

**Substructure layers**

Appendix I1

**Railway Project**

Pre-engineering, phase 2

VR Track Oy

15.12.2017



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VR TRACK

**Substructure layer categories**

	<b>A-Category, A_ET (existing track)</b>	<b>B-category, B_f = flood area</b>	<b>C-category</b>	<b>D-category</b>
	550 mm ballast 200 mm intermediate	550 mm ballast 200 mm intermediate 250 mm sub-base	550 mm ballast 200 mm intermediate 250 mm sub-base 250 mm sub-grade	550 mm ballast 200 mm intermediate 250 mm sub-base 450 mm sub-grade
	<b>750 mm Total thickness</b>	<b>1000 mm Total thickness</b>	<b>1250 mm Total thickness</b>	<b>1450 mm Total thickness</b>
<b>Subsoil and Subgrade requirements</b>	<b>Subsoil / Subgrade &gt; 80 MPa Subsoil rock, cobbles, E2 ≥ 80 MPa on existing layers of track</b>  CBR >18 %, SPT >21	<b>Subsoil/Subgrade 40...80 MPa</b>  CBR 10...18 %, SPT 15...21	<b>Subsoil/Subgrade 20...40 MPa</b>  CBR 4...10 %, SPT 6...15	<b>Subsoil/Subgrade &lt; 20 MPa</b>  CBR < 4 %, SPT 2...6

Bearing capacity of subsoil / subgrade MPa

SPT Standard penetration test Blows/0.3 m

CBR = Californian bearing rate %

**All the Categories are presented in Typical Cross Section drawings**

The categories by kilometers are shown on the following pages

Notes: Categories are estimated mainly for quantity estimate purposes.

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Categories A, B and C are shown in the technical cross-sections.

Categories are estimated mainly for quantity estimate purposes.

Chosen categories are based on the investigations.

<b>Substructure layer categories by kilometers</b>				
<b>Depending on the bearing capacity of the subsoil / subgrade</b>				
<b>Start km</b>	<b>End km</b>	<b>Category</b>	<b>Note</b>	<b>New alignment (distance &gt; 5 m to the existing alignment), Meeting station, Double track</b>
1+250	3+000	B		Double track
3+000	3+600	B	Trench	Double track
3+600	3+900	A	Trench	Double track
3+900	4+150	B	Trench	Double track
4+150	4+350	C		Double track
4+350	5+175	B		Double track
5+175	5+425	C		Double track
5+425	9+000	B		km 8+800 existing 2-track section ends
9+000	9+450	C		km 8+800–28+500, new 2-track section
9+450	10+600	B		New double track
10+600	10+800	C		New double track
10+800	11+500	B		New double track
11+500	12+170	C		New double track
12+170	12+440	B		New double track
12+440	12+750	C		New double track
12+750	12+950	B		New double track
12+950	13+200	C		New double track
13+200	14+600	B		New double track
14+600	15+100	C		New double track
15+100	16+000	B		New double track
16+000	16+500	C		New double track
16+500	17+100	B		New double track
17+100	17+500	C		New double track
17+500	18+650	B		New double track
18+650	19+000	B	Trench	New double track
19+000	20+300	A	Trench	New double track
20+300	20+600	B	Trench	New double track
20+600	24+950	B		New double track
24+950	25+100	C		New double track
25+100	25+550	B		New double track
25+550	29+700	C		km 28+500 new double track section ends
29+700	33+300	B		
33+300	34+100	C		

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<b>Depending on the bearing capacity of the subsoil / subgrade</b>				
<b>Start km</b>	<b>End km</b>	<b>Category</b>	<b>Note</b>	<b>New alignment (distance &gt; 5 m to the existing alignment), Meeting station, Double track</b>
34+100	34+750	B		
34+750	35+550	C		
35+550	37+400	B		
37+400	38+150	C		
38+150	43+000	B		km 38+150 - 43+000, Meeting station 1
43+000	45+300	C		
45+300	49+600	B		
49+600	50+220	B_f	Flood area	
50+220	50+280		Bridge	
50+280	52+000	B_f	Flood area	km 51+240 - 59+740 , New alignment
52+000	52+500	B		km 51+300 - 53+000 , Meeting station 2
52+500	53+100	C		
53+100	53+400	B		
53+400	53+500	C		
53+500	53+700	B		
53+700	54+300	A		
54+300	59+890	B		
59+890	60+510		Bridge	
60+510	64+100	B		km 62+850 - 63+350 , New alignment
64+100	64+450	C		
64+450	65+300	B		km 64+700 - 68+900 , New alignment, km 64+000 - 65+200, Meeting station 3
65+300	66+300	C		
66+300	66+900	B		
66+900	67+400	C		
67+400	67+500	B		
67+500	68+200	B_f	Flood area	
69+900	71+600	B		69+950 - 72+000 , New alignment
71+600	73+200	C		
73+200	75+500	B		74+200 - 75+800 , New alignment
75+500	77+250	C		
77+250	77+500	B		77+000 - 79+900 , New alignment
77+500	77+600	C		
77+600	78+400	B		

