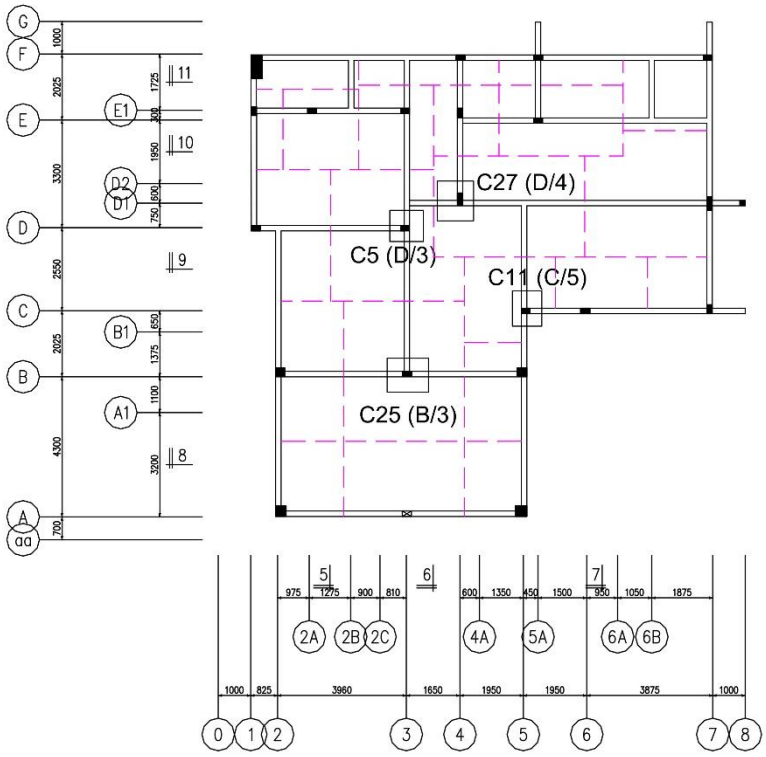
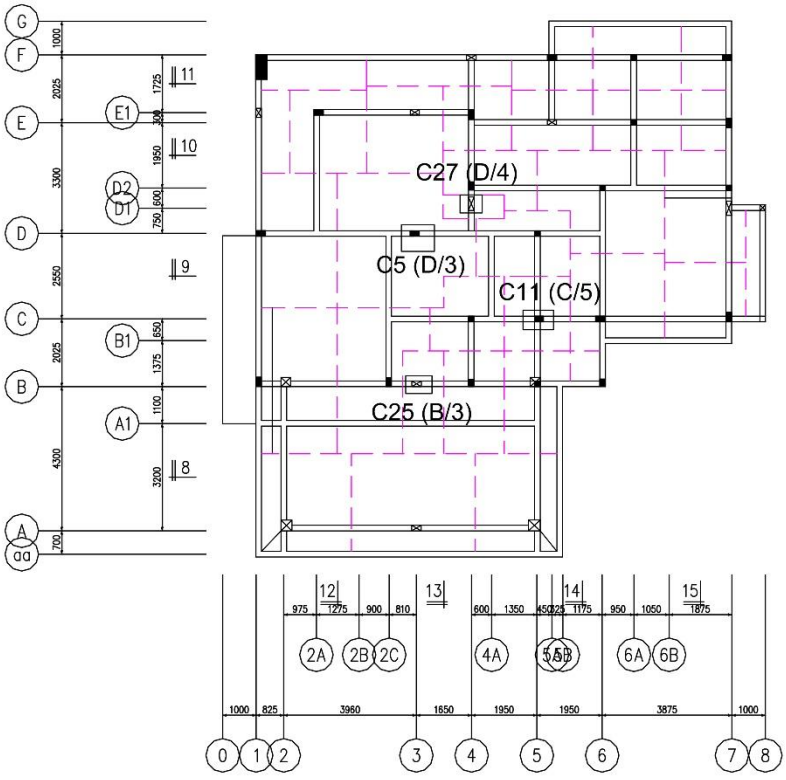
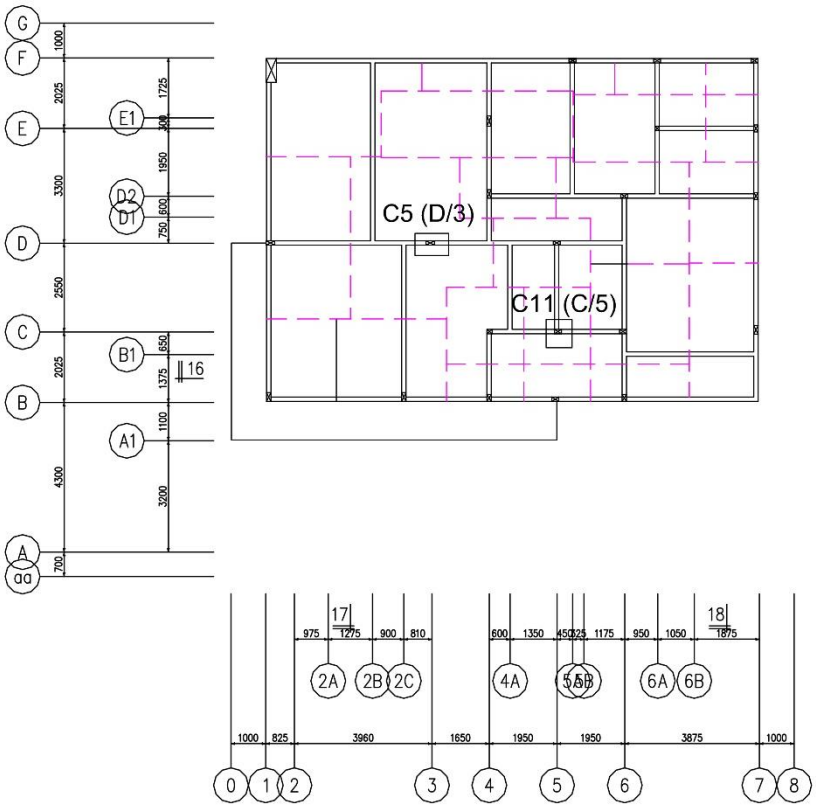
Column Analysis



