

1st European Road Marking Symposium

Intertraffic Amsterdam

April 3rd, 2008

German presentation (DSGS):

Winter test field in the Harz Mountains

Winter test field on the B4 near Torfhaus in the Harz Mountains



Start: August 10th, 2006



3 weeks of application



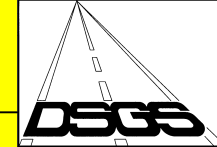
Applikationsschema Prüffeld Torfhaus / B4																				
				a		b		c		d		e		f		g		h		
			50	15	20	x	20	15	20	x	20	15	20	15	20	x	20	15	35	20
↑	200	Leitlinie 12 cm																		
	100																			
			50	280																20
			350																	

88 samples were laid out by August 31st, 2006



All samples are being measured





DATA:

number: 88 (90) systems altogether (36 coldpl., 29 thermopl., 16 paints, 7 tapes)

systems: type I = 14 ; type II = 74, 29 of them agglomerates ;
2 inlaid systems (I + II)

participants: 16 companies from 7 European countries

application period: August 10th - August 31st, 2006

opening for traffic: September 5th, 2006

STRAIN:

average traffic: about 8000 vehicles per day

winter 06/07: 173 snow plow pass overs (only steel blades) and
248 salt uses

DURATION:

at least 2 winter periods; perhaps 5 - 6 years with the possibility to apply new samples

