Structure Optimization Valuation for Steel Trusses using STADD Pro Tool

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Abstract— The requirement of this study arises where sometimes it is difficult for taking too much time to choose an effective and economical truss shape or truss geometry during the design period. Now a day, our study about the steel structures, steel trusses make one of the major structural systems, which require for accurate and reasonable design. The shape and configuration mainly depend upon the span of trusses and a variety of loads. We have proposed to optimize the steel truss pattern for increase structural efficiency. Long span structures are needed to resist lateral forces over the span length without vertical members at the mid spans, for such structures truss arrangement is more beneficial to distribute tension and compression of each members. We have tested the considered models using Staad.Pro .The designed steel truss structures are analyzed for increasing structural efficiency. The present investigation will encourage the utilization of steel truss arrangement for long span structures which may be cost effective, easy and fast in assembling. and concluded that in truss arrangement howe type truss is comparatively best suitable whereas in terms of sections beam section is more resistible and economical.

Keywords: Optimize, Structural Efficiency, Models, Valuation, Truss Arrangement, Encourage and Utilization

I. INTRODUCTION

Steel frames are usually the choice when constructing a larger building that needs a big open space because of the economical aspect and efficiency of building a single-storey unit. However, a problem that might occur is when designing for a cost effective solution the slenderness may be decreased, that in the end may contribute to an instability of the entire structure. A typical frame will in ultimate limit state (ULS) have compression forces and bending moments that are of big concern. The reason for this is that they may cause one element to buckle and deform. Because the elements are connected to each other, this may result in a deformation of the neighbouring element which in the end may lead to severe deformations and instability of the entire system of the frame. Structural steel is a category of steel used as a construction material for making structural steel shapes. An auxiliary steel shape is a profile, framed with a particular cross segment and keeping certain models for substance structure and mechanical properties. Basic steel shapes, sizes, piece, qualities, stockpiling rehearses, and so forth., are managed by principles in most industrialized nations. Basic steel individuals, for example, I-shafts, have high second snapshots of region, which enable them to be exceptionally hardened in regard to their cross- sectional territory.

There are an assortment of basic steel frameworks accessible for use in multi-story private construction. Common models incorporate show pillars and supports, Girder-Slab, stunned bracket, and stub support. Traditional shafts and supports are not ordinarily utilized in multi- story private construction because of the profundity and huge load of the individuals that would be required. The Girder-Slab is a protected surrounding and floor framework created in the 1990's to contend with the cast set up solid industry. The amazed support is a non- licensed effective surrounding framework created in the 1960's, however has never observed across the board use. Be that as it may, the framework has as of late picked up consideration as it has been utilized to construct various mid-ascent inns, lofts, and quarters. AISC distributed a Design Guide Series on the amazed support in 2002. The stub brace framework was created in the mid 1970's essentially for office construction, however it never again contends monetarily in the present construction advertise because of high work costs and was never effectively utilized in private construction because of the huge floor profundities.

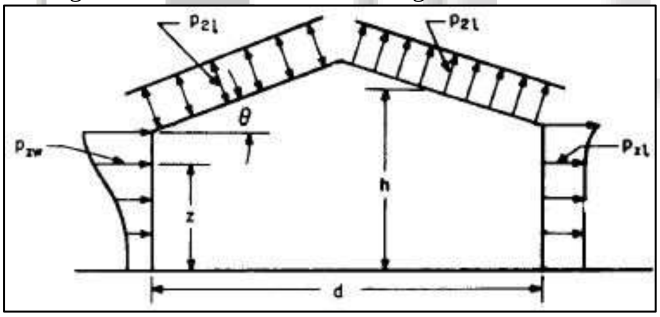
In this study we are presenting non-linear analysis of three different type of truss arrangement i.e. Flink, Howe and King post for long span open area of dimension 35m x 25m. In this study we will also discuss the variations occur due to different type of sections such as ISMB, Channel section and Angle section. For analysis purpose we will use staad.pro.

A. Truss Roof

Long span rooftops are commonly characterized as those that surpass 12 m in span. Long span rooftops can make adaptable, section free inside spaces and can lessen substructure expenses and development times. They are generally found in a wide scope of building types, for example, production lines, distribution centers, horticultural buildings, overhangs, huge shops, open lobbies, exercise rooms and fields.

B. Wind Load

Wind is air moving with respect to the outside of the earth. The essential driver of wind is followed to earth's pivot and contrasts in earthbound radiation. The radiation impacts are for the most part in charge of convection current either upwards or downwards. The wind by and large blows flat to the ground at high speeds. Since vertical parts of climatic movement are generally little, the term 'wind' means only the flat wind while 'vertical winds' are constantly distinguished all things considered. The wind paces are evaluated with the guide of anemometers or anemographs, which are introduced at meteorological observatories at statures for the most part shifting from 10 to 30 meters over the ground.



Wind pressure over the truss

C. Objectives behind the Study

The main objectives of this study are as follows:

1) To determine the most suitable type of truss arrangement for long span.
2) To determine the type of steel section most effective in resisting deformation.
3) To justify the utilization of analysis tool in steel sections analysis.

D. Scope & Need of the Study:

Long span structures are needed to resist lateral forces over the span length without vertical members at the mid spans, for such structures truss arrangement is more beneficial to distribute tension and compression of each members. Benefits of truss structures are as follows:

1) To provide lateral stiffness to the structure.
2) To minimize structure weight and support divisions.
3) Fast assembling and arrangement at the site.

