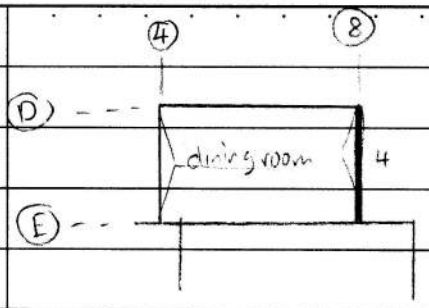
Beam D8 - E8 on GF

DATE: No:



$\Sigma F_y = 0$

$49.9454 - 99.8908 + R_{D8} = 0$

$R_{D8} = 49.9454$ kN ⏚

Slab self weight = 3.6 kN/m²

DEAD LOAD

1. DL of D8 - E8

$3.6 (4/2)(2/3) = 4.8$ kN/m

2. Beam self weight = 1.44 kN/m

3. Wall self weight = 2.55 kN/m²

LIVE LOAD

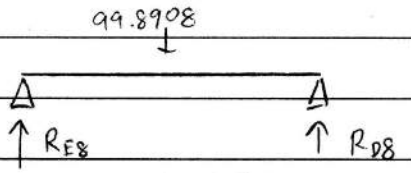
LL of D8 - E8

$2 \times (4/2)(2/3) = 2.6667$ kN/m

ULTIMATE LOAD

$14.79 (1.4) + 2.6667 (1.6)$

$= 24.9727$ kN/m



$M = 29.9727 \times 4$

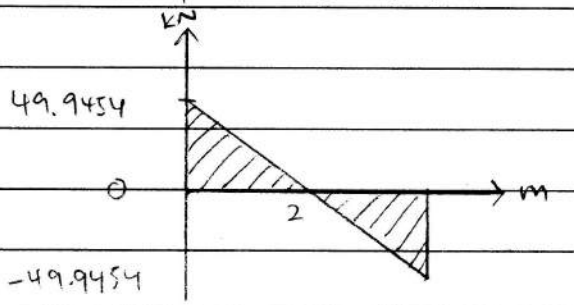
$= 99.8908$ kN

$(R_{E8} \times 4) - (99.8908 \times 2) = 0$

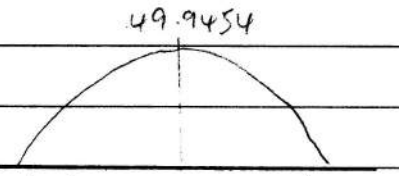
$R_{E8} \times 4 = 199.7816$

$R_{E8} = 49.9454$ kN ⏚

SHEAR FORCE DIAGRAM



BENDING MOMENT DIAGRAM

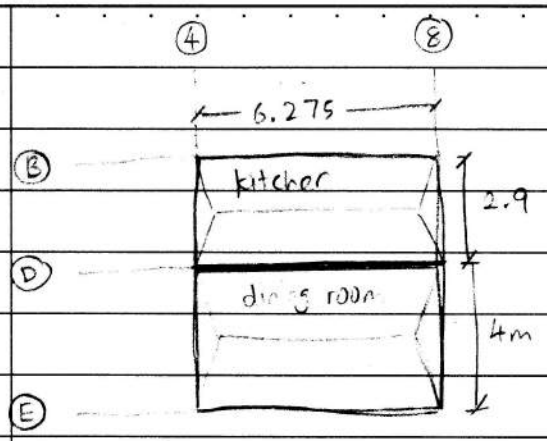


$\frac{1}{2} (49.9454 \times 2)$

$= 49.9454$

Beam D4 - D8 on GF

DATE: No:



$\frac{6275}{4000} = 1.569$

∴ 2 way slab

DEAD LOAD

1. Slab self weight = 0.15×24
= $3.6\ kN/m^2$

2. D.L. of DE
$3.6 \times \left(\frac{4}{2}\right) = 7.2\ kN/m$

3. DL of BD
$3.6 \times \left(\frac{2.9}{2}\right) = 5.22\ kN/m$

4. Beam self weight = $(0.15 \times 0.4)24$
= $1.44\ kN/m$

5. Wall self weight = $3 \times 0.15 \times 19$
= $8.55\ kN/m^2$

LIVE LOAD

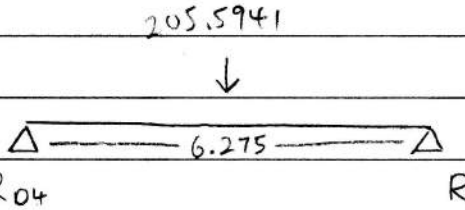
1. DE LL = $2 \times (4/2)$
= $4\ kN/m$

2. BD LL = $3 \times (2.9/2)$
= $4.35\ kN/m$

ULTIMATE LOAD

$13.86(1.4) + 9.79(1.6)$

$= 32.764\ kN/m$



$M = F \times d$
$= 32.764 \times 6.275$
$= 205.5941\ kN$

$(R_{D4} \times 6.275) - 205.5941(3.1375) = 0$

$(R_{D4} \times 6.275 = 645.0515$

$R_{D4} = 102.797\ kN$

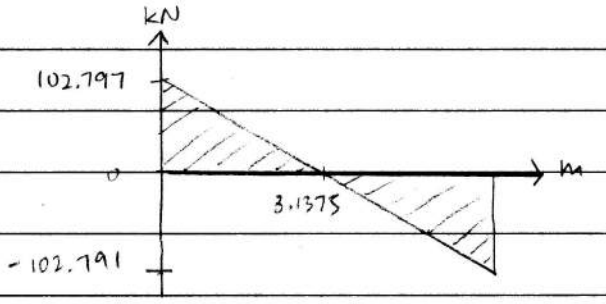
$\Sigma F_y = 0$

$R_{D4} - 205.5941 + R_{D8} = 0$

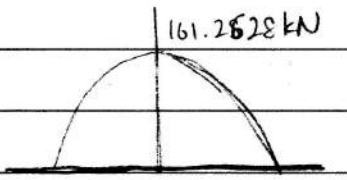
$102.797 - 205.5941 + R_{D8} = 0$

$R_{D8} = 102.7971\ kN$

SHEAR FORCE DIAGRAM



BENDING MOMENT DIAGRAM

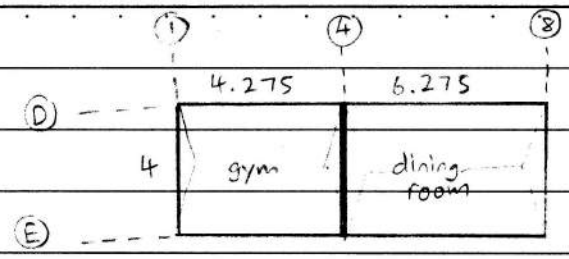


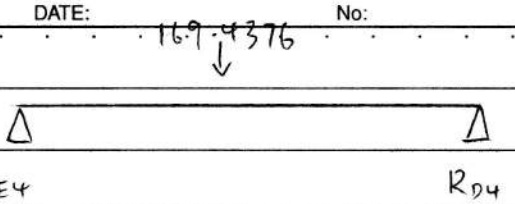
$\frac{1}{2}(102.797 \times 3.1375)$

$= 161.2628\ kN$

Beam D4 - E4 on GF

DATE: No:





$M = 42.3594 \times 4$

$= 169.4376$ kN

Slab self weight = 3.6 kN/m²

DEAD LOAD

1. D.L. of gym ◁

$3.6 \left(\frac{4}{2}\right)\left(\frac{2}{3}\right) = 4.8$ kN/m

2. D.L. of dining room ▷

$3.6 \left(\frac{4}{2}\right)\left(\frac{2}{3}\right) = 4.8$ kN/m

3. Beam self weight = 1.44 kN/m

4. Wall self weight = 8.55 kN/m²

$(R_{E4} \times 4) - (169.4376 \times 2) = 0$

$R_{E4} \times 4 = 328.8752$

$R_{E4} = 82.2188$ kN //

$\Sigma F_y = 0$

$82.2188 - 169.4376 + R_{D4} = 0$

$R_{D4} = 87.2188$ kN //

LIVE LOAD

1. L.L. of gym ◁

$5.0 \times \left(\frac{4}{2}\right)\left(\frac{2}{3}\right)$

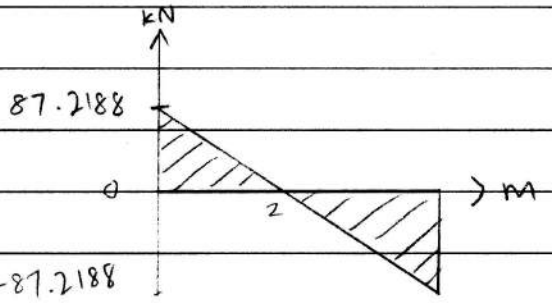
$= 6.6667$ kN/m

2. L.L. of dining room ▷

$2.0 \times \left(\frac{4}{2}\right)\left(\frac{2}{3}\right)$

$= 2.6667$ kN/m

SHEAR FORCE DIAGRAM



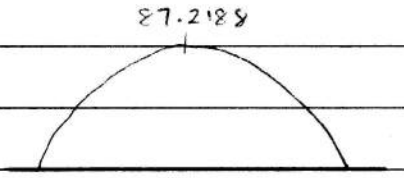
BENDING MOMENT DIAGRAM

ULTIMATE LOAD

$19.59 (1.4) + 9.3334 (1.6)$

$= 27.426 + 14.9334$

$= 42.3594$ kN/m

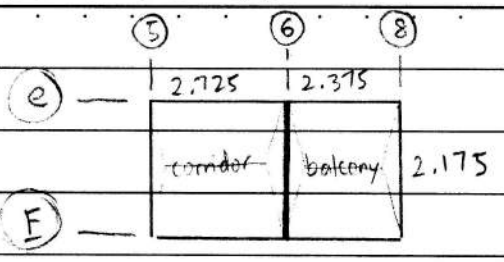


$\frac{1}{2} (87.2188 \times 2)$

$= 87.2188$ kN

Beam E6 - e6 on 2F

DATE: No:



slab self weight = 3.6 kN/m²

DEAD LOAD

1. DL of corridor ◁

$3.6\,(2.175/2)(2/3) = 2.61$ kN/m

2. DL of balcony ▷

$3.6\,(2.175/2)(2/3) = 2.61$ kN/m

3. Beam self weight = 1.44 kN/m

4. Wall self weight = 2.55 kN/m²

LIVE LOAD

1. LL of corridor ◁

$2.0 \times (2.175/2)(2/3) = 1.45$ kN/m

2. LL of balcony ▷

$1.5 \times (2.175/2)(2/3) = 1.0875$ kN/m

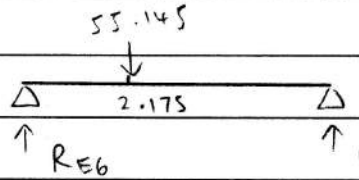
ULTIMATE LOAD

$(2.61 + 2.61 + 1.44 + 8.55)(1.4)$

$+ (1.45 + 1.0875)(1.6)$

$= 21.294 + 4.06$

$= 25.354$ kN



$M = 25.354 \times 2.175$

$= 55.145$ kN

$(R_{E6} \times 2.175) - (55.145 \times 1.0875) = 0$

$(R_{E6} \times 2.175) - 59.97 = 0$

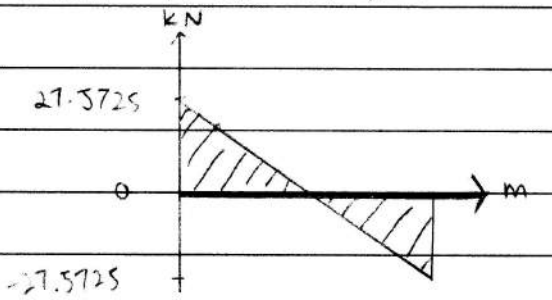
$R_{E6} = 27.5725$ kN

$\Sigma F_y = 0$

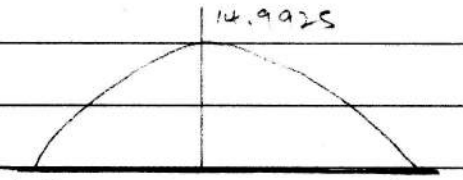
$27.5725 - 55.145 + R_{e6} = 0$

$R_{e6} = 27.5725$ kN

SHEAR FORCE DIAGRAM



BENDING MOMENT DIAGRAM



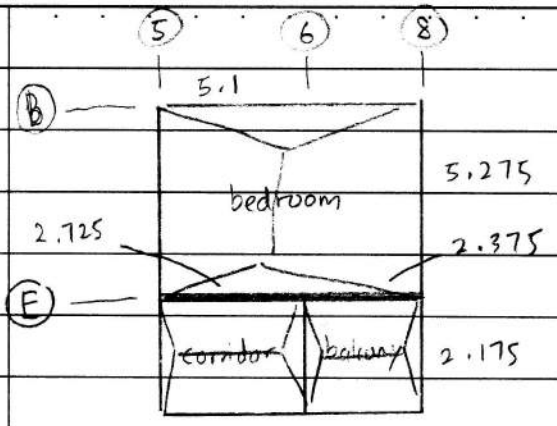
$\frac{1}{2}(27.5725 \times 1.0875)$

$= 14.9925$

27.5725 kN is the force acting on E5 - E8

Beam E5-E8 or 2F

DATE: No:



Slab self weight = 3.6 kN/m²

DEAD LOAD

1. DL of bedroom △

$3.6\,(5.1/2)(2/3) = 6.12$ kN/m

2. DL of corridor ▱

$3.6\,(2.175/2) = 3.915$ kN/m

3. DL of balcony ▱

$3.6\,(2.175/2) = 3.915$ kN/m

4. Beam self weight = 1.44 kN/m

5. Wall self weight = 8.55 kN/m²

LIVE LOAD

1. LL of bedroom △

$1.5\,(5.1/2)(2/3) = 2.55$ kN/m

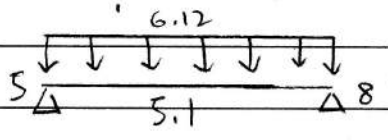
2. LL of corridor ▱

$2.0\,(2.175/2) = 2.175$ kN/m

3. LL of balcony ▱

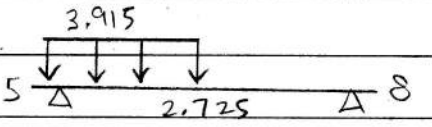
$1.5\,(2.175/2) = 1.6313$ kN/m

ULTIMATE LOAD

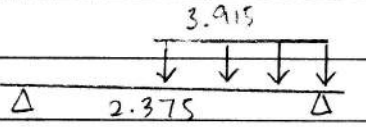


A - Bedroom dead load

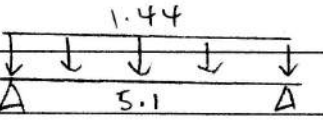
B - Corridor dead load



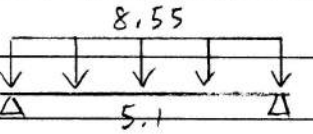
C - Balcony dead load



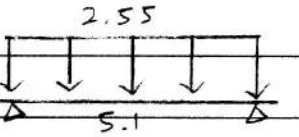
D - Beam self weight



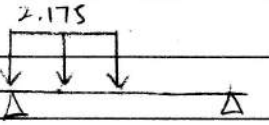
E - Wall self weight



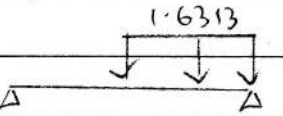
F - Bedroom live load



G - Corridor live load



H - Balcony live load



DATE: No:

Ultimate load of E5-E6

$[(A+B+D+E)\times 1.4] + [(F+G)\times 1.6]$

$= (6.12 + 3.915 + 1.44 + 8.55)(1.4)$

$+ (2.55 + 2.175)(1.6)$

$= 28.035 + 7.56$

$= 35.595$ kN

$103.1263 - 96.9964$

$= A = 6.1299$ kN

$6.1299 - 27.5725$

$= B = -21.4426$ kN

Ultimate load of E6-E8

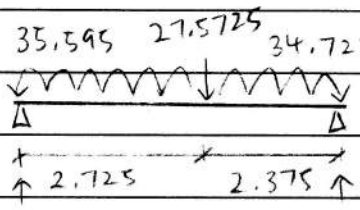
$[(A+C+D+E)\times 1.4] + [(F+G)\times 1.6]$

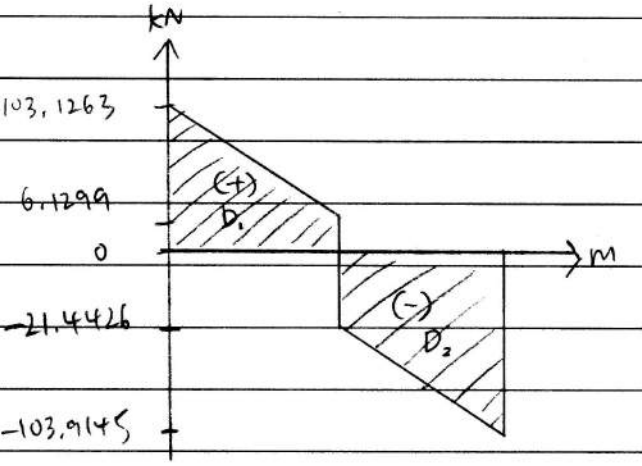
$= 28.035 + 6.690$

$= 34.725$ kN

$-21.4426 - 82.4719$

$= C = -103.9145$ kN





ΣM or $R_{E5} = 0$

$R_{E5}(5.1) - (35.595 \times 2.725 \times 3.7375)$

$- (27.5725 \times 2.375) - (34.725 \times 2.375 \times 1.1875)$

$= 0$

$R_{E5}(5.1) - 362.524 - 65.4847 - 97.9354 = 0$

$R_{E5} = 103.1263$ kN

$D_1 = \frac{1}{2}(103.1263 + 6.1299)(2.725)$

$= 148.8616$

$D_2 = \frac{1}{2}(21.4426 + 103.9145)(2.375)$

$= 148.8616$

$D_1 = D_2$

$\Sigma F_y = 0$

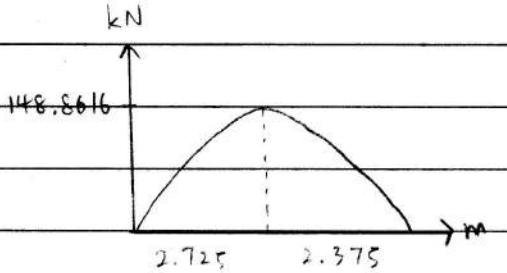
$103.1263 - (35.595 \times 2.725) - 27.5725$

$- (34.725 \times 2.375) + R_{E8} = 0$

$103.1263 - 96.9964 - 27.5725 - 82.4719$

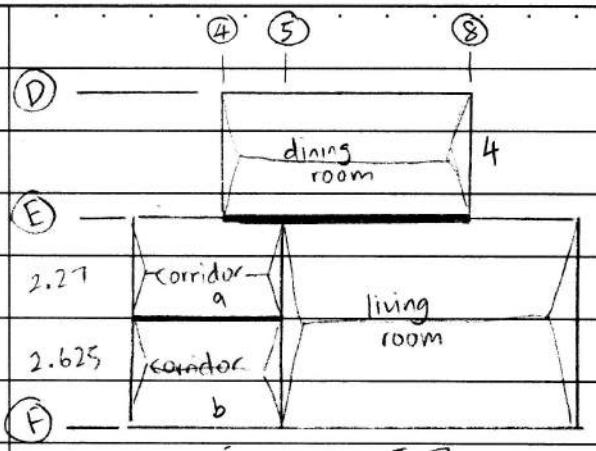
$+ R_{E8} = 0$

$R_{E8} = 103.9145$ kN



Beam E4 – E8 on GF

DATE: No:



Slab self weight = 3.6 kN/m²

DEAD LOAD

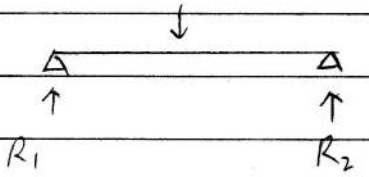
1. DL of corridor a
   3.6 × (2.27/2) = 4.086 kN/m
2. DL of corridor b
   3.6 (2.625/2) = 2.625 kN/m
3. Beam self weight = 1.44 kN/m
4. Wall self weight = 8.55 kN/m²

LIVE LOAD

1. L.L of corridor a
   2 (2.27/2) = 2.27 kN/m
2. LL of corridor b
   2 (2.625/2) = 2.625 kN/m

ULTIMATE LOAD

(4.086 + 4.725 + 1.44 + 8.55)(1.4)
+ (2.27 + 2.625)(1.6)
= 26.3214 + 7.832
= 34.1534



