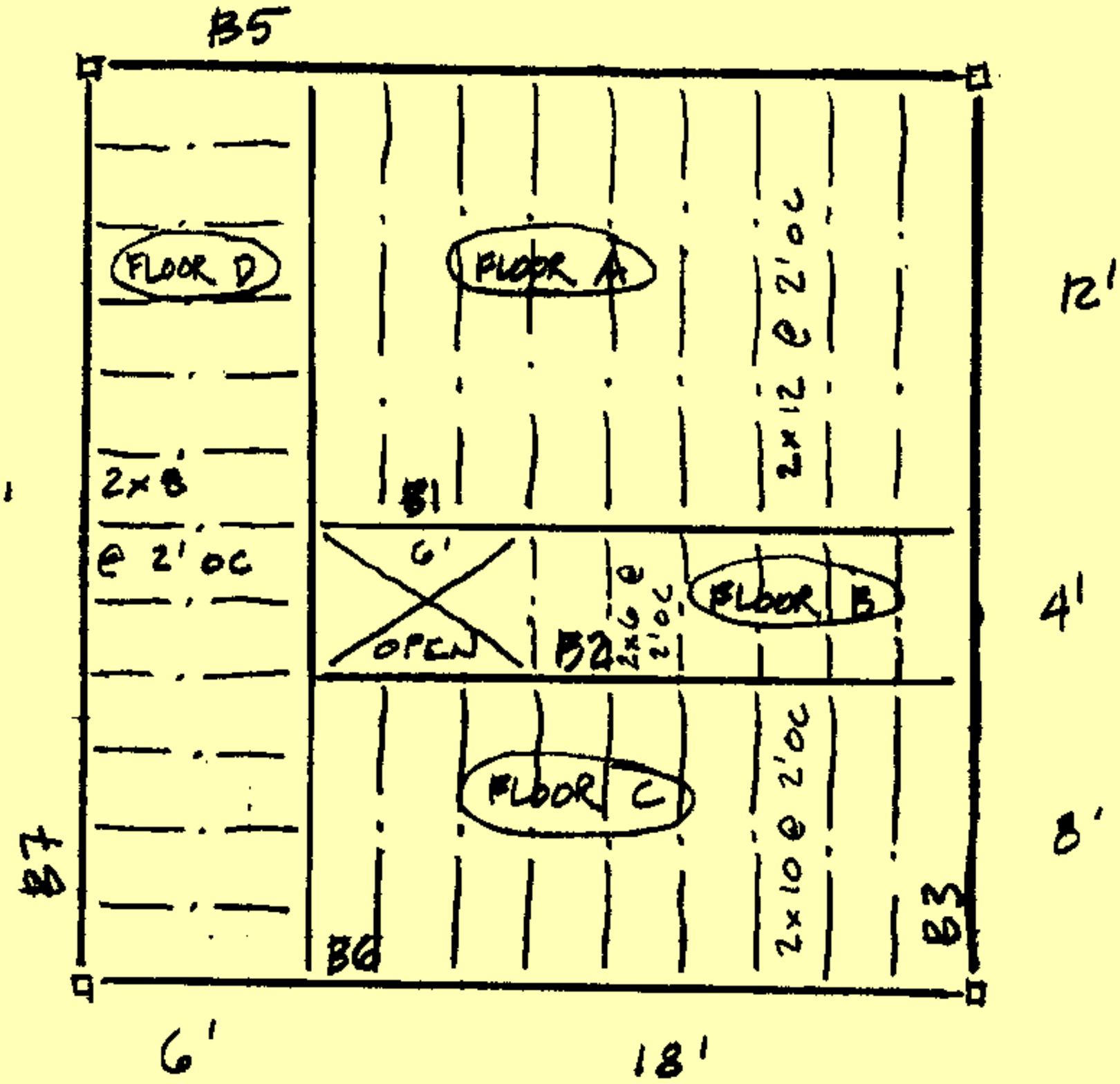
open.michigan



FLOOR LOAD 100 PSF

EXTERIOR WALL 300 PSF

B1 - B7 GLULAM BEAMS

JOISTS	F_b = 1200 psi F_v = 90 psi	CHECK FLEXURE AND SHEAR STRESS IN ALL MEMBERS
GLULAM	F_b = 2000 psi F_v = 135 psi	

CHECK JOISTS

FLOOR (A)
SPAN = ℓ = 12'
o.c. = 2'
SIZE 2×12
S = 31.64
A = 16.88

$M = \frac{w\ell^2}{8} = \frac{(200)12^2}{8} = 3600$ #'

