

**Index of Provisionally Approved Mix Designs
Pioneer Asphalts (Hong Kong) Ltd.**

I. Normal Mix

Bituminous Material	HyD Mix No.	Supplier's Mix No.	Date of Design	Approval Date	Expiry Date
10mm Friction Course	10FC/PIO/AR/012	158	21-Nov-2011	20-Mar-2012	19-Mar-2015
10mm Wearing Course	10WC/PIO/AR/009	148	20-Oct-2011	20-Mar-2012	19-Mar-2015
20mm Wearing Course	20WC/PIO/AR/009	147	17-Oct-2011	20-Mar-2012	19-Mar-2015
28mm Base Course	28BC/PIO/AR/009	150	27-Oct-2011	26-Mar-2012	25-Mar-2015
37.5mm Base Course	40BC/PIO/AR/009	151	31-Oct-2011	26-Mar-2012	25-Mar-2015
37.5mm Roadbase (recipe mix)	40RB/PIO/AR/004	RB-001	16-Jan-2012	--	--

II. Reclaimed Asphalt Pavement (RAP) Mix

Bituminous Material	HyD Mix No.	Supplier's Mix No.	Date of Design	Approval Date	Expiry Date
10mm Wearing Course	10WC/PIO/AR/RAP15/001	155	16-Feb-2012	20-Mar-2012	19-Mar-2015
20mm Wearing Course	20WC/PIO/AR/RAP15/001	154	5-Jan-2012	20-Mar-2012	19-Mar-2015
28mm Base Course	28BC/PIO/AR/RAP15/001	156	17-Jan-2012	20-Mar-2012	19-Mar-2015
37.5mm Base Course	40BC/PIO/AR/RAP15/001	157	9-Feb-2012	20-Mar-2012	19-Mar-2015
37.5mm Roadbase (recipe mix)	40RB/PIO/AR/RAP15/001	RB-RAP15-001	18-Jan-2012	--	--

III. Polymer Modified Mix

Bituminous Material	HyD Mix No.	Supplier's Mix No.	Date of Design	Approval Date	Expiry Date
10mm Polymer Modified Friction Course	10PMFC/PIO/AR/PG/004	149	2-Feb-2012	20-Mar-2012	19-Mar-2015
3.35mm Polymer Modified Cushion Course	CC/PIO/AR/PG/003	142	13-Jul-2011	5-Aug-2011	4-Aug-2014
10mm Polymer Modified Stone Mastic Asphalt	10PMSMA/PIO/AR/PG/VIA/75/001	159	17-Nov-2011	20-Mar-2012	19-Mar-2015

IV. Special Mix

Bituminous Material	HyD Mix No.	Supplier's Mix No.	Date of Design	Approval Date	Expiry Date
20mm Stone Mastic Asphalt	20SMA/PIO/AR/VIA/75/002	152	3-Nov-2011	20-Mar-2012	19-Mar-2015
20mm Stone Mastic Asphalt	20SMA/PIO/AR/VIA/50/001	160	23-Feb-2012	20-Mar-2012	19-Mar-2015
10mm Stone Mastic Asphalt	10SMA/PIO/AR/VIA/75/002	153	7-Nov-2011	20-Mar-2012	19-Mar-2015
10mm Stone Mastic Asphalt	10SMA/PIO/AR/VIA/50/002	161	1-Mar-2012	20-Mar-2012	19-Mar-2015

Remark: Mix design details are tabled in the appropriate spreadsheets.