November 1st, 2006: winter has arrived



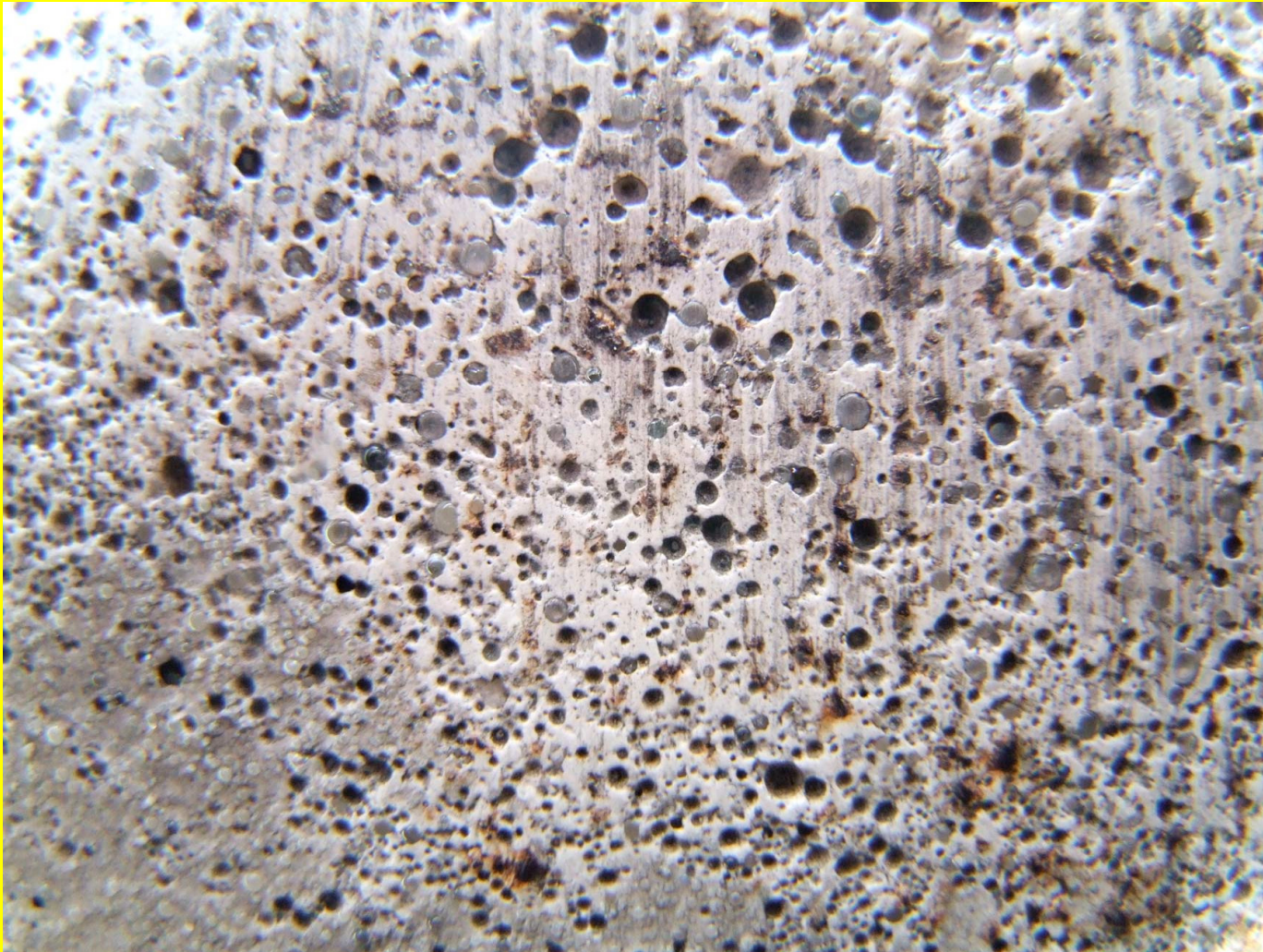
first damages during the winter 06/07



visible traces of the snow plow after the first winter 06/07

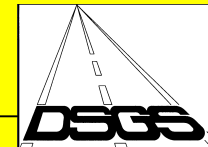


snow plow damages in detail (winter 06/07)



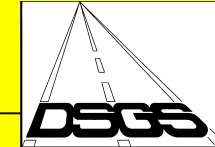
damaged beads due to snow plow use (winter 06/07)





German standards for road markings (ZTV M 02)

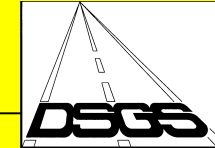
	class (DIN EN 1436)	minimum value
Night visibility (dry)	R3	$R_L \geq 150 \text{ mcd/m}^2\text{lx}$
Night visibility (wet)	RW2	$R_L \geq 35 \text{ mcd/m}^2\text{lx}$
Day visibility	Asphalt: Q3 Concrete: Q4	$Q_d \geq 130 \text{ mcd/m}^2\text{lx}$ $Q_d \geq 160 \text{ mcd/m}^2\text{lx}$
Skid resistance	S1	$\geq 45 \text{ SRT}$
Durability	-	$\geq 90 \% \text{ remaining area}$



8 water-based paints

material	system	type	08-06 Qd	04-07 Qd	08-07 Qd	08-06 SRT	04-07 SRT	08-07 SRT	08-06 RL-t	11-06 RL-t	04-07 RL-t	08-07 RL-t	11-06 RL-f	04-07 RL-f	08-07 RL-f
w-paint	smooth	1	246	98	98	55	55	54	322	298	151	112			
w-paint	smooth	1	268	115	106	53	52	50	338	293	175	124			
w-paint	smooth	1	260	127	123	60	55	53	302	246	208	154			
w-paint	smooth	2	232	119	108	55	53	56	300	333	204	118	38	26	13
w-paint	smooth	2	217	88	74	59	57	54	477	356	67	38	175	15	9
w-paint	smooth	2	227	120	115	66	54	49	259	255	172	119	94	29	25
w-paint	smooth	2	223	81	69	63	58	58	360	329	81	34	119	15	5
w-paint	smooth	2	238	114	105	55	52	50	299	305	156	99	75	24	15

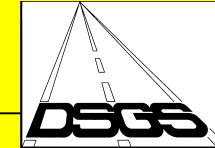
- Day visibility: no system reaches the class Q3
- Night visibility (dry): 1 x R3, 4 x R2, 3 x R0
- Night visibility (wet): 1 x RW1, 4 x RW0
- No system fulfills all German requirements



