3.6. 基礎の設計

地盤調査方法
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地業		:	べた基礎
建物総重量	ΣW	:	316.3 (kN)
１階床重量	W1	:	338.2 (kN)
地盤支持力	fe	:	20.0 (kN/m^2)
基礎版面積	A	:	177.63 (m^2)
基礎立上り部重量	Wt	:	178.2 (kN)
スラブ重量	Ws	:	639.5 (kN)
積載荷重	WL	:	0.0 (kN)
底版厚	t	:	15.0 (cm)
安全率	n	:	1.2

3.6.1. 地盤支持力の検討

fe = 20.00 (kN/m^2)

支持力 算定用分布荷重
$\omega 0 = n \times (\Sigma w + W1 + Wt + Ws + WL) / A$
$= 1.2 \times (316.26 + 338.17 + 178.21 + 639.47 + 0.00) / 177.63$
$= 9.94$ (kN/m^2) ≦ 20.0 OK

スラブ配筋 算定用分布荷重
$\omega 1 = n \times (\Sigma w + Wt) / A$
$= 1.2 \times (316.26 + 178.21) / 177.63 = 3.34$ (kN/m^2)

地中梁配筋 算定用分布荷重
$\omega 2 = n \times \Sigma w / A$
$= 1.2 \times 316.26 / 177.63 = 2.14$ (kN/m^2)

3.6.2.スラブの配筋

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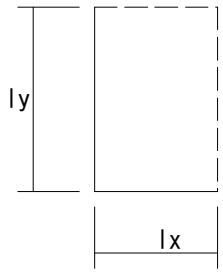

lx = 5.46 (m)　　ly = 5.46 (m)　　配筋 : D13
$\omega 1$= 3.34 (kN/m^2)

t = 15.0 (cm)　　dt = 7.5 (cm)
dx = t - dt = 7.50 (cm)　　dy = t - dt - 1.4 = 6.10 (cm)
jx = 7/8×dx = 6.56 (cm)　　jy =7/8×dy = 5.34 (cm)

$\omega x = (Ly^4 \times \omega 1)/(Lx^4 + Ly^4) = 1.670$ (kN/m^2)
Mx1 = 1 × ωx × Lx^2 / 8 = 6.22 (kN·m)　　at = 4.86 (cm^2/m)
Mx2 = 1 × ωx × Lx^2 / 18 = 2.77 (kN·m)　　at = 2.16 (cm^2/m)
My1 = 1 × $\omega 1$ × Lx^2 / 12 = 8.30 (kN·m)　　at = 7.97 (cm^2/m)
My2 = 1 × $\omega 1$ × Lx^2 / 36 = 2.77 (kN·m)　　at = 2.66 (cm^2/m)
l = 127 / atMax = 15.93 (cm) → D13 @150 両方向

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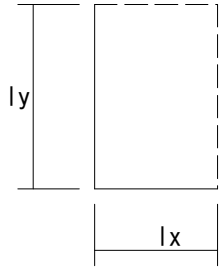

lx = 2.73 (m)　　ly = 5.46 (m)　　配筋 : D13
$\omega 1$= 3.34 (kN/m^2)

t = 15.0 (cm)　　dt = 7.5 (cm)
dx = t - dt = 7.50 (cm)　　dy = t - dt - 1.4 = 6.10 (cm)
jx = 7/8×dx = 6.56 (cm)　　jy =7/8×dy = 5.34 (cm)

$\omega x = (Ly^4 \times \omega 1)/(Lx^4 + Ly^4) = 3.144$ (kN/m^2)
Mx1 = 1 × ωx × Lx^2 / 8 = 2.93 (kN·m)　　at = 2.29 (cm^2/m)
Mx2 = 1 × ωx × Lx^2 / 18 = 1.30 (kN·m)　　at = 1.02 (cm^2/m)
My1 = 1 × $\omega 1$ × Lx^2 / 12 = 2.07 (kN·m)　　at = 1.99 (cm^2/m)
My2 = 1 × $\omega 1$ × Lx^2 / 36 = 0.69 (kN·m)　　at = 0.66 (cm^2/m)
l = 127 / atMax = 55.49 (cm) → D13 @300 両方向

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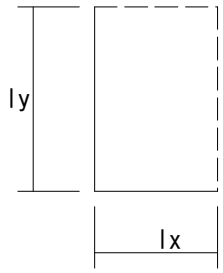

lx = 3.19 (m)　　ly = 7.28 (m)　　配筋 : D13
ω1= 3.34 (kN/m^2)

t = 15.0 (cm)　　dt = 7.5 (cm)
dx = t - dt = 7.50 (cm)　　dy = t - dt - 1.4 = 6.10 (cm)
jx = 7/8×dx = 6.56 (cm)　　jy =7/8×dy = 5.34 (cm)