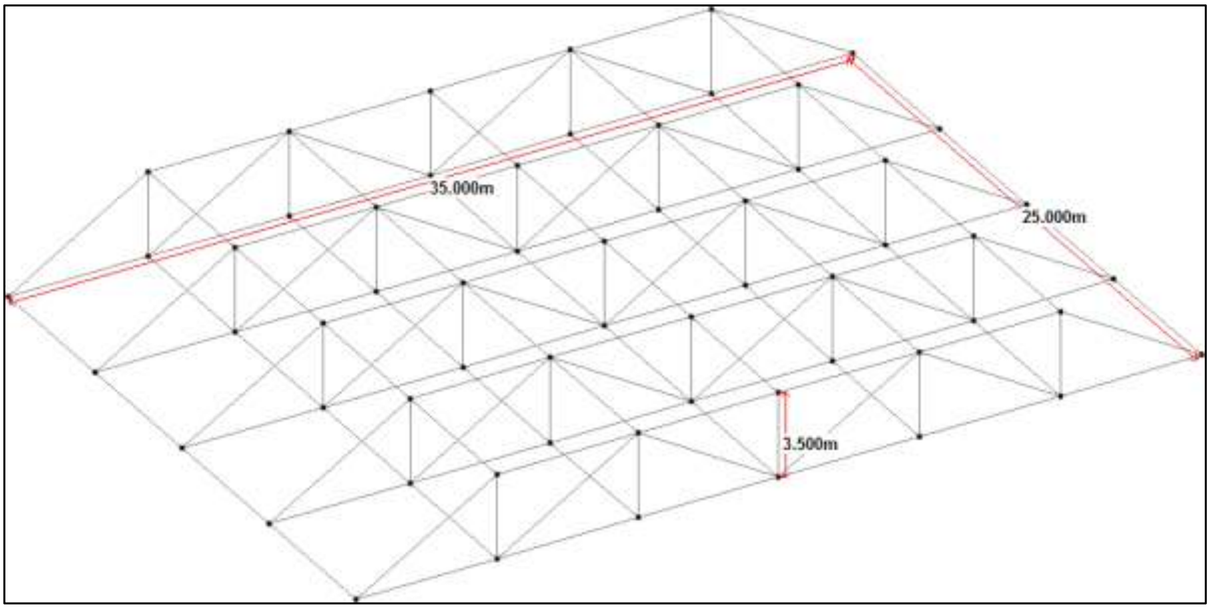
II. METHODOLOGY

The development in steel structures in long span structures has drive towards progressively exact and yet more innovative investigation strategy. In the present situation, due to the extensive variety of plans and structures, truss arrangement are very useful to provide stability and rigidity to the structure.

In this study three different truss arrangements are selected i.e. Howe Truss, King Post Truss and Flink Truss. Also three different sections are considered for each case i.e. Angel shape, channel shape and Beam shape sections.

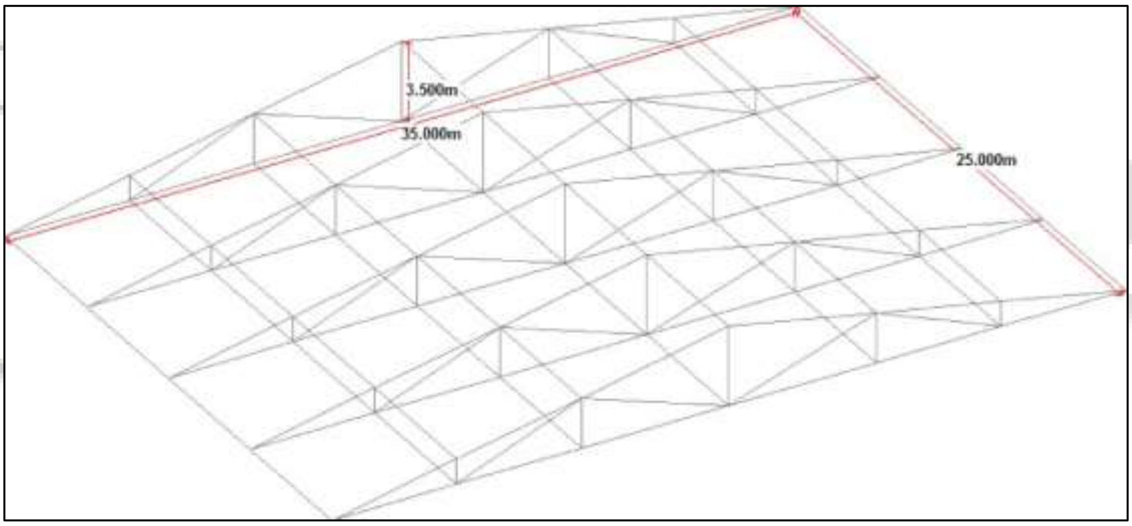
Cases assigned in present study are as follows:

