# DESIGN AND ANALYSIS OF COMPOSITE BRIDGE DECK SYSTEM


**A PROJECT REPORT**

*Submitted by*


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*In partial fulfilment for the award of degree*

*Of*

**BACHELOR OF ENGINEERING**

In

**CIVIL ENGINEERING**


**DEPARTMENT OF CIVIL ENGINEERING**

**KUMARAGURU COLLEGE OF TECHNOLOGY**

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**APRIL 2009**

P-2685

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## BONAFIDE CERTIFICATE

Certified that this project report "**DESIGN AND ANALYSIS OF COMPOSITE BRIDGE DECK SYSTEM**" is the bonafide work of "**S.GOBINATH, Q.MOHAMED AKRAM, S.PRABU, S.T.SARANRAJ**" who carried out the project work under my supervision.

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# ACKNOWLEDGEMENT

We the members of this project wish to express our thanks to our beloved **Principal** of our college for providing all the facilities in completing the project efficiently.

We express our gratitude to **Dr.S.L.Narasimhan M.E., PhD**, professer & head, Department of civil engineering, Kumaraguru college of technology, Coimbatore, for his encouragement and help rendered during this project work.

It is great pleasure to express our profound, sincere and whole hearted gratitude to our project guide **Mrs.M.Sabharimala M.E.,** lecturer, Department of civil engineering, Kumaraguru college of technology, Coimbatore, for her constant suggestions, encouragement and valuable guidance rendered to us in preparation and completion of this project work.

It is our firm duty to express our sincere and deep sense of gratitude to all non-teaching staff of our department for their help and cooperation.

Finally we are greatly indebted to our parents, our teachers and friends whose mark of affection gave us a new life.

# ABSTRACT

A Bridge is a structure constructed across a stream, canal, river or any other obstruction for the persons and vehicles to pass through.

We have selected our site at Sukaliyur, Karur district. The site we have selected has a reinforced concrete bridge. We have studied the details of the bridge which is in a deteriorated condition and replacing the same using a composite plate girder bridge which would suit the site.

To compute the bending moment due to live load in a girder and slab bridge, the distribution of the live loads among the longitudinal girders is determined. The moments are then calculated manually.

We have also analysed the bridge structure for a single span using STAAD.Pro. By using STAAD.Pro, for different loading position of class A and class AA loading for single lane and two lane, the finite element analysis were carried out. Thus the following parameters nodal displacements, stress distribution and the moments were studied.

# TABLE OF CONTENTS


| CHAPTER NO | TITLE | PAGE NO |
|---|---|---|
| | **ACKNOWLEDGEMENT** | **i** |
| | **ABSTRACT** | **ii** |
| | **LIST OF SYMBOLS** | **v** |
| 1 | **INTRODUCTION** | 1 |
| 2 | **I.R.C STANDARD LIVELOADS** | 2 |
| 3 | **LITERATURE REVIEW** | 7 |
| 4 | **MANUAL ANALYSIS** | 10 |
| | 4.1 Specifications | 11 |
| | 4.2 Design of deck slab | 12 |
| | 4.2.1 Live load B.M | 12 |
| | 4.2.2 Dead load B.M | 13 |
| | 4.2.3 Design of section | 14 |
| | 4.3 Design of steel plate girder | 16 |
| | 4.3.1 Dead load B.M | 16 |
| | 4.3.2 Live load B.M | 16 |
| | 4.3.3 Shear forces | 17 |

| | | |
|---|---|---|
| | 4.3.4 Proportioning of trial Section of web plate | 17 |
| | 4.3.5 Flange plate | 17 |
| | 4.3.6 Check for maximum stresses | 18 |
| | 4.3.7 Connection between flange and web | 19 |
| | 4.3.8 Intermediate stiffener | 19 |
| | 4.3.9 Connection of vertical stiffener to web | 20 |
| | 4.3.10 End bearing stiffener | 21 |
| | 4.3.11 Connection between bearing stiffener and web | 22 |
| | 4.4 Design of shear connector | 23 |
| | 4.4.1 Properties of the composite section | 23 |
| | 4.4.2 Pitch of shear connectors | 25 |
| 5 | **STAAD.Pro ANALYSIS** | 26 |
| | 5.1 Introduction of STAAD.Pro | 27 |
| | 5.2 Salient features | 28 |
| | 5.3 Analysis | 28 |
| 6 | **CONCLUSION** | 80 |
| 7 | **BIBLIOGRAPHY** | 82 |

# LIST OF SYMBOLS

$M_B$ – Bending moment for short span

$M_L$ – Bending moment for long span

L – Long span length

B – Short span length

u,v – Dimensions of the load spread after allowing for dispersion through the deck slab

k – Ratio of short to long span

$m_1$ & $m_2$ – coefficients for moments along the short and long spans

$\mu$ - Poisson's ratio for concrete generally assumed as 0.15

W – Load from the wheel under consideration

$A_{st}$ – Area of steel

$A_w$ – Area of web

$A_f$ – Area of flange

I – Moment of inertia

$\sigma_b$ – Maximum permissible bending tensile stress

$\tau_{va}$ – Maximum permissible average shear stress

$\tau_{max}$ – Maximum shear stress

V – Shear force

t – Thickness of web

d – Depth of web

c – Spacing of intermediate stiffener

h – Outstand of stiffener

Q – Capacity of shear connector

N – Number of shear connectors in a row

$S_h$ – Horizontal shear per unit length

F – Factor of safety = 2

P – Pitch of shear connectors

# CHAPTER - 1

# INTRODUCTION

# INTRODUCTION

**Bridge:**

A bridge is a structure constructed across a stream, canal, river or any obstruction for the persons and vehicles to pass through. Sometimes a bridge is built over a road or railway track. Bridges have space below for the movement of water as in case of river bridges or for the movement of pedestrians and vehicles as in the case of road bridges.

There are various types of bridges that have been constructed so far and among those the commonly constructed ones are Reinforced concrete bridge, Steel bridge and Composite bridge.

**Composite bridge:**

The composite bridge consists of RC deck slab supported by steel plate girders. This type of bridge is commonly used for spans that range from 10m to 30m. The various components of a composite bridge are:

1. Reinforced Deck slab
2. Footpaths, if provided, kerbs and handrails
3. Longitudinal steel plate girder
4. Cross steel plate girder
5. Bearings
6. Shear connectors

**Necessity of bridge:**

1. Bridges enable free flow of traffic during monsoons
2. Bridges provide addition communication facilities
3. Provide more socio-economic benefits to the people

# CHAPTER - 2

# I.R.C STANDARD LIVELOAD

# I.R.C STANDARD LIVELOADS

Live loads are those caused by vehicles which pass over the bridge and are transient in nature. Referred from I.R.C 6-2000(loads and stresses)

## I.R.C CLASS AA LOADING:

This consists of either a tracked vehicle of 700 KN or a wheeled vehicle of 400 KN. The tracked vehicle stimulates a combat tank used by the army. The ground contact length of the track is 3.6 m and the nose to tail length of the vehicles is 7.2 m. The nose to tail spacing between two successive vehicles shall not be less than 90 m. This type of loading is to be adopted for the bridges located within certain specified highways are provided with this load.

## I.R.C CLASS A LOADING:

Class A loading consists of a wheel load train composed of a driving vehicle and trailer of specified axial spacing and loads. The nose to tail spacing between two successive trains shall not be less than 18.5 m and no other live load shall cover any of the carriageway when train of vehicle is on the bridge. Class A loading is adopted on all roads on which permanent bridges and culverts are constructed.

## I.R.C CLASS B LOADING:

Class B loading comprises a wheel load train similar to that of a Class A loading with smaller axial loads. This loading is intended to be adopted for temporary structures, timber bridges.

## IMPACT EFFECT:

Provision for impact or dynamic action shall be made by an increment of the live load by an impact allowance expressed as a fraction or a percentage of the applied live load.

**a) For Class A or Class B Loading:**

In the members of any bridge designed either for Class A or Class B loading, this impact percentage shall be determined from the curves. The impact fraction shall be determined from the following equations which are applicable for spans between 3m and 45m.

Impact factor fraction for reinforced concrete bridges = $\frac{4.5}{6+L}$

Impact factor fraction for steel bridges = $\frac{9}{13.5+L}$

For spans simply supported or continuous or for arches-the L shall be the effective span of the member under consideration.

**b) For Class AA loading and Class 70 R loading:**

The value of the impact percentage shall be taken as follows:

For span less than 9m:

Tracked vehicles: 25 percent for spans up to 5m linearly reducing to 10 percent for spans of 9m

Wheeled vehicles: 25 percent

For spans of 9m or more:

Reinforced concrete bridges

Tracked vehicles: 10 percent up to a of 40m and in accordance with the curve for excess of 40m

Wheeled vehicles: 25 percent for spans up to 12m and in accordance with the curve for spans in excess of 12m

Steel bridges

Tracked vehicles: 10 percent for all spans

Wheeled vehicles: 25 percent for spans up to 23m and in accordance with the curve for spans in excess of 23m

# CHAPTER – 3

# LITERATURE REVIEW

# LITERATURE REVIEW

## Bridge Engineering Automated Vehicle Application B.E.A.V.A

Developed by Research Engineers International, May 2001, Version 1.1

The general philosophy governing the design of bridges is that, subject to a set of loading rules and constraints, the worst effects due to load application should be established and designed again.

The process of load application can be complex as governing rules can impose inter-dependent parameters such as loaded length on a lane, lane factors and load intensity. To obtain the maximum design effects, Engineers have to try maintaining loading situations on a trial and error basis. This leads to the generation of many live load application instances and a large volume of output data that has to be combined with dead load effects a s well. In view of the above, a computer program has been developed to minimise the load application process while complying with national code requirements. Users can avoid the trial and error approach and eliminate any possible errors arising from inaccuracies associated with it. The program is based on the use of influence surfaces, which are generated by STAAD.Pro as part of the loading process. An influence surface for a given effect on a bridge deck relates its value to movement of a unit load over the area of interest. The influence surface is a three dimensional form of an influence line for a single member. STAAD.Pro will automatically generate influence surfaces for effects such as bending moments for elements, deflection in all the degrees of freedom of nodes and support reactions. The engineer will then instruct the program to utilise the relevant influence surfaces and, with due regards to code requirements, optimise load positions to obtain the maximum desired effects.

**Structural Efficiency of Transverse Members in Composite Plate Girder bridges**

J.Prasad, M.A. Tantary and Jagdish Parwani

Ref: Advances in Bridge Engineering, March 24 – 25,2006

Composite Plate girder bridges are commonly adopted for small spans upto 30m. In congested city environment, more often than not, the choice falls on a bridge that aligns on a skew. Due to this the structural behaviour of the deck becomes complex and difficult to analyze. In such a situation, the entire deck is simulated as Grid-work of structural members interconnected at their center of gravity levels. The superimposed deck loads are converted into equivalent nodal loads and analysis is carried out.

