BENHA UNIVERSITY
SHOUBRA FACULTY OF ENGINEERING
CIVIL ENGINEERING DEPARTEMENT
Third Year Civil (General)
Code: CVG323

مادة:تصميم منشآت خرسانية-ب

الحل النموذجي لإمتحان الفصل الدراسي الثاني

ثالثة مدني عام

٢٠١٦-٢٠١٧

دكتور المادة

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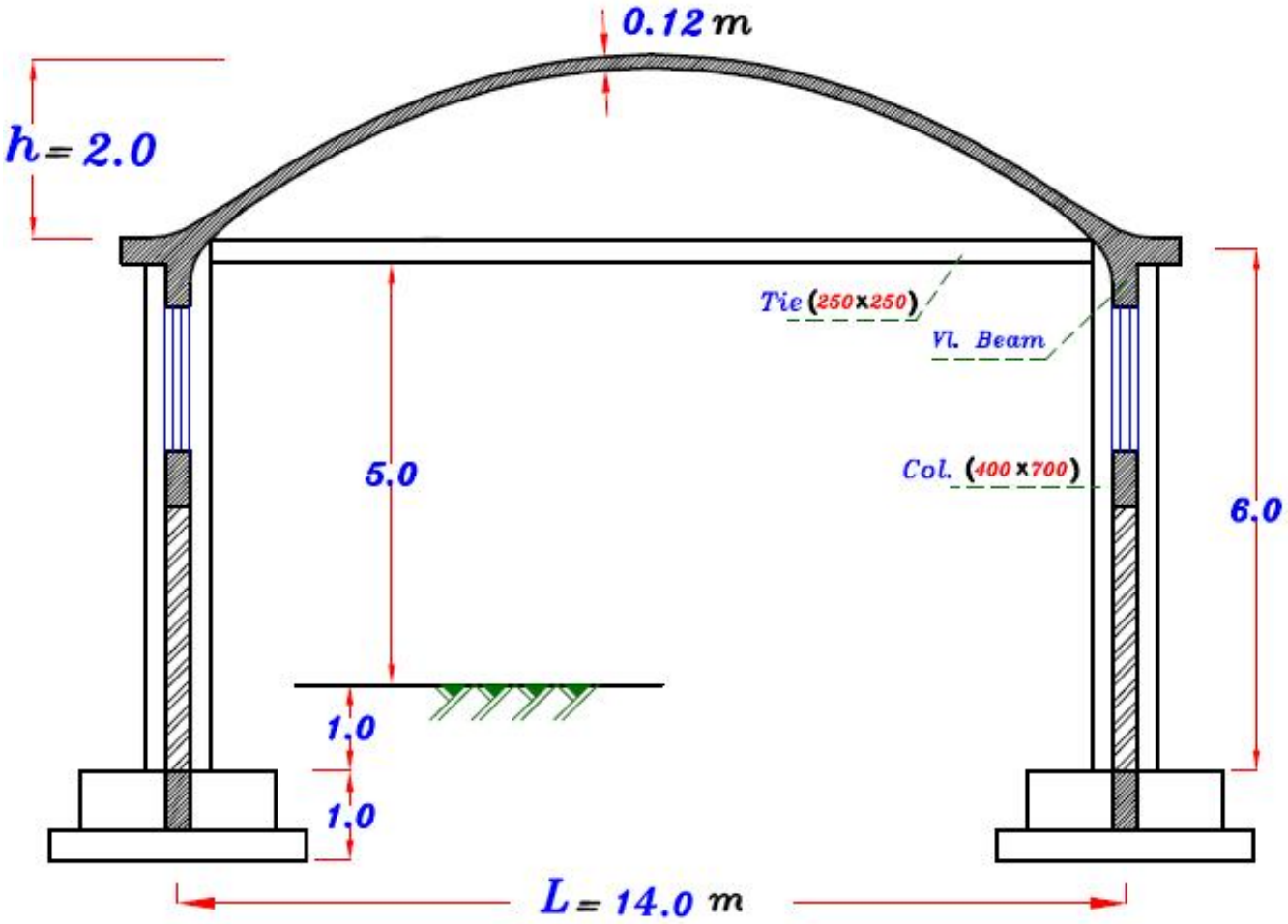
Final Term Exam
Wednesday 24/05/2017
Reinforced Concrete Structures (2-B)
Duration: 3.0 hours
No. of questions: 2

