***Solution***

***-Concrete Dimensions***

****

****

Take t = 40cm

***Calculate of loads***

**Lower walls ((8\*2+4\*3)\*4.2\*.25\*25 )=603.75kn**

**Upper walls (4\*4\*4.2\*25\*0.25)=420kn**

**To beams (3\*4\*4)=48kn**

**To water (4\*4\*4.2\*10)=672.kn**

**Live load=8\*4\*2=64kn**

***Loads on floor***

***For upper floor( full of water)***

****

****

***For upper floor(below soil)***

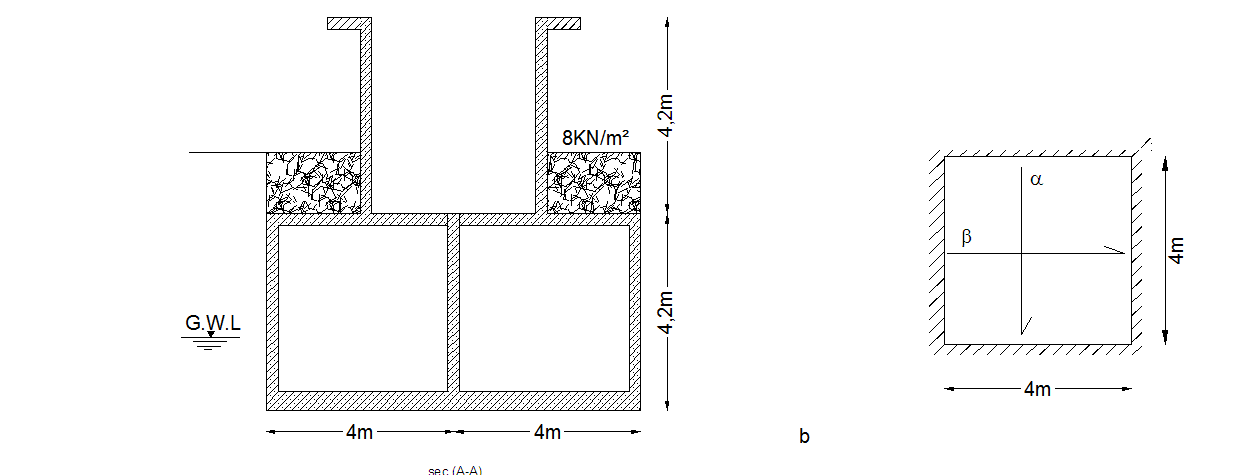