A. Case I- Howe Truss:



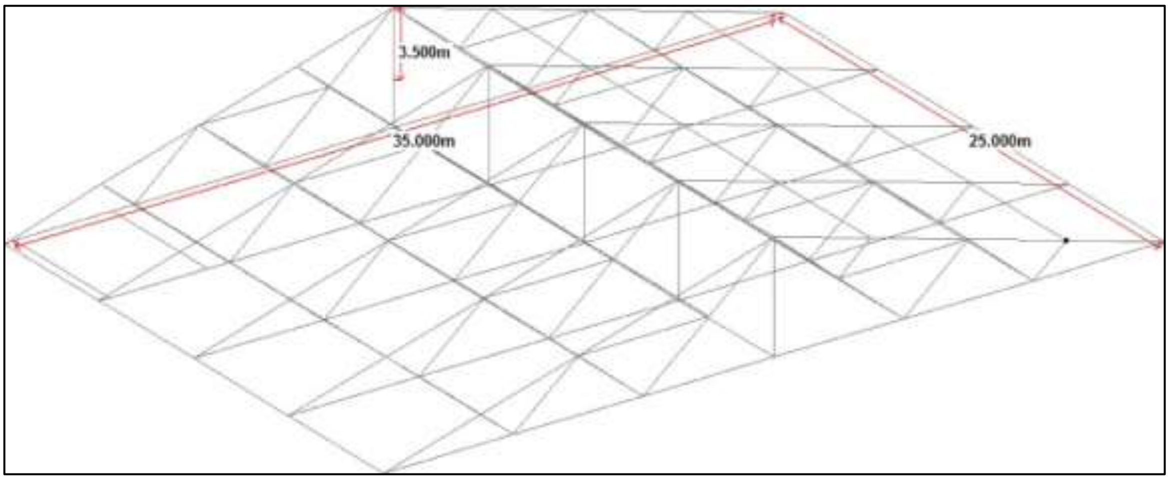
Howe truss

B. Case II- King Post Truss:



King post Truss

C. Case III- Flink Truss:

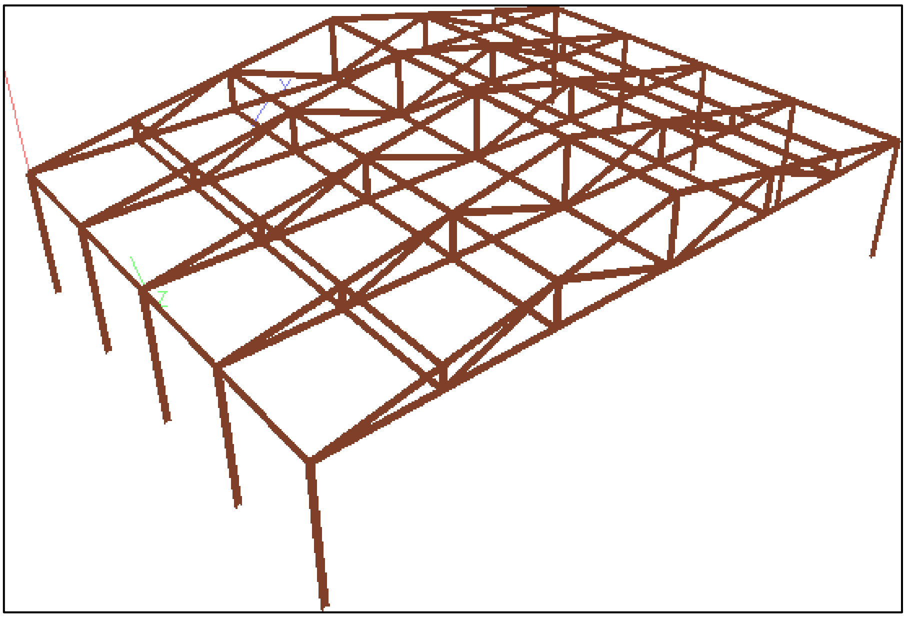


Flink Truss 3.2: Steps

Followed in this study are as follows:

Step-1: Modelling of the structure in Staad.pro

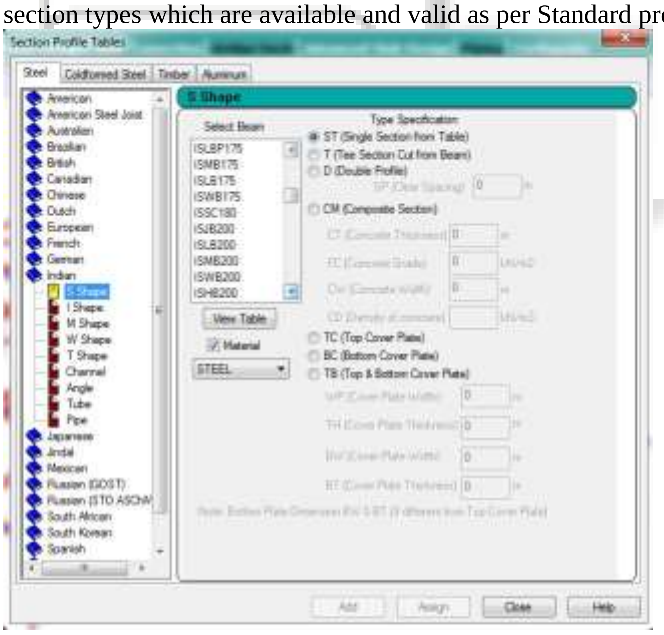
A Truss arrangement is a combination of structure joined in vertical, inclined and horizontal members working together to distribute compression and tension.



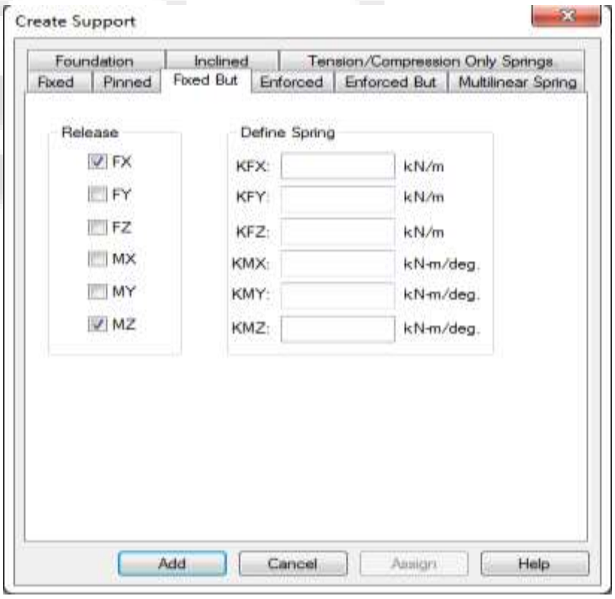
Modelling of truss in staad.pro

Step-2: Assigning Sectional properties and members as per Steel Table.

Staad.pro give us access to Indian steel tables as weel as other countries and companies tables. This helps us to provide suitable section types which are available and valid as per Standard provision.



