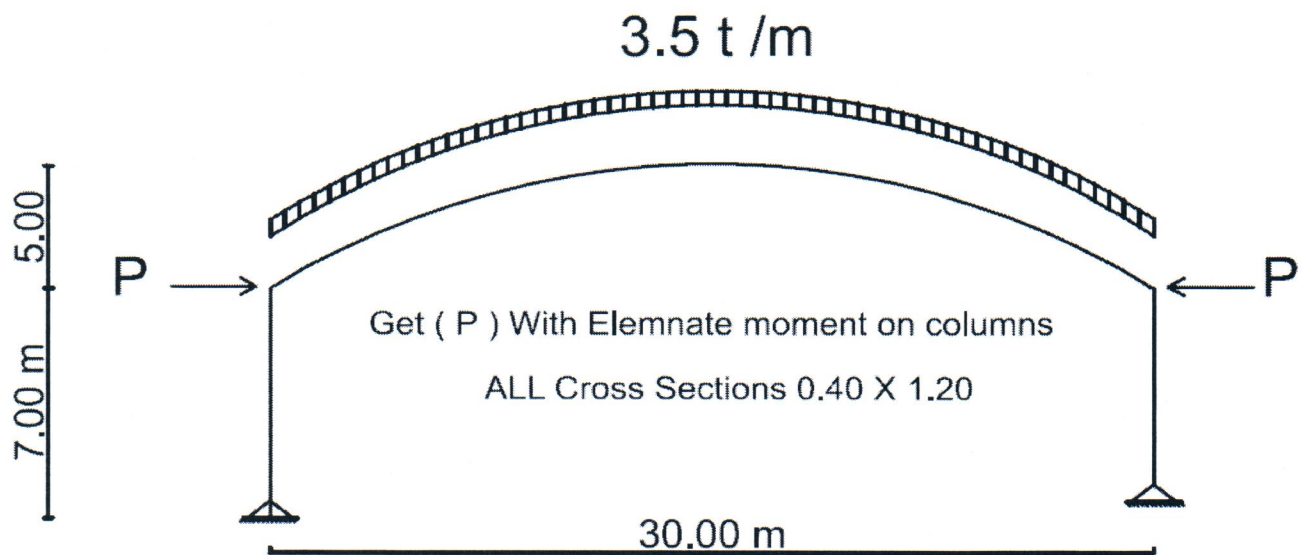


Example (6) Arched Girder**الحل :-**

1- نقوم بتوصيف الجزء المنحني وذلك من خلال Parabolic Arched Formula

$$Y = AX^2 + BX + C$$

نقوم بالتعويض بالثلاث نقاط المعلومة من الشكل بعلالية و النقاط هي

$$(0,0) \quad (15,5) \quad (30,0)$$

عند التعويض في المعادلة بالإحداثيات الثلاثة السابقة ينتج المعادلة كالآتي :-

$$Y = (-1/45) X^2 + (2/3) X$$

| point No | x | y | y+7m |
|----------|------|---------|---------|
| 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 7 |
| 3 | 0.5 | 0.32778 | 7.32778 |
| 4 | 1 | 0.64444 | 7.64444 |
| 5 | 1.5 | 0.95 | 7.95 |
| 6 | 2 | 1.24444 | 8.24444 |
| 7 | 2.5 | 1.52778 | 8.52778 |
| 8 | 3 | 1.8 | 8.8 |
| 9 | 3.5 | 2.06111 | 9.06111 |
| 10 | 4 | 2.31111 | 9.31111 |
| 11 | 4.5 | 2.55 | 9.55 |
| 12 | 5 | 2.77778 | 9.77778 |
| 13 | 5.5 | 2.99444 | 9.99444 |
| 14 | 6 | 3.2 | 10.2 |
| 15 | 6.5 | 3.39444 | 10.3944 |
| 16 | 7 | 3.57778 | 10.5778 |
| 17 | 7.5 | 3.75 | 10.75 |
| 18 | 8 | 3.91111 | 10.9111 |
| 19 | 8.5 | 4.06111 | 11.0611 |
| 20 | 9 | 4.2 | 11.2 |
| 21 | 9.5 | 4.32778 | 11.3278 |
| 22 | 10 | 4.44444 | 11.4444 |
| 23 | 10.5 | 4.55 | 11.55 |
| 24 | 11 | 4.64444 | 11.6444 |
| 25 | 11.5 | 4.72778 | 11.7278 |
| 26 | 12 | 4.8 | 11.8 |
| 27 | 12.5 | 4.86111 | 11.8611 |
| 28 | 13 | 4.91111 | 11.9111 |
| 29 | 13.5 | 4.95 | 11.95 |
| 30 | 14 | 4.97778 | 11.9778 |
| 31 | 14.5 | 4.99444 | 11.9944 |
| 32 | 15 | 5 | 12 |