****

****

***For base floor***



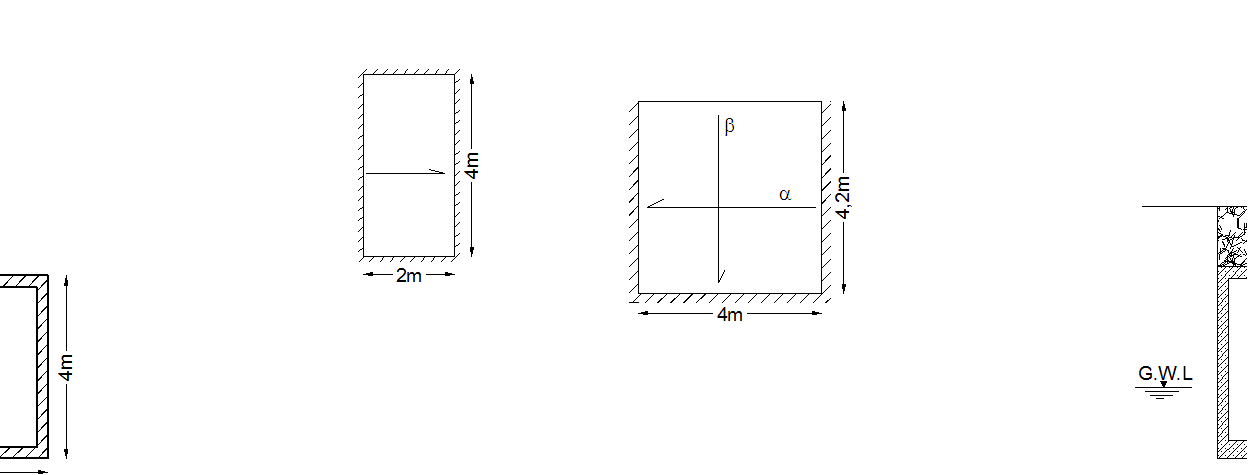
****

***Load Distribution***

***Floor(1) (4\*4)***

****

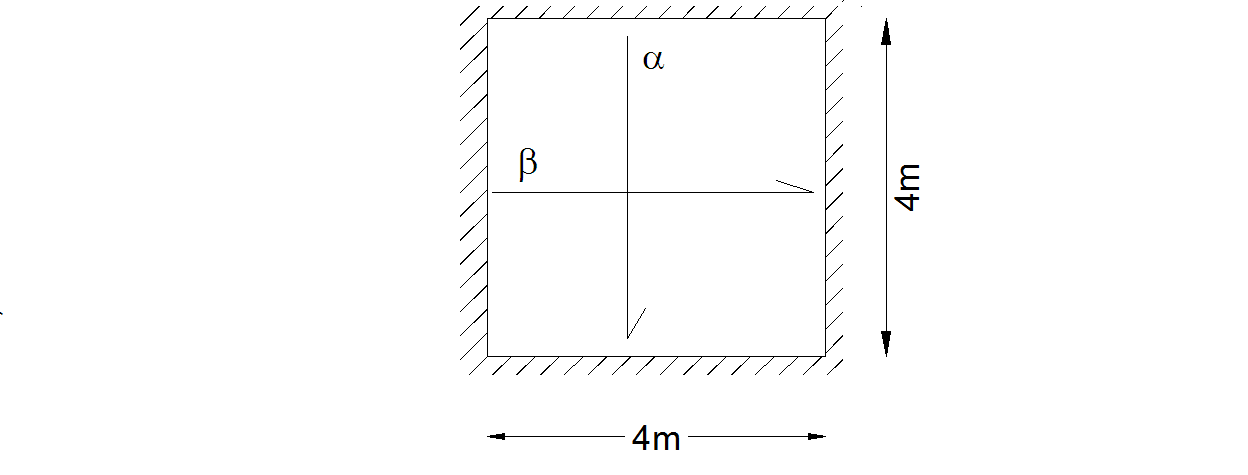


******

***Floor(2) (2\*4)***



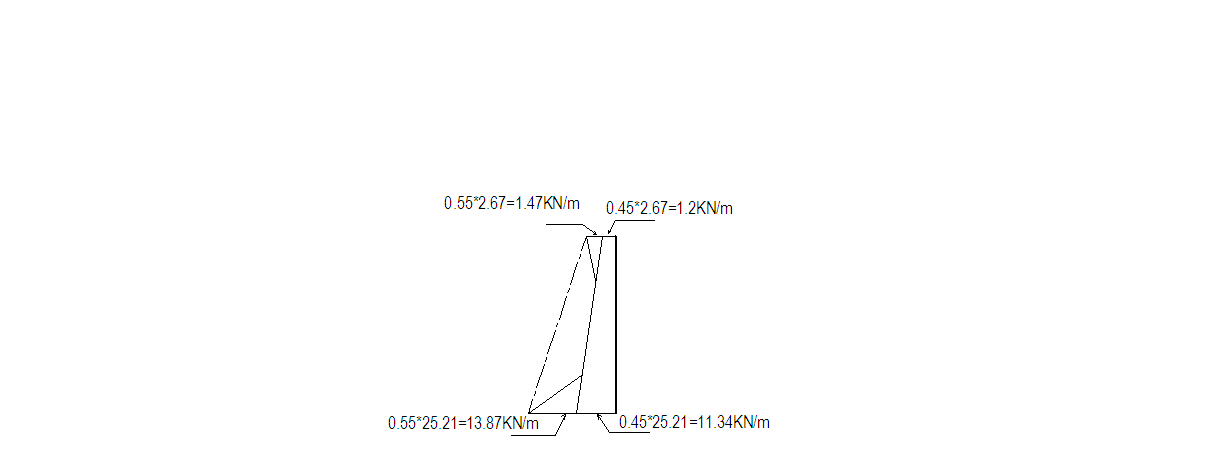
**The slab is one way**

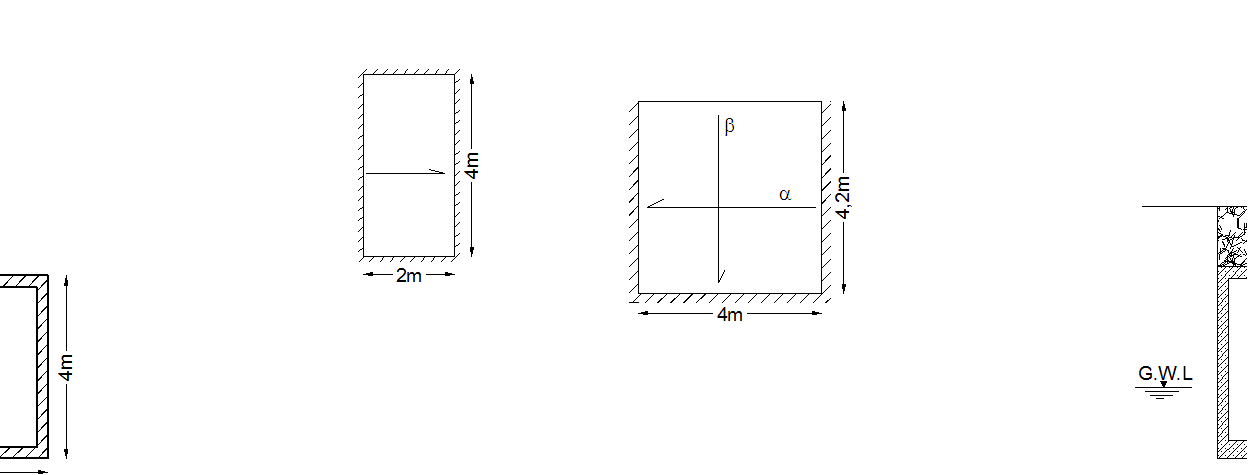
*** Wall lower (1)***







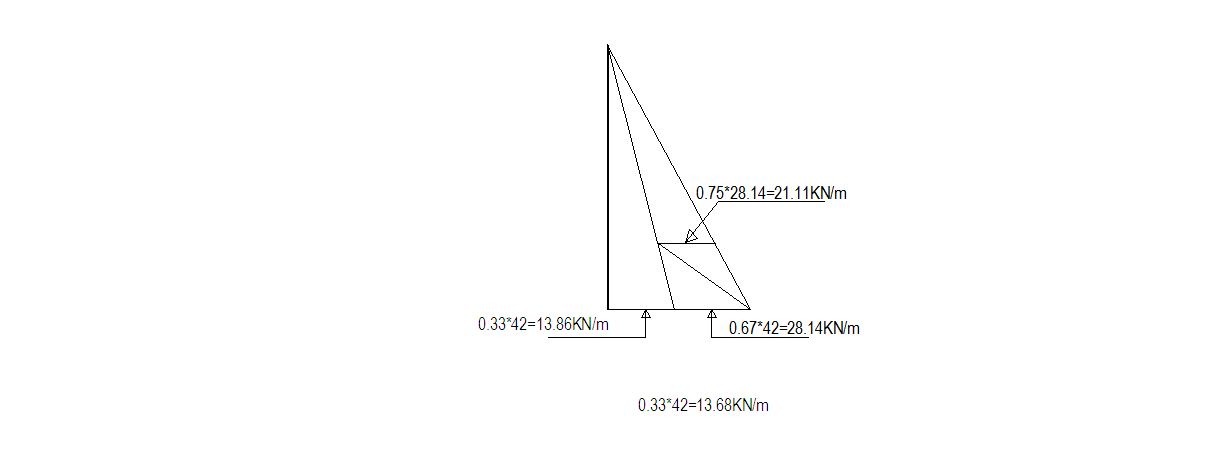




***Wall upper(2)***

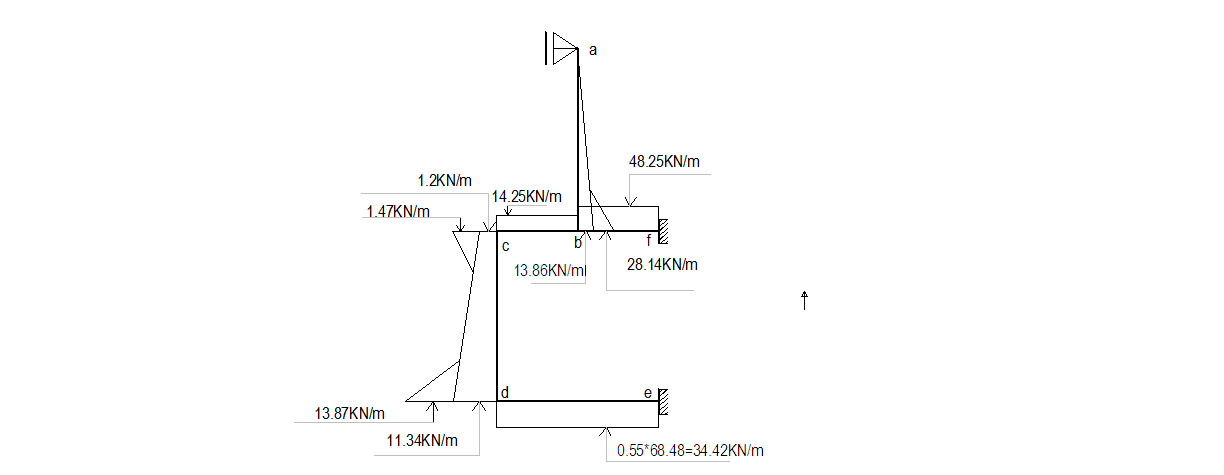