# CHAPTER - 4

# MANUAL ANALYSIS

# 4.1 SPECIFICATIONS

Span length = 21400mm= 21.4m

Clear width of roadway = 7.5m

Footpath = 1m on either side

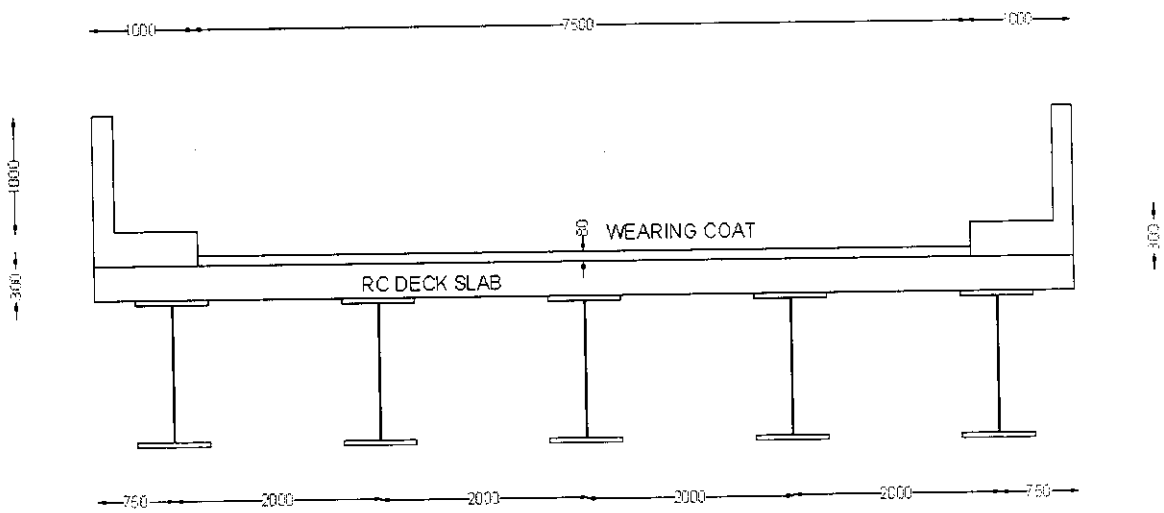
Spacing of main girders = 2m

Live load = IRC class AA tracked vehicle

Materials = $M_{35}$ grade concrete

$Fe_{415}$ grade HYSD bars






TRANSVERSE SECTION

# 4.2 DESIGN OF DECK SLAB

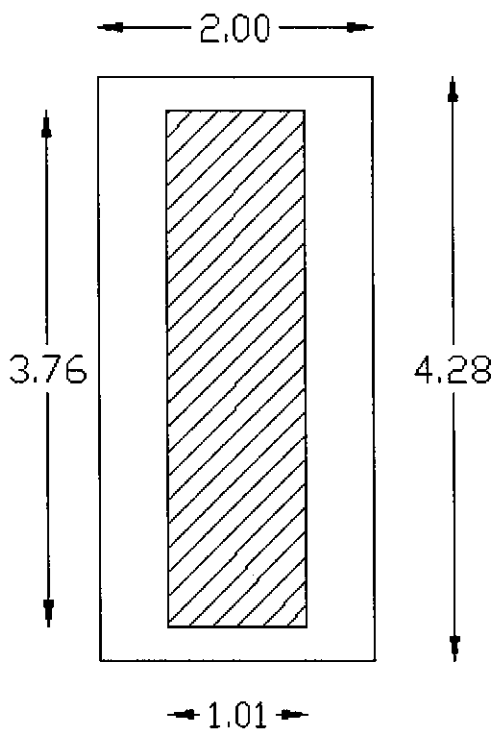
Panel dimension = 2m x 4.28m

Dead weight of slab = (0.3 x 24) = 7.20 KN/$m^2$

Dead weight of wearing coat = (0.08 x 22) = 1.76 KN/$m^2$

Total load = 9.00 KN/$m^2$

**4.2.1 Live load BM**:




u = (0.85 + 2 x 0.08) = 1.01m

v = (3.6 + 2 x 0.08) = 3.76m

u/B = 1.01/2 = 0.50

v/L = 3.76/4.28 = 0.88

k = B/L = 2/4.28 = 0.47

From pigeaud's curves for k = 0.5

The values of $m_1 = 0.082$

$m_2 = 0.015$

Short span moment $M_B = W (m_1 + 0.15m_2)$

$= 700 (0.082 + 0.15 \times 0.015)$

$= 58.98$ KNm

BM including impact and continuity factor

$= 1.1 \times 0.8 \times 58.98$

$= 51.9$ KNm

Long span moment $M_L = W (m_2 + 0.15m_1)$

$= 700 (0.015 + 0.15 \times 0.082)$

$= 19.11$ KNm

BM including impact and continuity factor

$= 1.1 \times 0.8 \times 19.11$

$= 16.82$ KNm

**4.2.2 Dead load BM:**

Dead load of deck slab = 9 KN/m$^2$

Total dead load/panel $= 9 \times 2 \times 4.28$

$= 77.04$ KN

$u/B = 1$ and $v/L = 1$

$k = B/L = 2/4.28 = 0.47$

$1/k = 2.13$

Using pigeaud's curves

$m_1 = 0.048$

$m_2 = 0.008$

Short span moment $M_B = 77.04\ (0.048 + 0.15 \times 0.008)$

$= 3.79$ KNm

Taking continuity into account

$M_B = 0.8 \times 3.79$

$= 3.03$ KNm

Long span moment $M_L = 77.04\ (0.008 + 0.15 \times 0.048)$

$= 1.17$ KNm

Taking continuity into account

$M_L = 0.8 \times 1.17$

$= 0.94$ KNm

The design bending moments are

$M_B = 51.9 + 3.03 = 54.93$ KNm

$M_L = 16.82 + 0.94 = 17.76$ KNm

**4.2.3 Design of section:**

For $M_{35}$ grade concrete and $Fe_{415}$ grade HYSD bars

$M/f_{ck}bd^2 = 0.138$

$d^2 = 11302.47$

$d = 106$mm

Assume

Overall depth = 300mm

Effective depth = 260mm

**Main reinforcement:**

$$M = 0.87 f_y A_{st} d [1 - (A_{st} f_y)/(bd f_{ck})]$$

$$54.93x10^6 = 0.87 \times 415 \times A_{st} \times 260 [1 - (A_{st} \times 415)/(1000 \times 260 \times 35)]$$

$$A_{st} = 602mm^2$$

Assume 12mm bar

$$\text{Spacing} = (\pi/4 \times 12^2 \times 1000)/602$$

$$= 180mm$$

Provide 12mm dia bar at 180mm c/c

**Distributors:**

$$A_{st\ min} = 0.12\% (bD)$$

$$= (0.12/100) \times 1000 \times 260$$

$$= 312mm^2$$

Assume 10mm dia bar

$$\text{Spacing} = (\pi/4 \times 10^2 \times 1000)/312$$

$$= 250mm$$

Provide 10mm dia bar at 250mm c/c

# 4.3 DESIGN OF STEEL PLATE GIRDER

Spacing of girder = 2m

Spacing of cross girder = 4.28m

Dead load on girder = 9 x 2 = 18 KN/m

Self weight on main girder = 0.2L+1

= 0.2 x 21.4 + 1

= 5.28 KN/m

Total load W = 23.28 KN/m

Self weight of cross girder (assumed as 1KN/m) = 2 x 1 = 2 KN

### 4.3.1 Dead load moment:

The maximum dead load moment is

$M_{max}$ = [23.28 x ($21.4^2$/8) + 2 x( 21.4/5) + 2 x 4.28]

= 1332.66 + 8.56 + 8.56

= 1349.78 KNm

### 4.3.2 Live load moment:

The maximum live load moment is

$M_{max}$ = 700 x (10.7/2) + 700 x (0.9/2)

= 3745 + 315

= 4060 KNm

Impact factor = 10%

Live load BM = 4060 x 1.1 = 4466 KNm

Dead load BM = 1349.78 = 1350 KNm

Total design BM = 5816 KNm

### 4.3.3 Shear forces:

Dead load shear = 250 + 0.4 + 0.8 + 1.2 + 1.6 + 2 = 256 KN

Live load shear = 1.1[700 x (21.4 – 1.8)/21.4] = 705 KN

Total shear = 256 + 705 = 961 KN

### 4.3.4 Proportioning of trial section of web plate:

Approximate depth of girder =1/10 of span

= 21.4/10 = 2.14m

Economical depth $= 5\sqrt[3]{M/\sigma_b}$

$= 5\sqrt[3]{(5816 \times 10^6)/165}$

= 1639.39mm

= 1640mm

Web plate depth based on shear considerations assuming 12mm thick plate is

$d = V/(\tau \times 12)$

$= 96 \times 10^3/(100 \times 12)$

= 800mm

Try a web 1200mm x 12mm

### 4.3.5 Flange plate:

Approximate flange area required

$A_f = [M/\sigma_b d - A_w/6]$

$= [5816 \times 10^6/(165 \times 1200) - 1200 \times 12/6]$

$= 29373.74 - 2400$

$= 26974mm^2$

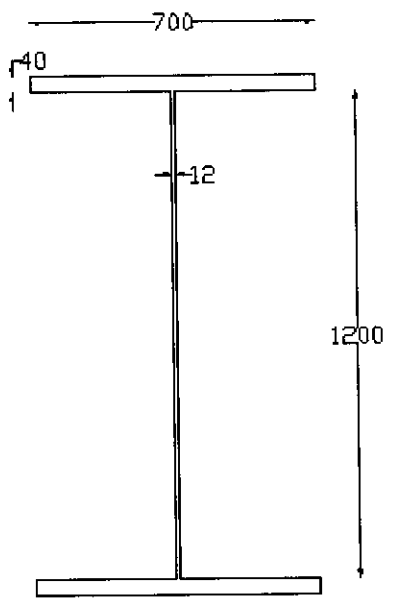
Flange width, B = (L/45) to (L/40)

$= 475mm$ to $535mm$

Adopt B = 700mm

Thickness of plate = 26974/700 = 38.53 = 40mm

Adopt flange plates 700mm x 40mm




### 4.3.6 Check for maximum stresses:

$$I = (12 \times 1200^3/12) + (700 \times (1280^3 - 1200^3)/12)$$
$$= 2322 \times 10^7 mm^4$$

Bending tensile stress, $\sigma_b = My/I$

$= 5816 \times 10^6 \times 640/(2323 \times 10^7)$

$= 160.23 < 165\ N/mm^2$

Average shear stress $= 961 \times 10^3/(12 \times 1200)$

$= 66.74\ N/mm^2$

Permissible average shear stress depends upon the ratio (d/t)

$$d/t = 1200/12 = 100$$

Adopt stiffener spacing c = 1200mm = d

From IS 800 – 1984 table 6.6 A, clause 6.4.2

$$\tau_{va} = 100 \text{ N/mm}^2$$

Hence the average shear stress is within safe permissible limits.

### 4.3.7 Connection between flange and web:

Maximum shear force at the junction of web and flange is given by

$$\tau = Vay/I$$

$$V = 961 \times 10^3 \text{ N}$$

$$a = 700 \times 40 = 28000\text{mm}^2$$

$$I = 2323 \times 10^7$$

$$\tau = 961 \times 10^3 \times 28000 \times 620/(2323 \times 10^7)$$

$$= 718 \text{ N/mm}$$

Assuming continuous weld on either side, strength of weld of sizes

$$718 = 2 \times 0.7 \times 110S$$

$$S = 4.66\text{mm}$$

Use 6mm fillet weld, continuous on either side.

### 4.3.8 Intermediate stiffeners:

Since $d/t = 1200/12 = 100 > 85$ [ $t < d/85$]

Vertical stiffeners are required

Spacing of stiffeners = 0.33d to 1.5d

= 396mm to 1800mm

Adopt 1200mm spacing

Hence c = 1200mm

The intermediate stiffeners are designed to have a minimum moment of inertia of

$I = 1.5d^3t^3/c^2$

$= 1.5 \times 1200^3 \times 12^3/1200^2$

$= 31 \times 10^5 mm^4$

Using 12mm thick plate

Maximum width of plate $\leq 16t \leq (16 \times 12) = 192mm$

Use a plate 12mm x 100mm

h = 100mm

$I = 12 \times 100^3/3 = 40 \times 10^5 > 31 \times 10^5 \ mm^4$

**4.3.9 Connection of vertical stiffeners to web:**

Shear on welds connecting stiffener to web

$= 125t^2/h$ KN/m

Where t = web thickness (mm)

h = outstand of stiffeners (mm)

Shear on welds $= 125 \times 12^2/100 = 180$ KN/m

Size of weld, $S = 180/(0.7 \times 110) = 2.33mm$

Use minimum 5mm size intermittent welds.

Effective length of weld $\geq 10t \geq 10 \times 12 = 120mm$

Use 120mm long, 5mm fillet welds alternately on either side.