**Summary of Provisionally Approved Mix Designs
Pioneer Asphalts (Hong Kong) Ltd.
(Normal Mix)**

1. Plant Location : Anderson Road

2. Source and Type of Constituent Materials :

Constituent Material	Source	Type
Bitumen	Shell (Hong Kong) Limited	Grade 60/70 pen
Coarse Aggregate (retained on 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)
Fine Aggregate (passing 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)
Filler (passing 75 μ m BS sieve)	KWP Quarry Co., Ltd., Anderson Road Hydrated Lime - Sun Man Lee, China	Crushed rock filler for WC & BC Mixture of crushed rock filler and hydrated lime for FC

3. Mix Designs :

Bituminous Material	10mm Friction Course		10mm Wearing Course		20mm Wearing Course		28mm Base Course		37.5mm Base Course		37.5mm Roadbase (recipe mix)	
	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Data	GS Requirement*
HyD Mix No.	10FC/PIO/AR/012		10WC/PIO/AR/009		20WC/PIO/AR/009		28BC/PIO/AR/009		40BC/PIO/AR/009		40RB/PIO/AR/004	
Supplier's Mix No.	158		148		147		150		151		RB-001	
Date of Design	21-Nov-2011		20-Oct-2011		17-Oct-2011		27-Oct-2011		31-Oct-2011		16-Jan-2012	
Approval Date	20-Mar-2012		20-Mar-2012		20-Mar-2012		26-Mar-2012		26-Mar-2012		--	
Expiry Date	19-Mar-2015		19-Mar-2015		19-Mar-2015		25-Mar-2015		25-Mar-2015		--	
Binder content (%)	4.5	4.0 - 5.0	6.0	5.5 - 6.5	5.3	4.8 - 5.8	4.7	4.2 - 5.2	4.2	3.7 - 4.7	3.5	3.0 - 4.0
B.S. Sieve (mm)	% Passing		% Passing		% Passing		% Passing		% Passing		% Passing	
50									100	100	100	100
37.5									98	94 - 100	98	90 - 100
28					100	100	96	92 - 100	92	85 - 99	88	70 - 94
20					96	92 - 100	89	82 - 96	79	72 - 86	74	62 - 84
14	100	100	100	100	88	81 - 95	78	71 - 85	68	61 - 75	--	--
10	95	91 - 99	96	92 - 100	79	72 - 86	69	62 - 76	60	53 - 67	56	49 - 67
5	26	19 - 33	76	69 - 83	66	59 - 73	48	41 - 55	49	42 - 56	45	37 - 55
2.36	12	5 - 19	55	48 - 62	51	44 - 58	36	29 - 43	35	28 - 42	33	27 - 43
1.18	--	--	40	33 - 47	36	29 - 43	26	19 - 33	26	19 - 33	--	--
0.600	--	--	27	22 - 32	26	21 - 31	18	13 - 23	18	13 - 23	18	13 - 28
0.300	--	--	18	13 - 23	18	13 - 23	13	8 - 18	12	7 - 17	12	7 - 21
0.150	--	--	12	9 - 15	10	7 - 13	8	5 - 11	9	6 - 12	--	--
0.075	4.0	2.0 - 6.0	7.2	5.2 - 9.2	6.5	4.5 - 8.5	4.8	2.8 - 6.8	6.5	4.5 - 8.5	5.0	2.0 - 8.0
	(including 2.0% hydrated lime)			10.2 [#]		9.5 [#]		7.8 [#]		9.5 [#]		8.0 [@]
	Marshall Properties		Marshall Properties		Marshall Properties		Marshall Properties		Marshall Properties		Marshall Properties	
Air voids in mix, VIM (%)	19.9	18 - 25	5.0	3.0 - 5.0	5.0	3.0 - 5.0	5.0	3.0 - 5.0	5.0	3.0 - 5.0	--	--
Void in mineral aggregate, VMA (%)	27.6	≥ 25	17.5	≥ 16	16.3	≥ 14	14.8	≥ 13	13.8	≥ 12.5	--	--
Marshall stability (kN)	--	--	12.7	≥ 10	13.5	≥ 10	14.5	≥ 10	15.6	≥ 10	--	--
Flow (mm)	--	--	2.3	≤ 4.0	2.2	≤ 4.0	2.7	≤ 4.0	2.5	≤ 4.0	--	--

* For reference only

[#] The percentage passing the 0.075mm BS sieve shall not deviate from the approved design value by more than 3%.