Tributary Area- Ground Floor (NTS)

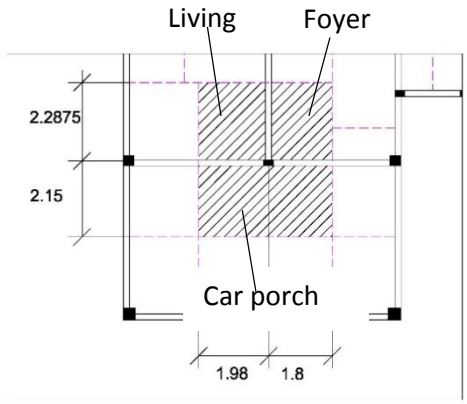


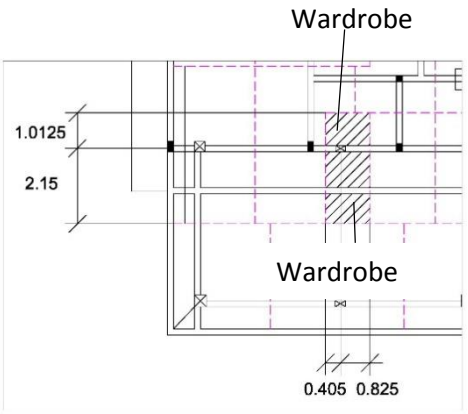
Tributary Area- First Floor (NTS)



Tributary Area- Roof (NTS)

Analysis on column **C25 (B/3)**





Ground floor tributary area of column C25

Tributary area
= (2.2875 + 2.15) x (1.98 + 1.8)
= 4.4375 x 3.78
= 16.7738m^2

First floor tributary area of column C25

Tributary area
= (1.0125 + 2.15) x (0.405 + 0.825)
= 3.1625 x 1.23
= 3.8899m^2

[Ground floor]