### 4.3.10 End bearing stiffener:

Maximum shear force = 961 KN

The end bearing stiffener is designed as a column

$$(h_1/t_1) \leq 12$$

Where $h_1$ = outstand of bearing stiffener

$t_1$ = thickness of bearing stiffener

If $h_1 = 180mm$ , $t_1 = 180/12 = 15mm$

Use 180mm x 15mm size plate

Permissible bearing stress = $0.75f_y$

$$\sigma_p = 0.75 \times 250$$

$$= 187.5 \text{ N/mm}^2$$

Bearing area required $= 961 \times 10^3/187.5$

$$= 5125 \text{ mm}^2$$

If two plates are used

Total area provided $= 2 \times 180 \times 15$

$$= 5400\text{mm}^2 > 5125\text{mm}^2$$

The length of the web plate which acts along with stiffener plates is bearing

The reaction = 20t = 20 x 12 = 240mm

$$I = [15 \times 372^3/12 + 2 \times 240 \times 12^3/12]$$

$$= 6441 \times 10^4\text{mm}^4$$

Area, $A = (372 \times 15) + (480 \times 12)$

$$= 11340\text{mm}^2$$

Slenderness ratio = L/r

$$r = \sqrt{\frac{I}{A}}$$

$$= \sqrt{6441 \times 10^4 / 11340}$$

$$= 75\text{mm}$$

Effective length of stiffener = (0.7 x 1200) = 840mm

$$= 840/75 = 11.2$$

From IS 800 : 1984 table 5.1 (clause 5.1.1)

Permissible stress in axial compression

$$\sigma_{ac} = 150 \text{ N/mm}^2$$

Area required = $961 \times 10^3/150 = 6407\text{mm}^2 < 11340\text{mm}^2$

### 4.3.11 Connection between bearing stiffener and web:

Length available for welding using alternate intermittent welds

$$= 2\,(1200 - 40) = 2320\text{mm}$$

Required strength of weld = $961 \times 10^3/2320 = 414$ N/mm

Size of weld = $414/(0.7 \times 110) = 5.38$

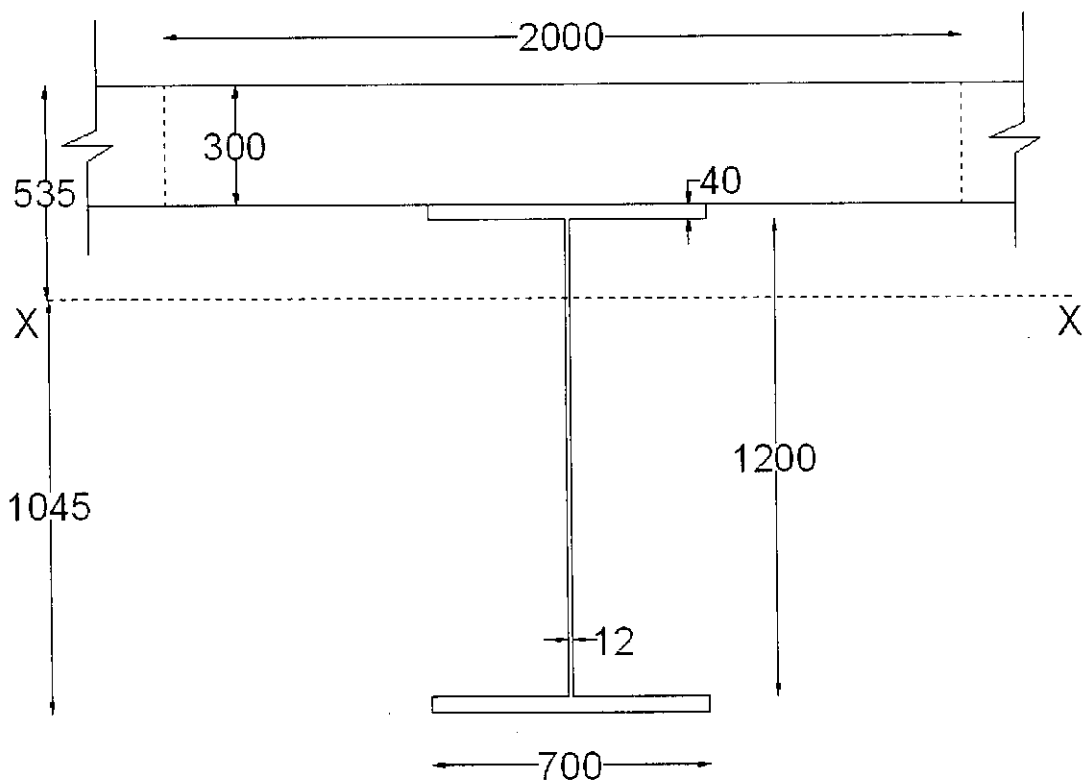
Use 6mm fillet weld

Length of weld $\geq 10t \geq 10 \times 12 = 120$mm

Use 120mm long , 5mm welds alternately.

## 4.4 DESIGN OF SHEAR CONNECTORS

### 4.4.1 Properties of the composite section:




Equivalent area of concrete in terms of steel is given by

$$A_{ce} = 2000 \times 300/8.12$$

$$= 73892mm^2$$

$$\Sigma AY = (73892 \times 150) + (700 \times 40 \times 320) + (12 \times 1200 \times 940) + (700 \times 40 \times 1560)$$

$$= 77259800mm^3$$

$$\Sigma A = 73892 + (700 \times 40) + (12 \times 1200) + (700 \times 40)$$

$$= 144292mm^2$$

$$Y = \Sigma AY/\Sigma A$$

$$= 77259800/144292$$

$$= 535mm$$

$$I_{comp} = (73892 \times 385^2) + (700 \times 1280^3/12 - 688 \times 1200^3/12) + (70400 \times 405^2)$$

$$= 4.58 \times 10^{10} mm^4$$

Maximum shear force at junction of slab and girder is

$$\tau = Vay/I$$

where $V = 961$ KN

$a = 73892mm^2$

$I = 4.58 \times 10^{10} mm^4$

$y = 385mm$

$$\tau = 961 \times 10^3 \times 73892 \times 385/(4.58 \times 10^{10})$$

$$= 597 \text{ N/mm}$$

Total shear force at junction = 597 x 700

= 417900 N

Using 60mm studs, capacity of one shear connector is given by

$$Q = 4.8 Hd\sqrt{f_{ck}}$$

Where $H = 4 \times d = 4 \times 6 = 24cm$

$d = 6cm$

$F_{ck} = 350 \text{ kg/cm}^2$

$$Q = 4.8 \times 24 \times 6 \times \sqrt{350}$$

= 12931.17 kg

= 129312 N

Number of studs required in row = 417900/129312

= 3.23

= 4

Provide 4 bolts in a row, two on either on either side of the flange.

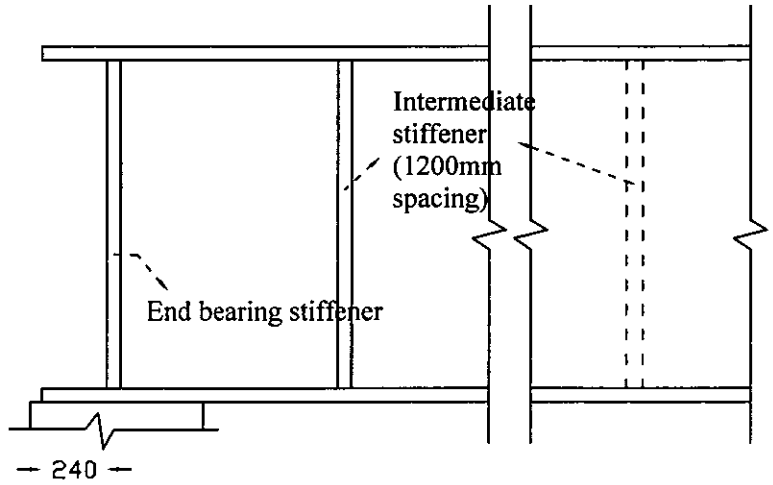
### 4.4.2 Pitch of shear connectors:

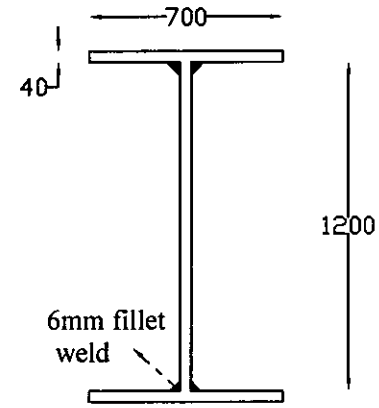
Pitch, $p = NQ/FS_h$

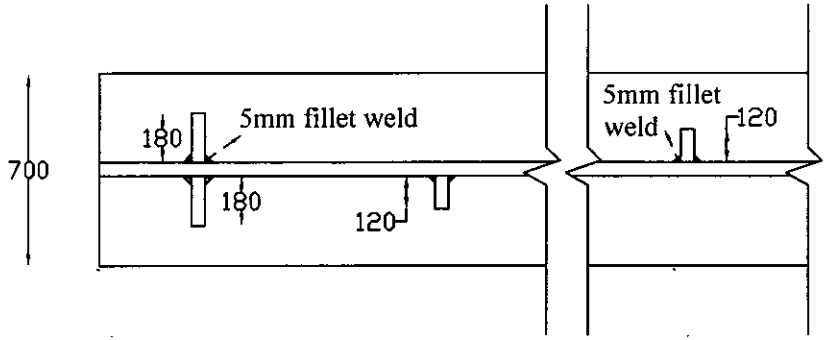
$p = 4 \times 129312/(2 \times 597)$

= 433.20mm = 400mm

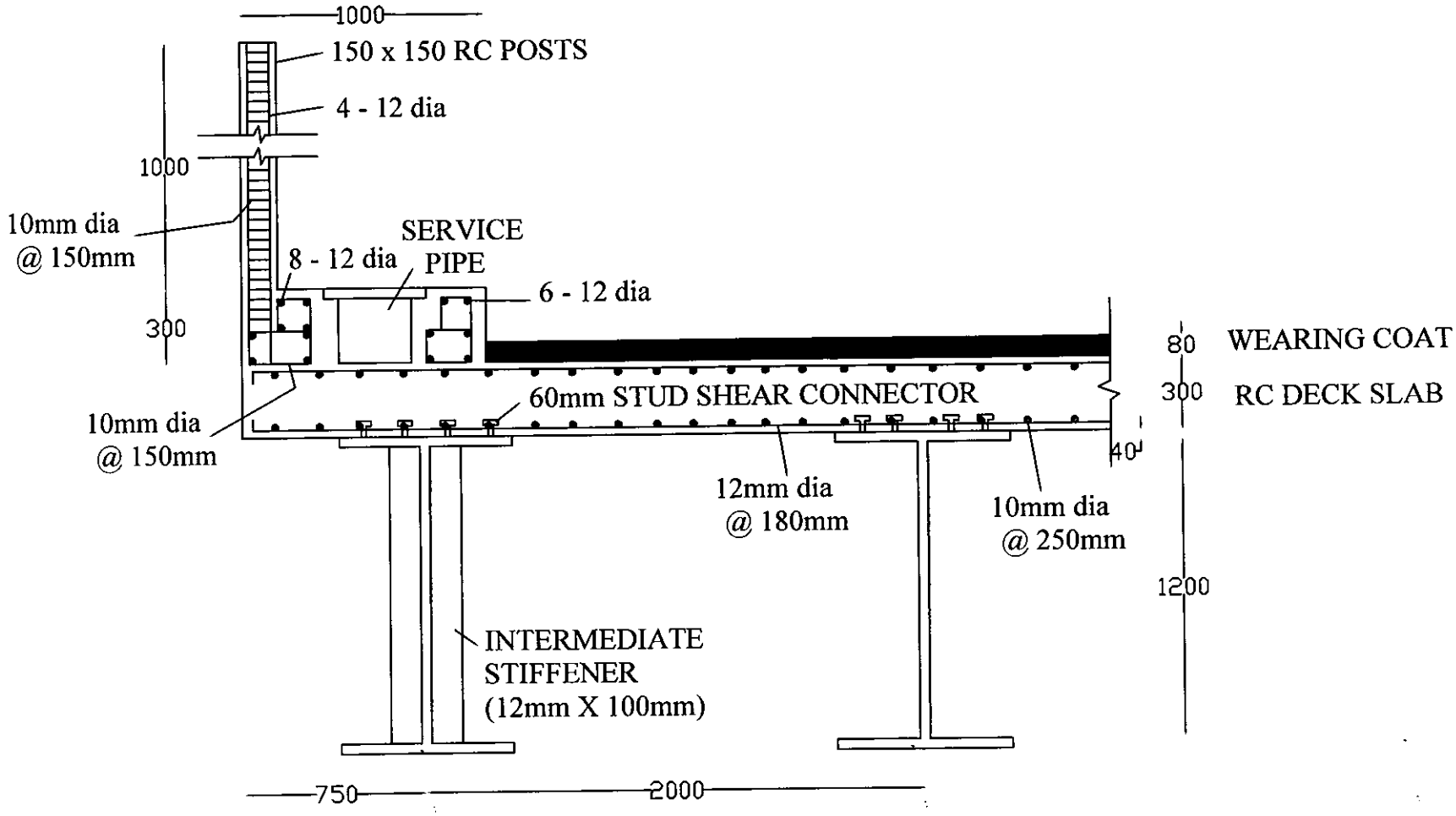
Adopt a pitch of 400mm




# DETAILS OF WELDED PLATE GIRDER




# REINFORCEMENT DETAILS

# CHAPTER - 5
# STAAD.Pro ANALYSIS

# STAAD.Pro ANALYSIS

## 5.1 Introduction to STAAD.Pro:

STAAD.Pro is the learning structural analysis and design software from research engineers. In STAAD.Pro, the focus is on productivity.

STAAD.Pro is designed for engineers, by engineers who understand the process of modelling, analyzing and designing a structure. Over 20 years of experience, along with the suggestions and input from practicing engineers, has helped to make STAAD.Pro the easiest-to-use structural analysis and design software on the market today.

STAAD.Pro addresses the entire process of structural engineering from model development to analysis and design. STAAD.Pro is design to work the way, the structural design office works.

STAAD.Pro is a general purpose program for performing the analysis and design of a variety of structures.