| point No | x | y | y+7m |
|----------|------|---------|---------|
| 33 | 15.5 | 4.99444 | 11.9944 |
| 34 | 15 | 5 | 12 |
| 35 | 16.5 | 4.95 | 11.95 |
| 36 | 17 | 4.91111 | 11.9111 |
| 37 | 17.5 | 4.86111 | 11.8611 |
| 38 | 18 | 4.8 | 11.8 |
| 39 | 18.5 | 4.72778 | 11.7278 |
| 40 | 19 | 4.64444 | 11.6444 |
| 41 | 19.5 | 4.55 | 11.55 |
| 42 | 20 | 4.44444 | 11.4444 |
| 43 | 20.5 | 4.32778 | 11.3278 |
| 44 | 21 | 4.2 | 11.2 |
| 45 | 21.5 | 4.06111 | 11.0611 |
| 46 | 22 | 3.91111 | 10.9111 |
| 47 | 22.5 | 3.75 | 10.75 |
| 48 | 23 | 3.57778 | 10.5778 |
| 49 | 23.5 | 3.39444 | 10.3944 |
| 50 | 24 | 3.2 | 10.2 |
| 51 | 24.5 | 2.99444 | 9.99444 |
| 52 | 25 | 2.77778 | 9.77778 |
| 53 | 25.5 | 2.55 | 9.55 |
| 54 | 26 | 2.31111 | 9.31111 |
| 55 | 26.5 | 2.06111 | 9.06111 |
| 56 | 27 | 1.8 | 8.8 |
| 57 | 27.5 | 1.52778 | 8.52778 |
| 58 | 28 | 1.24444 | 8.24444 |
| 59 | 28.5 | 0.95 | 7.95 |
| 60 | 29 | 0.64444 | 7.64444 |
| 61 | 29.5 | 0.32778 | 7.32778 |
| 62 | 30 | 0 | 7 |
| 63 | 30 | 0 | 0 |

