# THE ISLAMIC REPUBLIC OF PAKISTAN

# DETAILED DESIGN STUDY
# ON
# WEST WHARF
# THERMAL POWER PLANT PROJECT

# FINAL REPORT-I

## VOLUME 2

JANUARY 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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DRAFT FINAL REPORT - I

VOLUME 1

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VOLUME 2

# TRANSMISSION LINE AND GRID STATION

WEST WHARF THERMAL POWER PLANT PROJECT

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DRAFT FINAL PROJECT - I

VOLUME 3

# TLG-1

# OVER HEAD TRANSMISSION LINE

# TLG-1 OVER HEAD TRANSMISSION LINE

# 1. INTRODUCTION

## 1.1 General

The transmission line between the West Wharf Thermal Power Plant and the Baldia Grid Station has been studied, surveyed and checked, with the decisions planned as follows.

- Between the substation of the West Wharf Thermal Power Station and the site of tower No. 1 of existing 66 kV Baldia line and S.I.T.E. line (1.15 km)

  220 kV underground O.F. cable in tunnel

- Between tower No. 1 and tower No. 5 of existing 66 kV line (1 km)

  Overhead line of composite towers consists of 2 circuits of 220 kV line and 2 circuits of 132 kV line

- Between tower No. 5 of existing 66 kV line and the Baldia Grid Station (22.9 km)

  Overhead line of 2 circuits of 220 kV line

The area where the transmission line will be constructed is situated in a tropical zone exhibiting high temperature, high humidity and extremely low precipitation.

Also, as the area is situated nearby the sea, it has been concluded that the facilities shall be provided with effective measures against corrosion.

## 1.2 Summary of Design

| ITEM | DESCRIPTION | |
|---|---|---|
| Nominal voltage | 220 kV | 132 kV |
| Route length | 23.8 km | 1.0 km |
| Number of circuits | 2 cct | 2 cct |
| Supporter | Latice steel tower | Latice steel composite tower |
| Conductor | ACSR/AS 330 $mm^2$ x 2 | ACSR/AS 680 $mm^2$ |
| Ground wire | OPGW 190/90 $mm^2$ | - |
| Insulator | Fog type suspension insulator $\phi$254 mm | Fog type suspension insulator $\phi$254 mm |
| Suspension string | 22 pc./string | 14 pc./string |
| Tension string | 23 pc./string | 15 pc./string |
| Frequency | 50 Hz | 50 Hz |

## 2. TRANSMISSION LINE ROUTE AND TOWER HEIGHT

As a result of the site survey and the discussion with KESC's engineers and concerned authorities relating to the route of 220 kV transmission line, the optimum route was studied and selected taking into account the future extension plan of the transmission system, physical aspects of the tower site conditions, availability of land acquisition, ease of construction and maintenance, and the detour route around the Air Force Base.

The proposed route of the 220 kV transmission line is as shown in DWG. No. WLT-1001.

The limitations of tower heights are divided into three classes, 33 m, 45 m and 66 m so as not to interfere with the taking-off or landing of aircraft. Sections to be applied to each height limitation are as shown in DWG. No. WLT-1001.

## 3. CONDUCTOR

### 3.1 Characteristics of Conductor

(1) ACSR/AS 330 $mm^2$

(a) Composite wire

| | |
|---|---|
| Sectional area | 379.6 $mm^2$ |
| Construction | |
| Al | 26/4.0 mm |
| AS | 7/3.1 mm |
| Minimum ultimate tensile strength | 10,950 kg |
| Overall diameter | 25.3 mm |
| Weight per km | 1.239 kg |
| DC resistance at 20°C | 0.0835 ohm/km |

(b) Aluminum wire

| | |
|---|---|
| Diameter | 4.0 mm |
| Minimum tensile strength | 16.17 $kg/mm^2$ |
| Minimum elongation in 250 mm | 1.9% |
| Minimum conductivity at 20°C | 61% |

(c) Aluminum-clad steel core wire

| | |
|---|---|
| Diameter | 3.1 mm |
| Minimum tensile strength | 130 $kg/mm^2$ |
| Minimum elongation in 250 mm | 1.5% |
| Minimum conductivity at 20°C | 23% |
| Minimum stress at 1% extension | 110 $kg/mm^2$ |
| Minimum number of twisting before stranding | 20 times |

(2) ACSR/AS 680 $mm^2$

(a) Composite wire

| | |
|---|---|
| Sectional area | 766.8 $mm^2$ |
| Construction | |
| Al | 54/4.0 mm |
| AS | 7/4.0 mm |
| Minimum ultimate tensile strength | 20,180 kg |
| Overall diameter | 36.0 mm |
| Weight per km | 2,446 kg |
| D.C. resistance at 20°C | 0.0408 ohm/km |

(b) Aluminum wire

| | |
|---|---|
| Diameter | 4.0 mm |
| Minimum tensile strength | 16.17 $kg/mm^2$ |
| Minimum elongation in 250 mm | 1.9% |
| Minimum conductivity at 20°C | 61% |

(c) Aluminum-clad steel core wire

| | |
|---|---|
| Diameter | 4.0 mm |
| Minimum tensile strength | 130 $kg/mm^2$ |
| Minimum elongation in 250 mm | 1.5% |
| Minimum conductivity at 20°C | 23% |
| Minimum stress at 1% extension | 110 $kg/mm^2$ |
| Minimum number of twisting before stranding | 20 times |

## 3.2 Current Carrying Capacity

The concept for the conductor is to have enough capacity in continuous operation for full load in one circuit. Consequently,

the capacity is calculated on the basis of a 400 MW load for 220 kV and a 165 MVA load for 132 kV line, and were determined by power flow analysis and KESC instructions.

Required current capacity;

220 kV: $$I = \frac{P}{\sqrt{3}\ V\ \cos\phi} = \frac{400\ MW}{\sqrt{3} \times 220 \times 0.85} = 1,235\ (A)$$

132 kV: $$I = \frac{P}{\sqrt{3}\ V} = \frac{165\ MVA}{\sqrt{3} \times 132} = 722\ (A)$$

According to the calculation results shown in Table 3.1, ACSR/AS 330 $mm^2$ has 526A and 655A of capacity at 80°C and 90°C of conductor temperature, respectively, and ACSR/AS 680 $mm^2$ has 797A and 1010A of capacity at 80°C and 90°C respectively, with these values deemed to have sufficient current capacity.

Table 3.1 CURRENT CAPACITY

♥ Allowable Current

| | | | | | |
|---|---|---|---|---|---|
| Cond. Name : ACSR/AS 330 mm2 | Sec.Area = | 326.8 mm2 | Dia | = | 25.3 mm |
| DC Res.at 20deg= .0835 /km | Max Temp.= | 80 deg. | Amb.Temp.= | 48 | deg. |
| Solar Radiation= .1 W/cm2 | Rad.Ratio= | .9 | Wind V. | = .5 | m/sec. |
| DC Res.at Max.T= 0.1035/km | X =0.95052 | Beta =1.00421 | K | = 1.00000 | |
| Hw = 0.0012429 | Hr = 0.0008700 | | Ia = 525.89 A | | |

♥ Allowable Current

| | | | | | |
|---|---|---|---|---|---|
| Cond. Name : ACSR/AS 330 mm2 | Sec.Area = | 326.8 mm2 | Dia | = | 25.3 mm |
| DC Res.at 20deg= .0835 /km | Max Temp.= | 90 deg. | Amb.Temp.= | 48 | deg. |
| Solar Radiation= .1 W/cm2 | Rad.Ratio= | .9 | Wind V. | = .5 | m/sec. |
| DC Res.at Max.T= 0.1069/km | X =0.93555 | Beta =1.00396 | K | = 1.00000 | |
| Hw = 0.0012406 | Hr = 0.0009107 | | Ia = 654.78 A | | |

♥ Allowable Current

| | | | | | |
|---|---|---|---|---|---|
| Cond. Name : ACSR/AS 680 mm2 | Sec.Area = | 678.8 mm2 | Dia | = | 36 mm |
| DC Res.at 20deg= .0408 /km | Max Temp.= | 80 deg. | Amb.Temp.= | 48 | deg. |
| Solar Radiation= .1 W/cm2 | Rad.Ratio= | .9 | Wind V. | = .5 | m/sec. |
| DC Res.at Max.T= 0.0506/km | X =1.39303 | Beta =1.01929 | K | = 1.02591 | |
| Hw = 0.0010419 | Hr = 0.0008700 | | Ia = 797.47 A | | |

♥ Allowable Current

| | | | | | |
|---|---|---|---|---|---|
| Cond. Name : ACSR/AS 680 mm2 | Sec.Area = | 678.8 mm2 | Dia | = | 36 mm |
| DC Res.at 20deg= .0408 /km | Max Temp.= | 90 deg. | Amb.Temp.= | 48 | deg. |
| Solar Radiation= .1 W/cm2 | Rad.Ratio= | .9 | Wind V. | = .5 | m/sec. |
| DC Res.at Max.T= 0.0522/km | X =1.37109 | Beta =1.01812 | K | = 1.03072 | |
| Hw = 0.0010400 | Hr = 0.0009107 | | Ia =1010.26 A | | |

## 3.3 Sub-conductor Spacing in Phase

| | |
|---|---|
| Nominal spacing distance | 400 mm |
| Configuration | Horizontal |

The nominal spacing distance of ACSR/AS 330 $mm^2$ twin conductor shall be 400 mm based on the following.

(a) The larger the nominal spacing distance becomes, the smaller the inductance becomes. However, the mode has a tendency of saturation.

(b) The larger the nominal spacing distance becomes, the larger the capacitance becomes. However, the mode has a tendency of saturation.

(c) Corona noise level is minimum when the spacing distance is equal to the length of about ten times the conductor diameter. In the range of a spacing distance smaller than the above, it increases sharply, while for larger spacing distance, it increases slowly.

(d) The smaller the nominal spacing distance is, the greater the effect of wind pressure reduction. However, should the distance be excessively small, both subconductors are prone to be irregularly moved, stuck or distorted due to wind pressure.

(e) It is not desirable to frequently change the voltage drop of transmission line or corona voltage due to irregular changing of the spacing distance of subconductors and/or wind pressure.

Therefore, the nominal spacing distance shall be selected so that the curve indicating electrical characteristics, such as the relationship between change of inductance and electrostatic capacity, corona voltage and that of nominal spacing distance, is as flat as possible.

(f) In addition to electrical and mechanical characteristics, coordination with the design of insulator strings and stringing work, particularly the design of "vehicle for mid-air performance" for mounting spacers as well as the weight of workers mounting the vehicle, shall be taken into account in deciding the nominal spacing distance.

Based on the above, the nominal spacing distance shall be 400 mm.

## 4. GROUND WIRE

### 4.1 Characteristics of Ground Wire

(1) OPGW 190/90 $mm^2$

| | |
|---|---|
| Construction | 1/5.2 mm OP unit + 7/4.0 mm AS + 12/4.47 mm HAl |
| Overall diameter | 22.2 mm |
| Cross sectional area | |
| Nominal | 283.59 $mm^2$ |
| Minimum ultimate tensile strength | 10,500 kg |
| Weight per km | 1,136 kg |
| DC resistance at 20°C | 0.129 ohm/km |
| Maximum continuous operating temperature | 150°C |
| Maximum one second operating temperature | 300°C |
| System fault current | 40,000 A x 1 sec. |

(2) Optical cable

| | |
|---|---|
| Optical fiber type | Single mode |
| Number of optical fiber | 5 |
| Optical attenuation at wave length 1.3 μm | Max. 0.5 dB/km |

(3) Aluminum-clad steel wire

| | |
|---|---|
| Diameter | 4.40 mm |
| Minimum ultimate tensile strength | 116 $kg/mm^2$ |
| Minimum elongation in 250 mm | 1.5% |
| Minimum conductivity at 20°C | 20.3% |

| | |
|---|---|
| Minimum stress at 1% extension | 125 kg/mm$^2$ |
| Minimum aluminum thickness | 0.22 mm |

4.2 Temperature of Ground Wire

From the viewpoint of the mechanical strength of the ground wire and characteristic of the optical fiber, the temperature of ground wire shall be lower than 150°C under normal operation and lower than 300°C at the time of one line fault of which the duration is not more than one second.

(1) Under normal operation:

Conductor temperature affected by electro magnetic induced current shall be lower than 150°C.

Assuming the conductor arrangement is as shown in Fig. 4.1, induced current will be calculated as follows.

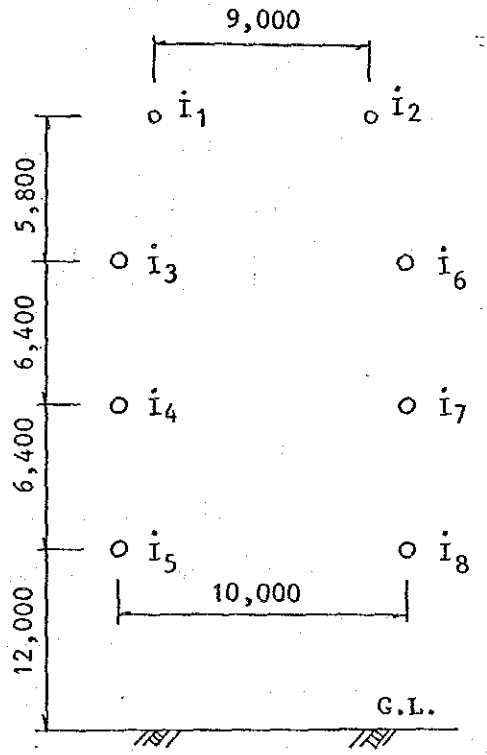



Fig. 4.1

Mutual inductance will be as follows.

$$Mij = \left[ 2 \log_e \frac{2}{K\, dij} - 0.1544 + \frac{2\sqrt{2}}{3} K\,(hi + hj) \right.$$

$$\left. - j \left\{ \frac{\pi}{2} - \frac{2\sqrt{2}}{3} K\,(hi + hj) \right\} \right] \times 10^{-4} \qquad (H/km)$$

$$K = \sqrt{4\pi\sigma\omega \times 10^{-14}}$$

$$dij = \sqrt{Dij^2 + (hi - hj)^2} \qquad (cm)$$

Self inductance will be,

$$Li = \{ 2 \log_e \frac{2}{Kri} - 0.1544 + \frac{4\sqrt{2}}{3} Khi + \frac{\mu si}{2}$$

$$- j \left( \frac{\pi}{2} - \frac{4\sqrt{2}}{3} Khi \right) \} \times 10^{-4} \qquad (H/km)$$

Mutual and self impedance will be,

$$Z_{ij} = j\omega M_{ij} \qquad (\Omega/km)$$

$$Z_{ii} = r_i + j\omega Li \qquad (\Omega/km)$$

Induced current in the ground wire will be,

$$\begin{bmatrix} \dot{I}_1 \\ \dot{I}_2 \end{bmatrix} = -\begin{bmatrix} \dot{Z}_{11} & \dot{Z}_{12} \\ \dot{Z}_{21} & \dot{Z}_{22} \end{bmatrix}^{-1} \begin{bmatrix} \dot{Z}_{13} + \dot{Z}_{14} + \dot{Z}_{15} + \cdots + \dot{Z}_{18} \\ \dot{Z}_{23} + \dot{Z}_{24} + \dot{Z}_{15} + \cdots + \dot{Z}_{28} \end{bmatrix} \begin{bmatrix} \dot{I}_3 \\ \dot{I}_4 \\ \vdots \\ \dot{I}_8 \end{bmatrix}$$

Where;

$\sigma$ : Electric conductivity of earth (m /m)

hi : Conductor height (cm)

Dij: Horizontal distance between conductors (cm)

ri : Equivalent radius of conductor (cm)

$\mu si$: Specific permeability of conductor

Now, assuming that $\sigma$ = 100 m $\nu$/m, $\mu si$ = 5 and the current of each phase is 1200 A, the induced current will be,

$$\dot{I}_1 = \dot{I}_2 = -122.4 + j\ 21.48 \quad (A)$$

$$\therefore\ \dot{I}_1 = \dot{I}_2 = 124.3 \quad (A)$$

According to the calculation result given below, the temperature of the OPGW will be lower than 64°C, thereby satisfying the requirements.

♥ Allowable Current

| | | |
|---|---|---|
| Cond. Name : OPGW 190/90 | Sec.Area = 188.3 mm2 | Dia = 22.2 mm |
| DC Res.at 20deg= .129 /km | Max Temp.= 64 deg. | Amb.Temp.= 48 deg. |
| Solar Radiation= .1 W/cm2 | Rad.Ratio= .9 | Wind V. = .5 m/sec. |
| DC Res.at Max.T= 0.1517/km | X =0.63003 Beta =1.00097 | K = 1.01616 |
| Hw = 0.0013307 | Hr = 0.0008081 | Ia = 139.10 A |

(2) At one line fault

Conductor temperature must be lower than 300°C at the fault of line.

The fault current carrying capacity of overhead ground wires is generally calculated by the following formula.

$$I = n \times \sqrt{\frac{C \cdot \ln (\theta \cdot \alpha + 1)}{\alpha \cdot Ro\ t}} \qquad (A)$$

Where,

I : Fault current (A)

α : Temperature coefficient of resistance (Ω/°C)

Ro: Electrical resistance at initial condition (Ω/cm)

t : Duration time (sec.)

C : Heat capacity (J/cm. °C)

Θ : Temperature rise (°C)

n : Number of ground wires

The temperature rise under the following conditions is obtained as described hereunder.

$To = 65^{o}C$ : Initial conductor temperature

$\alpha = 0.0038/^{o}C$

$C = 7.72\ J/cm^{o}C$

$t = 1.0$ sec.

$$Ro = 0.129 \times 10^{-5} \times \{ 1 + 0.0038\ (65 - 20)\} = 0.151 \times 10^{-5}\ (\Omega/cm)$$

$$X = \frac{(\frac{I}{n})^{2} \times \alpha \times Ro \times t}{C}$$

$$= \frac{20{,}000^{2} \times 0.0038 \times 0.151 \times 10^{-5} \times 1}{7.72} = 0.297$$

$$\Theta = \frac{e^{X} - 1}{\alpha} = \frac{e^{0.297} - 1}{0.0038} = 91^{o}C$$

Therefore, the temperature of the ground wire will be,

$Tc = To + \Theta = 65 + 91 = 156 \quad < 300^{o}C$

## 5. INSULATOR STRING

### 5.1 Number of Insulator Discs per String

Insulator disks shall be 254 mm diameter fog type suspension insulators.

| Insulator string | 220 kV | 132 kV |
|---|---|---|
| Suspension insulator string | 22 discs | 14 discs |
| Tension insulator string | 23 discs | 15 discs |

The reason why the tension string has one more disc than the suspension string is that the increase in the length of string has little effect on the tower height. Also, from the viewpoint of maintenance, it is more difficult to exchange an insulator disc on a tension string than on a suspension string.

The number of insulator discs shall be designed so that no flashover against switching surge impulse occurs. The design shall also take into consideration the effects of salt contamination. The required number of discs for switching surge shall be 11 and 7 discs for 220 kV and 132 kV lines, respectively. Minimum flashover voltage under contamination on 254 mm normal suspension insulator disc shall be calculated by using the following formula.

$$Vt = \frac{28\,k}{\left(\frac{\omega}{0.1}\right)^{1/5}\left\{1.5\left(K^{1/3}+2\right)+\frac{5}{8}K\right\}} \quad (kV)$$

Vt: Minimum flashover voltage of 254 mm normal suspension insulator disc (kV)

$\omega$ : Salt deposit density on outer surface in lower face of

disc ($mg/cm^2$)

K : Soil deposit density = 0.1 ($mg/cm^2$)

k : Correction factor

k = 1.15 for effective ground system

k = 1.25 for non-effective ground system

As the transmission line route is located in a coastal area, it is predicted that salt contamination will be considerably heavy. Therefore, assuming the salt deposit density as 0.5 $mg/cm^2$, minimum flashover voltage shall be calculated as 6.2 kV and 6.7 kV for 220 kV and 132 kV, respectively. For fog type insulator, it shall be multiplied by 1.3 to become 8.0 kV and 8.7 kV.

Required withstand voltage shall be,

$$V = Vn \times \frac{1.15}{1.1} \times \frac{1}{\sqrt{3}} q$$

Vn: Nominal voltage (kV)

q : Voltage build-up rate at fault

q = 1.3 for effective ground system

q = $\sqrt{3}$ for non-effective ground system

220 kV line:

$$V = 220 \times \frac{1.15}{1.1} \times \frac{1.3}{\sqrt{3}} = 173 \quad (kV)$$

Required number of discs : $N = \frac{173}{8.0} = 21.6 \quad 22$

132 kV line:

$$V = 132 \times \frac{1.15}{1.1} \times \frac{\sqrt{3}}{\sqrt{3}} = 138 \quad (kV)$$

Required number of discs : $N = \frac{138}{8.7} = 15.9 \rightarrow 16$

The existing 132 kV line has only 12 discs per string. Also, considering that the longer the insulator string becomes, the higher the tower height, 14 discs will be adopted for the proposed 132 kV line, so as to handle the density of 0.3 mg/cm$^2$ of salt deposit.

5.2 Arcing Horn

There are three main purposes of the arcing horn. One is to avoid flashover on the surface of insulator discs by containing it between horns when lightning surge impulse occurs. Another is to shift the surface arc to the horn at the time insulators become contaminated so as to minimize damage to insulator discs. The other is to restrain corona discharge from insulator discs and/or hardware.

It is understood that the probability of occurrence of lightning surge is negligible in the proposed area. Also, as the insulator strings will be considerably long in view of salt contamination, it is not a practical technique to make discharge between the horns, as this requires extending their length.

Consequently, it is advantageous to allow the flashover to occur at the tower body in the rare case of a lightning attack. Moreover, the horns shall be designed to lighten the share voltage of discs located at the charged end as well as countermeasures against surface arc.

## 6. INSULATION CLEARANCE

### (1) Standard insulation clearance

The standard insulation clearance will be 10% larger than the arcing horn gap so as to allow flashover between horns. However, in the case of this project, as flashover will be allowed to discharge to the tower body, the clearance shall be determined by taking into account the horn gap in normal cases and BIL, or Basic Insulation Level, of the substation. Consequently, 1,600 mm for the 220 kV line and 1,050 mm for 132 kV line will be appropriate.

### (2) Minimum insulation clearance

This clearance shall withstand the switching surge impulse.

For 220 kV:

Maximum circuit voltage

$$220 \times \frac{1.2}{1.1} = 240 \quad (\text{kV})$$

Switching surge voltage

$$240 \times \frac{\sqrt{2}}{\sqrt{3}} \times 2.8 = 549 \quad (\text{kV})$$

$\sqrt{2}$ : Ratio of absolute value of sine wave to crest value

$\sqrt{3}$ : Voltage ratio of phase-to-ground to phase-to-phase

2.8 : Multiple factor of switching surge

Minimum clearance (bar gap)

549 x 1.2 = 658 (kV) → 1,400 mm

1.2: Deterioration factor of insulation by ground level and others

For 132 kV:

Maximum circuit voltage

$$132 \times \frac{1.2}{1.1} = 144 \quad (kV)$$

Switching surge voltage

$$144 \times \frac{\sqrt{2}}{\sqrt{3}} \times 3.3 = 388 \quad (kV)$$

3.3: Multiple factor of switching surge

Minimum clearance (bar gap)

388 x 1.2 = 466 (kV) → 900 mm

(3) Clearance diagram

unit: mm

| | Description | 220 kV | 132 kV | Remarks |
|---|---|---|---|---|
| A | Standard clearance | 1,600 | 1,050 | |
| D | Minimum clearance | 1,400 | 900 | |
| Cs | Normal clearance for suspension tower | 2,000 | 1,680 | Cs = A+K+B |
| Cj | Normal clearance for tension tower | 1,650 | 1,100 | Cj = A+K |
| E | Abnormal clearance | 1,550 | 1,070 | E = D+L |
| J | Depth of jumper | 3,000 | 2,000 | |
| K | Consideration for tension member of cross arm | 50 | 50 | |
| B | Consideration for angle of catenary | 350 | 580 | Note 1 |
| L | Consideration for step bolt and post member | 150 | 170 | |

Note 1:

220 kV: $1{,}000 \times \tan 15^{\circ} + 1{,}600 \ (\sec 15^{\circ} - 1) = 324$ 350 mm

132 kV: $2{,}000 \times \tan 15^{\circ} + 1{,}050 \ (\sec 15^{\circ} - 1) = 573$ 580 mm

Where; 1,000, 2,000: Distance between hanging members of cross arm

$15^{\circ}$: Angle of catenary of conductor

## 7. TOWER DESIGN

### 7.1 Design Conception

(1) Standard

Tower design, in principle, shall be in accordance with JEC - 127 (1965), or equivalent.

(2) Conductor

Twin conductor of ACSR/AS 330 $mm^2$ for 220 kV line and single conductor of ACSR/AS 680 $mm^2$ for 132 kV line shall be applied. Maximum tension of conductors shall be 4,000 kg for ACSR/AS 330 $mm^2$ and 6,000 kg for ACSR/AS 680 $mm^2$.

(3) Ground wire

Two OPGW 190/90 $mm^2$ with 3,800 kg maximum tension shall be applied. Shield angle shall be less than $30^{o}$.

(4) Unbalance tension on tower

(a) Normal condition

- o Suspension and angle towers

  No unbalance tension will be applied.

- o Dead-end towers

  Full tension of all conductors and ground wire in the same span shall be applied.

- o Section towers

  One-third of maximum tension of all conductors and ground wire in the same span shall be applied.

(b) Abnormal condition

Unbalance tension and torsional force caused by breakage of any one conductor or two conductors in one phase in case of bundle conductors or ground wire shall be added to the normal condition.

Unbalance tension on suspension tower may be decreased but shall not be lower than 60% of assumed tension of conductor. This deduction shall not be applied on ground wire.

(5) Safety factor

Safety factor shall be more than 1.8 for normal condition and more than 1.2 for abnormal condition based on yield strength or buckling strength.

(6) Standard span

Standard span shall be 400 m. The standard span has been decided based on the following study.

(a) Type, size and number of conductor
(b) Type and construction of supporter
(c) Topographic and climatic conditions in the area along the transmission line route
(d) Applicable standards for safety based on those applied in Japan

Generally, the standard span of supporter is decided by carrying out a comparative study on the estimated total

construction cost after designing several types of towers corresponding to their span. The spans considered to be justifiable are based on the experience of the consultant in the past. These spans are as follows.

| Type of supporters | Standard span (m) |
|---|---|
| Wooden pole | 75 - 120 |
| Steel pole | 150 - 200 |
| Steel tower for transmission line of up to 77 kV | 200 - 300 |
| Steel tower for 154 kV line | 250 - 350 |
| Steel tower for 275 kV line | 300 - 400 |
| Steel tower for 500 kV line | 350 - 450 |

(7) Wind pressure

On tower:

| | |
|---|---|
| Tower height less than 40 m | 280 $kg/m^2$ |
| Tower height less than 50 m | 300 $kg/m^2$ |
| Tower height less than 60 m | 320 $kg/m^2$ |
| Tower height less than 70 m | 340 $kg/m^2$ |
| Tower height less than 80 m | 360 $kg/m^2$ |
| Tower height less than 90 m | 380 $kg/m^2$ |
| Tower height less than 100 m | 400 $kg/m^2$ |

On conductor:

| | |
|---|---|
| Single conductor | 90 $kg/m^2$ |
| Twin conductor | 81 $kg/m^2$ |

On insulator string: 126 $kg/m^2$

(Wind velocity v = 136 km/h = 37.8 m/sec.)

$$P = \frac{1}{2} \rho C V^2$$

$$= 0.5 \times 0.125 \times C \times 37.8^2 \quad (kg/m^2)$$

q: air density $(kg.sec^2/m^4)$

C: Coefficient of air resistance

C = 1.0 for single conductor

C = 0.9 for twin conductor

C = 1.4 for insulator string

(8) Sag calculation

| | |
|---|---|
| Ambient temperature | Max. 48°C |
| | Min. 0°C |
| Conductor temperature | Max. 80°C |

In no case shall ice on the conductor be considered. EDS condition shall be 25°C temperature with no wind.

Results of calculation are as shown in the attached Tables 7.1, 7.2 and 7.3.

Table 7.1 *** SAG CALCULATION ***

CONDUCTOR : ACSR/AS 330 mm2 CROSS S.AREA = 379.64 (sq.mm)
WEIGHT = 1.239 (kg/m) DIAMETER = 25.3 (mm)
ELASTIC M. = 7450 (kg/sq.mm) EXPANSION M. = .0000203 (/deg.C)

BASE TENSION = 4000 (kg)

| | SPAN (m) | TEMP (deg.C) | WIND P. (kg/sq.m) | ICE (mm) | GRAV. | RES.WT. (kg/m) | HOR.TENS. (kg) | SAG (m) | K |
|---|---|---|---|---|---|---|---|---|---|
| H.TEMP. | | 0 | 81.00 | 0 | | | | | |
| L.TEMP. | | 0 | 81.00 | 0 | 0.0 | | | | |
| | 200 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1401.48 | 4.420 | 45 |
| | 250 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1539.23 | 6.289 | 41 |
| | 300 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1642.26 | 8.488 | 38 |
| | 350 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1720.36 | 11.028 | 37 |
| | 400 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1780.38 | 13.918 | 35 |
| | 450 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1827.12 | 17.165 | 34 |
| | 500 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1864.00 | 20.772 | 34 |
| | 550 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1893.48 | 24.743 | 33 |
| | 600 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1917.31 | 29.080 | 33 |
| | 650 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1936.80 | 33.785 | 32 |
| | 700 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1952.90 | 38.859 | 32 |
| | 750 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1966.34 | 44.304 | 32 |
| | 800 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1977.64 | 50.120 | 32 |
| | 850 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1987.23 | 56.308 | 32 |
| | 900 | 80 | 0.00 | 0 | 0.0 | 1.239 | 1995.43 | 62.868 | 32 |
| | 400 | 0 | 0.00 | 0 | 0.0 | 1.239 | 2374.70 | 10.435 | 27 |
| | 400 | 25 | 0.00 | 0 | 0.0 | 1.239 | 2138.11 | 11.590 | 29 |
| | 400 | 55 | 0.00 | 0 | 0.0 | 1.239 | 1921.74 | 12.895 | 33 |

Table 7.2 *** SAG CALCULATION ***

CONDUCTOR : ACSR/AS 680 mm2 CROSS S.AREA = 766.79 (sq.mm)
WEIGHT = 2.446 (kg/m) DIAMETER = 36 (mm)
ELASTIC M. = 7250 (kg/sq.mm) EXPANSION M. = .0000207 (/deg.C)

BASE TENSION = 6000 (kg)

| | SPAN (m) | TEMP (deg.C) | WIND P. (kg/sq.m) | ICE (mm) | GRAV. | RES.WT. (kg/m) | HOR.TENS. (kg) | SAG (m) | K |
|---|---|---|---|---|---|---|---|---|---|
| H.TEMP. | | 0 | 90.00 | 0 | | | | | |
| L.TEMP. | | 0 | 90.00 | 0 | 0.0 | | | | |
| | 200 | 80 | 0.00 | 0 | 0.0 | 2.446 | 2375.53 | 5.148 | 52 |
| | 250 | 80 | 0.00 | 0 | 0.0 | 2.446 | 2635.60 | 7.250 | 47 |
| | 300 | 80 | 0.00 | 0 | 0.0 | 2.446 | 2829.48 | 9.725 | 44 |
| | 350 | 80 | 0.00 | 0 | 0.0 | 2.446 | 2975.74 | 12.587 | 42 |
| | 400 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3087.54 | 15.844 | 40 |
| | 450 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3174.18 | 19.506 | 39 |
| | 500 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3242.24 | 23.576 | 38 |
| | 550 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3296.41 | 28.058 | 38 |
| | 600 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3340.07 | 32.954 | 37 |
| | 650 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3375.66 | 38.268 | 37 |
| | 700 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3404.99 | 44.000 | 36 |
| | 750 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3429.40 | 50.150 | 36 |
| | 800 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3449.90 | 56.721 | 36 |
| | 850 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3467.26 | 63.712 | 36 |
| | 900 | 80 | 0.00 | 0 | 0.0 | 2.446 | 3482.09 | 71.123 | 36 |
| | 400 | 0 | 0.00 | 0 | 0.0 | 2.446 | 3866.39 | 12.653 | 32 |
| | 400 | 25 | 0.00 | 0 | 0.0 | 2.446 | 3568.57 | 13.709 | 35 |
| | 400 | 55 | 0.00 | 0 | 0.0 | 2.446 | 3282.57 | 14.903 | 38 |

Table 7.3 *** SAG CALCULATION ***

CONDUCTOR : OPGW 190/90
WEIGHT = 1.136 (kg/m)
ELASTIC M. = 9400 (kg/sq.mm)
CROSS S.AREA = 283.59 (sq.mm)
DIAMETER = 22.2 (mm)
EXPANSION M. = .0000176 (/deg.C)

BASE TENSION = 3800 (kg)

| | SPAN (m) | TEMP (deg.C) | WIND P. (kg/sq.m) | ICE (mm) | GRAV. | RES.WT. (kg/m) | HOR.TENS. (kg) | SAG (m) | K |
|---|---|---|---|---|---|---|---|---|---|
| H.TEMP. | | 0 | 90.00 | 0 | | | | | |
| L.TEMP. | | 0 | 90.00 | 0 | 0.0 | | | | |
| | 100 | 0 | 0.00 | 0 | 0.0 | 1.136 | 3510.01 | 0.405 | 17 |
| | 150 | 0 | 0.00 | 0 | 0.0 | 1.136 | 3200.59 | 0.998 | 18 |
| | 200 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2870.51 | 1.979 | 20 |
| | 250 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2592.92 | 3.423 | 22 |
| | 300 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2393.98 | 5.338 | 24 |
| | 300 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2393.98 | 5.338 | 24 |
| | 350 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2260.07 | 7.697 | 26 |
| | 400 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2169.84 | 10.471 | 27 |
| | 450 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2107.42 | 13.645 | 27 |
| | 500 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2062.85 | 17.209 | 28 |
| | 550 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2030.04 | 21.160 | 28 |
| | 600 | 0 | 0.00 | 0 | 0.0 | 1.136 | 2005.24 | 25.493 | 29 |

(9) Distance between conductors

(a) 220 kV line

(i) Experienced distance

Horizontal distance:

$$C_h = 1.5 \times \frac{220}{1.1 \times 25} = 9.5 \quad (m)$$

Vertical distance:

$$C_v = 1.0 + \frac{220}{1.1 \times 45} = 5.4 \quad (m)$$

(ii) Transverse swing by wind

$$C_h \geq (D-\varepsilon) \frac{Sm - S}{Sm} + 2\,(d+L)\,\sin\Theta + \varepsilon + 2r$$

$$= (4 - 0.84) \frac{600 - 400}{600} + 2\,(12.9 + 4.3)\,\sin 12.17^{\circ}$$

$$+ 0.84 + (0.4 + 0.0253) = 9.6 \quad (m)$$

$$\Theta = \tan^{-1} \frac{Ww}{Wc} = \tan^{-1} \frac{10.6 \times 25.3 \times 10^{-3}}{1.239} = 12.17^{\circ}$$

where;

D : distance between busbars of outdoor substation (m)

$\varepsilon$ : power-frequency flashover distance (m)

Sm: maximum span length (m)

S : applied span length (m)

d : sag at 55°C (m)

L : insulator string length (m)

$\Theta$ : swinged angle of conductor (deg.)

r : radius of conductor (m)

Wc: weight of conductor (kg/m)

Ww: wind pressure on conductor at wind velocity of 13 m/sec. (kg/m)

(iii) Statistical method

Generally, the swing of conductors will not be simultaneous at all instances. The probability of conductor being staid within the standard deviation ($\sigma$) from the mean swing angle ($\bar{\theta}$) is 68.26% and within $2\sigma$ is 95.44%. Taking into account to close conductors with $2\sigma$ , the required distance between conductors should be more than 6.2 m horizontally according to the following formula. Refer to Fig. 7.1.

$$\sigma = \frac{43.5h \cdot p\sqrt{\nu} \cdot d \cdot S}{\sqrt{\beta\gamma} \cdot (\sqrt{\frac{\gamma}{\alpha}})^{\frac{5}{6}}}$$

$$\alpha = \frac{w}{g} \cdot \frac{8\, d^2 S}{15}$$

$$\beta = a\bar{v}\,(1 + \cos^2\bar{\theta})\,\frac{8\, d^2 s}{15}$$

$$\gamma = (a\bar{v}^{-2}\sin\bar{\theta} + w\cos\bar{\theta})\,\frac{2}{3}\, d\, S$$

$$\nu = \frac{1}{15kS} - \frac{2}{3(kS)^3} + \frac{2}{(kS)^4} - \frac{8}{(kS)^6} + \frac{2e^{-ks}}{(KS)^4}\left(1 + \frac{2}{KS}\right)^2$$

$$k = ko\,\frac{\omega}{\bar{v}}$$

$$ko = 0.335$$

$$\omega = \sqrt{\frac{\gamma}{\alpha}}$$

where;

h : $\cos \bar{\theta}$

d : sag (m)

S : span (m)

$\bar{p}$ : wind pressure on conductor (kg/m) = $a\bar{v}^2$

w : weight of conductor (kg/m)

g : gravitational acceleration 9.8 m/sec.$^2$

(iv) Conclusion

Horizontal distance: more than 9.6 m

Vertical distance: more than 5.4 m

(b) 132 kV line

(i) Experienced distance

Horizontal distance:

$$C_h = 1.5 + \frac{132}{1.1 \times 25} = 6.3 \text{ (m)}$$

Vertical distance:

$$C_v = 1.0 + \frac{132}{1.1 \times 45} = 3.7 \text{ (m)}$$

(ii) Transverse swing by wind

$$C_h \geq (3 - 0.504) \frac{550 - 400}{550} + 2 (14.9 + 3) \sin 8.84^\circ$$

$$+ 0.504 + 0.036 = 6.72 \text{ (m)}$$

(iii) Statistical method

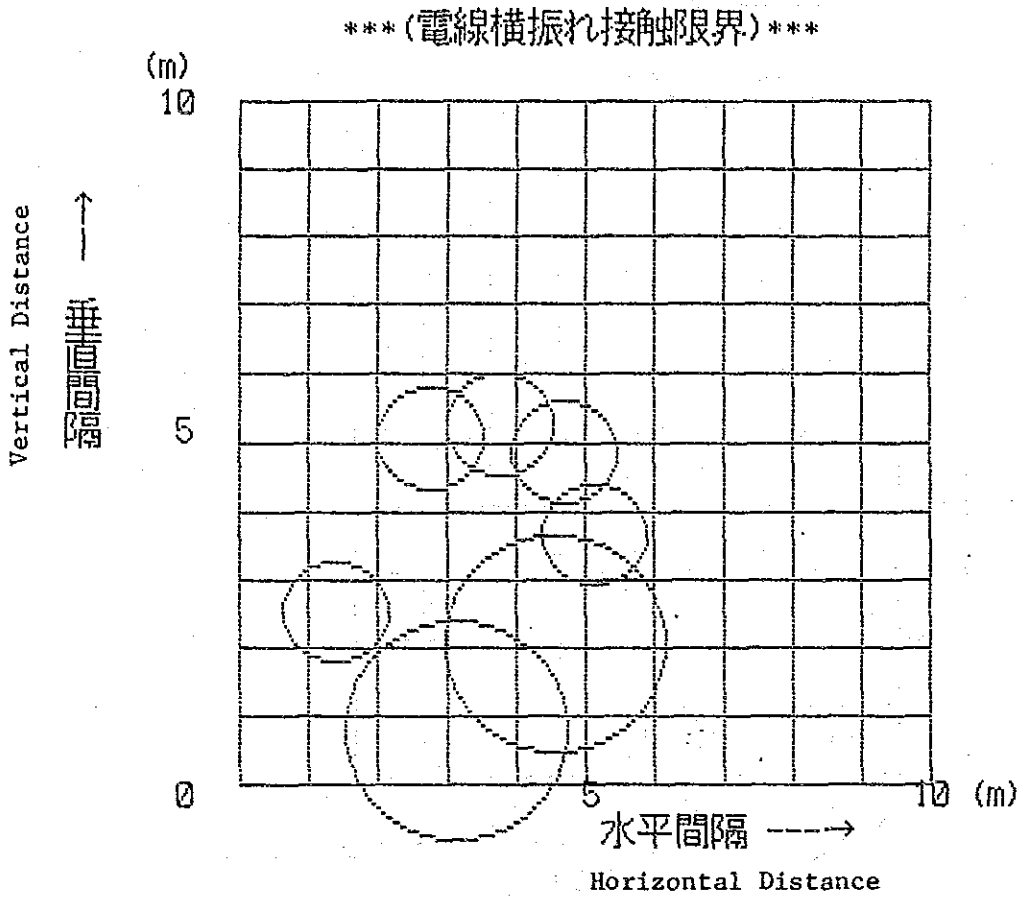
Refer to Fig. 7.2

(iv) Conclusion

Horizontal distance: more than 6.8 m

Fig. 7.1 CONDUCTOR SWING BY WIND

(STATISTICAL METHOD)