The basic three activities, where to be carried out to achieve the goal are model generation, calculation to obtain the analytical results, result verification

The GUI communicates with the STAAD analysis engine through the standard input files. Where input file is a text file consisting of a series of commands which are executed sequentially. The commands contain either instructions or data pertaining to analysis and/or design. The STAAD input file can be created through a text editor or the GUI modelling facility. The GUI modelling facility creates the input file through an interactive menu-driven graphics oriented procedure.

## 5.2 Salient features:

- ❖ STAAD.Pro is the only structural analysis and design software which meets the requirements of Nuclear Regulatory Commission.

- ❖ STAAD.Pro has building codes of most of the countries including India, US, Britain, Canada, Germany among others. More are constantly being added.

- ❖ STAAD.Pro's user interface is of industry standard. Complex models can be easily generated that provide true interactive model generation, editing and analysis.

- ❖ STAAD.Pro easily generates comprehensive custom reports and it can be exported to MS Word and MS Excel.

- ❖ STAAD.Pro structure wizard contains a library of trusses and frames using which models can be generated quickly.

## 5.3 Analysis:

The general philosophy governing the design of bridges in that, subject to a set of loading rules and constraints. The process of load application can be complex as governing rules can impose interdependent parameters such as loaded length on a lane, lane factors and load intensity. To obtain the maximum design effects, try many loading situation on a trial and error basis. This to the generation of many live load application instances. The program is based on the use of influence surfaces, which are generated by STAAD.Pro as part of loading process. The influence surface is a three dimensional form of an influence line

for a single member. STAAD.Pro will automatically generates influence surfaces for effects such as bending moment of elements, deflection in all degree of freedom of nodes and support reaction. The program utilize the relevant influence surfaces and with due regards to code requirements, optimize load positions to obtain the maximum desired effects.

The STAAD.Pro analysis of the bridge structure for a particular span, without considering the effect of continuity of bridge and analysed for I.R.C Class A Loading and Class AA loading in single lane and two lane.

# CLASS AA LOADING

## INPUT DATA FOR SINGLE LANE ANALYSIS:

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 24-Apr-07

END JOB INFORMATION

INPUT WIDTH 79

UNIT METER KN

JOINT COORDINATES

1 0 0 0; 2 2 0 0; 3 4 0 0; 4 6 0 0; 5 8 0 0; 6 0 0 4.28; 7 2 0 4.28;

8 4 0 4.28; 9 6 0 4.28; 10 8 0 4.28; 11 0 0 8.56; 12 2 0 8.56; 13 4 0 8.56;

14 6 0 8.56; 15 8 0 8.56; 16 0 0 12.84; 17 2 0 12.84; 18 4 0 12.84;

19 6 0 12.84; 20 8 0 12.84; 21 0 0 17.12; 22 2 0 17.12; 23 4 0 17.12;

24 6 0 17.12; 25 8 0 17.12; 26 0 0 21.4; 27 2 0 21.4; 28 4 0 21.4; 29 6 0 21.4;

30 8 0 21.4;

MEMBER INCIDENCES

1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 6 7; 6 7 8; 7 8 9; 8 9 10; 9 11 12; 10 12 13;

11 13 14; 12 14 15; 13 16 17; 14 17 18; 15 18 19; 16 19 20; 17 21 22; 18 22 23;

19 23 24; 20 24 25; 21 26 27; 22 27 28; 23 28 29; 24 29 30; 25 1 6; 26 2 7;

27 3 8; 28 4 9; 29 5 10; 30 6 11; 31 7 12; 32 8 13; 33 9 14; 34 10 15;

35 11 16; 36 12 17; 37 13 18; 38 14 19; 39 15 20; 40 16 21; 41 17 22; 42 18 23;

43 19 24; 44 20 25; 45 21 26; 46 22 27; 47 23 28; 48 24 29; 49 25 30;

START GROUP DEFINITION

MEMBER

END GROUP DEFINITION

START USER TABLE

TABLE 1

UNIT METER KN

ISECTION

I100012S7004

0 0.012 0 0.7 0.04 0.7 0.04 0 0 0

END

DEFINE MATERIAL START

ISOTROPIC STEEL

E 2.05e+008

POISSON 0.3

DENSITY 76.8195

ALPHA 1.2e-005

DAMP 0.03

END DEFINE MATERIAL

MEMBER PROPERTY INDIAN

1 TO 49 TABLE ST I80012B50012

START DECK DEFINITION

_DECK 1

PERIPHERY 1 26 5 25

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 1 5

OUTER 1 2 7 6

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 1

CW 2.140000 MEMB 5

_DECK 2

PERIPHERY 2 27 6 26

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 2 6

OUTER 2 3 8 7

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 2

CW 2.140000 MEMB 6

_DECK 3

PERIPHERY 3 28 7 27

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 3 7

OUTER 3 4 9 8

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 3

CW 2.140000 MEMB 7

_DECK 4

PERIPHERY 4 29 8 28

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 4 8

OUTER 4 5 10 9

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 4

CW 2.140000 MEMB 8

_DECK 5

PERIPHERY 5 31 9 30

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 5 9

OUTER 6 7 12 11

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 5

CW 2.140000 MEMB 9

_DECK 6

PERIPHERY 6 32 10 31

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 6 10

OUTER 7 8 13 12

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 6

CW 2.140000 MEMB 10

_DECK 7

PERIPHERY 7 33 11 32

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 7 11

OUTER 8 9 14 13

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 7

CW 2.140000 MEMB 11

_DECK 8

PERIPHERY 8 34 12 33

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 8 12

OUTER 9 10 15 14

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 8

CW 2.140000 MEMB 12

_DECK 9

PERIPHERY 9 36 13 35

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 9 13

OUTER 11 12 17 16

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 9

CW 2.140000 MEMB 13

_DECK 10

PERIPHERY 10 37 14 36

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 10 14

OUTER 12 13 18 17

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 10

CW 2.140000 MEMB 14

_DECK 11

PERIPHERY 11 38 15 37

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 11 15

OUTER 13 14 19 18

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 11

CW 2.140000 MEMB 15

_DECK 12

PERIPHERY 12 39 16 38

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 12 16

OUTER 14 15 20 19

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 12

CW 2.140000 MEMB 16

_DECK 13

PERIPHERY 13 41 17 40

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 13 17

OUTER 16 17 22 21

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 13

CW 2.140000 MEMB 17

_DECK 14

PERIPHERY 14 42 18 41

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 14 18

OUTER 17 18 23 22

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 14

CW 2.140000 MEMB 18

_DECK 15

PERIPHERY 15 43 19 42

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 15 19

OUTER 18 19 24 23

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 15

CW 2.140000 MEMB 19

_DECK 16

PERIPHERY 16 44 20 43

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 16 20

OUTER 19 20 25 24

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 16

CW 2.140000 MEMB 20

_DECK 17

PERIPHERY 17 46 21 45

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 17 21

OUTER 21 22 27 26

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 17

CW 2.139999 MEMB 21

_DECK 18

PERIPHERY 18 47 22 46

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 18 22

OUTER 22 23 28 27

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 18

CW 2.139999 MEMB 22

_DECK 19

PERIPHERY 19 48 23 47

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 19 23

OUTER 23 24 29 28

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 19

CW 2.139999 MEMB 23

_DECK 20

PERIPHERY 20 49 24 48

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 20 24

OUTER 24 25 30 29

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 20

CW 2.139999 MEMB 24

END DECK DEFINITION

CONSTANTS

MATERIAL STEEL ALL

SUPPORTS

1 TO 5 26 TO 30 PINNED

DEFINE MOVING LOAD

TYPE 1 LOAD 2 696 2

DIST 1.8 1.8 WID 2.9

LOAD 1 LOADTYPE Dead TITLE D.L

SELFWEIGHT Y -1

LOAD GENERATION 10

TYPE 1 1 0 1 ZINC 3

PERFORM ANALYSIS PRINT ALL

PARAMETER 1

CODE INDIAN

CHECK CODE ALL

PARAMETER 2

CODE INDIAN

STEEL TAKE OFF LIST 1 TO 49

PERFORM ANALYSIS PRINT ALL

PARAMETER 3

```
CODE INDIAN
GROUP AX MEMB 1 TO 49
START CONCRETE DESIGN
CODE INDIAN
CONCRETE TAKE
END CONCRETE DESIGN
PERFORM ANALYSIS PRINT ALL
PARAMETER 5
CODE INDIAN
CHECK CODE ALL
PARAMETER 6
CODE INDIAN
FIXED GROUP
PARAMETER 7
CODE INDIAN
STEEL MEMBER TAKE OFF LIST 1 TO 49
PARAMETER 8
CODE INDIAN
SELECT ALL
PARAMETER 9
CODE INDIAN
SELECT OPTIMIZED
PARAMETER 10
CODE INDIAN
STEEL TAKE OFF LIST 1 TO 49
PARAMETER 11
CODE INDIAN
GROUP AX MEMB 1 TO 49
FINISH
```

**STAAD.Pro CODE CHECKING - (ISA )**
**********

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 1 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 0.83 |
| 2 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 2.00 |
| 3 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 0.00 |
| 4 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 1.17 |
| 5 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.189 | 1 |
| | | 0.00 T | 0.00 | -18861.01 | 1.50 |
| 6 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.766 | 1 |
| | | 0.00 T | 0.00 | -28030.88 | 1.17 |
| 7 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.766 | 1 |
| | | 0.00 T | 0.00 | -28030.88 | 0.83 |
| 8 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.189 | 1 |
| | | 0.00 T | 0.00 | -18861.01 | 0.50 |
| 9 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.294 | 1 |
| | | 0.00 T | 0.00 | -20531.18 | 1.67 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 10 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.944 | 1 |
| | | 0.00 T | 0.00 | -30847.05 | 1.17 |
| 11 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.944 | 1 |
| | | 0.00 T | 0.00 | -30847.05 | 0.83 |
| 12 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.294 | 1 |
| | | 0.00 T | 0.00 | -20531.18 | 0.33 |
| 13 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.294 | 1 |
| | | 0.00 T | 0.00 | -20531.18 | 1.67 |
| 14 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.944 | 1 |
| | | 0.00 T | 0.00 | -30847.05 | 1.17 |
| 15 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.944 | 1 |
| | | 0.00 T | 0.00 | -30847.05 | 0.83 |
| 16 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.294 | 1 |
| | | 0.00 T | 0.00 | -20531.18 | 0.33 |
| 17 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.189 | 1 |
| | | 0.00 T | 0.00 | -18861.00 | 1.50 |
| 18 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.766 | 1 |
| | | 0.00 T | 0.00 | -28030.86 | 1.17 |

**LL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| EMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 19 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.766 | 1 |
| | | 0.00 T | 0.00 | -28030.87 | 0.83 |
| 20 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.189 | 1 |
| | | 0.00 T | 0.00 | -18861.00 | 0.50 |
| 21 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 0.83 |
| 22 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 2.00 |
| 23 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 0.00 |
| 24 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 1.17 |
| 25 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.301 | 1 |
| | | 0.00 T | 0.00 | -217754.09 | 4.28 |
| 26 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.669 | 1 |
| | | 0.00 T | 0.00 | -221193.19 | 4.28 |
| 27 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.797 | 1 |
| | | 0.00 T | 0.00 | -222395.42 | 4.28 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