Model Answer

Question (2): Define the following: (10 Marks) [ILO's: a1, b1, c1, c2]

(a)



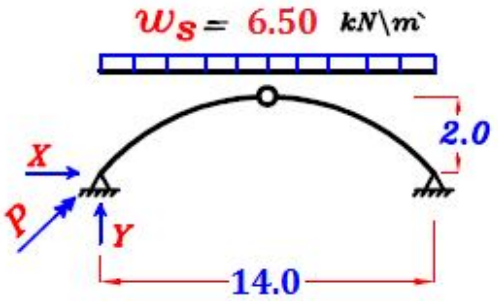
Design the Arch Slab.

Take $t_s = 120\ mm$

$(w_s)_{U.L.} = 1.4\ (t_s\ \gamma_c + F.C.) + 1.6\ (L.L.)$

$(w_s)_{U.L.} = 1.4\ (0.12 * 25 + 0.50) + 1.6\ (1.0)$

$= 6.50\ kN\backslash m^2\ \ (H.P.)$



To Get N.F.

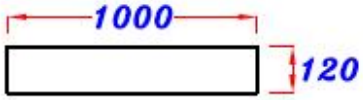
$Y = \frac{w\,L}{2} = \frac{6.50 * 12}{2} = 39.0\ kN\backslash m$

$X = \frac{w\,L^2}{8\,h} = \frac{6.50 * 12^2}{8 * 2.0} = 58.5\ kN\backslash m$

$P = \sqrt{X^2 + Y^2} = \sqrt{39.0^2 + 58.5^2} = 70.30\ kN$

* Design the Arch Slab.

Neglect B.M. & Design on N.F. only.



$\therefore$ Designed as a Column.

$\therefore P_{U.L.} = 0.35\ A_c\ F_{cu} + 0.67\ A_s\ F_y$

Take $A_c = 120 * 1000 = 120000\ mm^2$

$\therefore 70.30 * 10^3 = 0.35\ (120000)(30) + 0.67\ A_s\ (360)$

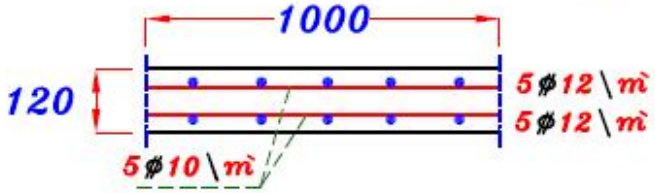
$\therefore A_s = -4932\ mm^2 = -\ (Ve)$ Value