ωx = (Ly^4×ω1)/(Lx^4 + Ly^4) = 3.222 (kN/m^2)
Mx1 = 1 × ωx × Lx^2 / 8 = 4.10 (kN·m)　　at = 3.20 (cm^2/m)
Mx2 = 1 × ωx × Lx^2 / 18 = 1.82 (kN·m)　　at = 1.42 (cm^2/m)
My1 = 1 × ω1 × Lx^2 / 12 = 2.83 (kN·m)　　at = 2.72 (cm^2/m)
My2 = 1 × ω1 × Lx^2 / 36 = 0.94 (kN·m)　　at = 0.91 (cm^2/m)
l = 127 / atMax = 39.66 (cm) → D13 @300 両方向

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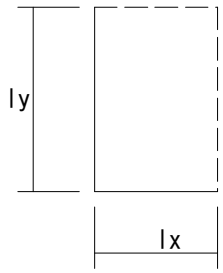

lx = 4.55 (m)　　ly = 7.28 (m)　　配筋 : D13
ω1= 3.34 (kN/m^2)

t = 15.0 (cm)　　dt = 7.5 (cm)
dx = t - dt = 7.50 (cm)　　dy = t - dt - 1.4 = 6.10 (cm)
jx = 7/8×dx = 6.56 (cm)　　jy =7/8×dy = 5.34 (cm)

ωx = (Ly^4×ω1)/(Lx^4 + Ly^4) = 2.898 (kN/m^2)
Mx1 = 1 × ωx × Lx^2 / 8 = 7.50 (kN·m)　　at = 5.86 (cm^2/m)
Mx2 = 1 × ωx × Lx^2 / 18 = 3.33 (kN·m)　　at = 2.60 (cm^2/m)
My1 = 1 × ω1 × Lx^2 / 12 = 5.76 (kN·m)　　at = 5.54 (cm^2/m)
My2 = 1 × ω1 × Lx^2 / 36 = 1.92 (kN·m)　　at = 1.85 (cm^2/m)
l = 127 / atMax = 21.67 (cm) → D13 @200 両方向

3.6.3. 地中梁の設計

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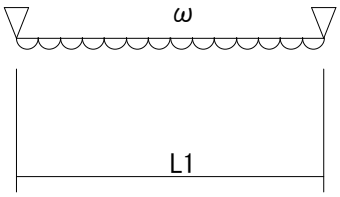

SD295A　　Lft = 195.00 (N/mm^2)　　Sft = 295.00 (N/mm^2)
Fc = 21　　Lfs = 0.70 (N/mm^2)　　Sfs = 1.05 (N/mm^2)
上部主筋：2-D13　　下部主筋：2-D13　　ＳＴ：D10@200

負担幅：2.43 (m)　　L1 = 5.46 (m)
ω = ω2 × 負担幅 = 5.192 (kN/m)
b = 15.0 (cm)　　D = 55.0 (cm)　　dt = 7.5 (cm)

d' = D - dt = 47.50 (cm)
j = 7/8×d' = 41.56 (cm)
A = b×j = 623.44 (cm^2)

ML = (ω×L1^2) / 8 = 19.35 (kN･m)
QL = (ω×L1) / 2 = 14.17 (kN)

at = ML / (Lft×j) = 2.39 (cm^2) ≦ 2.54 [2-D13] OK
τ / Lfs = Q / (A×Lfs) = 0.32 ≦ 1.0 OK

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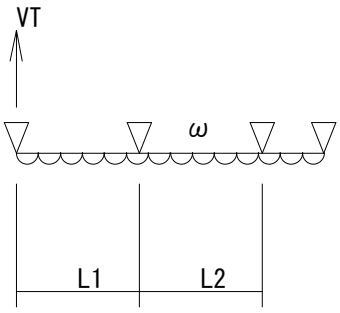


SD295A　　Lft = 195.00 (N/mm^2)　　Sft = 295.00 (N/mm^2)
Fc = 21　　Lfs = 0.70 (N/mm^2)　　Sfs = 1.05 (N/mm^2)
上部主筋：2-D13　　下部主筋：2-D13　　ＳＴ：D10@200

負担幅：1.56 (m)　　L1 = 0.91 (m)　　L2 = 0.91 (m)
ω = ω2 × 負担幅 = 3.333 (kN/m)
b = 15.0 (cm)　　D = 70.0 (cm)　　dt = 7.5 (cm)
VT = 15.00 (kN)