و جميع إحداثي $z = 0$ ويجب ملاحظة أن إحداثي y تم إضافة قيمة y

وذلك لأن الـ ORIGIN عند (0 , 0) فيجب نقله عند النقطة الأولى في الـ ARCH

يتم إدخال القيم التالية للبرنامج

| point | x | y | z |
|-------|-------|---------|---|
| 1 | 0 | 0 | 0 |
| 2 | 0 | 7 | 0 |
| 3 | 0.50 | 7.32778 | 0 |
| 4 | 1 | 7.64444 | 0 |
| 5 | 1.50 | 7.95 | 0 |
| 6 | 2 | 8.24444 | 0 |
| 7 | 2.50 | 8.52778 | 0 |
| 8 | 3 | 8.8 | 0 |
| 9 | 3.50 | 9.06111 | 0 |
| 10 | 4 | 9.31111 | 0 |
| 11 | 4.50 | 9.55 | 0 |
| 12 | 5 | 9.77778 | 0 |
| 13 | 5.50 | 9.99444 | 0 |
| 14 | 6 | 10.2 | 0 |
| 15 | 6.50 | 10.3944 | 0 |
| 16 | 7 | 10.5778 | 0 |
| 17 | 7.50 | 10.75 | 0 |
| 18 | 8 | 10.9111 | 0 |
| 19 | 8.50 | 11.0611 | 0 |
| 20 | 9 | 11.2 | 0 |
| 21 | 9.50 | 11.3278 | 0 |
| 22 | 10 | 11.4444 | 0 |
| 23 | 10.50 | 11.55 | 0 |
| 24 | 11 | 11.6444 | 0 |
| 25 | 11.50 | 11.7278 | 0 |
| 26 | 12 | 11.8 | 0 |
| 27 | 12.50 | 11.8611 | 0 |
| 28 | 13 | 11.9111 | 0 |
| 29 | 13.50 | 11.95 | 0 |
| 30 | 14 | 11.9778 | 0 |
| 31 | 14.50 | 11.9944 | 0 |
| 32 | 15 | 12 | 0 |
| 33 | 15.50 | 11.9944 | 0 |
| 34 | 16 | 11.9778 | 0 |
| 35 | 16.50 | 11.95 | 0 |
| 36 | 17 | 11.9111 | 0 |
| 37 | 17.50 | 11.8611 | 0 |
| 38 | 18 | 11.8 | 0 |
| 39 | 18.50 | 11.7278 | 0 |
| 40 | 19 | 11.6444 | 0 |
| 41 | 19.50 | 11.55 | 0 |
| 42 | 20 | 11.4444 | 0 |
| 43 | 20.50 | 11.3278 | 0 |
| 44 | 21 | 11.2 | 0 |
| 45 | 21.50 | 11.0611 | 0 |
| 46 | 22 | 10.9111 | 0 |
| 47 | 22.50 | 10.75 | 0 |
| 48 | 23 | 10.5778 | 0 |
| 49 | 23.50 | 10.3944 | 0 |
| 50 | 24 | 10.2 | 0 |
| 51 | 24.50 | 9.99444 | 0 |
| 52 | 25 | 9.77778 | 0 |
| 53 | 25.50 | 9.55 | 0 |
| 54 | 26 | 9.31111 | 0 |
| 55 | 26.50 | 9.06111 | 0 |
| 56 | 27 | 8.8 | 0 |
| 57 | 27.50 | 8.52778 | 0 |
| 58 | 28 | 8.24444 | 0 |
| 59 | 28.50 | 7.95 | 0 |
| 60 | 29 | 7.64444 | 0 |
| 61 | 29.50 | 7.32778 | 0 |
| 62 | 30.00 | 7 | 0 |
| 63 | 30 | 0 | 0 |

BeamARGR.std - No...