$\therefore$ Take $A_s = A_{s\,min.} = \frac{0.8}{100} * b * t$

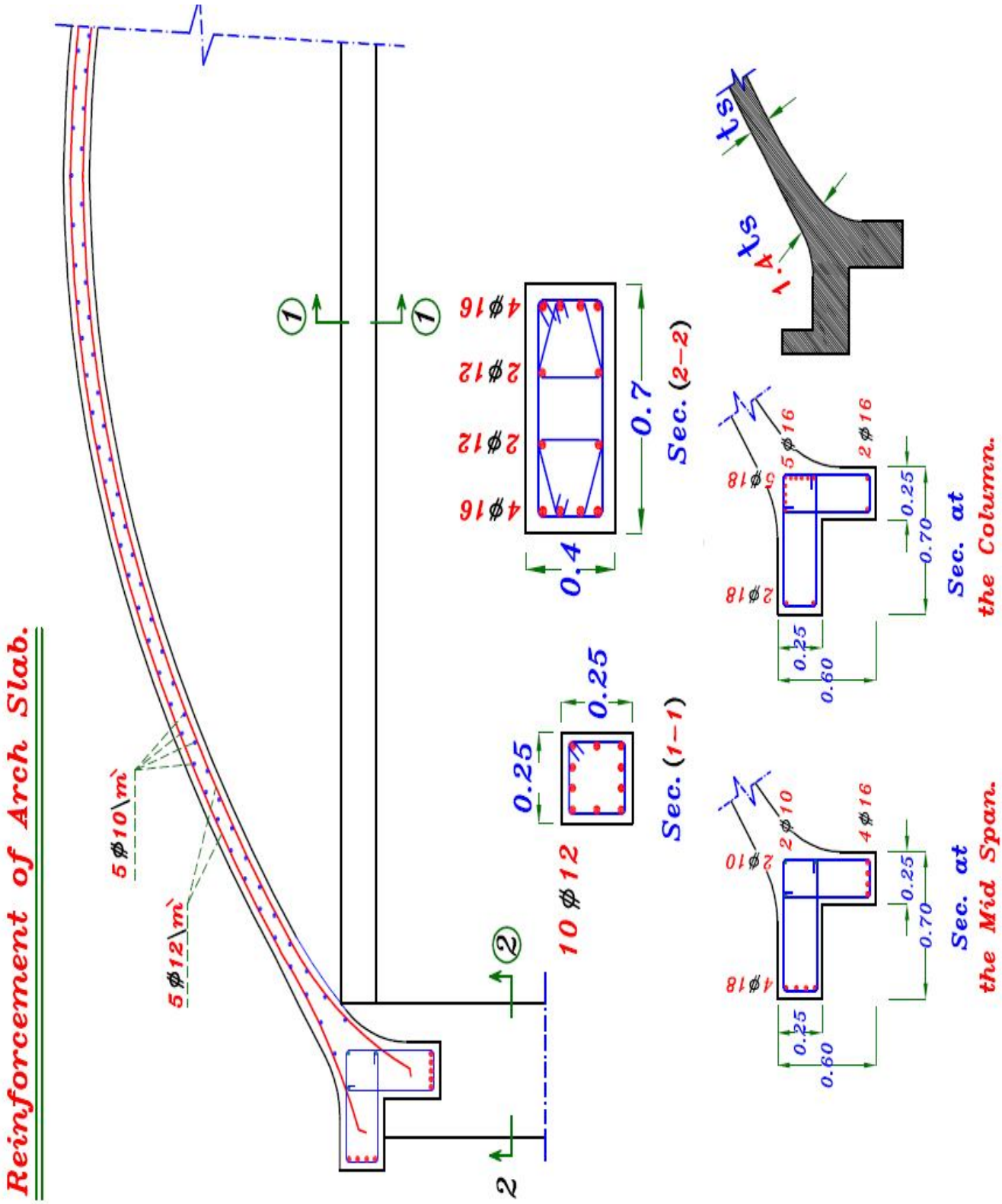
$\therefore A_s = \frac{0.8}{100} * 120 * 1000 = 960\ mm^2 = A_{s\,total}$

$\therefore$ Upper Steel & Lower Steel $= \frac{A_{s\,total}}{2} = \frac{960}{2} = 480\ mm^2$

$5\phi12\backslash m`$



(b)


Reinforcement of Arch Slab.
5 ϕ10\m`
5 ϕ12\m`
10 ϕ12
1
1
2
2
4ϕ16
2ϕ12
2ϕ12
4ϕ16
0.7
0.4
Sec. (2-2)
0.25
0.25
Sec. (1-1)
1.4ts
ts
5ϕ16
2ϕ16
5ϕ18
2ϕ18
0.25
0.70
0.25
0.60
Sec. at the Column.
2ϕ10
4ϕ16
2ϕ10
4ϕ18
0.25
0.70
0.25
0.60
Sec. at the Mid Span.