$f_b = M/S = 3600 \times 12 / 31.64$
$= 1365 > 1200$

∴ NO GOOD!
TRY SMALLER O.C. SPACING

FLOOR (B)
SPAN = ℓ = 4'
o.c. = 2'
SIZE = 2×6
S = 7.56
A = 8.25

$M = \frac{w\ell^2}{8} = \frac{200(4)^2}{8} = 400$ #'

$f_b = M/S = 400 \times 12 / 7.56 = 635 < 1200$ ✓

$V = \frac{w\ell}{2} = \frac{200(4)}{2} = 400$

$f_v = \frac{3}{2}\frac{V}{A} = 1.5\frac{400}{8.25} = 72.7 < 90$ ✓

∴ 2×6 ok ✓

FLOOR (C)
SPAN = ℓ = 8'
oc = 2'
SIZE = 2×10
S = 21.39
A = 13.88

$M = \frac{w\ell^2}{8} = \frac{200(8)^2}{8} = 1600$ #'

$f_b = M/S = 1600(12)/21.39 = 897.6 < 1200$ ✓

$V = \frac{w\ell}{2} = \frac{200\,8}{2} = 800$

$f_v = \frac{3}{2}\frac{V}{A} = 1.5\frac{800}{13.88} = 86 < 90$ ✓

∴ 2×10 OK

FLOOR (D)
SPAN = ℓ = 6'
o.c. = 2'
SIZE = 2×8
S = 13.14
A = 10.88

$M = \frac{w\ell^2}{8} = \frac{200\,6^2}{8} = 900$ #'

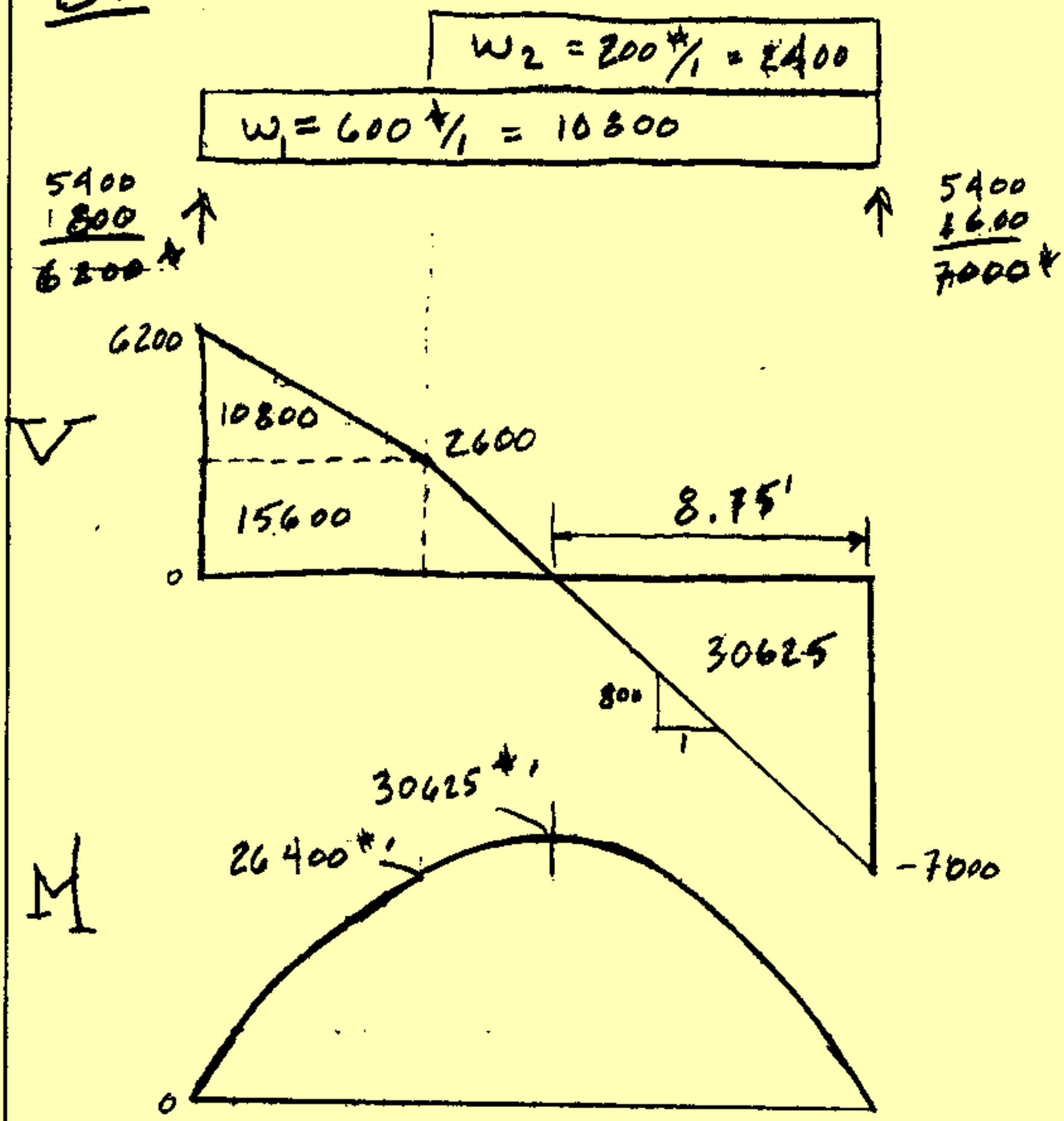
$f_b = M/S = 900^{\times 12}/13.14 = 822$ psi < 1200 ✓