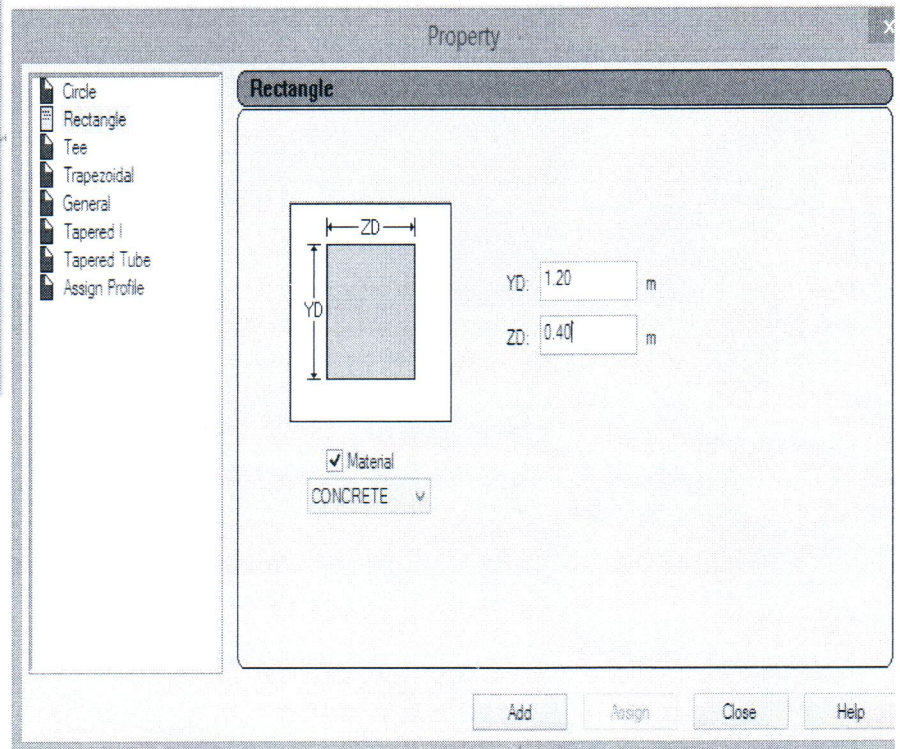
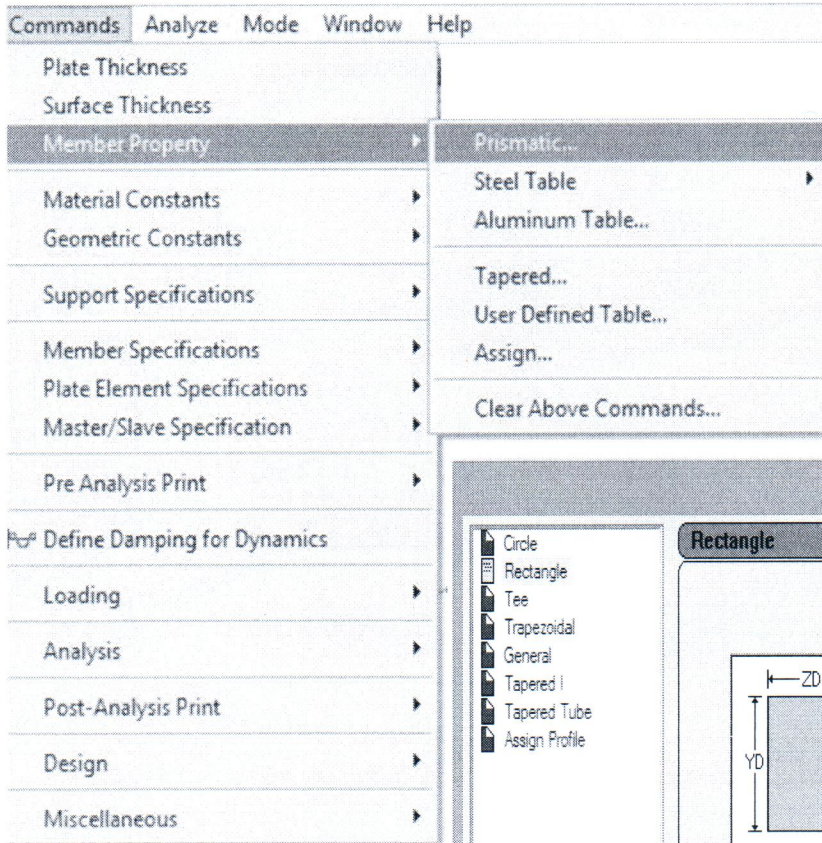
| Node | X m | Y m | Z m |
|------|--------|--------|--------|
| 1 | 0.000 | 0.000 | 0.000 |
| 2 | 0.000 | 7.000 | 0.000 |
| 3 | 0.500 | 7.328 | 0.000 |
| 4 | 1.000 | 7.644 | 0.000 |
| 5 | 1.500 | 7.950 | 0.000 |
| 6 | 2.000 | 8.244 | 0.000 |
| 7 | 2.500 | 8.528 | 0.000 |
| 8 | 3.000 | 8.800 | 0.000 |
| 9 | 3.500 | 9.061 | 0.000 |
| 10 | 4.000 | 9.311 | 0.000 |
| 11 | 4.500 | 9.550 | 0.000 |
| 12 | 5.000 | 9.778 | 0.000 |
| 13 | 5.500 | 9.994 | 0.000 |
| 14 | 6.000 | 10.200 | 0.000 |
| 15 | 6.500 | 10.394 | 0.000 |
| 16 | 7.000 | 10.578 | 0.000 |
| 17 | 7.500 | 10.750 | 0.000 |
| 18 | 8.000 | 10.911 | 0.000 |
| 19 | 8.500 | 11.061 | 0.000 |
| 20 | 9.000 | 11.200 | 0.000 |
| 21 | 9.500 | 11.328 | 0.000 |
| 22 | 10.000 | 11.444 | 0.000 |
| 23 | 10.500 | 11.550 | 0.000 |
| 24 | 11.000 | 11.644 | 0.000 |
| 25 | 11.500 | 11.728 | 0.000 |
| 26 | 12.000 | 11.800 | 0.000 |
| 27 | 12.500 | 11.861 | 0.000 |
| 28 | 13.000 | 11.911 | 0.000 |