34.1534 × 2.625
= 89.6527

$(R_1 \times 2.625) - 89.6527 (1.3125)$

$(R_1 \times 2.625) - 117.669 = 0$

$R_1 = 44.826$ kN

$\Sigma F_y = 0$

$44.826 - 89.6527 + R_2 = 0$

$R_2 = 44.826$ kN

44.826 kN is the force acting on beam E5 – F5

Beam E5 – F5

DEAD LOAD

1. DL of corridor a
   4.086 (2/3) = 2.724 kN/m
2. DL of corridor b
   4.725 (2/3) = 3.15 kN/m
3. DL of living room
   3.6 (5.3/2)(2/3) = 6.36 kN/m

LIVE LOAD

1. LL of corridor a
   2.27 (2/3) = 1.513 kN/m

DATE: No:

2. LL of corridor b

$2.625\ (2/3) = 1.75$ kN/m

3. LL of living room

$2.0\ (5.3/2)\ (2/3) = 3.533$ kN/m

ULTIMATE LOAD

1. Ultimate load of corridor b + living room

$(3.15 + 6.36 + 1.44 + 8.55)(1.4)$

$+ (1.75 + 3.533)(1.6)$

$= 27.3 + 8.4328$

$= 35.7528$

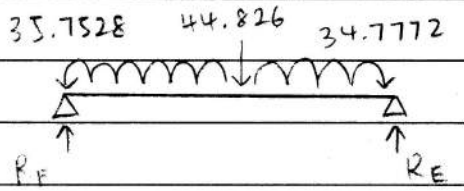
2. Ultimate load of corridor a + living room

$(2.724 + 6.36 + 1.44 + 8.55)(1.4)$

$+ (1.513 + 3.533)(1.6)$

$= 26.7036 + 8.0736$

$= 34.7772$



$R_F(5.655) - (35.7528)(3.03)(4.14)$

$- (44.826)(2.625)$

$- (34.7772 \times 2.625 \times 1.3125) = 0$

$R_F(5.655) - 448.4903 - 117.6683$

$- 119.8183 = 0$

$R_F = 121.3045$ kN

$\Sigma F_y = 0$

$121.3045 - (35.7528 \times 3.03) - 44.826$

$- (34.7772 \times 2.625) + R_E = 0$

$121.3045 - 108.331 - 44.826$

$-91.29 + R_E = 0$

$R_E = 123.1425$ kN

123.1425 kN is the force acting on beam E4-E8

Beam E4-E8

DEAD LOAD

1. DL of corridor a = 4.086 kN/m
2. D.L. of living room

$3.6\ (5.3/2) = 9.54$ kN/m

3. D.L. of dining room

$3.6\ (4/2) = 7.2$ kN/m

4. Beam self weight = 1.44 kN/m
5. Wall self weight = 8.55 kN/m²

LIVE LOAD

1. LL of corridor a = 2.27kN/m
2. LL of living room

$2\ (5.3/2) = 5.3$ kN/m

3. LL of dining room

$2\ (4/2) = 4$ kN/m

DATE: No:

ULTIMATE LOAD

1. Ultimate load of E4-E5

$21.276(1.4) + 6.27(1.6)$

$= 29.7864 + 10.032$

$= 39.8184$ kN

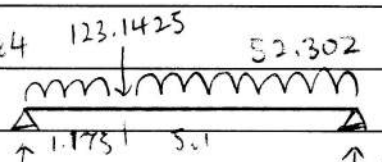
2. Ultimate load of E5-E8

$(7.2 + 9.54 + 1.44 + 8.55)(1.4)$

$+ (5.3 + 4)(1.6)$

$= 37.422 + 14.88$

$= 52.302$ kN



$R_{E4}(6.275) - (39.8184 \times 1.175 \times 5.6875)$

$- (123.1425 \times 5.1)$

$- (52.302 \times 5.1 \times 2.55) = 0$

$R_{E4}(6.275) - 266.0989 - 628.0268$

$- 680.1875 = 0$

$R_{E4} = 250.8866$ kN

$\Sigma F_y = 0$

$250.8866 - (39.8184 \times 1.175) - 34.7772$

$- (52.302 \times 5.1) + R_{E8} = 0$

$250.8866 - 46.7866 - 34.7772 -$

$266.7402 + R_{E8} = 0$

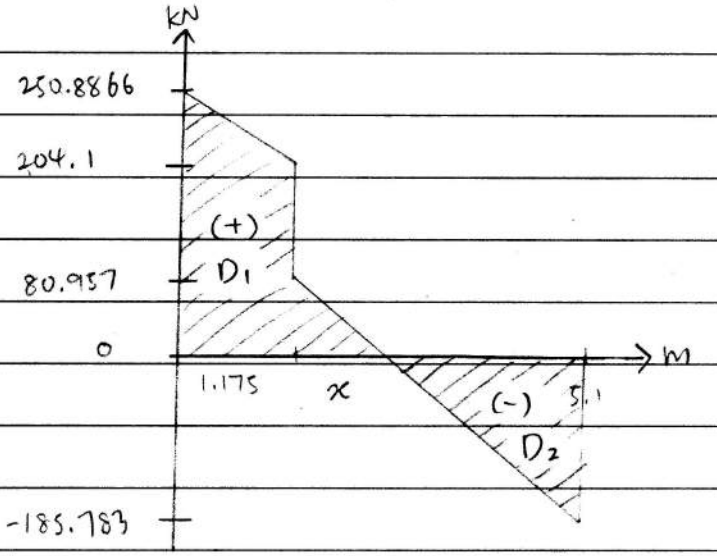
$R_{E8} = 97.4174$ kN

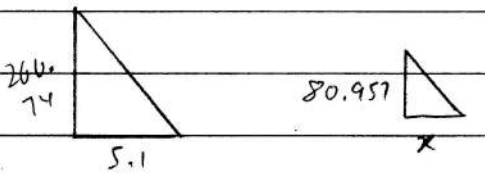
$250.8866 - (39.8184 \times .175) = A = 204.1$

$204.1 - 123.143$

$= B = 80.957$

$80.957 - (52.302 \times 5.1) = C = -185.783$





$\frac{266.74}{5.1} = \frac{80.957}{x}$

$x = 1.5479$

$D_1 = \frac{1}{2}(250.8866 + 204.1)(1.175) + \frac{1}{2}(1.5479)(80.957)$

$= 267.3046 + 62.6567$

$= 329.9613$

$= 330$

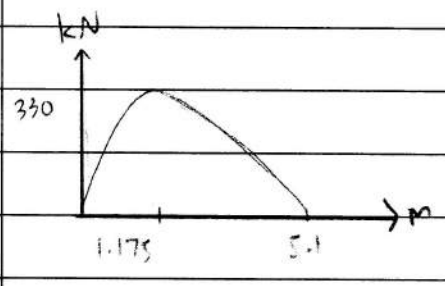
DATE: No:

$D_2 = \frac{1}{2}(3.5521)(185.783)$

$= 329.9599$

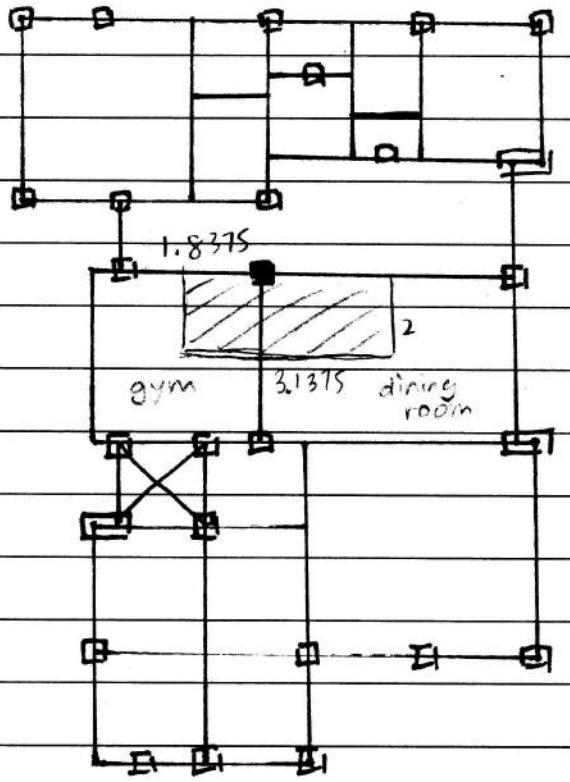
$= 330$

$D_1 = D_2$



Column A GF

DATE: No:



DEAD LOAD

Beam = 0.9 (1.8375 + 2 + 3.1375)

= 6.2775 kN

Wall = 8.5 (1.8375 + 2)

= 32.6188 kN

Slab (gym) = 3.6 (1.8375 × 2)

= 13.23 kN

Slab (dining room) = 3.6 (2 × 3.1375)

= 22.59 kN

LIVE LOAD

Slab (gym) = 5 (1.8375 × 2)

= 18.375 kN

Slab (dining room) = 2 (2 × 3.1375)

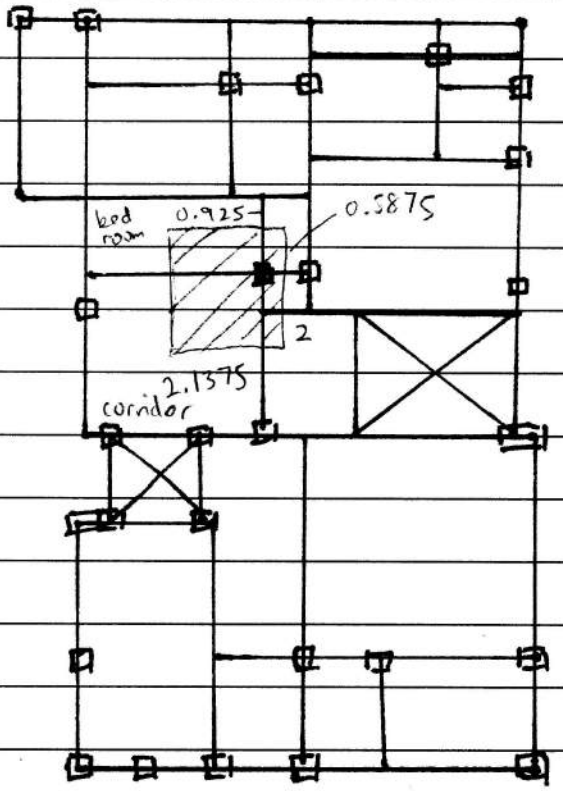
= 12.55 kN

Total dead load = 74.7163 kN

Total live load = 30.925 kN

Column A 1F

DATE: No:



DEAD LOAD

Beam = 0.9 (0.925 + 2.1375 + 2 + 0.3875)

= 5.085 kN

Wall = 8.5 (2.1375 + 0.5875)

= 23.1625 kN

Slab (bedroom) = 3.6 (2.1375 × 0.925)

= 7.1179 kN

Slab (bedroom) = 3.6 (0.925 × 0.5875)

= 1.9564 kN

Slab (corridor) = 2.4 (2.1375 × 2)

= 10.26 kN

Slab (corridor) = 2.4 (2 × 0.5875)

= 2.82 kN

LIVE LOAD

Slab (bedroom) = 1.5 (2.1375 × 0.925)

= 2.9658 kN

Slab (bedroom) = 1.5 (0.925 × 0.5875)

= 0.8152 kN

Slab (corridor) = 1.5 (2.1375 × 2)

= 6.4125 kN

Slab (corridor) = 1.5 (2 × 0.5875)

= 1.7625 kN

ULTIMATE LOAD OF COLUMN A

(74.7163 + 50.4018)(1.4)

+ (30.925 + 11.956)(1.6)

= 175.1653 + 68.6096

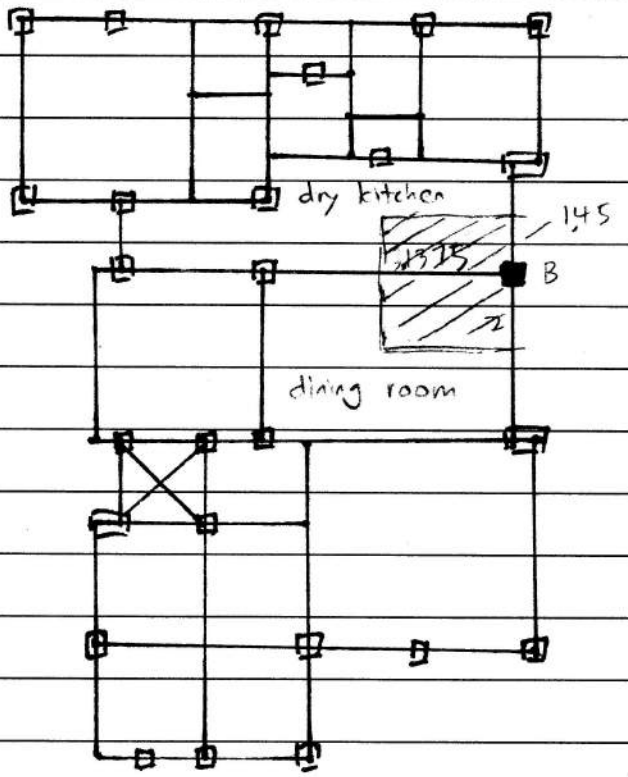
= 243.7749 kN

Total dead load = 50.4018 kN

Total live load = 11.956 kN

Column B GF

DATE: No:



DEAD LOAD

Beam = 0.9 (1.45 + 3.1375 + 2)

= 5.9288 kN

Slab (dry kitchen) = 3.6 (1.45 × 3.1375)

= 16.3778 kN

Slab (dining room) = 3.6 (3.1375 × 2)

= 22.59 kN

LIVE LOAD

Slab (dry kitchen) = 3 (1.45 × 3.1375)

= 13.6481 kN

Slab (dining room) = 2 (3.1375 × 2)

