg = 83	Tile 19 Avg = 3	2.4	2.8	2.8	2.8	2.5	2.8	3.1	3.2	3.1	2.6	Tile 20 Avg = 3	Tile 19 Avg = 13	10.5	6.6	8.0	10.4	27.4	14.3	5.2	6.7	6.0	10.0	Tile 20 Avg = 8	Tile 16 = 7
Sample Area 6 - Gloss Average = 87												Sample Area 6 - Gloss Average = 3												Sample Area 6 - Gloss Average = 10												Sample Area 6 = 9
Tile 21 Avg = 87	87.2	87.2	87.7	87.9	84.9	87.2	86.8	87.6	86.8	85.5	Tile 22 Avg = 87	Tile 21 Avg = 2	2.2	2.0	1.8	1.8	1.7	3.2	2.9	3.2	3.0	3.2	Tile 22 Avg = 3	Tile 21 Avg = 8	7.8	5.6	6.9	5.3	14.6	11.8	4.9	5.4	7.5	13.6	Tile 22 Avg = 9	Tile 17 = 6
Tile 23 Avg = 86	86.7	84.8	85.8	86.5	85.6	86.3	87.2	87.0	88.4	85.0	Tile 24 Avg = 87	Tile 23 Avg = 3	2.7	2.8	2.7	3.0	3.2	2.5	2.8	2.5	2.5	2.4	Tile 24 Avg = 3	Tile 23 Avg = 13	18.4	7.4	7.7	9.4	23.2	20.7	6.5	5.6	6.2	9.1	Tile 24 Avg = 10	Tile 18 = 7
	86	87	87	87	87	87	87	86	87	85	◀ Gloss Averages by Position		2	2	2	2	2	2	3	3	2	2	◀ Gloss Averages by Position		22	12	11	12	25	24	9	7	9	17	◀ Gloss Averages by Position	Tile 19 = 12
																							◀ Cleaning Efficiency by Position		24	11	10	12	26	26	7	6	7	17	◀ Cleaning Efficiency by Position	Tile 20 = 7
Initial Colorimeter Grayscale Readings - Overall Average = 91												Soiled Colorimeter Grayscale Readings - Overall Average = 48												Cleaned Colorimeter Grayscale Readings - Overall Average = 79												Overall Average All Tiles = 72
Position Number												Position Number												Position Number												
1 2 3 4 5 6 7 8 9 10												1 2 3 4 5 6 7 8 9 10												1 2 3 4 5 6 7 8 9 10												
Sample Area 1 - Grayscale Average = 91												Sample Area 1 - Grayscale Average = 46												Sample Area 1 - Grayscale Average = 86												Sample Area 1 = 90
Tile 1 Avg = 91	90.71	90.67	90.43	90.74	90.64	90.65	90.49	90.55	90.58	90.56	Tile 2 Avg = 91	Tile 1 Avg = 48	48.54	48.01	50.74	48.74	46.17	38.64	40.43	39.61	38.91	38.61	Tile 2 Avg = 39	Tile 1 Avg = 89	89.62	88.74	87.85	88.11	88.39	88.48	83.51	80.10	84.81	88.51	Tile 2 Avg = 85	Tile 1 = 95
Tile 3 Avg = 90	90.38	90.30	90.27	90.14	90.63	90.61	90.66	90.61	90.64	90.63	Tile 4 Avg = 91	Tile 3 Avg = 45	44.85	45.82	46.11	45.46	44.66	44.97	54.67	54.64	52.50	49.78	Tile 4 Avg = 51	Tile 3 Avg = 88	89.38	86.25	85.88	87.10	89.55	89.11	85.24	80.65	80.74	84.52	Tile 4 Avg = 84	Tile 2 = 89
Sample Area 2 - Grayscale Average = 91												Sample Area 2 - Grayscale Average = 47												Sample Area 2 - Grayscale Average = 83												Sample Area 2 = 83
Tile 5 Avg = 91	90.58	90.53	90.65	90.48	90.80	90.60	90.56	90.56	90.50	90.43	Tile 6 Avg = 91	Tile 5 Avg = 41	39.71	40.46	43.43	40.83	43.05	54.32	52.02	49.84	51.73	47.01	Tile 6 Avg = 51	Tile 5 Avg = 85	88.40	85.69	82.47	81.69	87.81	87.69	84.89	82.63	84.30	86.76	Tile 6 Avg = 85	Tile 3 = 94