Question (3): Define the following: **(10 Marks)** **[ILO's: a1, b1, c1, c2]**

(a)

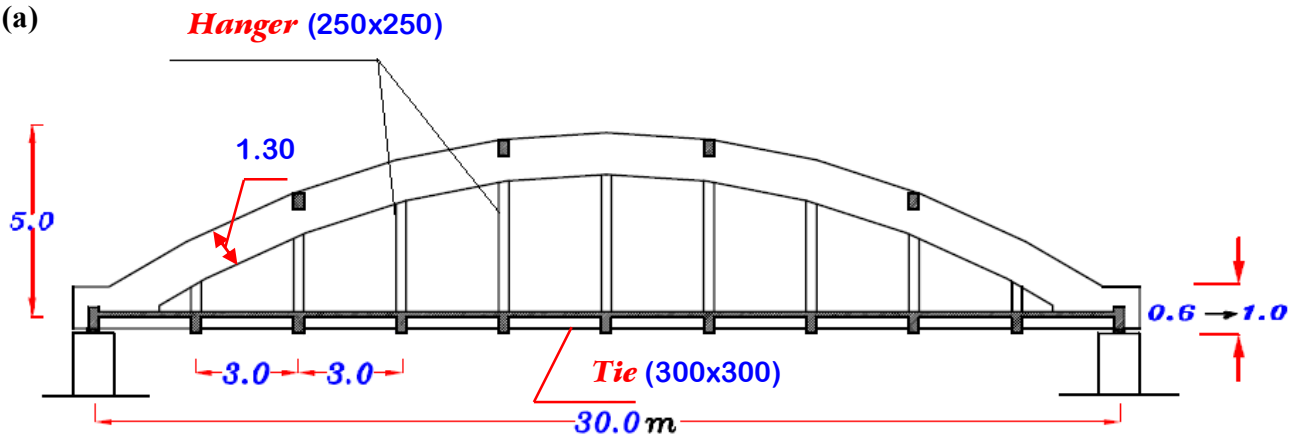


Figure (3)

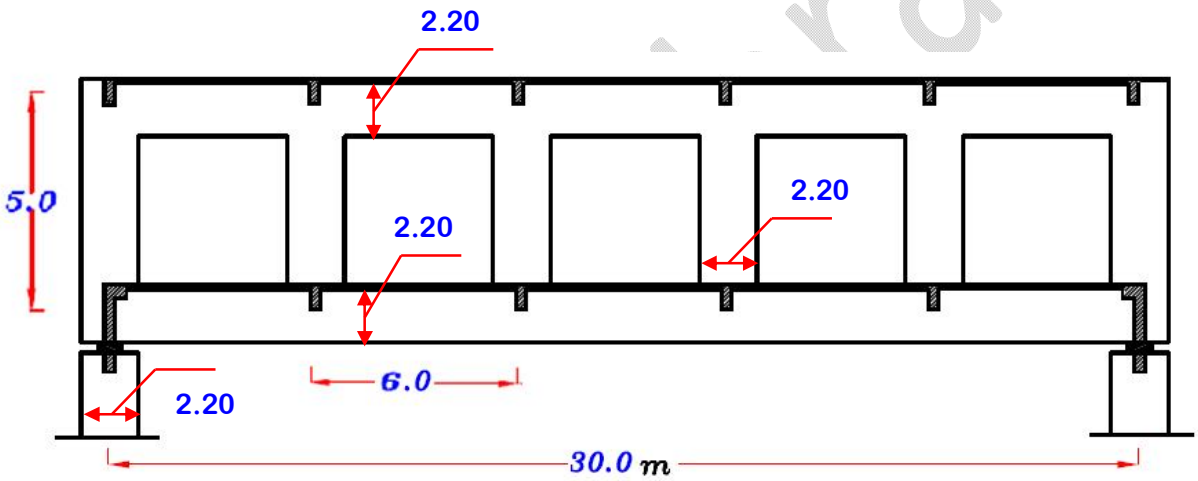


Figure (4)