[@] The percentage passing the 0.075mm BS test sieve shall not exceed 8.0%.

**Summary of Provisionally Approved Mix Designs
Pioneer Asphalts (Hong Kong) Ltd.
(RAP Mix)**

1. Plant Location : Anderson Road

2. Source and Type of Constituent Materials :

Constituent Material	Source	Type
Bitumen	Shell (Hong Kong) Limited	Grade 60/70 pen
Coarse Aggregate (retained on 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)
Fine Aggregate (passing 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)
Filler (passing 75 μ m BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock filler

3. Mix Designs :

Bituminous Material	10mm Wearing Course		20mm Wearing Course		28mm Base Course		37.5mm Base Course		37.5mm Roadbase (recipe mix)	
	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Grading	GS Requirement*	Design Data	GS Requirement*
HyD Mix No.	10WC/PIO/AR/RAP15/001		20WC/PIO/AR/RAP15/001		28BC/PIO/AR/RAP15/001		40BC/PIO/AR/RAP15/001		40RB/PIO/AR/RAP15/001	
Supplier's Mix No.	155		154		156		157		RB-RAP15-001	
Date of Design	16-Feb-2012		5-Jan-2012		17-Jan-2012		9-Feb-2012		18-Jan-2012	
Approval Date	20-Mar-2012		20-Mar-2012		20-Mar-2012		20-Mar-2012		--	
Expiry Date	19-Mar-2015		19-Mar-2015		19-Mar-2015		19-Mar-2015		--	
Binder content (%)	6.2	5.7 - 6.7	5.4	4.9 - 5.9	4.5	4.0 - 5.0	4.4	3.9 - 4.9	3.5	3.0 - 4.0
B.S. Sieve (mm)	% Passing		% Passing		% Passing		% Passing		% Passing	
50							100	100	100	100
37.5					100	100	98	94 - 100	98	90 - 100
28			100	100	96	92 - 100	92	85 - 99	89	70 - 94
20			96	92 - 100	89	82 - 96	79	72 - 86	76	62 - 84
14	100	100	88	81 - 95	78	71 - 85	70	63 - 77	--	--
10	96	92 - 100	79	72 - 86	69	62 - 76	60	53 - 67	56	49 - 67
5	76	69 - 83	66	59 - 73	48	41 - 55	49	42 - 56	47	37 - 55
2.36	55	48 - 62	51	44 - 58	36	29 - 43	35	28 - 42	34	27 - 43
1.18	40	33 - 47	37	30 - 44	26	19 - 33	26	19 - 33	--	--
0.600	27	22 - 32	28	23 - 33	18	13 - 23	18	13 - 23	19	13 - 28
0.300	18	13 - 23	18	13 - 23	13	8 - 18	12	7 - 17	12	7 - 21
0.150	12	9 - 15	11	8 - 14	8	5 - 11	9	6 - 12	--	--
0.075	7.2	5.2 - 9.2 10.2 [#]	7.0	5.0 - 9.0 10.0 [#]	5.4	3.4 - 7.4 8.4 [#]	6.5	4.5 - 8.5 9.5 [#]	6.2	2.0 - 8.0 8.0 [@]
	(including 15% RAP)		(including 15% RAP)		(including 15% RAP)		(including 15% RAP)		(including 15% RAP)	
	Marshall Properties		Marshall Properties		Marshall Properties		Marshall Properties		Marshall Properties	
Air voids in mix, VIM (%)	4.8	3.0 - 5.0	5.0	3.0 - 5.0	4.7	3.0 - 5.0	4.9	3.0 - 5.0	--	--
Voids in mineral aggregate, VMA (%)	17.7	≥ 16	16.2	≥ 14	14.2	≥ 13	14.1	≥ 12.5	--	--
Marshall stability (kN)	12.4	≥ 10	14.6	≥ 10	17.7	≥ 10	16.0	≥ 10	--	--
Flow (mm)	2.5	≤ 4.0	2.4	≤ 4.0	2.4	≤ 4.0	2.6	≤ 4.0	--	--

* For reference only

[#] The percentage passing the 0.075mm BS sieve shall not deviate from the approved design value by more than 3%.