Tile 7 Avg = 91	90.73	90.45	90.71	90.67	90.64	90.57	90.74	90.39	90.55	90.62	Tile 8 Avg = 91	Tile 7 Avg = 49	47.95	46.78	49.75	49.95	49.34	44.31	44.43	45.17	46.65	47.24	Tile 8 Avg = 46	Tile 7 Avg = 82	87.75	77.41	79.34	78.54	86.35	88.40	81.35	71.39	75.52	87.00	Tile 8 Avg = 81	Tile 4 = 83
Sample Area 3 - Grayscale Average = 91												Sample Area 3 - Grayscale Average = 47												Sample Area 3 - Grayscale Average = 76												Sample Area 3 = 67
Tile 9 Avg = 91	90.51	90.71	90.66	90.67	90.80	90.62	90.53	90.56	90.27	90.49	Tile 10 Avg = 90	Tile 9 Avg = 52	46.63	50.57	54.83	55.99	54.40	45.76	46.46	45.76	47.03	46.27	Tile 10 Avg = 46	Tile 9 Avg = 76	85.27	70.37	67.92	75.83	80.63	82.50	75.60	79.06	80.33	81.77	Tile 10 Avg = 80	Tile 5 = 89
Tile 11 Avg = 90	90.40	90.49	90.47	90.13	90.83	90.64	90.59	90.73	90.71	90.74	Tile 12 Avg = 91	Tile 11 Avg = 42	41.98	43.69	41.27	41.87	41.57	49.31	49.83	48.97	48.01	49.28	Tile 12 Avg = 49	Tile 11 Avg = 77	79.62	73.01	71.90	75.02	85.27	86.68	67.64	58.19	68.74	83.76	Tile 12 Avg = 73	Tile 6 = 87
Sample Area 4 - Grayscale Average = 91												Sample Area 4 - Grayscale Average = 48												Sample Area 4 - Grayscale Average = 75												Sample Area 4 = 63
Tile 13 Avg = 90	90.47	90.40	90.63	90.31	90.67	90.60	90.65	90.49	90.50	90.69	Tile 14 Avg = 91	Tile 13 Avg = 47	46.40	45.37	46.82	48.93	49.35	52.02	49.33	48.15	47.05	51.69	Tile 14 Avg = 50	Tile 13 Avg = 78	83.59	74.11	77.69	75.17	77.69	85.09	70.00	67.54	70.55	74.53	Tile 14 Avg = 74	Tile 7 = 79
Tile 15 Avg = 91	90.78	90.52	90.60	90.72	90.60	90.62	90.56	90.54	90.26	Tile 16 Avg = 91	Tile 15 Avg = 51	55.00	51.26	51.35	51.82	47.42	43.68	42.84	40.78	41.97	45.47	Tile 16 Avg = 43	Tile 15 Avg = 78	79.09	68.31	74.37	79.73	86.91	81.89	68.88	53.60	66.98	78.52	Tile 16 Avg = 70	Tile 8 = 78	
Sample Area 5 - Grayscale Average = 91												Sample Area 5 - Grayscale Average = 49												Sample Area 5 - Grayscale Average = 76												Sample Area 5 = 65
Tile 17 Avg = 91	90.59	90.53	90.61	90.59	90.64	90.41	90.51	90.51	90.57	90.36	Tile 18 Avg = 90	Tile 17 Avg = 50	43.37	45.85	53.58	54.77	53.10	46.29	45.65	42.67	41.15	43.58	Tile 18 Avg = 44	Tile 17 Avg = 77	78.01	79.26	73.71	77.46	76.65	79.33	65.90	67.16	71.70	81.96	Tile 18 Avg = 73	Tile 9 = 62
Tile 19 Avg = 91	90.58	90.79	90.74	90.62	90.71	90.78	90.82	90.77	90.45	90.56	Tile 20 Avg = 91	Tile 19 Avg = 48	47.46	50.09	49.05	46.52	44.78	52.73	53.60	54.56	57.27	55.74	Tile 20 Avg = 55	Tile 19 Avg = 79	80.83	71.50	77.32	79.67	86.01	82.28	67.42	72.14	74.34	81.25	Tile 20 Avg = 75	Tile 10 = 76
