***🟔 السلالم :-***

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*🟐 Design of stairs :-*

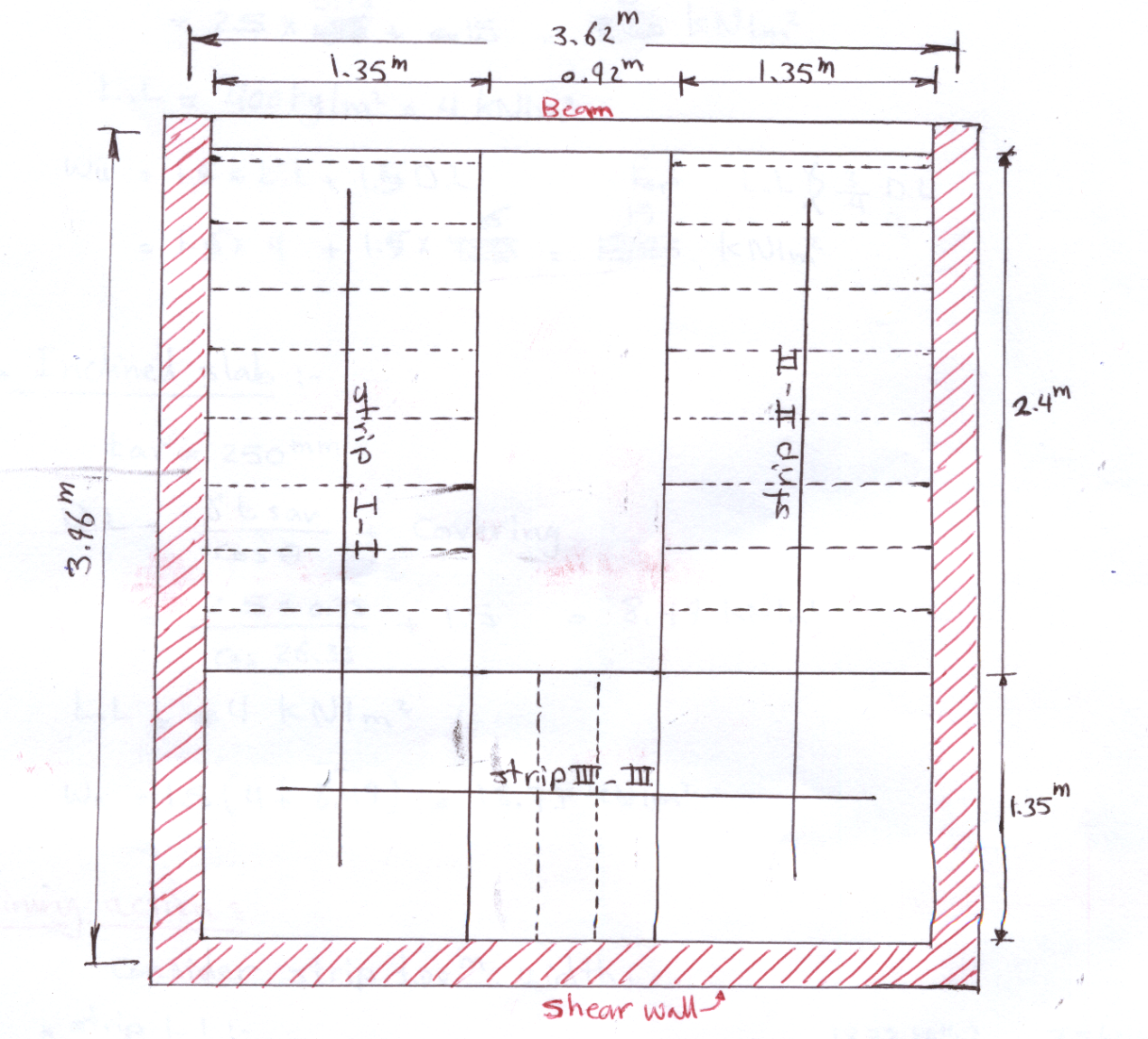
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*☞ a) Main stair :-*

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*(1)- statical system of stairs :-*