[First floor]

1. Brick wall dead load
   = 4.1m x 0.15m x 19kN/m^3
   = 11.685 kN/m
   = 3.3m x 0.15m x 19kN/m^3
   = 9.405kN/m
2. Beam dead load
   = 0.15m x 0.5m x 24kN/m^3
   = 1.8kN/m
   = 0.15m x 0.6m x 24kN/m^3
   = 2.16kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2
   = 0.125m x 24kN/m^3
   = 3kN/m^2
4. Column dead load
   = 0.25m x 0.15m x 4.1m x 24kN/m^3
   = 3.69kN

Load acting on the column C25 **(B/3)**

Dead Load

First Floor

1. Slab self-weight
   = 3.8899m^2 x 3kN/m^2
   =11.6697kN
1. Beam self-weight
   = (0.405m + 0.825m) x 2.16kN/m
   = 2.6568kN
2. Wall self-weight
   = 1.23m x 9.405kN/m
   = 11.56815kN

Total:

11.6697kN + 2.6568kN + 11.56815kN

= 25.8947kN

Ground Floor

1. Slab self-weight
   = 16.7738m^2 x 3kN/m^2
   = 50.3214kN
2. Beam self-weight
   = (2.2875m + 1.98m + 1.8m) x 1.8kN/m
   = 6.0675m x 1.8kN/m
   = 10.9215kN
3. Wall self-weight
   = 6.0675m x 11.685kN/m
   = 70.8987kN
4. Column
   = 3.69kN

Total:

50.3214kN + 10.9215kN + 70.8987kN + 3.69kN

= 135.8316kN

Total dead load

= 25.8947kN + 135.8316kN

= 161.7263kN

X 1.4 factor,

=226.4168kN

Ultimate Load

= 226.4168kN + 103.0178kN

= 329.43kN

Live Load

1. Live load from wardrobe
   = [(0.405m + 0.825m) x 1.0125m] x 2 kN/m
   = 1.245375m^2 x 2kN/m^2
   = 2.4908kN
2. Live load from balcony
   = [(0.405m + 0.825m) x 2.15m] x 1.5kN/m^2
   = 2.6445m^2 x 1.5kN/m^2
   = 3.96675kN

Total:

2.4908kN + 3.96675kN

= 6.45755kN

1. Live load from living room
   = (2.2875m x 1.98m) x 2 kN/m
   = 9.0585kN
2. Live load from foyer
   = (2.2875m x 1.8m) x 2 kN/m
   = 8.235kN
3. Live load from car porch
   = [(1.98m + 1.8m) x 2.15m] x 5kN/m
   = 40.635kN

Total:

9.0585kN + 8.235kN + 40.635kN

= 57.9285kN

Total live load

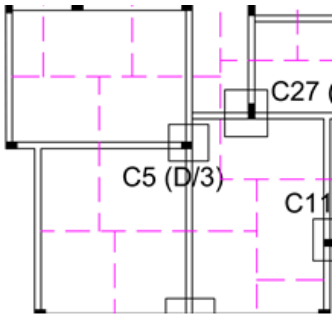
= 6.45755kN + 57.9285kN

= 64.3861kN

X 1.6 factor,

= 103.0178kN

Analysis on column **C5 (D/3)**

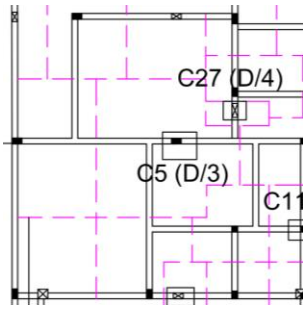


Ground floor tributary area

= [(1.05m + 1.65m) x (2.3925m + 0.825m)] + [1.3875m x (2.3925m + 1.8m)]