$V = \frac{w\ell}{2} = \frac{200\,6}{2} = 600$ #

$f_v = \frac{3}{2}\frac{V}{A} = 1.5\frac{600}{10.88} = 82.7 < 90$ ✓

∴ USE 2×8 ✓

B1



BENDING:

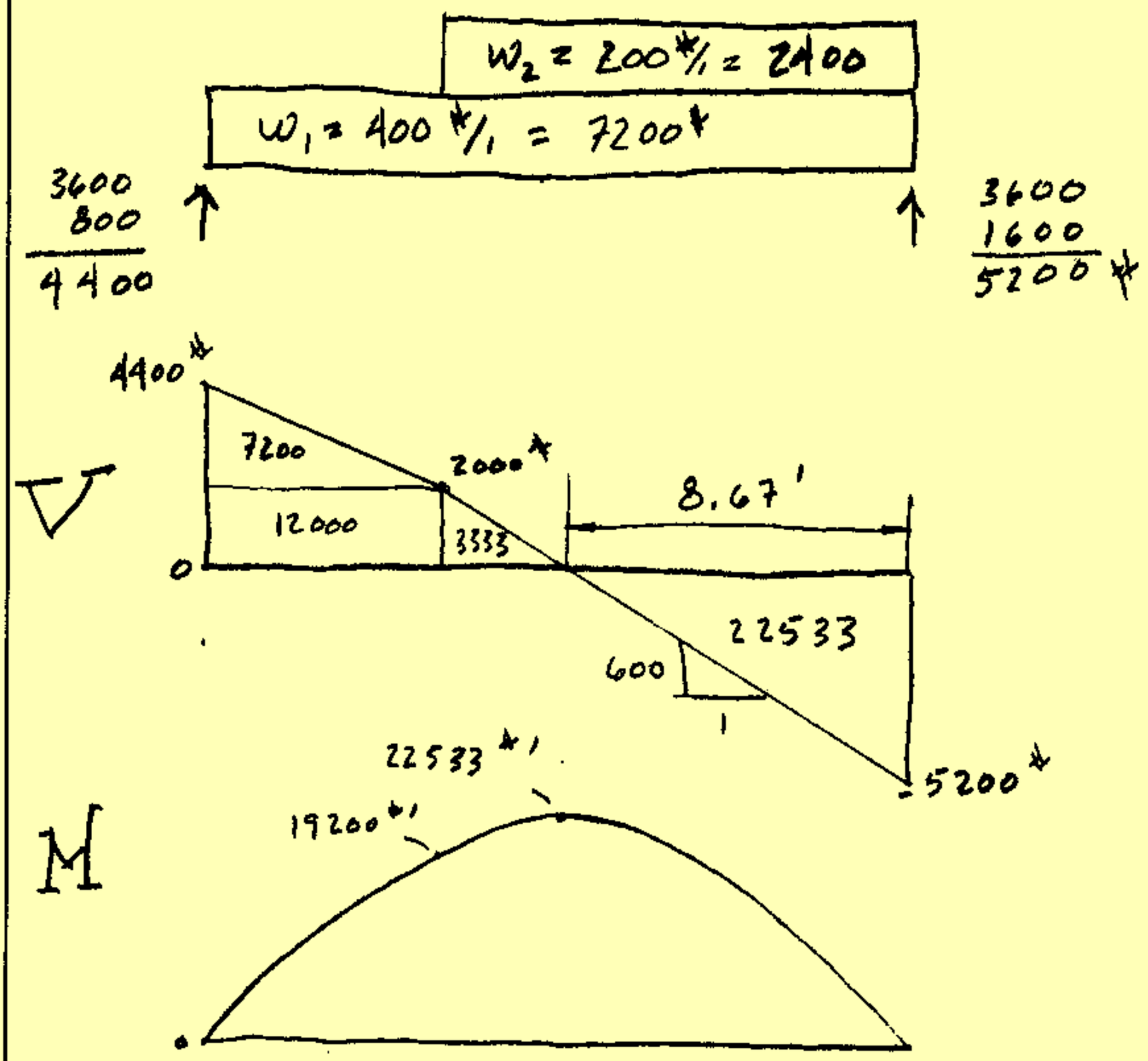
$F_b = 2000 = M/S$; $S = 30625 \times 12 / 2000 = 183.72\ in^3$