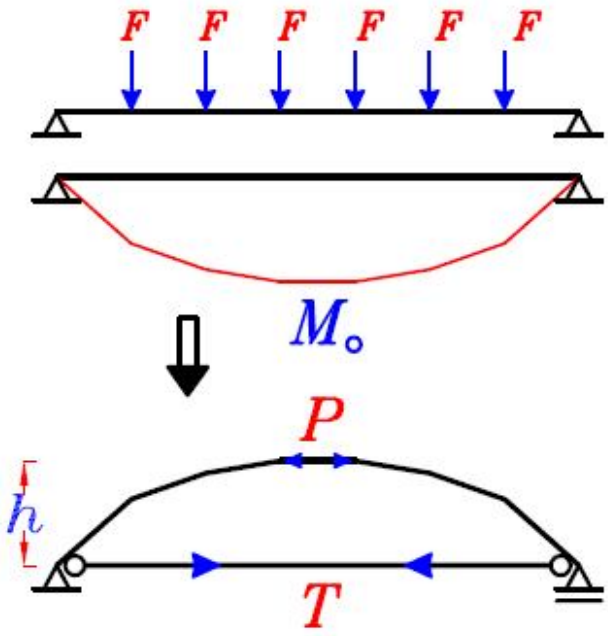
(b)

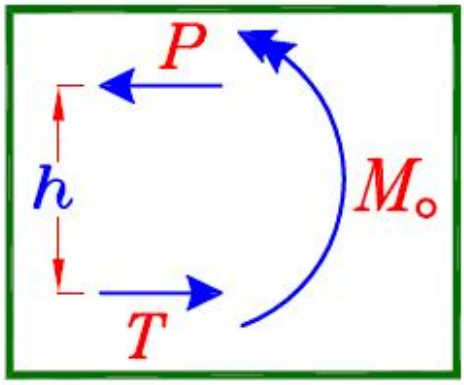
Arched Frame System:

Adv : no tension forces

disadv : when arch radius increases, tension increases making it weaker.

Arch Girder Applications.



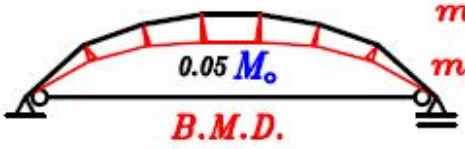


$$P = T = \frac{M_\circ}{h}$$

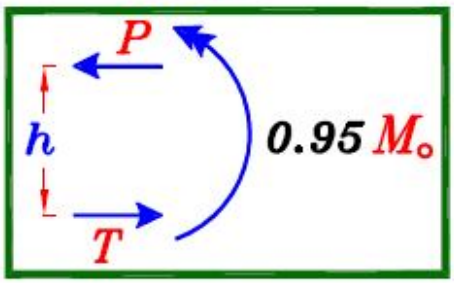
تعتمد فكره الـ *Arch Girder* على تحويل الـ *Bending moment* الى *Couple* اى الى *Tension Normal Forces* & *Compression Normal Forces*

و ذلك للتوفير لانه عند تصميم قطاع عليه *pure Compression* ستكون كميه الخرسانه و الحديد قليله مما يعمل على تقليل ثمن الـ *member*

و عند تصميم قطاع عليه *pure Tension* تكون كميه الحديد كبيره و كميه الخرسانه قليله و تكون ايضا نسبيا ثمن الـ *member* أقل .



اذا حدثت استطاله بسيطه لل *Tie* سيحدث *moment* بسيط قيمته فى حدود $0.05\,M_\circ$ اذا قيمه الـ *moment* الذى سيتحول لـ *couple* يساوى تقريبا $0.95\,M_\circ$



$$P = 0.95\ \frac{M_\circ}{h}$$

$$T = 0.95\ \frac{M_\circ}{h}$$

Vierendeel Girder:

Adv & disadv :

The Vierendeel girder design is sometimes adopted in the design of footbridges. In traditional truss design, triangular shape of truss is normally used because the shape cannot be changed without altering the length of its members. By applying loads only to the joints of trusses, the members of truss are only subjected to a uniform tensile or compressive stress across their cross sections because their lines of action pass through a common hinged joint.