Sample Area 6 - Grayscale Average = 91												Sample Area 6 - Grayscale Average = 50												Sample Area 6 - Grayscale Average = 75												Sample Area 6 = 63
Tile 21 Avg = 90	90.36	90.58	90.46	90.53	90.52	90.65	90.74	90.70	90.62	90.63	Tile 22 Avg = 91	Tile 21 Avg = 45	48.18	45.85	42.31	44.26	42.79	57.63	55.05	56.68	53.70	55.35	Tile 22 Avg = 56	Tile 21 Avg = 73	77.53	70.05	70.63	66.50	82.26	88.35	67.67	71.54	75.99	81.94	Tile 22 Avg = 77	Tile 11 = 72
Tile 23 Avg = 91	90.70	90.52	90.63	90.54	90.31	90.45	90.63	90.39	90.49	90.51	Tile 24 Avg = 90	Tile 23 Avg = 51	50.02	49.79	47.32	52.97	54.46	46.42	49.95	48.60	47.87	47.50	Tile 24 Avg = 48	Tile 23 Avg = 79	84.04	73.07	73.53	77.59	85.21	84.43	70.94	61.43	66.55	78.55	Tile 24 Avg = 72	Tile 12 = 58
	91	91	91	91	91	91	91	91	91	91	◀ Grayscale Averages by Position		47	47	48	49	48	48	49	48	48	◀ Grayscale Averages by Position		84	76	77	79	84	85	74	70	75	82	◀ Grayscale Averages by Position	Tile 12 = 58	
																							◀ Cleaning Efficiency by Position		84	68	68	71	85	88	61	53	64	81	◀ Cleaning Efficiency by Position	Tile 20 = 58

Table 4-15: Soil removal test 3 – Gloss and color meter readings for the Tennant T5, detergent, eCH2O™ off

INITIAL TILE READINGS											SOILED TILE READINGS											CLEANED TILE READINGS											Average Cleaning Efficiency %		
Initial Gloss Readings - Overall Average = 86											Soiled Gloss Readings - Overall Average = 3											Cleaned Gloss Readings - Overall Average = 35											Overall Average		
Position Number											Position Number											Position Number											All Tiles = 39		
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10						
Sample Area 1 - Gloss Average = 87											Sample Area 1 - Gloss Average = 3											Sample Area 1 - Gloss Average = 51											Sample Area 1 = 59		
Tile 1 Avg = 88	87.6	87.2	89.2	88.3	88.5	82.9	87.2	83.3	84.2	83.7	Tile 2 Avg = 84	Tile 1 Avg = 3	2.6	2.9	3.1	2.9	3.4	2.1	2.1	2.1	1.9	Tile 2 Avg = 2	Tile 1 Avg = 54	57.0	60.3	53.1	46.7	54.5	63.2	55.4	39.6	52.5	56.9	Tile 2 Avg = 57	
Tile 3 Avg = 88	87.5	88.3	87.6	88.2	87.3	86.1	87.6	86.2	89.5	88.2	Tile 4 Avg = 88	Tile 3 Avg = 2	2.1	2.1	2.1	2.0	2.0	2.9	3.3	3.2	3.2	Tile 4 Avg = 3	Tile 3 Avg = 49	57.3	34.0	41.5	45.7	67.8	72.2	51.9	18.0	45.0	56.4	Tile 4 Avg = 49	
Sample Area 2 - Gloss Average = 86											Sample Area 2 - Gloss Average = 2											Sample Area 2 - Gloss Average = 41											Sample Area 2 = 46		
Tile 5 Avg = 86	84.9	86.8	86.5	88.1	83.6	87.8	86.5	87.3	85.1	82.6	Tile 6 Avg = 86	Tile 5 Avg = 2	2.0	2.0	2.0	1.8	2.0	2.9	3.0	2.7	2.4	2.3	Tile 6 Avg = 3	Tile 5 Avg = 45	49.7	53.2	37.2	38.4	44.0	62.7	35.0	26.0	41.4	42.6	Tile 6 Avg = 42