[@] The percentage passing the 0.075mm BS test sieve shall not exceed 8.0%.

**Summary of Provisionally Approved Mix Designs
Pioneer Asphalts (Hong Kong) Ltd.
(Polymer Modified Mix)**

- Plant Location : Anderson Road
- Source and Type of Constituent Materials :

Constituent Material	Source	Type		
		10PMFC/PIO/AR/PG/004	CC/PIO/AR/PG/003	10PMSMA/PIO/AR/PG/VIA/75/001
Bitumen	Shell (Hong Kong) Limited	Cariphalte PG76		
Coarse Aggregate (retained on 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)	Not applicable	Crushed rock (Granite)
Fine Aggregate (passing 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)		
Filler (passing 75 μ m BS sieve)	KWP Quarry Co., Ltd., Anderson Road Hydrated Lime - Sun Man Lee, China	Mixture of crushed rock filler and hydrated lime		
Fibre	J. Rettenmaier & Sohne (Germany)	Not applicable		Cellulose Fibre (Viatop66)

- Mix Designs :

Bituminous Material	10mm Polymer Modified Friction Course		3.35mm Polymer Modified Cushion Course		10mm Polymer Modified Stone Mastic Asphalt	
HyD Mix No.	10PMFC/PIO/AR/PG/004		CC/PIO/AR/PG/003		10PMSMA/PIO/AR/PG/VIA/75/001	
Supplier's Mix No.	149		142		159	
Date of Design	2-Feb-2012		13-Jul-2011		17-Nov-2011	
Approval Date	20-Mar-2012		5-Aug-2011		20-Mar-2012	
Expiry Date	19-Mar-2015		4-Aug-2014		19-Mar-2015	
	Design Grading	PS Requirement*	Design Grading	PS Requirement*	Design grading	PS Requirement*
Polymer modified binder content (%)	5.5	5.0 - 6.0	10.0	9.5 - 10.5	6.3	5.6 - 6.6
B.S. Sieve (mm)	% passing		% passing		% Passing	
14	100	100			100	100
10	94	90 - 98			95	91 - 99
6.3	--	--	100	100	--	--
5	25	18 - 32	--	--	33	26 - 40
3.35	--	--	96	92 - 100	--	--
2.36	11	4 - 18	--	--	24	17 - 31
1.18	--	--	60	53 - 67	--	--
0.300	--	--	27	22 - 32	--	--
0.075	4.0	2.0 - 6.0	11.7	9.7 - 13.7	10.0	8.0 - 12.0 13.0 [#]
	(including 2% hydrated lime)		(including 2% hydrated lime)		(including 2% hydrated lime)	
	Marshall Properties		Marshall Properties		Marshall Properties	
Air voids in mix, VIM (%)	20.4	≥ 20	--	--	4.3	3.5 - 4.5
Voids in mineral aggregate, VMA (%)	--	--	--	--	17.7	≥ 17
Marshall stability (kN)	--	--	--	--	10.9	≥ 6
Binder draindown (%)	--	--	--	--	0.03	≤ 0.3
Marshall quotient (kN/mm)	--	--	1.1	0.7 - 1.2	--	--
Binder drainage test	Pass	Tmax > Binder content	--	--	--	--

* For reference only

[#] The percentage passing the 0.075mm BS sieve shall not deviate from the approved design value by more than 3%.