8 high solid and 2-component paints

material	system	type	08-06 Qd	04-07 Qd	08-07 Qd	08-06 SRT	04-07 SRT	08-07 SRT	08-06 RL-t	11-06 RL-t	04-07 RL-t	08-07 RL-t	11-06 RL-f	04-07 RL-f	08-07 RL-f
hs paint	smooth	1	241,4	116,0	114,3	52,5	52,5	55,0	137,9	91,1	60,5	38,8			
hs paint	smooth	1	254,5	150,6	145,4	56,0	48,3	48,0	266,1	162,3	68,3	48,9			
hs paint	smooth	2	231,1	150,8	151,9	54,3	48,5	46,0	242,3	63,6	41,0	35,8	9,4	2,8	3,8
hs paint	smooth	2	256,8	146,4	147,3	58,5	51,4	52,0	205,6	121,3	107,0	80,6	23,9	8,3	15,5
hs paint	smooth	2	210,4	140,4	135,0	67,3	51,5	49,7	561,1	259,1	115,9	91,9	98,3	25,6	23,3
2-c. paint	smooth	2	234,6	138,8	156,0	56,8	50,5	53,3	228,8	198,8	184,1	160,9	45,9	18,0	19,9
2-c. paint	smooth	2	256,1	163,3	180,8	57,5	52,5	51,0	213,1	172,0	68,4	63,3	30,6	5,6	7,9
2-c. paint	smooth	2	274,1	170,6	162,3	58,3	47,0	47,5	215,8	207,6	176,1	137,1	39,8	19,3	14,8

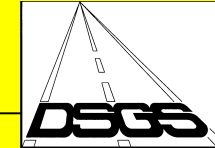
- Day visibility: 2 x Q4, 5 x Q3, 1 x Q0
- Night visibility (dry): 1 x R3, 1 x R2, 6 x R0
- Night visibility (wet): 6 x RW0
- No system fulfills all German requirements



13 coldsprayplastics

material	system	type	08-06 Qd	04-07 Qd	08-07 Qd	08-06 SRT	04-07 SRT	08-07 SRT	08-06 RL-t	11-06 RL-t	04-07 RL-t	08-07 RL-t	11-06 RL-f	04-07 RL-f	08-07 RL-f
csp	smooth	2	241	138	135	58	52	50	442	361	233	171	198	61	42
csp	smooth	2	240	142	132	74	51	51	371	287	281	197	166	52	32
csp	smooth	2	251	159	159	72	47	44	314	219	156	128	44	14	5
csp	smooth	2	246	152	153	53	47	45	281	166	101	76	27	8	14
csp	smooth	2	255	164	165	65	45	47	203	211	119	81	68	22	15
csp	smooth	2	274	159	178	64	44	46	134	118	105	88	32	10	17
csp	smooth	2	252	155	157	63	44	48	182	236	143	101	70	24	13
csp	smooth	2	247	142	151	59	54	51	157	264	234	190	64	30	27
csp	smooth	2	250	161	152	60	46	48	180	275	178	134	68	27	11
csp	smooth	2	264	174	154	60	42	47	195	189	158	117	67	22	24
csp	smooth	2	272	146	145	68	51	51	163	206	157	128	43	16	17
csp	injektion	2	234	147	143	61	47	46	230	259	222	182	43	22	23
csp	injektion	2	248	157	154	68	49	50	138	186	163	124	71	32	28

- Day visibility: 2 x Q4, 11 x Q3
- Night visibility (dry): 4 x R3, 6 x R2, 3 x R0
- Night visibility (wet): 1 x RW2, 3 x RW1, 9 x RW0
- One system fulfills all German requirements