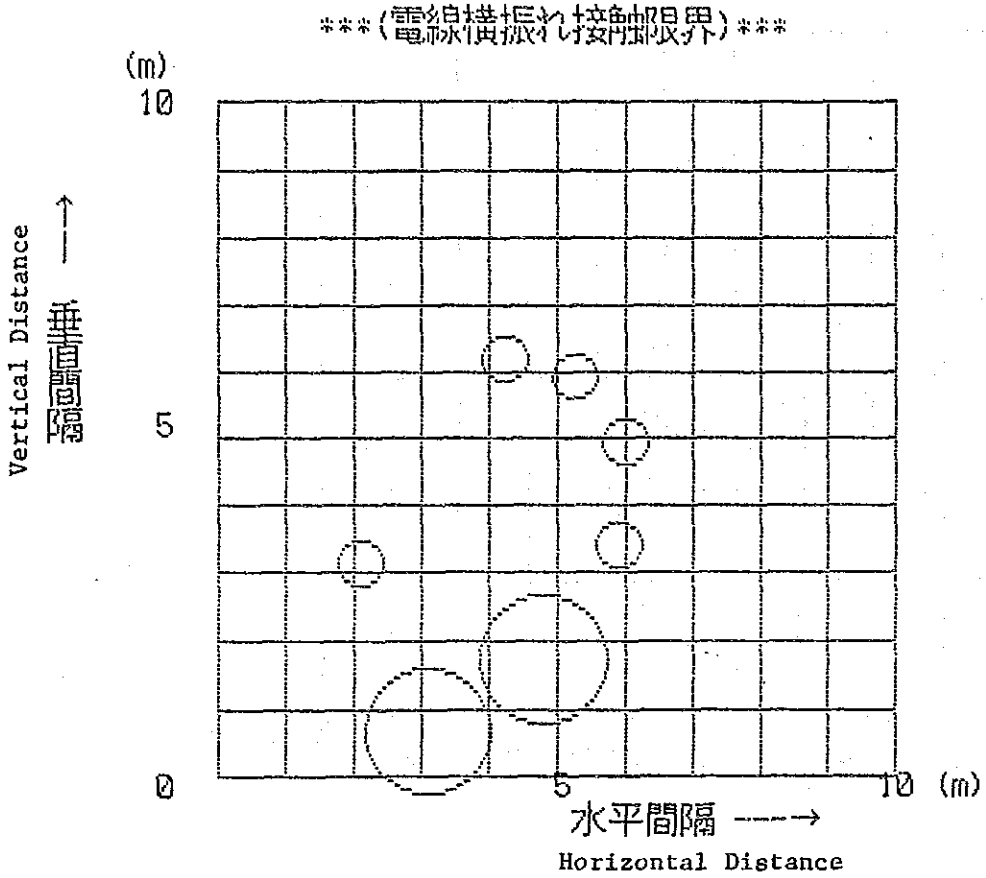



| | | |
|---|---|---|
| Conductor | 電線 | ACSR/AS 330 * 2 |
| | ( Tmax ) | 4000 (kg) |
| Voltage | 電圧 | 220 (KV) |
| Required Clearance | 所要離隔 | V≦20m/sec 1612.65 mm |
| | | V>20m/sec 752.65 mm |
| Applied Span | 径間 | 450 (m) |
| Ruling Span | 等価径間 | 400 (m) |

| Wind Verocity 風速 (m/s) | Conductor Temperature 電線温度 (°C) | Loading Factor 負荷係数 | Sag 弛度 (m) | Tension 張力 (kg) | Swinged Angle 横振れ角 θ (°) | Standard Deviation 標準偏差 σ (°) |
|---|---|---|---|---|---|---|
| 15.0 | 55.0 | 1.0000 | 16.32 | 1922 | 14.5 | 2.2 |
| 20.0 | 55.0 | 1.0000 | 16.32 | 1922 | 24.7 | 3.5 |
| 25.0 | 55.0 | 1.0000 | 16.32 | 1922 | 35.7 | 4.4 |
| 30.0 | 55.0 | 1.0000 | 16.32 | 1922 | 46.0 | 4.7 |
| 35.0 | 55.0 | 1.0000 | 16.32 | 1922 | 54.6 | 4.5 |
| 40.0 | 55.0 | 1.0000 | 16.32 | 1922 | 61.4 | 4.0 |

Fig. 7.2 CONDUCTOR SWING BY WIND

(STATISTICAL METHOD)




| | | |
|---|---|---|
| Conductor | 電線 | ACSR/AS 680 * 1 |
| | ( Tmax ) | 6000 (kg) |
| Voltage | 電圧 | 132 (KV) |
| Required Clearance | 所要離隔 | V≦20m/sec 918 mm |
| | | V＞20m/sec 348 mm |
| Applied Span | 径間 | 450 (m) |
| Ruling Span | 等価径間 | 400 (m) |

| Wind Verocity 風速 (m/s) | Conductor Temperature 電線温度 (°C) | Loading Factor 負荷係数 | Sag 弛度 (m) | Tension 張力 (kg) | Swinged Angle 横振れ角 θ (°) | Standard Deviation 標準偏差 σ (°) |
|---|---|---|---|---|---|---|
| 15.0 | 55.0 | 1.0000 | 18.86 | 3283 | 11.7 | 2.1 |
| 20.0 | 55.0 | 1.0000 | 18.86 | 3283 | 20.2 | 3.4 |
| 25.0 | 55.0 | 1.0000 | 18.86 | 3283 | 29.9 | 4.5 |
| 30.0 | 55.0 | 1.0000 | 18.86 | 3283 | 39.6 | 5.1 |
| 35.0 | 55.0 | 1.0000 | 18.86 | 3283 | 48.4 | 5.2 |
| 40.0 | 55.0 | 1.0000 | 18.86 | 3283 | 55.8 | 4.9 |

Vertical distance: more than 3.7 m

(c) Vertical distance between 220 kV line and 132 kV line

Unit: m

| Description \ Tower type | A | B | C | D |
|---|---|---|---|---|
| Suspension insulator string or jumper | 2.9 | 3.0 | 3.0 | 3.8 |
| Normal clearance | 2.0 | 1.65 | 1.65 | 1.65 |
| Height of personnel | 1.8 | 1.8 | 1.8 | 1.8 |
| Working space | 0.5 | 0.5 | 0.5 | 0.5 |
| Total | 7.2 | 6.95 | 6.95 | 7.75 |

(10) Tower type

| Type | Circuit number | Deviation angle | Wind span | Weight span |
|---|---|---|---|---|
| AS | 2 | $3^{o}$ | 250 m | 300 m |
| A | 2 | $3^{o}$ | 400 | 500 |
| AL | 2 | $3^{o}$ | 500 | 550 |
| B | 2 | $15^{o}$ | 300 | 300 |
| C | 2 | $35^{o}$ | 350 | 400 |
| D | 2 | $0^{o}$,$60^{o}$ | 300 | 300 |
| DR | 2 | $90^{o}$ | 300 | 350 |
| A4 | 4 | $3^{o}$ | 350 | 400 |
| D4 | 4 | $0^{o}$ | 250 | 300 |
| DR4 | 4 | $75^{o}$ | 350 | 350 |

Configurations of each tower type are as shown in DWG. NOS. WLT-1101 to WLT-1103, and the clearance diagrams are as shown in DWG. NOS. WLT-1151 to WLT-1153.

(11) Clearance from land or obstacles

| Particulars | Minimum clearance (m) 220 kV | 132 kV |
|---|---|---|
| Normal ground, open and agricultural land | 7.75 | 7.75 |
| Main road | 9.20 | 9.20 |
| Trees | 4.00 | 3.20 |
| Railway | 12.00 | 12.00 |
| Residential building | 6.00 | 4.50 |
| Telecommunication line | 4.00 | 3.20 |
| Shield wire of power line | 4.00 | 3.20 |
| Iron bridges, etc. | 4.00 | 3.20 |
| Highest water level of large river | 15.00 | 15.00 |

(12) Accessories

(a) Spacer

The spacer for the bundle conductor shall be fitted in the mid-span and in the jumper connections.

(b) Vibration damper

The vibration damper shall be double torsional damper having the following weight.

| | | |
|---|---|---|
| ACSR/AS | 330 $mm^2$ | 14 lb |
| ACSR/AS | 680 $mm^2$ | 18 lb |
| OPGW | 190/90 $mm^2$ | 12 lb |

(c) Armor rod

The preformed armor rod shall be fitted in suspension strings.

(d) Connection of conductor

Dead-end clamp and mid-span joint sleeves shall be of the compression type.

7.2 Cable Connection Point

Due to space limitation at the site of tower No. 1, connection of the overhead lines to the underground cables shall be made at every circuit aligned in series, and shall be as shown in DWG. NO. WLT-1104, DWG. NO. WLT-1105 and DWG. NO. WLT-1106. Cables shall be laid in the tunnel to be constructed for extending the cable tunnel from the W.W. P.P. along the centerline of tower No. 1 and the gantries.

## 7.3 Preliminary Tower Design

### (1) General

The tower design presented herein aims at obtaining a general idea of the tower weight, reaction force for its foundation, and estimation of the budget of the project. Design is based on DWG. No. TLT-01 to WDG. No. TLT-09. Design results given in this report are considered to be highly adequate in spite of some design conditions which are slightly different from those of actual towers.

### (2) Design Condition

Tower designs presented hereunder are in accordance with JEC-127 (1965), except where otherwise stipulated.

(a) Tower type

| Tower type | Circuit number | Deviation angle | Wind span | Coefficient of vertical load |
|---|---|---|---|---|
| AS | 2 | $3^{o}$ | 250 | 0.03 |
| A | 2 | $3^{o}$ | 400 | 0.05 |
| AL | 2 | $3^{o}$ | 500 | 0.03 |
| B | 2 | $15^{o}$ | 300 | 0.03 |
| C | 2 | $35^{o}$ | 350 | 0.03 |
| D | 2 | $60^{o}$ | 300 | 0.03 |
| DR | 2 | $90^{o}$ | 300 | 0.03 |
| A4 | 4 | $3^{o}$ | 350 | 0.03 |
| D4 | 4 | $60^{o}$ | 250 | 0.03 |
| DR4 | 4 | $75^{o}$ | 350 | 0.03 |

(b) Conductor

| Name | Max. tension kg | Weight kg/m | Diameter mm |
|---|---|---|---|
| OPGW 190/90 | 3,800 | 1.136 | 22.2 |
| ACSR/AS 330 | 4,000 | 1.239 | 25.30 |
| ACSR/AS 680 | 6,000 | 2.446 | 36.00 |

(c) Insulator string

Insulator strings are as shown in DWG. No. WLT-1201 to DWG. No. WLT-1209. Insulator disks are as shown in DWG. No. WLT-1210.

220 kV suspension string

Weight : 7.3 x 22 x 2 + 78 = 399.2 400 kg/support

Wind pressure : (0.027 x 22 x 2 + 0.33) x 126 = 191.3

200 kg/support

220 kV double tension string

Weight : 7.3 x 23 x 2 x 2 + 116 = 787.6 790 kg/support

Wind pressure : {0.027 x 23 x (1+0.3) x 2 + 0.47} x 126 = 262.7

270 kg/support

132 kV double suspension string

Weight : 7.3 x 16 x 2 + 75 = 308.6 310 kg/support

Wind pressure : {0.027 x 16 x (1+0.3) + 0.33} x 126 = 112.3

120 kg/support

132 kV double tension string

Weight : 7.3 x 17 x 2 x 2 + 119 = 615.4 620 kg/support

Wind pressure : {0.027 x 17 x (1+0.3) x 2 + 0.47} x 126 = 209.6

210 kg/support

(d) Safety factor

Normal condition 1.8

Abnormal condition 1.2

(e) Slenderness ratio

(i) Less than 200 for main posts and main members of crossarms

(ii) Less than 220 for compression members other than (i)

(iii) Less than 250 for redundant members used for reinforcing compression members

(f) Effective buckling length ratio

| | |
|---|---|
| Main post | 1.0 |
| Bracing | 0.9 |

(g) Weight ratio of plates and bolts

| | Suspension tower | Tension tower |
|---|---|---|
| Upper side of waist | 0.3 | 0.3 |
| Lower side of waist | 0.15 | 0.15 |
| Crossarm | 0.3 | 0.35 |

(3) Calculation Results

Calculation results are as shown in the pages listed hereunder.

AS : TLG-1-39 to TLG-1-44

A : TLG-1-45 to TLG-1-50

AL : TLG-1-51 to TLG-1-56

B : TLG-1-57 to TLG-1-62

C : TLG-1-63 to TLG-1-68

D : TLG-1-69 to TLG-1-75

DR : TLG-1-76 to TLG-1-82

A4 : TLG-1-83 to TLG-1-91

D4 : TLG-1-92 to TLG-1-100

DR4 : TLG-1-101 to TLG-1-110

| TOWER TYPE AS | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 250 \times 10^{-3}$ | 500 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 250 \times 10^{-3}$ | 1,225 |
| | Ins. | 200 | |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 1.5^{o} \times 2$ | 199 |
| | $C_{1-3}$ | $4,000 \times \sin 1.5^{o} \times 2 \times 2$ | 419 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 250$ | 284 |
| | $C_{1-3}$ | $1.239 \times 2 \times 250$ | 1,020 |
| | Ins. | 400 | |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |

## TOWER BODY

(AS)

| No. | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | F | HC G | C1-3 | Ha G | C1-3 | P G | C1-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0 | 0.05 | 500 | 1225 | 199 | 419 | 1140 | 2400 | | | | | | | |
| 1 | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 16 | 42 | 2 | 148 | 0 | 59 | 0 | 338 | 0 | 0 | 142 | 57 | 194 | 0 | 0 | 1 |
| 2 | 0.88 | 0.00 | 0.00 | 0.00 | 0.00 | 86 | 187 | 9 | 439 | 0 | 175 | 0 | 1003 | 0 | 0 | 652 | 177 | 1245 | 0 | 0 | 2 |
| 3 | 1.56 | 0.41 | 0.00 | 0.00 | 0.41 | 270 | 653 | 33 | 778 | 497 | 310 | 170 | 1777 | 975 | 0 | 652 | 177 | 1342 | 0 | 0 | 3 |
| 4 | 2.32 | 1.20 | 0.00 | 0.00 | 1.20 | 574 | 1348 | 67 | 1160 | 1468 | 462 | 502 | 2647 | 2876 | 0 | 652 | 177 | 1433 | 0 | 0 | 4 |
| 5 | 3.12 | 2.02 | 0.00 | 0.00 | 2.02 | 1035 | 2156 | 108 | 1557 | 2478 | 620 | 847 | 3553 | 4856 | 0 | 1162 | 297 | 2405 | 0 | 0 | 5 |
| 6 | 3.87 | 2.81 | 0.38 | 0.00 | 3.18 | 1622 | 3188 | 159 | 1935 | 3900 | 771 | 1334 | 4416 | 6741 | 0 | 1162 | 297 | 2536 | 0 | 0 | 6 |
| 7 | 4.53 | 3.49 | 1.11 | 0.00 | 4.60 | 2268 | 4297 | 215 | 2261 | 5629 | 901 | 1925 | 5160 | 8368 | 0 | 1162 | 297 | 2656 | 0 | 0 | 7 |
| 8 | 5.21 | 4.20 | 1.88 | 0.00 | 6.07 | 3099 | 5535 | 277 | 2602 | 7436 | 1036 | 2543 | 5938 | 10068 | 0 | 1671 | 417 | 3673 | 0 | 0 | 8 |
| 9 | 5.51 | 4.59 | 2.51 | 0.42 | 7.52 | 3898 | 6646 | 332 | 2751 | 9211 | 1096 | 3150 | 6278 | 11026 | 0 | 1671 | 417 | 3861 | 0 | 0 | 9 |
| 10 | 5.25 | 4.52 | 2.84 | 1.17 | 8.53 | 4477 | 7216 | 361 | 2622 | 10442 | 1044 | 3571 | 5984 | 10840 | 0 | 1671 | 417 | 4073 | 0 | 0 | 10 |
| 11 | 5.04 | 4.45 | 3.11 | 1.77 | 9.34 | 5218 | 7683 | 384 | 2518 | 11434 | 1003 | 3910 | 5748 | 10691 | 0 | 1671 | 417 | 4402 | 0 | 0 | 11 |
| 12 | 4.87 | 4.40 | 3.34 | 2.27 | 10.01 | 6200 | 8066 | 403 | 2432 | 12256 | 969 | 4191 | 5551 | 10567 | 0 | 1671 | 417 | 4897 | 0 | 0 | 12 |
| 1 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 32 | 80 | 4 | 289 | 0 | 115 | 0 | 659 | 0 | 1275 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 106 | 201 | 10 | 283 | 0 | 113 | 0 | 646 | 0 | 1250 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.62 | 0.64 | 0.00 | 0.00 | 0.64 | 204 | 556 | 28 | 308 | 783 | 123 | 268 | 702 | 1534 | 4986 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.59 | 0.62 | 0.00 | 0.00 | 0.62 | 279 | 537 | 27 | 297 | 756 | 118 | 258 | 678 | 1481 | 4812 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.62 | 0.64 | 0.00 | 0.00 | 0.64 | 418 | 670 | 33 | 309 | 786 | 123 | 269 | 705 | 1540 | 5006 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.55 | 0.57 | 0.62 | 0.00 | 1.19 | 498 | 930 | 46 | 276 | 1462 | 110 | 500 | 629 | 1490 | 4469 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.53 | 0.55 | 0.60 | 0.00 | 1.16 | 577 | 901 | 45 | 267 | 1416 | 106 | 484 | 610 | 1443 | 4328 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 0.55 | 0.58 | 0.62 | 0.00 | 1.20 | 742 | 1040 | 52 | 277 | 1468 | 110 | 502 | 632 | 1496 | 4489 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | -0.21 | -0.06 | 0.28 | 0.61 | 0.83 | 381 | 435 | 22 | -106 | 1011 | -42 | 346 | -241 | 1473 | 4103 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.17 | -0.05 | 0.22 | 0.49 | 0.65 | 472 | 346 | 17 | -84 | 800 | -33 | 273 | -191 | 1165 | 3246 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.14 | -0.04 | 0.18 | 0.40 | 0.54 | 612 | 281 | 14 | -69 | 656 | -27 | 224 | -157 | 956 | 2663 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | -0.11 | -0.03 | 0.14 | 0.32 | 0.43 | 799 | 225 | 11 | -55 | 526 | -22 | 180 | -126 | 767 | 2136 | 0 | 0 | 0 | 0 | 0 | 12 |

(AS)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 618 | 641 | 610 | 641 | L 60* 5 | 140 | 119 | 3914 | 6.11 | 775 | 1 |
| 2 | 2784 | 2537 | 2810 | 2810 | L 60* 5 | 140 | 119 | 3914 | 1.39 | 4,980 | 2 |
| 3 | 4230 | 4024 | 4366 | 4366 | L120* 8 | 200 | 84 | 25175 | 5.77 | 5,369 | 3 |
| 4 | 6495 | 6279 | 6790 | 6790 | L120* 8 | 200 | 84 | 25175 | 3.71 | 5,734 | 4 |
| 5 | 10508 | 10294 | 11091 | 11091 | L120* 8 | 240 | 101 | 17518 | 1.58 | 9,618 | 5 |
| 6 | 13716 | 13706 | 14665 | 14665 | L150*10 | 200 | 67 | 51642 | 3.52 | 10,145 | 6 |
| 7 | 17312 | 17206 | 18634 | 18634 | L150*10 | 200 | 67 | 51642 | 2.77 | 10,623 | 7 |
| 8 | 22754 | 21991 | 24595 | 24595 | L150*10 | 240 | 81 | 41812 | 1.70 | 14,692 | 8 |
| 9 | 26387 | 25067 | 28726 | 28726 | L150*10 | 163 | 55 | 59099 | 2.06 | 15,443 | 9 |
| 10 | 28678 | 26477 | 31345 | 31345 | L150*10 | 197 | 66 | 52396 | 1.67 | 16,291 | 10 |
| 11 | 30958 | 27905 | 34058 | 34058 | L150*12 | 260 | 88 | 42891 | 1.26 | 17,606 | 11 |
| 12 | 33436 | 29482 | 37114 | 37114 | L150*12 | 167 | 56 | 69456 | 1.87 | 19,586 | 12 |
| 1 | 439 | 1371 | 0 | 1371 | L 45* 4 | 124 | 141 | 1675 | 1.22 | | 1 |
| 2 | 512 | 1475 | 0 | 1475 | L 50* 4 | 125 | 128 | 2241 | 1.52 | | 2 |
| 3 | 1713 | 4878 | 0 | 4878 | L 70* 6 | 143 | 105 | 6110 | 1.25 | | 3 |
| 4 | 1735 | 4763 | 0 | 4763 | L 70* 6 | 146 | 106 | 6013 | 1.26 | | 4 |
| 5 | 1938 | 5115 | 0 | 5115 | L 75* 6 | 160 | 108 | 6324 | 1.24 | | 5 |
| 6 | 2892 | 4949 | 0 | 4949 | L 75* 6 | 151 | 102 | 6764 | 1.37 | | 6 |
| 7 | 2896 | 4857 | 0 | 4857 | L 75* 6 | 153 | 103 | 6664 | 1.37 | | 7 |
| 8 | 3152 | 5205 | 0 | 5205 | L 80* 6 | 167 | 105 | 6949 | 1.34 | | 8 |
| 9 | 1612 | 4283 | 0 | 4283 | L 90* 6 | 215 | 121 | 6652 | 1.55 | | 9 |
| 10 | 1446 | 3504 | 0 | 3504 | L 70* 6 | 131 | 123 | 4990 | 1.42 | | 10 |
| 11 | 1410 | 3023 | 0 | 3023 | L 75* 6 | 169 | 147 | 3842 | 1.27 | | 11 |
| 12 | 1439 | 2631 | 0 | 2631 | L 75* 6 | 215 | 145 | 3930 | 1.49 | | 12 |

## CROSSARM

(AS)

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 500 | 199 | 2280 | 114 | 284 | NML | A.NML | UI | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 1225 | 419 | 4800 | 240 | 1020 | | | | | | | | |
| G | M | 0.53 | 1.52 | 1.26 | 264 | 105 | 3466 | 144 | 358 | 4338 | 0 | 4338 | L100*10 | 353 | 181 | 5495 | 1.27 |
| | S | 0.00 | 0.00 | 1.35 | 0 | 0 | 0 | 154 | 384 | 539 | 0 | 539 | L 90* 6 | 379 | 213 | 2210 | 4.10 |
| | X | 0.00 | 0.33 | 0.00 | 0 | 0 | 754 | 0 | 0 | 0 | 505 | 505 | L 45* 4 | 164 | 187 | 950 | 1.88 |
| C 1 | M | 0.51 | 2.80 | 2.40 | 622 | 213 | 13416 | 575 | 2443 | 17269 | 0 | 17269 | L200*20 | 671 | 172 | 24404 | 1.41 |
| | S | 0.00 | 0.00 | 2.45 | 0 | 0 | 0 | 589 | 2501 | 3089 | 0 | 3089 | L175*12 | 587 | 200 | 66173 | 21.42 |
| | X | 0.00 | 0.80 | 0.00 | 0 | 0 | 3818 | 0 | 0 | 0 | 2558 | 2558 | L 65* 6 | 170 | 134 | 4003 | 1.56 |
| C 2 | M | 0.51 | 2.55 | 1.38 | 624 | 214 | 12238 | 331 | 1408 | 14815 | 0 | 14815 | L200*15 | 663 | 169 | 19284 | 1.30 |
| | S | 0.00 | 0.00 | 1.47 | 0 | 0 | 0 | 354 | 1503 | 1857 | 0 | 1857 | L175*12 | 708 | 206 | 66173 | 35.63 |
| | X | 0.00 | 0.71 | 0.00 | 0 | 0 | 3394 | 0 | 0 | 0 | 2274 | 2274 | L 65* 6 | 184 | 145 | 3412 | 1.50 |
| C 3 | M | 0.51 | 2.34 | 1.36 | 627 | 214 | 11231 | 328 | 1391 | 13791 | 0 | 13791 | L200*15 | 655 | 167 | 19742 | 1.43 |
| | S | 0.00 | 0.00 | 1.46 | 0 | 0 | 0 | 350 | 1488 | 1838 | 0 | 1838 | L175*12 | 700 | 204 | 66173 | 36.01 |
| | X | 0.00 | 0.63 | 0.00 | 0 | 0 | 3030 | 0 | 0 | 0 | 2030 | 2030 | L 65* 6 | 198 | 156 | 2942 | 1.45 |



## CROSSARM ( IN TOWER BODY )

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 500 | 199 | 2280 | 114 | 284 | NML | A.NML | UI | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 1225 | 419 | 4800 | 240 | 1020 | | | | | | | | |
| G | M | 0.00 | 0.72 | 1.19 | 0 | 0 | 1636 | 136 | 339 | 474 | 1414 | 1414 | L100*10 | 233 | 119 | 12188 | 8.62 |
| | S | 0.17 | 0.00 | 0.42 | 87 | 35 | 0 | 47 | 118 | 287 | 0 | 287 | L 60* 4 | 233 | 195 | 4585 | 15.98 |
| | SF | 0.00 | 0.00 | 1.19 | 0 | 0 | 0 | 135 | 337 | 472 | 0 | 472 | L 60* 4 | 236 | 199 | 4585 | 9.72 |
| | SS | 0.00 | 0.00 | 0.42 | 0 | 0 | 0 | 48 | 120 | 168 | 0 | 168 | L 60* 4 | 233 | 195 | 1168 | 6.95 |
| C 1 | M | 0.00 | 1.38 | 2.36 | 0 | 0 | 6600 | 566 | 2403 | 2969 | 6411 | 6411 | L200*20 | 240 | 62 | 76000 | 11.85 |
| | S | 0.09 | 0.00 | 0.43 | 111 | 38 | 0 | 103 | 437 | 689 | 0 | 689 | L 60* 4 | 240 | 202 | 4585 | 6.65 |
| | SF | 0.00 | 0.00 | 2.36 | 0 | 0 | 0 | 567 | 2410 | 2977 | 0 | 2977 | L 60* 4 | 236 | 199 | 4585 | 1.54 |
| | SS | 0.00 | 0.00 | 0.42 | 0 | 0 | 0 | 101 | 430 | 531 | 0 | 531 | L 60* 4 | 236 | 199 | 1131 | 2.13 |
| C 2 | M | 0.00 | 1.25 | 1.35 | 0 | 0 | 6000 | 325 | 1381 | 1706 | 5163 | 5163 | L200*15 | 260 | 66 | 57750 | 11.19 |
| | S | 0.10 | 0.00 | 0.27 | 122 | 42 | 0 | 65 | 276 | 505 | 0 | 505 | L 60* 4 | 260 | 218 | 4585 | 9.07 |
| | SF | 0.00 | 0.00 | 1.36 | 0 | 0 | 0 | 327 | 1389 | 1715 | 0 | 1715 | L 60* 4 | 253 | 212 | 4585 | 2.67 |
| | SS | 0.00 | 0.00 | 0.26 | 0 | 0 | 0 | 63 | 268 | 331 | 0 | 331 | L 60* 4 | 253 | 212 | 990 | 2.99 |
| C 3 | M | 0.00 | 1.14 | 1.33 | 0 | 0 | 5486 | 320 | 1359 | 1679 | 4801 | 4801 | L200*15 | 280 | 71 | 57750 | 12.03 |
| | S | 0.11 | 0.00 | 0.29 | 134 | 46 | 0 | 70 | 297 | 547 | 0 | 547 | L 70* 6 | 280 | 204 | 8226 | 15.03 |
| | SF | 0.00 | 0.00 | 1.34 | 0 | 0 | 0 | 322 | 1367 | 1689 | 0 | 1689 | L 65* 6 | 273 | 215 | 7483 | 4.43 |
| | SS | 0.00 | 0.00 | 0.28 | 0 | 0 | 0 | 68 | 289 | 358 | 0 | 358 | L 65* 6 | 273 | 215 | 1553 | 4.34 |

## FOUNDATION

(AS)

| No. | | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | F | HC G | C1-3 | Ha G | C1-3 | P G | C1-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1.0 | 0.05 | 500 | 1225 | 199 | 419 | 1140 | 2400 | | | | | | | |
| | C | 5.29 | 4.49 | 2.66 | 0.83 | 7.97 | 4099 | 6860 | 343 | 2640 | 9762 | 1052 | 3339 | 6026 | 10766 | 0 | 1671 | 417 | 3861 | 0 | 0 | |
| | T | 5.29 | 4.49 | 2.66 | 0.83 | 7.97 | 4099 | 6860 | 343 | 2640 | 9762 | 1052 | 3339 | 6026 | 10766 | 0 | 0 | 0 | -3861 | 0 | 0 | |
| 9 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 743 | 0 | 114 | 250 | 1837 | 99 | 628 | 0 | 0 | 2674 | 0 | 0 | 0 | 0 | 0 | 9 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 743 | 2288 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 2674 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.14 | -0.04 | 0.18 | 0.40 | 0.54 | 248 | 0 | 16 | -69 | 659 | -27 | 225 | 0 | 0 | 2674 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.14 | -0.04 | 0.18 | 0.40 | 0.54 | 248 | 316 | 0 | 0 | 0 | 0 | 0 | -157 | 960 | 2674 | 0 | 0 | 0 | 0 | 0 | |
| | C | 5.06 | 4.42 | 2.95 | 1.47 | 8.84 | 4726 | 7369 | 368 | 2529 | 10824 | 1007 | 3702 | 5772 | 10606 | 0 | 1671 | 417 | 4073 | 0 | 0 | |
| | T | 5.06 | 4.42 | 2.95 | 1.47 | 8.84 | 4726 | 7369 | 368 | 2529 | 10824 | 1007 | 3702 | 5772 | 10606 | 0 | 0 | 0 | -4073 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 884 | 0 | 114 | 250 | 1837 | 99 | 628 | 0 | 0 | 2154 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 884 | 2288 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 2154 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.11 | -0.03 | 0.14 | 0.32 | 0.43 | 313 | 0 | 13 | -56 | 531 | -22 | 181 | 0 | 0 | 2154 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.11 | -0.03 | 0.14 | 0.32 | 0.43 | 313 | 255 | 0 | 0 | 0 | 0 | 0 | -127 | 773 | 2154 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.88 | 4.36 | 3.19 | 2.02 | 9.57 | 5561 | 7798 | 390 | 2436 | 11719 | 970 | 4008 | 5559 | 10471 | 0 | 1671 | 417 | 4402 | 0 | 0 | |
| | T | 4.88 | 4.36 | 3.19 | 2.02 | 9.57 | 5561 | 7798 | 390 | 2436 | 11719 | 970 | 4008 | 5559 | 10471 | 0 | 0 | 0 | -4402 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1065 | 0 | 114 | 250 | 1837 | 99 | 628 | 0 | 0 | 1716 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1065 | 2288 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1716 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.09 | -0.03 | 0.12 | 0.26 | 0.35 | 394 | 0 | 10 | -44 | 423 | -16 | 145 | 0 | 0 | 1716 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.09 | -0.03 | 0.12 | 0.26 | 0.35 | 394 | 203 | 0 | 0 | 0 | 0 | 0 | -101 | 616 | 1716 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.72 | 4.32 | 3.39 | 2.46 | 10.16 | 6662 | 8146 | 407 | 2360 | 12444 | 940 | 4256 | 5386 | 10362 | 0 | 1671 | 417 | 4897 | 0 | 0 | |
| | T | 4.72 | 4.32 | 3.39 | 2.46 | 10.16 | 6662 | 8146 | 407 | 2360 | 12444 | 940 | 4256 | 5386 | 10362 | 0 | 0 | 0 | -4897 | 0 | 0 | |
| 12 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1313 | 0 | 114 | 250 | 1837 | 99 | 628 | 0 | 0 | 1361 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1313 | 2288 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1361 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.07 | -0.02 | 0.09 | 0.20 | 0.27 | 509 | 0 | 8 | -35 | 335 | -14 | 115 | 0 | 0 | 1361 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.07 | -0.02 | 0.09 | 0.20 | 0.27 | 509 | 161 | 0 | 0 | 0 | 0 | 0 | -80 | 488 | 1361 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(AS)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| 9 | C | 27184 | 25426 | 29630 | 29630 | 15,443 | 9 |
| | T | 17374 | 18854 | 19820 | 19820 | | |
| | Qf | 3672 | 4252 | 2337 | 0 | | |
| | Qs | 3031 | 4627 | 1018 | 0 | | |
| | QBf | 1052 | 2497 | 695 | 0 | | |
| | QBs | 564 | 2813 | 228 | 0 | | |
| 10 | C | 29318 | 26749 | 32131 | 32131 | 16,291 | 10 |
| | T | 19084 | 19892 | 21898 | 21898 | | |
| | Qf | 3813 | 3998 | 2478 | 0 | | |
| | Qs | 3172 | 4372 | 1102 | 0 | | |
| | QBf | 961 | 2087 | 673 | 0 | | |
| | QBs | 568 | 2342 | 252 | 0 | | |
| 11 | C | 31573 | 28169 | 34880 | 34880 | 17,606 | 11 |
| | T | 20682 | 20872 | 23989 | 23989 | | |
| | Qf | 3994 | 3826 | 2659 | 0 | | |
| | Qs | 3353 | 4200 | 1211 | 0 | | |
| | QBf | 910 | 1759 | 681 | 0 | | |
| | QBs | 597 | 1962 | 287 | 0 | | |
| 12 | C | 34053 | 29758 | 38015 | 38015 | 19,586 | 12 |
| | T | 22171 | 21797 | 26133 | 26133 | | |
| | Qf | 4242 | 3753 | 2906 | 0 | | |
| | Qs | 3601 | 4128 | 1360 | 0 | | |
| | QBf | 918 | 1526 | 736 | 0 | | |
| | QBs | 670 | 1687 | 345 | 0 | | |

| TOWER TYPE A | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 400 \times 10^{-3}$ | 799 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 400 \times 10^{-3}$ | |
| | Ins. | 200 | 1,839 |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 1.5^{\circ} \times 2$ | 199 |
| | $C_{1-3}$ | $4,000 \times \sin 1.5^{\circ} \times 2 \times 2$ | 419 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 400$ | 454 |
| | $C_{1-3}$ | $1.239 \times 2 \times 400$ | |
| | Ins. | 400 | 1,391 |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.05$ | 190 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.05$ | 400 |

## TOWER BODY

(A)

| No. | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | HTA F | HC G | HC C1-3 | Ha G | Ha C1-3 | P G | P C1-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0 | 0.05 | 799 | 1839 | 199 | 419 | 1140 | 2400 | | | | | | | |
| 1 | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 19 | 54 | 3 | 237 | 0 | 59 | 0 | 338 | 0 | 0 | 227 | 95 | 197 | 0 | 0 | 1 |
| 2 | 0.88 | 0.00 | 0.00 | 0.00 | 0.00 | 98 | 229 | 11 | 703 | 0 | 175 | 0 | 1003 | 0 | 0 | 923 | 295 | 1254 | 0 | 0 | 2 |
| 3 | 1.56 | 0.41 | 0.00 | 0.00 | 0.41 | 303 | 756 | 38 | 1245 | 747 | 310 | 170 | 1777 | 975 | 0 | 923 | 295 | 1352 | 0 | 0 | 3 |
| 4 | 2.32 | 1.20 | 0.00 | 0.00 | 1.20 | 640 | 1532 | 77 | 1856 | 2205 | 462 | 502 | 2647 | 2876 | 0 | 923 | 295 | 1443 | 0 | 0 | 4 |
| 5 | 3.12 | 2.02 | 0.00 | 0.00 | 2.02 | 1144 | 2430 | 122 | 2491 | 3722 | 620 | 847 | 3553 | 4856 | 0 | 1618 | 495 | 2414 | 0 | 0 | 5 |
| 6 | 3.87 | 2.81 | 0.38 | 0.00 | 3.18 | 1783 | 3566 | 178 | 3096 | 5858 | 771 | 1334 | 4416 | 6741 | 0 | 1618 | 495 | 2546 | 0 | 0 | 6 |
| 7 | 4.53 | 3.49 | 1.11 | 0.00 | 4.60 | 2483 | 4779 | 239 | 3618 | 8455 | 901 | 1925 | 5160 | 8368 | 0 | 1618 | 495 | 2665 | 0 | 0 | 7 |
| 8 | 5.21 | 4.20 | 1.88 | 0.00 | 6.07 | 3382 | 6133 | 307 | 4163 | 11170 | 1036 | 2543 | 5938 | 10068 | 0 | 2314 | 695 | 3682 | 0 | 0 | 8 |
| 9 | 5.50 | 4.59 | 2.50 | 0.42 | 7.51 | 4239 | 7325 | 366 | 4398 | 13823 | 1095 | 3147 | 6273 | 11017 | 0 | 2314 | 695 | 3870 | 0 | 0 | 9 |
| 10 | 5.23 | 4.50 | 2.83 | 1.16 | 8.50 | 4847 | 7911 | 396 | 4184 | 15639 | 1041 | 3561 | 5968 | 10810 | 0 | 2314 | 695 | 4083 | 0 | 0 | 10 |
| 11 | 5.02 | 4.43 | 3.10 | 1.76 | 9.30 | 5638 | 8388 | 419 | 4012 | 17098 | 999 | 3893 | 5722 | 10644 | 0 | 2314 | 695 | 4445 | 0 | 0 | 11 |
| 12 | 4.84 | 4.38 | 3.32 | 2.26 | 9.96 | 6730 | 8786 | 439 | 3868 | 18317 | 963 | 4171 | 5517 | 10505 | 0 | 2314 | 695 | 4998 | 0 | 0 | 12 |
| 13 | 4.69 | 4.33 | 3.50 | 2.67 | 10.50 | 8234 | 9107 | 455 | 3751 | 19306 | 934 | 4396 | 5351 | 10392 | 0 | 2314 | 695 | 5816 | 0 | 0 | 13 |
| 1 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 37 | 103 | 5 | 462 | 0 | 115 | 0 | 659 | 0 | 1275 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 120 | 237 | 12 | 453 | 0 | 113 | 0 | 646 | 0 | 1250 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.62 | 0.64 | 0.00 | 0.00 | 0.64 | 227 | 620 | 31 | 492 | 1176 | 123 | 268 | 702 | 1534 | 4986 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.59 | 0.62 | 0.00 | 0.00 | 0.62 | 307 | 599 | 30 | 475 | 1135 | 118 | 258 | 678 | 1481 | 4812 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.62 | 0.64 | 0.00 | 0.00 | 0.64 | 456 | 742 | 37 | 494 | 1181 | 123 | 269 | 705 | 1540 | 5006 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.55 | 0.57 | 0.62 | 0.00 | 1.19 | 541 | 1018 | 51 | 441 | 2196 | 110 | 500 | 629 | 1490 | 4469 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.53 | 0.55 | 0.60 | 0.00 | 1.16 | 625 | 987 | 49 | 427 | 2127 | 106 | 484 | 610 | 1443 | 4328 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 0.55 | 0.58 | 0.62 | 0.00 | 1.20 | 803 | 1136 | 57 | 443 | 2206 | 110 | 502 | 632 | 1496 | 4489 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | -0.22 | -0.07 | 0.27 | 0.61 | 0.81 | 399 | 448 | 22 | -176 | 1495 | -44 | 340 | -251 | 1471 | 4097 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.17 | -0.06 | 0.21 | 0.48 | 0.64 | 498 | 356 | 18 | -139 | 1179 | -35 | 269 | -198 | 1160 | 3232 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.14 | -0.05 | 0.17 | 0.40 | 0.52 | 661 | 288 | 14 | -114 | 965 | -28 | 220 | -162 | 949 | 2645 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | -0.12 | -0.04 | 0.14 | 0.32 | 0.42 | 900 | 231 | 12 | -92 | 781 | -23 | 178 | -131 | 769 | 2141 | 0 | 0 | 0 | 0 | 0 | 12 |
| 13 | -0.09 | -0.03 | 0.11 | 0.25 | 0.33 | 1223 | 182 | 9 | -73 | 616 | -18 | 140 | -104 | 606 | 1687 | 0 | 0 | 0 | 0 | 0 | 13 |