Steel Table in staad.pro



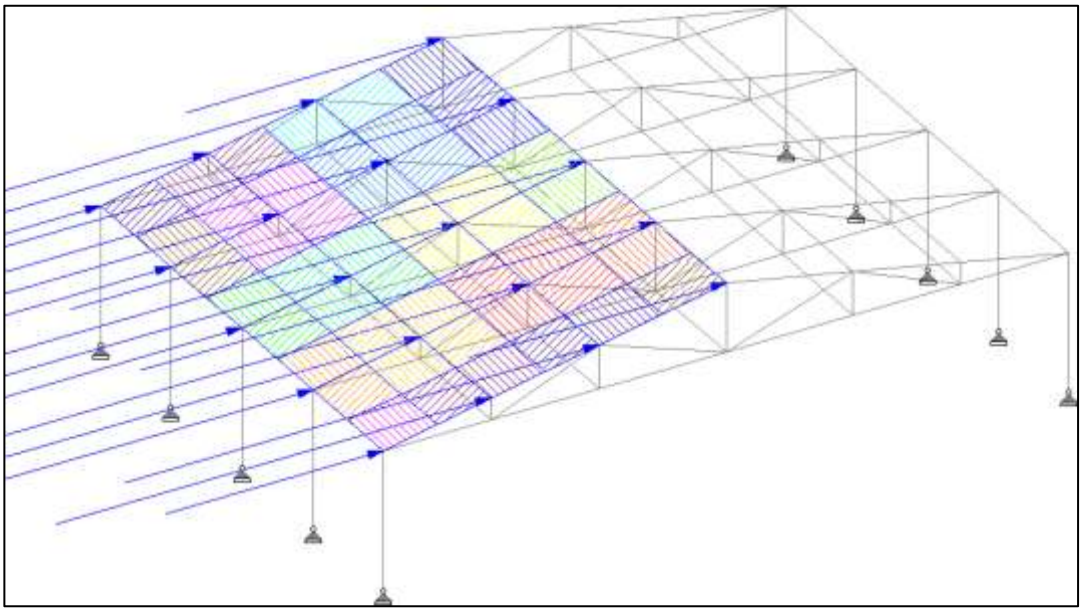
Fixed end condition

Step-3: Assigning Support Condition

Support conditions are assigned to retrain loads in direction, Supports are provided at the joints using node cursor, these supports are generally assigned at the join and end conditions of the members.

Step-4: Assigning load conditions:

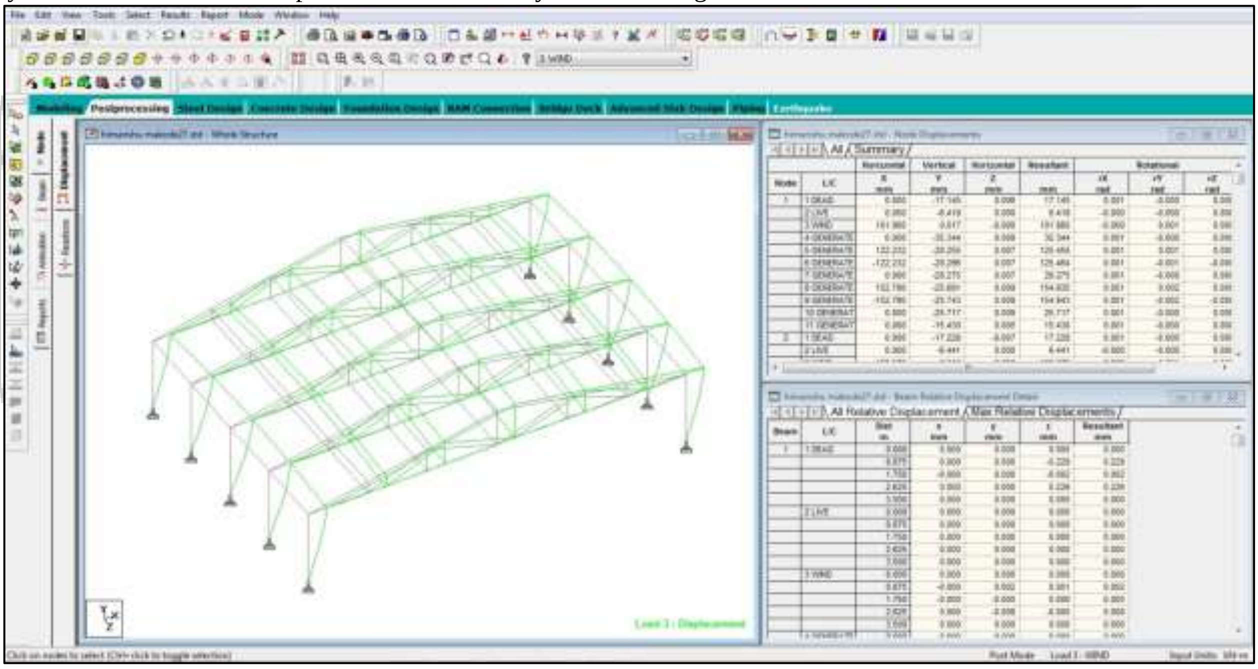
In this study we are considering Dead load of the structure, super dead load of the shed and other attached members, lateral load considered as per wind pressure in Bhopal region i.e. 39 m/s as per appendix A (I.S. 875-III).



