Appendix D

Calculation of Discrimination Power (DP)[1] for Automotive Paint based on published studies

Gothard (1976)

500 samples = 124,750 possible pairs
2 pairs not discriminated

2 / 124,750 x 100 = 0.0016% not discriminated
100.0000% - 0.0016% = 99.998% correctly discriminated
DP = 0.99998

Gothard (1996)

500 samples = 124,750 possible pairs
3 pairs not discriminated

3 / 124,750 x 100 = 0.0024% not discriminated
100.0000% - 0.0024% = 99.998% correctly discriminated
DP = 0.99998

Ryland (1979)

200 samples = 19,900 possible pairs
0 pairs not discriminated
100% correctly discriminated
DP = 1.00000

Edmondstone (2004)

260 samples = 32,670 possible pairs
1 pair not discriminated

1 / 32,670 x 100 = 0.0031% not discriminated
100.0000% - 0.0031= 99.997% correctly discriminated
DP = 0.99997

AVERAGE DISCRIMINATION POWER[1]:

0.99998
0.99998
1.00000
0.99997
3.99993 3.99993 / 4 = 0.99998 average Discrimination Power

FALSE INCLUSIONS VS. CORRECT EXCLUSIONS:

0.0016%
0.0024%
0.0000%

0.0031%
0.0071% 0.0071% / 4 = 0.0018% average percent of false inclusions

= 99.998% average percent correctly discriminated

Calculation of Discrimination Power (DP)[1] for Architectural Paint based on published studies

Tippett (1968)

2000 samples = 1,999,000 possible pairs
2 pairs not discriminated

2 / 1,999,000 x 100 = 0.0001% not discriminated
100.0000% - 0.0001% = 99.9999% correctly discriminated
DP = 0.999999

Wright (2011)

964 samples = 464,166 possible pairs
11 pairs not discriminated but all from the same respective structures
Thus, 100% correctly discriminated
DP = 1.000000

AVERAGE DISCRIMINATION POWER[1]:

0.999999
1.000000
1.999999 1.999999 / 2 = 0.9999995 average Discrimination Power

FALSE INCLUSIONS VS. CORRECT EXCLUSIONS:
Conservatively with rounding up:

0.0001%
0.0000%
0.0001% 0.0001% / 2 = 0.00005% (rounded up = 0.0001% average percent of false inclusions)

= 99.9999% average percent correctly discriminated

[1]**Smalldon KW, Moffat AC. The calculation of discrimination power for a series of correlated attributes. J Forensic Sci Soc 1973;13:291-5.**

DP = (number of discriminated sample pairs) / (number of possible sample pairs)