(A)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 837 | 787 | 813 | 837 | L 65* 6 | 140 | 110 | 5882 | 7.03 | 789 | 1 |
| 2 | 3460 | 2990 | 3447 | 3460 | L 65* 6 | 140 | 110 | 5882 | 1.70 | 5,017 | 2 |
| 3 | 5383 | 4797 | 5408 | 5408 | L120* 8 | 200 | 84 | 25175 | 4.66 | 5,406 | 3 |
| 4 | 8401 | 7556 | 8459 | 8459 | L120* 8 | 200 | 84 | 25175 | 2.98 | 5,771 | 4 |
| 5 | 13472 | 12280 | 13699 | 13699 | L120* 8 | 240 | 101 | 17518 | 1.28 | 9,655 | 5 |
| 6 | 17678 | 16361 | 18114 | 18114 | L150*10 | 200 | 67 | 51642 | 2.85 | 10,182 | 6 |
| 7 | 22398 | 20613 | 23020 | 23020 | L150*10 | 200 | 67 | 51642 | 2.24 | 10,660 | 7 |
| 8 | 29292 | 26371 | 30248 | 30248 | L150*10 | 240 | 81 | 41812 | 1.38 | 14,729 | 8 |
| 9 | 33948 | 30126 | 35232 | 35232 | L150*10 | 164 | 55 | 59059 | 1.68 | 15,481 | 9 |
| 10 | 36759 | 31871 | 38272 | 38272 | L150*10 | 197 | 66 | 52348 | 1.37 | 16,330 | 10 |
| 11 | 39512 | 33605 | 41392 | 41392 | L175*12 | 260 | 76 | 63597 | 1.54 | 17,778 | 11 |
| 12 | 42495 | 35510 | 44941 | 44941 | L175*12 | 173 | 50 | 85368 | 1.90 | 19,991 | 12 |
| 13 | 45902 | 37717 | 49176 | 49176 | L175*12 | 222 | 64 | 74275 | 1.51 | 23,263 | 13 |
| 1 | 619 | 1389 | 0 | 1389 | L 45* 4 | 124 | 141 | 1675 | 1.21 | | 1 |
| 2 | 697 | 1509 | 0 | 1509 | L 50* 4 | 125 | 128 | 2241 | 1.48 | | 2 |
| 3 | 2316 | 4936 | 0 | 4936 | L 70* 6 | 143 | 105 | 6110 | 1.24 | | 3 |
| 4 | 2323 | 4823 | 0 | 4823 | L 70* 6 | 146 | 106 | 6013 | 1.25 | | 4 |
| 5 | 2560 | 5189 | 0 | 5189 | L 75* 6 | 160 | 108 | 6324 | 1.22 | | 5 |
| 6 | 3838 | 5566 | 0 | 5566 | L 75* 6 | 151 | 102 | 6764 | 1.22 | | 6 |
| 7 | 3819 | 5459 | 0 | 5459 | L 75* 6 | 153 | 103 | 6664 | 1.22 | | 7 |
| 8 | 4121 | 5769 | 0 | 5769 | L 80* 6 | 167 | 106 | 6949 | 1.20 | | 8 |
| 9 | 2037 | 4298 | 0 | 4298 | L 90* 6 | 215 | 121 | 6635 | 1.54 | | 9 |
| 10 | 1790 | 3515 | 0 | 3515 | L 70* 6 | 132 | 123 | 4969 | 1.41 | | 10 |
| 11 | 1718 | 3044 | 0 | 3044 | L 75* 6 | 169 | 147 | 3817 | 1.25 | | 11 |
| 12 | 1756 | 2707 | 0 | 2707 | L 75* 6 | 220 | 149 | 3738 | 1.38 | | 12 |
| 13 | 1897 | 2477 | 0 | 2477 | L 90* 6 | 281 | 158 | 4014 | 1.62 | | 13 |

## CROSSARM

(A)

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 799 | 199 | 2280 | 190 | 454 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C | 1839 | 419 | 4800 | 400 | 1391 | | | | | | | | |
| G | M | 0.53 | 1.52 | 1.26 | | 423 | 105 | 3466 | 240 | 574 | 4808 | 0 | 4808 | L120* 8 | 353 | 148 | 8082 | 1.68 |
| | S | 0.00 | 0.00 | 1.35 | | 0 | 0 | 0 | 257 | 615 | 872 | 0 | 872 | L 90* 6 | 379 | 213 | 2210 | 2.53 |
| | X | 0.00 | 0.33 | 0.00 | | 0 | 0 | 754 | 0 | 0 | 0 | 505 | 505 | L 45* 4 | 164 | 187 | 950 | 1.88 |
| C 1 | M | 0.51 | 2.80 | 2.40 | | 935 | 213 | 13416 | 958 | 3333 | 18855 | 0 | 18855 | L200*20 | 671 | 172 | 24404 | 1.29 |
| | S | 0.00 | 0.00 | 2.45 | | 0 | 0 | 0 | 981 | 3412 | 4393 | 0 | 4393 | L175*12 | 687 | 200 | 63725 | 14.51 |
| | X | 0.00 | 0.80 | 0.00 | | 0 | 0 | 3818 | 0 | 0 | 0 | 2558 | 2558 | L 65* 6 | 170 | 134 | 4003 | 1.56 |
| C 2 | M | 0.51 | 2.55 | 1.38 | | 938 | 214 | 12238 | 552 | 1921 | 15863 | 0 | 15863 | L200*15 | 663 | 169 | 19284 | 1.22 |
| | S | 0.00 | 0.00 | 1.47 | | 0 | 0 | 0 | 590 | 2051 | 2641 | 0 | 2641 | L175*12 | 708 | 206 | 66173 | 25.05 |
| | X | 0.00 | 0.71 | 0.00 | | 0 | 0 | 3394 | 0 | 0 | 0 | 2274 | 2274 | L 65* 6 | 184 | 145 | 3412 | 1.50 |
| C 3 | M | 0.51 | 2.34 | 1.36 | | 941 | 214 | 11231 | 546 | 1899 | 14831 | 0 | 14831 | L200*15 | 655 | 167 | 19742 | 1.33 |
| | S | 0.00 | 0.00 | 1.46 | | 0 | 0 | 0 | 584 | 2030 | 2614 | 0 | 2614 | L175*12 | 700 | 204 | 66173 | 25.32 |
| | X | 0.00 | 0.63 | 0.00 | | 0 | 0 | 3030 | 0 | 0 | 0 | 2030 | 2030 | L 65* 6 | 198 | 156 | 2942 | 1.45 |

## CROSSARM ( IN TOWER BODY )

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 799 | 199 | 2280 | 190 | 454 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C | 1839 | 419 | 4800 | 400 | 1391 | | | | | | | | |
| G | M | 0.00 | 0.72 | 1.19 | | 0 | 0 | 1636 | 226 | 542 | 768 | 1611 | 1611 | L120* 8 | 233 | 98 | 15113 | 9.38 |
| | S | 0.17 | 0.00 | 0.42 | | 139 | 35 | 0 | 79 | 189 | 441 | 0 | 441 | L 60* 4 | 233 | 195 | 4585 | 10.39 |
| | SF | 0.00 | 0.00 | 1.19 | | 0 | 0 | 0 | 225 | 539 | 764 | 0 | 764 | L 60* 4 | 236 | 199 | 4585 | 6.00 |
| | SS | 0.00 | 0.00 | 0.42 | | 0 | 0 | 0 | 80 | 192 | 272 | 0 | 272 | L 60* 4 | 233 | 195 | 1168 | 4.30 |
| C 1 | M | 0.00 | 1.38 | 2.36 | | 0 | 0 | 6600 | 943 | 3279 | 4222 | 7251 | 7251 | L200*20 | 240 | 62 | 76000 | 10.48 |
| | S | 0.09 | 0.00 | 0.43 | | 167 | 38 | 0 | 171 | 596 | 973 | 0 | 973 | L 60* 4 | 240 | 202 | 4585 | 4.71 |
| | SF | 0.00 | 0.00 | 2.36 | | 0 | 0 | 0 | 946 | 3289 | 4234 | 0 | 4234 | L 65* 6 | 236 | 186 | 6691 | 1.58 |
| | SS | 0.00 | 0.00 | 0.42 | | 0 | 0 | 0 | 169 | 587 | 756 | 0 | 756 | L 60* 4 | 236 | 199 | 1131 | 1.50 |
| C 2 | M | 0.00 | 1.25 | 1.35 | | 0 | 0 | 6000 | 542 | 1884 | 2426 | 5645 | 5645 | L200*15 | 260 | 66 | 57750 | 10.23 |
| | S | 0.10 | 0.00 | 0.27 | | 184 | 42 | 0 | 108 | 377 | 711 | 0 | 711 | L 50* 4 | 260 | 218 | 4585 | 6.45 |
| | SF | 0.00 | 0.00 | 1.36 | | 0 | 0 | 0 | 545 | 1895 | 2440 | 0 | 2440 | L 60* 4 | 253 | 212 | 4585 | 1.88 |
| | SS | 0.00 | 0.00 | 0.26 | | 0 | 0 | 0 | 105 | 366 | 471 | 0 | 471 | L 60* 4 | 253 | 212 | 990 | 2.10 |
| C 3 | M | 0.00 | 1.14 | 1.33 | | 0 | 0 | 5486 | 533 | 1855 | 2388 | 5276 | 5276 | L200*15 | 280 | 71 | 57750 | 10.95 |
| | S | 0.11 | 0.00 | 0.29 | | 201 | 46 | 0 | 117 | 406 | 769 | 0 | 769 | L 70* 6 | 280 | 204 | 8226 | 10.69 |
| | SF | 0.00 | 0.00 | 1.34 | | 0 | 0 | 0 | 536 | 1866 | 2402 | 0 | 2402 | L 65* 6 | 273 | 215 | 7483 | 3.12 |
| | SS | 0.00 | 0.00 | 0.28 | | 0 | 0 | 0 | 114 | 395 | 508 | 0 | 508 | L 65* 6 | 273 | 215 | 1553 | 3.05 |

## FOUNDATION

(A)

| No. | | UNIT STRESS G | Cl | C2 | C3 | Tc | HT | STRESS HTA S | F | HC G | Cl-3 | Ha G | Cl-3 | P G | Cl-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1.0 | 0.05 | 799 | 1839 | 199 | 419 | 1140 | 2400 | | | | | | | |
| | C | 5.27 | 4.48 | 2.65 | 0.83 | 7.95 | 4447 | 7540 | 377 | 4215 | 14630 | 1049 | 3331 | 6012 | 10742 | 0 | 2314 | 695 | 3870 | 0 | 0 | |
| | T | 5.27 | 4.48 | 2.65 | 0.83 | 7.95 | 4447 | 7540 | 377 | 4215 | 14630 | 1049 | 3331 | 6012 | 10742 | 0 | 0 | 0 | -3870 | 0 | 0 | |
| 9 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 803 | 0 | 125 | 400 | 2759 | 99 | 628 | 0 | 0 | 2668 | 0 | 0 | 0 | 0 | 0 | 9 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 803 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 2668 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.14 | -0.05 | 0.18 | 0.40 | 0.53 | 260 | 0 | 16 | -115 | 974 | -29 | 222 | 0 | 0 | 2668 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.14 | -0.05 | 0.18 | 0.40 | 0.53 | 260 | 325 | 0 | 0 | 0 | 0 | 0 | -164 | 958 | 2668 | 0 | 0 | 0 | 0 | 0 | |
| | C | 5.04 | 4.40 | 2.93 | 1.47 | 8.80 | 5106 | 8062 | 403 | 4031 | 16192 | 1003 | 3687 | 5749 | 10564 | 0 | 2314 | 695 | 4083 | 0 | 0 | |
| | T | 5.04 | 4.40 | 2.93 | 1.47 | 8.80 | 5106 | 8062 | 403 | 4031 | 16192 | 1003 | 3687 | 5749 | 10564 | 0 | 0 | 0 | -4083 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 954 | 0 | 125 | 400 | 2759 | 99 | 628 | 0 | 0 | 2146 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 954 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 2146 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.12 | -0.04 | 0.14 | 0.32 | 0.43 | 331 | 0 | 13 | -92 | 783 | -23 | 178 | 0 | 0 | 2146 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.12 | -0.04 | 0.14 | 0.32 | 0.43 | 331 | 262 | 0 | 0 | 0 | 0 | 0 | -132 | 770 | 2146 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.85 | 4.34 | 3.17 | 2.01 | 9.52 | 6005 | 8501 | 425 | 3876 | 17506 | 965 | 3986 | 5528 | 10414 | 0 | 2314 | 695 | 4445 | 0 | 0 | |
| | T | 4.85 | 4.34 | 3.17 | 2.01 | 9.52 | 6005 | 8501 | 425 | 3876 | 17506 | 965 | 3986 | 5528 | 10414 | 0 | 0 | 0 | -4445 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1159 | 0 | 125 | 400 | 2759 | 99 | 628 | 0 | 0 | 1706 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1159 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1706 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.09 | -0.03 | 0.11 | 0.26 | 0.34 | 426 | 0 | 10 | -73 | 623 | -18 | 142 | 0 | 0 | 1706 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.09 | -0.03 | 0.11 | 0.26 | 0.34 | 426 | 208 | 0 | 0 | 0 | 0 | 0 | -105 | 613 | 1706 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.69 | 4.29 | 3.37 | 2.45 | 10.11 | 7260 | 8865 | 443 | 3747 | 18595 | 933 | 4234 | 5345 | 10290 | 0 | 2314 | 695 | 4998 | 0 | 0 | |
| | T | 4.69 | 4.29 | 3.37 | 2.45 | 10.11 | 7260 | 8865 | 443 | 3747 | 18595 | 933 | 4234 | 5345 | 10290 | 0 | 0 | 0 | -4998 | 0 | 0 | |
| 12 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1450 | 0 | 125 | 400 | 2759 | 99 | 628 | 0 | 0 | 1342 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1450 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1342 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.07 | -0.02 | 0.09 | 0.20 | 0.27 | 564 | 0 | 8 | -58 | 490 | -14 | 112 | 0 | 0 | 1342 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.07 | -0.02 | 0.09 | 0.20 | 0.27 | 564 | 164 | 0 | 0 | 0 | 0 | 0 | -82 | 482 | 1342 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.56 | 4.25 | 3.53 | 2.80 | 10.58 | 8969 | 9152 | 458 | 3646 | 19455 | 908 | 4430 | 5201 | 10192 | 0 | 2314 | 695 | 5816 | 0 | 0 | |
| | T | 4.56 | 4.25 | 3.53 | 2.80 | 10.58 | 8969 | 9152 | 458 | 3646 | 19455 | 908 | 4430 | 5201 | 10192 | 0 | 0 | 0 | -5816 | 0 | 0 | |
| 13 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1859 | 0 | 125 | 400 | 2759 | 99 | 628 | 0 | 0 | 1054 | 0 | 0 | 0 | 0 | 0 | 13 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1859 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1054 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.06 | -0.02 | 0.07 | 0.16 | 0.21 | 764 | 0 | 6 | -45 | 385 | -11 | 88 | 0 | 0 | 1054 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.06 | -0.02 | 0.07 | 0.16 | 0.21 | 764 | 129 | 0 | 0 | 0 | 0 | 0 | -65 | 378 | 1054 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(A)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| 9 | C | 34928 | 30599 | 36278 | 36278 | 15,481 | 9 |
| | T | 24179 | 23397 | 25529 | 25529 | | |
| | Qf | 4814 | 5013 | 3203 | 0 | | |
| | Qs | 3294 | 4799 | 1104 | 0 | | |
| | QBf | 1328 | 2678 | 908 | 0 | | |
| | QBs | 585 | 2822 | 237 | 0 | | |
| 10 | C | 37514 | 32212 | 39150 | 39150 | 16,330 | 10 |
| | T | 26340 | 24725 | 27976 | 27976 | | |
| | Qf | 4965 | 4764 | 3354 | 0 | | |
| | Qs | 3445 | 4550 | 1195 | 0 | | |
| | QBf | 1189 | 2235 | 852 | 0 | | |
| | QBs | 592 | 2350 | 264 | 0 | | |
| 11 | C | 40216 | 33922 | 42299 | 42299 | 17,778 | 11 |
| | T | 28318 | 25950 | 30401 | 30401 | | |
| | Qf | 5170 | 4607 | 3559 | 0 | | |
| | Qs | 3650 | 4393 | 1318 | 0 | | |
| | QBf | 1109 | 1887 | 841 | 0 | | |
| | QBs | 634 | 1979 | 308 | 0 | | |
| 12 | C | 43219 | 35851 | 45978 | 45978 | 19,991 | 12 |
| | T | 30214 | 27138 | 32974 | 32974 | | |
| | Qf | 5461 | 4558 | 3850 | 0 | | |
| | Qs | 3941 | 4344 | 1493 | 0 | | |
| | QBf | 1101 | 1637 | 890 | 0 | | |
| | QBs | 728 | 1710 | 379 | 0 | | |
| 13 | C | 46690 | 38111 | 50415 | 50415 | 23,263 | 13 |
| | T | 32050 | 28302 | 35774 | 35774 | | |
| | Qf | 5870 | 4639 | 4259 | 0 | | |
| | Qs | 4350 | 4425 | 1738 | 0 | | |
| | QBf | 1186 | 1501 | 1020 | 0 | | |
| | QBs | 893 | 1558 | 491 | 0 | | |

| TOWER TYPE AL | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 500 \times 10^{-3}$ | 999 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 500 \times 10^{-3}$ | 2,249 |
| | Ins. | 200 | |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 1.5^{\circ} \times 2$ | 199 |
| | $C_{1-3}$ | $4,000 \times \sin 1.5^{\circ} \times 2 \times 2$ | 419 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 500$ | 568 |
| | $C_{1-3}$ | $1.239 \times 2 \times 500$ | 1,639 |
| | Ins. | 400 | |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |

## TOWER BODY

(AL)

| No. | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | F | HC G | C1-3 | Ha G | C1-3 | P G | C1-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0 | 0.05 | 999 | 2249 | 199 | 419 | 1140 | 2400 | | | | | | | |
| 1 | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 19 | 54 | 3 | 296 | 0 | 59 | 0 | 338 | 0 | 0 | 284 | 57 | 197 | 0 | 0 | 1 |
| 2 | 0.88 | 0.00 | 0.00 | 0.00 | 0.00 | 98 | 229 | 11 | 879 | 0 | 175 | 0 | 1003 | 0 | 0 | 1104 | 177 | 1254 | 0 | 0 | 2 |
| 3 | 1.56 | 0.41 | 0.00 | 0.00 | 0.41 | 306 | 756 | 38 | 1557 | 914 | 310 | 170 | 1777 | 975 | 0 | 1104 | 177 | 1366 | 0 | 0 | 3 |
| 4 | 2.32 | 1.20 | 0.00 | 0.00 | 1.20 | 650 | 1532 | 77 | 2319 | 2696 | 462 | 502 | 2647 | 2876 | 0 | 1104 | 177 | 1469 | 0 | 0 | 4 |
| 5 | 3.12 | 2.02 | 0.00 | 0.00 | 2.02 | 1173 | 2430 | 122 | 3113 | 4551 | 620 | 847 | 3553 | 4856 | 0 | 1923 | 297 | 2626 | 0 | 0 | 5 |
| 6 | 3.87 | 2.81 | 0.38 | 0.00 | 3.18 | 1838 | 3566 | 178 | 3870 | 7163 | 771 | 1334 | 4416 | 6741 | 0 | 1923 | 297 | 2761 | 0 | 0 | 6 |
| 7 | 4.53 | 3.49 | 1.11 | 0.00 | 4.60 | 2566 | 4779 | 239 | 4522 | 10339 | 901 | 1925 | 5160 | 8368 | 0 | 1923 | 297 | 2885 | 0 | 0 | 7 |
| 8 | 5.21 | 4.20 | 1.88 | 0.00 | 6.07 | 3500 | 6133 | 307 | 5204 | 13658 | 1036 | 2543 | 5938 | 10068 | 0 | 2743 | 417 | 3911 | 0 | 0 | 8 |
| 9 | 5.48 | 4.58 | 2.53 | 0.47 | 7.59 | 4438 | 7387 | 369 | 5476 | 17064 | 1090 | 3177 | 6249 | 10999 | 0 | 2743 | 417 | 4163 | 0 | 0 | 9 |
| 10 | 5.18 | 4.48 | 2.89 | 1.30 | 8.68 | 5189 | 8027 | 401 | 5175 | 19522 | 1030 | 3635 | 5905 | 10761 | 0 | 2743 | 417 | 4457 | 0 | 0 | 10 |
| 11 | 4.95 | 4.41 | 3.17 | 1.93 | 9.51 | 6167 | 8517 | 426 | 4946 | 21386 | 985 | 3982 | 5644 | 10581 | 0 | 2743 | 417 | 4916 | 0 | 0 | 11 |
| 12 | 4.77 | 4.35 | 3.39 | 2.42 | 10.16 | 7478 | 8902 | 445 | 4767 | 22845 | 949 | 4254 | 5440 | 10440 | 0 | 2743 | 417 | 5581 | 0 | 0 | 12 |
| 13 | 4.63 | 4.30 | 3.55 | 2.80 | 10.66 | 9237 | 9200 | 460 | 4628 | 23980 | 922 | 4465 | 5281 | 10331 | 0 | 2743 | 417 | 6636 | 0 | 0 | 13 |
| 1 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 37 | 103 | 5 | 577 | 0 | 115 | 0 | 659 | 0 | 1275 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 120 | 237 | 12 | 566 | 0 | 113 | 0 | 646 | 0 | 1250 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.62 | 0.64 | 0.00 | 0.00 | 0.64 | 230 | 620 | 31 | 615 | 1438 | 123 | 268 | 702 | 1534 | 4986 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.59 | 0.62 | 0.00 | 0.00 | 0.62 | 317 | 599 | 30 | 594 | 1388 | 118 | 258 | 678 | 1481 | 4812 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.62 | 0.64 | 0.00 | 0.00 | 0.64 | 474 | 742 | 37 | 618 | 1444 | 123 | 269 | 705 | 1540 | 5006 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.55 | 0.57 | 0.62 | 0.00 | 1.19 | 563 | 1018 | 51 | 552 | 2685 | 110 | 500 | 629 | 1490 | 4469 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.53 | 0.55 | 0.60 | 0.00 | 1.16 | 650 | 987 | 49 | 534 | 2600 | 106 | 484 | 610 | 1443 | 4328 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 0.55 | 0.58 | 0.62 | 0.00 | 1.20 | 833 | 1136 | 57 | 554 | 2697 | 110 | 502 | 632 | 1496 | 4489 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | -0.24 | -0.08 | 0.28 | 0.65 | 0.85 | 453 | 454 | 23 | -235 | 1921 | -47 | 358 | -269 | 1552 | 4324 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.18 | -0.06 | 0.22 | 0.49 | 0.65 | 583 | 348 | 17 | -178 | 1455 | -36 | 271 | -204 | 1176 | 3275 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.14 | -0.05 | 0.17 | 0.38 | 0.50 | 775 | 271 | 14 | -139 | 1135 | -28 | 211 | -159 | 917 | 2554 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | -0.11 | -0.04 | 0.13 | 0.30 | 0.39 | 1041 | 211 | 11 | -109 | 887 | -22 | 165 | -124 | 717 | 1996 | 0 | 0 | 0 | 0 | 0 | 12 |
| 13 | -0.08 | -0.03 | 0.10 | 0.23 | 0.31 | 1400 | 164 | 8 | -84 | 687 | -17 | 128 | -96 | 555 | 1545 | 0 | 0 | 0 | 0 | 0 | 13 |

(AL)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 915 | 839 | 876 | 915 | L 65* 6 | 140 | 110 | 5882 | 6.43 | 789 | 1 |
| 2 | 3699 | 3150 | 3641 | 3699 | L 65* 6 | 140 | 110 | 5882 | 1.59 | 5,017 | 2 |
| 3 | 5940 | 5170 | 5847 | 5940 | L130* 9 | 200 | 78 | 34366 | 5.79 | 5,464 | 3 |
| 4 | 9456 | 8263 | 9282 | 9456 | L130* 9 | 200 | 78 | 34366 | 3.63 | 5,877 | 4 |
| 5 | 15272 | 13486 | 15153 | 15272 | L130* 9 | 240 | 93 | 24760 | 1.62 | 10,502 | 5 |
| 6 | 20135 | 18007 | 20084 | 20135 | L150*10 | 200 | 67 | 51642 | 2.56 | 11,046 | 6 |
| 7 | 25596 | 22756 | 25571 | 25596 | L150*10 | 200 | 67 | 51642 | 2.02 | 11,539 | 7 |
| 8 | 33319 | 29069 | 33463 | 33463 | L150*10 | 240 | 81 | 41812 | 1.25 | 15,645 | 8 |
| 9 | 38938 | 33457 | 39289 | 39289 | L175*12 | 195 | 57 | 80742 | 2.06 | 16,653 | 9 |
| 10 | 42570 | 35732 | 43121 | 43121 | L175*12 | 240 | 70 | 69498 | 1.61 | 17,829 | 10 |
| 11 | 45968 | 37888 | 46918 | 46918 | L175*12 | 154 | 45 | 89036 | 1.90 | 19,665 | 11 |
| 12 | 49479 | 40146 | 51068 | 51068 | L175*12 | 200 | 58 | 79598 | 1.56 | 22,324 | 12 |
| 13 | 53488 | 42758 | 56018 | 56018 | L175*15 | 254 | 74 | 80543 | 1.44 | 26,542 | 13 |
| 1 | 734 | 1389 | 0 | 1389 | L 45* 4 | 124 | 141 | 1675 | 1.21 | | 1 |
| 2 | 810 | 1509 | 0 | 1509 | L 50* 4 | 125 | 128 | 2241 | 1.48 | | 2 |
| 3 | 2705 | 5153 | 0 | 5153 | L 75* 6 | 143 | 97 | 7079 | 1.37 | | 3 |
| 4 | 2705 | 5037 | 0 | 5037 | L 75* 6 | 146 | 98 | 6982 | 1.39 | | 4 |
| 5 | 2965 | 5340 | 0 | 5340 | L 80* 6 | 160 | 101 | 7246 | 1.36 | | 5 |
| 6 | 4460 | 5982 | 0 | 5982 | L 80* 6 | 151 | 95 | 7687 | 1.28 | | 6 |
| 7 | 4424 | 5864 | 0 | 5864 | L 80* 6 | 153 | 97 | 7587 | 1.29 | | 7 |
| 8 | 4754 | 6193 | 0 | 6193 | L 90* 6 | 167 | 94 | 8814 | 1.42 | | 8 |
| 9 | 2472 | 4553 | 0 | 4553 | L 90* 6 | 239 | 134 | 5567 | 1.22 | | 9 |
| 10 | 2113 | 3610 | 0 | 3610 | L 75* 6 | 150 | 130 | 4862 | 1.35 | | 10 |
| 11 | 1968 | 3030 | 0 | 3030 | L 70* 6 | 193 | 141 | 3910 | 1.29 | | 11 |
| 12 | 1973 | 2660 | 0 | 2660 | L 80* 6 | 249 | 157 | 3574 | 1.34 | | 12 |
| 13 | 2122 | 2457 | 0 | 2457 | L 90* 6 | 318 | 178 | 3150 | 1.28 | | 13 |

## CROSSARM

(AL)

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 999 | 199 | 2280 | 114 | 568 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 2249 | 419 | 4800 | 240 | 1639 | | | | | | | | |
| G | M | 0.53 | 1.52 | 1.26 | 529 | 105 | 3466 | 144 | 717 | 4961 | 0 | 4961 | L120* 8 | 353 | 148 | 8082 | 1.63 |
| | S | 0.00 | 0.00 | 1.35 | 0 | 0 | 0 | 154 | 769 | 923 | 0 | 923 | L 90* 6 | 379 | 213 | 2210 | 2.39 |
| | X | 0.00 | 0.33 | 0.00 | 0 | 0 | 754 | 0 | 0 | 0 | 505 | 505 | L 45* 4 | 164 | 187 | 950 | 1.88 |
| C 1 | M | 0.51 | 2.80 | 2.40 | 1143 | 213 | 13416 | 575 | 3927 | 19274 | 0 | 19274 | L200*20 | 671 | 172 | 24404 | 1.27 |
| | S | 0.00 | 0.00 | 2.45 | 0 | 0 | 0 | 589 | 4020 | 4609 | 0 | 4609 | L175*12 | 687 | 200 | 61277 | 13.30 |
| | X | 0.00 | 0.80 | 0.00 | 0 | 0 | 3818 | 0 | 0 | 0 | 2558 | 2558 | L 65* 6 | 170 | 134 | 4003 | 1.56 |
| C 2 | M | 0.51 | 2.55 | 1.38 | 1147 | 214 | 12238 | 331 | 2263 | 16193 | 0 | 16193 | L200*20 | 663 | 170 | 24992 | 1.54 |
| | S | 0.00 | 0.00 | 1.47 | 0 | 0 | 0 | 354 | 2417 | 2771 | 0 | 2771 | L175*12 | 708 | 206 | 66173 | 23.88 |
| | X | 0.00 | 0.71 | 0.00 | 0 | 0 | 3394 | 0 | 0 | 0 | 2274 | 2274 | L 65* 6 | 184 | 145 | 3412 | 1.50 |
| C 3 | M | 0.51 | 2.34 | 1.36 | 1151 | 214 | 11231 | 328 | 2237 | 15161 | 0 | 15161 | L200*15 | 655 | 167 | 19742 | 1.30 |
| | S | 0.00 | 0.00 | 1.46 | 0 | 0 | 0 | 350 | 2392 | 2742 | 0 | 2742 | L175*12 | 700 | 204 | 66173 | 24.13 |
| | X | 0.00 | 0.63 | 0.00 | 0 | 0 | 3030 | 0 | 0 | 0 | 2030 | 2030 | L 65* 6 | 198 | 156 | 2942 | 1.45 |

## CROSSARM ( IN TOWER BODY )

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 999 | 199 | 2280 | 114 | 568 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 2249 | 419 | 4800 | 240 | 1639 | | | | | | | | |
| G | M | 0.00 | 0.72 | 1.19 | 0 | 0 | 1636 | 136 | 677 | 813 | 1641 | 1641 | L120* 8 | 233 | 98 | 15113 | 9.21 |
| | S | 0.17 | 0.00 | 0.42 | 174 | 35 | 0 | 47 | 236 | 492 | 0 | 492 | L 60* 4 | 233 | 195 | 4585 | 9.32 |
| | SF | 0.00 | 0.00 | 1.19 | 0 | 0 | 0 | 135 | 673 | 808 | 0 | 808 | L 60* 4 | 236 | 199 | 4585 | 5.67 |
| | SS | 0.00 | 0.00 | 0.42 | 0 | 0 | 0 | 48 | 240 | 288 | 0 | 288 | L 60* 4 | 233 | 195 | 1168 | 4.06 |
| C 1 | M | 0.00 | 1.38 | 2.36 | 0 | 0 | 6600 | 566 | 3863 | 4429 | 7389 | 7389 | L200*20 | 240 | 62 | 76000 | 10.28 |
| | S | 0.09 | 0.00 | 0.43 | 204 | 38 | 0 | 103 | 702 | 1048 | 0 | 1048 | L 60* 4 | 240 | 202 | 4585 | 4.38 |
| | SF | 0.00 | 0.00 | 2.36 | 0 | 0 | 0 | 567 | 3874 | 4442 | 0 | 4442 | L 65* 6 | 236 | 186 | 6691 | 1.51 |
| | SS | 0.00 | 0.00 | 0.42 | 0 | 0 | 0 | 101 | 691 | 793 | 0 | 793 | L 60* 4 | 236 | 199 | 1131 | 1.43 |
| C 2 | M | 0.00 | 1.25 | 1.35 | 0 | 0 | 6000 | 325 | 2219 | 2544 | 5725 | 5725 | L200*20 | 260 | 67 | 76000 | 13.28 |
| | S | 0.10 | 0.00 | 0.27 | 225 | 42 | 0 | 65 | 444 | 776 | 0 | 776 | L 60* 4 | 260 | 218 | 4585 | 5.91 |
| | SF | 0.00 | 0.00 | 1.36 | 0 | 0 | 0 | 327 | 2232 | 2559 | 0 | 2559 | L 60* 4 | 253 | 212 | 4585 | 1.79 |
| | SS | 0.00 | 0.00 | 0.26 | 0 | 0 | 0 | 63 | 431 | 494 | 0 | 494 | L 60* 4 | 253 | 212 | 990 | 2.00 |
| C 3 | M | 0.00 | 1.14 | 1.33 | 0 | 0 | 5486 | 320 | 2185 | 2505 | 5354 | 5354 | L200*15 | 280 | 71 | 57750 | 10.79 |
| | S | 0.11 | 0.00 | 0.29 | 246 | 46 | 0 | 70 | 478 | 840 | 0 | 840 | L 70* 6 | 280 | 204 | 8226 | 9.79 |
| | SF | 0.00 | 0.00 | 1.34 | 0 | 0 | 0 | 322 | 2198 | 2520 | 0 | 2520 | L 65* 6 | 273 | 215 | 7483 | 2.97 |
| | SS | 0.00 | 0.00 | 0.28 | 0 | 0 | 0 | 68 | 465 | 533 | 0 | 533 | L 65* 6 | 273 | 215 | 1553 | 2.91 |

## FOUNDATION

(AL)

| No. | | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S (1.0) | HTA F (0.05) | HC G (999) | HC C1-3 (2249) | Ha G (199) | Ha C1-3 (419) | P G (1140) | P C1-3 (2400) | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | 5.23 | 4.46 | 2.70 | 0.94 | 8.09 | 4700 | 7624 | 381 | 5225 | 18204 | 1041 | 3390 | 5963 | 10703 | 0 | 2743 | 417 | 4163 | 0 | 0 | |
| | T | 5.23 | 4.46 | 2.70 | 0.94 | 8.09 | 4700 | 7624 | 381 | 5225 | 18204 | 1041 | 3390 | 5963 | 10703 | 0 | 0 | 0 | -4163 | 0 | 0 | |
| 9 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 845 | 0 | 125 | 500 | 3374 | 99 | 628 | 0 | 0 | 2577 | 0 | 0 | 0 | 0 | 0 | 9 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 845 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 2577 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.14 | -0.05 | 0.17 | 0.39 | 0.51 | 270 | 0 | 16 | -140 | 1145 | -28 | 213 | 0 | 0 | 2577 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.14 | -0.05 | 0.17 | 0.39 | 0.51 | 270 | 312 | 0 | 0 | 0 | 0 | 0 | -160 | 925 | 2577 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.98 | 4.38 | 3.00 | 1.63 | 9.01 | 5527 | 8186 | 409 | 4972 | 20267 | 990 | 3774 | 5674 | 10504 | 0 | 2743 | 417 | 4457 | 0 | 0 | |
| | T | 4.98 | 4.38 | 3.00 | 1.63 | 9.01 | 5527 | 8186 | 409 | 4972 | 20267 | 990 | 3774 | 5674 | 10504 | 0 | 0 | 0 | -4457 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1034 | 0 | 125 | 500 | 3374 | 99 | 628 | 0 | 0 | 2008 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1034 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 2008 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.11 | -0.04 | 0.13 | 0.30 | 0.40 | 358 | 0 | 12 | -109 | 892 | -22 | 166 | 0 | 0 | 2008 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.11 | -0.04 | 0.13 | 0.30 | 0.40 | 358 | 243 | 0 | 0 | 0 | 0 | 0 | -125 | 721 | 2008 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.78 | 4.31 | 3.24 | 2.17 | 9.73 | 6626 | 8625 | 431 | 4775 | 21878 | 951 | 4074 | 5449 | 10348 | 0 | 2743 | 417 | 4916 | 0 | 0 | |
| | T | 4.78 | 4.31 | 3.24 | 2.17 | 9.73 | 6626 | 8625 | 431 | 4775 | 21878 | 951 | 4074 | 5449 | 10348 | 0 | 0 | 0 | -4916 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1286 | 0 | 125 | 500 | 3374 | 99 | 628 | 0 | 0 | 1564 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1286 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1564 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.09 | -0.03 | 0.10 | 0.23 | 0.31 | 475 | 0 | 9 | -85 | 695 | -17 | 129 | 0 | 0 | 1564 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.09 | -0.03 | 0.10 | 0.23 | 0.31 | 475 | 189 | 0 | 0 | 0 | 0 | 0 | -97 | 562 | 1564 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.62 | 4.26 | 3.43 | 2.60 | 10.29 | 8110 | 8970 | 448 | 4620 | 23142 | 920 | 4309 | 5272 | 10226 | 0 | 2743 | 417 | 5581 | 0 | 0 | |
| | T | 4.62 | 4.26 | 3.43 | 2.60 | 10.29 | 8110 | 8970 | 448 | 4620 | 23142 | 920 | 4309 | 5272 | 10226 | 0 | 0 | 0 | -5581 | 0 | 0 | |
| 12 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1627 | 0 | 125 | 500 | 3374 | 99 | 628 | 0 | 0 | 1216 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1627 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 1216 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.07 | -0.02 | 0.08 | 0.18 | 0.24 | 634 | 0 | 7 | -66 | 540 | -13 | 101 | 0 | 0 | 1216 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.07 | -0.02 | 0.08 | 0.18 | 0.24 | 634 | 147 | 0 | 0 | 0 | 0 | 0 | -76 | 436 | 1216 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.51 | 4.22 | 3.57 | 2.93 | 10.72 | 10094 | 9235 | 462 | 4501 | 24115 | 896 | 4490 | 5136 | 10132 | 0 | 2743 | 417 | 6636 | 0 | 0 | |
| | T | 4.51 | 4.22 | 3.57 | 2.93 | 10.72 | 10094 | 9235 | 462 | 4501 | 24115 | 896 | 4490 | 5136 | 10132 | 0 | 0 | 0 | -6636 | 0 | 0 | |
| 13 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 2094 | 0 | 125 | 500 | 3374 | 99 | 628 | 0 | 0 | 948 | 0 | 0 | 0 | 0 | 0 | 13 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 2094 | 2491 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 948 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.05 | -0.02 | 0.06 | 0.14 | 0.19 | 858 | 0 | 6 | -52 | 421 | -10 | 78 | 0 | 0 | 948 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.05 | -0.02 | 0.06 | 0.14 | 0.19 | 858 | 115 | 0 | 0 | 0 | 0 | 0 | -59 | 340 | 948 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(AL)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND (U1) | | | |
| | C | 40264 | 34148 | 40657 | 40657 | | |
| | T | 28778 | 26452 | 29171 | 29171 | | |
| 9 | Qf | 5571 | 5459 | 3781 | 0 | 16,653 | 9 |
| | Qs | 3336 | 4766 | 1130 | 0 | | |
| | QBf | 1475 | 2715 | 1027 | 0 | | |
| | QBs | 582 | 2736 | 240 | 0 | | |
| | C | 43556 | 36220 | 44246 | 44246 | | |
| | T | 31483 | 28131 | 32173 | 32173 | | |
| 10 | Qf | 5760 | 5205 | 3970 | 0 | 17,829 | 10 |
| | Qs | 3525 | 4511 | 1243 | 0 | | |
| | QBf | 1297 | 2214 | 948 | 0 | | |
| | QBs | 601 | 2231 | 275 | 0 | | |
| | C | 46811 | 38296 | 48005 | 48005 | | |
| | T | 33819 | 29592 | 35012 | 35012 | | |
| 11 | Qf | 6012 | 5076 | 4222 | 0 | 19,665 | 11 |
| | Qs | 3777 | 4383 | 1394 | 0 | | |
| | QBf | 1206 | 1856 | 934 | 0 | | |
| | QBs | 664 | 1869 | 332 | 0 | | |
| | C | 50290 | 40546 | 52251 | 52251 | | |
| | T | 35968 | 30950 | 37930 | 37930 | | |
| 12 | Qf | 6353 | 5071 | 4563 | 0 | 22,324 | 12 |
| | Qs | 4118 | 4378 | 1599 | 0 | | |
| | QBf | 1203 | 1621 | 991 | 0 | | |
| | QBs | 781 | 1631 | 417 | 0 | | |
| | C | 54354 | 43206 | 57412 | 57412 | | |
| | T | 37923 | 32197 | 40982 | 40982 | | |
| 13 | Qf | 6820 | 5204 | 5031 | 0 | 26,542 | 13 |
| | Qs | 4586 | 4511 | 1879 | 0 | | |
| | QBf | 1302 | 1507 | 1137 | 0 | | |
| | QBs | 973 | 1515 | 544 | 0 | | |

| TOWER TYPE B | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 300 \times 10^{-3}$ | 599 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 300 \times 10^{-3}$ | |
| | Ins. | 270 | 1,500 |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 7.5^{\circ} \times 2$ | 992 |
| | $C_{1-3}$ | $4,000 \times \sin 7.5^{\circ} \times 2 \times 2$ | 2,088 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 300$ | 341 |
| | $C_{1-3}$ | $1.239 \times 2 \times 300$ | |
| | Ins. | 790 | 1,533 |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |