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<b>Substructure layer categories by kilometers</b>				
<b>Depending on the bearing capacity of the subsoil / subgrade</b>				
<b>Start km</b>	<b>End km</b>	<b>Category</b>	<b>Note</b>	<b>New alignment (distance &gt; 5 m to the existing alignment), Meeting station, Double track</b>
78+400	79+000	C		78+100 - 79+300 , Meeting station 4
79+000	82+150	B		
82+150	82+550	B_f	Flood area	82+050 - 82+400 , New alignment
82+550	83+100	C		
83+100	84+500	B		83+100 - 84+500 , New alignment
84+500	89+050	B		88+600 - 88+800 , New alignment
89+050	90+350	B		89+100 - 90+350 , New alignment
90+350	91+400	B		90+380 - 91+295 , Meeting station 5
91+400	94+050	B		91+400 - 94+050 , New alignment
94+050	95+100	B		94+550 - 95+100 , New alignment
95+100	97+400	B		96+050 - 97+000 , New alignment
97+400	99+950	B		98+150 - 101+300 , New alignment
99+950	100+050	A		
100+050	100+250	B		
100+250	100+650	A		
100+650	103+430	B		
103+430	103+620		Bridge	
103+620	105+750	B		104+300 - 105+750 , New alignment
105+750	108+950	B		108+600 - 108+950 , New alignment
108+950	109+800	B		109+400 - 109+800 , New alignment
109+800	111+620	B		110+337 - 111+485 , Meeting station 6
111+620	113+250	B		111+620 - 113+250 , New alignment
113+250	114+350	B		113+700 - 114+350 , New alignment
114+350	115+100	B		114+555 - 115+843 , New alignment
115+100	115+200	A		
115+200	116+500	B		116+100 - 116+900 , New alignment
116+500	116+600	A		
116+600	120+000	B		118+500 - 119+050 , New alignment
119+050	121+000	B		120+000 - 121+900 , New alignment
121+000	121+300	A		
121+300	122+500	B		120+000 - 121+900 , New alignment
122+500	126+420	B		km 122+500 - 124+850 , New alignment, km 123+958 - 125+083 , Meeting station 7
126+420	127+100	B		126+420 - 126+900 , New alignment

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<b>Start km</b>	<b>End km</b>	<b>Category</b>	<b>Note</b>	<b>New alignment (distance &gt; 5 m to the existing alignment), Meeting station, Double track</b>
127+100	130+600	B		127+100 - 129+800 , New alignment
130+600	130+800	A		
130+800	131+850	B		130+800 - 134+010 , New alignment
131+850	132+100	A		
132+100	132+650	B		
132+200	136+500	B		
132+650	132+200	A		
136+500	136+800	A		
136+800	136+900	B		136+100 - 136+750 , New alignment
136+900	138+350	B		137+150 - 138+350 , New alignment
138+350	140+500	B		138+551 - 139+751 , Meeting station 8
140+500	141+000	B		140+500 - 141+000 , New alignment
141+000	143+300	B		141+220 - 143+300 , New alignment
143+300	147+300	B		146+250 - 147+300 , New alignment
147+300	150+360	B		149+100 - 150+360 , New alignment
150+360	153+850	B		149+687 - 150+855 , Meeting station 9
153+850	156+420	B		153+900 - 156+420 , New alignment
156+420	160+240	B		159+000 - 159+300 , New alignment
160+240	161+980	B		160+240 - 161+980 , New alignment
161+980	163+300	B		162+130 - 162+840 , New alignment
163+300	166+880	B		km 163+300 - 166+880 , New alignment, km 163+388 - 164+517 Meeting station 10
166+880	168+310	B		167+540 - 168+310 , New alignment
168+310	169+950	B		169+200 - 171+210 , New alignment
169+950	170+400	A		

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<b>Start km</b>	<b>End km</b>	<b>Category</b>	<b>Note</b>	<b>New alignment (distance &gt; 5 m to the existing alignment), Meeting station, Double track</b>
170+400	179+600	B		178+190 - 179+500 , New alignment, 176+904 - 178+650 Meeting station 11
179+600	182+410	B		179+600 - 181+450 , New alignment
182+410	184+300	B		182+410 - 186+800 , New alignment
184+300	184+500	A		
184+500	188+010	B		187+600 - 188+010 , New alignment , 186+312 - 187+513 Meeting station 12
188+010	198+300	B		190+600 - 192+550 , New alignment, 196+170 - 197+370 Meeting station 13
198+300	199+750	B_f		
199+750	199+980	B		
199+980	200+620		Bridge	
200+620	215+250	B		213+600 - 214+800 , Meeting station 14
215+250	215+550	A_ET		
215+550	215+900	B		
215+900	216+150	A		
216+150	219+950	B		
219+950	220+000		Bridge	
220+000	227+800	B		
227+800	227+900	A_ET		
227+900	228+600	B		
228+600	228+750	A_ET		229+820 - 231+020 , Meeting station 15
228+750	237+400	B		
237+400	238+000	A_ET		
238+000	239+600	B		
239+600	239+750	A_ET		
239+750	263+800	B		km 244+200 - 245+400 , Meeting station 16, km 254+200 - 255+400 , Meeting station 17
263+800	264+580		Bridge	
<b>Port Connection</b>				
		B		
<b>Mill Connections; South, North</b>				
		B		