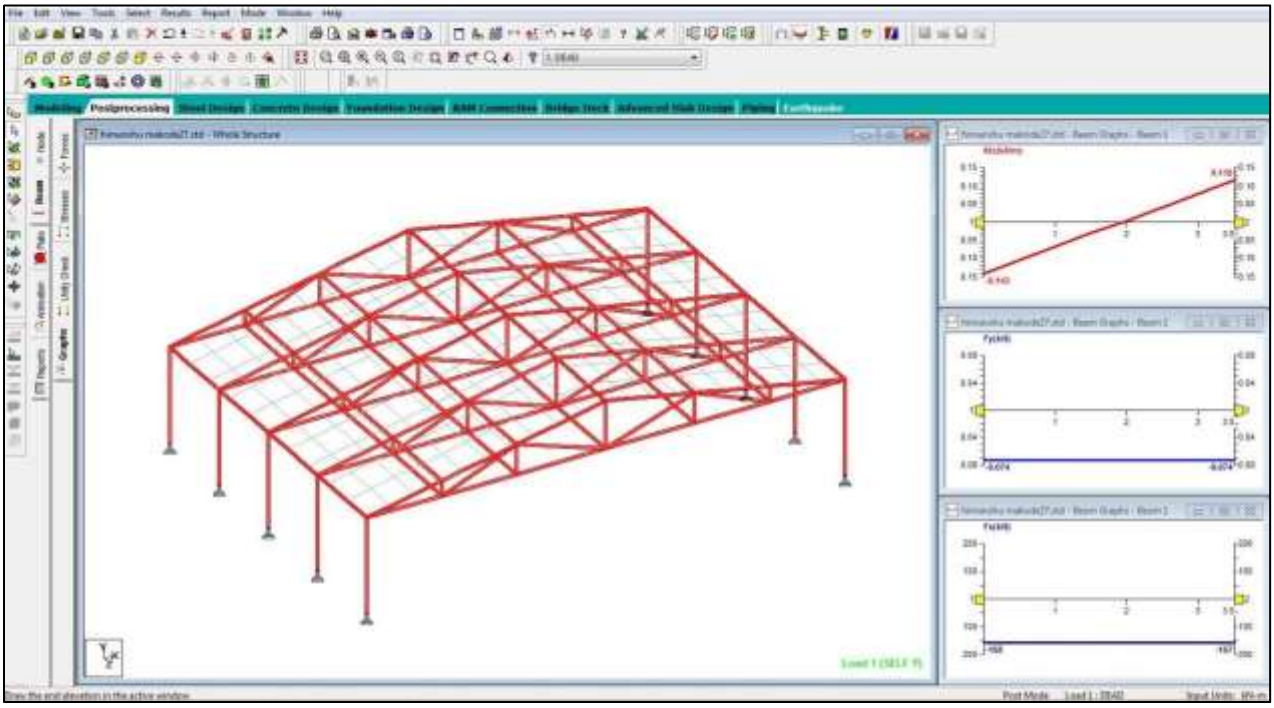
Lateral load

Step-5: Analysis of structure

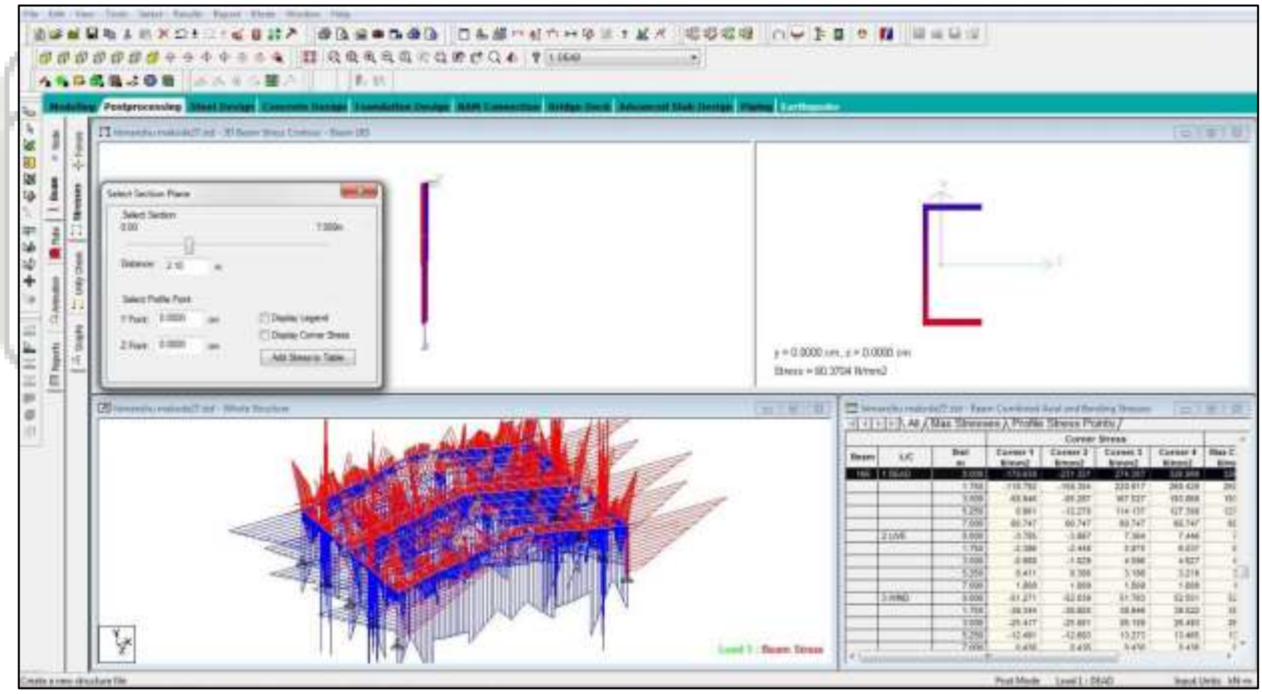
Analysis of structure is done as per finite element analysis considering lateral forces