## TOWER BODY

(B)

| No. | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | HTA F | HC G | HC C1-3 | Ha G | Ha C1-3 | P G | P C1-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0 | 0.05 | 599 | 1500 | 992 | 2088 | 1900 | 4000 | | | | | | | |
| 1 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 26 | 28 | 1 | 209 | 0 | 346 | 0 | 663 | 0 | 0 | 170 | 57 | 157 | 0 | 0 | 1 |
| 2 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 119 | 88 | 4 | 612 | 0 | 1013 | 0 | 1940 | 0 | 0 | 170 | 57 | 210 | 0 | 0 | 2 |
| 3 | 1.71 | 0.00 | 0.00 | 0.00 | 0.00 | 322 | 200 | 10 | 1024 | 0 | 1695 | 0 | 3246 | 0 | 0 | 937 | 177 | 926 | 0 | 0 | 3 |
| 4 | 2.56 | 0.55 | 0.00 | 0.00 | 0.55 | 773 | 602 | 30 | 1537 | 831 | 2544 | 1157 | 4872 | 2216 | 0 | 937 | 177 | 1136 | 0 | 0 | 4 |
| 5 | 3.35 | 1.44 | 0.00 | 0.00 | 1.44 | 1371 | 1123 | 56 | 2009 | 2162 | 3325 | 3011 | 6369 | 5767 | 0 | 1704 | 297 | 1853 | 0 | 0 | 5 |
| 6 | 4.05 | 2.23 | 0.50 | 0.00 | 2.73 | 2180 | 1827 | 91 | 2428 | 4099 | 4019 | 5709 | 7697 | 8921 | 0 | 1704 | 297 | 2112 | 0 | 0 | 6 |
| 7 | 4.70 | 2.96 | 1.31 | 0.00 | 4.27 | 3124 | 2593 | 130 | 2817 | 6409 | 4662 | 8926 | 8929 | 11845 | 0 | 2471 | 417 | 2791 | 0 | 0 | 7 |
| 8 | 4.87 | 3.32 | 1.85 | 0.38 | 5.56 | 3889 | 3184 | 159 | 2918 | 8335 | 4830 | 11608 | 9251 | 13283 | 0 | 2471 | 417 | 3082 | 0 | 0 | 8 |
| 9 | 4.54 | 3.35 | 2.21 | 1.08 | 6.64 | 4546 | 3557 | 178 | 2722 | 9962 | 4506 | 13874 | 8630 | 13389 | 0 | 2471 | 417 | 3446 | 0 | 0 | 9 |
| 10 | 4.28 | 3.37 | 2.50 | 1.63 | 7.50 | 5455 | 3849 | 192 | 2567 | 11251 | 4249 | 15669 | 8138 | 13473 | 0 | 2471 | 417 | 4024 | 0 | 0 | 10 |
| 11 | 4.08 | 3.38 | 2.72 | 2.06 | 8.17 | 6724 | 4078 | 204 | 2447 | 12252 | 4049 | 17063 | 7756 | 13539 | 0 | 2471 | 417 | 4969 | 0 | 0 | 11 |
| 1 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 45 | 46 | 2 | 361 | 0 | 597 | 0 | 1143 | 0 | 1519 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 117 | 58 | 3 | 343 | 0 | 568 | 0 | 1087 | 0 | 1444 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 218 | 120 | 6 | 349 | 0 | 577 | 0 | 1105 | 0 | 1468 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.65 | 0.74 | 0.00 | 0.00 | 0.74 | 418 | 398 | 20 | 391 | 1104 | 648 | 1537 | 1241 | 2945 | 6625 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.50 | 0.57 | 0.00 | 0.00 | 0.57 | 482 | 371 | 19 | 302 | 853 | 500 | 1188 | 959 | 2275 | 5119 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.56 | 0.63 | 0.70 | 0.00 | 1.33 | 732 | 630 | 31 | 336 | 1997 | 556 | 2782 | 1065 | 2799 | 5689 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.45 | 0.50 | 0.56 | 0.00 | 1.06 | 758 | 564 | 28 | 267 | 1587 | 442 | 2210 | 846 | 2224 | 4519 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | -0.27 | 0.02 | 0.30 | 0.58 | 0.91 | 414 | 288 | 14 | -164 | 1366 | -272 | 1902 | -521 | 2340 | 4335 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | -0.22 | 0.02 | 0.24 | 0.46 | 0.72 | 569 | 224 | 11 | -130 | 1077 | -215 | 1500 | -411 | 1845 | 3418 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.17 | 0.01 | 0.18 | 0.35 | 0.55 | 774 | 172 | 9 | -99 | 826 | -165 | 1150 | -315 | 1415 | 2622 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.13 | 0.01 | 0.14 | 0.27 | 0.43 | 1080 | 132 | 7 | -77 | 639 | -127 | 890 | -244 | 1095 | 2028 | 0 | 0 | 0 | 0 | 0 | 11 |

(B)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 968 | 1092 | 944 | 1092 | L 90* 7 | 180 | 102 | 11036 | 10.10 | 630 | 1 |
| 2 | 2186 | 2764 | 2144 | 2764 | L 90* 7 | 180 | 102 | 11036 | 3.99 | 841 | 2 |
| 3 | 5091 | 5586 | 5119 | 5586 | L 90* 7 | 220 | 124 | 7503 | 1.34 | 3,706 | 3 |
| 4 | 9123 | 9377 | 9266 | 9377 | L120* 8 | 170 | 72 | 31327 | 3.34 | 4,544 | 4 |
| 5 | 15789 | 14845 | 16074 | 16074 | L120* 8 | 220 | 93 | 20827 | 1.30 | 7,413 | 5 |
| 6 | 22640 | 21146 | 23138 | 23138 | L150*10 | 170 | 57 | 57912 | 2.50 | 8,448 | 6 |
| 7 | 31748 | 29207 | 32482 | 32482 | L150*10 | 220 | 74 | 46919 | 1.44 | 11,165 | 7 |
| 8 | 37708 | 34164 | 38661 | 38661 | L175*12 | 190 | 55 | 81859 | 2.12 | 12,326 | 8 |
| 9 | 42122 | 37192 | 43279 | 43279 | L175*12 | 260 | 76 | 63489 | 1.47 | 13,784 | 9 |
| 10 | 46295 | 40045 | 47845 | 47845 | L175*12 | 171 | 50 | 85865 | 1.79 | 16,095 | 10 |
| 11 | 50595 | 42970 | 52790 | 52790 | L175*12 | 232 | 68 | 71443 | 1.35 | 19,875 | 11 |
| 1 | 1005 | 1845 | 0 | 1845 | L 60* 4 | 143 | 120 | 2989 | 1.62 | | 1 |
| 2 | 1031 | 1814 | 0 | 1814 | L 60* 4 | 146 | 123 | 2882 | 1.59 | | 2 |
| 3 | 1150 | 1951 | 0 | 1951 | L 60* 4 | 162 | 136 | 2417 | 1.24 | | 3 |
| 4 | 4118 | 7198 | 0 | 7198 | L100* 7 | 204 | 103 | 10386 | 1.44 | | 4 |
| 5 | 3344 | 5670 | 0 | 5670 | L 90* 6 | 172 | 97 | 8574 | 1.51 | | 5 |
| 6 | 6435 | 8123 | 0 | 8123 | L100* 7 | 212 | 108 | 9921 | 1.22 | | 6 |
| 7 | 5292 | 6573 | 0 | 6573 | L 90* 6 | 183 | 103 | 8077 | 1.23 | | 7 |
| 8 | 3260 | 5089 | 0 | 5089 | L100* 7 | 260 | 132 | 7429 | 1.46 | | 8 |
| 9 | 2812 | 4174 | 0 | 4174 | L 90* 6 | 173 | 125 | 6300 | 1.51 | | 9 |
| 10 | 2495 | 3428 | 0 | 3428 | L 80* 6 | 227 | 143 | 4304 | 1.26 | | 10 |
| 11 | 2411 | 2975 | 0 | 2975 | L 90* 7 | 303 | 171 | 3955 | 1.33 | | 11 |

## CROSSARM

(B)

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 599 | 992 | 3800 | 114 | 341 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 1500 | 2088 | 8000 | 240 | 1533 | | | | | | | | |
| G | M | 0.58 | 0.97 | 0.67 | 350 | 579 | 3677 | 76 | 228 | 4910 | 0 | 4910 | L 90* 7 | 240 | 136 | 6295 | 1.28 |
| | S | 0.00 | 0.00 | 0.83 | 0 | 0 | 0 | 95 | 283 | 378 | 0 | 378 | L 70* 6 | 299 | 218 | 1620 | 4.29 |
| | X | 0.00 | 0.12 | 0.00 | 0 | 0 | 441 | 0 | 0 | 0 | 296 | 296 | L 45* 4 | 176 | 200 | 833 | 2.82 |
| C 1 | M | 0.52 | 1.82 | 1.16 | 780 | 1086 | 14560 | 278 | 1776 | 18480 | 0 | 18480 | L200*15 | 510 | 130 | 32628 | 1.77 |
| | S | 0.00 | 0.00 | 1.27 | 0 | 0 | 0 | 305 | 1948 | 2253 | 0 | 2253 | L130* 9 | 559 | 217 | 34999 | 15.54 |
| | X | 0.00 | 0.44 | 0.00 | 0 | 0 | 3536 | 0 | 0 | 0 | 2369 | 2369 | L 65* 6 | 198 | 156 | 2942 | 1.24 |
| C 2 | M | 0.53 | 1.61 | 1.14 | 789 | 1098 | 12894 | 273 | 1741 | 16795 | 0 | 16795 | L175*15 | 500 | 146 | 22348 | 1.33 |
| | S | 0.00 | 0.00 | 1.25 | 0 | 0 | 0 | 300 | 1915 | 2215 | 0 | 2215 | L130* 9 | 550 | 214 | 34999 | 15.80 |
| | X | 0.00 | 0.36 | 0.00 | 0 | 0 | 2920 | 0 | 0 | 0 | 1956 | 1956 | L 65* 6 | 219 | 173 | 2400 | 1.23 |
| C 3 | M | 0.53 | 1.44 | 1.11 | 799 | 1113 | 11539 | 267 | 1709 | 15428 | 0 | 15428 | L175*12 | 490 | 143 | 18941 | 1.23 |
| | S | 0.00 | 0.00 | 1.23 | 0 | 0 | 0 | 295 | 1885 | 2180 | 0 | 2180 | L130* 9 | 541 | 210 | 34999 | 16.06 |
| | X | 0.00 | 0.30 | 0.00 | 0 | 0 | 2412 | 0 | 0 | 0 | 1616 | 1616 | L 65* 6 | 240 | 189 | 1995 | 1.23 |

## CROSSARM ( IN TOWER BODY )

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 599 | 992 | 3800 | 114 | 341 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 1500 | 2088 | 8000 | 240 | 1533 | | | | | | | | |
| G | M | 0.00 | 0.41 | 0.57 | 0 | 0 | 1574 | 65 | 195 | 260 | 1229 | 1229 | L 90* 7 | 248 | 140 | 5894 | 4.80 |
| | S | 0.30 | 0.00 | 0.35 | 181 | 299 | 0 | 39 | 118 | 637 | 0 | 637 | L 60* 4 | 248 | 209 | 4585 | 7.20 |
| | SF | 0.00 | 0.00 | 0.56 | 0 | 0 | 0 | 64 | 190 | 254 | 0 | 254 | L 60* 4 | 258 | 217 | 4585 | 18.07 |
| | SS | 0.00 | 0.00 | 0.36 | 0 | 0 | 0 | 41 | 122 | 163 | 0 | 163 | L 60* 4 | 248 | 209 | 1023 | 6.27 |
| C 1 | M | 0.00 | 0.88 | 1.11 | 0 | 0 | 7000 | 267 | 1708 | 1975 | 6013 | 6013 | L200*15 | 280 | 71 | 57750 | 9.60 |
| | S | 0.14 | 0.00 | 0.32 | 214 | 298 | 0 | 76 | 488 | 1077 | 0 | 1077 | L 70* 6 | 280 | 204 | 8226 | 7.64 |
| | SF | 0.00 | 0.00 | 1.13 | 0 | 0 | 0 | 271 | 1729 | 1999 | 0 | 1999 | L 65* 6 | 268 | 211 | 7483 | 3.74 |
| | SS | 0.00 | 0.00 | 0.30 | 0 | 0 | 0 | 73 | 467 | 540 | 0 | 540 | L 65* 6 | 268 | 211 | 1606 | 2.97 |
| C 2 | M | 0.00 | 0.77 | 1.08 | 0 | 0 | 6129 | 259 | 1655 | 1914 | 5389 | 5389 | L175*15 | 310 | 91 | 43145 | 8.01 |
| | S | 0.16 | 0.00 | 0.35 | 245 | 341 | 0 | 85 | 540 | 1210 | 0 | 1210 | L 75* 6 | 310 | 209 | 8968 | 7.41 |
| | SF | 0.00 | 0.00 | 1.09 | 0 | 0 | 0 | 262 | 1676 | 1939 | 0 | 1939 | L 70* 6 | 298 | 218 | 8226 | 4.24 |
| | SS | 0.00 | 0.00 | 0.34 | 0 | 0 | 0 | 81 | 519 | 601 | 0 | 601 | L 70* 6 | 298 | 218 | 1632 | 2.72 |
| C 3 | M | 0.00 | 0.68 | 1.05 | 0 | 0 | 5412 | 251 | 1603 | 1854 | 4868 | 4868 | L175*12 | 340 | 99 | 32289 | 6.63 |
| | S | 0.18 | 0.00 | 0.39 | 277 | 386 | 0 | 93 | 592 | 1348 | 0 | 1348 | L 80* 6 | 340 | 215 | 9711 | 7.20 |
| | SF | 0.00 | 0.00 | 1.06 | 0 | 0 | 0 | 254 | 1624 | 1878 | 0 | 1878 | L 80* 6 | 328 | 208 | 9711 | 5.17 |
| | SS | 0.00 | 0.00 | 0.37 | 0 | 0 | 0 | 89 | 572 | 661 | 0 | 661 | L 80* 6 | 328 | 208 | 2056 | 3.11 |

## FOUNDATION

(B)

| No. | | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | HTA F | HC G | HC C1-3 | Ha G | Ha C1-3 | P G | P C1-3 | q | Wc | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1.0 | 0.05 | 599 | 1500 | 992 | 2088 | 1900 | 4000 | | | | | | | |
| | C | 4.59 | 3.26 | 2.01 | 0.75 | 6.03 | 4072 | 3310 | 166 | 2750 | 9036 | 4551 | 12585 | 8717 | 13056 | 0 | 2471 | 417 | 3082 | 0 | 0 | |
| | T | 4.59 | 3.26 | 2.01 | 0.75 | 6.03 | 4072 | 3310 | 166 | 2750 | 9036 | 4551 | 12585 | 8717 | 13056 | 0 | 0 | 0 | -3082 | 0 | 0 | |
| 8 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 880 | 0 | 71 | 300 | 2249 | 496 | 3133 | 0 | 0 | 2876 | 0 | 0 | 0 | 0 | 0 | 8 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 880 | 1413 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 2876 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.18 | 0.01 | 0.20 | 0.39 | 0.60 | 275 | 0 | 11 | -109 | 906 | -181 | 1262 | 0 | 0 | 2876 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.18 | 0.01 | 0.20 | 0.39 | 0.60 | 275 | 214 | 0 | 0 | 0 | 0 | 0 | -346 | 1552 | 2876 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.30 | 3.29 | 2.33 | 1.36 | 6.98 | 4825 | 3648 | 182 | 2578 | 10462 | 4267 | 14571 | 8173 | 13149 | 0 | 2471 | 417 | 3446 | 0 | 0 | |
| | T | 4.30 | 3.29 | 2.33 | 1.36 | 6.98 | 4825 | 3648 | 182 | 2578 | 10462 | 4267 | 14571 | 8173 | 13149 | 0 | 0 | 0 | -3446 | 0 | 0 | |
| 9 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1084 | 0 | 71 | 300 | 2249 | 496 | 3133 | 0 | 0 | 2203 | 0 | 0 | 0 | 0 | 0 | 9 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1084 | 1413 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 2203 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.14 | 0.01 | 0.15 | 0.30 | 0.46 | 366 | 0 | 8 | -84 | 694 | -138 | 967 | 0 | 0 | 2203 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.14 | 0.01 | 0.15 | 0.30 | 0.46 | 366 | 164 | 0 | 0 | 0 | 0 | 0 | -265 | 1189 | 2203 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.08 | 3.31 | 2.57 | 1.83 | 7.71 | 5851 | 3907 | 195 | 2446 | 11558 | 4049 | 16097 | 7755 | 13221 | 0 | 2471 | 417 | 4024 | 0 | 0 | |
| | T | 4.08 | 3.31 | 2.57 | 1.83 | 7.71 | 5851 | 3907 | 195 | 2446 | 11558 | 4049 | 16097 | 7755 | 13221 | 0 | 0 | 0 | -4024 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1367 | 0 | 71 | 300 | 2249 | 496 | 3133 | 0 | 0 | 1686 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1367 | 1413 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1686 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.11 | 0.01 | 0.12 | 0.23 | 0.35 | 498 | 0 | 6 | -64 | 531 | -106 | 740 | 0 | 0 | 1686 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.11 | 0.01 | 0.12 | 0.23 | 0.35 | 498 | 126 | 0 | 0 | 0 | 0 | 0 | -203 | 910 | 1686 | 0 | 0 | 0 | 0 | 0 | |
| | C | 3.91 | 3.32 | 2.76 | 2.20 | 8.28 | 7309 | 4111 | 206 | 2343 | 12421 | 3877 | 17299 | 7425 | 13277 | 0 | 2471 | 417 | 4969 | 0 | 0 | |
| | T | 3.91 | 3.32 | 2.76 | 2.20 | 8.28 | 7309 | 4111 | 206 | 2343 | 12421 | 3877 | 17299 | 7425 | 13277 | 0 | 0 | 0 | -4969 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1768 | 0 | 71 | 300 | 2249 | 496 | 3133 | 0 | 0 | 1279 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1768 | 1413 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1279 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.08 | 0.01 | 0.09 | 0.17 | 0.27 | 681 | 0 | 5 | -49 | 403 | -80 | 561 | 0 | 0 | 1279 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.08 | 0.01 | 0.09 | 0.17 | 0.27 | 681 | 95 | 0 | 0 | 0 | 0 | 0 | -154 | 690 | 1279 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(B)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| | C | 39129 | 34964 | 40115 | 40115 | | |
| | T | 30078 | 28900 | 31064 | 31064 | | |
| 8 | Qf | 7128 | 6703 | 2809 | 0 | 12,326 | 8 |
| | Qs | 2292 | 4803 | 881 | 0 | | |
| | QBf | 2164 | 3377 | 875 | 0 | | |
| | QBs | 489 | 3294 | 218 | 0 | | |
| | C | 43219 | 37767 | 44495 | 44495 | | |
| | T | 33439 | 31214 | 34715 | 34715 | | |
| 9 | Qf | 7332 | 6389 | 3013 | 0 | 13,784 | 9 |
| | Qs | 2496 | 4489 | 1003 | 0 | | |
| | QBf | 1814 | 2691 | 826 | 0 | | |
| | QBs | 531 | 2628 | 261 | 0 | | |
| | C | 47109 | 40421 | 48876 | 48876 | | |
| | T | 36173 | 33094 | 37941 | 37941 | | |
| 10 | Qf | 7616 | 6232 | 3297 | 0 | 16,095 | 10 |
| | Qs | 2780 | 4332 | 1174 | 0 | | |
| | QBf | 1605 | 2205 | 850 | 0 | | |
| | QBs | 623 | 2157 | 330 | 0 | | |
| | C | 51310 | 43274 | 53855 | 53855 | | |
| | T | 38485 | 34681 | 41030 | 41030 | | |
| 11 | Qf | 8016 | 6228 | 3697 | 0 | 19,875 | 11 |
| | Qs | 3180 | 4328 | 1414 | 0 | | |
| | QBf | 1521 | 1876 | 948 | 0 | | |
| | QBs | 776 | 1840 | 432 | 0 | | |

| TOWER TYPE C | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 350 \times 10^{-3}$ | 699 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 350 \times 10^{-3}$ | |
| | Ins. | 270 | 1,705 |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 17.5^{\circ} \times 2$ | 2,285 |
| | $C_{1-3}$ | $4,000 \times \sin 17.5^{\circ} \times 2 \times 2$ | 4,811 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 350$ | 398 |
| | $C_{1-3}$ | $1.239 \times 2 \times 350$ | |
| | Ins. | 790 | 1,657 |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |

## TOWER BODY

(C)

| No. | UNIT STRESS | | | | | | STRESS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | HTA | | HC | | Ha | | P | | | | | | | | |
| | G | C1 | C2 | C3 | Te | HT | S | F | G | C1-3 | G | C1-3 | G | C1-3 | g | Wc | Va | WT | E | E' | No. |
| | | | | | | | 1.0 | 0.05 | 699 | 1705 | 2285 | 4811 | 1900 | 4000 | | | | | | | |
| 1 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 29 | 50 | 2 | 243 | 0 | 794 | 0 | 660 | 0 | 0 | 199 | 57 | 218 | 0 | 0 | 1 |
| 2 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 130 | 158 | 8 | 712 | 0 | 2326 | 0 | 1934 | 0 | 0 | 199 | 57 | 281 | 0 | 0 | 2 |
| 3 | 1.71 | 0.00 | 0.00 | 0.00 | 0.00 | 350 | 338 | 17 | 1194 | 0 | 3901 | 0 | 3243 | 0 | 0 | 1027 | 177 | 1283 | 0 | 0 | 3 |
| 4 | 2.35 | 0.31 | 0.00 | 0.00 | 0.31 | 669 | 685 | 34 | 1644 | 531 | 5372 | 1498 | 4466 | 1245 | 0 | 1027 | 177 | 1423 | 0 | 0 | 4 |
| 5 | 2.89 | 0.91 | 0.00 | 0.00 | 0.91 | 1052 | 1123 | 56 | 2020 | 1559 | 6603 | 4400 | 5490 | 3658 | 0 | 1027 | 177 | 1551 | 0 | 0 | 5 |
| 6 | 3.45 | 1.54 | 0.00 | 0.00 | 1.54 | 1585 | 1626 | 81 | 2411 | 2624 | 7878 | 7406 | 6550 | 6157 | 0 | 1856 | 297 | 2473 | 0 | 0 | 6 |
| 7 | 3.97 | 2.13 | 0.28 | 0.00 | 2.41 | 2224 | 2253 | 113 | 2778 | 4106 | 9077 | 11591 | 7547 | 8508 | 0 | 1856 | 297 | 2670 | 0 | 0 | 7 |
| 8 | 4.41 | 2.62 | 0.83 | 0.00 | 3.45 | 2891 | 2914 | 146 | 3087 | 5884 | 10087 | 16610 | 8386 | 10488 | 0 | 1856 | 297 | 2847 | 0 | 0 | 8 |
| 9 | 4.87 | 3.14 | 1.40 | 0.00 | 4.54 | 3733 | 3648 | 182 | 3409 | 7738 | 11141 | 21842 | 9262 | 12553 | 0 | 2685 | 417 | 3823 | 0 | 0 | 9 |
| 10 | 5.03 | 3.48 | 1.93 | 0.38 | 5.80 | 4616 | 4386 | 219 | 3517 | 9884 | 11493 | 27898 | 9555 | 13923 | 0 | 2685 | 417 | 4232 | 0 | 0 | 10 |
| 11 | 4.67 | 3.47 | 2.28 | 1.08 | 6.83 | 5340 | 4822 | 241 | 3263 | 11640 | 10662 | 32856 | 8864 | 13883 | 0 | 2685 | 417 | 4693 | 0 | 0 | 11 |
| 12 | 4.38 | 3.46 | 2.55 | 1.63 | 7.64 | 6337 | 5163 | 258 | 3061 | 13031 | 10005 | 36781 | 8318 | 13852 | 0 | 2685 | 417 | 5400 | 0 | 0 | 12 |
| 13 | 4.15 | 3.46 | 2.76 | 2.06 | 8.28 | 7732 | 5430 | 271 | 2905 | 14111 | 9494 | 39830 | 7893 | 13827 | 0 | 2685 | 417 | 6523 | 0 | 0 | 13 |
| 1 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 50 | 82 | 4 | 421 | 0 | 1374 | 0 | 1143 | 0 | 1828 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 128 | 105 | 5 | 401 | 0 | 1310 | 0 | 1089 | 0 | 1743 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 235 | 185 | 9 | 409 | 0 | 1336 | 0 | 1110 | 0 | 1777 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.52 | 0.58 | 0.00 | 0.00 | 0.58 | 322 | 420 | 21 | 363 | 992 | 1188 | 2801 | 988 | 2328 | 5821 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.50 | 0.56 | 0.00 | 0.00 | 0.56 | 403 | 403 | 20 | 349 | 952 | 1140 | 2688 | 948 | 2234 | 5586 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.51 | 0.57 | 0.00 | 0.00 | 0.57 | 550 | 483 | 24 | 355 | 968 | 1159 | 2733 | 963 | 2272 | 5680 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.46 | 0.51 | 0.57 | 0.00 | 1.08 | 637 | 680 | 34 | 320 | 1842 | 1046 | 5198 | 870 | 2271 | 5127 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 0.44 | 0.49 | 0.55 | 0.00 | 1.04 | 722 | 657 | 33 | 309 | 1776 | 1009 | 5013 | 839 | 2190 | 4945 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | 0.45 | 0.50 | 0.56 | 0.00 | 1.06 | 892 | 734 | 37 | 313 | 1801 | 1023 | 5084 | 851 | 2221 | 5015 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.31 | -0.01 | 0.29 | 0.58 | 0.86 | 460 | 336 | 17 | -213 | 1474 | -697 | 4161 | -580 | 2340 | 4817 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.24 | -0.01 | 0.23 | 0.46 | 0.68 | 624 | 262 | 13 | -168 | 1162 | -550 | 3281 | -457 | 1845 | 3798 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | -0.18 | -0.01 | 0.17 | 0.35 | 0.52 | 847 | 201 | 10 | -129 | 892 | -422 | 2516 | -350 | 1415 | 2913 | 0 | 0 | 0 | 0 | 0 | 12 |
| 13 | -0.14 | -0.00 | 0.13 | 0.27 | 0.40 | 1189 | 154 | 8 | -100 | 690 | -326 | 1947 | -271 | 1095 | 2254 | 0 | 0 | 0 | 0 | 0 | 13 |

(C)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 1542 | 1475 | 1521 | 1542 | L100* 7 | 180 | 91 | 13970 | 9.06 | 874 | 1 |
| 2 | 3713 | 3783 | 3684 | 3783 | L100* 7 | 180 | 91 | 13970 | 3.69 | 1,125 | 2 |
| 3 | 7949 | 7499 | 8013 | 8013 | L100* 7 | 220 | 112 | 10361 | 1.29 | 5,134 | 3 |
| 4 | 12376 | 11284 | 12542 | 12542 | L150*10 | 180 | 61 | 55883 | 4.46 | 5,692 | 4 |
| 5 | 18446 | 16037 | 18688 | 18688 | L150*10 | 180 | 61 | 55883 | 2.99 | 6,203 | 5 |
| 6 | 26610 | 22217 | 27035 | 27035 | L150*10 | 220 | 74 | 46923 | 1.74 | 9,891 | 6 |
| 7 | 34711 | 28957 | 35338 | 35338 | L175*12 | 180 | 52 | 83954 | 2.38 | 10,679 | 7 |
| 8 | 43705 | 36310 | 44508 | 44508 | L175*12 | 180 | 52 | 83954 | 1.89 | 11,389 | 8 |
| 9 | 54970 | 45241 | 56065 | 56065 | L175*12 | 220 | 64 | 74659 | 1.33 | 15,294 | 9 |
| 10 | 64960 | 52852 | 66352 | 66352 | L200*15 | 190 | 48 | 123657 | 1.86 | 16,927 | 10 |
| 11 | 71797 | 57406 | 73445 | 73445 | L200*15 | 260 | 66 | 103537 | 1.41 | 18,772 | 11 |
| 12 | 77974 | 61523 | 80076 | 80076 | L200*15 | 171 | 43 | 128049 | 1.60 | 21,598 | 12 |
| 13 | 83967 | 65522 | 86796 | 86796 | L200*15 | 232 | 59 | 112247 | 1.29 | 26,093 | 13 |
| 1 | 1849 | 2464 | 0 | 2464 | L 60* 4 | 143 | 120 | 2979 | 1.21 | | 1 |
| 2 | 1845 | 2404 | 0 | 2404 | L 60* 5 | 146 | 124 | 3511 | 1.46 | | 2 |
| 3 | 1989 | 2523 | 0 | 2523 | L 65* 6 | 162 | 127 | 4371 | 1.73 | | 3 |
| 4 | 5688 | 7711 | 0 | 7711 | L 90* 6 | 154 | 87 | 9395 | 1.22 | | 4 |
| 5 | 5551 | 7462 | 0 | 7462 | L 90* 6 | 158 | 89 | 9235 | 1.24 | | 5 |
| 6 | 5789 | 7684 | 0 | 7684 | L 90* 7 | 172 | 97 | 9884 | 1.29 | | 6 |
| 7 | 9077 | 9517 | 0 | 9517 | L100* 7 | 166 | 84 | 12389 | 1.30 | | 7 |
| 8 | 8862 | 9251 | 0 | 9251 | L100* 7 | 169 | 86 | 12198 | 1.32 | | 8 |
| 9 | 9151 | 9491 | 0 | 9491 | L100* 7 | 183 | 93 | 11461 | 1.21 | | 9 |
| 10 | 5202 | 6712 | 0 | 6712 | L100*10 | 260 | 133 | 10168 | 1.51 | | 10 |
| 11 | 4362 | 5467 | 0 | 5467 | L 90* 7 | 173 | 126 | 7255 | 1.33 | | 11 |
| 12 | 3715 | 4441 | 0 | 4441 | L 90* 6 | 227 | 127 | 6114 | 1.38 | | 12 |
| 13 | 3407 | 3793 | 0 | 3793 | L100* 7 | 303 | 154 | 5460 | 1.44 | | 13 |

## CROSSARM

(C)

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 699 | 2285 | 3800 | 114 | 398 | NML | A.NML | UI | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C | 1705 | 4811 | 8000 | 240 | 1657 | | | | | | | | |
| G | M | 0.55 | 1.21 | 0.84 | | 384 | 1255 | 4592 | 96 | 334 | 6660 | 0 | 6660 | L120* 8 | 302 | 127 | 11063 | 1.66 |
| | S | 0.00 | 0.00 | 0.97 | | 0 | 0 | 0 | 111 | 386 | 497 | 0 | 497 | L 90* 6 | 350 | 196 | 2597 | 5.22 |
| | X | 0.00 | 0.21 | 0.00 | | 0 | 0 | 806 | 0 | 0 | 0 | 540 | 540 | L 45* 4 | 177 | 201 | 822 | 1.52 |
| C 1 | M | 0.52 | 2.06 | 1.31 | | 878 | 2480 | 16492 | 315 | 2174 | 22340 | 0 | 22340 | L200*20 | 577 | 148 | 32958 | 1.48 |
| | S | 0.00 | 0.00 | 1.41 | | 0 | 0 | 0 | 339 | 2341 | 2681 | 0 | 2681 | L150*10 | 622 | 209 | 46429 | 17.32 |
| | X | 0.00 | 0.53 | 0.00 | | 0 | 0 | 4243 | 0 | 0 | 0 | 2843 | 2843 | L 70* 6 | 198 | 145 | 3697 | 1.30 |
| C 2 | M | 0.52 | 1.83 | 1.29 | | 886 | 2501 | 14622 | 309 | 2134 | 20453 | 0 | 20453 | L200*15 | 567 | 144 | 26393 | 1.29 |
| | S | 0.00 | 0.00 | 1.39 | | 0 | 0 | 0 | 334 | 2303 | 2637 | 0 | 2637 | L150*10 | 612 | 206 | 46429 | 17.61 |
| | X | 0.00 | 0.44 | 0.00 | | 0 | 0 | 3558 | 0 | 0 | 0 | 2384 | 2384 | L 70* 6 | 219 | 160 | 3016 | 1.26 |
| C 3 | M | 0.53 | 1.64 | 1.26 | | 895 | 2526 | 13096 | 304 | 2096 | 18918 | 0 | 18918 | L200*15 | 557 | 142 | 27351 | 1.45 |
| | S | 0.00 | 0.00 | 1.37 | | 0 | 0 | 0 | 328 | 2267 | 2596 | 0 | 2596 | L150*10 | 602 | 203 | 46429 | 17.89 |
| | X | 0.00 | 0.37 | 0.00 | | 0 | 0 | 2995 | 0 | 0 | 0 | 2007 | 2007 | L 70* 6 | 240 | 175 | 2507 | 1.25 |

TLG-1-66

## CROSSARM ( IN TOWER BODY )

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 699 | 2285 | 3800 | 114 | 398 | NML | A.NML | UI | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C | 1705 | 4811 | 8000 | 240 | 1657 | | | | | | | | |
| G | M | 0.00 | 0.55 | 0.76 | | 0 | 0 | 2090 | 87 | 304 | 391 | 1662 | 1662 | L120* 8 | 250 | 105 | 14062 | 8.46 |
| | S | 0.23 | 0.00 | 0.35 | | 159 | 519 | 0 | 40 | 138 | 856 | 0 | 856 | L 60* 4 | 250 | 210 | 4585 | 5.36 |
| | SF | 0.00 | 0.00 | 0.75 | | 0 | 0 | 0 | 86 | 299 | 384 | 0 | 384 | L 60* 4 | 259 | 218 | 4585 | 11.94 |
| | SS | 0.00 | 0.00 | 0.36 | | 0 | 0 | 0 | 41 | 143 | 184 | 0 | 184 | L 60* 4 | 250 | 210 | 1010 | 5.48 |
| C 1 | M | 0.00 | 1.00 | 1.27 | | 0 | 0 | 8000 | 305 | 2109 | 2415 | 6978 | 6978 | L200*20 | 280 | 72 | 76000 | 10.89 |
| | S | 0.13 | 0.00 | 0.32 | | 213 | 601 | 0 | 76 | 527 | 1418 | 0 | 1418 | L 70* 6 | 280 | 204 | 8226 | 5.80 |
| | SF | 0.00 | 0.00 | 1.29 | | 0 | 0 | 0 | 309 | 2131 | 2439 | 0 | 2439 | L 65* 6 | 269 | 212 | 7483 | 3.07 |
| | SS | 0.00 | 0.00 | 0.31 | | 0 | 0 | 0 | 73 | 506 | 579 | 0 | 579 | L 65* 6 | 269 | 212 | 1598 | 2.76 |
| C 2 | M | 0.00 | 0.88 | 1.24 | | 0 | 0 | 7032 | 297 | 2053 | 2350 | 6286 | 6286 | L200*15 | 310 | 79 | 54801 | 8.72 |
| | S | 0.14 | 0.00 | 0.35 | | 242 | 684 | 0 | 85 | 584 | 1595 | 0 | 1595 | L 75* 6 | 310 | 209 | 8968 | 5.62 |
| | SF | 0.00 | 0.00 | 1.25 | | 0 | 0 | 0 | 300 | 2074 | 2375 | 0 | 2375 | L 70* 6 | 299 | 218 | 8226 | 3.46 |
| | SS | 0.00 | 0.00 | 0.34 | | 0 | 0 | 0 | 81 | 562 | 644 | 0 | 644 | L 70* 6 | 299 | 218 | 1625 | 2.52 |
| C 3 | M | 0.00 | 0.78 | 1.20 | | 0 | 0 | 6235 | 289 | 1996 | 2285 | 5709 | 5709 | L200*15 | 340 | 87 | 51442 | 9.01 |
| | S | 0.16 | 0.00 | 0.39 | | 273 | 772 | 0 | 93 | 640 | 1778 | 0 | 1778 | L 80* 6 | 340 | 215 | 9711 | 5.46 |
| | SF | 0.00 | 0.00 | 1.22 | | 0 | 0 | 0 | 292 | 2018 | 2310 | 0 | 2310 | L 80* 6 | 329 | 208 | 9711 | 4.20 |
| | SS | 0.00 | 0.00 | 0.37 | | 0 | 0 | 0 | 90 | 619 | 709 | 0 | 709 | L 80* 6 | 329 | 208 | 2048 | 2.89 |

## FOUNDATION

(C)

| No. | | UNIT STRESS G | C1 | C2 | C3 | Te | HT | STRESS HTA S | F | HC G | C1-3 | Ha G | C1-3 | P G | C1-3 | q | We | Va | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1.0 | 0.05 | 699 | 1705 | 2285 | 4811 | 1900 | 4000 | | | | | | | |
| | C | 4.72 | 3.40 | 2.08 | 0.75 | 6.23 | 4813 | 4526 | 226 | 3304 | 10621 | 10798 | 29981 | 8977 | 13604 | 0 | 2685 | 417 | 4232 | 0 | 0 | |
| | T | 4.72 | 3.40 | 2.08 | 0.75 | 6.23 | 4813 | 4526 | 226 | 3304 | 10621 | 10798 | 29981 | 8977 | 13604 | 0 | 0 | 0 | -4232 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1021 | 0 | 92 | 350 | 2557 | 1143 | 7217 | 0 | 0 | 3196 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1021 | 1846 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 3196 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.20 | -0.01 | 0.19 | 0.39 | 0.57 | 305 | 0 | 13 | -141 | 978 | -462 | 2760 | 0 | 0 | 3196 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.20 | -0.01 | 0.19 | 0.39 | 0.57 | 305 | 250 | 0 | 0 | 0 | 0 | 0 | -384 | 1552 | 3196 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.41 | 3.39 | 2.38 | 1.36 | 7.13 | 5639 | 4920 | 246 | 3081 | 12160 | 10070 | 34325 | 8372 | 13569 | 0 | 2685 | 417 | 4693 | 0 | 0 | |
| | T | 4.41 | 3.39 | 2.38 | 1.36 | 7.13 | 5639 | 4920 | 246 | 3081 | 12160 | 10070 | 34325 | 8372 | 13569 | 0 | 0 | 0 | -4693 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1241 | 0 | 92 | 350 | 2557 | 1143 | 7217 | 0 | 0 | 2448 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1241 | 1846 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 2448 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.16 | -0.00 | 0.15 | 0.30 | 0.44 | 402 | 0 | 10 | -108 | 749 | -354 | 2115 | 0 | 0 | 2448 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.16 | -0.00 | 0.15 | 0.30 | 0.44 | 402 | 192 | 0 | 0 | 0 | 0 | 0 | -295 | 1189 | 2448 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.16 | 3.39 | 2.61 | 1.83 | 7.83 | 6763 | 5223 | 261 | 2910 | 13343 | 9511 | 37664 | 7907 | 13542 | 0 | 2685 | 417 | 5400 | 0 | 0 | |
| | T | 4.16 | 3.39 | 2.61 | 1.83 | 7.83 | 6763 | 5223 | 261 | 2910 | 13343 | 9511 | 37664 | 7907 | 13542 | 0 | 0 | 0 | -5400 | 0 | 0 | |
| 12 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1550 | 0 | 92 | 350 | 2557 | 1143 | 7217 | 0 | 0 | 1873 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1550 | 1846 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1873 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.12 | -0.00 | 0.11 | 0.23 | 0.34 | 545 | 0 | 7 | -83 | 573 | -271 | 1618 | 0 | 0 | 1873 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.12 | -0.00 | 0.11 | 0.23 | 0.34 | 545 | 147 | 0 | 0 | 0 | 0 | 0 | -225 | 910 | 1873 | 0 | 0 | 0 | 0 | 0 | |
| | C | 3.97 | 3.38 | 2.79 | 2.20 | 8.37 | 8369 | 5461 | 273 | 2776 | 14274 | 9071 | 40292 | 7541 | 13521 | 0 | 2685 | 417 | 6523 | 0 | 0 | |
| | T | 3.97 | 3.38 | 2.79 | 2.20 | 8.37 | 8369 | 5461 | 273 | 2776 | 14274 | 9071 | 40292 | 7541 | 13521 | 0 | 0 | 0 | -6523 | 0 | 0 | |
| 13 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1994 | 0 | 92 | 350 | 2557 | 1143 | 7217 | 0 | 0 | 1421 | 0 | 0 | 0 | 0 | 0 | 13 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1994 | 1846 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1421 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.09 | -0.00 | 0.09 | 0.17 | 0.26 | 750 | 0 | 6 | -63 | 435 | -206 | 1228 | 0 | 0 | 1421 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.09 | -0.00 | 0.09 | 0.17 | 0.26 | 750 | 111 | 0 | 0 | 0 | 0 | 0 | -171 | 690 | 1421 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(C)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| | C | 67077 | 54056 | 68521 | 68521 | | |
| | T | 55512 | 46308 | 56955 | 56955 | | |
| 10 | Qf | 12379 | 10435 | 3224 | 0 | 16,927 | 10 |
| | Qs | 2867 | 5402 | 1074 | 0 | | |
| | QBf | 3452 | 4454 | 936 | 0 | | |
| | QBs | 555 | 3553 | 246 | 0 | | |
| | C | 73317 | 58214 | 75104 | 75104 | | |
| | T | 60829 | 49847 | 62616 | 62616 | | |
| 11 | Qf | 12599 | 10081 | 3443 | 0 | 18,772 | 11 |
| | Qs | 3087 | 5048 | 1206 | 0 | | |
| | QBf | 2813 | 3525 | 885 | 0 | | |
| | QBs | 594 | 2835 | 289 | 0 | | |
| | C | 78954 | 61973 | 81299 | 81299 | | |
| | T | 65053 | 52659 | 67398 | 67398 | | |
| 12 | Qf | 12909 | 9904 | 3753 | 0 | 21,598 | 12 |
| | Qs | 3396 | 4871 | 1392 | 0 | | |
| | QBf | 2390 | 2856 | 914 | 0 | | |
| | QBs | 691 | 2328 | 364 | 0 | | |
| | C | 84679 | 65794 | 87896 | 87896 | | |
| | T | 68531 | 54975 | 71748 | 71748 | | |
| 13 | Qf | 13352 | 9898 | 4197 | 0 | 26,093 | 13 |
| | Qs | 3840 | 4865 | 1658 | 0 | | |
| | QBf | 2149 | 2392 | 1030 | 0 | | |
| | QBs | 861 | 1992 | 478 | 0 | | |

| TOWER TYPE D | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 300 \times 10^{-3}$ | 599 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 300 \times 10^{-3}$ | |
| | Ins. | 270 | 1,500 |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 30^{o} \times 2$ | 3,800 |
| | $C_{1-3}$ | $4,000 \times \sin 30^{o} \times 2 \times 2$ | 8,000 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 300$ | 341 |
| | $C_{1-3}$ | $1.239 \times 2 \times 300$ | |
| | Ins. | 790 | 1,533 |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |

## TOWER BODY

(D)

| No. | UNIT STRESS | | | | | | STRESS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | HTA | | HC | | Ha | | F | | | | | | | | |
| | G | C1 | C2 | C3 | Tc | HT | S | F | G | C1-3 | G | C1-3 | G | C1-3 | q | Wc | Va | WT | E | E' | No. |
| | | | | | | | 1.0 | 0.05 | 599 | 1500 | 3800 | 8000 | 1900 | 4000 | | | | | | | |
| 1 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 28 | 30 | 2 | 206 | 0 | 1308 | 0 | 654 | 0 | 0 | 170 | 57 | 185 | 0 | 0 | 1 |
| 2 | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 125 | 96 | 5 | 606 | 0 | 3845 | 0 | 1922 | 0 | 0 | 170 | 57 | 258 | 0 | 0 | 2 |
| 3 | 1.70 | 0.00 | 0.00 | 0.00 | 0.00 | 341 | 215 | 11 | 1021 | 0 | 6474 | 0 | 3237 | 0 | 0 | 937 | 177 | 1008 | 0 | 0 | 3 |
| 4 | 2.40 | 0.36 | 0.00 | 0.00 | 0.36 | 692 | 501 | 25 | 1439 | 544 | 9122 | 2901 | 4561 | 1451 | 0 | 937 | 177 | 1197 | 0 | 0 | 4 |
| 5 | 3.05 | 1.08 | 0.00 | 0.00 | 1.08 | 1167 | 898 | 45 | 1828 | 1620 | 11588 | 8641 | 5794 | 4320 | 0 | 937 | 177 | 1377 | 0 | 0 | 5 |
| 6 | 3.67 | 1.77 | 0.00 | 0.00 | 1.77 | 1781 | 1312 | 66 | 2200 | 2649 | 13946 | 14131 | 6973 | 7065 | 0 | 1704 | 297 | 2223 | 0 | 0 | 6 |
| 7 | 4.24 | 2.39 | 0.33 | 0.00 | 2.72 | 2520 | 1840 | 92 | 2540 | 4084 | 16106 | 21787 | 8053 | 9579 | 0 | 1704 | 297 | 2529 | 0 | 0 | 7 |
| 8 | 4.77 | 2.98 | 0.98 | 0.00 | 3.96 | 3382 | 2452 | 123 | 2860 | 5945 | 18130 | 31716 | 9065 | 11935 | 0 | 1704 | 297 | 2810 | 0 | 0 | 8 |
| 9 | 5.28 | 3.55 | 1.61 | 0.00 | 5.16 | 4381 | 3070 | 154 | 3167 | 7737 | 20079 | 41275 | 10039 | 14203 | 0 | 2471 | 417 | 3719 | 0 | 0 | 9 |
| 10 | 5.30 | 3.78 | 2.08 | 0.38 | 6.25 | 5208 | 3494 | 175 | 3177 | 9370 | 20142 | 49986 | 10071 | 15133 | 0 | 2471 | 417 | 4101 | 0 | 0 | 10 |
| 11 | 4.55 | 3.47 | 2.26 | 1.06 | 6.79 | 5623 | 3570 | 179 | 2725 | 10176 | 17274 | 54287 | 8637 | 13876 | 0 | 2471 | 417 | 4676 | 0 | 0 | 11 |
| 12 | 3.99 | 3.24 | 2.40 | 1.55 | 7.19 | 6470 | 3626 | 181 | 2389 | 10775 | 15144 | 57483 | 7572 | 12942 | 0 | 2471 | 417 | 5890 | 0 | 0 | 12 |
| 1 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 48 | 50 | 3 | 360 | 0 | 2282 | 0 | 1141 | 0 | 1487 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 125 | 65 | 3 | 345 | 0 | 2188 | 0 | 1094 | 0 | 1426 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 233 | 127 | 6 | 354 | 0 | 2242 | 0 | 1121 | 0 | 1461 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.55 | 0.61 | 0.00 | 0.00 | 0.61 | 345 | 334 | 17 | 331 | 916 | 2099 | 4887 | 1050 | 2443 | 5498 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.54 | 0.59 | 0.00 | 0.00 | 0.59 | 452 | 324 | 16 | 321 | 889 | 2038 | 4743 | 1019 | 2372 | 5336 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.51 | 0.57 | 0.00 | 0.00 | 0.57 | 587 | 368 | 18 | 307 | 849 | 1946 | 4531 | 973 | 2265 | 5097 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.48 | 0.53 | 0.59 | 0.00 | 1.13 | 713 | 550 | 28 | 290 | 1689 | 1838 | 9013 | 919 | 2368 | 4812 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 0.47 | 0.52 | 0.58 | 0.00 | 1.10 | 830 | 536 | 27 | 282 | 1646 | 1790 | 8780 | 895 | 2307 | 4688 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | 0.45 | 0.50 | 0.55 | 0.00 | 1.05 | 971 | 568 | 28 | 271 | 1581 | 1719 | 8433 | 860 | 2216 | 4502 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.64 | -0.27 | 0.15 | 0.57 | 0.46 | 178 | 58 | 3 | -384 | 684 | -2431 | 3647 | -1216 | 2282 | 4228 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.47 | -0.20 | 0.11 | 0.42 | 0.33 | 425 | 42 | 2 | -281 | 500 | -1780 | 2669 | -890 | 1670 | 3094 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | -0.33 | -0.14 | 0.08 | 0.30 | 0.24 | 778 | 29 | 1 | -199 | 354 | -1260 | 1889 | -630 | 1182 | 2190 | 0 | 0 | 0 | 0 | 0 | 12 |

(D)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 1956 | 1749 | 1935 | 1956 | L100*10 | 180 | 92 | 19290 | 9.86 | 740 | 1 |
| 2 | 5067 | 4683 | 5034 | 5067 | L100*10 | 180 | 92 | 19290 | 3.81 | 1,032 | 2 |
| 3 | 9969 | 8848 | 10015 | 10015 | L100*10 | 220 | 113 | 14166 | 1.41 | 4,031 | 3 |
| 4 | 17033 | 14468 | 17178 | 17178 | L150*12 | 210 | 71 | 58526 | 3.41 | 4,787 | 4 |
| 5 | 27379 | 22226 | 27621 | 27621 | L150*12 | 220 | 74 | 55646 | 2.01 | 5,509 | 5 |
| 6 | 38996 | 30861 | 39443 | 39443 | L150*12 | 220 | 74 | 55646 | 1.41 | 8,892 | 6 |
| 7 | 51658 | 41029 | 52342 | 52342 | L200*15 | 210 | 53 | 118509 | 2.26 | 10,114 | 7 |
| 8 | 66966 | 52864 | 67898 | 67898 | L200*15 | 220 | 56 | 115778 | 1.71 | 11,241 | 8 |
| 9 | 83398 | 65392 | 84682 | 84682 | L200*15 | 220 | 56 | 115778 | 1.37 | 14,874 | 9 |
| 10 | 95045 | 73819 | 96606 | 96606 | L200*15 | 211 | 54 | 118209 | 1.22 | 16,402 | 10 |
| 11 | 97827 | 74841 | 99583 | 99583 | L200*15 | 162 | 41 | 130011 | 1.31 | 18,703 | 11 |
| 12 | 101219 | 76488 | 103442 | 103442 | L200*20 | 242 | 62 | 141402 | 1.37 | 23,560 | 12 |
| 1 | 2693 | 2800 | 0 | 2800 | L 60* 5 | 144 | 122 | 3612 | 1.29 | | 1 |
| 2 | 2661 | 2738 | 0 | 2738 | L 60* 5 | 147 | 124 | 3497 | 1.28 | | 2 |
| 3 | 2835 | 2879 | 0 | 2879 | L 65* 6 | 161 | 127 | 4378 | 1.52 | | 3 |
| 4 | 8595 | 9442 | 0 | 9442 | L100* 7 | 162 | 82 | 12578 | 1.33 | | 4 |
| 5 | 8460 | 9243 | 0 | 9243 | L100* 7 | 168 | 85 | 12240 | 1.32 | | 5 |
| 6 | 8239 | 8935 | 0 | 8935 | L100* 7 | 172 | 87 | 12048 | 1.35 | | 6 |
| 7 | 13570 | 12316 | 0 | 13570 | L100*10 | 173 | 89 | 16610 | 1.22 | | 7 |
| 8 | 13355 | 12089 | 0 | 13355 | L100*10 | 179 | 92 | 16138 | 1.21 | | 8 |
| 9 | 13004 | 11729 | 0 | 13004 | L100*10 | 183 | 94 | 15858 | 1.22 | | 9 |
| 10 | 1697 | 4520 | 0 | 4520 | L100* 7 | 284 | 144 | 6241 | 1.38 | | 10 |
| 11 | 1536 | 3504 | 0 | 3504 | L 80* 6 | 209 | 132 | 5058 | 1.44 | | 11 |
| 12 | 1565 | 2800 | 0 | 2800 | L 90* 7 | 307 | 174 | 3848 | 1.37 | | 12 |

## CROSSARM

(D)

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | | STRENGTH OF MEMBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 599 | 3800 | 3800 | 114 | 341 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C | 1500 | 8000 | 8000 | 240 | 1533 | | | | | | | | |
| G | M | 0.59 | 0.95 | 0.67 | | 353 | 2238 | 3596 | 76 | 227 | 6489 | 0 | 6489 | L100* 7 | 240 | 122 | 8748 | 1.35 |
| | S | 0.00 | 0.00 | 0.83 | | 0 | 0 | 0 | 95 | 283 | 377 | 0 | 377 | L 70* 6 | 299 | 218 | 1625 | 4.31 |
| | X | 0.00 | 0.11 | 0.00 | | 0 | 0 | 408 | 0 | 0 | 0 | 273 | 273 | L 45* 4 | 179 | 203 | 801 | 2.94 |
| C 1 | M | 0.52 | 1.82 | 1.16 | | 780 | 4160 | 14560 | 278 | 1776 | 21554 | 0 | 21554 | L200*15 | 510 | 130 | 32628 | 1.51 |
| | S | 0.00 | 0.00 | 1.27 | | 0 | 0 | 0 | 305 | 1946 | 2250 | 0 | 2250 | L130* 9 | 558 | 217 | 34999 | 15.55 |
| | X | 0.00 | 0.44 | 0.00 | | 0 | 0 | 3536 | 0 | 0 | 0 | 2369 | 2369 | L 65* 6 | 198 | 156 | 2942 | 1.24 |
| C 2 | M | 0.53 | 1.61 | 1.14 | | 789 | 4208 | 12894 | 273 | 1741 | 19904 | 0 | 19904 | L200*15 | 500 | 127 | 33941 | 1.71 |
| | S | 0.00 | 0.00 | 1.25 | | 0 | 0 | 0 | 299 | 1913 | 2213 | 0 | 2213 | L130* 9 | 549 | 214 | 34999 | 15.82 |
| | X | 0.00 | 0.36 | 0.00 | | 0 | 0 | 2920 | 0 | 0 | 0 | 1956 | 1956 | L 65* 6 | 219 | 173 | 2400 | 1.23 |
| C 3 | M | 0.53 | 1.44 | 1.11 | | 799 | 4264 | 11539 | 267 | 1709 | 18579 | 0 | 18579 | L175*15 | 490 | 143 | 23198 | 1.25 |
| | S | 0.00 | 0.00 | 1.23 | | 0 | 0 | 0 | 295 | 1883 | 2178 | 0 | 2178 | L130* 9 | 540 | 210 | 34999 | 16.07 |
| | X | 0.00 | 0.30 | 0.00 | | 0 | 0 | 2412 | 0 | 0 | 0 | 1616 | 1616 | L 65* 6 | 240 | 189 | 1995 | 1.23 |
| G | M | 0.59 | 0.95 | 0.67 | | 353 | 2238 | 3596 | 76 | 227 | 6489 | 0 | 6489 | L100* 7 | 240 | 122 | 8748 | 1.35 |
| | S | 0.00 | 0.00 | 0.83 | | 0 | 0 | 0 | 95 | 283 | 377 | 0 | 377 | L 70* 6 | 299 | 218 | 1625 | 4.31 |
| | X | 0.00 | 0.11 | 0.00 | | 0 | 0 | 408 | 0 | 0 | 0 | 273 | 273 | L 45* 4 | 179 | 203 | 801 | 2.94 |
| C 1 | M | 0.50 | 0.88 | 1.11 | | 750 | 4000 | 7000 | 267 | 1708 | 13725 | 0 | 13725 | L175*12 | 490 | 142 | 18972 | 1.38 |
| | S | 0.00 | 0.00 | 1.23 | | 0 | 0 | 0 | 296 | 1888 | 2184 | 0 | 2184 | L130* 9 | 542 | 211 | 34999 | 16.03 |
| | X | 0.00 | 0.44 | 0.00 | | 0 | 0 | 3536 | 0 | 0 | 0 | 2369 | 2369 | L 65* 6 | 198 | 156 | 2942 | 1.24 |
| C 2 | M | 0.50 | 0.77 | 1.08 | | 750 | 4000 | 6129 | 259 | 1655 | 12793 | 0 | 12793 | L175*12 | 475 | 138 | 20189 | 1.58 |
| | S | 0.00 | 0.00 | 1.20 | | 0 | 0 | 0 | 288 | 1840 | 2128 | 0 | 2128 | L130* 9 | 528 | 205 | 34999 | 16.44 |
| | X | 0.00 | 0.36 | 0.00 | | 0 | 0 | 2920 | 0 | 0 | 0 | 1956 | 1956 | L 65* 6 | 219 | 173 | 2400 | 1.23 |
| C 3 | M | 0.50 | 0.68 | 1.05 | | 750 | 4000 | 5412 | 251 | 1603 | 12016 | 0 | 12016 | L175*12 | 460 | 134 | 21528 | 1.79 |
| | S | 0.00 | 0.00 | 1.17 | | 0 | 0 | 0 | 281 | 1793 | 2074 | 0 | 2074 | L120* 8 | 514 | 216 | 28331 | 13.66 |
| | X | 0.00 | 0.30 | 0.00 | | 0 | 0 | 2412 | 0 | 0 | 0 | 1616 | 1616 | L 65* 6 | 240 | 189 | 1995 | 1.23 |

## CROSSARM ( IN TOWER BODY )

(D)

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 599 | 3800 | 3800 | 114 | 341 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C | 1500 | 8000 | 8000 | 240 | 1533 | | | | | | | | |
| G | M | 0.00 | 0.40 | 0.57 | | 0 | 0 | 1526 | 64 | 193 | 257 | 1195 | 1195 | L100* 7 | 253 | 129 | 7772 | 6.50 |
| | S | 0.31 | 0.00 | 0.35 | | 187 | 1183 | 0 | 40 | 120 | 1529 | 0 | 1529 | L 60* 4 | 253 | 213 | 4585 | 3.00 |
| | SF | 0.00 | 0.00 | 0.55 | | 0 | 0 | 0 | 63 | 189 | 252 | 0 | 252 | L 60* 4 | 262 | 220 | 4585 | 18.22 |
| | SS | 0.00 | 0.00 | 0.36 | | 0 | 0 | 0 | 41 | 124 | 165 | 0 | 165 | L 60* 4 | 253 | 213 | 985 | 5.96 |
| C 1 | M | 0.00 | 0.88 | 1.11 | | 0 | 0 | 7000 | 267 | 1708 | 1975 | 6013 | 6013 | L200*15 | 280 | 71 | 57750 | 9.60 |
| | S | 0.14 | 0.00 | 0.32 | | 214 | 1143 | 0 | 76 | 488 | 1921 | 0 | 1921 | L 70* 6 | 280 | 204 | 8226 | 4.28 |
| | SF | 0.00 | 0.00 | 1.13 | | 0 | 0 | 0 | 270 | 1725 | 1995 | 0 | 1995 | L 65* 6 | 270 | 212 | 7483 | 3.75 |
| | SS | 0.00 | 0.00 | 0.31 | | 0 | 0 | 0 | 74 | 470 | 544 | 0 | 544 | L 65* 6 | 270 | 212 | 1584 | 2.91 |
| C 2 | M | 0.00 | 0.77 | 1.08 | | 0 | 0 | 6129 | 259 | 1655 | 1914 | 5389 | 5389 | L200*15 | 310 | 79 | 54801 | 10.17 |
| | S | 0.16 | 0.00 | 0.35 | | 245 | 1305 | 0 | 85 | 540 | 2175 | 0 | 2175 | L 75* 6 | 310 | 209 | 8968 | 4.12 |
| | SF | 0.00 | 0.00 | 1.09 | | 0 | 0 | 0 | 262 | 1673 | 1935 | 0 | 1935 | L 70* 6 | 300 | 219 | 8226 | 4.25 |
| | SS | 0.00 | 0.00 | 0.34 | | 0 | 0 | 0 | 82 | 522 | 604 | 0 | 604 | L 70* 6 | 300 | 219 | 1612 | 2.67 |
| C 3 | M | 0.00 | 0.68 | 1.05 | | 0 | 0 | 5412 | 251 | 1603 | 1854 | 4868 | 4868 | L175*15 | 340 | 99 | 39789 | 8.17 |
| | S | 0.18 | 0.00 | 0.39 | | 277 | 1478 | 0 | 93 | 592 | 2441 | 0 | 2441 | L 80* 6 | 340 | 215 | 9711 | 3.98 |
| | SF | 0.00 | 0.00 | 1.06 | | 0 | 0 | 0 | 254 | 1621 | 1874 | 0 | 1874 | L 80* 6 | 330 | 209 | 9711 | 5.18 |
| | SS | 0.00 | 0.00 | 0.37 | | 0 | 0 | 0 | 90 | 575 | 665 | 0 | 665 | L 80* 6 | 330 | 209 | 2033 | 3.06 |

## FOUNDATION

(D)

| No. | | UNIT STRESS G | C1 | C2 | C3 | Tc | HT | STRESS HTA S | HTA F | HC G | HC C1-3 | Ha G | Ha C1-3 | F G | F C1-3 | q | hc | Va | HT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1.0 | 0.05 | 599 | 1500 | 3800 | 8000 | 1900 | 4000 | | | | | | | |
| | C | 4.70 | 3.48 | 2.11 | 0.74 | 6.33 | 5142 | 3463 | 173 | 2818 | 9485 | 17866 | 50601 | 8933 | 13915 | 0 | 2471 | 417 | 4101 | 0 | 0 | |
| | T | 4.70 | 3.48 | 2.11 | 0.74 | 6.33 | 5142 | 3463 | 173 | 2818 | 9485 | 17866 | 50601 | 8933 | 13915 | 0 | 0 | 0 | -4101 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1098 | 0 | 71 | 300 | 2249 | 1900 | 12000 | 0 | 0 | 2657 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1098 | 1414 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 2657 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.40 | -0.17 | 0.10 | 0.36 | 0.29 | 112 | 0 | 2 | -241 | 430 | -1528 | 2292 | 0 | 0 | 2657 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.40 | -0.17 | 0.10 | 0.36 | 0.29 | 112 | 43 | 0 | 0 | 0 | 0 | 0 | -764 | 1434 | 2657 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.07 | 3.22 | 2.26 | 1.30 | 6.77 | 5712 | 3530 | 176 | 2441 | 10157 | 15477 | 54185 | 7738 | 12868 | 0 | 2471 | 417 | 4676 | 0 | 0 | |
| | T | 4.07 | 3.22 | 2.26 | 1.30 | 6.77 | 5712 | 3530 | 176 | 2441 | 10157 | 15477 | 54185 | 7738 | 12868 | 0 | 0 | 0 | -4676 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1351 | 0 | 71 | 300 | 2249 | 1900 | 12000 | 0 | 0 | 1859 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1351 | 1414 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1859 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.28 | -0.12 | 0.07 | 0.25 | 0.20 | 255 | 0 | 1 | -169 | 301 | -1069 | 1604 | 0 | 0 | 1859 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.28 | -0.12 | 0.07 | 0.25 | 0.20 | 255 | 30 | 0 | 0 | 0 | 0 | 0 | -535 | 1003 | 1859 | 0 | 0 | 0 | 0 | 0 | |
| | C | 3.62 | 3.03 | 2.37 | 1.70 | 7.10 | 6776 | 3578 | 179 | 2169 | 10641 | 13754 | 56769 | 6877 | 12112 | 0 | 2471 | 417 | 5890 | 0 | 0 | |
| | T | 3.62 | 3.03 | 2.37 | 1.70 | 7.10 | 6776 | 3578 | 179 | 2169 | 10641 | 13754 | 56769 | 6877 | 12112 | 0 | 0 | 0 | -5890 | 0 | 0 | |
| 12 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1756 | 0 | 71 | 300 | 2249 | 1900 | 12000 | 0 | 0 | 1285 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1756 | 1414 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1285 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.19 | -0.08 | 0.05 | 0.17 | 0.14 | 456 | 0 | 1 | -117 | 208 | -739 | 1108 | 0 | 0 | 1285 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.19 | -0.08 | 0.05 | 0.17 | 0.14 | 456 | 21 | 0 | 0 | 0 | 0 | 0 | -369 | 693 | 1285 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(D)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| | C | 93073 | 71682 | 94640 | 94640 | | |
| | T | 81984 | 64253 | 83552 | 83552 | | |
| 10 | Qf | 17618 | 13584 | 3028 | 0 | 16,402 | 10 |
| | Qs | 2513 | 4803 | 1013 | 0 | | |
| | QBf | 1067 | 2494 | 254 | 0 | | |
| | QBs | 155 | 2844 | 78 | 0 | | |
| | C | 95712 | 72748 | 97578 | 97578 | | |
| | T | 83473 | 64548 | 85339 | 85339 | | |
| 11 | Qf | 17871 | 13219 | 3281 | 0 | 18,703 | 11 |
| | Qs | 2766 | 4439 | 1164 | 0 | | |
| | QBf | 923 | 1864 | 355 | 0 | | |
| | QBs | 285 | 2109 | 161 | 0 | | |
| | C | 99066 | 74490 | 101539 | 101539 | | |
| | T | 84399 | 64663 | 86872 | 86872 | | |
| 12 | Qf | 18276 | 13106 | 3686 | 0 | 23,560 | 12 |
| | Qs | 3171 | 4325 | 1407 | 0 | | |
| | QBf | 918 | 1476 | 525 | 0 | | |
| | QBs | 477 | 1645 | 279 | 0 | | |

| TOWER TYPE DR | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 300 \times 10^{-3}$ | 599 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 300 \times 10^{-3}$ | |
| | Ins. | 270 | 1,500 |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 45^{\circ} \times 2$ | 5,374 |
| | $C_{1-3}$ | $4,000 \times \sin 45^{\circ} \times 2 \times 2$ | 11,314 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 300$ | 341 |
| | $C_{1-3}$ | $1.239 \times 2 \times 300$ | |
| | Ins. | 790 | 1,533 |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |

## TOWER BODY

(DR)

| UNIT STRESS | | | | | | STRESS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | HTA | | HC | | Ha | | P | | | | | | | |
| No. | G | C1 | C2 | C3 | Tc | HT | S | F | G | C1-3 | G | C1-3 | G | C1-3 | q | Wc | Wa | WT | E | E' | No. |
| | | | | | | | 1.0 | 0.05 | 599 | 1500 | 5374 | 11314 | 1900 | 4000 | | | | | | | |
| 1 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 30 | 30 | 2 | 206 | 0 | 1850 | 0 | 654 | 0 | 0 | 170 | 57 | 220 | 0 | 0 | 1 |
| 2 | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 138 | 96 | 5 | 606 | 0 | 5437 | 0 | 1922 | 0 | 0 | 170 | 57 | 304 | 0 | 0 | 2 |
| 3 | 1.70 | 0.00 | 0.00 | 0.00 | 0.00 | 375 | 215 | 11 | 1021 | 0 | 9156 | 0 | 3237 | 0 | 0 | 937 | 177 | 1057 | 0 | 0 | 3 |
| 4 | 2.40 | 0.36 | 0.00 | 0.00 | 0.36 | 758 | 501 | 25 | 1439 | 544 | 12900 | 4103 | 4561 | 1451 | 0 | 937 | 177 | 1303 | 0 | 0 | 4 |
| 5 | 3.05 | 1.08 | 0.00 | 0.00 | 1.08 | 1276 | 898 | 45 | 1828 | 1620 | 16387 | 12220 | 5794 | 4320 | 0 | 937 | 177 | 1536 | 0 | 0 | 5 |
| 6 | 3.67 | 1.77 | 0.00 | 0.00 | 1.77 | 1942 | 1312 | 66 | 2200 | 2649 | 19723 | 19984 | 6973 | 7065 | 0 | 1704 | 297 | 2436 | 0 | 0 | 6 |
| 7 | 4.24 | 2.39 | 0.33 | 0.00 | 2.72 | 2741 | 1840 | 92 | 2540 | 4084 | 22777 | 30811 | 8053 | 9579 | 0 | 1704 | 297 | 2822 | 0 | 0 | 7 |
| 8 | 4.77 | 2.98 | 0.98 | 0.00 | 3.96 | 3678 | 2452 | 123 | 2860 | 5945 | 25640 | 44854 | 9065 | 11935 | 0 | 1704 | 297 | 3175 | 0 | 0 | 8 |
| 9 | 5.28 | 3.55 | 1.61 | 0.00 | 5.16 | 4773 | 3070 | 154 | 3167 | 7737 | 28395 | 58371 | 10039 | 14203 | 0 | 2471 | 417 | 4198 | 0 | 0 | 9 |
| 10 | 5.30 | 3.78 | 2.08 | 0.38 | 6.25 | 5682 | 3502 | 175 | 3177 | 9370 | 28485 | 70691 | 10071 | 15133 | 0 | 2471 | 417 | 4660 | 0 | 0 | 10 |
| 11 | 4.55 | 3.47 | 2.26 | 1.06 | 6.79 | 6120 | 3588 | 179 | 2725 | 10176 | 24429 | 76774 | 8637 | 13876 | 0 | 2471 | 417 | 5329 | 0 | 0 | 11 |
| 12 | 3.99 | 3.24 | 2.40 | 1.55 | 7.19 | 6987 | 3652 | 183 | 2389 | 10775 | 21416 | 81293 | 7572 | 12942 | 0 | 2471 | 417 | 6696 | 0 | 0 | 12 |
| 1 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 53 | 50 | 3 | 360 | 0 | 3227 | 0 | 1141 | 0 | 1487 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 138 | 65 | 3 | 345 | 0 | 3094 | 0 | 1094 | 0 | 1426 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 256 | 127 | 6 | 354 | 0 | 3171 | 0 | 1121 | 0 | 1461 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 0.55 | 0.61 | 0.00 | 0.00 | 0.61 | 376 | 334 | 17 | 331 | 916 | 2969 | 6911 | 1050 | 2443 | 5498 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0.54 | 0.59 | 0.00 | 0.00 | 0.59 | 492 | 324 | 16 | 321 | 889 | 2882 | 6708 | 1019 | 2372 | 5336 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 0.51 | 0.57 | 0.00 | 0.00 | 0.57 | 634 | 368 | 18 | 307 | 849 | 2753 | 6408 | 973 | 2265 | 5097 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 0.48 | 0.53 | 0.59 | 0.00 | 1.13 | 771 | 550 | 28 | 290 | 1689 | 2599 | 12746 | 919 | 2368 | 4812 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 0.47 | 0.52 | 0.58 | 0.00 | 1.10 | 907 | 536 | 27 | 282 | 1646 | 2531 | 12417 | 895 | 2307 | 4688 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | 0.45 | 0.50 | 0.55 | 0.00 | 1.05 | 1067 | 568 | 28 | 271 | 1581 | 2431 | 11926 | 860 | 2216 | 4502 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | -0.64 | -0.27 | 0.15 | 0.57 | 0.46 | 197 | 66 | 3 | -384 | 684 | -3439 | 5158 | -1216 | 2282 | 4228 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | -0.47 | -0.20 | 0.11 | 0.42 | 0.33 | 441 | 47 | 2 | -281 | 500 | -2517 | 3775 | -890 | 1670 | 3094 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | -0.33 | -0.14 | 0.08 | 0.30 | 0.24 | 790 | 33 | 2 | -199 | 354 | -1781 | 2672 | -630 | 1182 | 2190 | 0 | 0 | 0 | 0 | 0 | 12 |

(DR)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 2536 | 2137 | 2516 | 2536 | L120* 8 | 180 | 76 | 29403 | 11.60 | 879 | 1 |
| 2 | 6717 | 5788 | 6691 | 6717 | L120* 8 | 180 | 76 | 29403 | 4.38 | 1,214 | 2 |
| 3 | 12734 | 10701 | 12801 | 12801 | L120* 8 | 220 | 92 | 20835 | 1.63 | 4,229 | 3 |
| 4 | 22186 | 17921 | 22371 | 22371 | L175*12 | 210 | 61 | 77160 | 3.45 | 5,212 | 4 |
| 5 | 36026 | 28019 | 36334 | 36334 | L175*12 | 220 | 64 | 74667 | 2.06 | 6,146 | 5 |
| 6 | 51000 | 38904 | 51543 | 51543 | L175*12 | 220 | 64 | 74667 | 1.45 | 9,744 | 6 |
| 7 | 67867 | 51889 | 68684 | 68684 | L200*20 | 210 | 54 | 153131 | 2.23 | 11,287 | 7 |
| 8 | 88275 | 67141 | 89384 | 89384 | L200*20 | 220 | 56 | 149630 | 1.67 | 12,701 | 8 |
| 9 | 109682 | 83003 | 111202 | 111202 | L200*20 | 220 | 56 | 149630 | 1.35 | 16,791 | 9 |
| 10 | 125127 | 93974 | 126975 | 126975 | L200*20 | 211 | 54 | 152746 | 1.20 | 18,640 | 10 |
| 11 | 128620 | 95472 | 130682 | 130682 | L200*20 | 162 | 41 | 167875 | 1.28 | 21,316 | 11 |
| 12 | 132626 | 97530 | 135170 | 135170 | L200*25 | 242 | 62 | 173821 | 1.29 | 26,783 | 12 |
| 1 | 3642 | 3437 | 0 | 3642 | L 65* 6 | 144 | 113 | 5181 | 1.42 | | 1 |
| 2 | 3580 | 3354 | 0 | 3580 | L 65* 6 | 147 | 115 | 5042 | 1.41 | | 2 |
| 3 | 3787 | 3516 | 0 | 3787 | L 70* 6 | 161 | 118 | 5301 | 1.40 | | 3 |
| 4 | 11520 | 11402 | 0 | 11520 | L100*10 | 162 | 83 | 17424 | 1.51 | | 4 |
| 5 | 11308 | 11151 | 0 | 11308 | L100*10 | 168 | 86 | 16948 | 1.50 | | 5 |
| 6 | 10969 | 10764 | 0 | 10969 | L100*10 | 172 | 88 | 16677 | 1.52 | | 6 |
| 7 | 18123 | 15367 | 0 | 18123 | L130* 9 | 173 | 67 | 22740 | 1.25 | | 7 |
| 8 | 17809 | 15073 | 0 | 17809 | L130* 9 | 179 | 70 | 22740 | 1.28 | | 8 |
| 9 | 17306 | 14611 | 0 | 17306 | L130* 9 | 183 | 71 | 22740 | 1.31 | | 9 |
| 10 | 2220 | 4537 | 0 | 4537 | L100* 7 | 284 | 144 | 6241 | 1.38 | | 10 |
| 11 | 1921 | 3519 | 0 | 3519 | L 80* 6 | 209 | 132 | 5058 | 1.44 | | 11 |
| 12 | 1838 | 2811 | 0 | 2811 | L 90* 7 | 307 | 174 | 3848 | 1.37 | | 12 |

## CROSSARM

(DR)

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 599 | 5374 | 3800 | 114 | 341 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 1500 | 11314 | 8000 | 240 | 1533 | | | | | | | | |
| G | M | 0.59 | 0.95 | 0.67 | 353 | 3165 | 3596 | 76 | 227 | 7416 | 0 | 7416 | L100*10 | 240 | 123 | 11958 | 1.61 |
| | S | 0.00 | 0.00 | 0.83 | 0 | 0 | 0 | 95 | 283 | 377 | 0 | 377 | L 70* 6 | 299 | 218 | 1625 | 4.31 |
| | X | 0.00 | 0.11 | 0.00 | 0 | 0 | 408 | 0 | 0 | 0 | 273 | 273 | L 45* 4 | 179 | 203 | 801 | 2.94 |
| C 1 | M | 0.52 | 1.82 | 1.16 | 780 | 5883 | 14560 | 278 | 1776 | 23277 | 0 | 23277 | L200*15 | 510 | 130 | 32628 | 1.40 |
| | S | 0.00 | 0.00 | 1.27 | 0 | 0 | 0 | 305 | 1946 | 2250 | 0 | 2250 | L130* 9 | 558 | 217 | 34999 | 15.55 |
| | X | 0.00 | 0.44 | 0.00 | 0 | 0 | 3536 | 0 | 0 | 0 | 2369 | 2369 | L 65* 6 | 198 | 156 | 2942 | 1.24 |
| C 2 | M | 0.53 | 1.61 | 1.14 | 789 | 5950 | 12894 | 273 | 1741 | 21647 | 0 | 21647 | L200*15 | 500 | 127 | 33941 | 1.57 |
| | S | 0.00 | 0.00 | 1.25 | 0 | 0 | 0 | 299 | 1913 | 2213 | 0 | 2213 | L130* 9 | 549 | 214 | 34999 | 15.82 |
| | X | 0.00 | 0.36 | 0.00 | 0 | 0 | 2920 | 0 | 0 | 0 | 1956 | 1956 | L 65* 6 | 219 | 173 | 2400 | 1.23 |
| C 3 | M | 0.53 | 1.44 | 1.11 | 799 | 6031 | 11539 | 267 | 1709 | 20346 | 0 | 20346 | L200*15 | 490 | 125 | 35233 | 1.73 |
| | S | 0.00 | 0.00 | 1.23 | 0 | 0 | 0 | 295 | 1883 | 2178 | 0 | 2178 | L130* 9 | 540 | 210 | 34999 | 16.07 |
| | X | 0.00 | 0.30 | 0.00 | 0 | 0 | 2412 | 0 | 0 | 0 | 1616 | 1616 | L 65* 6 | 240 | 189 | 1995 | 1.23 |
| G | M | 0.59 | 0.95 | 0.67 | 353 | 3165 | 3596 | 76 | 227 | 7416 | 0 | 7416 | L100*10 | 240 | 123 | 11958 | 1.61 |
| | S | 0.00 | 0.00 | 0.83 | 0 | 0 | 0 | 95 | 283 | 377 | 0 | 377 | L 70* 6 | 299 | 218 | 1625 | 4.31 |
| | X | 0.00 | 0.11 | 0.00 | 0 | 0 | 408 | 0 | 0 | 0 | 273 | 273 | L 45* 4 | 179 | 203 | 801 | 2.94 |
| C 1 | M | 0.50 | 0.88 | 1.11 | 750 | 5657 | 7000 | 267 | 1708 | 15382 | 0 | 15382 | L175*12 | 490 | 142 | 18972 | 1.23 |
| | S | 0.00 | 0.00 | 1.23 | 0 | 0 | 0 | 296 | 1888 | 2184 | 0 | 2184 | L130* 9 | 542 | 211 | 34999 | 16.03 |
| | X | 0.00 | 0.44 | 0.00 | 0 | 0 | 3536 | 0 | 0 | 0 | 2369 | 2369 | L 65* 6 | 198 | 156 | 2942 | 1.24 |
| C 2 | M | 0.50 | 0.77 | 1.08 | 750 | 5657 | 6129 | 259 | 1655 | 14450 | 0 | 14450 | L175*12 | 475 | 138 | 20189 | 1.40 |
| | S | 0.00 | 0.00 | 1.20 | 0 | 0 | 0 | 288 | 1840 | 2128 | 0 | 2128 | L130* 9 | 528 | 205 | 34999 | 16.44 |
| | X | 0.00 | 0.36 | 0.00 | 0 | 0 | 2920 | 0 | 0 | 0 | 1956 | 1956 | L 65* 6 | 219 | 173 | 2400 | 1.23 |
| C 3 | M | 0.50 | 0.68 | 1.05 | 750 | 5657 | 5412 | 251 | 1603 | 13672 | 0 | 13672 | L175*12 | 460 | 134 | 21528 | 1.57 |
| | S | 0.00 | 0.00 | 1.17 | 0 | 0 | 0 | 281 | 1793 | 2074 | 0 | 2074 | L120* 8 | 514 | 216 | 28331 | 13.66 |
| | X | 0.00 | 0.30 | 0.00 | 0 | 0 | 2412 | 0 | 0 | 0 | 1616 | 1616 | L 65* 6 | 240 | 189 | 1995 | 1.23 |

## CROSSARM ( IN TOWER BODY )

(DR)

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 599 | 5374 | 3800 | 114 | 341 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | C 1600 | 11314 | 8000 | 240 | 1533 | | | | | | | | |
| G | M | 0.00 | 0.40 | 0.57 | 0 | 0 | 1526 | 64 | 193 | 257 | 1195 | 1195 | L100*10 | 253 | 130 | 10651 | 8.91 |
| | S | 0.31 | 0.00 | 0.35 | 187 | 1672 | 0 | 40 | 120 | 2019 | 0 | 2019 | L 60* 4 | 253 | 213 | 4585 | 2.27 |
| | SF | 0.00 | 0.00 | 0.55 | 0 | 0 | 0 | 63 | 189 | 252 | 0 | 252 | L 60* 4 | 262 | 220 | 4585 | 18.22 |
| | SS | 0.00 | 0.00 | 0.36 | 0 | 0 | 0 | 41 | 124 | 165 | 0 | 165 | L 60* 4 | 253 | 213 | 985 | 5.96 |
| C 1 | M | 0.00 | 0.88 | 1.11 | 0 | 0 | 7000 | 267 | 1708 | 1975 | 6013 | 6013 | L200*15 | 280 | 71 | 57750 | 9.60 |
| | S | 0.14 | 0.00 | 0.32 | 214 | 1616 | 0 | 76 | 488 | 2395 | 0 | 2395 | L 70* 6 | 280 | 204 | 8226 | 3.43 |
| | SF | 0.00 | 0.00 | 1.13 | 0 | 0 | 0 | 270 | 1725 | 1995 | 0 | 1995 | L 65* 6 | 270 | 212 | 7483 | 3.75 |
| | SS | 0.00 | 0.00 | 0.31 | 0 | 0 | 0 | 74 | 470 | 544 | 0 | 544 | L 65* 6 | 270 | 212 | 1584 | 2.91 |
| C 2 | M | 0.00 | 0.77 | 1.08 | 0 | 0 | 6129 | 259 | 1655 | 1914 | 5389 | 5389 | L200*15 | 310 | 79 | 54801 | 10.17 |
| | S | 0.16 | 0.00 | 0.35 | 245 | 1846 | 0 | 85 | 540 | 2715 | 0 | 2715 | L 75* 6 | 310 | 209 | 8968 | 3.30 |
| | SF | 0.00 | 0.00 | 1.09 | 0 | 0 | 0 | 262 | 1673 | 1935 | 0 | 1935 | L 70* 6 | 300 | 219 | 8226 | 4.25 |
| | SS | 0.00 | 0.00 | 0.34 | 0 | 0 | 0 | 82 | 522 | 604 | 0 | 604 | L 70* 6 | 300 | 219 | 1612 | 2.67 |
| C 3 | M | 0.00 | 0.68 | 1.05 | 0 | 0 | 5412 | 251 | 1603 | 1854 | 4868 | 4868 | L200*15 | 340 | 87 | 51442 | 10.57 |
| | S | 0.18 | 0.00 | 0.39 | 277 | 2091 | 0 | 93 | 592 | 3053 | 0 | 3053 | L 80* 6 | 340 | 215 | 9711 | 3.18 |
| | SF | 0.00 | 0.00 | 1.06 | 0 | 0 | 0 | 254 | 1621 | 1874 | 0 | 1874 | L 80* 6 | 330 | 209 | 9711 | 5.18 |
| | SS | 0.00 | 0.00 | 0.37 | 0 | 0 | 0 | 90 | 575 | 665 | 0 | 665 | L 80* 6 | 330 | 209 | 2033 | 3.06 |