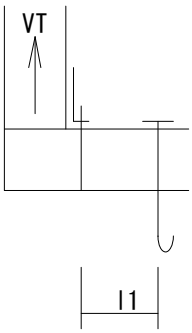
d' = D - dt = 62.50 (cm)
j = 7/8×d' = 54.69 (cm)
A = b×j = 820.31 (cm^2)

ML1 = (ω×L1^2) / 8 = 0.35 (kN･m)
ML2 = (ω×L2^2) / 12 = 0.23 (kN･m)
QL = (ω×L1) / 2 = 1.52 (kN)
QS = QL + VT = 16.52 (kN)

Mt = VT×L1 = 13.65 (kN･m)
Ms = ML + Mt = 14.00 (kN･m)

atL = ML / (Lft×j) = 0.03 (cm^2) ≦ 2.54 [2-D13] OK
atS = Ms / (sft×j) = 0.87 (cm^2) ≦ 2.54 [2-D13] OK
τ / Lfs = Q / (A×Lfs) = 0.03 ≦ 1.0 OK
τ / Sfs = Q / (A×Sfs) = 0.19 ≦ 1.0 OK

3.6.4. 土台の設計



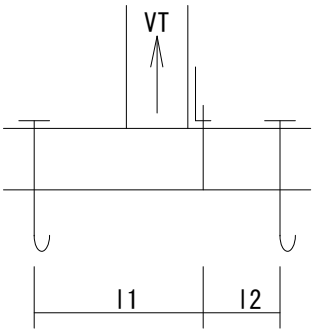
桧E70　　Fs = 2.10 (N/mm^2)　　Fb = 22.00 (N/mm^2)
Sfs = 2.00×Fs／3 = 1.40 (N/mm^2)　　Sfb = 2.00×Fb／3 = 14.67 (N/mm^2)
b = 9.0 (cm)
L1 = 15.0 (cm)　　VT = 8.50 (kN)

Q = VT = 8.50 (kN)
M = Q×L1 = 127.50 (kN·cm)

hminQ = (1.5×Q) / (b×Sfs) = 10.12 (cm)

hminM = $\sqrt{(6\times M) / (b\times Sfb)}$ = 7.61 (cm)

最小梁せい　　hmin = 10.2 (cm)



桧E70　　Fs = 2.10 (N/mm^2)　　Fb = 22.00 (N/mm^2)
Sfs = 2.00×Fs／3 = 1.40 (N/mm^2)　　Sfb = 2.00×Fb／3 = 14.67 (N/mm^2)
b = 9.0 (cm)
L1 = 167.0 (cm)　　L2 = 15.0 (cm)　　VT = 8.50 (kN)

Q = VT×L1 / (L1 + L2) = 7.80 (kN)
M = Q×L2 = 116.99 (kN·cm)

hminQ = (1.5×Q) / (b×Sfs) = 9.29 (cm)