= 12.55 kN

☑ Dry kitchen

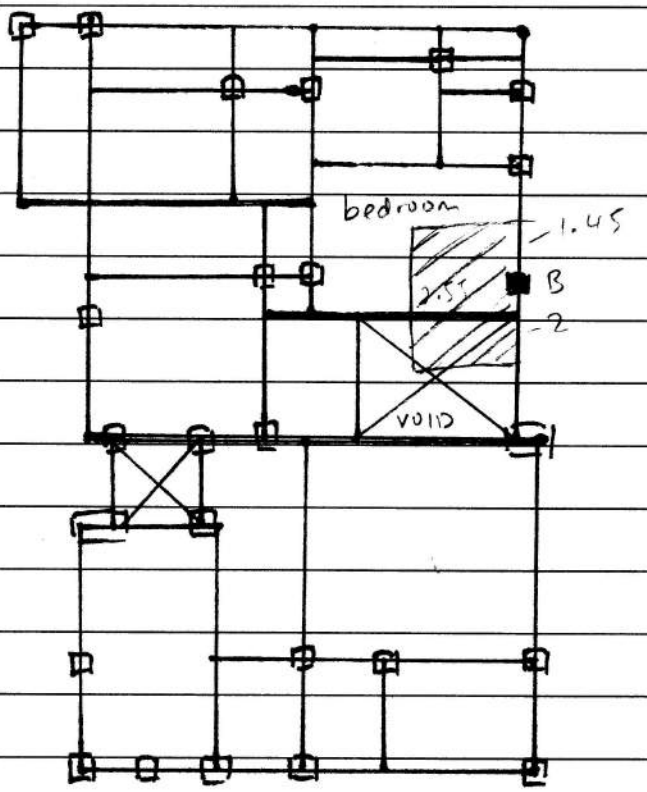
☑ Dining room

Total dead load = 44.8966 kN

Total live load = 26.1981 kN

Column B 1 F

DATE: No:



DEAD LOAD

Beam = 0.9 (1.45 + 2.55 + 2)

= 5.4 kN

Wall = 8.5 (2.55 + 1.45)

= 34 kN

Slab (bedroom) = 3.6 (2.55 x 1.45)

= 13.311 kN

LIVE LOAD

Slab (bedroom) = 1.5 (2.55 x 1.45)

= 5.5463 kN

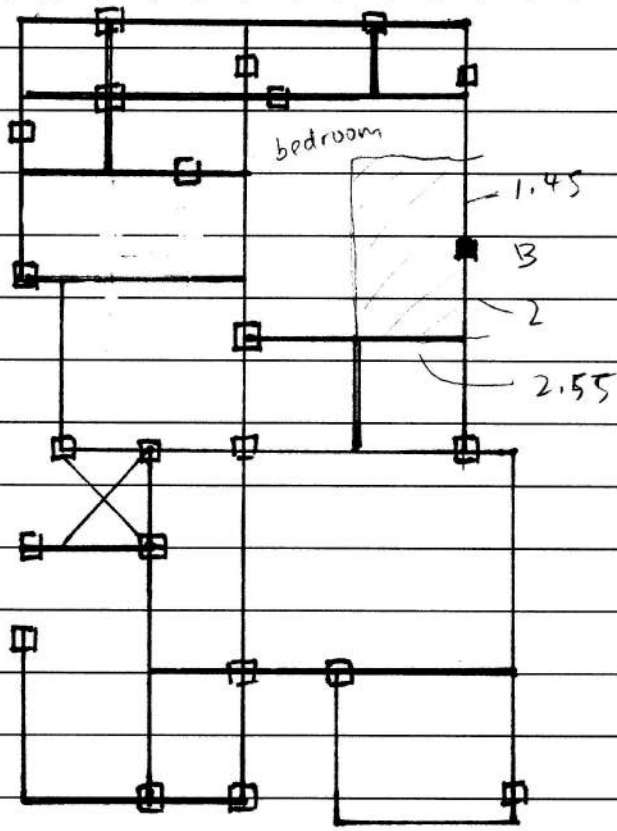
Total dead load = 52.711 kN

Total live load = 5.5463 kN

Column B 2F

DATE:

No: 26



DEAD LOAD

Beam = 0.9 (1.45 + 2)

= 3.105 kN

Wall = 8.5 (1.45 + 2)

= 29.325 kN

Slab (bedroom) = 3.6 [(1.45 + 2) × 2.55]

= 31.671 kN

LIVE LOAD

Slab (bedroom) = 1.5 (3.45 × 2.55)

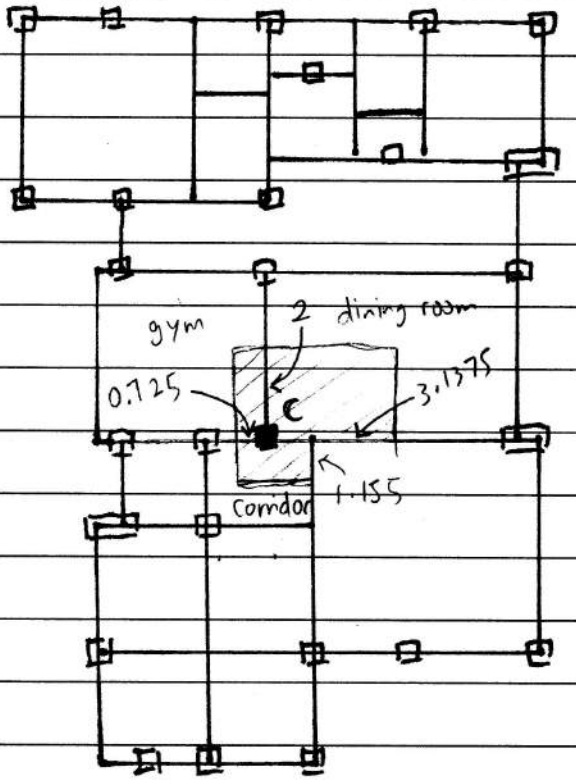
= 13.1963 kN

Total dead load = 64.101 kN

Total live load = 13.1963 kN

Column C GF

DATE: No:



DEAD LOAD

Beam = 0.9 (2 + 0.725 + 1.155 + 3.1375)

= 6.3158 kN

Wall = 8.5 (0.725 + 2)

= 23.1625 kN

Slab (gym) = 3.6 (0.725 × 2)

= 5.22 kN

Slab (dining room) = 3.6 (2 × 3.1375)

= 22.59 kN

Slab (corridor) = 2.4 (1.155 × 1.9)

= 5.2668 kN

LIVE LOAD

Slab (gym) = 5 (0.725 × 2)

= 7.25 kN

Slab (dining room) = 2 (3.1375 × 2)

= 12.55 kN

Slab (corridor) = 1.5 (1.155 × 1.9)