## FOUNDATION

(DR)

| | | UNIT STRESS | | | | | | STRESS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HTA | | HC | | HS | | P | | | | | | | |
| No. | | G | C1 | C2 | C3 | Tc | HT | S | F | G | C1-3 | G | C1-3 | G | C1-3 | q | Wc | Va | WT | E | E' | No. |
| | | | | | | | | 1.0 | 0.05 | 599 | 1500 | 5374 | 11314 | 1900 | 4000 | | | | | | | |
| | C | 4.70 | 3.48 | 2.11 | 0.74 | 6.33 | 5611 | 3475 | 174 | 2818 | 9485 | 25267 | 71560 | 8933 | 13915 | 0 | 2471 | 417 | 4660 | 0 | 0 | |
| | T | 4.70 | 3.48 | 2.11 | 0.74 | 6.33 | 5611 | 3475 | 174 | 2818 | 9485 | 25267 | 71560 | 8933 | 13915 | 0 | 0 | 0 | -4660 | 0 | 0 | |
| 10 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1200 | 0 | 72 | 300 | 2249 | 2687 | 16971 | 0 | 0 | 2657 | 0 | 0 | 0 | 0 | 0 | 10 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1200 | 1430 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 2657 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.40 | -0.17 | 0.10 | 0.36 | 0.29 | 124 | 0 | 2 | -241 | 430 | -2161 | 3241 | 0 | 0 | 2657 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.40 | -0.17 | 0.10 | 0.36 | 0.29 | 124 | 49 | 0 | 0 | 0 | 0 | 0 | -764 | 1434 | 2657 | 0 | 0 | 0 | 0 | 0 | |
| | C | 4.07 | 3.22 | 2.26 | 1.30 | 6.77 | 6203 | 3551 | 178 | 2441 | 10157 | 21887 | 76630 | 7738 | 12868 | 0 | 2471 | 417 | 5329 | 0 | 0 | |
| | T | 4.07 | 3.22 | 2.26 | 1.30 | 6.77 | 6203 | 3551 | 178 | 2441 | 10157 | 21887 | 76630 | 7738 | 12868 | 0 | 0 | 0 | -5329 | 0 | 0 | |
| 11 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1455 | 0 | 72 | 300 | 2249 | 2687 | 16971 | 0 | 0 | 1859 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1455 | 1430 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1859 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.28 | -0.12 | 0.07 | 0.25 | 0.20 | 265 | 0 | 2 | -169 | 301 | -1512 | 2268 | 0 | 0 | 1859 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.28 | -0.12 | 0.07 | 0.25 | 0.20 | 265 | 34 | 0 | 0 | 0 | 0 | 0 | -535 | 1003 | 1859 | 0 | 0 | 0 | 0 | 0 | |
| | C | 3.62 | 3.03 | 2.37 | 1.70 | 7.10 | 7283 | 3605 | 180 | 2169 | 10641 | 19451 | 80284 | 6877 | 12112 | 0 | 2471 | 417 | 6696 | 0 | 0 | |
| | T | 3.62 | 3.03 | 2.37 | 1.70 | 7.10 | 7283 | 3605 | 180 | 2169 | 10641 | 19451 | 80284 | 6877 | 12112 | 0 | 0 | 0 | -6696 | 0 | 0 | |
| 12 | Qf | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1861 | 0 | 72 | 300 | 2249 | 2687 | 16971 | 0 | 0 | 1285 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Qs | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 1861 | 1430 | 0 | 0 | 0 | 0 | 0 | 950 | 2000 | 1285 | 0 | 0 | 0 | 0 | 0 | |
| | QBf | -0.19 | -0.08 | 0.05 | 0.17 | 0.14 | 463 | 0 | 1 | -117 | 208 | -1045 | 1567 | 0 | 0 | 1285 | 0 | 0 | 0 | 0 | 0 | |
| | QBs | -0.19 | -0.08 | 0.05 | 0.17 | 0.14 | 463 | 23 | 0 | 0 | 0 | 0 | 0 | -369 | 693 | 1285 | 0 | 0 | 0 | 0 | 0 | |

# LOAD FOR FOUNDATION

(DR)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| | C | 122462 | 91373 | 124316 | 124316 | | |
| | T | 110255 | 83194 | 112109 | 112109 | | |
| 10 | Qf | 23478 | 17510 | 3130 | 0 | 18,640 | 10 |
| | Qs | 2631 | 4882 | 1078 | 0 | | |
| | QBf | 1395 | 2715 | 266 | 0 | | |
| | QBs | 172 | 2856 | 86 | 0 | | |
| | C | 125711 | 92848 | 127881 | 127881 | | |
| | T | 112166 | 83772 | 114336 | 114336 | | |
| 11 | Qf | 23733 | 17147 | 3384 | 0 | 21,316 | 11 |
| | Qs | 2885 | 4519 | 1230 | 0 | | |
| | QBf | 1155 | 2019 | 364 | 0 | | |
| | QBs | 299 | 2118 | 167 | 0 | | |
| | C | 129592 | 94942 | 132382 | 132382 | | |
| | T | 113313 | 84035 | 116102 | 116102 | | |
| 12 | Qf | 24139 | 17034 | 3790 | 0 | 26,783 | 12 |
| | Qs | 3291 | 4406 | 1474 | 0 | | |
| | QBf | 1078 | 1583 | 532 | 0 | | |
| | QBs | 487 | 1651 | 284 | 0 | | |

| TOWER TYPE A4 | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 350 \times 10^{-3}$ | 699 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 350 \times 10^{-3}$ | |
| | Ins. | 200 | 1,635 |
| | $C_{4-6}$ | $36.00 \times 90 \times 350 \times 10^{-3}$ | |
| | Ins. | 120 | 1,254 |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 1.5^{o} \times 2$ | 199 |
| | $C_{1-3}$ | $4,000 \times \sin 1.5^{o} \times 2 \times 2$ | 419 |
| | $C_{4-6}$ | $6,000 \times \sin 1.5^{o} \times 2$ | 314 |
| Conductorn and Insulator Weight (Wc) | G.W. | $1.136 \times 350$ | 398 |
| | $C_{1-3}$ | $1.239 \times 2 \times 350$ | |
| | Ins. | 400 | 1,267 |
| | $C_{4-6}$ | $2.446 \times 350$ | |
| | Ins. | 310 | 1,166 |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |
| | $C_{4-6}$ | $6,000 \times 0.03$ | 180 |

## TOWER BODY

(A4)

UNIT STRESS

| No. | G | C1 | C2 | C3 | C4 | C5 | C6 | C1-C3 | C4-C6 | No. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.296 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 |
| 2 | 0.880 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2 |
| 3 | 1.558 | 0.406 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.406 | 0.000 | 3 |
| 4 | 2.322 | 1.198 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.198 | 0.000 | 4 |
| 5 | 3.117 | 2.023 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.023 | 0.000 | 5 |
| 6 | 3.873 | 2.809 | 0.376 | 0.000 | 0.000 | 0.000 | 0.000 | 3.185 | 0.000 | 6 |
| 7 | 4.526 | 3.487 | 1.110 | 0.000 | 0.000 | 0.000 | 0.000 | 4.596 | 0.000 | 7 |
| 8 | 5.209 | 4.195 | 1.877 | 0.000 | 0.000 | 0.000 | 0.000 | 6.072 | 0.000 | 8 |
| 9 | 5.830 | 4.874 | 2.689 | 0.504 | 0.000 | 0.000 | 0.000 | 8.067 | 0.000 | 9 |
| 10 | 6.289 | 5.419 | 3.429 | 1.439 | 0.000 | 0.000 | 0.000 | 10.286 | 0.000 | 10 |
| 11 | 6.599 | 5.786 | 3.928 | 2.070 | 0.000 | 0.000 | 0.000 | 11.785 | 0.000 | 11 |
| 12 | 6.879 | 6.118 | 4.380 | 2.641 | 0.467 | 0.000 | 0.000 | 13.139 | 0.467 | 12 |
| 13 | 7.136 | 6.424 | 4.794 | 3.165 | 1.129 | 0.000 | 0.000 | 14.383 | 1.129 | 13 |
| 14 | 7.354 | 6.682 | 5.145 | 3.608 | 1.688 | 0.415 | 0.000 | 15.435 | 2.103 | 14 |
| 15 | 7.556 | 6.921 | 5.471 | 4.020 | 2.207 | 1.005 | 0.000 | 16.412 | 3.212 | 15 |
| 16 | 7.475 | 6.900 | 5.587 | 4.274 | 2.632 | 1.544 | 0.456 | 16.761 | 4.632 | 16 |
| 17 | 7.126 | 6.648 | 5.557 | 4.465 | 3.100 | 2.196 | 1.292 | 16.670 | 6.589 | 17 |
| 18 | 6.837 | 6.439 | 5.531 | 4.623 | 3.488 | 2.736 | 1.984 | 16.594 | 8.208 | 18 |
| 19 | 6.597 | 6.266 | 5.510 | 4.755 | 3.810 | 3.184 | 2.558 | 16.531 | 9.551 | 19 |
| 1 | 0.578 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 |
| 2 | 0.566 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2 |
| 3 | 0.616 | 0.639 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.639 | 0.000 | 3 |
| 4 | 0.594 | 0.617 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.617 | 0.000 | 4 |
| 5 | 0.618 | 0.642 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.642 | 0.000 | 5 |
| 6 | 0.552 | 0.573 | 0.621 | 0.000 | 0.000 | 0.000 | 0.000 | 1.194 | 0.000 | 6 |
| 7 | 0.535 | 0.555 | 0.601 | 0.000 | 0.000 | 0.000 | 0.000 | 1.156 | 0.000 | 7 |
| 8 | 0.555 | 0.576 | 0.624 | 0.000 | 0.000 | 0.000 | 0.000 | 1.199 | 0.000 | 8 |
| 9 | 0.340 | 0.404 | 0.549 | 0.693 | 0.000 | 0.000 | 0.000 | 1.646 | 0.000 | 9 |
| 10 | 0.300 | 0.356 | 0.484 | 0.612 | 0.000 | 0.000 | 0.000 | 1.452 | 0.000 | 10 |
| 11 | 0.222 | 0.263 | 0.358 | 0.452 | 0.000 | 0.000 | 0.000 | 1.073 | 0.000 | 11 |
| 12 | 0.260 | 0.309 | 0.419 | 0.530 | 0.669 | 0.000 | 0.000 | 1.258 | 0.669 | 12 |
| 13 | 0.190 | 0.226 | 0.307 | 0.387 | 0.489 | 0.000 | 0.000 | 0.920 | 0.489 | 13 |
| 14 | 0.217 | 0.258 | 0.350 | 0.443 | 0.559 | 0.635 | 0.000 | 1.051 | 1.194 | 14 |
| 15 | 0.167 | 0.198 | 0.268 | 0.339 | 0.428 | 0.487 | 0.000 | 0.805 | 0.915 | 15 |
| 16 | -0.270 | -0.195 | -0.024 | 0.148 | 0.362 | 0.503 | 0.645 | -0.071 | 1.510 | 16 |
| 17 | -0.224 | -0.162 | -0.020 | 0.123 | 0.301 | 0.418 | 0.536 | -0.059 | 1.255 | 17 |
| 18 | -0.185 | -0.134 | -0.016 | 0.101 | 0.249 | 0.346 | 0.443 | -0.049 | 1.038 | 18 |
| 19 | -0.155 | -0.112 | -0.014 | 0.085 | 0.208 | 0.289 | 0.371 | -0.041 | 0.868 | 19 |

STRESS

| No. | HT | HTA S | HTA F | HC G | HC C1-3 | HC C4-6 | Ha G | Ha C1-3 | Ha C4-6 | P G | P C1-3 | P C4-6 | q | Va | Wc | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | 0.05 | 699 | 1635 | 1254 | 199 | 419 | 314 | 1140 | 2400 | 1800 | | | | | | | |
| 1 | 22 | 61 | 3 | 207 | 0 | 0 | 59 | 0 | 0 | 338 | 0 | 0 | 0 | 57 | 199 | 197 | 0 | 0 | 1 |
| 2 | 112 | 260 | 13 | 615 | 0 | 0 | 175 | 0 | 0 | 1003 | 0 | 0 | 0 | 177 | 832 | 1249 | 0 | 0 | 2 |
| 3 | 344 | 857 | 43 | 1090 | 664 | 0 | 310 | 170 | 0 | 1777 | 975 | 0 | 0 | 177 | 832 | 1347 | 0 | 0 | 3 |
| 4 | 723 | 1736 | 87 | 1624 | 1959 | 0 | 462 | 502 | 0 | 2647 | 2876 | 0 | 0 | 177 | 832 | 1438 | 0 | 0 | 4 |
| 5 | 1294 | 2754 | 138 | 2179 | 3307 | 0 | 620 | 847 | 0 | 3553 | 4856 | 0 | 0 | 297 | 1466 | 2413 | 0 | 0 | 5 |
| 6 | 2020 | 4041 | 202 | 2709 | 5205 | 0 | 771 | 1334 | 0 | 4416 | 6741 | 0 | 0 | 297 | 1466 | 2545 | 0 | 0 | 6 |
| 7 | 2816 | 5417 | 271 | 3165 | 7513 | 0 | 901 | 1925 | 0 | 5160 | 8368 | 0 | 0 | 297 | 1466 | 2664 | 0 | 0 | 7 |
| 8 | 3839 | 6951 | 348 | 3643 | 9925 | 0 | 1036 | 2543 | 0 | 5938 | 10068 | 0 | 0 | 417 | 2100 | 3682 | 0 | 0 | 8 |
| 9 | 5161 | 8950 | 448 | 4077 | 13186 | 0 | 1160 | 3379 | 0 | 6647 | 11698 | 0 | 0 | 417 | 2100 | 3932 | 0 | 0 | 9 |
| 10 | 6642 | 10904 | 545 | 4398 | 16813 | 0 | 1251 | 4308 | 0 | 7170 | 13005 | 0 | 0 | 417 | 2100 | 4179 | 0 | 0 | 10 |
| 11 | 7839 | 12201 | 610 | 4615 | 19262 | 0 | 1313 | 4936 | 0 | 7523 | 13887 | 0 | 0 | 507 | 2683 | 4695 | 0 | 0 | 11 |
| 12 | 9248 | 13693 | 685 | 4811 | 21475 | 586 | 1369 | 5503 | 147 | 7842 | 14684 | 841 | 0 | 507 | 2683 | 5034 | 0 | 0 | 12 |
| 13 | 10713 | 15035 | 752 | 4991 | 23510 | 1415 | 1420 | 6024 | 355 | 8136 | 15417 | 2031 | 0 | 597 | 3266 | 5604 | 0 | 0 | 13 |
| 14 | 12296 | 16452 | 823 | 5143 | 25229 | 2637 | 1463 | 6465 | 661 | 8384 | 16036 | 3038 | 0 | 597 | 3266 | 6003 | 0 | 0 | 14 |
| 15 | 13934 | 17742 | 887 | 5284 | 26826 | 4028 | 1503 | 6874 | 1009 | 8614 | 16611 | 3972 | 0 | 687 | 3849 | 6674 | 0 | 0 | 15 |
| 16 | 15457 | 18557 | 928 | 5227 | 27396 | 5809 | 1487 | 7020 | 1455 | 8522 | 16561 | 4737 | 0 | 687 | 3849 | 7153 | 0 | 0 | 16 |
| 17 | 17397 | 19108 | 955 | 4983 | 27247 | 8263 | 1418 | 6982 | 2070 | 8123 | 15956 | 5581 | 0 | 687 | 3849 | 7808 | 0 | 0 | 17 |
| 18 | 19738 | 19564 | 978 | 4781 | 27123 | 10293 | 1360 | 6950 | 2578 | 7794 | 15455 | 6278 | 0 | 687 | 3849 | 8651 | 0 | 0 | 18 |
| 19 | 22634 | 19943 | 997 | 4613 | 27020 | 11978 | 1312 | 6924 | 3000 | 7520 | 15039 | 6858 | 0 | 687 | 3849 | 9954 | 0 | 0 | 19 |
| 1 | 42 | 117 | 6 | 404 | 0 | 0 | 115 | 0 | 0 | 659 | 0 | 0 | 1275 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 136 | 269 | 13 | 396 | 0 | 0 | 113 | 0 | 0 | 646 | 0 | 0 | 1250 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 256 | 703 | 35 | 431 | 1045 | 0 | 123 | 268 | 0 | 702 | 1534 | 0 | 4986 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 346 | 678 | 34 | 416 | 1008 | 0 | 118 | 258 | 0 | 678 | 1481 | 0 | 4812 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 517 | 841 | 42 | 432 | 1049 | 0 | 123 | 269 | 0 | 705 | 1540 | 0 | 5006 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 615 | 1154 | 58 | 386 | 1951 | 0 | 110 | 500 | 0 | 629 | 1490 | 0 | 4469 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 711 | 1118 | 56 | 374 | 1890 | 0 | 106 | 484 | 0 | 610 | 1443 | 0 | 4328 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 912 | 1288 | 64 | 388 | 1960 | 0 | 110 | 502 | 0 | 632 | 1496 | 0 | 4489 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | 985 | 1391 | 70 | 238 | 2690 | 0 | 68 | 689 | 0 | 388 | 1664 | 0 | 4636 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | 1085 | 1235 | 62 | 210 | 2373 | 0 | 60 | 608 | 0 | 342 | 1468 | 0 | 4090 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | 978 | 1000 | 50 | 155 | 1754 | 0 | 44 | 449 | 0 | 253 | 1085 | 0 | 3023 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | 1395 | 1345 | 67 | 182 | 2057 | 838 | 52 | 527 | 210 | 297 | 1272 | 1203 | 3544 | 0 | 0 | 0 | 0 | 0 | 12 |
| 13 | 1234 | 1071 | 54 | 133 | 1503 | 613 | 38 | 385 | 153 | 217 | 930 | 880 | 2590 | 0 | 0 | 0 | 0 | 0 | 13 |
| 14 | 1672 | 1384 | 69 | 152 | 1718 | 1497 | 43 | 440 | 375 | 248 | 1063 | 1143 | 2961 | 0 | 0 | 0 | 0 | 0 | 14 |
| 15 | 1517 | 1139 | 57 | 116 | 1316 | 1147 | 33 | 337 | 287 | 190 | 814 | 876 | 2269 | 0 | 0 | 0 | 0 | 0 | 15 |
| 16 | 1247 | 395 | 20 | -189 | -115 | 1894 | -54 | -30 | 474 | -307 | 354 | 1161 | 2684 | 0 | 0 | 0 | 0 | 0 | 16 |
| 17 | 1495 | 329 | 16 | -157 | -96 | 1574 | -45 | -25 | 394 | -256 | 295 | 965 | 2231 | 0 | 0 | 0 | 0 | 0 | 17 |
| 18 | 1825 | 272 | 14 | -130 | -79 | 1301 | -37 | -20 | 326 | -211 | 244 | 798 | 1844 | 0 | 0 | 0 | 0 | 0 | 18 |
| 19 | 2280 | 227 | 11 | -108 | -66 | 1089 | -31 | -17 | 273 | -177 | 204 | 668 | 1543 | 0 | 0 | 0 | 0 | 0 | 19 |

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 744 | 725 | 733 | 744 | L 60* 5 | 140 | 119 | 3914 | 5.26 | 788 | 1 |
| 2 | 3174 | 2799 | 3205 | 3205 | L 60* 5 | 140 | 119 | 3914 | 1.22 | 4,998 | 2 |
| 3 | 4977 | 4525 | 5130 | 5130 | L120* 8 | 200 | 84 | 25175 | 4.91 | 5,387 | 3 |
| 4 | 7804 | 7156 | 8123 | 8123 | L120* 8 | 200 | 84 | 25175 | 3.10 | 5,752 | 4 |
| 5 | 12562 | 11670 | 13206 | 13206 | L120* 8 | 240 | 101 | 17518 | 1.33 | 9,653 | 5 |
| 6 | 16549 | 15604 | 17601 | 17601 | L150*10 | 200 | 67 | 51642 | 2.93 | 10,181 | 6 |
| 7 | 21018 | 19689 | 22476 | 22476 | L150*10 | 200 | 67 | 51642 | 2.30 | 10,658 | 7 |
| 8 | 27532 | 25192 | 29571 | 29571 | L150*10 | 240 | 81 | 41812 | 1.41 | 14,727 | 8 |
| 9 | 33859 | 30523 | 36668 | 36668 | L150*12 | 163 | 55 | 70367 | 1.92 | 15,730 | 9 |
| 10 | 40653 | 35951 | 44243 | 44243 | L150*12 | 168 | 57 | 69302 | 1.57 | 16,717 | 10 |
| 11 | 46460 | 40432 | 50685 | 50685 | L150*12 | 170 | 58 | 68674 | 1.35 | 18,780 | 11 |
| 12 | 52047 | 44710 | 57039 | 57039 | L175*12 | 188 | 55 | 82179 | 1.44 | 20,138 | 12 |
| 13 | 58645 | 49621 | 64360 | 64360 | L175*12 | 170 | 50 | 85947 | 1.34 | 22,416 | 13 |
| 14 | 64582 | 54014 | 71111 | 71111 | L175*15 | 187 | 55 | 101787 | 1.43 | 24,013 | 14 |
| 15 | 71554 | 59070 | 78864 | 78864 | L175*15 | 170 | 50 | 106255 | 1.35 | 26,694 | 15 |
| 16 | 76469 | 62330 | 84485 | 84485 | L175*15 | 135 | 39 | 114173 | 1.35 | 28,613 | 16 |
| 17 | 81658 | 65401 | 90572 | 90572 | L200*15 | 163 | 41 | 129808 | 1.43 | 31,231 | 17 |
| 18 | 86988 | 68637 | 97086 | 97086 | L200*15 | 193 | 49 | 122992 | 1.27 | 34,603 | 18 |
| 19 | 92968 | 72365 | 104620 | 104620 | L200*20 | 234 | 60 | 144482 | 1.38 | 39,814 | 19 |
| 1 | 567 | 1402 | 0 | 1402 | L 50* 4 | 124 | 126 | 2285 | 1.63 | | 1 |
| 2 | 658 | 1541 | 0 | 1541 | L 50* 4 | 125 | 128 | 2241 | 1.45 | | 2 |
| 3 | 2157 | 5011 | 0 | 5011 | L 70* 6 | 143 | 105 | 6110 | 1.22 | | 3 |
| 4 | 2181 | 4903 | 0 | 4903 | L 70* 6 | 146 | 106 | 6013 | 1.23 | | 4 |
| 5 | 2433 | 5296 | 0 | 5296 | L 80* 6 | 160 | 101 | 7246 | 1.37 | | 5 |
| 6 | 3620 | 5420 | 0 | 5420 | L 75* 6 | 151 | 102 | 6764 | 1.25 | | 6 |
| 7 | 3621 | 5326 | 0 | 5326 | L 75* 6 | 153 | 103 | 6664 | 1.25 | | 7 |
| 8 | 3937 | 5646 | 0 | 5646 | L 80* 6 | 167 | 106 | 6949 | 1.23 | | 8 |
| 9 | 4740 | 6282 | 0 | 6282 | L 90* 7 | 202 | 114 | 8331 | 1.33 | | 9 |
| 10 | 4398 | 5687 | 0 | 5687 | L 90* 7 | 214 | 121 | 7685 | 1.35 | | 10 |
| 11 | 3431 | 4324 | 0 | 4324 | L 75* 6 | 177 | 120 | 5567 | 1.29 | | 11 |
| 12 | 5328 | 5945 | 0 | 5945 | L100* 7 | 243 | 123 | 8329 | 1.40 | | 12 |
| 13 | 4113 | 4491 | 0 | 4491 | L 80* 6 | 197 | 125 | 5602 | 1.25 | | 13 |
| 14 | 5967 | 5982 | 0 | 5982 | L100* 7 | 258 | 131 | 7512 | 1.26 | | 14 |
| 15 | 4811 | 4743 | 0 | 4811 | L 90* 6 | 217 | 122 | 6553 | 1.36 | | 15 |
| 16 | 3248 | 3974 | 0 | 3974 | L 70* 6 | 172 | 125 | 4837 | 1.22 | | 16 |
| 17 | 3158 | 3610 | 0 | 3610 | L 80* 6 | 207 | 131 | 5162 | 1.43 | | 17 |
| 18 | 3200 | 3380 | 0 | 3380 | L 90* 6 | 246 | 138 | 5227 | 1.55 | | 18 |
| 19 | 3431 | 3332 | 0 | 3431 | L100* 7 | 298 | 151 | 5655 | 1.65 | | 19 |

## CROSSARM

(A4)

| | | ΔH | ΔP | ΔV | | Hc | Ha | P | Va | Wc | DESUGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | G | 699 | 1254 | 2280 | 114 | 398 | | | | | | | | |
| | | | | | UC | 1635 | 419 | 4800 | 240 | 1267 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | LC | 1254 | 314 | 3600 | 180 | 1166 | | | | | | | | |
| G | M | 0.53 | 1.52 | 1.26 | | 370 | 664 | 3466 | 144 | 502 | 5146 | 0 | 5146 | L120* 8 | 353 | 148 | 8082 | 1.57 |
| | S | 0.00 | 0.00 | 1.35 | | 0 | 0 | 0 | 154 | 538 | 693 | 0 | 693 | L 90* 6 | 379 | 213 | 2210 | 3.19 |
| | X | 0.00 | 0.33 | 0.00 | | 0 | 0 | 754 | 0 | 0 | 0 | 505 | 505 | L 45* 4 | 164 | 187 | 950 | 1.88 |
| C 1 | M | 0.51 | 2.80 | 2.40 | | 831 | 213 | 13416 | 575 | 3036 | 18071 | 0 | 18071 | L200*20 | 671 | 172 | 24404 | 1.35 |
| | S | 0.00 | 0.00 | 2.45 | | 0 | 0 | 0 | 589 | 3108 | 3697 | 0 | 3697 | L175*12 | 687 | 200 | 66173 | 17.90 |
| | X | 0.00 | 0.80 | 0.00 | | 0 | 0 | 3818 | 0 | 0 | 0 | 2558 | 2558 | L 65* 6 | 170 | 134 | 4003 | 1.56 |
| C 2 | M | 0.51 | 2.55 | 1.38 | | 833 | 214 | 12238 | 331 | 1750 | 15366 | 0 | 15366 | L200*15 | 663 | 169 | 19284 | 1.25 |
| | S | 0.00 | 0.00 | 1.47 | | 0 | 0 | 0 | 354 | 1869 | 2223 | 0 | 2223 | L175*12 | 708 | 206 | 66173 | 29.77 |
| | X | 0.00 | 0.71 | 0.00 | | 0 | 0 | 3394 | 0 | 0 | 0 | 2274 | 2274 | L 65* 6 | 184 | 145 | 3412 | 1.50 |
| C 3 | M | 0.51 | 2.34 | 1.36 | | 837 | 214 | 11231 | 328 | 1730 | 14339 | 0 | 14339 | L200*15 | 655 | 167 | 19742 | 1.38 |
| | S | 0.00 | 0.00 | 1.46 | | 0 | 0 | 0 | 350 | 1849 | 2199 | 0 | 2199 | L175*12 | 700 | 204 | 66173 | 30.09 |
| | X | 0.00 | 0.63 | 0.00 | | 0 | 0 | 3030 | 0 | 0 | 0 | 2030 | 2030 | L 65* 6 | 198 | 156 | 2942 | 1.45 |
| C 4 | M | 0.54 | 1.38 | 1.43 | | 673 | 169 | 4961 | 258 | 1669 | 7729 | 0 | 7729 | L150*10 | 487 | 164 | 10338 | 1.34 |
| | S | 0.00 | 0.00 | 1.53 | | 0 | 0 | 0 | 275 | 1782 | 2058 | 0 | 2058 | L120* 8 | 520 | 218 | 28331 | 13.77 |
| | X | 0.00 | 0.28 | 0.00 | | 0 | 0 | 998 | 0 | 0 | 0 | 669 | 669 | L 60* 4 | 250 | 210 | 1012 | 1.51 |
| C 5 | M | 0.55 | 1.18 | 1.39 | | 692 | 173 | 4248 | 251 | 1625 | 6990 | 0 | 6990 | L150*10 | 474 | 160 | 10901 | 1.56 |
| | S | 0.00 | 0.00 | 1.49 | | 0 | 0 | 0 | 263 | 1739 | 2008 | 0 | 2008 | L120* 8 | 507 | 213 | 28331 | 14.11 |
| | X | 0.00 | 0.20 | 0.00 | | 0 | 0 | 724 | 0 | 0 | 0 | 485 | 485 | L 70* 6 | 284 | 207 | 1797 | 3.70 |
| C 6 | M | 0.57 | 1.03 | 1.36 | | 717 | 180 | 3706 | 245 | 1589 | 6438 | 0 | 6438 | L150*10 | 463 | 156 | 11404 | 1.77 |
| | S | 0.00 | 0.00 | 1.46 | | 0 | 0 | 0 | 263 | 1703 | 1966 | 0 | 1966 | L120* 8 | 496 | 209 | 28331 | 14.41 |
| | X | 0.00 | 0.14 | 0.00 | | 0 | 0 | 509 | 0 | 0 | 0 | 341 | 341 | L 75* 6 | 318 | 215 | 1794 | 5.26 |

# CROSSARM ( IN TOWER BODY )

(A4)

| | | UNIT STRESS | | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | All | AP | AV | G | 699 | 1254 | 2280 | 114 | 398 | | | | | | | | |
| | | | | | UC | 1635 | 419 | 4800 | 240 | 1267 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | LC | 1254 | 314 | 3600 | 180 | 1166 | | | | | | | | |
| G | M | 0.00 | 0.72 | 1.19 | | 0 | 0 | 1636 | 136 | 474 | 610 | 1505 | 1505 | L120* 8 | 233 | 98 | 15113 | 10.04 |
| | S | 0.17 | 0.00 | 0.42 | | 122 | 218 | 0 | 47 | 165 | 553 | 0 | 553 | L 60* 4 | 233 | 195 | 4585 | 8.30 |
| | SF | 0.00 | 0.00 | 1.19 | | 0 | 0 | 0 | 135 | 471 | 606 | 0 | 606 | L 60* 4 | 236 | 199 | 4585 | 7.56 |
| | SS | 0.00 | 0.00 | 0.42 | | 0 | 0 | 0 | 48 | 168 | 216 | 0 | 216 | L 60* 4 | 233 | 195 | 1168 | 5.41 |
| C 1 | M | 0.00 | 1.38 | 2.36 | | 0 | 0 | 6600 | 566 | 2987 | 3553 | 6802 | 6802 | L200*20 | 240 | 62 | 76000 | 11.17 |
| | S | 0.09 | 0.00 | 0.43 | | 149 | 38 | 0 | 103 | 543 | 833 | 0 | 833 | L 60* 4 | 240 | 202 | 4585 | 5.51 |
| | SF | 0.00 | 0.00 | 2.36 | | 0 | 0 | 0 | 567 | 2996 | 3563 | 0 | 3563 | L 60* 5 | 236 | 200 | 5654 | 1.59 |
| | SS | 0.00 | 0.00 | 0.42 | | 0 | 0 | 0 | 101 | 535 | 636 | 0 | 636 | L 60* 4 | 236 | 199 | 1131 | 1.78 |
| C 2 | M | 0.00 | 1.25 | 1.35 | | 0 | 0 | 6000 | 325 | 1716 | 2041 | 5388 | 5388 | L200*15 | 260 | 66 | 57750 | 10.72 |
| | S | 0.10 | 0.00 | 0.27 | | 163 | 42 | 0 | 65 | 343 | 614 | 0 | 614 | L 60* 4 | 260 | 218 | 4585 | 7.47 |
| | SF | 0.00 | 0.00 | 1.36 | | 0 | 0 | 0 | 327 | 1726 | 2053 | 0 | 2053 | L 60* 4 | 253 | 212 | 4585 | 2.23 |
| | SS | 0.00 | 0.00 | 0.26 | | 0 | 0 | 0 | 63 | 333 | 396 | 0 | 396 | L 60* 4 | 253 | 212 | 990 | 2.50 |
| C 3 | M | 0.00 | 1.14 | 1.33 | | 0 | 0 | 5486 | 320 | 1690 | 2010 | 5022 | 5022 | L200*15 | 280 | 71 | 57750 | 11.50 |
| | S | 0.11 | 0.00 | 0.29 | | 179 | 46 | 0 | 70 | 370 | 664 | 0 | 664 | L 70* 6 | 280 | 204 | 8226 | 12.38 |
| | SF | 0.00 | 0.00 | 1.34 | | 0 | 0 | 0 | 322 | 1700 | 2022 | 0 | 2022 | L 65* 6 | 273 | 215 | 7483 | 3.70 |
| | SS | 0.00 | 0.00 | 0.28 | | 0 | 0 | 0 | 68 | 360 | 428 | 0 | 428 | L 65* 6 | 273 | 215 | 1553 | 3.63 |
| C 4 | M | 0.00 | 0.64 | 1.33 | | 0 | 0 | 2311 | 240 | 1555 | 1795 | 2751 | 2751 | L150*10 | 353 | 119 | 18812 | 6.84 |
| | S | 0.19 | 0.00 | 0.52 | | 244 | 61 | 0 | 93 | 606 | 1004 | 0 | 1004 | L 90* 6 | 353 | 198 | 11224 | 11.18 |
| | SF | 0.00 | 0.00 | 1.36 | | 0 | 0 | 0 | 244 | 1582 | 1826 | 0 | 1826 | L 80* 6 | 338 | 214 | 9711 | 5.32 |
| | SS | 0.00 | 0.00 | 0.50 | | 0 | 0 | 0 | 89 | 579 | 668 | 0 | 668 | L 80* 6 | 338 | 214 | 1941 | 2.90 |
| C 5 | M | 0.00 | 0.53 | 1.26 | | 0 | 0 | 1924 | 227 | 1472 | 1699 | 2428 | 2428 | L150*10 | 402 | 135 | 15180 | 6.25 |
| | S | 0.23 | 0.00 | 0.59 | | 293 | 73 | 0 | 106 | 689 | 1162 | 0 | 1162 | L100* 7 | 402 | 204 | 14718 | 12.67 |
| | SF | 0.00 | 0.00 | 1.29 | | 0 | 0 | 0 | 231 | 1499 | 1730 | 0 | 1730 | L 90* 6 | 386 | 217 | 11224 | 6.49 |
| | SS | 0.00 | 0.00 | 0.57 | | 0 | 0 | 0 | 102 | 662 | 764 | 0 | 764 | L 90* 6 | 386 | 217 | 2131 | 2.79 |
| C 6 | M | 0.00 | 0.45 | 1.19 | | 0 | 0 | 1620 | 214 | 1389 | 1603 | 2160 | 2160 | L150*10 | 450 | 152 | 12088 | 5.60 |
| | S | 0.28 | 0.00 | 0.66 | | 348 | 87 | 0 | 119 | 772 | 1326 | 0 | 1326 | L120* 8 | 450 | 189 | 28331 | 21.36 |
| | SF | 0.00 | 0.00 | 1.21 | | 0 | 0 | 0 | 219 | 1416 | 1634 | 0 | 1634 | L120* 8 | 434 | 183 | 28331 | 17.34 |
| | SS | 0.00 | 0.00 | 0.64 | | 0 | 0 | 0 | 115 | 745 | 860 | 0 | 860 | L120* 8 | 434 | 183 | 5348 | 6.22 |

# FOUNDATION

(A4)

| No. | | UNIT STRESS G | C1 | C2 | C3 | C4 | C5 | C6 | C1-C3 | C4-C6 | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | 7.222 | 6.705 | 5.523 | 4.340 | 2.863 | 1.884 | 0.905 | 16.568 | 5.652 | |
| | T | 7.222 | 6.705 | 5.523 | 4.340 | 2.863 | 1.884 | 0.905 | 16.568 | 5.652 | |
| 16 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 16 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.174 | -0.125 | -0.015 | 0.095 | 0.233 | 0.324 | 0.416 | -0.045 | 0.973 | |
| | QBs | -0.174 | -0.125 | -0.015 | 0.095 | 0.233 | 0.324 | 0.416 | -0.045 | 0.973 | |
| | C | 6.907 | 6.477 | 5.495 | 4.513 | 3.285 | 2.471 | 1.658 | 16.485 | 7.414 | |
| | T | 6.907 | 6.477 | 5.495 | 4.513 | 3.285 | 2.471 | 1.658 | 16.485 | 7.414 | |
| 17 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 17 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.144 | -0.104 | -0.013 | 0.079 | 0.194 | 0.269 | 0.345 | -0.038 | 0.808 | |
| | QBs | -0.144 | -0.104 | -0.013 | 0.079 | 0.194 | 0.269 | 0.345 | -0.038 | 0.808 | |
| | C | 6.649 | 6.291 | 5.473 | 4.654 | 3.631 | 2.954 | 2.276 | 16.418 | 8.861 | |
| | T | 6.649 | 6.291 | 5.473 | 4.654 | 3.631 | 2.954 | 2.276 | 16.418 | 8.861 | |
| 18 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 18 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.120 | -0.087 | -0.010 | 0.066 | 0.161 | 0.224 | 0.288 | -0.031 | 0.673 | |
| | QBs | -0.120 | -0.087 | -0.010 | 0.066 | 0.161 | 0.224 | 0.288 | -0.031 | 0.673 | |
| | C | 6.432 | 6.134 | 5.454 | 4.773 | 3.923 | 3.359 | 2.796 | 16.361 | 10.078 | |
| | T | 6.432 | 6.134 | 5.454 | 4.773 | 3.923 | 3.359 | 2.796 | 16.361 | 10.078 | |
| 19 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 19 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.100 | -0.072 | -0.009 | 0.055 | 0.134 | 0.187 | 0.239 | -0.026 | 0.560 | |
| | QBs | -0.100 | -0.072 | -0.009 | 0.055 | 0.134 | 0.187 | 0.239 | -0.026 | 0.560 | |

(A4)

| No. | | HT | HTA | | HC | | | Ha | | | P | | | q | Va | Wc | WT | E | E' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S | F | G | C1-3 | C4-6 | G | C1-3 | C4-6 | G | C1-3 | C4-6 | | | | | | |
| | | | 1.0 | 0.05 | 699 | 1635 | 1254 | 199 | 419 | 314 | 1140 | 2400 | 1800 | | | | | | |
| | C | 16199 | 18730 | 936 | 5050 | 27080 | 7087 | 1437 | 6939 | 1775 | 8233 | 16091 | 5153 | 0 | 687 | 3849 | 7153 | 0 | 0 |
| | T | 16199 | 18730 | 936 | 5050 | 27080 | 7087 | 1437 | 6939 | 1775 | 8233 | 16091 | 5153 | 0 | 0 | 0 | -7153 | 0 | 0 |
| 16 | Qf | 2315 | 0 | 203 | 350 | 2452 | 1881 | 99 | 628 | 471 | 0 | 0 | 0 | 1729 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 2315 | 4054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 1729 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 804 | 0 | 14 | -121 | -74 | 1220 | -35 | -19 | 306 | 0 | 0 | 0 | 1729 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 804 | 280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 748 | 1047 | 0 | 0 | 0 | 0 | 0 |
| | C | 18296 | 19236 | 962 | 4830 | 26945 | 9297 | 1374 | 6905 | 2329 | 7874 | 15546 | 5913 | 0 | 687 | 3849 | 7808 | 0 | 0 |
| | T | 18296 | 19236 | 962 | 4830 | 26945 | 9297 | 1374 | 6905 | 2329 | 7874 | 15546 | 5913 | 0 | 0 | 0 | -7808 | 0 | 0 |
| 17 | Qf | 2669 | 0 | 203 | 350 | 2452 | 1881 | 99 | 628 | 471 | 0 | 0 | 0 | 1437 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 2669 | 4054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 1437 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 962 | 0 | 12 | -101 | -62 | 1014 | -29 | -16 | 254 | 0 | 0 | 0 | 1437 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 962 | 233 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 622 | 870 | 0 | 0 | 0 | 0 | 0 |
| | C | 20841 | 19653 | 983 | 4650 | 26835 | 11112 | 1323 | 6876 | 2783 | 7580 | 15098 | 6536 | 0 | 687 | 3849 | 8651 | 0 | 0 |
| | T | 20841 | 19653 | 983 | 4650 | 26835 | 11112 | 1323 | 6876 | 2783 | 7580 | 15098 | 6536 | 0 | 0 | 0 | -8651 | 0 | 0 |
| 18 | Qf | 3128 | 0 | 203 | 350 | 2452 | 1881 | 99 | 628 | 471 | 0 | 0 | 0 | 1197 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 3128 | 4054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 1197 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 1184 | 0 | 10 | -84 | -51 | 844 | -24 | -13 | 212 | 0 | 0 | 0 | 1197 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 1184 | 194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 518 | 725 | 0 | 0 | 0 | 0 | 0 |
| | C | 24038 | 20003 | 1000 | 4498 | 26742 | 12638 | 1280 | 6852 | 3166 | 7332 | 14721 | 7061 | 0 | 687 | 3849 | 9954 | 0 | 0 |
| | T | 24038 | 20003 | 1000 | 4498 | 26742 | 12638 | 1280 | 6852 | 3166 | 7332 | 14721 | 7061 | 0 | 0 | 0 | -9954 | 0 | 0 |
| 19 | Qf | 3713 | 0 | 203 | 350 | 2452 | 1881 | 99 | 628 | 471 | 0 | 0 | 0 | 995 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 3713 | 4054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 995 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 1471 | 0 | 8 | -70 | -43 | 702 | -20 | -11 | 176 | 0 | 0 | 0 | 995 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 1471 | 161 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 431 | 603 | 0 | 0 | 0 | 0 | 0 |