Tile 7 Avg = 86	82.4	87.3	85.9	88.0	87.0	86.3	83.8	85.0	86.0	87.0	Tile 8 Avg = 86	Tile 7 Avg = 3	2.7	2.9	3.0	2.9	2.7	1.9	2.0	2.0	2.2	2.0	Tile 8 Avg = 2	Tile 7 Avg = 45	38.4	37.8	43.3	41.5	63.4	68.1	31.0	15.7	16.8	34.8	Tile 8 Avg = 33
Sample Area 3 - Gloss Average = 86											Sample Area 3 - Gloss Average = 2											Sample Area 3 - Gloss Average = 31											Sample Area 3 = 35		
Tile 9 Avg = 84	85.5	83.5	83.9	87.2	80.2	84.6	85.8	86.7	86.2	87.8	Tile 10 Avg = 86	Tile 9 Avg = 3	2.6	3.0	2.7	2.6	2.2	2.3	2.3	2.5	2.4	2.1	Tile 10 Avg = 2	Tile 9 Avg = 42	49.2	38.8	42.6	36.3	42.4	51.2	24.8	12.0	20.7	43.4	Tile 10 Avg = 30
Tile 11 Avg = 86	86.8	85.7	86.4	83.9	85.0	87.1	87.2	86.1	87.6	83.9	Tile 12 Avg = 86	Tile 11 Avg = 2	1.9	1.9	1.9	2.0	2.1	3.0	2.9	3.0	2.9	2.8	Tile 12 Avg = 3	Tile 11 Avg = 30	30.3	14.8	22.0	21.0	59.9	65.1	17.1	8.7	8.5	19.9	Tile 12 Avg = 24
Sample Area 4 - Gloss Average = 86											Sample Area 4 - Gloss Average = 3											Sample Area 4 - Gloss Average = 30											Sample Area 4 = 34		
Tile 13 Avg = 83	84.2	80.7	84.1	86.2	80.6	85.2	86.5	84.9	84.9	86.2	Tile 14 Avg = 86	Tile 13 Avg = 2	1.9	2.2	2.1	2.1	1.7	3.7	4.5	4.1	3.7	4.4	Tile 14 Avg = 4	Tile 13 Avg = 26	36.0	32.1	18.6	16.5	29.1	51.7	38.9	21.5	43.1	50.1	Tile 14 Avg = 41
Tile 15 Avg = 85	85.9	87.3	83.2	86.5	83.7	89.2	89.3	89.8	88.9	89.3	Tile 16 Avg = 89	Tile 15 Avg = 2	2.1	2.6	2.8	2.3	2.2	2.1	2.2	2.5	2.3	2.3	Tile 16 Avg = 2	Tile 15 Avg = 31	34.5	11.6	20.6	22.6	67.7	59.7	20.7	9.7	11.0	13.1	Tile 16 Avg = 23
Sample Area 5 - Gloss Average = 87											Sample Area 5 - Gloss Average = 3											Sample Area 5 - Gloss Average = 29											Sample Area 5 = 31		
Tile 17 Avg = 88	87.6	86.0	88.8	88.6	86.7	88.5	89.2	89.2	87.5	88.0	Tile 18 Avg = 88	Tile 17 Avg = 3	3.7	3.3	3.3	3.1	3.0	2.5	2.1	1.8	1.8	2.2	Tile 18 Avg = 2	Tile 17 Avg = 30	40.3	32.4	31.2	22.2	22.1	61.7	27.5	14.9	19.7	44.2	Tile 18 Avg = 34
Tile 19 Avg = 86	83.5	85.3	86.3	87.8	87.2	88.0	86.6	86.4	86.3	83.7	Tile 20 Avg = 86	Tile 19 Avg = 3	2.8	2.8	2.8	2.5	2.2	2.6	3.1	3.1	3.1	2.5	Tile 20 Avg = 3	Tile 19 Avg = 24	36.6	14.8	23.9	29.5	15.7	66.9	20.3	6.7	10.2	35.9	Tile 20 Avg = 28
Sample Area 6 - Gloss Average = 86											Sample Area 6 - Gloss Average = 3											Sample Area 6 - Gloss Average = 26											Sample Area 6 = 28		
Tile 21 Avg = 85	85.5	87.7	85.5	83.7	84.7	86.9	87.5	87.5	86.5	86.0	Tile 22 Avg = 87	Tile 21 Avg = 2	2.1	2.2	2.4	2.3	2.3	2.7	3.1	3.1	3.2	2.9	Tile 22 Avg = 3	Tile 21 Avg = 28	32.6	25.6	23.5	14.4	44.3	58.2	21.0	18.8	28.6	26.7	Tile 22 Avg = 31
Tile 23 Avg = 88	86.6	86.7	88.9	86.7	88.9	87.4	83.2	84.9	86.4	82.9	Tile 24 Avg = 85	Tile 23 Avg = 3	3.1	2.7	2.7	2.6	2.1	2.2	2.3	2.5	2.7	2.4	Tile 24 Avg = 2	Tile 23 Avg = 25	27.7	12.3	13.2	14.2	58.6	25.5	17.1	9.2	24.4	30.9	Tile 24 Avg = 21