***Analysis of strips***

***VL.strip(1)sec (A-A)***



***Find distribution factor***



***Jont b***



***Joint c***





***Joint d***

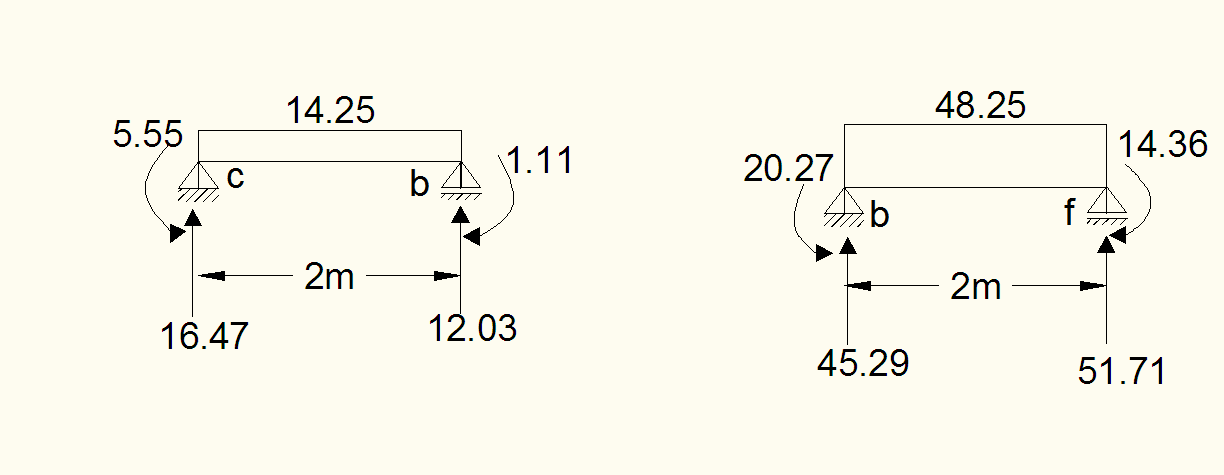




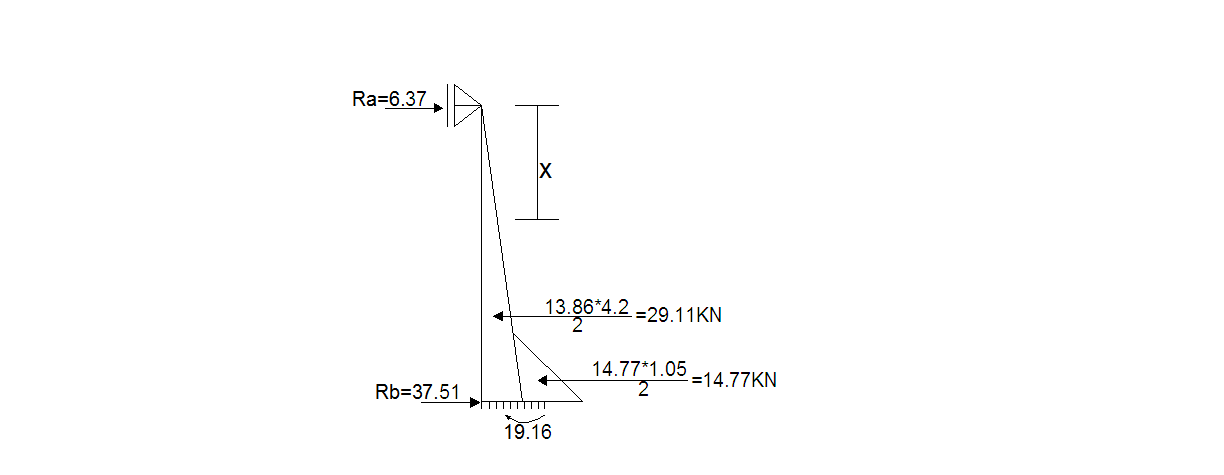
***Find F.E.M***



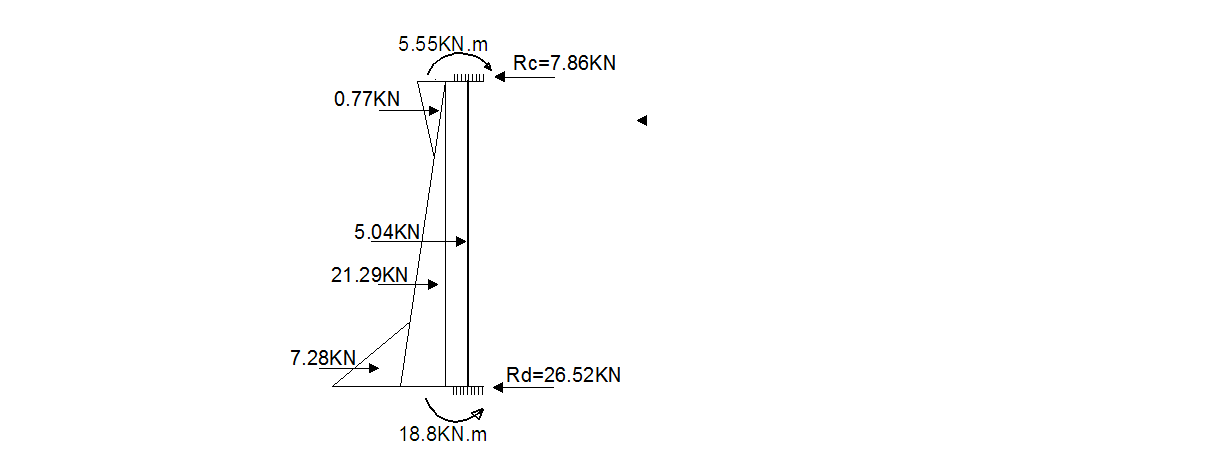
|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Joint** | **f** | **b** | | | **c** |  | **d** | | **e** |
| **member** | **fb** | **bf** | **ba** | **bc** | **cb** | **cd** | **dc** | **de** | **ed** |
| **D.F** | **0** | **0.425** | **0.15** | **0.425** | **0.68** | **0.32** | **0.19** | **0.81** | **0** |
| **F.E.M** | **16.08** | **-16.08** | **20.64** | **4.75** | **-4.75** | **8.21** | **-12.71** | **45.89** | **-45.89** |
| **Dist** | **0** | **-3.96** | **-1.40** | **-3.96** | **-2.35** | **-1.11** | **-6.3** | **-26.88** | **0** |
| **C.O.M** | **-1.98** | **0** | **0** | **-1.2** | **-1.98** | **-3.15** | **-0.56** | **0** | **-13.44** |
| **Dist** | **0** | **0.51** | **0.18** | **0.51** | **3.49** | **1.64** | **0.11** | **0.45** | **0** |
| **C.O.M** | **0.26** | **0** | **0** | **1.75** | **0.26** | **0.06** | **0.82** | **0** | **0.22** |
| **Dist** | **0** | **-0.74** | **-0.26** | **-0.74** | **-0.22** | **-0.1** | **-0.16** | **-0.66** | **0** |
| **Mf** | **14.36** | **-20.27** | **19.16** | **1.11** | **-5.55** | **5.55** | **-18.8** | **18.8** | **-59.11** |