The Vierendeel truss/girder is characterized by having only vertical members between the top and bottom chords and is a statically indeterminate structure. Hence, bending, shear and axial capacity of these members contribute to the resistance to external loads. The use of this girder enables the footbridge to span larger distances and present an attractive outlook. However, it suffers from the drawback that the distribution of stresses is more complicated than normal truss structures

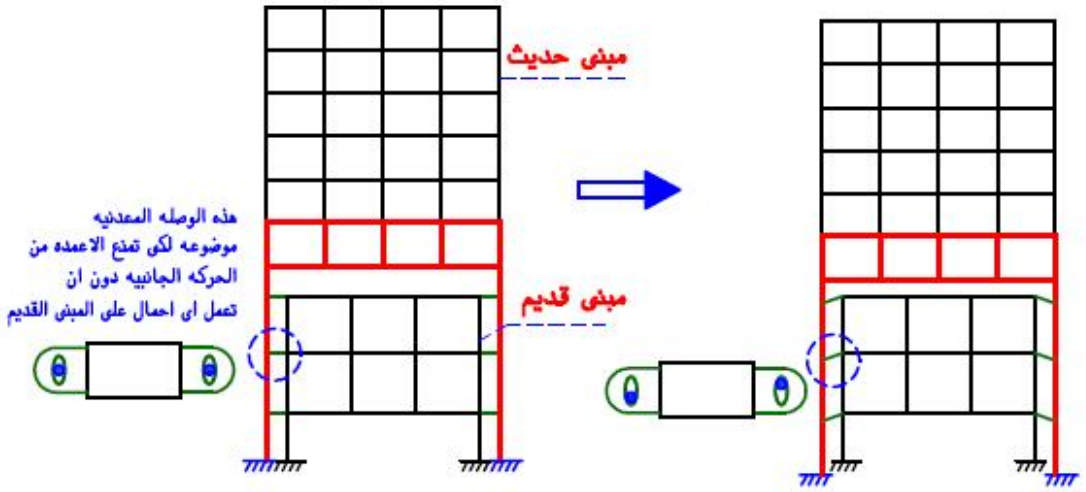
Vierendeel Applications.

أهم إستخدامات الـ Vierendeels

يتميز الـ Vierendeels أنه يستطيع أن يحمل عدد من أدوار المبنى فوقه دون وضع أعمده فى المنتصف .

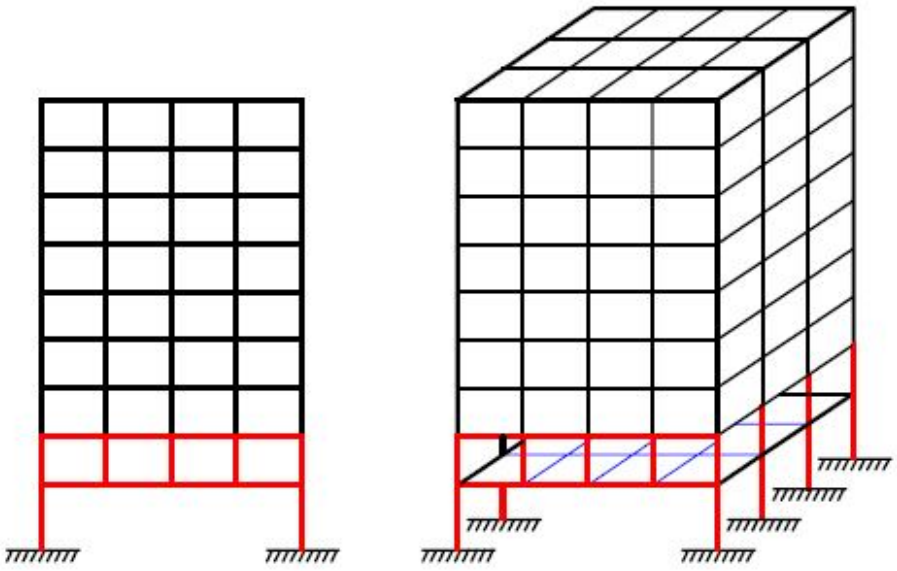
المبنى الحديث محمول على Vierendeels

و الـ Vierendeels محموله على أعمده خارجيه دون أن يحمل على المبنى القديم



لا توجد أعمده فى الدور الارضى لان كل الادوارالعلويه محموله على Vierendeels

و الـ Vierendeels محموله على أعمده خارجيه فقط.



توجد قاعه بدون أعمده داخليه فى الدور الخامس

و الادوار العلويه محموله على *Vierendeels* فى الدور الخامس و ال *Vierendeels* محموله على أعمده خارجيه .