# LOAD FOR FOUNDATION

(A4)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U1) | | |
| | C | 78193 | 63170 | 86536 | 86536 | | |
| | T | 59351 | 50546 | 67694 | 67694 | | |
| 16 | Qf | 8399 | 6785 | 4466 | 0 | 28,613 | 16 |
| | Qs | 6369 | 6229 | 2402 | 0 | | |
| | QBf | 2094 | 2561 | 660 | 0 | | |
| | QBs | 1083 | 1929 | 552 | 0 | | |
| | C | 83282 | 66214 | 92648 | 92648 | | |
| | T | 63130 | 52713 | 72497 | 72497 | | |
| 17 | Qf | 8753 | 6827 | 4821 | 0 | 31,231 | 17 |
| | Qs | 6723 | 6271 | 2615 | 0 | | |
| | QBf | 2034 | 2326 | 843 | 0 | | |
| | QBs | 1195 | 1800 | 636 | 0 | | |
| | C | 88589 | 69470 | 99288 | 99288 | | |
| | T | 66751 | 54839 | 77451 | 77451 | | |
| 18 | Qf | 9212 | 6974 | 5280 | 0 | 34,603 | 18 |
| | Qs | 7182 | 6418 | 2891 | 0 | | |
| | QBf | 2077 | 2194 | 1085 | 0 | | |
| | QBs | 1378 | 1756 | 759 | 0 | | |
| | C | 94702 | 73314 | 107157 | 107157 | | |
| | T | 70259 | 56937 | 82714 | 82714 | | |
| 19 | Qf | 9797 | 7231 | 5865 | 0 | 39,814 | 19 |
| | Qs | 7767 | 6675 | 3241 | 0 | | |
| | QBf | 2213 | 2149 | 1388 | 0 | | |
| | QBs | 1632 | 1786 | 923 | 0 | | |

| TOWER TYPE D4 | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (Hc) | G.W. | $22.2 \times 90 \times 250 \times 10^{-3}$ | 500 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 250 \times 10^{-3}$ | 1,295 |
| | Ins. | 270 | |
| | $C_{4-6}$ | $36.00 \times 90 \times 250 \times 10^{-3}$ | 1,020 |
| | Ins. | 210 | |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 30^{o} \times 2$ | 3,800 |
| | $C_{1-3}$ | $4,000 \times \sin 30^{o} \times 2 \times 2$ | 8,000 |
| | $C_{4-6}$ | $6,000 \times \sin 30^{o} \times 2$ | 6,000 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 250$ | 284 |
| | $C_{1-3}$ | $1.239 \times 2 \times 250$ | 1,410 |
| | Ins. | 790 | |
| | $C_{4-6}$ | $2.446 \times 250$ | 1,232 |
| | Ins. | 620 | |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |
| | $C_{4-6}$ | $6,000 \times 0.03$ | 180 |

TOWER BODY

(D4)

| No. | UNIT STRESS | | | | | | | | | No. |
|---|---|---|---|---|---|---|---|---|---|---|
| | G | C1 | C2 | C3 | C4 | C5 | C6 | C1-C3 | C4-C6 | |
| 1 | 0.344 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 |
| 2 | 1.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2 |
| 3 | 1.704 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3 |
| 4 | 2.401 | 0.363 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.363 | 0.000 | 4 |
| 5 | 3.049 | 1.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.080 | 0.000 | 5 |
| 6 | 3.670 | 1.766 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.766 | 0.000 | 6 |
| 7 | 4.238 | 2.395 | 0.329 | 0.000 | 0.000 | 0.000 | 0.000 | 2.723 | 0.000 | 7 |
| 8 | 4.771 | 2.984 | 0.981 | 0.000 | 0.000 | 0.000 | 0.000 | 3.965 | 0.000 | 8 |
| 9 | 5.284 | 3.551 | 1.609 | 0.000 | 0.000 | 0.000 | 0.000 | 5.159 | 0.000 | 9 |
| 10 | 5.795 | 4.157 | 2.321 | 0.486 | 0.000 | 0.000 | 0.000 | 6.964 | 0.000 | 10 |
| 11 | 6.265 | 4.759 | 3.071 | 1.383 | 0.000 | 0.000 | 0.000 | 9.214 | 0.000 | 11 |
| 12 | 6.576 | 5.158 | 3.567 | 1.977 | 0.000 | 0.000 | 0.000 | 10.703 | 0.000 | 12 |
| 13 | 6.817 | 5.466 | 3.951 | 2.436 | 0.339 | 0.000 | 0.000 | 11.853 | 0.339 | 13 |
| 14 | 7.041 | 5.752 | 4.308 | 2.863 | 0.863 | 0.000 | 0.000 | 12.923 | 0.863 | 14 |
| 15 | 7.241 | 6.008 | 4.626 | 3.244 | 1.331 | 0.310 | 0.000 | 13.877 | 1.641 | 15 |
| 16 | 7.427 | 6.247 | 4.924 | 3.600 | 1.768 | 0.791 | 0.000 | 14.771 | 2.559 | 16 |
| 17 | 7.053 | 6.017 | 4.857 | 3.696 | 2.089 | 1.232 | 0.375 | 14.570 | 3.696 | 17 |
| 18 | 5.835 | 5.090 | 4.255 | 3.421 | 2.265 | 1.649 | 1.032 | 12.766 | 4.946 | 18 |
| 19 | 4.925 | 4.397 | 3.806 | 3.215 | 2.397 | 1.960 | 1.524 | 11.419 | 5.880 | 19 |
| 1 | 0.601 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 |
| 2 | 0.576 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2 |
| 3 | 0.590 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3 |
| 4 | 0.552 | 0.611 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.611 | 0.000 | 4 |
| 5 | 0.536 | 0.593 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.593 | 0.000 | 5 |
| 6 | 0.512 | 0.566 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.566 | 0.000 | 6 |
| 7 | 0.484 | 0.535 | 0.592 | 0.000 | 0.000 | 0.000 | 0.000 | 1.127 | 0.000 | 7 |
| 8 | 0.471 | 0.521 | 0.577 | 0.000 | 0.000 | 0.000 | 0.000 | 1.097 | 0.000 | 8 |
| 9 | 0.452 | 0.500 | 0.554 | 0.000 | 0.000 | 0.000 | 0.000 | 1.054 | 0.000 | 9 |
| 10 | 0.358 | 0.458 | 0.570 | 0.682 | 0.000 | 0.000 | 0.000 | 1.710 | 0.000 | 10 |
| 11 | 0.316 | 0.404 | 0.503 | 0.602 | 0.000 | 0.000 | 0.000 | 1.510 | 0.000 | 11 |
| 12 | 0.238 | 0.304 | 0.379 | 0.453 | 0.000 | 0.000 | 0.000 | 1.137 | 0.000 | 12 |
| 13 | 0.253 | 0.324 | 0.403 | 0.482 | 0.592 | 0.000 | 0.000 | 1.209 | 0.592 | 13 |
| 14 | 0.213 | 0.273 | 0.339 | 0.406 | 0.499 | 0.000 | 0.000 | 1.018 | 0.499 | 14 |
| 15 | 0.224 | 0.287 | 0.357 | 0.428 | 0.525 | 0.577 | 0.000 | 1.072 | 1.102 | 15 |
| 16 | 0.193 | 0.247 | 0.307 | 0.368 | 0.452 | 0.496 | 0.000 | 0.922 | 0.948 | 16 |
| 17 | -1.050 | -0.800 | -0.518 | -0.237 | 0.152 | 0.359 | 0.567 | -1.556 | 1.078 | 17 |
| 18 | -0.771 | -0.587 | -0.380 | -0.174 | 0.111 | 0.264 | 0.416 | -1.141 | 0.791 | 18 |
| 19 | -0.557 | -0.424 | -0.275 | -0.126 | 0.081 | 0.191 | 0.301 | -0.825 | 0.572 | 19 |

| No. | HT | STRESS HTA S | HTA F | HTA G | HC C1-3 | HC C4-6 | Ha G | Ha C1-3 | Ha C4-6 | P G | P C1-3 | P C4-6 | q | Va | Wc | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | 0.05 | 500 | 1295 | 1020 | 3800 | 8000 | 6000 | 1140 | 2400 | 1800 | | | | | | | |
| 1 | 33 | 33 | 2 | 172 | 0 | 0 | 1308 | 0 | 0 | 393 | 0 | 0 | 0 | 57 | 142 | 170 | 0 | 0 | 1 |
| 2 | 149 | 105 | 5 | 505 | 0 | 0 | 3845 | 0 | 0 | 1153 | 0 | 0 | 0 | 57 | 142 | 243 | 0 | 0 | 2 |
| 3 | 406 | 240 | 12 | 851 | 0 | 0 | 6474 | 0 | 0 | 1942 | 0 | 0 | 0 | 177 | 847 | 922 | 0 | 0 | 3 |
| 4 | 820 | 569 | 28 | 1199 | 470 | 0 | 9122 | 2901 | 0 | 2737 | 870 | 0 | 0 | 177 | 847 | 1086 | 0 | 0 | 4 |
| 5 | 1377 | 1027 | 51 | 1523 | 1398 | 0 | 11588 | 8641 | 0 | 3476 | 2592 | 0 | 0 | 177 | 847 | 1244 | 0 | 0 | 5 |
| 6 | 2092 | 1508 | 75 | 1833 | 2287 | 0 | 13946 | 14131 | 0 | 4184 | 4239 | 0 | 0 | 297 | 1552 | 1915 | 0 | 0 | 6 |
| 7 | 2951 | 2122 | 106 | 2117 | 3526 | 0 | 16106 | 21787 | 0 | 4832 | 5747 | 0 | 0 | 297 | 1552 | 2221 | 0 | 0 | 7 |
| 8 | 3956 | 2832 | 142 | 2383 | 5133 | 0 | 18130 | 31716 | 0 | 5439 | 7161 | 0 | 0 | 297 | 1552 | 2503 | 0 | 0 | 8 |
| 9 | 5130 | 3552 | 178 | 2639 | 6680 | 0 | 20079 | 41275 | 0 | 6024 | 8522 | 0 | 0 | 417 | 2256 | 3311 | 0 | 0 | 9 |
| 10 | 6806 | 4615 | 231 | 2894 | 9016 | 0 | 22019 | 55715 | 0 | 6606 | 9976 | 0 | 0 | 417 | 2256 | 4042 | 0 | 0 | 10 |
| 11 | 8973 | 5800 | 290 | 3129 | 11929 | 0 | 23807 | 73709 | 0 | 7142 | 11422 | 0 | 0 | 417 | 2256 | 4744 | 0 | 0 | 11 |
| 12 | 10711 | 6578 | 329 | 3285 | 13856 | 0 | 24991 | 85620 | 0 | 7497 | 12378 | 0 | 0 | 507 | 2872 | 5517 | 0 | 0 | 12 |
| 13 | 12428 | 7348 | 367 | 3405 | 15345 | 346 | 25905 | 94822 | 2034 | 7771 | 13117 | 610 | 0 | 507 | 2872 | 6338 | 0 | 0 | 13 |
| 14 | 14248 | 8102 | 405 | 3517 | 16731 | 880 | 26756 | 103383 | 5179 | 8027 | 13805 | 1554 | 0 | 597 | 3488 | 7266 | 0 | 0 | 14 |
| 15 | 16239 | 8916 | 446 | 3617 | 17966 | 1674 | 27514 | 111017 | 9844 | 8254 | 14418 | 2395 | 0 | 597 | 3488 | 8294 | 0 | 0 | 15 |
| 16 | 18328 | 9707 | 485 | 3710 | 19123 | 2610 | 28224 | 118165 | 15355 | 8467 | 14992 | 3183 | 0 | 687 | 4104 | 9415 | 0 | 0 | 16 |
| 17 | 19587 | 9643 | 482 | 3523 | 18862 | 3770 | 26800 | 116556 | 22175 | 8040 | 14441 | 3760 | 0 | 687 | 4104 | 10576 | 0 | 0 | 17 |
| 18 | 19637 | 8951 | 448 | 2915 | 16528 | 5045 | 22173 | 102131 | 29675 | 6652 | 12216 | 4077 | 0 | 687 | 4104 | 12368 | 0 | 0 | 18 |
| 19 | 20750 | 8436 | 422 | 2460 | 14783 | 5998 | 18714 | 91348 | 35281 | 5614 | 10553 | 4314 | 0 | 687 | 4104 | 15434 | 0 | 0 | 19 |
| 1 | 57 | 55 | 3 | 300 | 0 | 0 | 2282 | 0 | 0 | 685 | 0 | 0 | 892 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 149 | 71 | 4 | 288 | 0 | 0 | 2188 | 0 | 0 | 656 | 0 | 0 | 855 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 276 | 146 | 7 | 295 | 0 | 0 | 2242 | 0 | 0 | 673 | 0 | 0 | 877 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 406 | 386 | 19 | 276 | 791 | 0 | 2099 | 4887 | 0 | 630 | 1466 | 0 | 3299 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 529 | 374 | 19 | 268 | 768 | 0 | 2038 | 4743 | 0 | 611 | 1423 | 0 | 3202 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 681 | 428 | 21 | 256 | 733 | 0 | 1946 | 4531 | 0 | 584 | 1359 | 0 | 3058 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 829 | 639 | 32 | 242 | 1459 | 0 | 1838 | 9013 | 0 | 551 | 1421 | 0 | 2887 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 972 | 622 | 31 | 235 | 1421 | 0 | 1790 | 8780 | 0 | 537 | 1384 | 0 | 2813 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | 1144 | 664 | 33 | 226 | 1365 | 0 | 1719 | 8433 | 0 | 516 | 1329 | 0 | 2701 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | 1460 | 871 | 44 | 179 | 2214 | 0 | 1359 | 13681 | 0 | 408 | 1637 | 0 | 3034 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | 1650 | 774 | 39 | 158 | 1955 | 0 | 1200 | 12081 | 0 | 360 | 1446 | 0 | 2679 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | 1520 | 647 | 32 | 119 | 1472 | 0 | 904 | 9094 | 0 | 271 | 1088 | 0 | 2017 | 0 | 0 | 0 | 0 | 0 | 12 |
| 13 | 1928 | 838 | 42 | 126 | 1565 | 604 | 961 | 9669 | 3552 | 288 | 1157 | 1066 | 2144 | 0 | 0 | 0 | 0 | 0 | 13 |
| 14 | 1928 | 760 | 38 | 106 | 1318 | 508 | 809 | 8143 | 2991 | 243 | 975 | 897 | 1806 | 0 | 0 | 0 | 0 | 0 | 14 |
| 15 | 2371 | 939 | 47 | 112 | 1388 | 1124 | 852 | 8576 | 6612 | 256 | 1026 | 1039 | 1902 | 0 | 0 | 0 | 0 | 0 | 15 |
| 16 | 2367 | 858 | 43 | 96 | 1194 | 967 | 733 | 7376 | 5687 | 220 | 883 | 893 | 1636 | 0 | 0 | 0 | 0 | 0 | 16 |
| 17 | -305 | 541 | 27 | -525 | -2014 | 1100 | -3992 | -12444 | 6470 | -1198 | -570 | 1021 | 1715 | 0 | 0 | 0 | 0 | 0 | 17 |
| 18 | 371 | 392 | 20 | -385 | -1478 | 807 | -2929 | -9131 | 4748 | -879 | -418 | 749 | 1258 | 0 | 0 | 0 | 0 | 0 | 18 |
| 19 | 1239 | 279 | 14 | -278 | -1068 | 583 | -2116 | -6597 | 3430 | -635 | -302 | 541 | 909 | 0 | 0 | 0 | 0 | 0 | 19 |

| No. | DESIGN STRESS | | | MAX | SIZE | L.k | L/r | STRENGTH | S.F | WT | No |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 1884 | 1526 | 1876 | 1884 | L100*10 | 180 | 92 | 19290 | 10.24 | 682 | 1 |
| 2 | 4947 | 4087 | 4958 | 4958 | L100*10 | 180 | 92 | 19290 | 3.89 | 973 | 2 |
| 3 | 9689 | 7793 | 9828 | 9828 | L100*10 | 220 | 113 | 14166 | 1.44 | 3,688 | 3 |
| 4 | 16650 | 12989 | 16981 | 16981 | L150*10 | 210 | 71 | 49334 | 2.91 | 4,345 | 4 |
| 5 | 26845 | 20315 | 27403 | 27403 | L150*10 | 220 | 74 | 46930 | 1.71 | 4,974 | 5 |
| 6 | 38128 | 28386 | 39032 | 39032 | L150*10 | 220 | 74 | 46930 | 1.20 | 7,661 | 6 |
| 7 | 50661 | 37794 | 51976 | 51976 | L200*15 | 210 | 53 | 118509 | 2.28 | 8,884 | 7 |
| 8 | 65811 | 48891 | 67580 | 67580 | L200*15 | 220 | 56 | 115778 | 1.71 | 10,010 | 8 |
| 9 | 81964 | 60625 | 84311 | 84311 | L200*15 | 220 | 56 | 115778 | 1.37 | 13,243 | 9 |
| 10 | 103397 | 75960 | 106580 | 106580 | L200*25 | 188 | 49 | 197306 | 1.85 | 16,166 | 10 |
| 11 | 129254 | 94253 | 133483 | 133483 | L200*25 | 188 | 48 | 197546 | 1.48 | 18,976 | 11 |
| 12 | 147688 | 107244 | 152789 | 152789 | L200*25 | 180 | 46 | 200252 | 1.31 | 22,070 | 12 |
| 13 | 164369 | 118916 | 170358 | 170358 | L250*25 | 155 | 32 | 277869 | 1.63 | 25,350 | 13 |
| 14 | 182450 | 131491 | 189363 | 189363 | L250*25 | 180 | 37 | 270830 | 1.43 | 29,064 | 14 |
| 15 | 200695 | 144126 | 208637 | 208637 | L250*35 | 154 | 32 | 377760 | 1.81 | 33,177 | 15 |
| 16 | 220206 | 157583 | 229210 | 229210 | L250*35 | 180 | 37 | 367759 | 1.60 | 37,658 | 16 |
| 17 | 227122 | 161847 | 236675 | 236675 | L250*35 | 150 | 31 | 379236 | 1.60 | 42,303 | 17 |
| 18 | 215710 | 152710 | 225398 | 225398 | L250*35 | 221 | 46 | 349227 | 1.55 | 49,472 | 18 |
| 19 | 209979 | 147757 | 220415 | 220415 | L250*35 | 329 | 68 | 282009 | 1.28 | 61,734 | 19 |
| 1 | 2642 | 2368 | 0 | 2642 | L 60* 5 | 144 | 122 | 3612 | 1.37 | | 1 |
| 2 | 2628 | 2334 | 0 | 2628 | L 60* 5 | 147 | 124 | 3497 | 1.33 | | 2 |
| 3 | 2821 | 2477 | 0 | 2821 | L 65* 6 | 161 | 127 | 4378 | 1.55 | | 3 |
| 4 | 8478 | 7890 | 0 | 8478 | L 90* 7 | 162 | 92 | 10420 | 1.23 | | 4 |
| 5 | 8364 | 7749 | 0 | 8364 | L 90* 7 | 168 | 95 | 10083 | 1.21 | | 5 |
| 6 | 8169 | 7522 | 0 | 8169 | L 90* 7 | 172 | 97 | 9891 | 1.21 | | 6 |
| 7 | 13411 | 10920 | 0 | 13411 | L100*10 | 173 | 89 | 16610 | 1.24 | | 7 |
| 8 | 13229 | 10748 | 0 | 13229 | L100*10 | 179 | 92 | 16138 | 1.22 | | 8 |
| 9 | 12921 | 10467 | 0 | 12921 | L100*10 | 183 | 94 | 15858 | 1.23 | | 9 |
| 10 | 18936 | 14720 | 0 | 18936 | L150*10 | 238 | 80 | 27462 | 1.45 | | 10 |
| 11 | 17082 | 13240 | 0 | 17082 | L150*10 | 247 | 83 | 26742 | 1.57 | | 11 |
| 12 | 13140 | 10155 | 0 | 13140 | L120* 8 | 205 | 86 | 16753 | 1.27 | | 12 |
| 13 | 18446 | 13795 | 0 | 18446 | L150*10 | 243 | 82 | 27049 | 1.47 | | 13 |
| 14 | 15841 | 11824 | 0 | 15841 | L130* 9 | 222 | 86 | 20260 | 1.28 | | 14 |
| 15 | 21082 | 15399 | 0 | 21082 | L150*10 | 258 | 87 | 25905 | 1.23 | | 15 |
| 16 | 18464 | 13467 | 0 | 18464 | L150*10 | 240 | 81 | 27320 | 1.48 | | 16 |
| 17 | 235 | 1991 | 0 | 1991 | L 65* 6 | 204 | 161 | 2759 | 1.39 | | 17 |
| 18 | 763 | 1856 | 0 | 1856 | L 80* 6 | 293 | 185 | 2582 | 1.39 | | 18 |
| 19 | 1518 | 1988 | 0 | 1988 | L100* 7 | 426 | 216 | 2773 | 1.39 | | 19 |

## CROSSARM

(D4)

| | | UNIT STRESS | | | | Hc | Ba | P | Va | kc | DESIGN STRESS MAX | | | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | | | | | | | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | G | 500 | 1020 | 2280 | 114 | 284 | | | | | | | | |
| | | | | | UC | 1295 | 8000 | 4800 | 240 | 1410 | | | | | | | | |
| | | | | | LC | 1020 | 6000 | 3600 | 180 | 1232 | | | | | | | | |
| G | M | 0.59 | 0.95 | 0.67 | | 294 | 601 | 2157 | 76 | 189 | 3317 | 0 | 3317 | L 90* 6 | 240 | 135 | 5532 | 1.67 |
| | S | 0.00 | 0.00 | 0.83 | | 0 | 0 | 0 | 95 | 236 | 330 | 0 | 330 | L 70* 6 | 299 | 218 | 1625 | 4.92 |
| | X | 0.00 | 0.11 | 0.00 | | 0 | 0 | 245 | 0 | 0 | 0 | 164 | 164 | L 45* 4 | 179 | 203 | 801 | 4.89 |
| C 1 | M | 0.52 | 1.82 | 1.16 | | 673 | 4160 | 8736 | 278 | 1632 | 15480 | 0 | 15480 | L175*15 | 510 | 149 | 21483 | 1.39 |
| | S | 0.00 | 0.00 | 1.27 | | 0 | 0 | 0 | 305 | 1788 | 2093 | 0 | 2093 | L130* 9 | 558 | 217 | 34999 | 16.72 |
| | X | 0.00 | 0.44 | 0.00 | | 0 | 0 | 2121 | 0 | 0 | 0 | 1421 | 1421 | L 60* 5 | 198 | 168 | 1958 | 1.38 |
| C 2 | M | 0.53 | 1.61 | 1.14 | | 681 | 4208 | 7737 | 273 | 1601 | 14498 | 0 | 14498 | L175*12 | 500 | 145 | 18247 | 1.26 |
| | S | 0.00 | 0.00 | 1.25 | | 0 | 0 | 0 | 299 | 1759 | 2058 | 0 | 2058 | L130* 9 | 549 | 214 | 34999 | 17.01 |
| | X | 0.00 | 0.36 | 0.00 | | 0 | 0 | 1752 | 0 | 0 | 0 | 1174 | 1174 | L 60* 5 | 219 | 186 | 1597 | 1.36 |
| C 3 | M | 0.53 | 1.44 | 1.11 | | 690 | 4264 | 6923 | 267 | 1571 | 13716 | 0 | 13716 | L175*12 | 490 | 143 | 18941 | 1.38 |
| | S | 0.00 | 0.00 | 1.23 | | 0 | 0 | 0 | 295 | 1731 | 2025 | 0 | 2025 | L130* 9 | 540 | 210 | 34999 | 17.28 |
| | X | 0.00 | 0.30 | 0.00 | | 0 | 0 | 1447 | 0 | 0 | 0 | 970 | 970 | L 60* 5 | 240 | 204 | 1328 | 1.37 |
| C 4 | M | 0.57 | 1.02 | 1.18 | | 585 | 3441 | 3673 | 213 | 1457 | 9370 | 0 | 9370 | L150*10 | 426 | 143 | 13493 | 1.44 |
| | S | 0.00 | 0.00 | 1.29 | | 0 | 0 | 0 | 233 | 1592 | 1824 | 0 | 1824 | L120* 8 | 465 | 195 | 28331 | 15.53 |
| | X | 0.00 | 0.14 | 0.00 | | 0 | 0 | 496 | 0 | 0 | 0 | 332 | 332 | L 70* 6 | 295 | 215 | 1663 | 5.01 |
| C 5 | M | 0.60 | 0.91 | 1.16 | | 609 | 3585 | 3288 | 209 | 1433 | 9125 | 0 | 9125 | L150*10 | 419 | 141 | 13943 | 1.53 |
| | S | 0.00 | 0.00 | 1.27 | | 0 | 0 | 0 | 229 | 1567 | 1797 | 0 | 1797 | L120* 8 | 458 | 193 | 28331 | 15.77 |
| | X | 0.00 | 0.09 | 0.00 | | 0 | 0 | 337 | 0 | 0 | 0 | 225 | 225 | L 75* 6 | 324 | 219 | 1726 | 7.66 |
| C 6 | M | 0.63 | 0.83 | 1.15 | | 640 | 3764 | 2981 | 207 | 1416 | 9008 | 0 | 9008 | L150*10 | 414 | 139 | 14281 | 1.59 |
| | S | 0.00 | 0.00 | 1.26 | | 0 | 0 | 0 | 226 | 1549 | 1776 | 0 | 1776 | L120* 8 | 453 | 190 | 28331 | 15.95 |
| | X | 0.00 | 0.06 | 0.00 | | 0 | 0 | 204 | 0 | 0 | 0 | 136 | 136 | L 90* 6 | 354 | 199 | 2540 | 18.62 |

# CROSSARM ( IN TOWER BODY )

(D4)

| | | UNIT STRESS | | | Hc | Ha | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 500<br>UC 1295<br>LC 1020 | 1020<br>8000<br>6000 | 2280<br>4800<br>3600 | 114<br>240<br>180 | 284<br>1410<br>1232 | NML | A.NML | HT | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| G | M | 0.00 | 0.40 | 0.57 | 0 | 0 | 916 | 64 | 160 | 225 | 764 | 764 | L 90* 6 | 253 | 142 | 4953 | 6.48 |
| | S | 0.31 | 0.00 | 0.35 | 155 | 317 | 0 | 40 | 100 | 613 | 0 | 613 | L 60* 4 | 253 | 213 | 4585 | 7.48 |
| | SF | 0.00 | 0.00 | 0.55 | 0 | 0 | 0 | 63 | 157 | 220 | 0 | 220 | L 60* 4 | 252 | 220 | 4585 | 20.82 |
| | SS | 0.00 | 0.00 | 0.36 | 0 | 0 | 0 | 41 | 103 | 145 | 0 | 145 | L 60* 4 | 253 | 213 | 985 | 6.81 |
| C 1 | M | 0.00 | 0.88 | 1.11 | 0 | 0 | 4200 | 267 | 1570 | 1837 | 4045 | 4045 | L175*15 | 280 | 82 | 46502 | 11.50 |
| | S | 0.14 | 0.00 | 0.32 | 185 | 1143 | 0 | 76 | 448 | 1853 | 0 | 1853 | L 70* 6 | 280 | 204 | 8226 | 4.44 |
| | SF | 0.00 | 0.00 | 1.13 | 0 | 0 | 0 | 270 | 1586 | 1856 | 0 | 1856 | L 65* 6 | 270 | 212 | 7483 | 4.03 |
| | SS | 0.00 | 0.00 | 0.31 | 0 | 0 | 0 | 74 | 432 | 506 | 0 | 506 | L 65* 6 | 270 | 212 | 1584 | 3.13 |
| C 2 | M | 0.00 | 0.77 | 1.08 | 0 | 0 | 3677 | 259 | 1522 | 1781 | 3657 | 3657 | L175*12 | 310 | 90 | 34982 | 9.57 |
| | S | 0.16 | 0.00 | 0.35 | 211 | 1305 | 0 | 85 | 497 | 2098 | 0 | 2098 | L 75* 6 | 310 | 209 | 8968 | 4.28 |
| | SF | 0.00 | 0.00 | 1.09 | 0 | 0 | 0 | 262 | 1538 | 1800 | 0 | 1800 | L 70* 6 | 300 | 219 | 8226 | 4.57 |
| | SS | 0.00 | 0.00 | 0.34 | 0 | 0 | 0 | 82 | 480 | 562 | 0 | 562 | L 70* 6 | 300 | 219 | 1612 | 2.87 |
| C 3 | M | 0.00 | 0.68 | 1.05 | 0 | 0 | 3247 | 251 | 1474 | 1724 | 3331 | 3331 | L175*12 | 340 | 99 | 32289 | 9.69 |
| | S | 0.18 | 0.00 | 0.39 | 239 | 1478 | 0 | 93 | 545 | 2355 | 0 | 2355 | L 80* 6 | 340 | 215 | 9711 | 4.12 |
| | SF | 0.00 | 0.00 | 1.06 | 0 | 0 | 0 | 254 | 1490 | 1744 | 0 | 1744 | L 80* 6 | 330 | 209 | 9711 | 5.57 |
| | SS | 0.00 | 0.00 | 0.37 | 0 | 0 | 0 | 90 | 528 | 618 | 0 | 618 | L 80* 6 | 330 | 209 | 2033 | 3.29 |
| C 4 | M | 0.00 | 0.44 | 1.03 | 0 | 0 | 1601 | 186 | 1270 | 1456 | 2048 | 2048 | L150*10 | 417 | 141 | 14048 | 6.86 |
| | S | 0.28 | 0.00 | 0.58 | 287 | 1686 | 0 | 104 | 714 | 2791 | 0 | 2791 | L100* 7 | 417 | 212 | 14718 | 5.27 |
| | SF | 0.00 | 0.00 | 1.05 | 0 | 0 | 0 | 190 | 1297 | 1486 | 0 | 1486 | L100* 7 | 402 | 204 | 14718 | 9.90 |
| | SS | 0.00 | 0.00 | 0.56 | 0 | 0 | 0 | 100 | 687 | 788 | 0 | 788 | L100* 7 | 402 | 204 | 3108 | 3.94 |
| C 5 | M | 0.00 | 0.38 | 0.97 | 0 | 0 | 1376 | 175 | 1200 | 1375 | 1843 | 1843 | L150*10 | 459 | 154 | 11633 | 6.31 |
| | S | 0.33 | 0.00 | 0.64 | 334 | 1962 | 0 | 115 | 785 | 3195 | 0 | 3195 | L120* 8 | 459 | 193 | 28331 | 8.87 |
| | SF | 0.00 | 0.00 | 1.00 | 0 | 0 | 0 | 179 | 1226 | 1405 | 0 | 1405 | L120* 8 | 443 | 186 | 28331 | 20.16 |
| | SS | 0.00 | 0.00 | 0.62 | 0 | 0 | 0 | 111 | 758 | 869 | 0 | 869 | L120* 8 | 443 | 186 | 5139 | 5.91 |
| C 6 | M | 0.00 | 0.33 | 0.92 | 0 | 0 | 1188 | 165 | 1129 | 1294 | 1663 | 1663 | L150*10 | 500 | 168 | 9791 | 5.89 |
| | S | 0.38 | 0.00 | 0.69 | 386 | 2273 | 0 | 125 | 855 | 3639 | 0 | 3639 | L120* 8 | 500 | 210 | 28331 | 7.78 |
| | SF | 0.00 | 0.00 | 0.94 | 0 | 0 | 0 | 169 | 1155 | 1324 | 0 | 1324 | L120* 8 | 485 | 204 | 28331 | 21.39 |
| | SS | 0.00 | 0.00 | 0.67 | 0 | 0 | 0 | 121 | 829 | 950 | 0 | 950 | L120* 8 | 485 | 204 | 4300 | 4.53 |

# FOUNDATION

(D4)

| No. | | UNIT STRESS G | C1 | C2 | C3 | C4 | C5 | C6 | C1-C3 | C4-C6 | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | 6.139 | 5.299 | 4.358 | 3.417 | 2.114 | 1.419 | 0.724 | 13.074 | 4.257 | |
| | T | 6.139 | 5.299 | 4.358 | 3.417 | 2.114 | 1.419 | 0.724 | 13.074 | 4.257 | |
| 17 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 17 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.671 | -0.510 | -0.331 | -0.152 | 0.097 | 0.229 | 0.362 | -0.993 | 0.688 | |
| | QBs | -0.671 | -0.510 | -0.331 | -0.152 | 0.097 | 0.229 | 0.362 | -0.993 | 0.688 | |
| | C | 5.129 | 4.530 | 3.859 | 3.189 | 2.260 | 1.765 | 1.269 | 11.578 | 5.294 | |
| | T | 5.129 | 4.530 | 3.859 | 3.189 | 2.260 | 1.765 | 1.269 | 11.578 | 5.294 | |
| 18 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 18 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.478 | -0.364 | -0.236 | -0.108 | 0.069 | 0.164 | 0.258 | -0.708 | 0.491 | |
| | QBs | -0.478 | -0.364 | -0.236 | -0.108 | 0.069 | 0.164 | 0.258 | -0.708 | 0.491 | |
| | C | 4.381 | 3.961 | 3.490 | 3.020 | 2.368 | 2.020 | 1.673 | 10.471 | 6.061 | |
| | T | 4.381 | 3.961 | 3.490 | 3.020 | 2.368 | 2.020 | 1.673 | 10.471 | 6.061 | |
| 19 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 19 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.335 | -0.255 | -0.166 | -0.076 | 0.048 | 0.115 | 0.181 | -0.497 | 0.344 | |
| | QBs | -0.335 | -0.255 | -0.166 | -0.076 | 0.048 | 0.115 | 0.181 | -0.497 | 0.344 | |

(D4)

| No. | | HT | HTA | | HC | | | Ha | | | P | | | q | Va | Wc | WT | E | E' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S | F | G | C1-3 | C4-6 | G | C1-3 | C4-6 | G | C1-3 | C4-6 | | | | | | |
| | | | 1.0 | 0.05 | 500 | 1295 | 1020 | 3800 | 8000 | 6000 | 1140 | 2400 | 1800 | | | | | | |
| | C | 18717 | 9182 | 459 | 3066 | 16926 | 4342 | 23328 | 104593 | 25540 | 6998 | 12718 | 3805 | 0 | 687 | 4104 | 10576 | 0 | 0 |
| | T | 18717 | 9182 | 459 | 3066 | 16926 | 4342 | 23328 | 104593 | 25540 | 6998 | 12718 | 3805 | 0 | 0 | 0 | -10576 | 0 | 0 |
| 17 | Qf | 3374 | 0 | 135 | 250 | 1942 | 1530 | 1900 | 12000 | 9000 | 0 | 0 | 0 | 1095 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 3374 | 2699 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 1095 | 0 | 0 | 0 | 0 | 0 |
| | QBf | -195 | 0 | -20 | -335 | -1286 | 702 | -2548 | -7944 | 4130 | 0 | 0 | 0 | 1095 | 0 | 0 | 0 | 0 | 0 |
| | QBs | -195 | -401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 652 | 756 | 0 | 0 | 0 | 0 | 0 |
| | C | 19203 | 8577 | 429 | 2562 | 14990 | 5400 | 19489 | 92625 | 31763 | 5847 | 10872 | 4068 | 0 | 687 | 4104 | 12368 | 0 | 0 |
| | T | 19203 | 8577 | 429 | 2562 | 14990 | 5400 | 19489 | 92625 | 31763 | 5847 | 10872 | 4068 | 0 | 0 | 0 | -12368 | 0 | 0 |
| 18 | Qf | 3892 | 0 | 135 | 250 | 1942 | 1530 | 1900 | 12000 | 9000 | 0 | 0 | 0 | 780 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 3892 | 2699 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 780 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 230 | 0 | -14 | -239 | -916 | 500 | -1816 | -5662 | 2944 | 0 | 0 | 0 | 780 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 230 | -286 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 464 | 539 | 0 | 0 | 0 | 0 | 0 |
| | C | 20866 | 8130 | 406 | 2188 | 13557 | 6182 | 16648 | 83770 | 36367 | 4994 | 9507 | 4262 | 0 | 687 | 4104 | 15434 | 0 | 0 |
| | T | 20866 | 8130 | 406 | 2188 | 13557 | 6182 | 16648 | 83770 | 36367 | 4994 | 9507 | 4262 | 0 | 0 | 0 | -15434 | 0 | 0 |
| 19 | Qf | 4725 | 0 | 135 | 250 | 1942 | 1530 | 1900 | 12000 | 9000 | 0 | 0 | 0 | 547 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 4725 | 2699 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 547 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 746 | 0 | -10 | -168 | -643 | 351 | -1274 | -3973 | 2066 | 0 | 0 | 0 | 547 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 746 | -201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 326 | 378 | 0 | 0 | 0 | 0 | 0 |

# LOAD FOR FOUNDATION

(D4)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (U I) | | |
| 17 | C | 212338 | 150787 | 221616 | 221616 | 42,303 | 17 |
| | T | 186396 | 133406 | 195674 | 195674 | | |
| | Qf | 30131 | 20921 | 5052 | 0 | | |
| | Qs | 6073 | 5606 | 2699 | 0 | | |
| | QBf | 0 | 0 | 0 | 0 | | |
| | QBs | 0 | 812 | 0 | 0 | | |
| 18 | C | 203618 | 143708 | 213261 | 213261 | 49,472 | 18 |
| | T | 174091 | 123925 | 183735 | 183735 | | |
| | Qf | 30648 | 21057 | 5569 | 0 | | |
| | Qs | 6590 | 5742 | 3010 | 0 | | |
| | QBf | 0 | 0 | 0 | 0 | | |
| | QBs | 230 | 826 | 66 | 0 | | |
| 19 | C | 200208 | 140509 | 210904 | 210904 | 61,734 | 19 |
| | T | 164550 | 116618 | 175246 | 175246 | | |
| | Qf | 31481 | 21459 | 6402 | 0 | | |
| | Qs | 7423 | 6144 | 3509 | 0 | | |
| | QBf | 0 | 0 | 136 | 0 | | |
| | QBs | 746 | 971 | 397 | 0 | | |

| TOWER TYPE DR4 | | | |
|---|---|---|---|
| Item | | Calculation | Load (kg) |
| Wind Pressure (HC) | G.W. | $22.2 \times 90 \times 350 \times 10^{-3}$ | 699 |
| | $C_{1-3}$ | $25.30 \times 2 \times 81 \times 350 \times 10^{-3}$ | 1,705 |
| | Ins. | 270 | |
| | $C_{4-6}$ | $36.00 \times 90 \times 350 \times 10^{-3}$ | 1,344 |
| | Ins. | 210 | |
| Horizontal Transverse Component of Tension (Ha) | G.W. | $3,800 \times \sin 37.5^{\circ} \times 2$ | 4,627 |
| | $C_{1-3}$ | $4,000 \times \sin 37.5^{\circ} \times 2 \times 2$ | 9,740 |
| | $C_{4-6}$ | $6,000 \times \sin 37.5^{\circ} \times 2$ | 7,305 |
| Conductor and Insulator Weight (Wc) | G.W. | $1.136 \times 350$ | 398 |
| | $C_{1-3}$ | $1.239 \times 2 \times 350$ | 1,657 |
| | Ins. | 790 | |
| | $C_{4-6}$ | $2.446 \times 350$ | 1,476 |
| | Ins. | 620 | |
| Effect of Vertical Angles (Va) | G.W. | $3,800 \times 0.03$ | 114 |
| | $C_{1-3}$ | $4,000 \times 2 \times 0.03$ | 240 |
| | $C_{4-6}$ | $6,000 \times 0.03$ | 180 |

TOWER BODY

(DR4)

UNIT STRESS

| No. | G | C1 | C2 | C3 | C4 | C5 | C6 | C1-C3 | C4-C6 | No. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.344 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 |
| 2 | 1.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2 |
| 3 | 1.704 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3 |
| 4 | 2.401 | 0.363 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.363 | 0.000 | 4 |
| 5 | 3.049 | 1.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.080 | 0.000 | 5 |
| 6 | 3.670 | 1.766 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.766 | 0.000 | 6 |
| 7 | 4.238 | 2.395 | 0.329 | 0.000 | 0.000 | 0.000 | 0.000 | 2.723 | 0.000 | 7 |
| 8 | 4.771 | 2.984 | 0.981 | 0.000 | 0.000 | 0.000 | 0.000 | 3.965 | 0.000 | 8 |
| 9 | 5.284 | 3.551 | 1.609 | 0.000 | 0.000 | 0.000 | 0.000 | 5.159 | 0.000 | 9 |
| 10 | 5.795 | 4.157 | 2.321 | 0.486 | 0.000 | 0.000 | 0.000 | 6.964 | 0.000 | 10 |
| 11 | 6.265 | 4.759 | 3.071 | 1.383 | 0.000 | 0.000 | 0.000 | 9.214 | 0.000 | 11 |
| 12 | 6.576 | 5.158 | 3.567 | 1.977 | 0.000 | 0.000 | 0.000 | 10.703 | 0.000 | 12 |
| 13 | 6.817 | 5.466 | 3.951 | 2.436 | 0.339 | 0.000 | 0.000 | 11.853 | 0.339 | 13 |
| 14 | 7.041 | 5.752 | 4.308 | 2.863 | 0.863 | 0.000 | 0.000 | 12.923 | 0.863 | 14 |
| 15 | 7.241 | 6.008 | 4.626 | 3.244 | 1.331 | 0.310 | 0.000 | 13.877 | 1.641 | 15 |
| 16 | 7.427 | 6.247 | 4.924 | 3.600 | 1.768 | 0.791 | 0.000 | 14.771 | 2.559 | 16 |
| 17 | 7.053 | 6.017 | 4.857 | 3.696 | 2.089 | 1.232 | 0.375 | 14.570 | 3.696 | 17 |
| 18 | 5.835 | 5.090 | 4.255 | 3.421 | 2.265 | 1.649 | 1.032 | 12.766 | 4.946 | 18 |
| 19 | 5.098 | 4.530 | 3.892 | 3.254 | 2.371 | 1.901 | 1.430 | 11.676 | 5.702 | 19 |
| 20 | 4.711 | 4.235 | 3.701 | 3.167 | 2.427 | 2.033 | 1.639 | 11.102 | 6.099 | 20 |
| 1 | 0.601 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1 |
| 2 | 0.576 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2 |
| 3 | 0.590 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3 |
| 4 | 0.552 | 0.611 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.611 | 0.000 | 4 |
| 5 | 0.536 | 0.593 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.593 | 0.000 | 5 |
| 6 | 0.512 | 0.566 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.566 | 0.000 | 6 |
| 7 | 0.484 | 0.535 | 0.592 | 0.000 | 0.000 | 0.000 | 0.000 | 1.127 | 0.000 | 7 |
| 8 | 0.471 | 0.521 | 0.577 | 0.000 | 0.000 | 0.000 | 0.000 | 1.097 | 0.000 | 8 |
| 9 | 0.452 | 0.500 | 0.554 | 0.000 | 0.000 | 0.000 | 0.000 | 1.054 | 0.000 | 9 |
| 10 | 0.358 | 0.458 | 0.570 | 0.682 | 0.000 | 0.000 | 0.000 | 1.710 | 0.000 | 10 |
| 11 | 0.316 | 0.404 | 0.503 | 0.602 | 0.000 | 0.000 | 0.000 | 1.510 | 0.000 | 11 |
| 12 | 0.238 | 0.304 | 0.379 | 0.453 | 0.000 | 0.000 | 0.000 | 1.137 | 0.000 | 12 |
| 13 | 0.253 | 0.324 | 0.403 | 0.482 | 0.592 | 0.000 | 0.000 | 1.209 | 0.592 | 13 |
| 14 | 0.213 | 0.273 | 0.339 | 0.406 | 0.499 | 0.000 | 0.000 | 1.018 | 0.499 | 14 |
| 15 | 0.224 | 0.287 | 0.357 | 0.428 | 0.525 | 0.577 | 0.000 | 1.072 | 1.102 | 15 |
| 16 | 0.193 | 0.247 | 0.307 | 0.368 | 0.452 | 0.496 | 0.000 | 0.922 | 0.948 | 16 |
| 17 | -1.050 | -0.800 | -0.518 | -0.237 | 0.152 | 0.359 | 0.567 | -1.556 | 1.078 | 17 |
| 18 | -0.771 | -0.587 | -0.380 | -0.174 | 0.111 | 0.264 | 0.416 | -1.141 | 0.791 | 18 |
| 19 | -0.486 | -0.370 | -0.240 | -0.110 | 0.070 | 0.166 | 0.262 | -0.720 | 0.499 | 19 |
| 20 | -0.405 | -0.308 | -0.200 | -0.092 | 0.059 | 0.139 | 0.219 | -0.600 | 0.416 | 20 |

