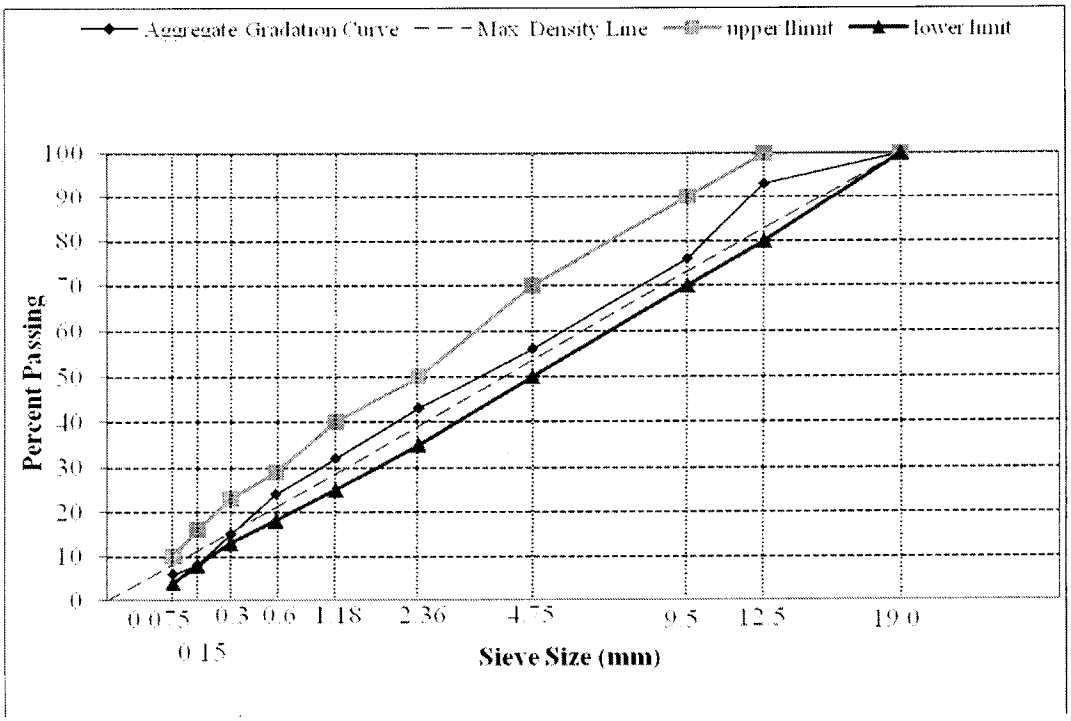
CE400 Spring2009 Homework#5 Solutions

1.

a) (6)

By inspecting the gradations, it is seen that all material retained on the 12.5mm sieve has to come from aggregate 1 (large critical sieve), and all material finer than the 0.6mm sieve must be furnished by aggregate 2 (small critical sieve). With regard to aggregate 1, because 100-86=14 percent is retained on the 12.5mm sieve 1, the percentage needed from 1to retain 10 percent on this sieve is 1=10/14=71.42%. If with regard to aggregate 2, because there is 46% passing the 0.6mm sieve, the percentage of aggregate 2 required to arrive at the desired 24% passing this sieve is 2=24/46=52%. Since there are relatively large differences from the analysis of the two critical sieves, we have to adjust them to make the results close to the specification median. At last, the following proportion is selected: aggregate stockpile 1 48% and stockpile 2 52%. The final blending result is shown in the table.

Stockpile	19	12.5	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075
1	100	86	54	16	5	4	0	0	0	0
2	100	100	96	92	78	60	46	28	16	12
48% 1	100	41.3	26	8	2	1.92	0	0	0	0
52% 2	100	52	50	48	41	31.2	24	15	8	6
Blend	100	93	76	56	43	33.12	24	15	8	6
Desired	100	90	80	60	43	32	24	18	12	7
Spec.	100	80-100	70-90	50-70	35-50	25-40	18-29	13-23	8-16	4-10



(4)

b) Based on the equation given in textbook, $G = \dfrac{P_1 + P_2}{\dfrac{P_1}{G_1} + \dfrac{P_2}{G_2}}$

a. $\mathbf{G_{sb}} = \dfrac{1}{\dfrac{48\%}{2.562} + \dfrac{52\%}{2.521}} = \mathbf{2.541}$

b. $\mathbf{G_{sa}} = \dfrac{1}{\dfrac{48\%}{2.674} + \dfrac{52\%}{2.611}} = \mathbf{2.641}$

2. (6)

a) $W_s = 4505\ g$.