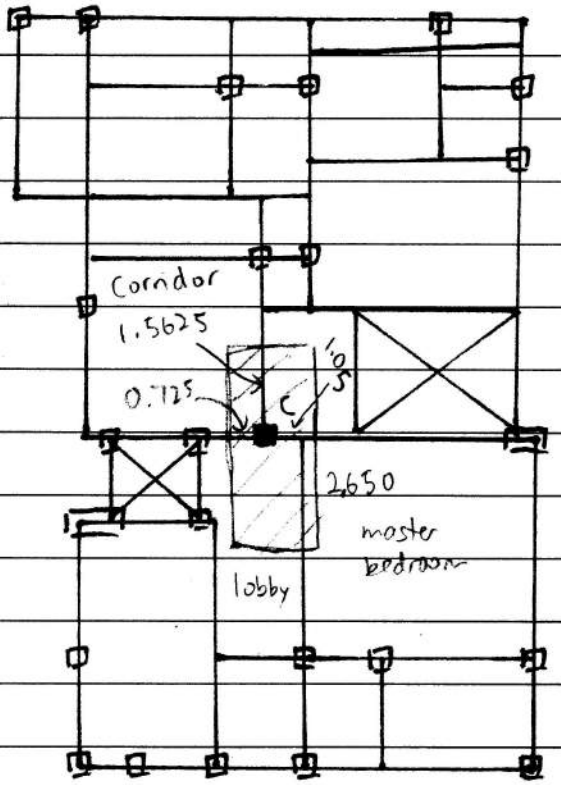
= 3.2918 kN

Total dead load = 62.3551 kN

Total live load = 23.0918 kN

Column C 1F

DATE: No:



DEAD LOAD

Beam = 0.9 (1.5625 + 0.725 + 1.05 + 2.65)
= 5.3888 kN

Wall = 8.5 (2.65 + 1.05 + 0.725)
= 37.6125 kN

Slab (corridor) = 2.4 (1.5625 × 0.725)
= 2.7188 kN

Slab (corridor) = 2.4 (1.05 × 1.5625)
= 3.9375 kN

Slab (lobby) = 2.4 (1.775 × 2.65)
= 11.289 kN

Slab (bedroom) = 3.6 (2.65 × 1.05)
= 10.017 kN

LIVE LOAD

Slab (corridor) = 1.5 (1.5625 × 0.725)
= 1.6992 kN

Slab (corridor) = 1.5 (1.05 × 1.5625)
= 2.4609 kN

Slab (lobby) = 1.5 (1.775 × 2.65)
= 7.0556 kN

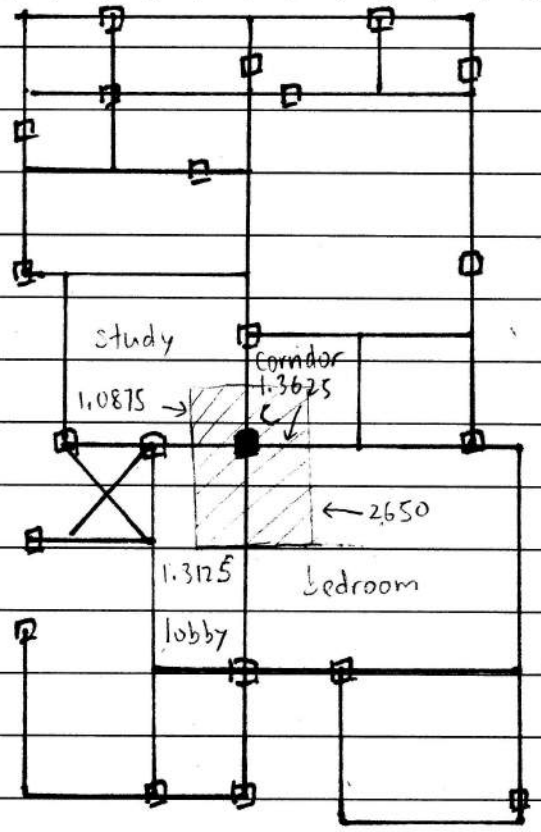
Slab (bedroom) = 1.5 (2.65 × 1.05)
= 4.1738 kN

Total dead load = 70.9636 kN

Total live load = 15.3895 kN

Column C 2F

DATE: No:



DEAD LOAD

Beam = 0.9 (1.0875 + 1.3625 + 2.65 + 1.3125)

= 5.7713 kN

Wall = 8.5 (1.3125 + 2.65 + 1.3625)

= 45.2625 kN

Slab (study) = 3.6 (1.0875 × 1.3125)

= 5.1384 kN

Slab (corridor) = 2.4 (1.3625 × 1.0875)

= 3.5561 kN

Slab (lobby) = 2.4 (1.3125 × 2.65)

= 8.3475 kN

Slab (bedroom) = 3.6 (2.65 × 1.3625)

= 12.9982 kN

LIVE LOAD

Slab (study) = 1.5 (1.0875 × 1.3125)

= 2.141 kN

Slab (corridor) = 1.5 (1.3625 × 1.0875)

= 2.2226 kN

Slab (lobby) = 1.5 (1.3125 × 2.65)

= 5.2172 kN

Slab (bedroom) = 1.5 (2.65 × 1.3625)

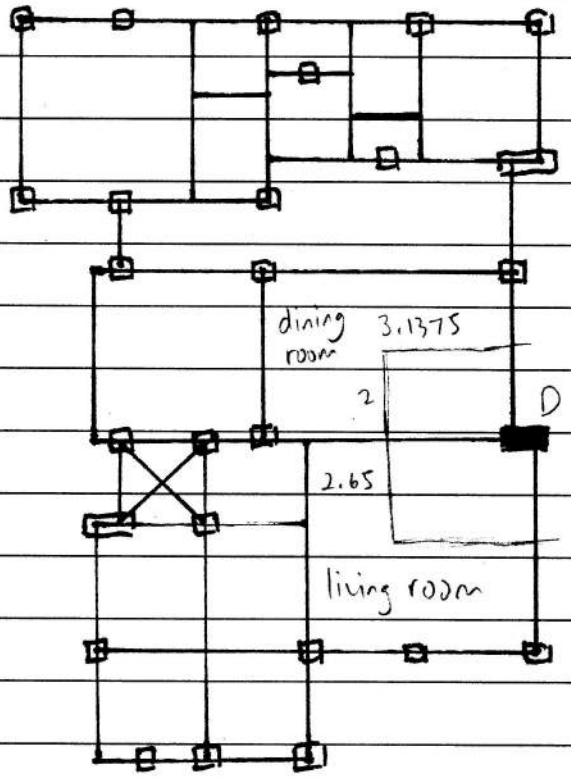
= 5.4159 kN

Total dead load = 81.0741 kN

Total live load = 14.9967 kN

Column D GF

DATE: No:



DEAD LOAD

Beam = 0.9 (2 + 3.1375 + 2.65)

= 7.0088 kN

Slab (dining room) = 3.6 (2 × 3.1375)

= 22.59 kN

Slab (living room) = 3.6 (2.65 × 3.1375)

= 29.9318 kN

LIVE LOAD

Slab (dining room) = 2 (2 × 3.1375)

= 12.55 kN

Slab (living room) = 4. (2.65 × 3.1375)