STRESS

| No. | HT | HTA S | HTA F | HTA G | HC C1-3 | HC C4-6 | Ha G | Ha C1-3 | Ha C4-6 | P G | P C1-3 | P C4-6 | q | Va | Wc | WT | E | E' | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | 0.05 | 699 | 1705 | 1344 | 4627 | 9740 | 7305 | 1140 | 2400 | 1800 | | | | | | | |
| 1 | 34 | 33 | 2 | 241 | 0 | 0 | 1593 | 0 | 0 | 393 | 0 | 0 | 0 | 57 | 199 | 182 | 0 | 0 | 1 |
| 2 | 154 | 105 | 5 | 708 | 0 | 0 | 4681 | 0 | 0 | 1153 | 0 | 0 | 0 | 57 | 199 | 266 | 0 | 0 | 2 |
| 3 | 417 | 240 | 12 | 1191 | 0 | 0 | 7882 | 0 | 0 | 1942 | 0 | 0 | 0 | 177 | 1027 | 954 | 0 | 0 | 3 |
| 4 | 844 | 569 | 28 | 1679 | 618 | 0 | 11106 | 3532 | 0 | 2737 | 870 | 0 | 0 | 177 | 1027 | 1161 | 0 | 0 | 4 |
| 5 | 1431 | 1027 | 51 | 2132 | 1841 | 0 | 14108 | 10520 | 0 | 3476 | 2592 | 0 | 0 | 177 | 1027 | 1394 | 0 | 0 | 5 |
| 6 | 2196 | 1508 | 75 | 2566 | 3011 | 0 | 16980 | 17205 | 0 | 4184 | 4239 | 0 | 0 | 297 | 1856 | 2189 | 0 | 0 | 6 |
| 7 | 3123 | 2122 | 106 | 2964 | 4642 | 0 | 19609 | 26526 | 0 | 4832 | 5747 | 0 | 0 | 297 | 1856 | 2575 | 0 | 0 | 7 |
| 8 | 4217 | 2832 | 142 | 3336 | 6758 | 0 | 22074 | 38615 | 0 | 5439 | 7161 | 0 | 0 | 297 | 1856 | 2929 | 0 | 0 | 8 |
| 9 | 5503 | 3551 | 178 | 3695 | 8794 | 0 | 24446 | 50253 | 0 | 6024 | 8522 | 0 | 0 | 417 | 2685 | 3818 | 0 | 0 | 9 |
| 10 | 7346 | 4597 | 230 | 4052 | 11871 | 0 | 26809 | 67835 | 0 | 6606 | 9976 | 0 | 0 | 417 | 2685 | 4739 | 0 | 0 | 10 |
| 11 | 9734 | 5757 | 288 | 4381 | 15705 | 0 | 28986 | 89743 | 0 | 7142 | 11422 | 0 | 0 | 417 | 2685 | 5536 | 0 | 0 | 11 |
| 12 | 11652 | 6518 | 326 | 4599 | 18242 | 0 | 30427 | 104244 | 0 | 7497 | 12378 | 0 | 0 | 507 | 3423 | 6399 | 0 | 0 | 12 |
| 13 | 13536 | 7264 | 363 | 4767 | 20203 | 456 | 31540 | 115448 | 2477 | 7771 | 13117 | 610 | 0 | 507 | 3423 | 7389 | 0 | 0 | 13 |
| 14 | 15521 | 7991 | 400 | 4924 | 22027 | 1160 | 32576 | 125872 | 6306 | 8027 | 13805 | 1554 | 0 | 597 | 4161 | 8472 | 0 | 0 | 14 |
| 15 | 17670 | 8772 | 439 | 5063 | 23654 | 2205 | 33499 | 135166 | 11986 | 8254 | 14418 | 2395 | 0 | 597 | 4161 | 9570 | 0 | 0 | 15 |
| 16 | 19913 | 9528 | 476 | 5194 | 25177 | 3440 | 34364 | 143869 | 18696 | 8467 | 14992 | 3183 | 0 | 687 | 4899 | 10688 | 0 | 0 | 16 |
| 17 | 21214 | 9427 | 471 | 4932 | 24834 | 4967 | 32630 | 141910 | 26998 | 8040 | 14441 | 3760 | 0 | 687 | 4899 | 11856 | 0 | 0 | 17 |
| 18 | 21151 | 8708 | 435 | 4080 | 21761 | 6647 | 26996 | 124347 | 36130 | 6652 | 12216 | 4077 | 0 | 687 | 4899 | 13647 | 0 | 0 | 18 |
| 19 | 21725 | 8328 | 416 | 3565 | 19901 | 7663 | 23588 | 113723 | 41653 | 5812 | 10871 | 4259 | 0 | 687 | 4899 | 15372 | 0 | 0 | 19 |
| 20 | 22706 | 8095 | 405 | 3295 | 18924 | 8197 | 21797 | 108140 | 44556 | 5371 | 10164 | 4369 | 0 | 687 | 4899 | 17702 | 0 | 0 | 20 |
| 1 | 59 | 55 | 3 | 420 | 0 | 0 | 2778 | 0 | 0 | 685 | 0 | 0 | 892 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 154 | 71 | 4 | 403 | 0 | 0 | 2664 | 0 | 0 | 656 | 0 | 0 | 855 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3 | 283 | 146 | 7 | 413 | 0 | 0 | 2730 | 0 | 0 | 673 | 0 | 0 | 877 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 421 | 386 | 19 | 386 | 1041 | 0 | 2556 | 5950 | 0 | 630 | 1466 | 0 | 3299 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 562 | 374 | 19 | 375 | 1011 | 0 | 2481 | 5775 | 0 | 611 | 1423 | 0 | 3202 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 732 | 428 | 21 | 358 | 965 | 0 | 2370 | 5517 | 0 | 584 | 1359 | 0 | 3058 | 0 | 0 | 0 | 0 | 0 | 6 |
| 7 | 897 | 639 | 32 | 338 | 1920 | 0 | 2237 | 10974 | 0 | 551 | 1421 | 0 | 2887 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8 | 1063 | 622 | 31 | 329 | 1871 | 0 | 2179 | 10690 | 0 | 537 | 1384 | 0 | 2813 | 0 | 0 | 0 | 0 | 0 | 8 |
| 9 | 1255 | 662 | 33 | 316 | 1797 | 0 | 2093 | 10268 | 0 | 516 | 1329 | 0 | 2701 | 0 | 0 | 0 | 0 | 0 | 9 |
| 10 | 1608 | 853 | 43 | 250 | 2915 | 0 | 1655 | 16657 | 0 | 408 | 1637 | 0 | 3034 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | 1820 | 758 | 38 | 221 | 2574 | 0 | 1461 | 14708 | 0 | 360 | 1446 | 0 | 2679 | 0 | 0 | 0 | 0 | 0 | 11 |
| 12 | 1677 | 631 | 32 | 166 | 1938 | 0 | 1100 | 11072 | 0 | 271 | 1088 | 0 | 2017 | 0 | 0 | 0 | 0 | 0 | 12 |
| 13 | 2110 | 809 | 40 | 177 | 2060 | 796 | 1170 | 11772 | 4324 | 288 | 1157 | 1066 | 2144 | 0 | 0 | 0 | 0 | 0 | 13 |
| 14 | 2091 | 732 | 37 | 149 | 1735 | 670 | 985 | 9914 | 3642 | 243 | 975 | 897 | 1806 | 0 | 0 | 0 | 0 | 0 | 14 |
| 15 | 2554 | 899 | 45 | 157 | 1827 | 1481 | 1037 | 10441 | 8050 | 256 | 1026 | 1039 | 1902 | 0 | 0 | 0 | 0 | 0 | 15 |
| 16 | 2527 | 819 | 41 | 135 | 1572 | 1274 | 892 | 8981 | 6924 | 220 | 883 | 893 | 1636 | 0 | 0 | 0 | 0 | 0 | 16 |
| 17 | -409 | 563 | 28 | -735 | -2651 | 1449 | -4860 | -15151 | 7877 | -1198 | -570 | 1021 | 1715 | 0 | 0 | 0 | 0 | 0 | 17 |
| 18 | 305 | 407 | 20 | -539 | -1946 | 1063 | -3566 | -11118 | 5780 | -879 | -418 | 749 | 1258 | 0 | 0 | 0 | 0 | 0 | 18 |
| 19 | 836 | 290 | 14 | -340 | -1227 | 671 | -2250 | -7013 | 3646 | -554 | -264 | 472 | 794 | 0 | 0 | 0 | 0 | 0 | 19 |
| 20 | 1433 | 242 | 12 | -283 | -1022 | 559 | -1874 | -5842 | 3038 | -462 | -220 | 394 | 661 | 0 | 0 | 0 | 0 | 0 | 20 |

(DR4)

| No. | DESIGN STRESS | | | MAX | SIZE | Lk | L/r | STRENGTH | S.F | WT | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NML | A.NML | DIAG.WIND | (U1) | | | | (U2) | U2/U1 | | |
| 1 | 2307 | 1808 | 2261 | 2307 | L100*10 | 180 | 92 | 19290 | 8.36 | 726 | 1 |
| 2 | 6069 | 4839 | 6032 | 6069 | L100*10 | 180 | 92 | 19290 | 3.18 | 1,063 | 2 |
| 3 | 11661 | 9114 | 11722 | 11722 | L100*10 | 220 | 113 | 14166 | 1.21 | 3,814 | 3 |
| 4 | 20173 | 15349 | 20361 | 20361 | L175*12 | 210 | 61 | 77160 | 3.79 | 4,642 | 4 |
| 5 | 32682 | 24226 | 33009 | 33009 | L175*12 | 220 | 64 | 74667 | 2.26 | 5,576 | 5 |
| 6 | 46375 | 33912 | 46977 | 46977 | L175*12 | 220 | 64 | 74667 | 1.59 | 8,757 | 6 |
| 7 | 61697 | 45188 | 62624 | 62624 | L200*20 | 210 | 54 | 153131 | 2.45 | 10,301 | 7 |
| 8 | 80223 | 58547 | 81504 | 81504 | L200*20 | 220 | 56 | 149630 | 1.84 | 11,714 | 8 |
| 9 | 99788 | 72568 | 101566 | 101566 | L200*20 | 220 | 56 | 149630 | 1.47 | 15,273 | 9 |
| 10 | 125983 | 91093 | 128478 | 128478 | L250*25 | 188 | 38 | 268459 | 2.09 | 18,957 | 10 |
| 11 | 157473 | 113160 | 160883 | 160883 | L250*25 | 188 | 38 | 268653 | 1.67 | 22,143 | 11 |
| 12 | 179818 | 128771 | 184032 | 184032 | L250*25 | 180 | 37 | 270830 | 1.47 | 25,595 | 12 |
| 13 | 200108 | 142861 | 205142 | 205142 | L250*35 | 155 | 32 | 377619 | 1.84 | 29,555 | 13 |
| 14 | 222015 | 157999 | 227896 | 227896 | L250*35 | 180 | 37 | 367759 | 1.61 | 33,890 | 14 |
| 15 | 244010 | 173147 | 250829 | 250829 | L250*35 | 154 | 32 | 377760 | 1.51 | 38,282 | 15 |
| 16 | 267401 | 189203 | 275183 | 275183 | L250*35 | 180 | 37 | 367759 | 1.34 | 42,751 | 16 |
| 17 | 275398 | 194192 | 283686 | 283686 | L250*35 | 150 | 31 | 379236 | 1.34 | 47,425 | 17 |
| 18 | 260780 | 182907 | 269267 | 269267 | L250*35 | 221 | 46 | 349227 | 1.30 | 54,587 | 18 |
| 19 | 253194 | 176923 | 262194 | 262194 | L250*35 | 141 | 29 | 382319 | 1.46 | 61,486 | 19 |
| 20 | 251308 | 175186 | 260971 | 260971 | L250*35 | 163 | 34 | 374511 | 1.44 | 70,809 | 20 |
| 1 | 3260 | 2782 | 0 | 3260 | L 65* 6 | 144 | 113 | 5181 | 1.59 | | 1 |
| 2 | 3224 | 2733 | 0 | 3224 | L 65* 6 | 147 | 115 | 5042 | 1.56 | | 2 |
| 3 | 3433 | 2887 | 0 | 3433 | L 65* 6 | 161 | 127 | 4378 | 1.28 | | 3 |
| 4 | 10374 | 9161 | 0 | 10374 | L100* 7 | 162 | 82 | 12578 | 1.21 | | 4 |
| 5 | 10222 | 8994 | 0 | 10222 | L100*10 | 168 | 86 | 16948 | 1.66 | | 5 |
| 6 | 9964 | 8725 | 0 | 9964 | L100* 7 | 172 | 87 | 12048 | 1.21 | | 6 |
| 7 | 16399 | 12922 | 0 | 16399 | L130* 9 | 173 | 67 | 22740 | 1.39 | | 7 |
| 8 | 16163 | 12713 | 0 | 16163 | L130* 9 | 179 | 70 | 22740 | 1.41 | | 8 |
| 9 | 15762 | 12371 | 0 | 15762 | L130* 9 | 183 | 71 | 22740 | 1.44 | | 9 |
| 10 | 23127 | 17528 | 0 | 23127 | L150*12 | 238 | 80 | 32617 | 1.41 | | 10 |
| 11 | 20823 | 15746 | 0 | 20823 | L150*10 | 247 | 83 | 26742 | 1.28 | | 11 |
| 12 | 15984 | 12061 | 0 | 15984 | L130* 9 | 205 | 80 | 21412 | 1.34 | | 12 |
| 13 | 22448 | 16477 | 0 | 22448 | L150*10 | 243 | 82 | 27049 | 1.20 | | 13 |
| 14 | 19222 | 14089 | 0 | 19222 | L150*10 | 222 | 75 | 28617 | 1.49 | | 14 |
| 15 | 25593 | 18422 | 0 | 25593 | L150*12 | 258 | 87 | 30758 | 1.20 | | 15 |
| 16 | 22346 | 16068 | 0 | 22346 | L150*10 | 240 | 81 | 27320 | 1.22 | | 16 |
| 17 | 154 | 1936 | 0 | 1936 | L 65* 6 | 204 | 161 | 2759 | 1.43 | | 17 |
| 18 | 713 | 1822 | 0 | 1822 | L 80* 6 | 293 | 185 | 2582 | 1.42 | | 18 |
| 19 | 1126 | 1602 | 0 | 1602 | L 75* 6 | 289 | 135 | 2171 | 1.35 | | 19 |
| 20 | 1675 | 1829 | 0 | 1829 | L 90* 6 | 343 | 192 | 2705 | 1.48 | | 20 |

## CROSSARM

(DR4)

| | | UNIT STRESS | | | | Hc | Hs | P | Va | Vc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G | 699 | 1344 | 2280 | 114 | 398 | | | | | | | | |
| | | | | | UC | 1705 | 9740 | 4800 | 240 | 1657 | NML | A.NML | U1 | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| | | | | | LC | 1344 | 7305 | 3600 | 180 | 1476 | | | | | | | | |
| G | M | 0.59 | 0.95 | 0.67 | | 412 | 792 | 2157 | 76 | 265 | 3701 | 0 | 3701 | L 90* 6 | 240 | 135 | 5532 | 1.49 |
| | S | 0.00 | 0.00 | 0.83 | | 0 | 0 | 0 | 95 | 330 | 424 | 0 | 424 | L 70* 6 | 299 | 218 | 1625 | 3.83 |
| | X | 0.00 | 0.11 | 0.00 | | 0 | 0 | 245 | 0 | 0 | 0 | 164 | 164 | L 45* 4 | 179 | 203 | 801 | 4.89 |
| C 1 | M | 0.52 | 1.82 | 1.16 | | 886 | 5065 | 8736 | 278 | 1919 | 16885 | 0 | 16885 | L175*15 | 510 | 149 | 21483 | 1.27 |
| | S | 0.00 | 0.00 | 1.27 | | 0 | 0 | 0 | 305 | 2103 | 2407 | 0 | 2407 | L130* 9 | 558 | 217 | 34999 | 14.54 |
| | X | 0.00 | 0.44 | 0.00 | | 0 | 0 | 2121 | 0 | 0 | 0 | 1421 | 1421 | L 60* 5 | 198 | 168 | 1958 | 1.38 |
| C 2 | M | 0.53 | 1.61 | 1.14 | | 896 | 5123 | 7737 | 273 | 1882 | 15910 | 0 | 15910 | L175*15 | 500 | 146 | 22348 | 1.40 |
| | S | 0.00 | 0.00 | 1.25 | | 0 | 0 | 0 | 299 | 2068 | 2367 | 0 | 2367 | L130* 9 | 549 | 214 | 34999 | 14.79 |
| | X | 0.00 | 0.36 | 0.00 | | 0 | 0 | 1752 | 0 | 0 | 0 | 1174 | 1174 | L 60* 5 | 219 | 186 | 1597 | 1.36 |
| C 3 | M | 0.53 | 1.44 | 1.11 | | 909 | 5192 | 6923 | 267 | 1847 | 15139 | 0 | 15139 | L175*12 | 490 | 143 | 18941 | 1.25 |
| | S | 0.00 | 0.00 | 1.23 | | 0 | 0 | 0 | 295 | 2035 | 2330 | 0 | 2330 | L130* 9 | 540 | 210 | 34999 | 15.02 |
| | X | 0.00 | 0.30 | 0.00 | | 0 | 0 | 1447 | 0 | 0 | 0 | 970 | 970 | L 60* 5 | 240 | 204 | 1328 | 1.37 |
| C 4 | M | 0.57 | 1.02 | 1.18 | | 771 | 4190 | 3673 | 213 | 1746 | 10594 | 0 | 10594 | L150*10 | 426 | 143 | 13493 | 1.27 |
| | S | 0.00 | 0.00 | 1.29 | | 0 | 0 | 0 | 233 | 1908 | 2140 | 0 | 2140 | L120* 8 | 465 | 195 | 28331 | 13.24 |
| | X | 0.00 | 0.14 | 0.00 | | 0 | 0 | 496 | 0 | 0 | 0 | 332 | 332 | L 70* 6 | 295 | 215 | 1663 | 5.01 |
| C 5 | M | 0.60 | 0.91 | 1.16 | | 803 | 4365 | 3288 | 209 | 1718 | 10383 | 0 | 10383 | L150*10 | 419 | 141 | 13943 | 1.34 |
| | S | 0.00 | 0.00 | 1.27 | | 0 | 0 | 0 | 229 | 1879 | 2108 | 0 | 2108 | L120* 8 | 458 | 193 | 28331 | 13.44 |
| | X | 0.00 | 0.09 | 0.00 | | 0 | 0 | 337 | 0 | 0 | 0 | 225 | 225 | L 75* 6 | 324 | 219 | 1726 | 7.66 |
| C 6 | M | 0.63 | 0.83 | 1.15 | | 843 | 4582 | 2981 | 207 | 1698 | 10311 | 0 | 10311 | L150*10 | 414 | 139 | 14281 | 1.39 |
| | S | 0.00 | 0.00 | 1.26 | | 0 | 0 | 0 | 226 | 1857 | 2084 | 0 | 2084 | L120* 8 | 453 | 190 | 28331 | 13.60 |
| | X | 0.00 | 0.06 | 0.00 | | 0 | 0 | 204 | 0 | 0 | 0 | 136 | 136 | L 90* 6 | 354 | 199 | 2540 | 18.62 |

## CROSSARM

(DR4)

| | | UNIT STRESS AH | AP | AV | Hc | Ha | P | Va | Wc | DESIGN STRESS NML | A.NML | MAX U1 | SIZE | STRENGTH OF MEMBER L | L/r | STRENGTH (U2) | S.F U2/U1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | G 699 | 1344 | 2280 | 114 | 398 | | | | | | | | |
| | | | | | UC 1705 | 9740 | 4800 | 240 | 1657 | | | | | | | | |
| | | | | | LC 1344 | 7305 | 3600 | 180 | 1476 | | | | | | | | |
| G | M | 0.59 | 0.95 | 0.67 | 412 | 792 | 2157 | 76 | 265 | 3701 | 0 | 3701 | L 90* 6 | 240 | 135 | 5532 | 1.49 |
| | S | 0.00 | 0.00 | 0.83 | 0 | 0 | 0 | 95 | 330 | 424 | 0 | 424 | L 70* 6 | 299 | 218 | 1625 | 3.83 |
| | X | 0.00 | 0.11 | 0.00 | 0 | 0 | 245 | 0 | 0 | 0 | 164 | 164 | L 45* 4 | 179 | 203 | 801 | 4.89 |
| C 1 | M | 0.50 | 0.88 | 1.11 | 852 | 4870 | 4200 | 267 | 1845 | 12035 | 0 | 12035 | L175*12 | 490 | 142 | 18972 | 1.58 |
| | S | 0.00 | 0.00 | 1.23 | 0 | 0 | 0 | 296 | 2041 | 2336 | 0 | 2336 | L130* 9 | 542 | 211 | 34999 | 14.98 |
| | X | 0.00 | 0.44 | 0.00 | 0 | 0 | 2121 | 0 | 0 | 0 | 1421 | 1421 | L 60* 5 | 198 | 168 | 1958 | 1.38 |
| C 2 | M | 0.50 | 0.77 | 1.08 | 852 | 4870 | 3677 | 259 | 1789 | 11448 | 0 | 11448 | L175*12 | 475 | 138 | 20189 | 1.76 |
| | S | 0.00 | 0.00 | 1.20 | 0 | 0 | 0 | 288 | 1989 | 2277 | 0 | 2277 | L130* 9 | 528 | 205 | 34999 | 15.37 |
| | X | 0.00 | 0.36 | 0.00 | 0 | 0 | 1752 | 0 | 0 | 0 | 1174 | 1174 | L 60* 5 | 219 | 186 | 1597 | 1.36 |
| C 3 | M | 0.50 | 0.68 | 1.05 | 852 | 4870 | 3247 | 251 | 1733 | 10953 | 0 | 10953 | L150*12 | 460 | 155 | 13677 | 1.25 |
| | S | 0.00 | 0.00 | 1.17 | 0 | 0 | 0 | 281 | 1938 | 2218 | 0 | 2218 | L120* 8 | 514 | 216 | 28331 | 12.77 |
| | X | 0.00 | 0.30 | 0.00 | 0 | 0 | 1447 | 0 | 0 | 0 | 970 | 970 | L 60* 5 | 240 | 204 | 1328 | 1.37 |
| C 4 | M | 0.50 | 0.44 | 1.03 | 672 | 3653 | 1601 | 186 | 1522 | 7634 | 0 | 7634 | L130* 9 | 371 | 144 | 10350 | 1.36 |
| | S | 0.00 | 0.00 | 1.17 | 0 | 0 | 0 | 210 | 1720 | 1930 | 0 | 1930 | L100* 7 | 420 | 213 | 14718 | 7.62 |
| | X | 0.00 | 0.14 | 0.00 | 0 | 0 | 496 | 0 | 0 | 0 | 332 | 332 | L 70* 6 | 295 | 215 | 1663 | 5.01 |
| C 5 | M | 0.50 | 0.38 | 0.97 | 672 | 3653 | 1376 | 175 | 1438 | 7314 | 0 | 7314 | L130* 9 | 351 | 136 | 11605 | 1.59 |
| | S | 0.00 | 0.00 | 1.11 | 0 | 0 | 0 | 201 | 1644 | 1845 | 0 | 1845 | L100* 7 | 401 | 204 | 14718 | 7.98 |
| | X | 0.00 | 0.09 | 0.00 | 0 | 0 | 337 | 0 | 0 | 0 | 225 | 225 | L 75* 6 | 324 | 219 | 1726 | 7.66 |
| C 6 | M | 0.50 | 0.33 | 0.92 | 672 | 3653 | 1188 | 165 | 1353 | 7031 | 0 | 7031 | L120* 8 | 330 | 139 | 9270 | 1.32 |
| | S | 0.00 | 0.00 | 1.06 | 0 | 0 | 0 | 191 | 1569 | 1761 | 0 | 1761 | L 90* 6 | 383 | 215 | 11224 | 6.38 |
| | X | 0.00 | 0.06 | 0.00 | 0 | 0 | 204 | 0 | 0 | 0 | 136 | 136 | L 90* 6 | 354 | 199 | 2540 | 18.62 |

## CROSSARM ( IN TOWER BODY )

(DR4)

| | | UNIT STRESS | | | Hc | He | P | Va | Wc | DESIGN STRESS | | MAX | STRENGTH OF MEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AH | AP | AV | G 699<br>UC 1705<br>LC 1344 | 1344<br>9740<br>7305 | 2280<br>4800<br>3600 | 114<br>240<br>180 | 398<br>1657<br>1476 | NML | A.NML | (U) | SIZE | L | L/r | STRENGTH (U2) | S.F U2/U1 |
| G | M | 0.00 | 0.40 | 0.57 | 0 | 0 | 916 | 64 | 225 | 289 | 807 | 807 | L 90* 6 | 253 | 142 | 4953 | 6.14 |
| | S | 0.31 | 0.00 | 0.35 | 218 | 418 | 0 | 40 | 140 | 816 | 0 | 816 | L 60* 4 | 253 | 213 | 4585 | 5.62 |
| | SF | 0.00 | 0.00 | 0.55 | 0 | 0 | 0 | 63 | 220 | 283 | 0 | 283 | L 60* 4 | 262 | 220 | 4585 | 16.19 |
| | SS | 0.00 | 0.00 | 0.36 | 0 | 0 | 0 | 41 | 144 | 186 | 0 | 186 | L 60* 4 | 253 | 213 | 985 | 5.30 |
| C 1 | M | 0.00 | 0.88 | 1.11 | 0 | 0 | 4200 | 267 | 1846 | 2113 | 4230 | 4230 | L175*15 | 280 | 82 | 46502 | 10.99 |
| | S | 0.14 | 0.00 | 0.32 | 244 | 1391 | 0 | 76 | 527 | 2239 | 0 | 2239 | L 70* 6 | 280 | 204 | 8226 | 3.67 |
| | SF | 0.00 | 0.00 | 1.13 | 0 | 0 | 0 | 270 | 1865 | 2135 | 0 | 2135 | L 65* 6 | 270 | 212 | 7483 | 3.51 |
| | SS | 0.00 | 0.00 | 0.31 | 0 | 0 | 0 | 74 | 508 | 582 | 0 | 582 | L 65* 6 | 270 | 212 | 1584 | 2.72 |
| C 2 | M | 0.00 | 0.77 | 1.08 | 0 | 0 | 3677 | 259 | 1789 | 2048 | 3836 | 3836 | L175*15 | 310 | 91 | 43145 | 11.25 |
| | S | 0.16 | 0.00 | 0.35 | 278 | 1589 | 0 | 85 | 584 | 2536 | 0 | 2536 | L 75* 6 | 310 | 209 | 8968 | 3.54 |
| | SF | 0.00 | 0.00 | 1.09 | 0 | 0 | 0 | 262 | 1808 | 2070 | 0 | 2070 | L 70* 6 | 300 | 219 | 8226 | 3.97 |
| | SS | 0.00 | 0.00 | 0.34 | 0 | 0 | 0 | 82 | 565 | 646 | 0 | 646 | L 70* 6 | 300 | 219 | 1612 | 2.49 |
| C 3 | M | 0.00 | 0.68 | 1.05 | 0 | 0 | 3247 | 251 | 1733 | 1984 | 3505 | 3505 | L175*12 | 340 | 99 | 32289 | 9.21 |
| | S | 0.18 | 0.00 | 0.39 | 315 | 1800 | 0 | 93 | 640 | 2848 | 0 | 2848 | L 80* 6 | 340 | 215 | 9711 | 3.41 |
| | SF | 0.00 | 0.00 | 1.06 | 0 | 0 | 0 | 254 | 1752 | 2005 | 0 | 2005 | L 80* 6 | 330 | 209 | 9711 | 4.84 |
| | SS | 0.00 | 0.00 | 0.37 | 0 | 0 | 0 | 90 | 621 | 711 | 0 | 711 | L 80* 6 | 330 | 209 | 2033 | 2.86 |
| C 4 | M | 0.00 | 0.44 | 1.03 | 0 | 0 | 1601 | 186 | 1522 | 1708 | 2217 | 2217 | L150*10 | 417 | 141 | 14048 | 6.34 |
| | S | 0.28 | 0.00 | 0.58 | 378 | 2053 | 0 | 104 | 856 | 3391 | 0 | 3391 | L100* 7 | 417 | 212 | 14718 | 4.34 |
| | SF | 0.00 | 0.00 | 1.05 | 0 | 0 | 0 | 190 | 1554 | 1744 | 0 | 1744 | L100* 7 | 402 | 204 | 14718 | 8.44 |
| | SS | 0.00 | 0.00 | 0.56 | 0 | 0 | 0 | 100 | 824 | 925 | 0 | 925 | L100* 7 | 402 | 204 | 3108 | 3.36 |
| C 5 | M | 0.00 | 0.38 | 0.97 | 0 | 0 | 1376 | 175 | 1438 | 1613 | 2003 | 2003 | L150*10 | 459 | 154 | 11633 | 5.81 |
| | S | 0.33 | 0.00 | 0.64 | 440 | 2389 | 0 | 115 | 940 | 3884 | 0 | 3884 | L120* 8 | 459 | 193 | 28331 | 7.29 |
| | SF | 0.00 | 0.00 | 1.00 | 0 | 0 | 0 | 179 | 1469 | 1649 | 0 | 1649 | L120* 8 | 443 | 186 | 28331 | 17.18 |
| | SS | 0.00 | 0.00 | 0.62 | 0 | 0 | 0 | 111 | 909 | 1019 | 0 | 1019 | L120* 8 | 443 | 186 | 5139 | 5.04 |
| C 6 | M | 0.00 | 0.33 | 0.92 | 0 | 0 | 1188 | 165 | 1353 | 1518 | 1813 | 1813 | L150*10 | 500 | 168 | 9791 | 5.40 |
| | S | 0.38 | 0.00 | 0.69 | 509 | 2767 | 0 | 125 | 1025 | 4426 | 0 | 4426 | L120* 8 | 500 | 210 | 26699 | 6.03 |
| | SF | 0.00 | 0.00 | 0.94 | 0 | 0 | 0 | 169 | 1385 | 1554 | 0 | 1554 | L120* 8 | 485 | 204 | 28331 | 18.23 |
| | SS | 0.00 | 0.00 | 0.67 | 0 | 0 | 0 | 121 | 993 | 1114 | 0 | 1114 | L120* 8 | 485 | 204 | 4300 | 3.86 |

# FOUNDATION

(DR4)

| No. | | UNIT STRESS G | C1 | C2 | C3 | C4 | C5 | C6 | C1-C3 | C4-C6 | No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | 6.139 | 5.299 | 4.358 | 3.417 | 2.114 | 1.419 | 0.724 | 13.074 | 4.257 | |
| | T | 6.139 | 5.299 | 4.358 | 3.417 | 2.114 | 1.419 | 0.724 | 13.074 | 4.257 | |
| 17 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 17 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.671 | -0.510 | -0.331 | -0.152 | 0.097 | 0.229 | 0.362 | -0.993 | 0.688 | |
| | QBs | -0.671 | -0.510 | -0.331 | -0.152 | 0.097 | 0.229 | 0.362 | -0.993 | 0.688 | |
| | C | 5.129 | 4.530 | 3.859 | 3.189 | 2.260 | 1.765 | 1.269 | 11.578 | 5.294 | |
| | T | 5.129 | 4.530 | 3.859 | 3.189 | 2.260 | 1.765 | 1.269 | 11.578 | 5.294 | |
| 18 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 18 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.478 | -0.364 | -0.236 | -0.108 | 0.069 | 0.164 | 0.258 | -0.708 | 0.491 | |
| | QBs | -0.478 | -0.364 | -0.236 | -0.108 | 0.069 | 0.164 | 0.258 | -0.708 | 0.491 | |
| | C | 4.717 | 4.216 | 3.656 | 3.096 | 2.319 | 1.906 | 1.492 | 10.968 | 5.717 | |
| | T | 4.717 | 4.216 | 3.656 | 3.096 | 2.319 | 1.906 | 1.492 | 10.968 | 5.717 | |
| 19 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 19 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.399 | -0.304 | -0.197 | -0.090 | 0.058 | 0.137 | 0.216 | -0.591 | 0.410 | |
| | QBs | -0.399 | -0.304 | -0.197 | -0.090 | 0.058 | 0.137 | 0.216 | -0.591 | 0.410 | |
| | C | 4.381 | 3.961 | 3.490 | 3.020 | 2.368 | 2.020 | 1.673 | 10.471 | 6.061 | |
| | T | 4.381 | 3.961 | 3.490 | 3.020 | 2.368 | 2.020 | 1.673 | 10.471 | 6.061 | |
| 20 | Qf | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | 20 |
| | Qs | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 1.500 | 1.500 | |
| | QBf | -0.335 | -0.255 | -0.166 | -0.076 | 0.048 | 0.115 | 0.181 | -0.497 | 0.344 | |
| | QBs | -0.335 | -0.255 | -0.166 | -0.076 | 0.048 | 0.115 | 0.181 | -0.497 | 0.344 | |

(DR4)

| No. | | HT | HTA | | HC | | | Ha | | | P | | | q | Va | Wc | WT | E | E' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S | F | G | C1-3 | C4-6 | G | C1-3 | C4-6 | G | C1-3 | C4-6 | | | | | | |
| | | | 1.0 | 0.05 | 699 | 1705 | 1344 | 4627 | 9740 | 7305 | 1140 | 2400 | 1800 | | | | | | |
| | C | 20221 | 8958 | 448 | 4293 | 22285 | 5721 | 28402 | 127344 | 31096 | 6998 | 12718 | 3805 | 0 | 687 | 4899 | 11856 | 0 | 0 |
| | T | 20221 | 8958 | 448 | 4293 | 22285 | 5721 | 28402 | 127344 | 31096 | 6998 | 12718 | 3805 | 0 | 0 | 0 | -11856 | 0 | 0 |
| 17 | Qf | 3595 | 0 | 129 | 350 | 2557 | 2016 | 2313 | 14610 | 10958 | 0 | 0 | 0 | 1095 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 3595 | 2582 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 1095 | 0 | 0 | 0 | 0 | 0 |
| | QBf | -261 | 0 | -21 | -469 | -1692 | 925 | -3102 | -9671 | 5028 | 0 | 0 | 0 | 1095 | 0 | 0 | 0 | 0 | 0 |
| | QBs | -261 | -417 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 652 | 756 | 0 | 0 | 0 | 0 | 0 |
| | C | 20621 | 8330 | 416 | 3586 | 19735 | 7115 | 23728 | 112773 | 38672 | 5847 | 10872 | 4068 | 0 | 687 | 4899 | 13647 | 0 | 0 |
| | T | 20621 | 8330 | 416 | 3586 | 19735 | 7115 | 23728 | 112773 | 38672 | 5847 | 10872 | 4068 | 0 | 0 | 0 | -13647 | 0 | 0 |
| 18 | Qf | 4121 | 0 | 129 | 350 | 2557 | 2016 | 2313 | 14610 | 10958 | 0 | 0 | 0 | 780 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 4121 | 2582 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 780 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 189 | 0 | -15 | -334 | -1206 | 659 | -2211 | -6893 | 3584 | 0 | 0 | 0 | 780 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 189 | -297 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 464 | 539 | 0 | 0 | 0 | 0 | 0 |
| | C | 21330 | 8073 | 404 | 3298 | 18695 | 7683 | 21821 | 106829 | 41762 | 5377 | 10119 | 4175 | 0 | 687 | 4899 | 15372 | 0 | 0 |
| | T | 21330 | 8073 | 404 | 3298 | 18695 | 7683 | 21821 | 106829 | 41762 | 5377 | 10119 | 4175 | 0 | 0 | 0 | -15372 | 0 | 0 |
| 19 | Qf | 4754 | 0 | 129 | 350 | 2557 | 2016 | 2313 | 14610 | 10958 | 0 | 0 | 0 | 652 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 4754 | 2582 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 652 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 687 | 0 | -12 | -279 | -1008 | 551 | -1848 | -5760 | 2995 | 0 | 0 | 0 | 652 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 687 | -249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 388 | 450 | 0 | 0 | 0 | 0 | 0 |
| | C | 22517 | 7864 | 393 | 3064 | 17848 | 8146 | 20270 | 101991 | 44277 | 4994 | 9507 | 4262 | 0 | 687 | 4899 | 17702 | 0 | 0 |
| | T | 22517 | 7864 | 393 | 3064 | 17848 | 8146 | 20270 | 101991 | 44277 | 4994 | 9507 | 4262 | 0 | 0 | 0 | -17702 | 0 | 0 |
| 20 | Qf | 5480 | 0 | 129 | 350 | 2557 | 2016 | 2313 | 14610 | 10958 | 0 | 0 | 0 | 547 | 0 | 0 | 0 | 0 | 0 |
| | Qs | 5480 | 2582 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 570 | 1200 | 900 | 547 | 0 | 0 | 0 | 0 | 0 |
| | QBf | 1187 | 0 | -10 | -235 | -846 | 463 | -1552 | -4837 | 2515 | 0 | 0 | 0 | 547 | 0 | 0 | 0 | 0 | 0 |
| | QBs | 1187 | -209 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 326 | 378 | 0 | 0 | 0 | 0 | 0 |

# LOAD FOR FOUNDATION

(DR4)

| No. | | DESIGN STRESS | | | MAX | WT | No. |
|---|---|---|---|---|---|---|---|
| | | NML | A.NML | DIAG.WIND | (UI) | | |
| 17 | C | 257252 | 180880 | 265341 | 265341 | 47,425 | 17 |
| | T | 227954 | 161250 | 236043 | 236043 | | |
| | Qf | 36527 | 25207 | 5807 | 0 | | |
| | Qs | 6176 | 5675 | 2802 | 0 | | |
| | QBf | 0 | 0 | 0 | 0 | | |
| | QBs | 0 | 768 | 0 | 0 | | |
| 18 | C | 245879 | 172024 | 254391 | 254391 | 54,587 | 18 |
| | T | 213000 | 149995 | 221512 | 221512 | | |
| | Qf | 37054 | 25349 | 6333 | 0 | | |
| | Qs | 6703 | 5818 | 3118 | 0 | | |
| | QBf | 0 | 0 | 0 | 0 | | |
| | QBs | 189 | 799 | 39 | 0 | | |
| 19 | C | 242780 | 169442 | 251791 | 251791 | 61,486 | 19 |
| | T | 206451 | 145102 | 215462 | 215462 | | |
| | Qf | 37687 | 25687 | 6966 | 0 | | |
| | Qs | 7336 | 6156 | 3498 | 0 | | |
| | QBf | 0 | 0 | 0 | 0 | | |
| | QBs | 687 | 1022 | 350 | 0 | | |
| 20 | C | 241795 | 168372 | 251579 | 251579 | 70,809 | 20 |
| | T | 200804 | 140908 | 210589 | 210589 | | |
| | Qf | 38413 | 26103 | 7692 | 0 | | |
| | Qs | 8062 | 6572 | 3933 | 0 | | |
| | QBf | 0 | 0 | 373 | 0 | | |
| | QBs | 1187 | 1267 | 660 | 0 | | |