$V_{sb} = \dfrac{W_s}{G_{sb} \cdot 1} = \dfrac{4505}{2.638 \times 1} = 1707.7\ cm^3$

$V_{sa} = \dfrac{W_s}{G_{sa} \cdot 1} = \dfrac{4505}{2.751 \times 1} = 1637.6\ cm^3$

$V_b = \dfrac{W_b}{G_b} = \dfrac{235}{1.0} = 235\ cm^3$

$W_T = W_s + W_b = 4505 + 235 = 4740\ g$.

$G_{mm} = \dfrac{W_T}{V_{sb} + V_{be}} \Rightarrow V_{be} = \dfrac{W_T}{G_{mm}} - V_{sb} = \dfrac{4740}{2.498} - 1707.7 = 189.8\ cm^3$ (189.8)

$V_{ba} = V_b - V_{be} = 235 - 189.8 = 45.2\ cm^3$

$W_b = G_b \cdot V_b = 1 \times 235 = 235\ g$

$W_{ba} = G_b\ V_{ba} = 45.2\ g$. $W_{be} = G_b\ V_{be} = 189.8\ g$

$V_{mm} = V_{sb} + V_{be} = 1707.7 + 189.8 = 1897.5\ cm^3$

$V_{se} = V_{mm} - V_b = 1897.5 - 235 = 1662.5\ cm^3$

$AV = 4\% = \dfrac{V_{air}}{V_{air} + V_{mm}} \Rightarrow V_{air} = \dfrac{4\%\ V_{mm}}{96\%} = \dfrac{4\% \times 1897.5}{96\%}$

$V_{air} = 79.1\ (cm^3)$

$V_T = V_a + V_{mm} = 79.1 + 1897.5 = 1976.6\ cm^3$

$$VTM = \frac{V_a + V_{be}}{V_T} = \frac{79.1 + 189.8}{1976.6} = \underline{13.6\%}$$