SHEAR:

$F_v = 135 = \frac{3}{2}\frac{V}{A}$; $A = 77.8\ in^2$ ← CONTROLS

USE $5\frac{1}{8}" \times 16\frac{1}{2}"$

B2



BENDING:

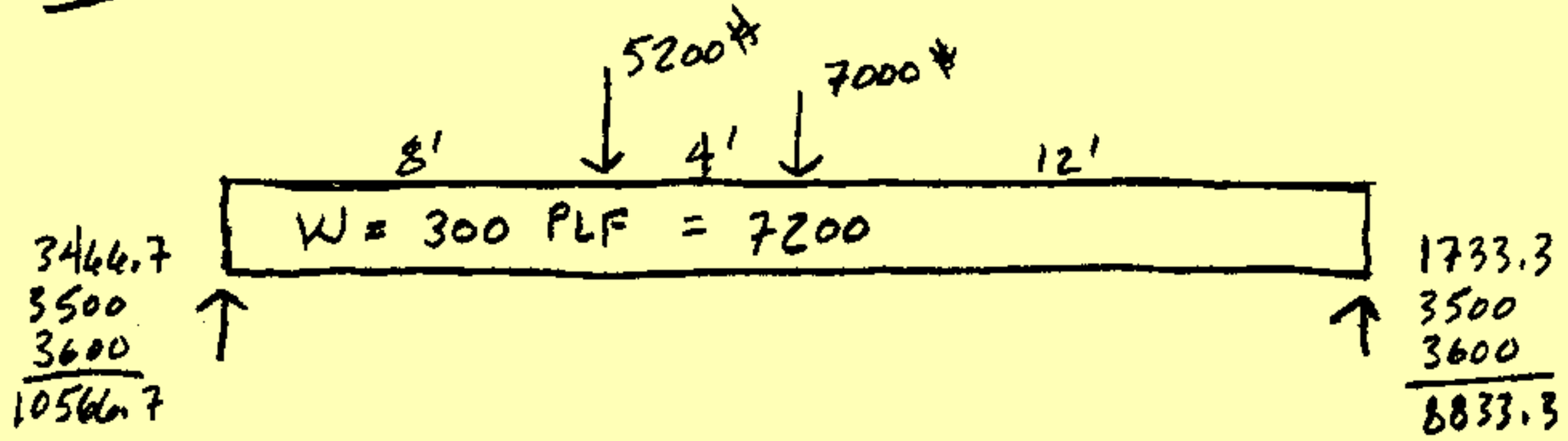
$$F_b = 2000 \text{ psi} = M/S \; ; \; S = \frac{22533 \times 12}{2000} = 135.2 \text{ in}^3$$

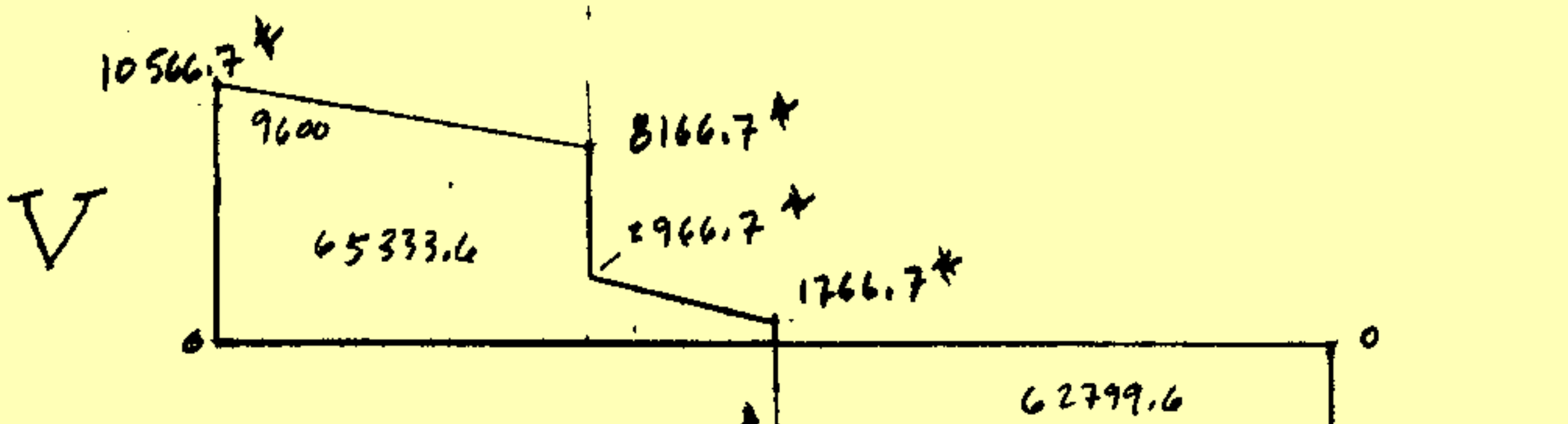
SHEAR:

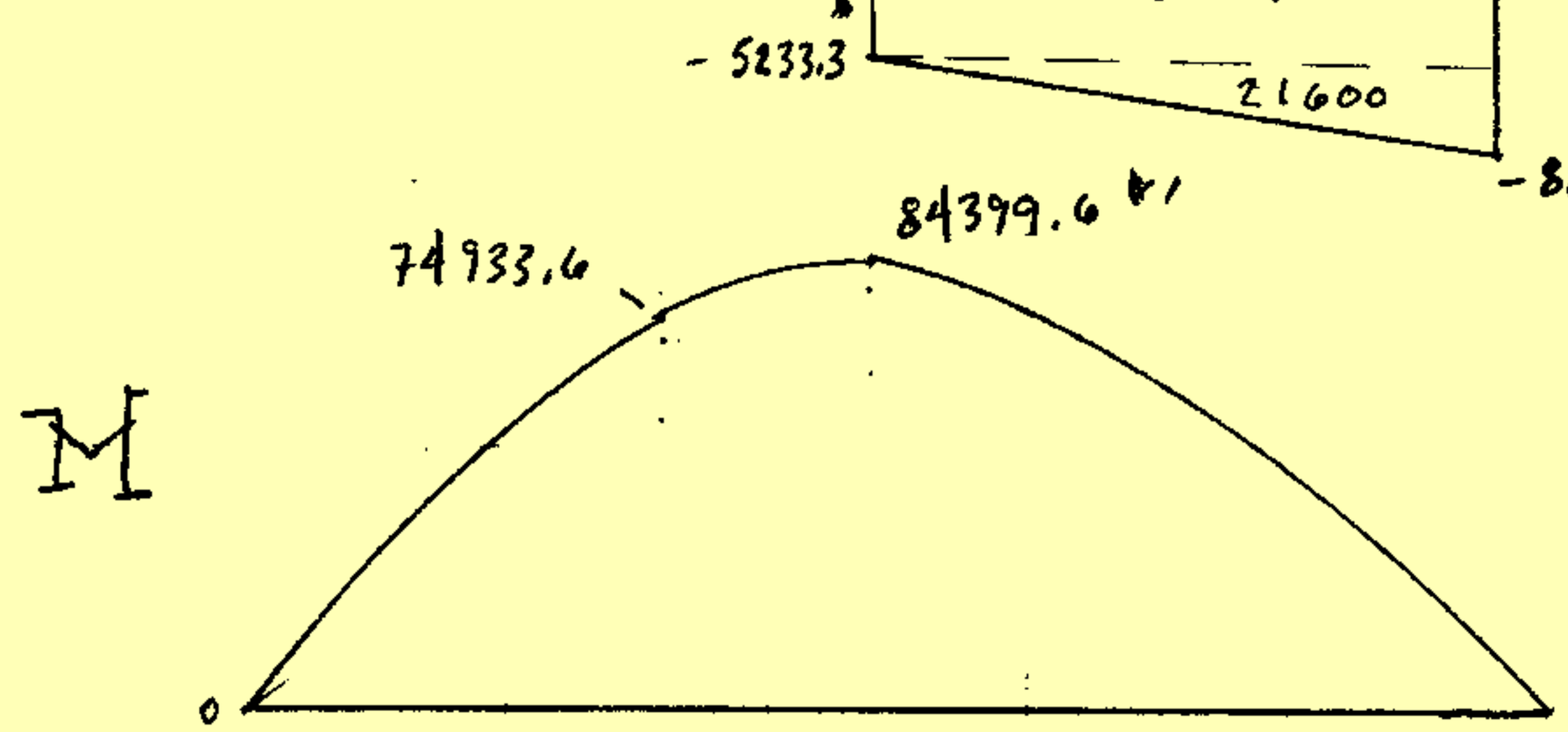
$$F_v = 135 \text{ psi} = \frac{3}{2}\frac{V}{A} \; ; \; A = 1.5\,\frac{5200}{135} = 57.8 \text{ in}^2$$

USE $5\frac{1}{8}'' \times 15''$

B3







BENDING:

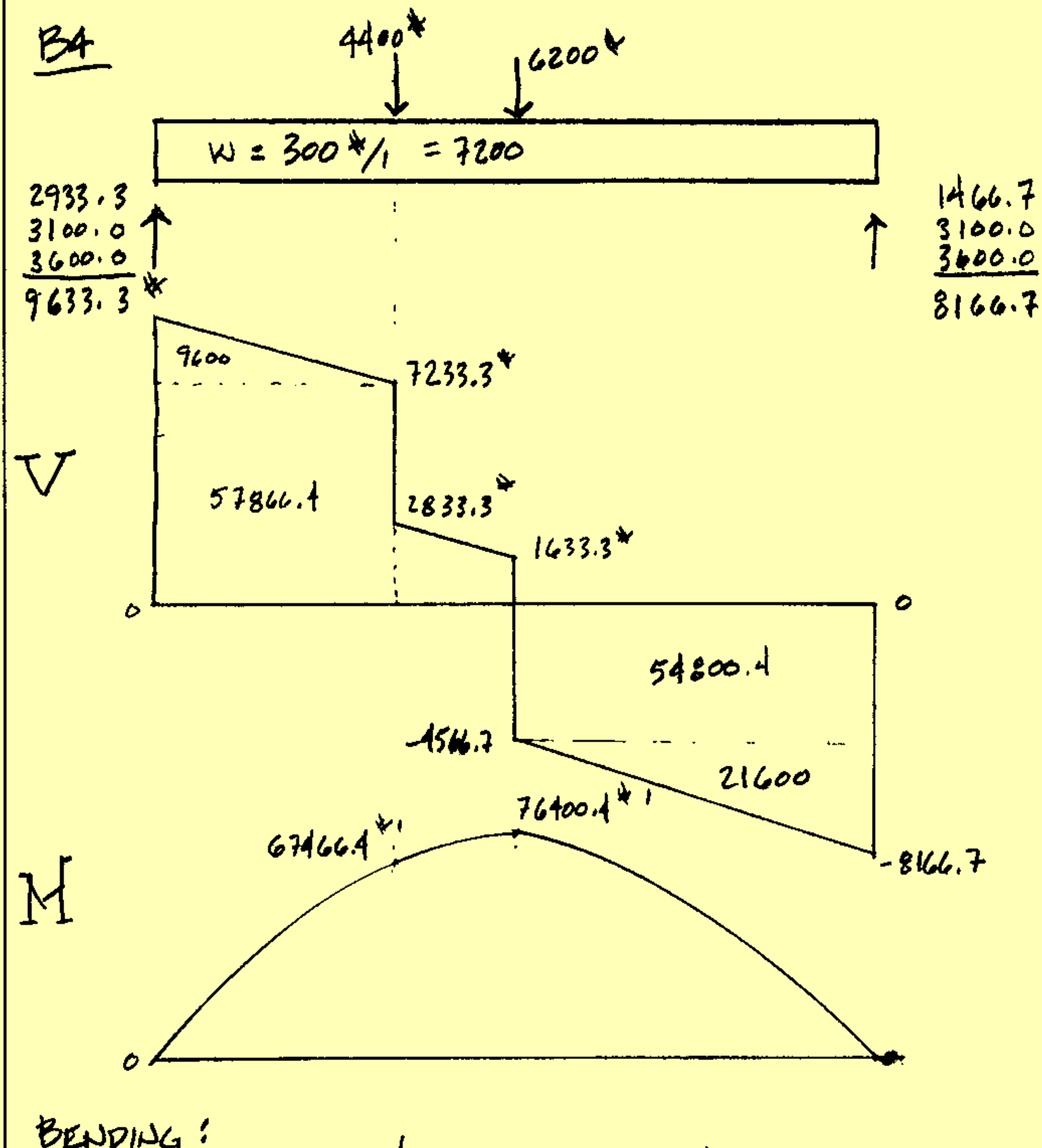
$F_b = 2000$ psi $= M/S$; $S = \frac{M}{F_b} = \frac{84399.6 \times 12}{2000} = 506.4$ ↑ CONTROLS

SHEAR:

$F_v = \frac{3}{2}\frac{V}{A}$; $A = 1.5\frac{10566.7}{135} = 117.4\ in^2$

USE $6\frac{3}{4}" \times 22\frac{1}{2}"$

B4



BENDING:

$$F_b = 2000 psi = \frac{M}{S} \; ; \; S = \frac{76400.4 \times 12}{2000} = 458.4 \text{ in}^3$$

↑ CONTROLS

SHEAR:

$$F_v = \frac{3}{2}\frac{V}{A} = 135 psi \; ; \; A = 1.5\,\frac{9633.3}{135} = 107.03 \text{ in}^2$$