= 8.68725 m^2 + 5.81709 m^2

= 14.50434m^2

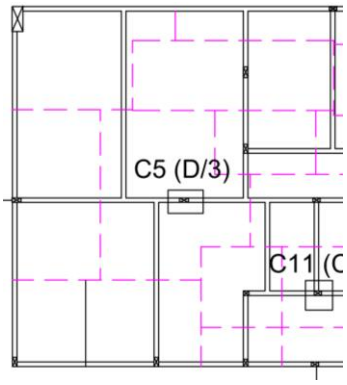


First floor tributary area

= (1.425m x 3.2175m) + [1.65m x (1.5825m + 1.635m + 1.8m)] + [1.0125m x (1.5825m + 1.635m)]

= 4.5849 m^2 + 8.2789 m^2 + 3.2577 m^2

= 16.1215m^2



Roof tributary area

= [0.1875m x (0.6825m + 0.1425m)] + [1.8m x (0.6825m + 0.1425m + 2.3925m)] + [(0.675m + 1.275m) x (1.9875m + 1.23m + 1.38m)] + [1.0125m x (1.9875m + 1.23m)]

= 0.1547 m^2 + 5.7915 m^2 + 8.9651 m^2 + 3.2577 m^2

= 18.169m^2

Ground Floor

1. Brick wall dead load
   = 4.1m x 0.15m x 19kN/m^3
   = 11.685 kN/m
2. Beam dead load
   = 0.15m x 0.5m x 24kN/m^3
   = 1.8kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2
4. Column dead load
   = 0.25m x 0.15m x 4.1m x 24kN/m^3
   = 3.69kN

First Floor

1. Brick wall dead load
   = 3.3m x 0.15m x 19kN/m^3
   = 9.405kN/m
2. Beam dead load
   = 0.15m x 0.6m x 24kN/m^3
   = 2.16kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2
4. Column dead load
   = 0.25m x 0.125m x 3.3m 24kN/m^3
   = 2.475kN

Roof

2. Beam dead load
   = 0.125m x 0.45m x 24kN/m^3
   = 1.35kN/m
3. Slab dead load
   = 0.15m x 24kN/m^3
   = 3.6kN/m^2

Load acting on the column C5 **(D/3)**

Dead Load

Roof

1. Slab (flat roof) self-weight
   = 18.169m^2 x 3.6kN/m^2
   = 65.4084kN
2. Roof beam self-weight
   = (2.6625m + 2.2875m + 0.675m + 1.9875m + 1.23m + 1.38m + 1.35m) x 1.35kN/m
   = 13.8004kN

Total:

65.4084kN + 13.8004kN = 79.2088kN

First Floor

1. Slab self-weight
   = 16.1215m^2 x 3kN/m^2
   = 48.3645kN
2. Beam self-weight
   = (1.5825m + 1.635m + 1.8m + 2.2875m + 0.375m) x 2.16kN/m
   =7.68m x 2.16kN/m
   = 16.5888kN
3. Wall self-weight
   = 7.68m x 9.405kN/m
   = 72.2304kN
4. Column = 2.475kN

Total:

48.3645kN + 16.5888kN + 72.2304kN + 2.475kN
= 139.6587kN

Ground Floor

1. Slab self-weight
   = 14.50434m^2 x 3kN/m^2
   = 43.51302kN
2. Beam self-weight
   = (2.3925m + 0.825m + 2.2875m + 1.8m) x 1.8kN/m
   = 7.305m x 1.8kN/m
   = 13.149kN
3. Wall self-weight
   = (1.8m + 2.3925m) x 11.685kN/m
   = 4.1925m x 11.685kN/m
   = 48.9894kN
4. Column = 3.69kN

Total:

43.51302kN + 13.149kN + 48.9894kN + 3.69kN
= 109.34142kN

Total dead load

= 79.2088kN + 139.6587kN + 109.34142kN
= 328.2089kN

X 1.4 factor,
= 459.49246kN

Live Load

Roof

1. Live load from roof
   = 18.169m^2 x 0.5 kN/m
   = 9.0845N

First floor

1. Live load from family room
   = [(3.2175m x 1.8m) + (0.375m x 0.825m] x 1.92 kN/m
   = 6.1009m^2 x 1.92kN/m^2
   = 11.7137kN
2. Live load from passage to family
   = (0.375m + 0.975m) x 1.92kN/m^2
   = 0.3656m^2 x 1.92kN/m^2
   = 0.701952kN
3. Live load from master bedroom
   = (2.2875m x 1.5825m) x 2 kN/m
   = 7.23994kN
4. Live load from wardrobe
   = [(1.635m x 2.2875m) + (1.275m x 1.8m)] x 2 kN/m
   = 12.0702kN

Total

= 11.713kN + 0.701952kN 7.23994kN + 12.0702kN

= 31.7258kN

Ground floor

1. Live load from guest room
   = (2.3925m x 1.8m) x 2 kN/m
   = 8.613kN
2. Live load from living room
   = (2.2875m x 2.3925m) x 2 kN/m
   = 10.9456kN
3. Live load from passage to staircase
   = (1.05m x 0.825m) x 2kN/m
   = 1.7325kN
4. Live load from foyer
   = [(1.65m x 0.825m) + (1.3875 x 1.8)] x 2kN/m
   = 7.7175kN

Total:

8.613kN + 10.9456kN + 1.7325kN + 7.7175k/N

= 29.0086kN

Total live load

= 9.0845kN + 31.7258kN + 29.0086kN

= 69.8189kN

X 1.6 factor,

= 111.71024kN

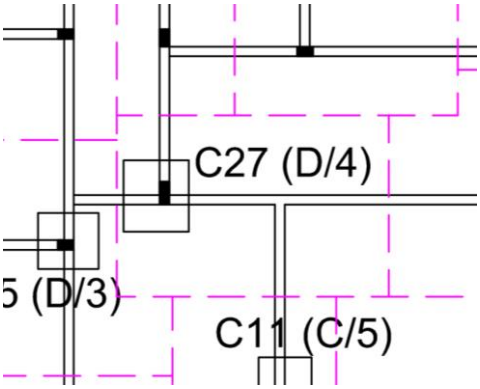
Ultimate Load

= 459.49246kN + 111.71024kN

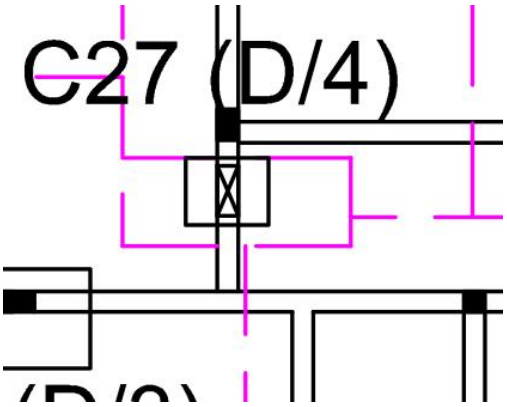
= 571.2027kN

≈ 571.2kN

Analysis on column **C27 (D1/4)**



Ground floor tributary area
= (1.425m + 1.65m) x (2.775m + 1.9375m)
= 14.4909 m^2



First floor tributary area
= (0.825m + 0.975m) x 0.675m
= 1.215 m^2

Ground Floor

1. Brick wall dead load
   = 4.1m x 0.15m x 19kN/m^3
   = 11.685 kN/m
2. Beam dead load
   = 0.15m x 0.5m x 24kN/m^3
   = 1.8kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2
4. Column dead load
   = 0.15m x 0.4m x 4.1m x 24kN/m^3
   = 5.904kN

First Floor

1. Brick wall dead load
   = 3.3m x 0.15m x 19kN/m^3
   = 9.405kN/m
2. Beam dead load
   = 0.15m x 0.6m x 24kN/m^3
   = 2.16kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2