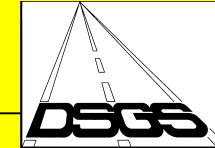


23 (19 agglomerates + 4 smooth) coldplastics

material	system	type	08-06 Qd	04-07 Qd	08-07 Qd	08-06 SRT	04-07 SRT	08-07 SRT	08-06 RL-t	11-06 RL-t	04-07 RL-t	08-07 RL-t	11-06 RL-f	04-07 RL-f	08-07 RL-f
cp	agglo	2	203	151	152	66	57	58	276	279	251	215	71	52	55
cp	agglo	2	175	116	126	77	68	64	339	243	308	287	202	161	147
cp	agglo	2	259	148	144	59	56	53	347	317	278	213	59	45	40
cp	agglo	2	200	121	128	77	63	63	280	182	270	248	126	119	110
cp	agglo	2	240	143	147	64	60	62	317	307	294	249	56	47	57
cp	agglo	2	231	118	126	64	58	54	333	199	152	127	55	29	37
cp	agglo	2	216	116	129	73	69	66	312	174	128	115	59	28	46
cp	agglo	2	217	120	132	68	66	58	308	232	176	159	85	39	51
cp	agglo	2	218	116	129	70	61	61	373	234	205	174	93	36	51
cp	agglo	2	243	123	129	73	65	65	197	230	176	138	43	19	40
cp	agglo	2	228	122	130	70	60	55	205	185	131	104	42	25	35
cp	agglo	2	235	139	147	68	54	55	263	191	177	149	61	34	41
cp	agglo	2	200	133	137	65	63	60	368	271	250	213	60	50	44
cp	agglo	2	247	145	131	51	48	48	343	301	312	235	82	53	47
cp	agglo	2	254	153	147	61	48	48	487	295	281	225	106	60	51
cp	agglo	2	241	143	139	56	48	50	393	317	258	216	94	57	40
cp	agglo+u-(2-c.)	2	249	128	127	69	58	55	337	191	160	124	50	34	37
cp	agglo+u-(2-c.)	2	228	124	125	78	68	60	272	181	137	110	70	38	44
cp	agglo+u-(csp)	2	248	157	150	64	56	61	301	296	290	238	59	48	56
cp	smooth	2	237	169	160	76	51	48	166	258	253	210	82	65	57
cp	smooth	2	244	164	157	73	52	49	170	259	244	200	103	68	58
cp	smooth	2	249	147	131	56	50	48	230	300	266	265	52	33	41
cp	smooth	1	236	144	149	56	52	52	120	224	185	138			

- Day visibility: 1 x Q4, 14 x Q3, 8 x Q0
- Night visibility (dry): 13 x R4, 2 x R3, 8 x R2
- Night visibility (wet): 2 x RW4, 8 x RW3, 12 x RW2

- 12 systems fulfill all German requirements (only type II: 9 agglomerates + 3 smooth)



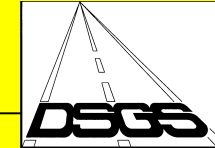
29 (10 agglomerates + 18 smooth + 1 profiled) thermoplastics

