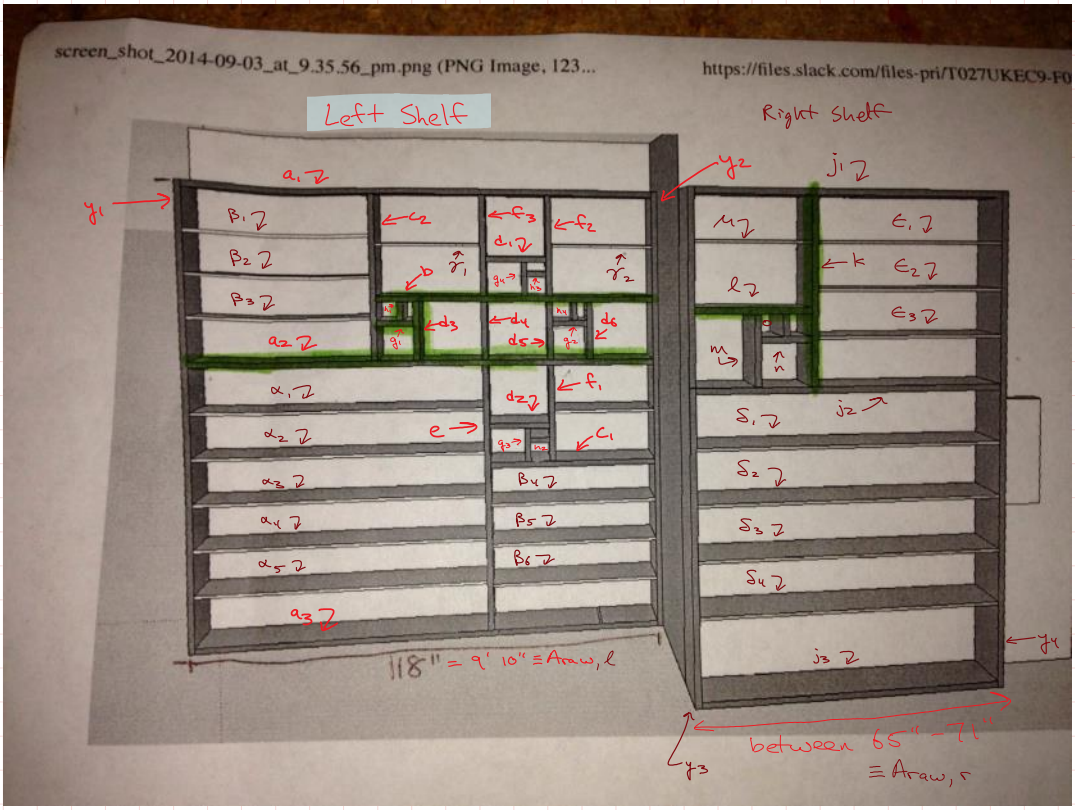
Golden ratio specs

Monday, November 3, 2014 8:00 PM



IMG_0126

Defs:

$t \equiv$ thickness of thick boards (eg 1")

$A_{raw,\ell} \equiv$ measured width + height of left bookshelf

$A_{raw,r} \equiv$ measured width of right bookshelf

$A_\ell = A_{raw,\ell} - t \equiv$ width between centers of boards bounding left bookshelf

$A_r = A_{raw,r} - t \equiv$ " " right bookshelf

$\varphi \approx 1.618$ (golden ratio)

- To account for the thickness of the boards, we assume that the lines that define the edges of the "golden ratio boxes" lie in the center (thickness-wise) of the thick boards. As a consequence, when determining the width of the actual board spans, we have to subtract a factor of $t/2$ from each side.

Left bookshelf

- Thick board span lengths

$$|y_1| = |y_2| = A_{raw,\ell}$$

$$|a_i| = A_\ell - t \qquad |b| = \left(\frac{A_\ell}{\varphi^3} + \frac{A_\ell}{\varphi^2}\right) - t \qquad |c_i| = \frac{A_\ell}{\varphi^2} - t$$

$$|d_i| = \frac{A_\ell}{\varphi^4} - t \qquad |e| = \frac{A_\ell}{\varphi} - t$$

$$|f_i| = \frac{A_\ell}{\varphi^3} - t \qquad |g_i| = \frac{A_\ell}{\varphi^5} - t \qquad |h_i| = \frac{A_\ell}{\varphi^5} - t$$

- Thin board span lengths

$$|\alpha_i| = \frac{A_\ell}{\varphi} - t \qquad |\beta_i| = \frac{A_\ell}{\varphi^2} - t \qquad |\gamma_i| = \frac{A_\ell}{\varphi^3} - t$$

- Materials (assuming $A_{raw,\ell} = 118''$, $t = 1'' \Rightarrow A_\ell = 117''$)

2x	y	@	118.0"	± 0.1"
3x	a	@	116.0"	
1x	b	@	73.3"	
2x	c	@	43.7"	
6x	d	@	16.1"	
1x	e	@	71.3"	
3x	f	@	26.6"	
4x	g	@	9.55"	± 0.01"
4x	h	@	5.52"	

Total thick span $\simeq 105.3'' = 8'7.9''$

5x	α	@	71.3"	± 0.1"
6x	β	@	43.7"	
2x	γ	@	26.6"	

Total thin span $\simeq 56'$

Right bookshelf

NB: Ideally we would have $A_r = A_\ell/\varphi \simeq 72.3''$, so that the left + right bookshelves would be the same height. Unfortunately there is a power outlet to the left of the fuse box which reduces our available width to $\sim 65''$

- Thick board span lengths

$$|y_3| = |y_4| = \varphi A_{raw,r}$$

$$|j_i| = A_r - t \qquad |k| = \frac{A_r}{\varphi} - t \qquad |\ell| = \frac{A_r}{\varphi^2} - t$$

$$|m| = \frac{A_r}{\varphi^3} - t \qquad |n| = \frac{A_r}{\varphi^4} - t \qquad |o| = \frac{A_r}{\varphi^5} - t$$

- Thin board span lengths

$$|s_i| = A_r - t \qquad |\epsilon_i| = \frac{A_r}{\varphi^2} - t \qquad |\mu| = \frac{A_r}{\varphi^3} - t$$

--- Materials later once we figure out the power outlet issue ---