***Point of zero shear***

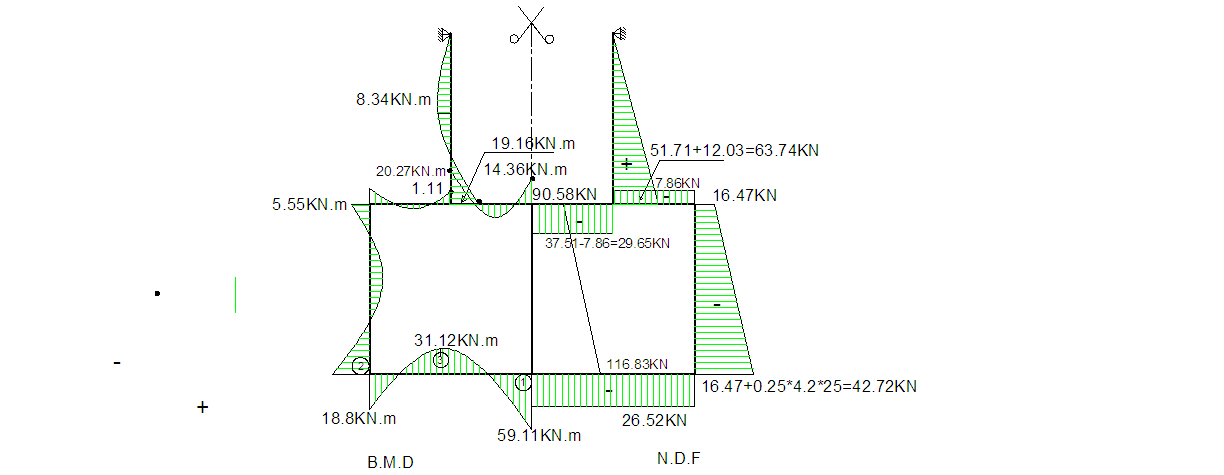


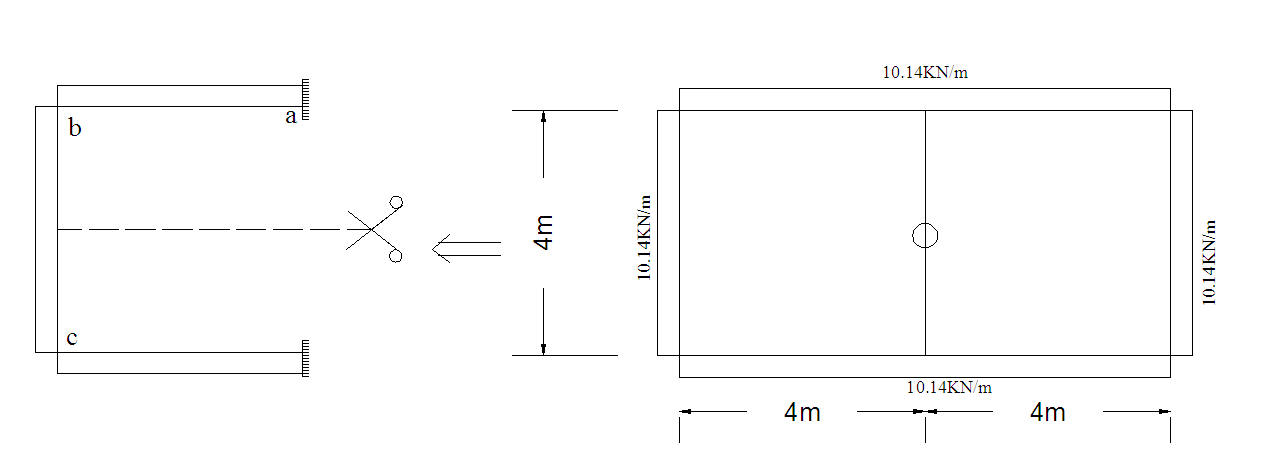




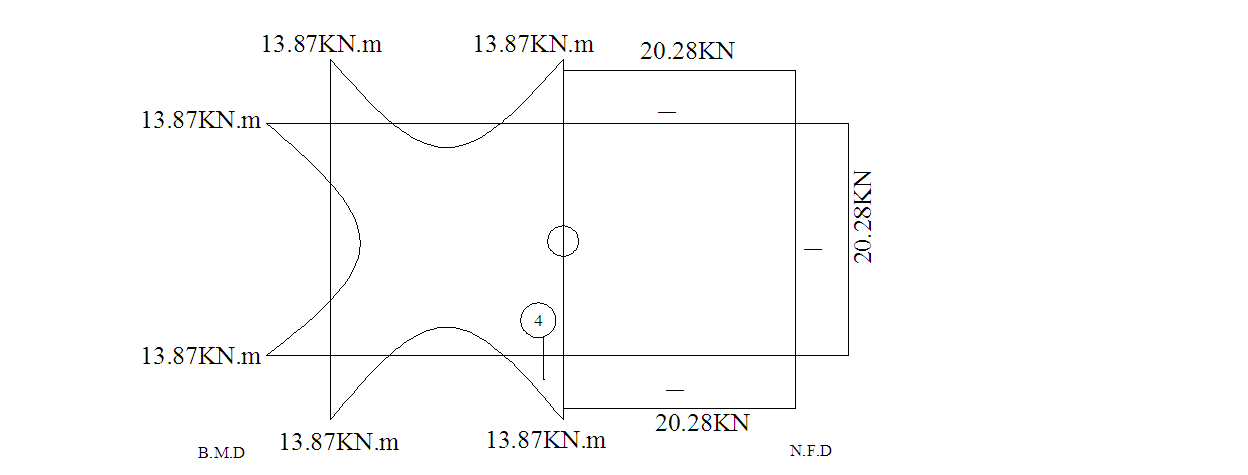


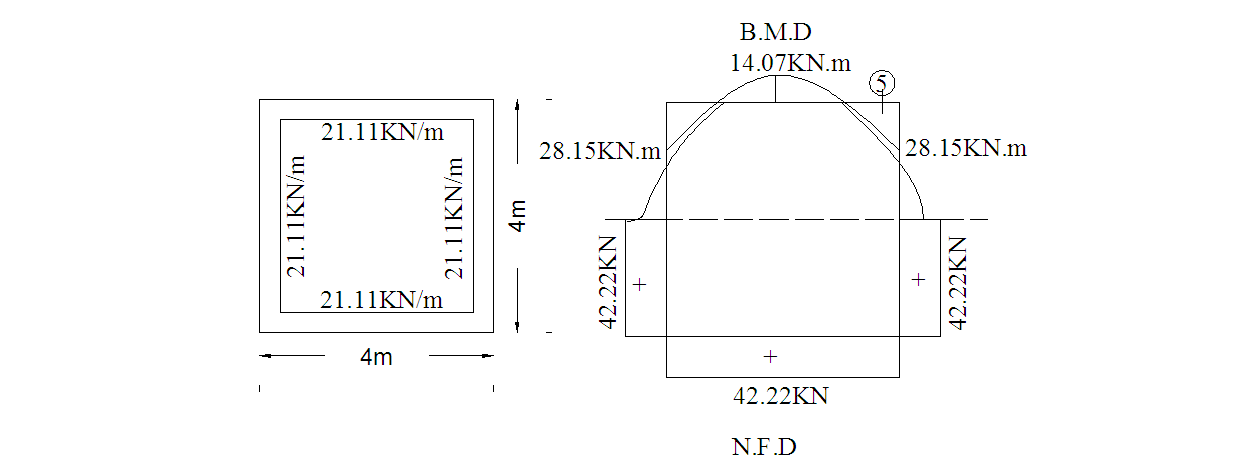




***HZ .strip (1) at h=1.05 m sec (B-B)***

|  |  |  |  |
| --- | --- | --- | --- |
| A | b | | Joint |
| ab | ab | bc | member |
| 0 | 2 ∕ 3 | 1 ∕ 3 | D.f |
| 13.87 | 13.87 | -13.87 | F.E.M |
| 0 | 0 | 0 | Dist |
| 0 | 0 | 0 | C.O.M |
| 13.87 | 13.87 | -13.87 | Mf |



**HZ. Strip (2) at h=5.25m**

***Design of sections***

***Sec (1-1) water section***



***Stage I***



**Take t=450mm**

**Check stresses**



****





***depended on virtual thickness***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 400 | 200 |  | Virtual thickness(mm) |
| 1.70 | 1.60 | 1.30 | 1.00 |  |