يتم التوصيل بين النقاط كما يلي حتى يتم رسم الشكل بالكامل

| Beam | Node A | Node B |
|------|--------|--------|
| 1 | 1 | 2 |
| 2 | 2 | 3 |
| 3 | 3 | 4 |
| 4 | 4 | 5 |
| 5 | 5 | 6 |
| 6 | 6 | 7 |
| 7 | 7 | 8 |
| 8 | 8 | 9 |
| 9 | 9 | 10 |
| 10 | 10 | 11 |
| 11 | 11 | 12 |
| 12 | 12 | 13 |
| 13 | 13 | 14 |
| 14 | 14 | 15 |
| 15 | 15 | 16 |
| 16 | 16 | 17 |
| 17 | 17 | 18 |
| 18 | 18 | 19 |
| 19 | 19 | 20 |
| 20 | 20 | 21 |
| 21 | 21 | 22 |
| 22 | 22 | 23 |
| 23 | 23 | 24 |
| 24 | 24 | 25 |
| 25 | 25 | 26 |
| 26 | 26 | 27 |
| 27 | 27 | 28 |



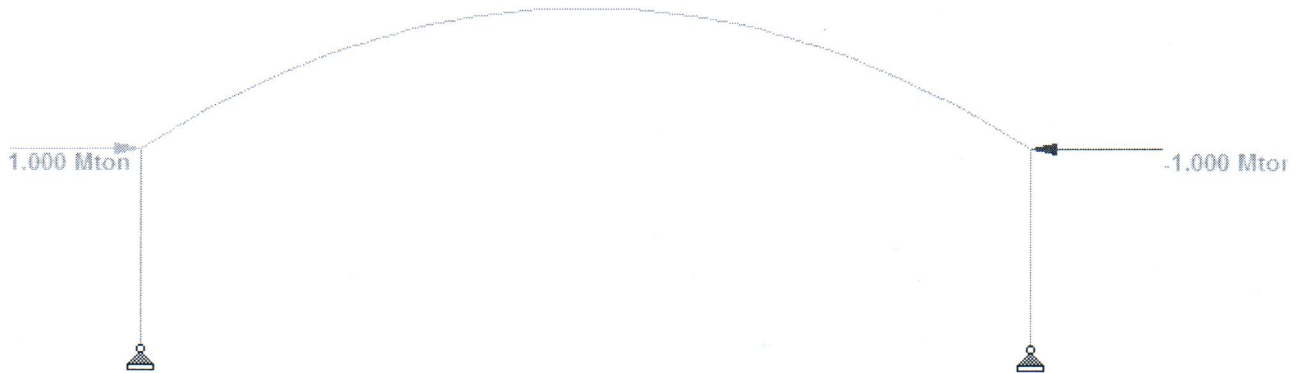
نخصص القطاع والركائز كما تم شرحه سابقاً



يتم عمل حالتين تحميل
الحالة الأولي :-



الة الثانية :-



نقوم بعمل التحليل الإنشائي كالآتي :-

command --> Analysis-->Perform analysis

Ctrl + F5

نقسم الإزاحة الناتجة عن تأثير حمل ٣.٥٠ طن . متر والإزاحة الناتجة عن تأثير حمل ١ طن لتنتج القوي المفروض تطبيقها لتقليل قيم العزوم علي المنشأ حيث ان القيم كبيرة جدا

ويتضح ان قيمة القوي المطلوبة للتأثير علي النقطتين التي تم وضع عندهما حمل ١ طن كفرض مبدئي = ٧٧.٥٥٣ طن