*----------------------------------------*



*(2)- Concrete dimensions:-*

*------------------------------------*

*✯☞ " Use high tensile steel "*

*Take ts= 180 mm.*

*🢩 for mild steel ..*

*ts=3460-(1350/2) / (1.25×20) = 131.4*

*\*\* Design for H.T steel :*

*✯🢩 ts = 180 mm ..*

*t avr = 180+70 = 250 mm*

*✹ Dimension of steps = 15 cm ×30 cm*

*Ф= Tcm -1 15/30 = 26 0 33\*

*(3)-Loads :-*

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*✹ Hrozental slab :-*

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*D.L =ɣ ts + corering*

*= 25 \* 0.18 + 1.5 = 6 KN/m 2.*

*L.L = 400 kg /m 2 = 4 KN/m 2*

*Wu = 1.5 \* L.L + 1.50 D.L*

***☞*** *for L.L* ***≯****¾D.L..*

*= 1.5 \* 4 + 1.5×6 = 15 KN/m 2*

✯ *Inclined slab :-*

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*tar = 250 mm*

*D.L = ɣ t s avr / cosθ + covering*

*= 2.5\*0.25 / cos 26.33+1.5=8.44 KN/m2.*

*L.L = 4 KN/m2 ..*

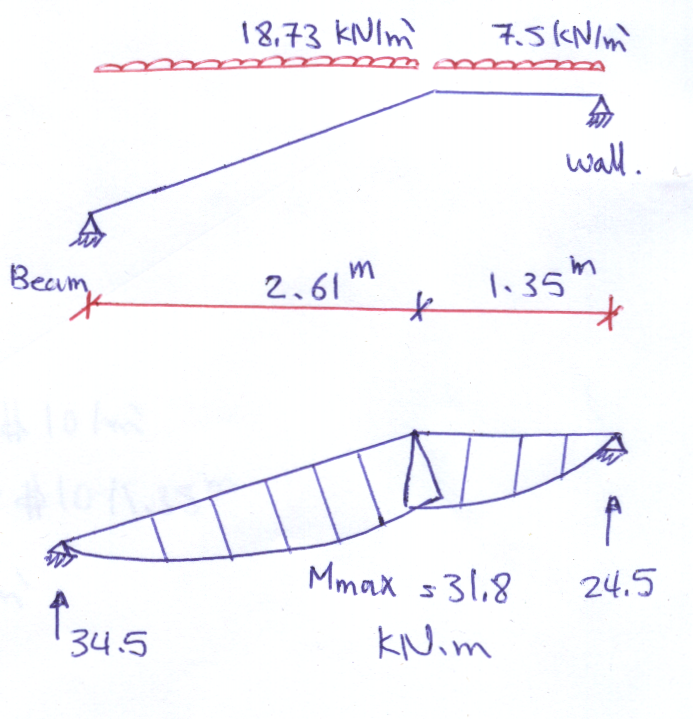
*Wu = 1.5 (4 + 8.49) = 18.73 KN/m 2 ..*

*(4)- Straining action :-*

*-----------------------------*

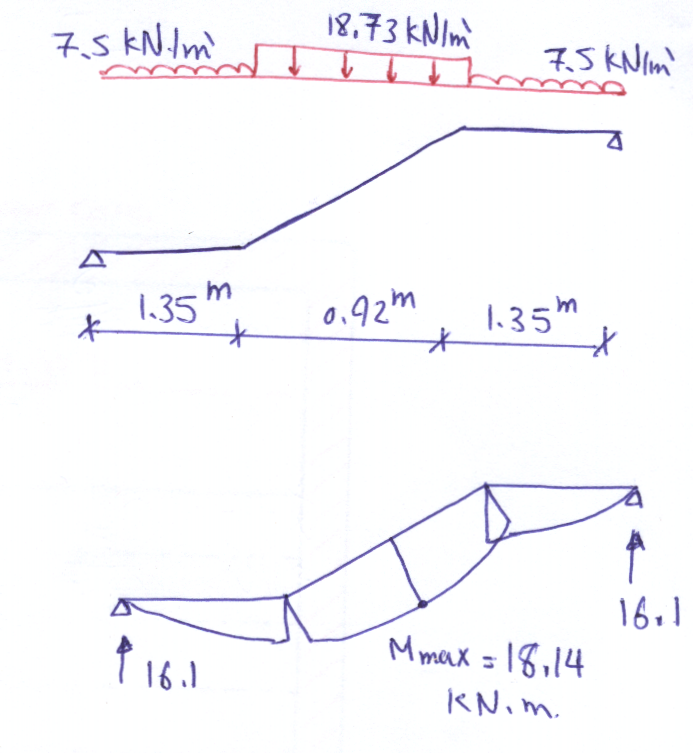
*✹ consider strip 1.00 m width ..*

*✯ Strip( 1-1) :-*



*✯ Strip(2-2) the same as (1-1)*

*✯ Strip(3-3) :-*



*(5)- Design for slab :-*

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*strip 1-1 :*

*--------------*

*Mu = 31.8 KN/m*

*d = (180 - 20) = c1 √ 31.8×10 6 / 25 × 1000*

***⇛*** *c1= 4.48 , J = 0.826*

*As = 31.8×10 6 / 0.826×360×160 = 668.4 mm2 .*

*☞ Take 5Ф16/m \ .*

*✯🢩 No of bars = 7Ф16 / 1.35 m*

*As \ = 5Ф8 / m \*

*strip 2-2 :*

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*Mu = 18.14 KN.m*

*d = 160 mm , J = 0.826 ..*

*As = 18.14 × 10 6 / 0.826×360×160 = 381*

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| --- |
| *✹↣*Use 5Ф12/m\  and 7Ф12/1.35 m |