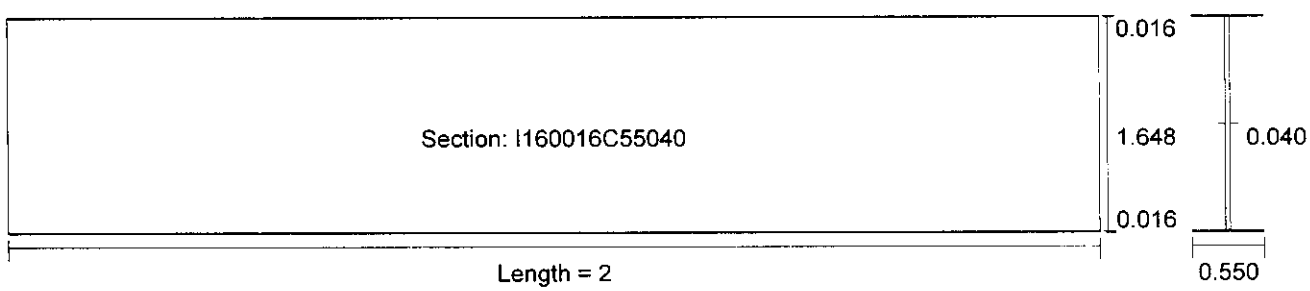
| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 28 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.669 | 1 |
| | | 0.00 T | 0.00 | -221193.19 | 4.28 |
| 29 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.301 | 1 |
| | | 0.00 T | 0.00 | -217754.09 | 4.28 |
| 30 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.304 | 1 |
| | | 0.00 T | 0.00 | -329924.16 | 4.28 |
| 31 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.329 | 1 |
| | | 0.00 T | 0.00 | -330165.44 | 4.28 |
| 32 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.339 | 1 |
| | | 0.00 T | 0.00 | -330255.78 | 4.28 |
| 33 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.329 | 1 |
| | | 0.00 T | 0.00 | -330165.44 | 4.28 |
| 34 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.304 | 1 |
| | | 0.00 T | 0.00 | -329924.16 | 4.28 |
| 35 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.319 | 1 |
| | | 0.00 T | 0.00 | -330068.19 | 1.43 |
| 36 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.323 | 1 |
| | | 0.00 T | 0.00 | -330103.56 | 1.43 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 37 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.325 | 1 |
| | | 0.00 T | 0.00 | -330121.53 | 1.43 |
| 38 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.323 | 1 |
| | | 0.00 T | 0.00 | -330103.56 | 1.43 |
| 39 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.319 | 1 |
| | | 0.00 T | 0.00 | -330068.19 | 1.43 |
| 40 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.304 | 1 |
| | | 0.00 T | 0.00 | -329924.09 | 0.00 |
| 41 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.329 | 1 |
| | | 0.00 T | 0.00 | -330165.38 | 0.00 |
| 42 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.339 | 1 |
| | | 0.00 T | 0.00 | -330255.75 | 0.00 |
| 43 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.329 | 1 |
| | | 0.00 T | 0.00 | -330165.38 | 0.00 |
| 44 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.304 | 1 |
| | | 0.00 T | 0.00 | -329924.09 | 0.00 |
| 45 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.301 | 1 |
| | | 0.00 T | 0.00 | -217753.97 | 0.00 |

Staad.Pro Query Steel Design

Beam no. 2



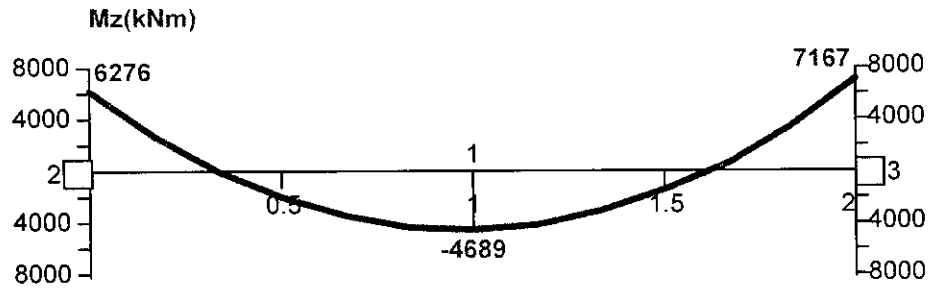

DESIGN STRESSES (NEW, MMS )

| | | | |
|---|---|---|---|
| YLD | 249.950 | FA | 149.970 |
| FCZ | 15.750 | FTZ | 137.470 |
| FCY | 0.000 | FTY | 0.000 |
| FT | 21.750 | FV | 99.980 |

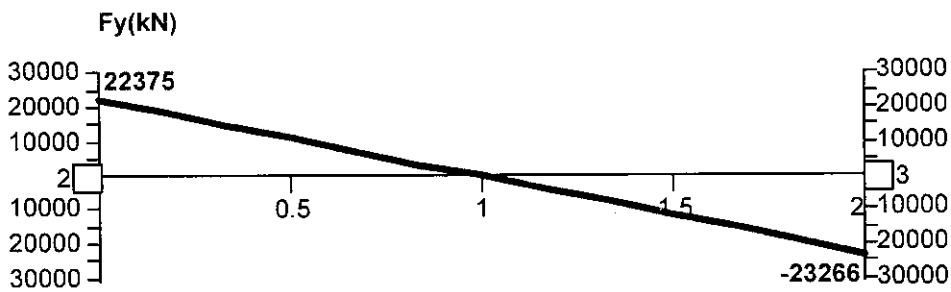
Critical load (KN ,METE)

| | |
|---|---|
| Load | 1 |
| Location | 2.000 |
| FX | 0.000 T |
| My | 0.000 |
| Mz | 5286.801 |

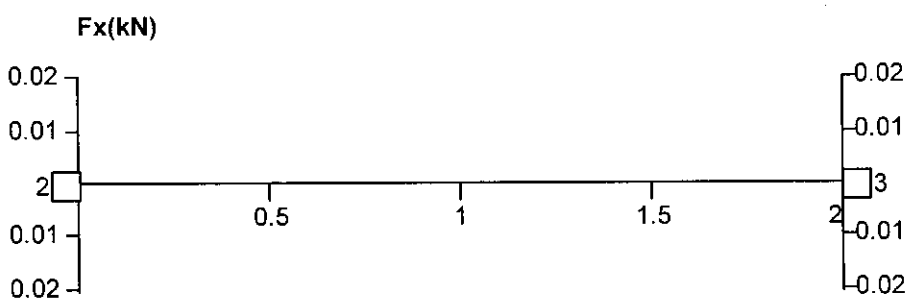
| Code | Result | Ratio | Critical | KLR |
|---|---|---|---|---|
| IS-800 | PASS | 0.818 | CONC-STRESS | 4.904 |




*Beam 2, Mz, 1 D.L*




*Beam 2, Fy, 1 D.L*




*Beam 2, Fx, 1 D.L*

# CLASS AA LOADING

**Input data for two lane**:

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 24-Apr-07

END JOB INFORMATION

INPUT WIDTH 79

UNIT METER KN

JOINT COORDINATES

1 0 0 0; 2 2 0 0; 3 4 0 0; 4 6 0 0; 5 8 0 0; 6 0 0 4.28; 7 2 0 4.28;

8 4 0 4.28; 9 6 0 4.28; 10 8 0 4.28; 11 0 0 8.56; 12 2 0 8.56; 13 4 0 8.56;

14 6 0 8.56; 15 8 0 8.56; 16 0 0 12.84; 17 2 0 12.84; 18 4 0 12.84;

19 6 0 12.84; 20 8 0 12.84; 21 0 0 17.12; 22 2 0 17.12; 23 4 0 17.12;

24 6 0 17.12; 25 8 0 17.12; 26 0 0 21.4; 27 2 0 21.4; 28 4 0 21.4; 29 6 0 21.4;

30 8 0 21.4;

MEMBER INCIDENCES

1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 6 7; 6 7 8; 7 8 9; 8 9 10; 9 11 12; 10 12 13;

11 13 14; 12 14 15; 13 16 17; 14 17 18; 15 18 19; 16 19 20; 17 21 22; 18 22 23;

19 23 24; 20 24 25; 21 26 27; 22 27 28; 23 28 29; 24 29 30; 25 1 6; 26 2 7;

27 3 8; 28 4 9; 29 5 10; 30 6 11; 31 7 12; 32 8 13; 33 9 14; 34 10 15;

35 11 16; 36 12 17; 37 13 18; 38 14 19; 39 15 20; 40 16 21; 41 17 22; 42 18 23;

43 19 24; 44 20 25; 45 21 26; 46 22 27; 47 23 28; 48 24 29; 49 25 30;

START GROUP DEFINITION

MEMBER

END GROUP DEFINITION

START USER TABLE

TABLE 1

UNIT METER KN

ISECTION

I100012S7004

0 0.012 0 0.7 0.04 0.7 0.04 0 0 0

END

DEFINE MATERIAL START

ISOTROPIC STEEL

E 2.05e+008

POISSON 0.3

DENSITY 76.8195

ALPHA 1.2e-005

DAMP 0.03

END DEFINE MATERIAL

MEMBER PROPERTY INDIAN

1 TO 49 TABLE ST I80012B50012

START DECK DEFINITION

_DECK 1

PERIPHERY 1 26 5 25

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 1 5

OUTER 1 2 7 6

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 1

CW 2.140000 MEMB 5

_DECK 2

PERIPHERY 2 27 6 26

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 2 6

OUTER 2 3 8 7

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 2

CW 2.140000 MEMB 6

_DECK 3

PERIPHERY 3 28 7 27

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 3 7

OUTER 3 4 9 8

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 3

CW 2.140000 MEMB 7

_DECK 4

PERIPHERY 4 29 8 28

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 4 8

OUTER 4 5 10 9

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 4

CW 2.140000 MEMB 8

_DECK 5

PERIPHERY 5 31 9 30

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 5 9

OUTER 6 7 12 11

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 5

CW 2.140000 MEMB 9

_DECK 6

PERIPHERY 6 32 10 31

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 6 10

OUTER 7 8 13 12

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 6

CW 2.140000 MEMB 10

_DECK 7

PERIPHERY 7 33 11 32

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 7 11

OUTER 8 9 14 13

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 7

CW 2.140000 MEMB 11

_DECK 8

PERIPHERY 8 34 12 33

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 8 12

OUTER 9 10 15 14

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 8

CW 2.140000 MEMB 12

_DECK 9

PERIPHERY 9 36 13 35

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 9 13

OUTER 11 12 17 16

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 9

CW 2.140000 MEMB 13

_DECK 10

PERIPHERY 10 37 14 36

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 10 14

OUTER 12 13 18 17

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 10

CW 2.140000 MEMB 14

_DECK 11

PERIPHERY 11 38 15 37

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 11 15

OUTER 13 14 19 18

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 11

CW 2.140000 MEMB 15

_DECK 12

PERIPHERY 12 39 16 38

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 12 16

OUTER 14 15 20 19

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 12

CW 2.140000 MEMB 16

_DECK 13

PERIPHERY 13 41 17 40

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 13 17

OUTER 16 17 22 21

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 13

CW 2.140000 MEMB 17

_DECK 14

PERIPHERY 14 42 18 41

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 14 18

OUTER 17 18 23 22

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 14

CW 2.140000 MEMB 18

_DECK 15

PERIPHERY 15 43 19 42

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 15 19

OUTER 18 19 24 23

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 15

CW 2.140000 MEMB 19

_DECK 16

PERIPHERY 16 44 20 43

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 16 20

OUTER 19 20 25 24

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 16

CW 2.140000 MEMB 20

_DECK 17

PERIPHERY 17 46 21 45

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 17 21

OUTER 21 22 27 26

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 17

CW 2.139999 MEMB 21

_DECK 18

PERIPHERY 18 47 22 46

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 18 22

OUTER 22 23 28 27

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 18

CW 2.139999 MEMB 22

_DECK 19

PERIPHERY 19 48 23 47

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 19 23

OUTER 23 24 29 28

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 19

CW 2.139999 MEMB 23

_DECK 20

PERIPHERY 20 49 24 48

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 20 24

OUTER 24 25 30 29

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 20

CW 2.139999 MEMB 24

END DECK DEFINITION

CONSTANTS

MATERIAL STEEL ALL

SUPPORTS

1 TO 5 26 TO 30 PINNED

DEFINE MOVING LOAD

TYPE 1 LOAD 2 696 2

DIST 1.8 1.8 WID 2.9

LOAD 1 LOADTYPE Dead TITLE D.L

SELFWEIGHT Y -1

LOAD GENERATION 10 ADD LOAD 1

TYPE 1 1 0 1 ZINC 3

TYPE 1 4.7 0 20.4 ZINC -3

PERFORM ANALYSIS PRINT ALL

PARAMETER 1

CODE INDIAN

CHECK CODE ALL

PARAMETER 2

CODE INDIAN

STEEL TAKE OFF LIST 1 TO 49

PERFORM ANALYSIS PRINT ALL

PARAMETER 3

CODE INDIAN

GROUP AX MEMB 1 TO 49

START CONCRETE DESIGN

CODE INDIAN

CONCRETE TAKE

END CONCRETE DESIGN

PERFORM ANALYSIS PRINT ALL

PARAMETER 5

CODE INDIAN

CHECK CODE ALL

PARAMETER 6

CODE INDIAN

FIXED GROUP

PARAMETER 7

CODE INDIAN

STEEL MEMBER TAKE OFF LIST 1 TO 49

PARAMETER 8

CODE INDIAN

SELECT ALL

PARAMETER 9

CODE INDIAN

SELECT OPTIMIZED

PARAMETER 10

CODE INDIAN

STEEL TAKE OFF LIST 1 TO 49

PARAMETER 11

CODE INDIAN

GROUP AX MEMB 1 TO 49

PERFORM ANALYSIS PRINT ALL

FINISH

**STAAD.Pro CODE CHECKING - (ISA )**
**********

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 1 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 0.83 |
| 2 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 2.00 |
| 3 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 0.00 |
| 4 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 1.17 |
| 5 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.212 | 7 |
| | | 0.00 T | 0.00 | -19239.80 | 1.50 |
| 6 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.798 | 7 |
| | | 0.00 T | 0.00 | -28532.42 | 1.17 |
| 7 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.791 | 7 |
| | | 0.00 T | 0.00 | -28425.88 | 0.83 |
| 8 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.200 | 7 |
| | | 0.00 T | 0.00 | -19048.03 | 0.50 |
| 9 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.323 | 5 |
| | | 0.00 T | 0.00 | -20990.32 | 1.67 |

UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)

| MBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 10 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.980 | 5 |
| | | 0.00 T | 0.00 | -31426.52 | 1.17 |
| 11 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.973 | 5 |
| | | 0.00 T | 0.00 | -31307.55 | 0.83 |
| 12 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.308 | 5 |
| | | 0.00 T | 0.00 | -20752.39 | 0.33 |
| 13 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.324 | 4 |
| | | 0.00 T | 0.00 | -21015.30 | 1.67 |
| 14 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.981 | 4 |
| | | 0.00 T | 0.00 | -31432.22 | 1.17 |
| 15 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.973 | 4 |
| | | 0.00 T | 0.00 | -31309.62 | 0.83 |
| 16 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.309 | 4 |
| | | 0.00 T | 0.00 | -20770.12 | 0.33 |
| 17 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.208 | 3 |
| | | 0.00 T | 0.00 | -19165.79 | 1.50 |
| 18 CM | I160016C55040 | PASS | (INDIAN SECTIONS) CONC-STRESS | 1.792 | 3 |
| | | 0.00 T | 0.00 | -28438.30 | 1.17 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 19 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.787 | 3 |
| | | 0.00 T | 0.00 | -28354.67 | 0.83 |
| 20 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 1.198 | 3 |
| | | 0.00 T | 0.00 | -19015.25 | 0.50 |
| 21 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 0.83 |
| 22 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 2.00 |
| 23 CM | I125012B50016 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.996 | 1 |
| | | 0.00 T | 0.00 | 8958.93 | 0.00 |
| 24 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.816 | 1 |
| | | 0.00 T | 0.00 | -9564.99 | 1.17 |
| 25 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.472 | 3 |
| | | 0.00 T | 0.00 | -219349.52 | 4.28 |
| 26 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.816 | 3 |
| | | 0.00 T | 0.00 | -222564.44 | 4.28 |
| 27 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.926 | 6 |
| | | 0.00 T | 0.00 | -223597.98 | 4.28 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 28 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.786 | 6 |
| | | 0.00 T | 0.00 | -222292.91 | 4.28 |
| 29 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.399 | 6 |
| | | 0.00 T | 0.00 | -218672.59 | 4.28 |
| 30 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.609 | 4 |
| | | 0.00 T | 0.00 | -332782.66 | 4.28 |
| 31 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.610 | 4 |
| | | 0.00 T | 0.00 | -332791.53 | 4.28 |
| 32 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.598 | 4 |
| | | 0.00 T | 0.00 | -332675.69 | 4.28 |
| 33 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.569 | 5 |
| | | 0.00 T | 0.00 | -332404.06 | 4.28 |
| 34 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.515 | 5 |
| | | 0.00 T | 0.00 | -331895.88 | 4.28 |
| 35 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.634 | 5 |
| | | 0.00 T | 0.00 | -333007.69 | 3.21 |
| 36 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.634 | 5 |
| | | 0.00 T | 0.00 | -333014.78 | 1.07 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 37 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.626 | 5 |
| | | 0.00 T | 0.00 | -332941.94 | 3.21 |
| 38 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.599 | 5 |
| | | 0.00 T | 0.00 | -332687.16 | 1.07 |
| 39 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.579 | 5 |
| | | 0.00 T | 0.00 | -332501.41 | 0.00 |
| 40 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.608 | 5 |
| | | 0.00 T | 0.00 | -332768.84 | 0.00 |
| 41 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.608 | 5 |
| | | 0.00 T | 0.00 | -332767.69 | 0.00 |
| 42 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.599 | 4 |
| | | 0.00 T | 0.00 | -332689.31 | 0.00 |
| 43 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.569 | 4 |
| | | 0.00 T | 0.00 | -332404.78 | 0.00 |
| 44 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 35.513 | 4 |
| | | 0.00 T | 0.00 | -331885.62 | 0.00 |
| 45 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.470 | 6 |
| | | 0.00 T | 0.00 | -219330.81 | 0.00 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 46 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.813 | 6 |
| | | 0.00 T | 0.00 | -222544.95 | 0.00 |
| 47 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.927 | 3 |
| | | 0.00 T | 0.00 | -223607.88 | 0.00 |
| 48 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.787 | 3 |
| | | 0.00 T | 0.00 | -222294.12 | 0.00 |
| 49 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 23.399 | 4 |
| | | 0.00 T | 0.00 | -218669.31 | 0.00 |

********** END OF TABULATED RESULT OF DESIGN **********

423. PARAMETER 9
424. CODE INDIAN
425. SELECT OPTIMIZED

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 5

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 6

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 7

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 8

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 9

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 10

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 11

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 12

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 13

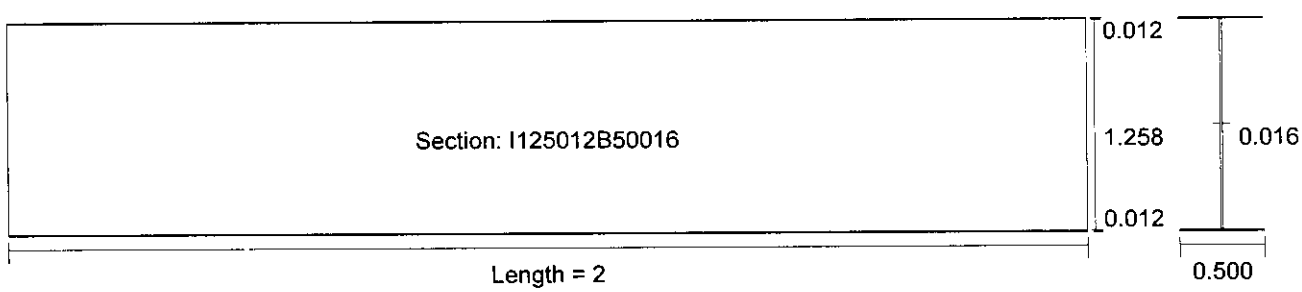
DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 14

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 15

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 16

Staad.Pro Query Steel Design

Beam no. 2



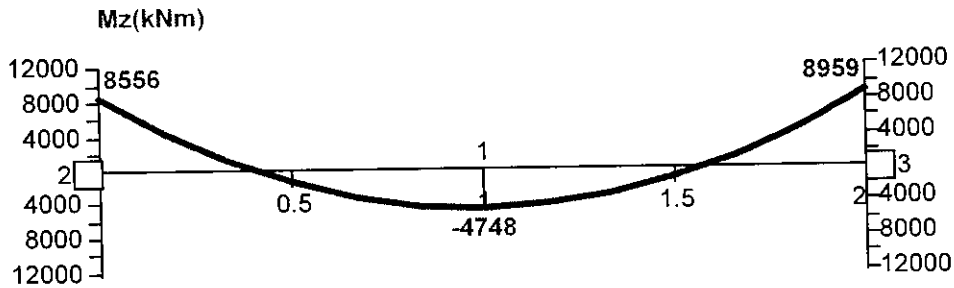

DESIGN STRESSES (NEW, MMS )

| | | | |
|---|---|---|---|
| YLD | 249.950 | FA | 149.970 |
| FCZ | 15.750 | FTZ | 137.470 |
| FCY | 0.000 | FTY | 0.000 |
| FT | 21.750 | FV | 99.980 |

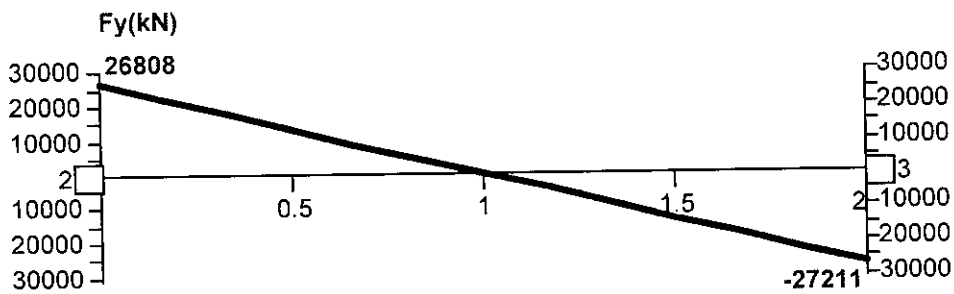
Critical load (KN ,METE)

| | |
|---|---|
| Load | 1 |
| Location | 2.000 |
| FX | 0.000 T |
| My | 0.000 |
| Mz | 8958.934 |

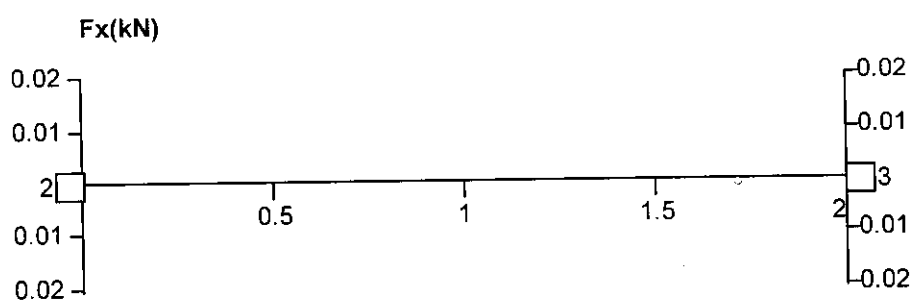
| Code | Result | Ratio | Critical | KLR |
|---|---|---|---|---|
| IS-800 | PASS | 0.996 | CONC-STRESS | 4.035 |




*Beam 2, Mz, 1 D.L*




*Beam 2, Fy, 1 D.L*




*Beam 2, Fx, 1 D.L*

# CLASS A LOADING

## Input data for single lane

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 21-Apr-09

END JOB INFORMATION

INPUT WIDTH 79

UNIT METER KN

JOINT COORDINATES

1 0 0 0; 2 2 0 0; 3 4.00001 0 0; 4 6.00001 0 0; 5 8.00002 0 0; 6 0 0 4.28001;

7 2 0 4.28001; 8 4.00001 0 4.28001; 9 6.00001 0 4.28001; 10 8.00002 0 4.28001;

11 0 0 8.56002; 12 2 0 8.56002; 13 4.00001 0 8.56002; 14 6.00001 0 8.56002;

15 8.00002 0 8.56002; 16 0 0 12.84; 17 2 0 12.84; 18 4.00001 0 12.84;

19 6.00001 0 12.84; 20 8.00002 0 12.84; 21 0 0 17.12; 22 2 0 17.12;

23 4.00001 0 17.12; 24 6.00001 0 17.12; 25 8.00002 0 17.12; 26 0 0 21.4;

27 2 0 21.4; 28 4.00001 0 21.4; 29 6.00001 0 21.4; 30 8.00002 0 21.4;

MEMBER INCIDENCES

1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 6 7; 6 7 8; 7 8 9; 8 9 10; 9 11 12; 10 12 13;

11 13 14; 12 14 15; 13 16 17; 14 17 18; 15 18 19; 16 19 20; 17 21 22; 18 22 23;

19 23 24; 20 24 25; 21 26 27; 22 27 28; 23 28 29; 24 29 30; 25 1 6; 26 2 7;

27 3 8; 28 4 9; 29 5 10; 30 6 11; 31 7 12; 32 8 13; 33 9 14; 34 10 15;

35 11 16; 36 12 17; 37 13 18; 38 14 19; 39 15 20; 40 16 21; 41 17 22; 42 18 23;

43 19 24; 44 20 25; 45 21 26; 46 22 27; 47 23 28; 48 24 29; 49 25 30;