Load acting on the column **C27 (D1/4)**

Dead Load

First Floor

1. Slab self-weight
   = 1.215m^2 x 3kN/m^2
   =3.645kN
2. Beam self-weight
   = 0.675m x 2.16kN/m
   = 1.458kN
3. Wall self-weight
   = 0 (There is no wall acting on this beam)

Total

= 3.645kN + 1.458kN

= 5.103kN

Ground Floor

1. Slab self-weight
   = 14.4909m^2 x 3kN/m^2
   = 43.4727kN
2. Beam self-weight
   = (1.425m + 1.65m + 2.775m + 1.9375m) x 1.8kN/m
   = 7.7875m x 1.8kN/m
   = 14.0175kN
3. Wall self-weight
   = (1.425m + 3.8875m + 1.65m) x 11.685kN/m
   = 81.3568kN
4. Column = 5.904kN

Total

= 43.4727kN + 14.0175kN + 81.3568kN + 5.904kN

= 144.751kN

Total dead load

= 5.103kN + 144.751kN

= 149.854kN

X 1.4 factor,

=209.7956N

Ultimate Load

= 209.7956kN + 58.96704kN

= 268.76264kN ≈ 268.76kN

Live Load

First floor

1. Live load from family room
   = (0.675m x 0.825m) x 1.92 kN/m
   = 0.556875m^2 x 1.92kN/m^2
   = 1.0692kN
2. Live load from passage to family
   = (0.675m x 0.975m) x 1.92 kN/m
   = 0.658125m^2 x 1.92kN/m^2
   = 1.2636kN

Total

= 1.0692kN + 1.2636kN

= 2.3328kN

Ground floor

1. Live load from staircase
   = (0.825m x 1.425m) x 2 kN/m
   = 2.35125kN
2. Live load from dry kitchen
   = (3.38875m x 1.425m) x 3 kN/m
   = 16.6191kN
3. Live load from foyer
   = (1.65m x 2.775m) x 2 kN/m
   = 9.1575kN
4. Live load from dining room
   = (1.9375m x 1.65m) x 2 kN/m
   = 96.39375kN

Total

= 2.35125kN + 16.6191kN + 9.1575kN + 6.39375kN

= 34.5216kN

Total live load

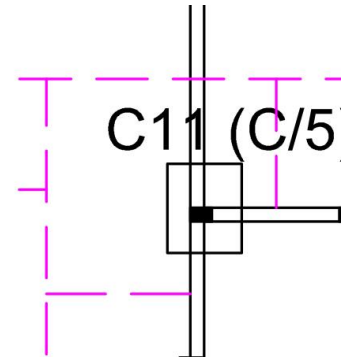
= 2.3328kN + 34.5216kN

= 36.8544kN

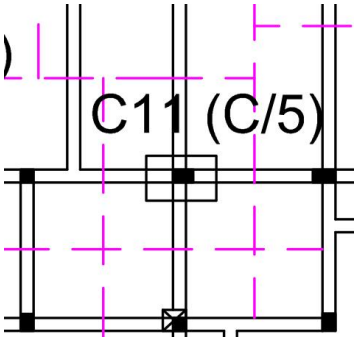
X 1.6 factor,

= 58.96704kN

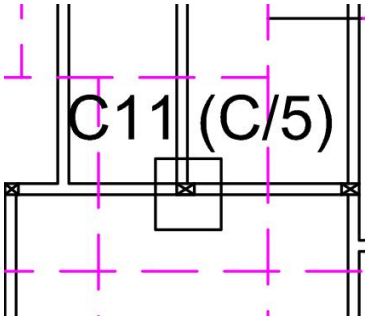
Analysis on column **C11 (C/5)**



Ground floor tributary area
= [(1.65m + 0.125m) x 1.8m] + (0.975m + 1.65m)
= 4.7925 m^2 + 1.60875 m^2
= 6.40125m^2



First floor tributary area
= [(1.275m + 1.0125m) x (0.975m + 0.975m)]
= 2.2875 m^2 x 1.95m^2
= 4.4606m^2