86	86	86	87	85	87	87	86	87	86	◀ Gloss Averages by Position	2	3	3	2	2	3	3	3	3	3	◀ Gloss Averages by Position	41	31	31	29	47	59	30	17	27	38	◀ Gloss Averages by Position			
																				46	34	34	32	54	67	33	17	29	42	◀ Cleaning Efficiency by Position					
Initial Colorimeter Grayscale Readings - Overall Average = 91											Soiled Colorimeter Grayscale Readings - Overall Average = 48											Cleaned Colorimeter Grayscale Readings - Overall Average = 86											Overall Average		
Position Number											Position Number											Position Number											All Tiles = 89		
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10						
Sample Area 1 - Grayscale Average = 90											Sample Area 1 - Grayscale Average = 46											Sample Area 1 - Grayscale Average = 89											Sample Area 1 = 96		
Tile 1 Avg = 90	90.51	90.51	90.47	90.37	90.61	90.46	90.34	90.18	90.38	90.50	Tile 2 Avg = 90	Tile 1 Avg = 49	49.01	48.13	50.11	48.26	47.13	41.71	40.89	41.24	39.52	38.95	Tile 2 Avg = 40	Tile 1 Avg = 89	89.69	89.60	88.84	88.47	89.08	89.41	88.75	87.78	88.64	89.63	Tile 2 Avg = 89
Tile 3 Avg = 90	90.58	90.37	90.39	90.55	90.57	90.61	90.73	90.43	90.68	90.49	Tile 4 Avg = 91	Tile 3 Avg = 45	48.76	46.46	44.69	43.44	43.62	50.13	51.29	52.03	50.35	53.48	Tile 4 Avg = 51	Tile 3 Avg = 89	89.58	86.78	88.17	88.59	89.95	90.30	88.95	83.95	89.22	89.72	Tile 4 Avg = 88
Sample Area 2 - Grayscale Average = 91											Sample Area 2 - Grayscale Average = 47											Sample Area 2 - Grayscale Average = 87											Sample Area 2 = 93		
Tile 5 Avg = 90	90.32	90.40	90.50	90.55	90.39	90.80	90.83	90.67	90.83	90.81	Tile 6 Avg = 91	Tile 5 Avg = 41	42.18	41.71	41.28	38.80	43.27	56.25	55.23	52.24	47.29	49.99	Tile 6 Avg = 52	Tile 5 Avg = 88	88.71	89.04	87.49	86.87	87.66	89.25	87.23	85.38	87.84	88.42	Tile 6 Avg = 88
Tile 7 Avg = 90	90.44	90.57	90.42	90.56	90.44	90.51	90.41	90.63	90.55	90.07	Tile 8 Avg = 90	Tile 7 Avg = 49	45.53	48.46	51.87	49.37	49.04	45.53	45.84	44.12	48.09	44.46	Tile 8 Avg = 46	Tile 7 Avg = 88	88.30	87.34	87.83	87.66	89.26	89.57	86.76	83.03	83.43	87.51	Tile 8 Avg = 86
Sample Area 3 - Grayscale Average = 91											Sample Area 3 - Grayscale Average = 48											Sample Area 3 - Grayscale Average = 85											Sample Area 3 = 87		
Tile 9 Avg = 91	90.66	90.74	90.91	90.56	90.53	90.67	90.64	90.58	90.45	90.53	Tile 10 Avg = 91	Tile 9 Avg = 53	52.38	53.58	52.82	52.32	51.56	45.87	45.84	46.13	46.42	47.02	Tile 10 Avg = 46	Tile 9 Avg = 88	88.38	87.38	88.45	87.18	86.82	87.85	85.35	81.98	80.96	88.15	Tile 10 Avg = 85