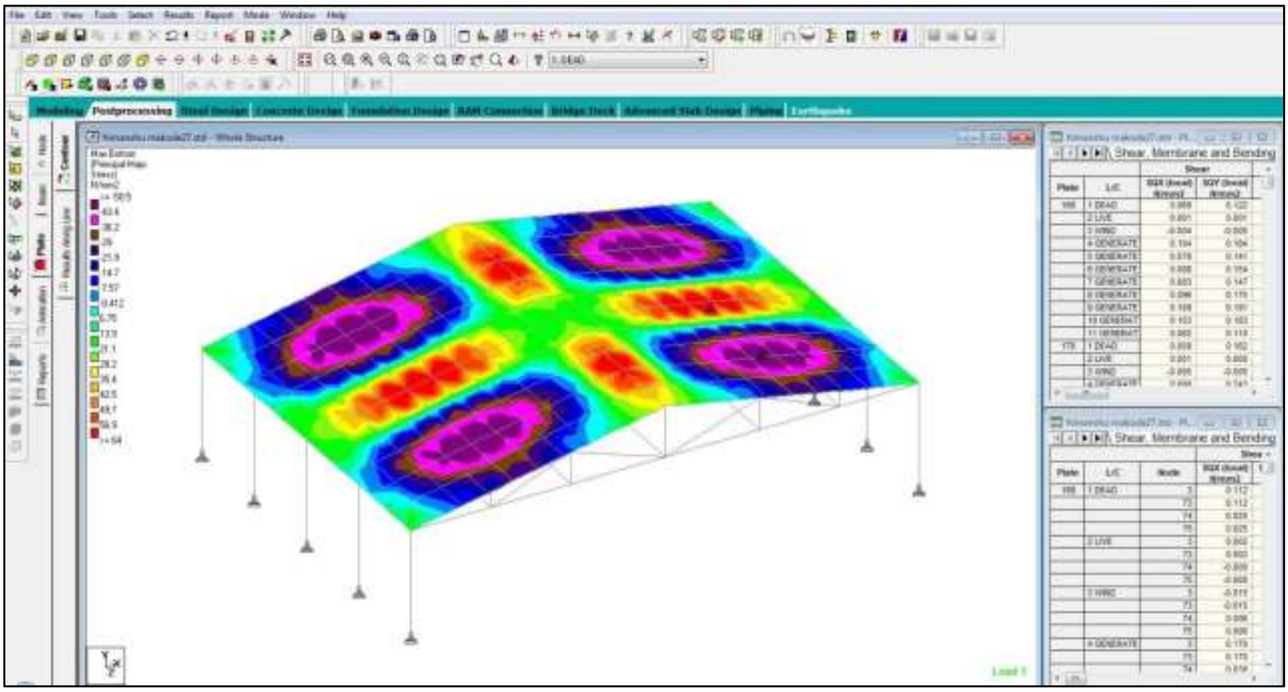
a. Lateral Load Analysis



b. Member stresses



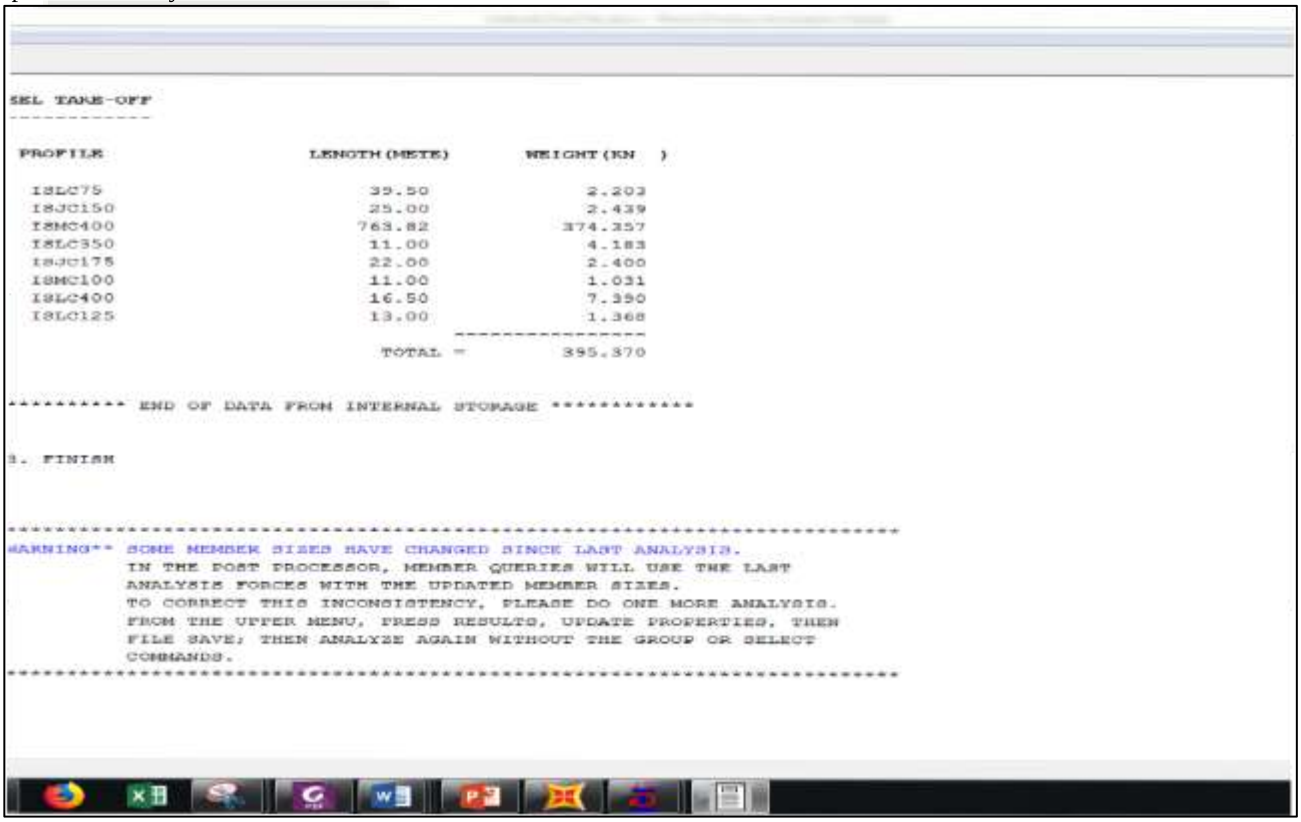
c. Sectional Stresses



d. Plate Anaysis

Analysis

Step-6: Cost Analysis



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SEL TAKE-OFF
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 PROFILE                   LENGTH(METE)       WEIGHT(KN  )