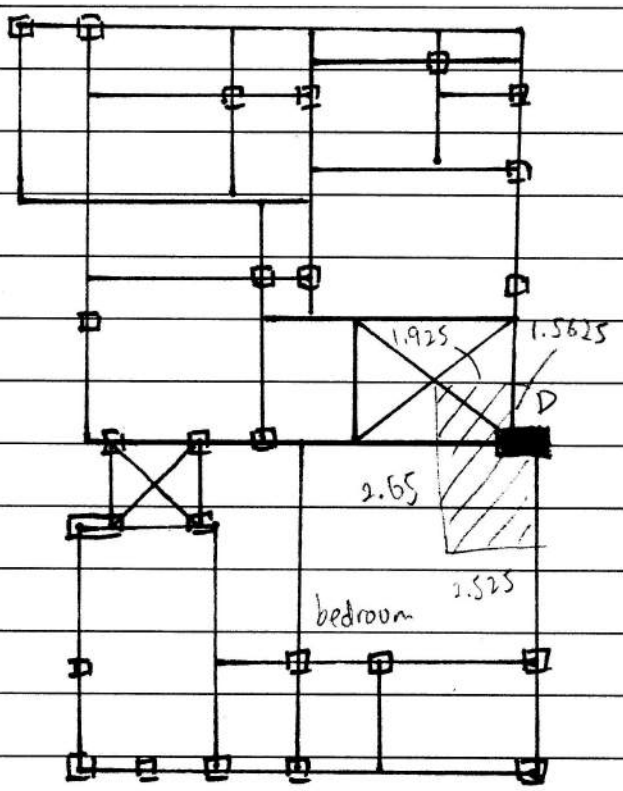
= 33.2575 kN

Total dead load = 59.5306 kN

Total live load = 45.805 kN

Column D 1F

DATE: No:



DEAD LOAD

Beam = 0.9 (1.5625 + 1.925 + 2.65 + 0.6)

= 6.0638 kN

Wall = 8.5 (1.925 + 2.65 + 0.6)

= 43.9875 kN

Slab (bedroom) = 3.6 (2.65 × 2.525)

= 24.0885 kN

LIVE LOAD

Slab (bedroom) = 1.5 (2.65 × 2.525)

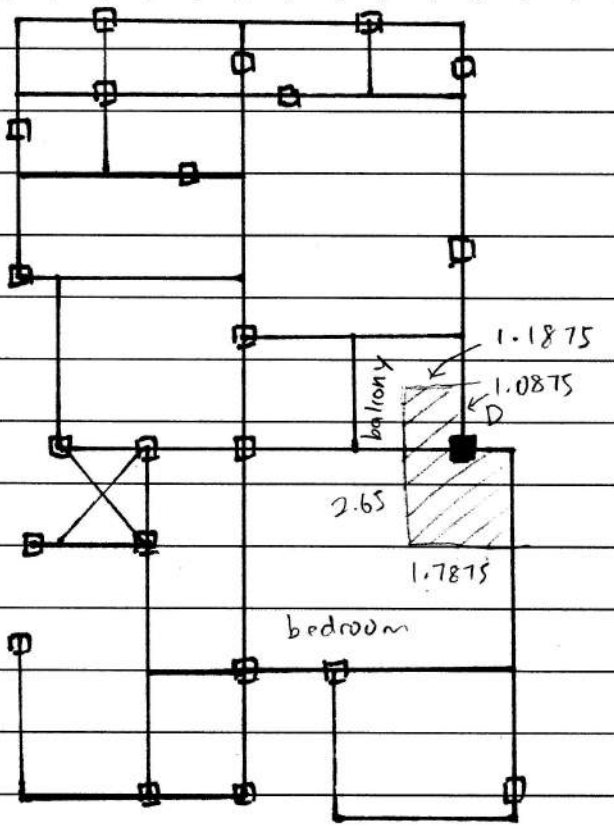
= 10.0369 kN

Total dead load = 74.1398 kN

Total live load = 10.0369 kN

Column D 2F

DATE: No:



DEAD LOAD

Beam = 0.9 (1.1875 + 1.0875 + 2.65 + 1.7875)

= 6.0413 kN

Wall = 8.5 x 1.1875

= 10.0938 kN

Slab (balcony) = 2.4 (1.1875 x 1.0875)

= 3.0994 kN

Slab (bedroom) = 3.6 (2.65 x 1.7875)

= 17.0528 kN

LIVE LOAD

Slab (balcony) = 1.5 (1.1875 x 1.0875)

= 1.9371 kN

Slab (bedroom) = 1.5 (2.65 x 1.7875)

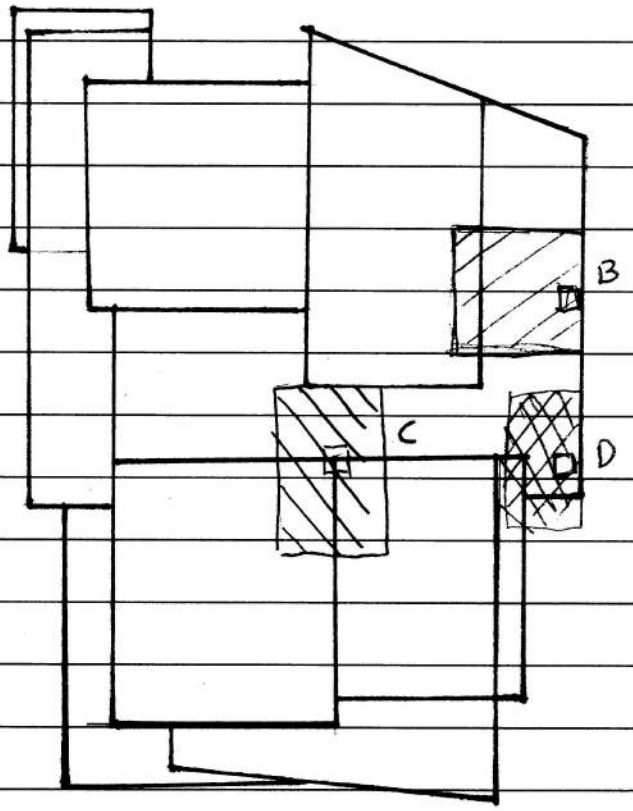
= 7.1053 kN

Total dead load = 36.2873 kN

Total live load = 9.0424 kN

Roof

DATE: No:



Column B

DEAD LOAD

1.0 (3.45 × 2.55)

= 8.7975 kN

LIVE LOAD

0.5 (3.45 × 2.55)

= 4.3988 kN

ULTIMATE LOAD OF COLUMN B

(44.8966 + 52.711 + 64.101 + 8.7975)(1.4)

+ (26.1981 + 5.5463 + 13.1963 + 4.3988)(1.6)

= 238.7085 + 78.9432

= 317.6517 kN

Column B Column C Column D

Column C DEAD LOAD

1.0 (2.675 × 3.7375)

= 9.9978 kN

LIVE LOAD

0.5 (2.675 × 3.7375)

= 4.99989 kN

ULTIMATE LOAD OF COLUMN C

(62.5551 + 70.9636 + 81.0741 + 9.9978)(1.4)

+ (23.0918 + 15.3895 + 14.9967 + 4.9989)(1.6)

= 314.4268 + 93.563

= 407.9898 kN

Column D DEAD LOAD

1.0 (1.1875 × 1.0275) + (2.65 × 1.7875)

= 6.0283 kN

LIVE LOAD

0.5 (1.2914 + 4.7369)

= 3.0142 kN

ULTIMATE LOAD OF COLUMN D

(59.5306 + 74.1398 + 36.2873 + 6.0283)(1.4)

+ (45.805 + 10.0369 + 9.0424 + 3.0142)(1.6)

= 246.3804 + 108.6376

= 355.018 kN