Tile 11 Avg = 90	90.53	90.42	90.32	90.38	90.36	90.69	90.54	90.40	90.57	90.43	Tile 12 Avg = 91	Tile 11 Avg = 42	40.09	40.23	41.29	43.48	45.89	50.12	50.83	49.36	47.80	47.41	Tile 12 Avg = 49	Tile 11 Avg = 85	86.71	80.56	83.29	84.96	88.95	89.55	82.86	74.91	77.57	84.42	Tile 12 Avg = 82
Sample Area 4 - Grayscale Average = 91											Sample Area 4 - Grayscale Average = 48											Sample Area 4 - Grayscale Average = 85											Sample Area 4 = 86		
Tile 13 Avg = 90	90.75	90.32	90.51	90.42	90.64	90.57	90.75	90.56	90.48	90.48	Tile 14 Avg = 91	Tile 13 Avg = 47	45.20	48.96	49.43	49.67	43.92	49.37	50.97	49.34	47.68	51.27	Tile 14 Avg = 50	Tile 13 Avg = 85	87.88	85.85	84.19	82.77	85.52	88.32	86.94	85.05	87.55	88.64	Tile 14 Avg = 87
Tile 15 Avg = 91	90.63	90.66	90.69	90.78	90.42	90.57	90.79	90.47	90.62	90.62	Tile 16 Avg = 91	Tile 15 Avg = 54	53.68	53.31	53.75	52.97	53.79	39.48	42.19	45.06	43.34	45.44	Tile 16 Avg = 43	Tile 15 Avg = 84	86.52	78.47	82.18	84.34	89.18	88.31	84.70	79.26	80.18	80.47	Tile 16 Avg = 83
Sample Area 5 - Grayscale Average = 91											Sample Area 5 - Grayscale Average = 49											Sample Area 5 - Grayscale Average = 85											Sample Area 5 = 86		
Tile 17 Avg = 91	90.54	90.46	90.67	90.58	90.34	90.30	90.66	90.60	90.51	90.55	Tile 18 Avg = 91	Tile 17 Avg = 50	54.08	50.94	50.05	47.69	48.00	48.50	43.06	39.62	39.77	48.58	Tile 18 Avg = 44	Tile 17 Avg = 86	87.97	86.17	86.06	85.15	83.72	88.34	84.85	83.83	83.56	87.58	Tile 18 Avg = 86
Tile 19 Avg = 91	90.28	90.64	90.61	90.64	90.65	90.86	90.76	90.80	90.69	90.70	Tile 20 Avg = 91	Tile 19 Avg = 48	47.00	47.84	51.82	47.30	44.19	52.51	55.97	57.01	57.74	51.61	Tile 20 Avg = 55	Tile 19 Avg = 86	87.18	81.93	85.12	86.29	87.80	89.13	83.52	75.00	80.03	87.68	Tile 20 Avg = 83
Sample Area 6 - Grayscale Average = 91											Sample Area 6 - Grayscale Average = 50											Sample Area 6 - Grayscale Average = 84											Sample Area 6 = 84		
Tile 21 Avg = 90	90.08	90.47	90.46	90.54	90.60	90.59	90.39	90.53	90.61	90.60	Tile 22 Avg = 91	Tile 21 Avg = 45	41.57	45.47	46.58	43.95	46.58	53.08	57.27	57.16	57.86	54.84	Tile 22 Avg = 56	Tile 21 Avg = 85	86.56	84.70	84.58	83.35	86.66	87.98	82.68	82.73	85.59	85.66	Tile 22 Avg = 85
Tile 23 Avg = 91	90.72	90.81	90.67	90.70	90.66	90.65	90.60	90.59	90.53	90.46	Tile 24 Avg = 91	Tile 23 Avg = 51	54.61	50.40	51.48	49.89	48.20	45.16	47.00	50.65	50.92	46.68	Tile 24 Avg = 48	Tile 23 Avg = 83	86.28	78.88	80.06	81.40	88.25	86.17	82.61	77.50	84.58	86.46	Tile 24 Avg = 83
91	91	91	91	90	91	91	91	91	91	◀ Grayscale Averages by Position	48	48	49	47	47	48	49	49	48	48	◀ Grayscale Averages by Position	88	85	86	86	88	89	85	82	84	87	◀ Grayscale Averages by Position			
																				94	86	88	89	94	95	88	79	85	92	◀ Cleaning Efficiency by Position					