***Stage II***







***Sec (2-2) water section***



***Stage I***



**Take =250mm**

**Check stresses**



***stageII***



***sec (3-3) air section***

****

***Stage I***



**Take t=450mm**

**Check stresse**



***Stage II***







***Sec (4-4) water section***



***Stage I***



**Take t=250mm**

**Check stresses**



***Stage II***







***Sec (5-5) water section***



***Stage I***



**Take t=350mm**

**Check stresses**



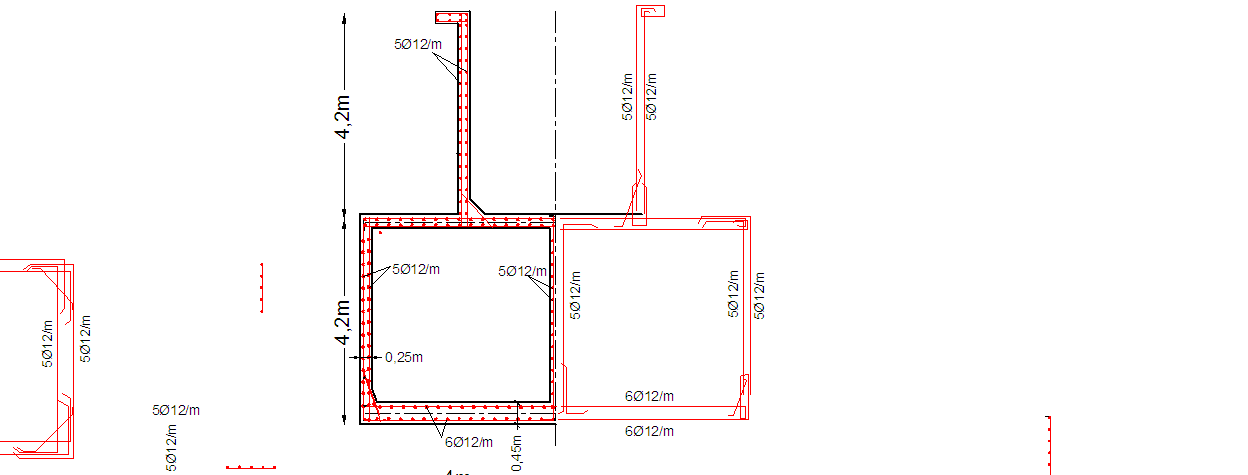
***Stage II***



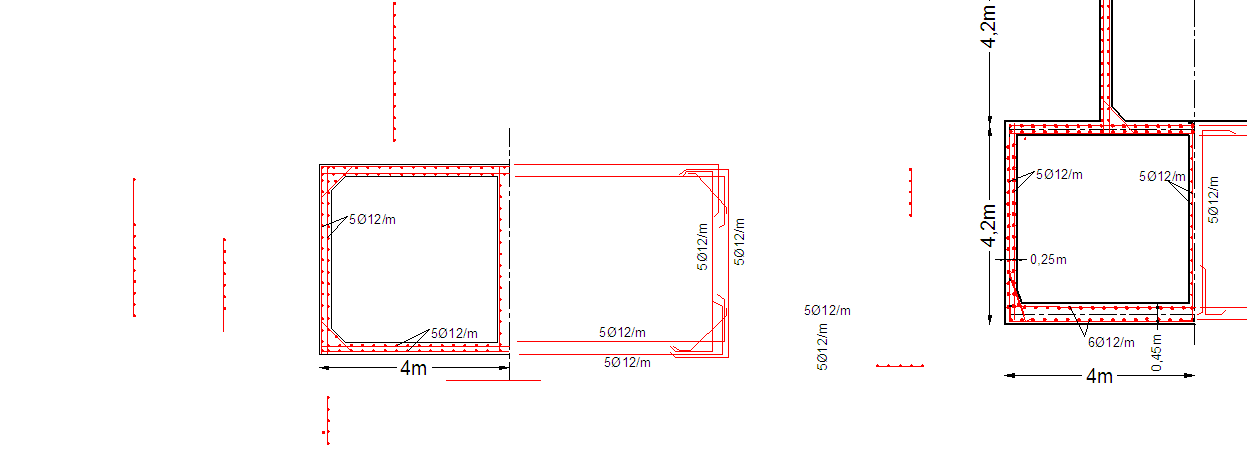




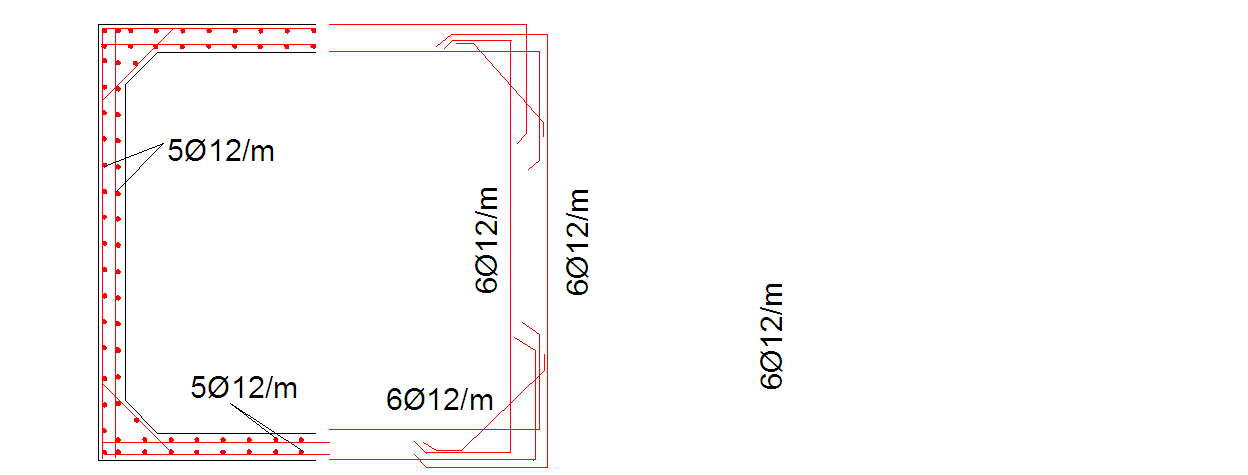
***Detailing of reinforcement***



**VL ــstrip(1)**

****

**HZ ــ strip (1)**



**HZ ــ strip (2)**

**HZ ــ strip (2)**