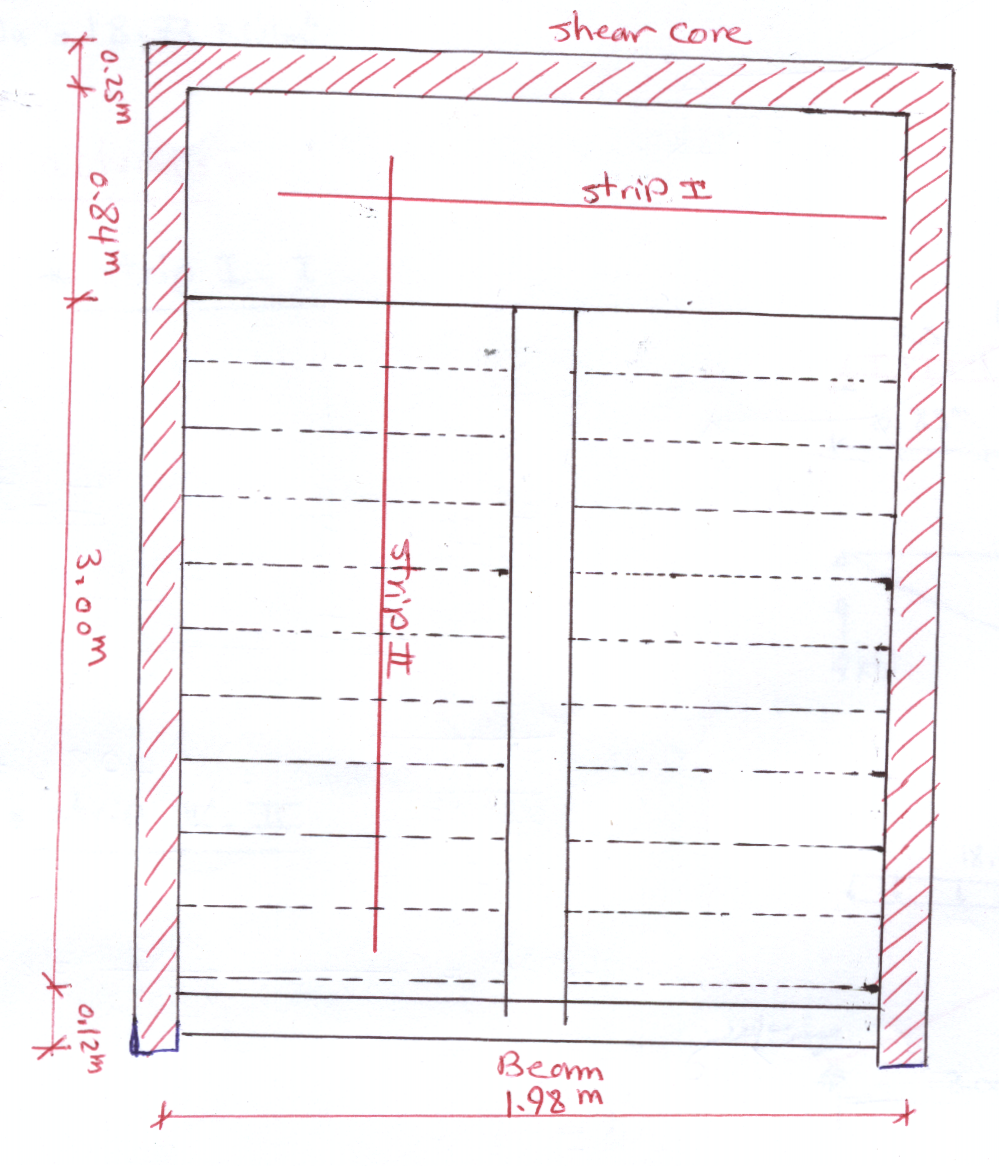
*🢩 use As\ = 5Ф8/m\ ..*

*☞ b) The secorelry stairs :-*

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*(1)-Statical system :*

*--------------------------*



*(2)-Cocrete dimensions :*

*--------------------------------*

*ts =****[****( 3+ 0.84 + 0.15 ) –( 0.84/2 ) ×103* ***]*** */ 20*

*= 178* ***≃*** *180 mm ..*

*tsar =250 mm .*

*Dimension of steps = 15 cm × 50 cm*

***θ****= 260 33\ as before*

*(3)- Loads :-*

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*✹ Horozontal slab :-*

*--------------------------*

*D.L = 6 KN/m 2*

*L.L = 4 KN/m 2 , Wu = 15 KN/m 2 ..*

*✹ Vertical slab :-*

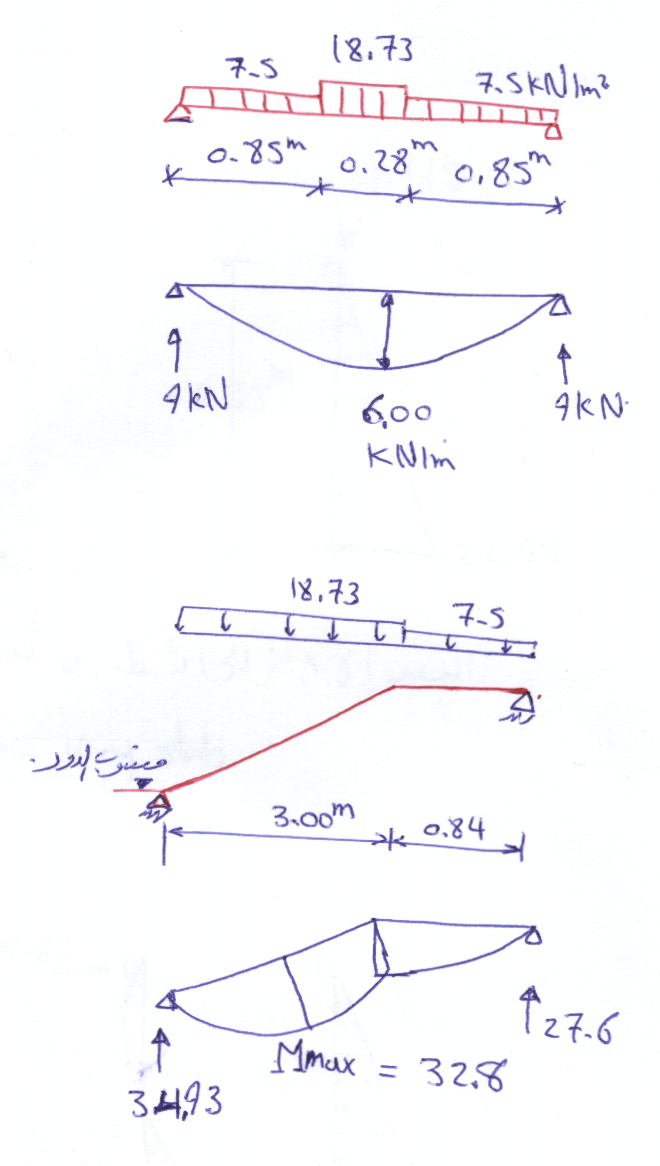
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*D.L = 8.49 KN/m 2*

*L.L = 4 KN/m 2 , Wu = 18.73 KN/m 2  .. (4)- straining actions :-*

*------------------------------*

*✯ strip (1-1) :-*

*-------------------*

*✯ strip (2-2) :-*

*-------------------*

*(5)- Design of slabs :-*

*-----------------------------*

*✯ strip (2-2) :-*

*-------------------*

*d = 180 - 20 = c1√ 31.8 × 10 6 / 25 × 1000*

*🢩 c1 = 4.41 , J = 0.826 .*

*As = 32.8 ×10 6 / 0.826 × 360 × 160 = 689.4 ..*

*☞ Take 5Ф16/m \ .*

*No of bars = 5Ф16/0.84 m , As \ = 5Ф10/m \ .*

*✯ strip (1-1) :-*

*-------------------*

*As = 6×10 6 / (0.826×360×160 ) = 126 .*

|  |
| --- |
| *✹↣Use 5Ф10/m \ Top and bottom ..* |

*🟐 🟐 ------------------------*