START USER TABLE

TABLE 1

UNIT METER KN

WIDE FLANGE

I100012F7004

0.068 1.08 0.012 0.7 0.04 0.0161499 0.00228681 3.04427e-005 0.01296 0.0373333

END

DEFINE MATERIAL START

ISOTROPIC STEEL

E 1.99947e+008

POISSON 0.3

DENSITY 76.8191

ALPHA 6.5e-006

DAMP 0.03

END DEFINE MATERIAL

MEMBER PROPERTY INDIAN

1 TO 49 TABLE ST I80012B50012

START DECK DEFINITION

_DECK DECK1

PERIPHERY 1 TO 4 29 34 39 44 49 24 23 22 21 45 40 35 30 25

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 1 TO 4 24 23 22 21

OUTER 1 5 30 26

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 24000.000

CMP 2.0

CW 4.280009 MEMB 20

CW 4.280009 MEMB 19

CW 4.280009 MEMB 18

CW 4.280009 MEMB 17

CW 4.280009 MEMB 16

CW 4.280009 MEMB 15

CW 4.280009 MEMB 14

CW 4.280009 MEMB 13

CW 4.280009 MEMB 12

CW 4.280009 MEMB 11

CW 4.280009 MEMB 10

CW 4.280009 MEMB 9

CW 4.280009 MEMB 8

CW 4.280009 MEMB 7

CW 4.280009 MEMB 6

CW 4.280009 MEMB 5

CW 2.140004 MEMB 1

CW 2.140004 MEMB 2

CW 2.140004 MEMB 3

CW 2.140004 MEMB 4

CW 2.140005 MEMB 24

CW 2.140005 MEMB 23

CW 2.140005 MEMB 22

CW 2.140005 MEMB 21

END DECK DEFINITION

CONSTANTS

MATERIAL STEEL ALL

SUPPORTS

1 TO 5 26 TO 30 PINNED

DEFINE MOVING LOAD

TYPE 1 LOAD 27 27 114 114 68 68 68 68

DIST 1.1 3.2 1.1 4.3 3 3 3 WID 2.3

LOAD 1 LOADTYPE Dead TITLE D.L

SELFWEIGHT Y -1

LOAD GENERATION 10 ADD LOAD 1

TYPE 1 1 0 1 ZINC 3

PERFORM ANALYSIS PRINT ALL

PRINT MAXFORCE ENVELOPE ALL

STEEL TAKE OFF LIST 1 TO 49

START CONCRETE DESIGN

CODE INDIAN

CONCRETE TAKE

END CONCRETE DESIGN

PARAMETER 1

CODE INDIAN

FYLD 415000 ALL

PROFILE I160 ALL

STEEL TAKE OFF LIST 1 TO 49

PARAMETER 2

CODE INDIAN

CHECK CODE ALL

PARAMETER 3

CODE INDIAN

FIXED GROUP

PARAMETER 5

CODE INDIAN

GROUP AX MEMB 1 TO 49

PARAMETER 6

CODE INDIAN

STEEL MEMBER TAKE OFF LIST 1 TO 49

PARAMETER 7

CODE INDIAN

SELECT ALL

PARAMETER 8

CODE INDIAN

SELECT OPTIMIZED

PARAMETER 9

CODE INDIAN

STEEL TAKE OFF LIST 1 TO 49

PERFORM ANALYSIS PRINT ALL

FINISH

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 10 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 3.804 | 3 |
| | | 0.00 T | 0.00 | -58875.29 | 1.17 |
| 11 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 3.801 | 3 |
| | | 0.00 T | 0.00 | -58828.92 | 0.83 |
| 12 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 2.528 | 2 |
| | | 0.00 T | 0.00 | -39128.59 | 0.33 |
| 13 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 2.533 | 4 |
| | | 0.00 T | 0.00 | -39208.34 | 1.67 |
| 14 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 3.803 | 4 |
| | | 0.00 T | 0.00 | -58867.40 | 1.17 |
| 15 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 3.801 | 4 |
| | | 0.00 T | 0.00 | -58825.36 | 0.83 |
| 16 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 2.528 | 3 |
| | | 0.00 T | 0.00 | -39130.15 | 0.33 |
| 17 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 2.259 | 6 |
| | | 0.00 T | 0.00 | -34958.86 | 1.50 |
| 18 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 3.336 | 6 |
| | | 0.00 T | 0.00 | -51634.61 | 1.17 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 19 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 3.333 | 6 |
| | | 0.00 T | 0.00 | -51590.90 | 0.83 |
| 20 CM | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 2.254 | 1 |
| | | 0.00 T | 0.00 | -34884.39 | 0.50 |
| 21 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.485 | 7 |
| | | 0.00 T | 0.00 | 5548.80 | 2.00 |
| 22 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.485 | 7 |
| | | 0.00 T | 0.00 | 5547.61 | 0.00 |
| 23 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.483 | 1 |
| | | 0.00 T | 0.00 | 5520.89 | 2.00 |
| 24 CM | I160012B50012 | | (INDIAN SECTIONS) | | |
| | | PASS | CONC-STRESS | 0.483 | 1 |
| | | 0.00 T | 0.00 | 5522.09 | 0.00 |
| 25 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 27.561 | 2 |
| | | 0.00 T | 0.00 | -415763.88 | 4.28 |
| 26 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 28.257 | 2 |
| | | 0.00 T | 0.00 | -426260.06 | 4.28 |
| 27 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 28.497 | 2 |
| | | 0.00 T | 0.00 | -429890.28 | 4.28 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 28 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 28.244 | 2 |
| | | 0.00 T | 0.00 | -426074.28 | 4.28 |
| 29 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 27.529 | 2 |
| | | 0.00 T | 0.00 | -415279.19 | 4.28 |
| 30 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 41.982 | 3 |
| | | 0.00 T | 0.00 | -633303.88 | 4.28 |
| 31 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.058 | 3 |
| | | 0.00 T | 0.00 | -634455.38 | 4.28 |
| 32 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.084 | 3 |
| | | 0.00 T | 0.00 | -634853.12 | 4.28 |
| 33 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.048 | 3 |
| | | 0.00 T | 0.00 | -634304.31 | 4.28 |
| 34 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 41.959 | 2 |
| | | 0.00 T | 0.00 | -632968.38 | 4.28 |
| 35 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.024 | 3 |
| | | 0.00 T | 0.00 | -633949.94 | 0.71 |
| 36 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.034 | 3 |
| | | 0.00 T | 0.00 | -634099.19 | 0.71 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 37 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.037 | 3 |
| | | 0.00 T | 0.00 | -634139.19 | 0.71 |
| 38 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.027 | 3 |
| | | 0.00 T | 0.00 | -633992.38 | 0.00 |
| 39 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.013 | 3 |
| | | 0.00 T | 0.00 | -633774.06 | 1.78 |
| 40 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 41.976 | 4 |
| | | 0.00 T | 0.00 | -633220.62 | 0.00 |
| 41 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.054 | 4 |
| | | 0.00 T | 0.00 | -634390.50 | 0.00 |
| 42 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.081 | 4 |
| | | 0.00 T | 0.00 | -634797.50 | 0.00 |
| 43 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 42.045 | 3 |
| | | 0.00 T | 0.00 | -634263.12 | 0.00 |
| 44 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 41.957 | 3 |
| | | 0.00 T | 0.00 | -632925.31 | 0.00 |
| 45 ST | I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 27.554 | 3 |
| | | 0.00 T | 0.00 | -415665.03 | 0.00 |

**ALL UNITS ARE - KN METE (UNLESS OTHERWISE NOTED)**

| MEMBER | TABLE | RESULT/ FX | CRITICAL COND/ MY | RATIO/ MZ | LOADING/ LOCATION |
|---|---|---|---|---|---|
| 46 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 28.251 | 3 |
| | | 0.00 T | 0.00 | -426177.47 | 0.00 |
| 47 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 28.493 | 3 |
| | | 0.00 T | 0.00 | -429824.59 | 0.00 |
| 48 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 28.241 | 3 |
| | | 0.00 T | 0.00 | -426029.28 | 0.00 |
| 49 | ST I160016C55040 | | (INDIAN SECTIONS) | | |
| | | PASS | IS-7.1.1(A) | 27.527 | 3 |
| | | 0.00 T | 0.00 | -415259.03 | 0.00 |

********** END OF TABULATED RESULT OF DESIGN **********

118. PARAMETER 8
119. CODE INDIAN
120. SELECT OPTIMIZED

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 5

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 6

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 7

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 8

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 9

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 10

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 11

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 12

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 13

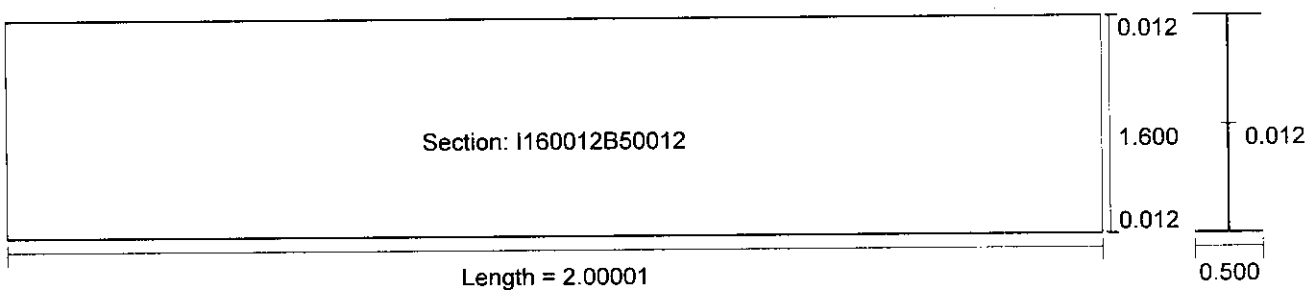
DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 14

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 15

DMAX, DMIN OR PROFILE REQUIREMENTS CANNOT BE SATISFIED FOR MEMBER 16

Staad.Pro Query Steel Design

Beam no. 2



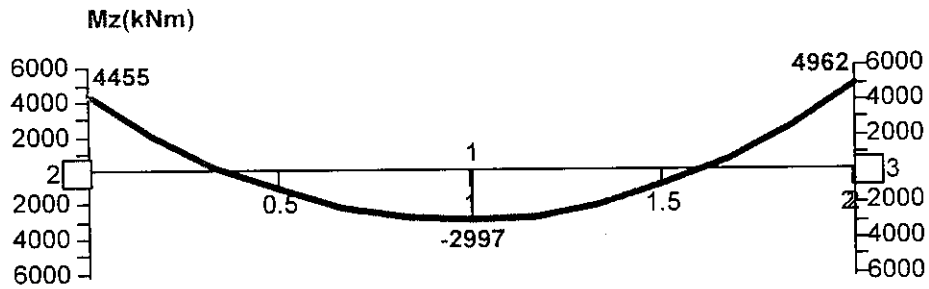

DESIGN STRESSES (NEW, MMS )

| | | | |
|---|---|---|---|
| YLD | 415.000 | FA | 249.000 |
| FCZ | 15.750 | FTZ | 228.250 |
| FCY | 0.000 | FTY | 0.000 |
| FT | 36.110 | FV | 166.000 |

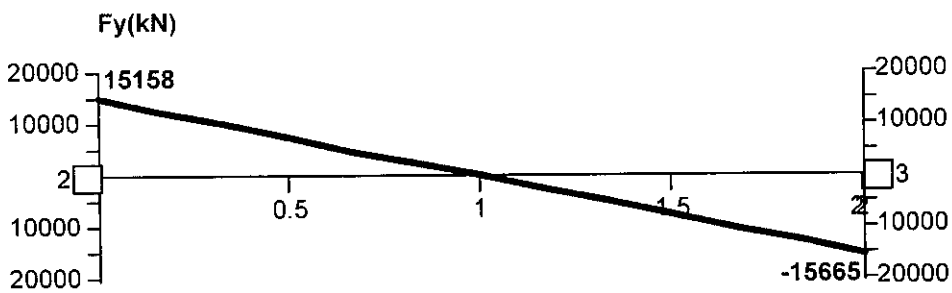
Critical load (KN ,METE)

| | |
|---|---|
| Load | 1 |
| Location | 2.000 |
| FX | 0.000 T |
| My | 0.000 |
| Mz | 4962.416 |

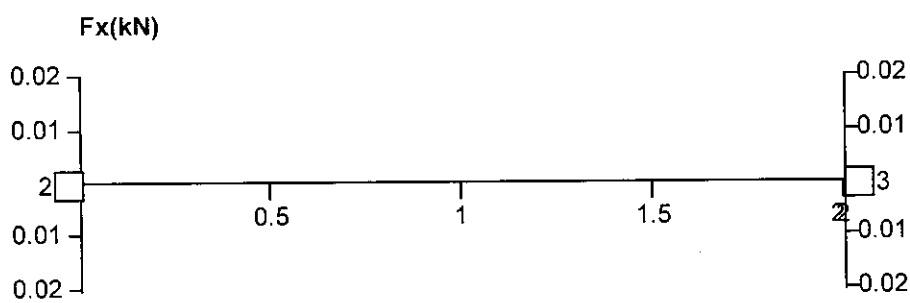
| Code | Result | Ratio | Critical | KLR |
|---|---|---|---|---|
| IS-800 | PASS | 0.434 | CONC-STRESS | 4.043 |




*Beam 2, Mz, 1 D.L*




*Beam 2, Fy, 1 D.L*




*Beam 2, Fx, 1 D.L*

# CLASS A LOADING

## Input data for two lane

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 21-Apr-09

END JOB INFORMATION

INPUT WIDTH 79

UNIT METER KN

JOINT COORDINATES

1 0 0 0; 2 2 0 0; 3 4.00001 0 0; 4 6.00001 0 0; 5 8.00002 0 0; 6 0 0 4.28001;