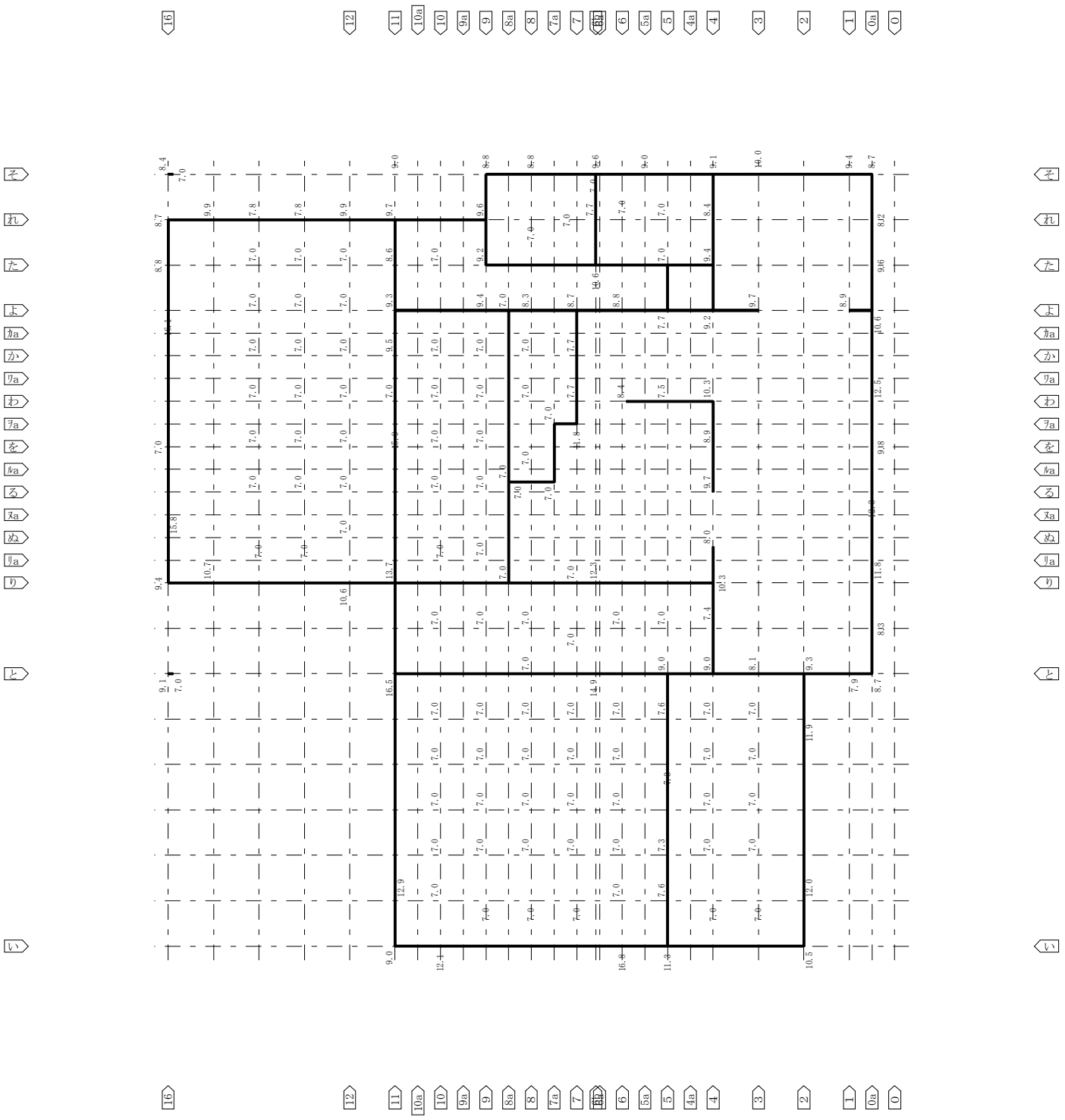
hminM = $\sqrt{(6\times M) / (b\times Sfb)}$ = 7.29 (cm)

最小梁せい　　hmin = 9.3 (cm)

凡例　　長期基礎反力図
基礎反力［kN］

Σ =　1472.11 kN

3.6.5. 基礎反力図



3.7. その他

3.7.1. 転倒の検討

Mo ： 転倒モーメント
Σw ： 全重量
L ： X,Y 方向の建物長さ

方向	Σw/2 (kN)	L (m)	地震時モーメント Mo (kN･m)	判定 (Σw×L) /(2×Mo)	
X	262.15	15.47	46.92×3.56 = 166.79	24.31	≧ 1.0 OK
Y	262.15	14.11	46.92×3.56 = 166.79	22.17	≧ 1.0 OK

方向	Σw/2 (kN)	L (m)	風圧時モーメント Mo (kN･m)	判定 (Σw×L) /(2×Mo)	
X	262.15	15.47	74.42×3.56 = 264.58	15.33	≧ 1.0 OK
Y	262.15	14.11	64.29×3.56 = 228.56	16.18	≧ 1.0 OK

3.9. 土台アンカーボルトの設計

桧E70
土台材厚　　L = 105 (mm)
基準圧縮強度　　Fc = 18.0 (N/mm^2)
アンカーボルト径　d = 12 (mm)

土台の樹種	アンカーボルト	短期許容せん断耐力 (kN)	
Fc ≧ 23.4 [N/mm^2] の樹種	M12	8.72	
	M16	15.51	
Fc ≧ 18.0 [N/mm^2] の樹種	M12	7.65	○
	M16	13.60	

Pa = 7.65 (kN)

方向	通り	鉛直構面の短期許容せん断耐力(kN)	本数	必要本数
X	0a →	19.263	3	
	←	19.263	3	3
	2 →	9.631	2	
	←	9.631	2	2
	4 →	7.134	1	
	←	7.134	1	1
	7 →	7.134	1	
	←	7.134	1	1
	11 →	18.193	3	
	←	18.193	3	3
	16 →	18.193	3	
	←	18.193	3	3
Y	い ↑	15.517	3	
	↓	15.517	3	3
	と ↑	11.950	2	
	↓	11.950	2	2
	り ↑	9.631	2	
	↓	9.631	2	2
	よ ↑	14.269	2	
	↓	14.269	2	2
	れ ↑	9.631	2	
	↓	9.631	2	2
	そ ↑	9.631	2	
	↓	9.631	2	2