USE $5\frac{1}{8}'' \times 24''$

B5

8166.7*

18'

6'

$w_2 = 600\ ^k/_1 = 10\,800^*$

$w_1 = 300$ PLF $= 7200^*$

3600
6125
4050
13 775*

3600
2041.7
6750
12391.7

24'

V

5400
13775
11975*
71850
8058
3808.3*
13.768'
0
1.232
85304
12391.7

M

77250'*
85304'*
0

BENDING:

$F_b = 2000$ psi $= \frac{M}{S_x}$; $S_x = \frac{85304 \times 12}{2000} = 511.8\ in^3$

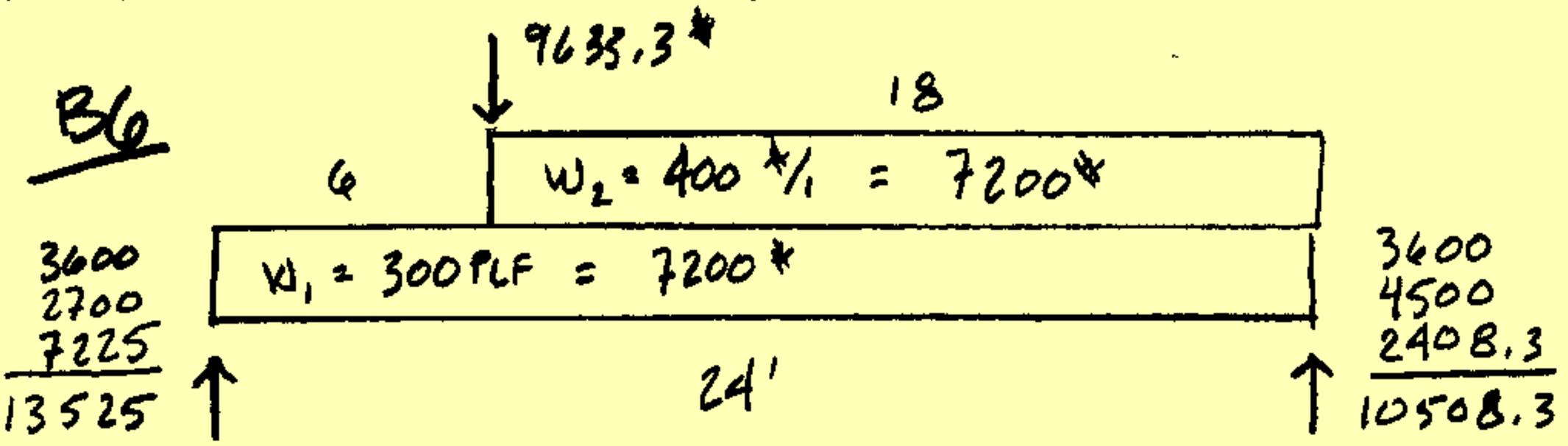
↑ CONTROLS

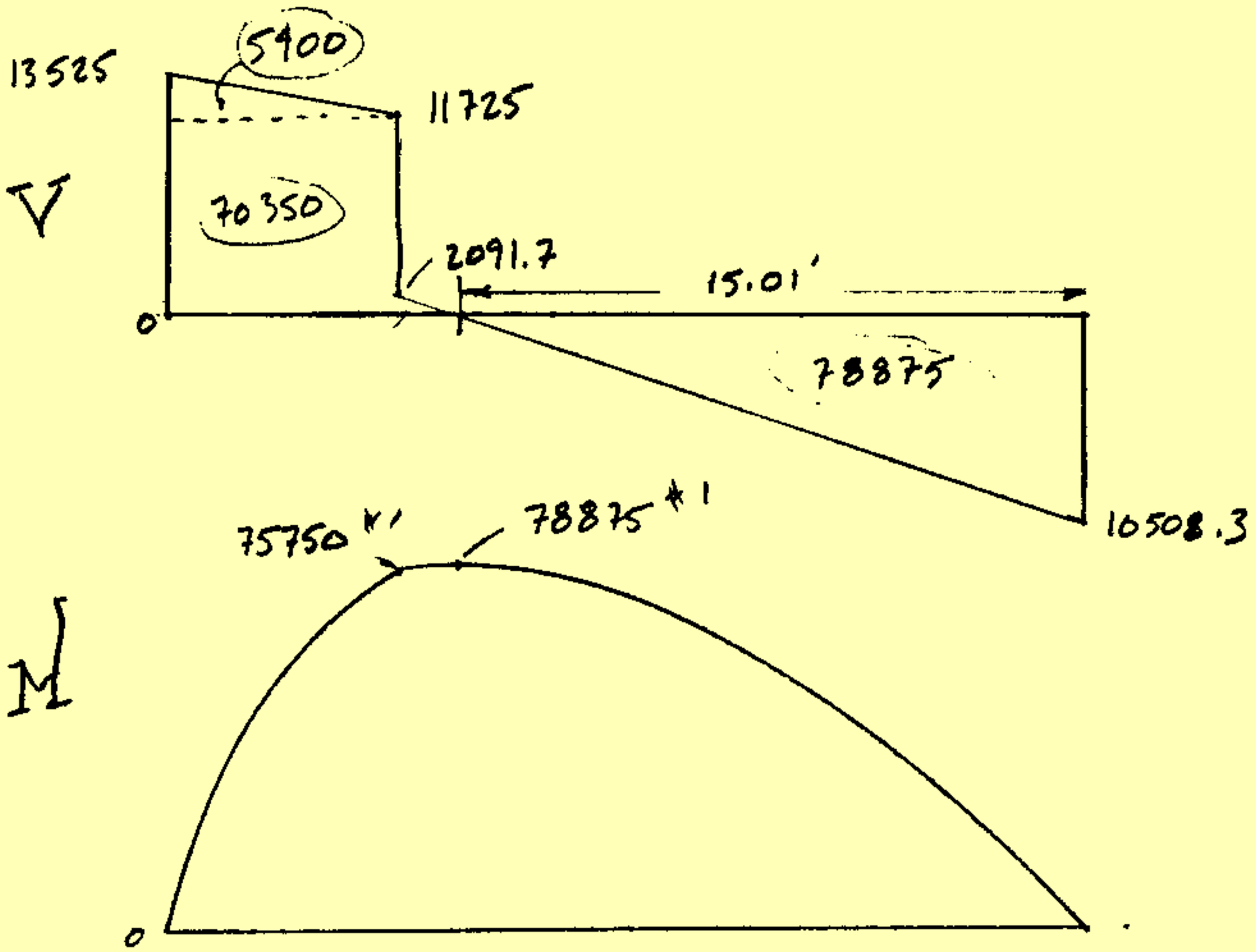
SHEAR:

$F_v = 135$ psi $= \frac{3}{2}\frac{V}{A}$; $A = 1.5\ \frac{13775}{135} = 102\ in^2$

USE $5\frac{1}{8}" \times 25\frac{1}{2}"$

B6





BENDING:

$$F_b = 2000 = \frac{M}{S} \quad ; \quad S = \frac{78875\,(12)}{2000} = 473.2\ in^3$$

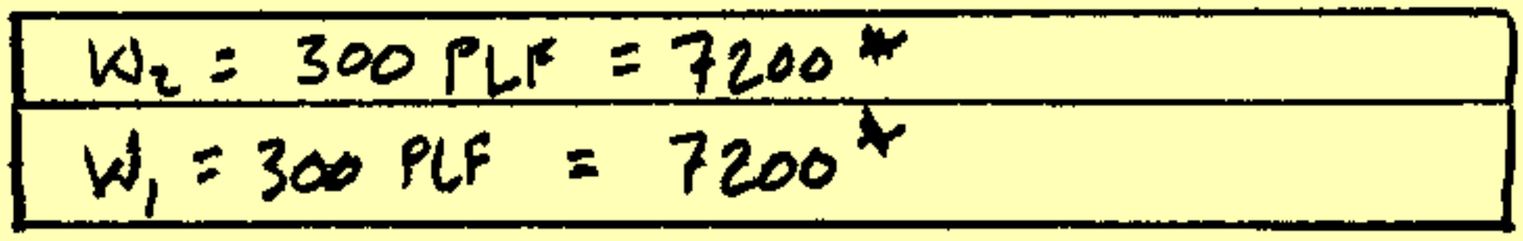
↑ CONTROLS

SHEAR:

$$F_v = 135 = \frac{3}{2}\frac{V}{A} \quad ; \quad A = 1.5\,\frac{13525}{135} = 100.2\ in^2$$

USE $5\frac{1}{8}" \times 24"$

B7



$$V_{max} = \frac{wl}{2} = \frac{600(24)}{2} = 7200\#$$

$$M_{max} = \frac{wl^2}{8} = \frac{600\ 24^2}{8} = 43200\#'$$

BENDING:

$$F_b = 2000_{psi} = \frac{M}{S}\ ;\ S = \frac{43200 \times 12}{2000} = 259.2\ in^3$$

↑ CONTROLS

SHEAR:

$$F_v = 135_{psi} = \frac{3}{2}\frac{V}{A}\ ;\ A = 1.5\ \frac{7200}{135} = 80\ in^2$$

USE $5\frac{1}{8}'' \times 18''$