7 2 0 4.28001; 8 4.00001 0 4.28001; 9 6.00001 0 4.28001; 10 8.00002 0 4.28001;

11 0 0 8.56002; 12 2 0 8.56002; 13 4.00001 0 8.56002; 14 6.00001 0 8.56002;

15 8.00002 0 8.56002; 16 0 0 12.84; 17 2 0 12.84; 18 4.00001 0 12.84;

19 6.00001 0 12.84; 20 8.00002 0 12.84; 21 0 0 17.12; 22 2 0 17.12;

23 4.00001 0 17.12; 24 6.00001 0 17.12; 25 8.00002 0 17.12; 26 0 0 21.4;

27 2 0 21.4; 28 4.00001 0 21.4; 29 6.00001 0 21.4; 30 8.00002 0 21.4;

MEMBER INCIDENCES

1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 6 7; 6 7 8; 7 8 9; 8 9 10; 9 11 12; 10 12 13;

11 13 14; 12 14 15; 13 16 17; 14 17 18; 15 18 19; 16 19 20; 17 21 22; 18 22 23;

19 23 24; 20 24 25; 21 26 27; 22 27 28; 23 28 29; 24 29 30; 25 1 6; 26 2 7;

27 3 8; 28 4 9; 29 5 10; 30 6 11; 31 7 12; 32 8 13; 33 9 14; 34 10 15;

35 11 16; 36 12 17; 37 13 18; 38 14 19; 39 15 20; 40 16 21; 41 17 22; 42 18 23;

43 19 24; 44 20 25; 45 21 26; 46 22 27; 47 23 28; 48 24 29; 49 25 30;

DEFINE MATERIAL START

ISOTROPIC STEEL

E 1.99947e+008

POISSON 0.3

DENSITY 76.8191

ALPHA 6.5e-006

DAMP 0.03

END DEFINE MATERIAL

MEMBER PROPERTY INDIAN

1 TO 4 21 TO 24 TABLE ST I100012B50012

5 TO 20 25 TO 49 TABLE ST I160016C55040

START DECK DEFINITION

_DECK 1

PERIPHERY 1 26 5 25

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 1 5

OUTER 1 2 7 6

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 1

CW 2.140005 MEMB 5

_DECK 2

PERIPHERY 2 27 6 26

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 2 6

OUTER 2 3 8 7

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 2

CW 2.140005 MEMB 6

_DECK 3

PERIPHERY 3 28 7 27

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 3 7

OUTER 3 4 9 8

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 3

CW 2.140005 MEMB 7

_DECK 4

PERIPHERY 4 29 8 28

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 4 8

OUTER 4 5 10 9

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 4

CW 2.140005 MEMB 8

_DECK 12

PERIPHERY 12 39 16 38

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 12 16

OUTER 14 15 20 19

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139990 MEMB 12

CW 2.139990 MEMB 16

_DECK 13

PERIPHERY 13 41 17 40

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 13 17

OUTER 16 17 22 21

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 13

CW 2.140000 MEMB 17

_DECK 14

PERIPHERY 14 42 18 41

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 14 18

OUTER 17 18 23 22

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 14

CW 2.140000 MEMB 18

_DECK 15

PERIPHERY 15 43 19 42

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 15 19

OUTER 18 19 24 23

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 15

CW 2.140000 MEMB 19

_DECK 16

PERIPHERY 16 44 20 43

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 16 20

OUTER 19 20 25 24

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140000 MEMB 16

CW 2.140000 MEMB 20

_DECK 17

PERIPHERY 17 46 21 45

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 17 21

OUTER 21 22 27 26

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 17

CW 2.139999 MEMB 21

_DECK 18

PERIPHERY 18 47 22 46

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 18 22

OUTER 22 23 28 27

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 18

CW 2.139999 MEMB 22

_DECK 19

PERIPHERY 19 48 23 47

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 19 23

OUTER 23 24 29 28

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 19

CW 2.139999 MEMB 23

_DECK 20

PERIPHERY 20 49 24 48

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 20 24

OUTER 24 25 30 29

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139999 MEMB 20

CW 2.139999 MEMB 24

_DECK 5

PERIPHERY 5 31 9 30

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 5 9

OUTER 6 7 12 11

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 5

CW 2.140005 MEMB 9

_DECK 6

PERIPHERY 6 32 10 31

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 6 10

OUTER 7 8 13 12

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 6

CW 2.140005 MEMB 10

_DECK 7

PERIPHERY 7 33 11 32

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 7 11

OUTER 8 9 14 13

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 7

CW 2.140005 MEMB 11

_DECK 8

PERIPHERY 8 34 12 33

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 8 12

OUTER 9 10 15 14

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.140005 MEMB 8

CW 2.140005 MEMB 12

_DECK 9

PERIPHERY 9 36 13 35

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 9 13

OUTER 11 12 17 16

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139990 MEMB 9

CW 2.139990 MEMB 13

_DECK 10

PERIPHERY 10 37 14 36

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 10 14

OUTER 12 13 18 17

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139990 MEMB 10

CW 2.139990 MEMB 14

_DECK 11

PERIPHERY 11 38 15 37

DIRECTION 0.000000 0.000000 1.000000

COMPOSITE 11 15

OUTER 13 14 19 18

DIA 0.060000

HGT 0.120

CT 0.300

FC 35000.000

RBW 0.000

RBH 0.000

SHR 0

VENDOR NONE

CD 25000.000

CMP 2.0

CW 2.139990 MEMB 11

CW 2.139990 MEMB 15

END DECK DEFINITION

CONSTANTS

MATERIAL STEEL ALL

SUPPORTS

1 TO 5 26 TO 30 PINNED

DEFINE MOVING LOAD

TYPE 1 LOAD 27 27 114 114 68 68 68 68

DIST 1.1 3.2 1.1 4.3 3 3 3 WID 2.3

LOAD 1 LOADTYPE Dead TITLE D.L

SELFWEIGHT Y -1

LOAD GENERATION 10 ADD LOAD 1

TYPE 1 1 0 1 ZINC 1

TYPE 1 4.7 0 20.4 ZINC -3

PERFORM ANALYSIS PRINT ALL

PRINT MAXFORCE ENVELOPE ALL

PERFORM ANALYSIS PRINT ALL

PERFORM ANALYSIS PRINT ALL

PERFORM ANALYSIS PRINT ALL

PERFORM ANALYSIS PRINT ALL

PERFORM ANALYSIS PRINT ALL

PARAMETER 1

CODE INDIAN

CHECK CODE ALL

PARAMETER 2

CODE INDIAN

FIXED GROUP

PARAMETER 3

CODE INDIAN

STEEL MEMBER TAKE OFF LIST 1 TO 49

PARAMETER 4

CODE INDIAN

SELECT ALL

PARAMETER 5

CODE INDIAN

SELECT OPTIMIZED

PARAMETER 6

CODE INDIAN

STEEL TAKE OFF LIST 1 TO 49

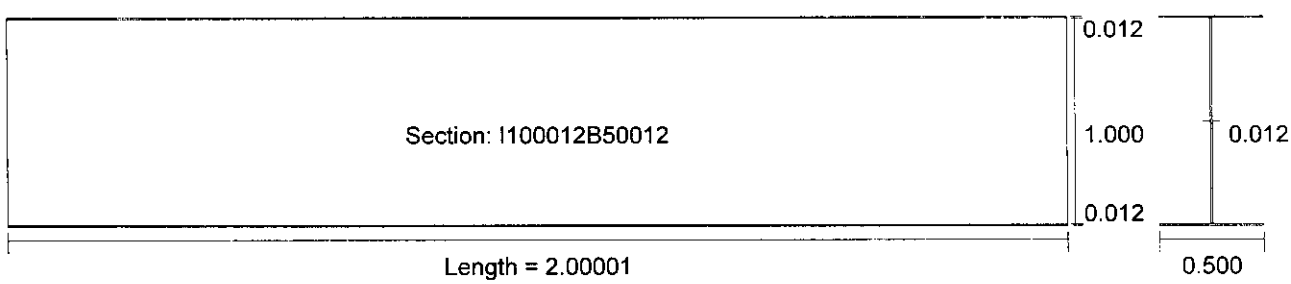
PERFORM ANALYSIS PRINT ALL

PERFORM ANALYSIS PRINT ALL

FINISH

Staad.Pro Query Steel Design

Beam no. 2



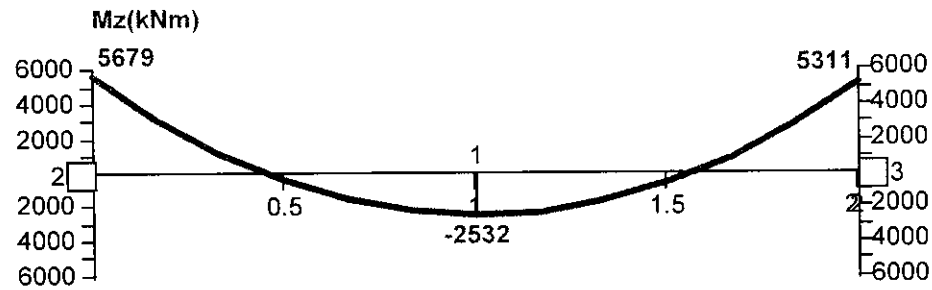

DESIGN STRESSES (NEW, MMS )

| | | | |
|---|---|---|---|
| YLD | 249.950 | FA | 0.000 |
| FCZ | 15.750 | FTZ | 137.470 |
| FCY | 0.000 | FTY | 0.000 |
| FT | 0.000 | FV | 0.000 |

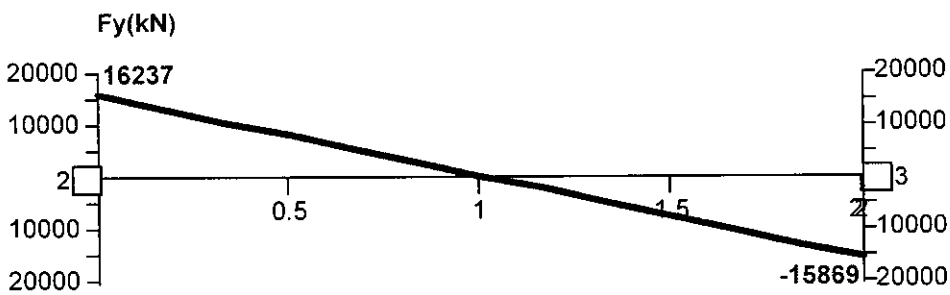
Critical load (KN ,METE)

| | |
|---|---|
| Load | 7 |
| Location | 0.000 |
| FX | 0.000 T |
| My | 0.000 |
| Mz | 5692.596 |

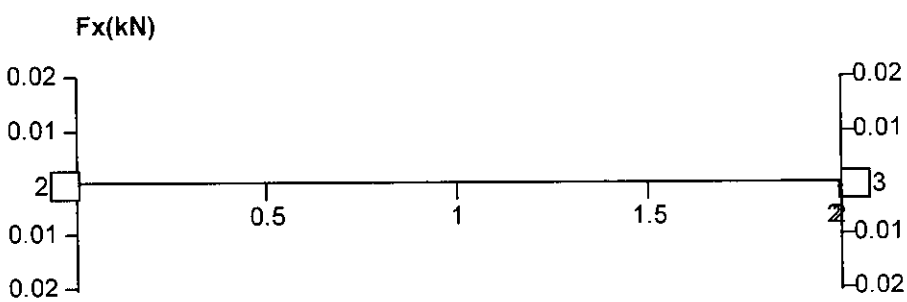
| Code | Result | Ratio | Critical | KLR |
|---|---|---|---|---|
| IS-800 | PASS | 0.903 | CONC-STRESS | 4.904 |




*Beam 2, Mz, 1 D.L*




*Beam 2, Fy, 1 D.L*




*Beam 2, Fx, 1 D.L*

# CHAPTER - 6

# CONCLUSION

# CONCLUSION

- In this project, an attempt has been made to plan, analyse and design of composite bridge deck system based on the provision of IRC 5 – 1970, IRC 6 – 2000, IRC 21 – 1972, IRC 22 – 1986.

- The design has been done manually for Class AA loading (tracked vehicle).

- The structure composed of deck slab, plate girder and shear connectors is modelled in STAAD.Pro software and are analysed for Class A loading and Class AA loading conditions.

- Code books were referred for manual design and the detailed drawing of the various components are presented.

- AUTO CAD software is used to plot the structural drawings.

- For Class A loading (single lane and double lane) and similarly for Class AA loading (single lane and double lane) analyses has been carried out using STAAD.Pro.

- Bending moment, stresses, shear force and node displacement for the above loading conditions are shown.

# CHAPTER - 7
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# BIBLIOGRAPHY


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