**Summary of Provisionally Approved Mix Designs
Pioneer Asphalts (Hong Kong) Ltd.
(Special Mix)**

1. Plant Location : Anderson Road

2. Source and Type of Constituent Materials :

Constituent Material	Source	Type
Bitumen	Shell (Hong Kong) Limited	Grade 60/70 pen
Coarse Aggregate (retained on 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)
Fine Aggregate (passing 5mm BS sieve)	KWP Quarry Co., Ltd., Anderson Road	Crushed rock (Granite)
Filler (passing 75 μ m BS sieve)	KWP Quarry Co., Ltd., Anderson Road Hydrated Lime - Sun Man Lee, China	Mixture of crushed rock filler and hydrated lime
Fibre	J. Rettenmaier & Sohne (Germany)	Cellulose Fibre (Viatop66)

3. Mix Designs :

Bituminous Material	20mm Stone Mastic Asphalt		20mm Stone Mastic Asphalt		10mm Stone Mastic Asphalt		10mm Stone Mastic Asphalt	
	Design grading	PS Requirement*	Design grading	PS Requirement*	Design grading	PS Requirement*	Design grading	PS Requirement*
HyD Mix No.	20SMA/PIO/AR/VIA/75/002		20SMA/PIO/AR/VIA/50/001		10SMA/PIO/AR/VIA/75/002		10SMA/PIO/AR/VIA/50/002	
Supplier's Mix No.	152		160		153		161	
Date of Design	3-Nov-2011		23-Feb-2012		7-Nov-2011		1-Mar-2012	
Approval Date	20-Mar-2012		20-Mar-2012		20-Mar-2012		20-Mar-2012	
Expiry Date	19-Mar-2015		19-Mar-2015		19-Mar-2015		19-Mar-2015	
Binder content (%)	5.9	5.2 - 6.2	6.0	5.5 - 6.5	6.0	5.3 - 6.3	6.4	5.9 - 6.9
B.S. Sieve (mm)	% Passing		% Passing		% Passing		% Passing	
28	100	100	100	100	--	--	--	--
20	96	92 - 100	96	92 - 100	--	--	--	--
14	88	81 - 95	87	80 - 94	100	100	100	100
10	74	67 - 81	73	66 - 80	95	91 - 99	95	91 - 99
5	26	19 - 33	25	18 - 32	32	25 - 39	31	24 - 38
2.36	18	11 - 25	18	11 - 25	24	17 - 31	24	17 - 31
1.18	--	--	--	--	--	--	--	--
0.600	14	9 - 19	14	9 - 19	--	--	--	--
0.300	13	8 - 18	13	8 - 18	--	--	--	--
0.150	--	--	--	--	--	--	--	--
0.075	8.5	6.5 - 10.5 11.5 [#]	8.5	6.5 - 10.5 11.5 [#]	9.4	7.4 - 11.4 12.4 [#]	9.4	7.4 - 11.4 12.4 [#]
		(including 2% hydrated lime)		(including 2% hydrated lime)		(including 2% hydrated lime)		(including 2% hydrated lime)
	Marshall Properties		Marshall Properties		Marshall Properties		Marshall Properties	
Air voids in mix, VIM (%)	4.2	3.0 - 4.5	4.2	3.0 - 4.5	4.5	3.0 - 4.5	4.4	3.0 - 4.5
Voids in mineral aggregate, VMA (%)	17.1	≥ 17	17.0	≥ 17	17.2	≥ 17	17.9	≥ 17
Marshall stability (kN)	8.4	≥ 6	7.4	≥ 6	9.0	≥ 6	7.2	≥ 6
Flow (mm)	2.5	≤ 4	2.6	≤ 4	2.5	≤ 4	2.8	≤ 4
Binder draindown (%)	0.09	≤ 0.3	0.04	≤ 0.3	0.02	≤ 0.3	0.03	≤ 0.3

* For reference only

[#] The percentage passing the 0.075mm BS sieve shall not deviate from the approved design value by more than 3%.