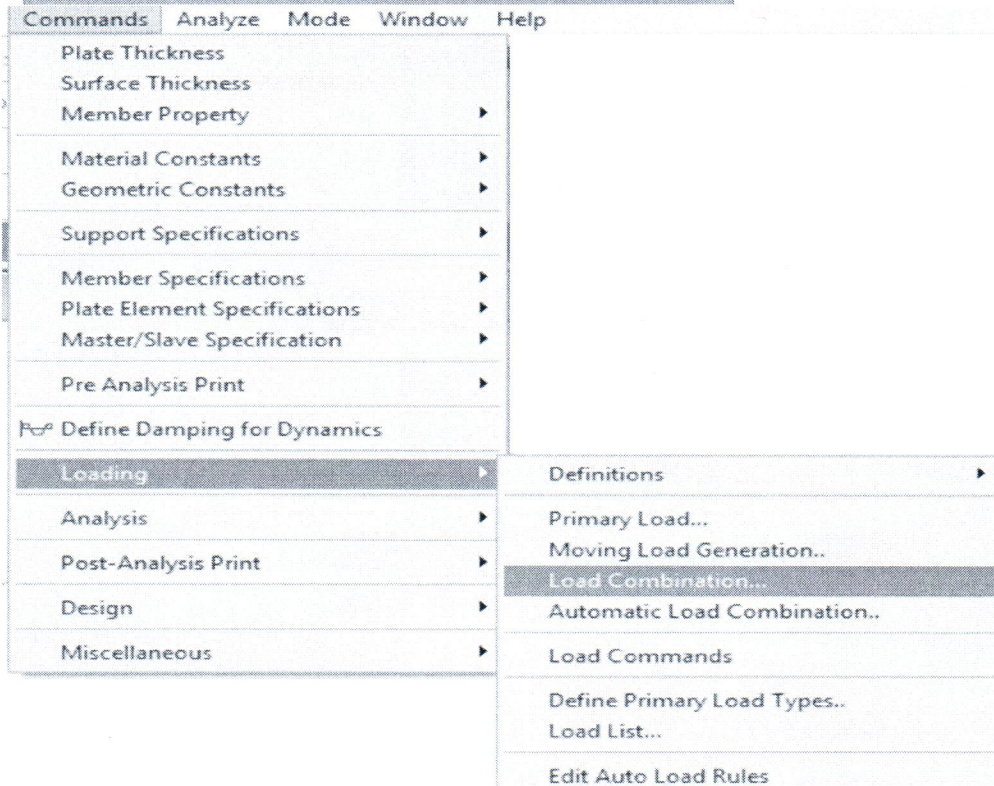
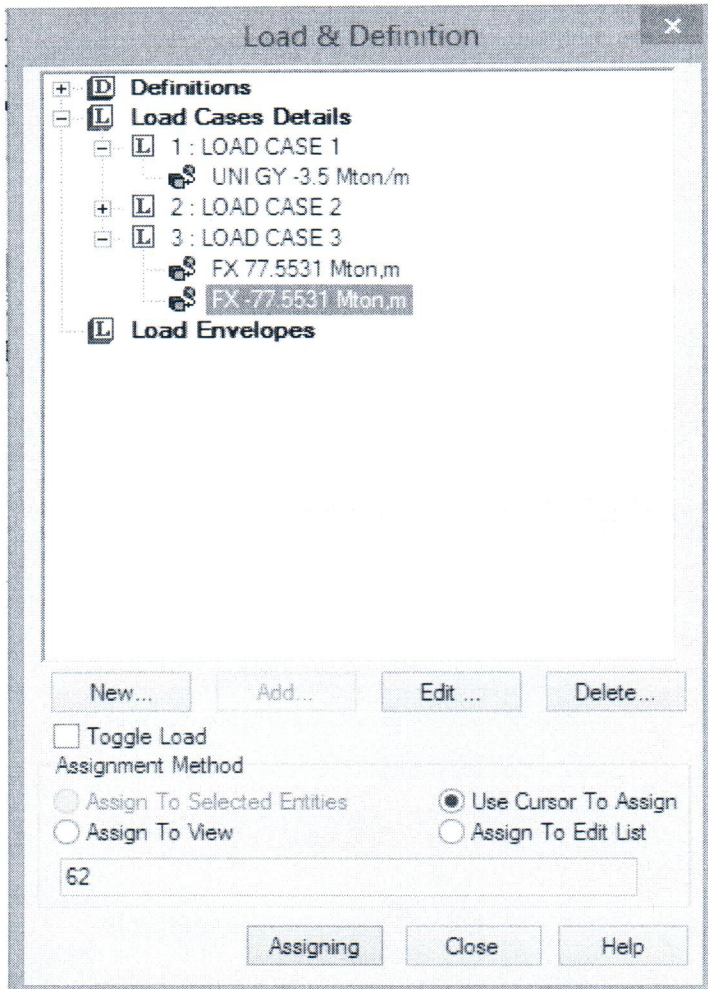
| BeamARGR.std - Node Displacements: | | | | | | | | |
|------------------------------------|---------------|-----------------------|----------------------------|-----------------------|-----------------|------------|-----------|-----------|
| All / Summary / | | | | | | | | |
| Node | L/C | Horizontal X mm | Vertical Y mm | Horizontal Z mm | Resultant mm | Rotational | | |
| | | | | | | rX deg | rY deg | rZ deg |
| 1 | 1 LOAD CASE 1 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 1 LOAD CASE 1 | -18.225 | P=18.225/.235=77.55319 ton | | | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.235 | | | | 0.000 | 0.000 | 0.000 |
| 3 | 1 LOAD CASE 1 | -17.853 | -0.991 | 0.000 | 17.880 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.230 | 0.006 | 0.000 | 0.230 | 0.000 | 0.000 | 0.000 |
| 4 | 1 LOAD CASE 1 | -17.259 | -1.980 | 0.000 | 17.372 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.223 | 0.017 | 0.000 | 0.223 | 0.000 | 0.000 | 0.000 |
| 5 | 1 LOAD CASE 1 | -16.488 | -3.293 | 0.000 | 16.814 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.213 | 0.032 | 0.000 | 0.216 | 0.000 | 0.000 | 0.000 |
| 6 | 1 LOAD CASE 1 | -15.581 | -4.884 | 0.000 | 16.328 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.202 | 0.051 | 0.000 | 0.208 | 0.000 | 0.000 | 0.000 |
| 7 | 1 LOAD CASE 1 | -14.572 | -6.713 | 0.000 | 16.044 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.190 | 0.072 | 0.000 | 0.203 | 0.000 | 0.000 | 0.000 |
| 8 | 1 LOAD CASE 1 | -13.495 | -8.741 | 0.000 | 16.078 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.176 | 0.096 | 0.000 | 0.201 | 0.000 | 0.000 | 0.000 |
| 9 | 1 LOAD CASE 1 | -12.376 | -10.933 | 0.000 | 16.513 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.162 | 0.122 | 0.000 | 0.203 | 0.000 | 0.000 | 0.000 |
| 10 | 1 LOAD CASE 1 | -11.240 | -13.253 | 0.000 | 17.377 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.148 | 0.150 | 0.000 | 0.210 | 0.000 | 0.000 | 0.000 |
| 11 | 1 LOAD CASE 1 | -10.108 | -15.670 | 0.000 | 18.647 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.134 | 0.178 | 0.000 | 0.223 | 0.000 | 0.000 | 0.000 |
| 12 | 1 LOAD CASE 1 | -8.998 | -18.154 | 0.000 | 20.261 | 0.000 | 0.000 | 0.000 |
| | 2 LOAD CASE 2 | 0.120 | 0.208 | 0.000 | 0.240 | 0.000 | 0.000 | 0.000 |
| 13 | 1 LOAD CASE 1 | -7.926 | -20.677 | 0.000 | 22.144 | 0.000 | 0.000 | 0.000 |