$$P_{be} = \frac{W_{be}}{W_T} = \frac{189.8}{4740} = \underline{4\%}$$

$$P_{ba} = \frac{W_{ba}}{W_s} = \frac{45.2}{4505} = \underline{1\%}$$

$$G_{mb} = \frac{W_T}{V_T} = \frac{4740}{1976.6} = \underline{2.398}$$

3 ⑪

$$G_{mb} = \frac{W_T}{V_T}$$

$$V_T = \frac{\pi}{4} d^2 \times h$$

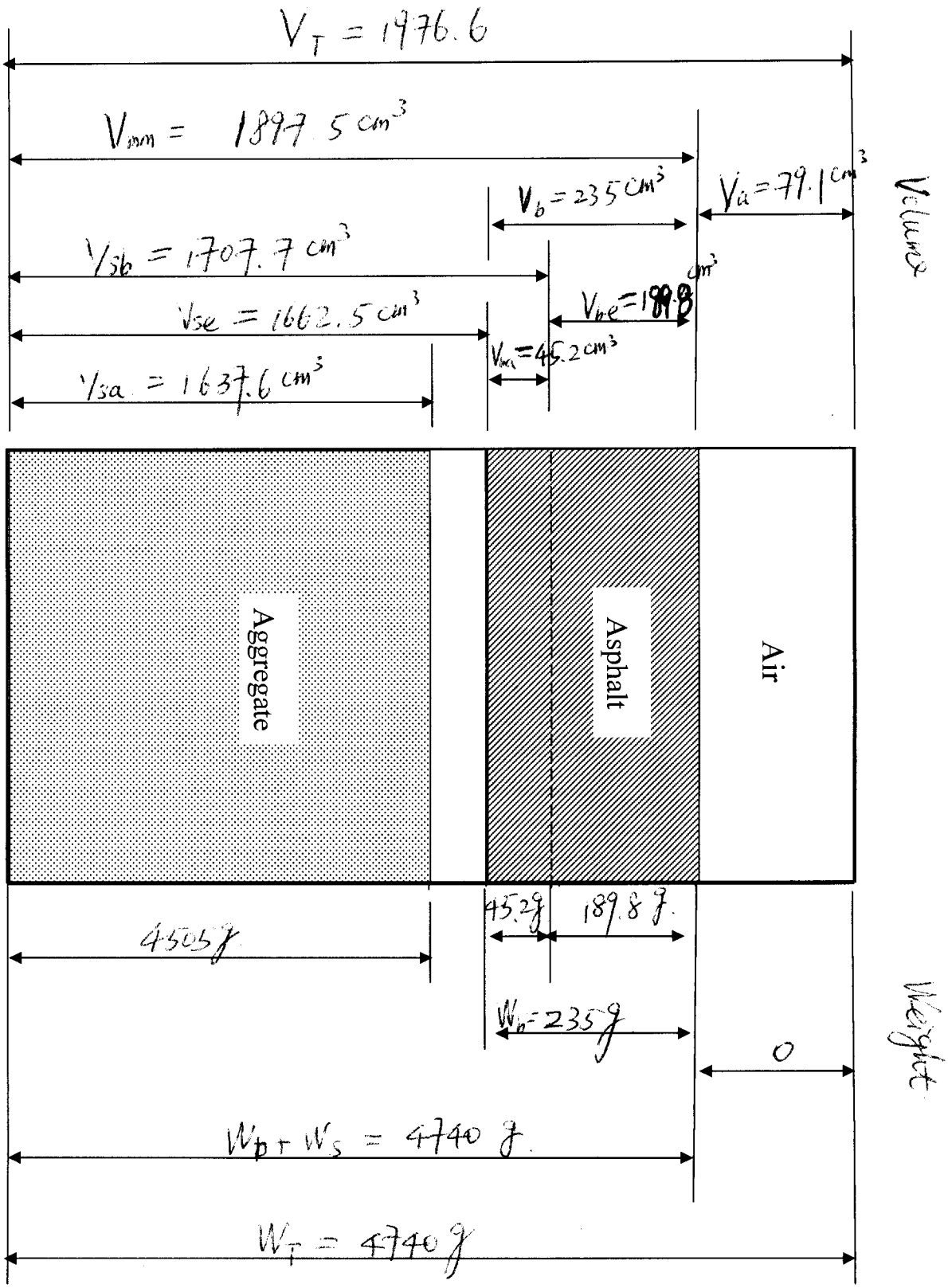
$$\Rightarrow W_T = G_{mb} \times \frac{\pi}{4} d^2 \times h \times 1$$

$$= 2.363 \times \frac{\pi}{4} \times 150^2 \times 115 \times 10^{-3} \times 1$$

$$= \underline{4802\ g}$$

$$P_b = 5.6\% \Rightarrow W_b = W_T \times 5.6\% = 4802 \times 5.6\% = \underline{268.9\ (g)}$$

~~P_s~~ $W_s = W_T - W_b = 4802 - 268.9 = \underline{4533.1\ (g)}$


$V_T = 1976.6$
$V_{mm} = 1897.5\ cm^3$
$V_b = 235\ cm^3$
$V_a = 79.1\ cm^3$
$V_{sb} = 1707.7\ cm^3$
$V_{be} = 189.8\ cm^3$
$V_{se} = 1662.5\ cm^3$
$V_{ma} = 45.2\ cm^3$
$V_{sa} = 1637.6\ cm^3$
Volume
Aggregate
Asphalt
Air
4505 g
45.2 g
189.8 g
$W_b = 235$ g
0
$W_b + W_s = 4740$ g
$W_T = 4740$ g
Weight