material	system	type	08-06 Qd	04-07 Qd	08-07 Qd	08-06 SRT	04-07 SRT	08-07 SRT	08-06 RL-t	11-06 RL-t	04-07 RL-t	08-07 RL-t	11-06 RL-f	04-07 RL-f	08-07 RL-f
tp	agglo	2	183	133	128	75	59	57	299	204	128	107	73	29	16
tp	agglo	2	180	116	83	63	60	53	541	282	121	85	99	31	15
tp	agglo	2	231	158	169	55	52	52	317	224	146	148	73	44	44
tp	agglo	2	231	159	172	55	52	52	590	335	185	174	103	54	49
tp	agglo	2	230	154	169	55	53	51	442	285	149	152	89	48	48
tp	agglo	2	269	169	200	49	51	55	263	255	198	179	47	37	38
tp	agglo	2	434	167	195	43	53	55	277	202	147	157	69	47	35
tp	agglo	2	204	162	179	51	55	57	334	175	139	159	63	47	51
tp	agglo	2	199	160	170	53	47	52	257	369	325	303	80	74	59
tp	agglo + u. (tp)	2	217	178	182	48	50	57	285	175	172	181	42	22	26
tp	profiled	2	242	182	180	75	60	62	202	226	174	187	95	48	48
tp	smooth	2	229	175	170	45	49	50	245	379	232	179	174	54	28
tp	smooth	2	229	168	162	44	43	43	258	377	236	189	140	58	33
tp	smooth	2	256	169	195	54	52	50	197	310	251	255	56	26	22
tp	smooth	2	231	173	180	36	50	49	559	543	272	217	140	38	33
tp	smooth	2	237	177	195	37	41	43	504	571	348	302	111	44	36
tp	smooth	2	269	152	174	56	51	52	219	162	136	134	17	21	8
tp	smooth	2	259	185	206	51	47	50	276	363	93	110	75	20	19
tp	smooth	2	226	168	184	45	50	49	171	181	188	203	15	42	21
tp	smooth	2	233	165	165	55	50	50	211	243	243	244	28	15	14
inlaid tp	smooth	2	231	166	168	73	55	54	240	263	225	199	52	32	28
inlaid tp	smooth	1	236	165	166	66	52	50	164	187	207	202			
tp	smooth	1	250	178	171	59	56	51	152	221	167	153			
tp	smooth	1	239	178	194	48	50	50	246	260	166	156			
tp	smooth.	1	236	164	174	53	52	47	230	299	233	255			
tp	smooth	1	235	167	186	53	52	49	215	277	216	254			
tp	smooth	1	231	156	179	53	55	53	233	253	182	198			
tp	smooth	1	225	168	177	58	48	52	203	199	216	236			
tp	smooth	1	222	171	172	56	47	48	204	209	255	282			

- Day visibility: 2 x Q5, 25 x Q4, 2 x Q0 Night visibility (dry): 2 x R5, 9 x R4, 13 x R3, 4 x R2, 1 x R0

- Night visibility (wet): 2 x RW3, 6 x RW2, 6 x RW1, 7 x RW0

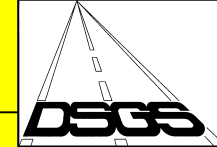
- 15 systems fulfill all German requirements (6 agglomerates + 8 smooth (only type I) + 1 profiled)



7 tapes

material	system	type	08-06 Qd	04-07 Qd	08-07 Qd	08-06 SRT	04-07 SRT	08-07 SRT	08-06 RL-t	11-06 RL-t	04-07 RL-t	08-07 RL-t	11-06 RL-f	04-07 RL-f	08-07 RL-f
tape	smooth	2	267	209		46	36		359	542	208		122		
tape	smooth	2	270			51			344	415			88		
tape	smooth	2	260	210		52	48		319	436	206		81		
tape	profiled	2	185	145	148	79	52	52	362	480	496	413	233	159	101
tape	profiled	2	192	130	132	49	46	49	354	519	565	524	532	336	176
tape	profiled	2	239	153	168	67	49	51	362	692	795	760	92	88	77
tape	profiled	2	217	148	150	46	44	46	360	422	433	342	294	164	77

- Day visibility: 1 x Q4, 3 x Q3, 3 x Q0
- Night visibility (dry): 4 x R5, 3 x R0
- Night visibility (wet): 4 x RW4, 3 x RW0
- 4 systems fulfill all German requirements



Summary

88 systems altogether (14 type I + 74 type II, 29 of them agglomerates)

Fulfillment of the German requirements (ZTV M 02) after one year:

0 paints (16)	type I + type II
1 csp (13)	type II
12 cp (23)	type II (9 agglomerates + 3 smooth)
15 tp (29)	8 type I (all smooth) 7 type II (6 agglomerates + 1 profiled)
4 tapes (7)	type II (4 profiled)

32 systems	24 type II (15 agglomerates, 5 profiled, 4 smooth)
	8 type I

Extension of the test field:

- 14 samples were removed in August, 2007
- 27 new samples were applied,
1 sample was freshened up





THE END