Roof tributary area
= [(1.275m + 1.0125m) x (0.975m + 0.975m)]
= 2.2875 m^2 x 1.95m^2
= 4.4606m^2

Ground Floor

1. Brick wall dead load
   = 4.1m x 0.15m x 19kN/m^3
   = 11.685 kN/m
2. Beam dead load
   = 0.15m x 0.5m x 24kN/m^3
   = 1.8kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2
4. Column dead load
   = 0.25m x 0.15m x 4.1m x 24kN/m^3
   = 3.69kN

First Floor

1. Brick wall dead load
   = 3.3m x 0.15m x 19kN/m^3
   = 9.405kN/m
2. Beam dead load
   = 0.15m x 0.6m x 24kN/m^3
   = 2.16kN/m
3. Slab dead load
   = 0.125m x 24kN/m^3
   = 3kN/m^2
4. Column dead load
   = 0.2m x 0.125m x 3.3m 24kN/m^3
   = 1.98kN

Roof

2. Beam dead load
   = 0.125m x 0.45m x 24kN/m^3
   = 1.35kN/m
3. Slab dead load
   = 0.15m x 24kN/m^3
   = 3.6kN/m^2

Load acting on the column **C11 (C/5)**

Dead Load

Roof

1. Slab (flat roof) self-weight
   = 4.4606m^2 x 3.6kN/m^2
   = 16.05816kN
2. Roof beam self-weight
   = (1.275m + 0.975m + 0.975m) x 1.35kN/m
   = 4.35375kN

Total:

16.05816kN + 4.35375kN = 20.4119kN

First Floor

1. Slab self-weight
   = 4.4606m^2 x 3kN/m^2
   = 13.3818kN
2. Beam self-weight
   = (1.275m + 1.0125m + 0.975m + 0.975m) x 2.16kN/m
   = 9.153kN
3. Wall self-weight
   = (1.275m + 0.975m + 0.975m) x 9.405kN/m
   = 30.3311kN
4. Column = 1.98kN

Total

= 13.3818kN + 9.153kN + 30.3311kN + 1.98kN

= 54.8459kN

Ground Floor

1. Slab self-weight
   = 6.40125m^2 x 3kN/m^2
   = 19.20375kN
2. Beam self-weight
   = (1.65m + 1.0125m + 0.975m) x 1.8kN/m
   = 6.5475kN
3. Wall self-weight
   = (1.0125m + 0.975m) x 11.685kN/m
   = 1.9875m x 11.685kN/m
   = 23.2239kN
4. Column = 3.69kN

Total

= 19.20375kN + 6.5475kN + 23.2239kN + 3.69kN

= 52.66515kN

Total dead load

= 20.4119kN + 54.8459kN + 52.66515kN

= 127.92295kN

X 1.4 factor,

= 179.0213kN

Live Load

Roof

1. Live load from roof
   = 4.4606m^2 x 0.5 kN/m
   = 2.2303kN

First floor

1. Live load from utility
   = (1.275m x 0.975m) x 2kN/m^2
   = 2.48625kN
2. Live load from bedroom
   = (1.275m x 0.975m) x 2kN/m^2
   = 2.48625kN
3. Live load from master bedroom
   = [1.0125m x (0.975m x 2)] x 2 kN/m
   = 3.94875kN

Total
= 2.48625kN + 2.48625kN + 3.94875kN
= 8.92125kN

Ground floor

1. Live load from foyer
   = [(1.65m + 1.0125m) x 1.8m] x 2 kN/m
   = 9.585kN
2. Live load from dining room
   = (0.975 x 1.65m) x 2 kN/m
   = 3.2175kN

Total
= 9.585kN + 3.2175kN
= 12.8025kN

Total live load
= 2.2303kN + 8.92125kN + 12.8025kN
= 23.95405kN

X 1.6 factor,
= 38.32648kN

Ultimate Load
= 179.09213kN + 38.32648kN
= 217.41861kN
≈ 217.42kN