Load Case 1 = distributed Load = 3.50 t /m'



نقوم بعمل حالة تحميل ثالثة $P = 77.553 \text{ ton}$

نقوم بعمل Load Combination بين حالة التحميل الناتجة عن الحمل الموزع $w = 3.50 \text{ t/m}$ والحمل $p = 77.553 \text{ t}$



Create New Definitions / Load Cases / Load Items :

Define Combinations

Load No: 4 Name: COMBINATION LOAD CASE 4

Type

☒ Normal ☐ SRSS ☐ ABS

General Format : $\alpha_i * L_i$

Factor b 1 ☐ SRSS Component

Default α_i 1 ☐ Generate Combination

Available Load Cases:

2: LOAD CASE 2

Load Combination Definition: [S] = SRSS

| Load Cases | Factor |
|-------------|----------------|
| Load Case 1 | $\alpha_i = 1$ |
| Load Case 3 | $\alpha_i = 1$ |

> >> << <

Add Close Help

Load & Definition

- Definitions
- Load Cases Details
 - 1: LOAD CASE 1
 - 2: LOAD CASE 2
 - 3: LOAD CASE 3
 - 4: COMBINATION LOAD CASE 4
 - (1)x Load 1
 - (1)x Load 3
- Load Envelopes

New... Add... Edit... Delete...

☐ Toggle Load

Assignment Method

☐ Assign To Selected Entities ☒ Use Cursor To Assign

☐ Assign To View ☐ Assign To Edit List

Assign Close Help

Modeling Mo Load 3: LOAD CASE 3 Input Units: Mto

من الواضح بعد التأثير بالحمل المركز مقداره ٧٧.٥٥٣١ طن إضمحلال قيم العزوم علي المنشأ ويتم التأثير بهذا الحمل من خلال TIE ممكن يكون precast concrete وهو عنصر عليه قوتين شد من الناحيتين