  ISLC75                        39.50              2.203
  ISJC150                       25.00              2.439
  ISMC400                      763.82            374.357
  ISLC350                       11.00              4.183
  ISJC175                       22.00              2.400
  ISMC100                       11.00              1.031
  ISLC400                       16.50              7.390
  ISLC125                       13.00              1.368
                                              ----------------
                               TOTAL =           395.370

********** END OF DATA FROM INTERNAL STORAGE ************

3. FINISH

**************************************************************************
WARNING** SOME MEMBER SIZES HAVE CHANGED SINCE LAST ANALYSIS.
          IN THE POST PROCESSOR, MEMBER QUERIES WILL USE THE LAST
          ANALYSIS FORCES WITH THE UPDATED MEMBER SIZES.
          TO CORRECT THIS INCONSISTENCY, PLEASE DO ONE MORE ANALYSIS.
          FROM THE UPPER MENU, PRESS RESULTS, UPDATE PROPERTIES, THEN
          FILE SAVE; THEN ANALYZE AGAIN WITHOUT THE GROUP OR SELECT
          COMMANDS.
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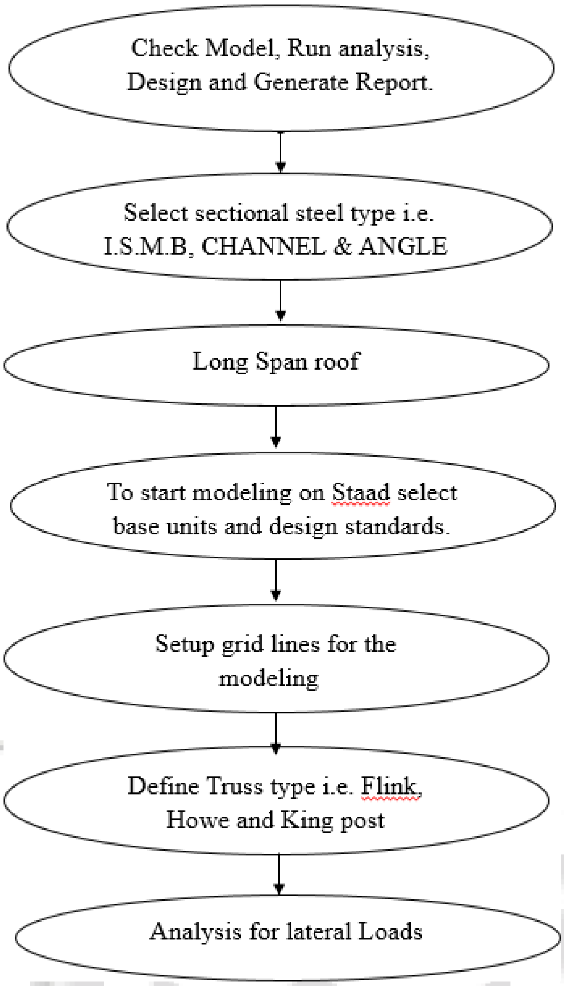
Cost Analysis

D. Flow Chart of the Study:



III. PROBLEM FORMULATION

A. Problem Statement

In present work with the end goal to do make Comparative investigation of different truss arrangements examination for lateral forces with different sections type, and structure with practical materials which are as per Indian steel table. In the present work cost investigation is additionally included to decide the most conservative truss structure.

Geometrical details

Design data of building	Dimension
Plan dimension	25 x 35 m
No. of bay in X direction	6 Bay
No. of bay in Y direction	4 Bay
Typical storey height	3.50 m
Sections	I.S.M.B, CHANNEL & ANGLE
Truss	Howe, Flink & King Post
Grade of steel	Fe-345

Loading conditions

Following loading is adopted for analysis: - a). Dead Loads: as per IS: 875 (part-1)-1987.

Live Loads: as per IS: 875 (part-2) 1987. Live Load on truss members = 4.50 KN

Wind Pressure: All frames are analyzed for (39 m/s) wind speed. The wind load calculation is as per IS: 875 (part-3)-2015.

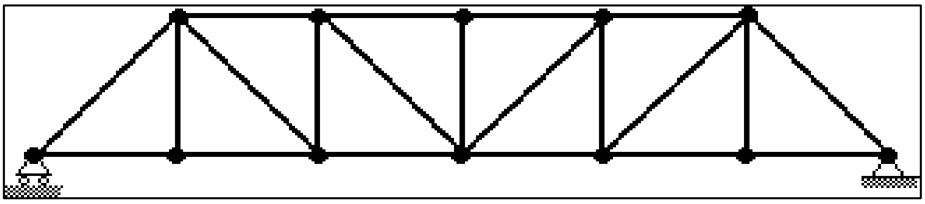
Load case no.	Load cases
1	D-L
2	L-L
3	Wx
4	Wz
5	Wx -ve
6	Wz -ve
7	1.5(D-L+L-L)
8	1.5(D-L+ Wx)
9	1.5(D-L- Wx)
10	1.5(D-L+ Wz)
11	1.5 (D.L- Wz)
12	1.2(D.L+L.L+ Wx)
13	1.2 (D.L+L.L- Wx)
14	1.2 (D.L+L.L+ Wz)
15	(D.L+L.L-Wz)

Load Combinations as per I.S. 875-III-2015

B. Type of Truss Arrangements:

1) Pratt Truss:

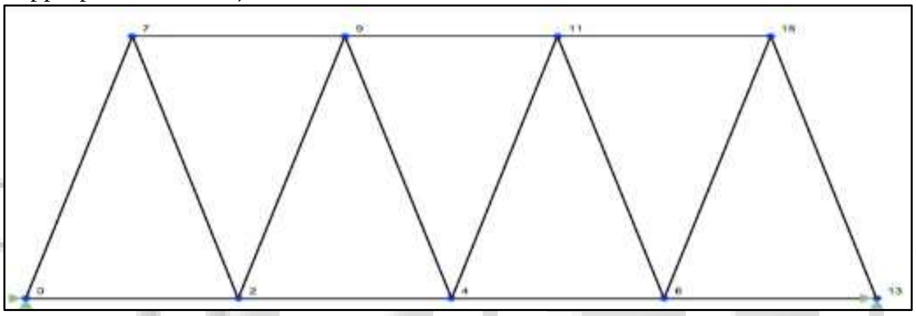
A Pratt Truss has been utilized in the course of recent hundreds of years as a powerful support technique. The vertical individuals are in pressure, while the corner to corner individuals are in strain. This disentangles and creates an increasingly effective plan since the steel in the inclining individuals (in pressure) can be diminished. This has a couple of impacts– it diminishes the expense of the structure because of progressively effective individuals, decreases oneself weight and facilitates the constructability of the structure. This kind of bracket is most proper for even ranges, where the power is overwhelmingly in the vertical course.



Pratt truss

2) *Warren Truss:*

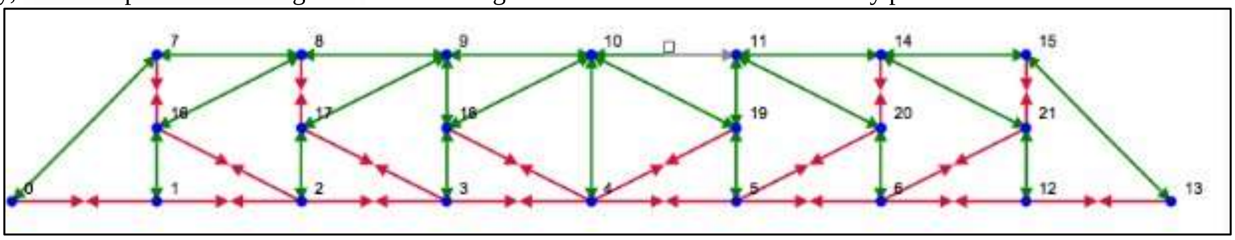
The Warren Truss is another well known support structure framework and is effectively recognized by its development from symmetrical triangles. One of the fundamental focal points of a Warren Truss is its capacity to spread the heap uniformly over various individuals; this is anyway by and large for situations when the structure is experiencing a traversed burden (an appropriated burden). Its fundamental bit of leeway is likewise the reason for its detriment – the bracket structure will experience concentrated power under a point load. Under these concentrated burden situations, the structure isn't as great at conveying the heap equally over its individuals. Consequently the Warren bracket type is progressively profitable for spread over burdens, yet not appropriate where the heap is gathered at a solitary point or hub.



Warren truss

3) *K-Truss*

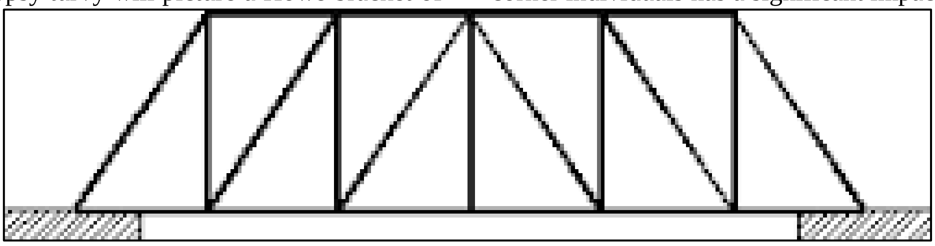
The K Truss is a somewhat progressively convoluted rendition of the Pratt Truss. Its fundamental distinction is that the vertical individuals have turned out to be abbreviated – improving its obstruction against clasping. It does, be that as it may, have comparable advantages and disadvantages to the Pratt Truss and despite the fact that it isn't generally utilized, it is a solid plan. One of its fundamental impediments is that the individuals don't generally carry on true to form. A part might be in pressure under one burden situation and in strain under another. This can mean the structure will most likely be unable to be ideally planned – since.



K-truss

4) *Howe Truss:*

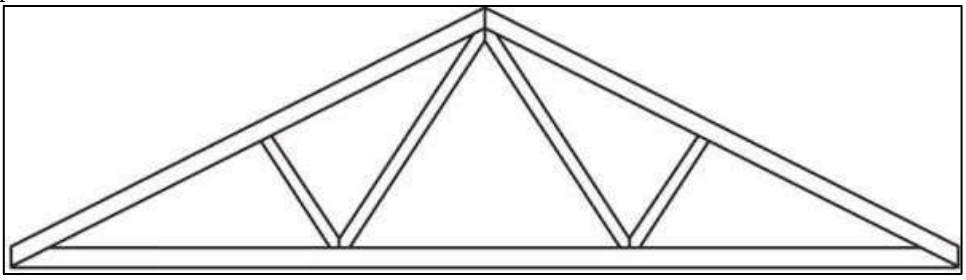
Howe supports are basically something contrary to Pratt brackets regarding geometry. Truth be told, taking a gander at a Pratt support topsy turvy will picture a Howe bracket of sorts. The whole structure is still generally the equivalent, yet the corner to corner props are presently involving the inverse or the vacant joints. This switch in situation of the corner to corner individuals has a significant impact basically.



Howe Truss

5) *Flink Truss:*

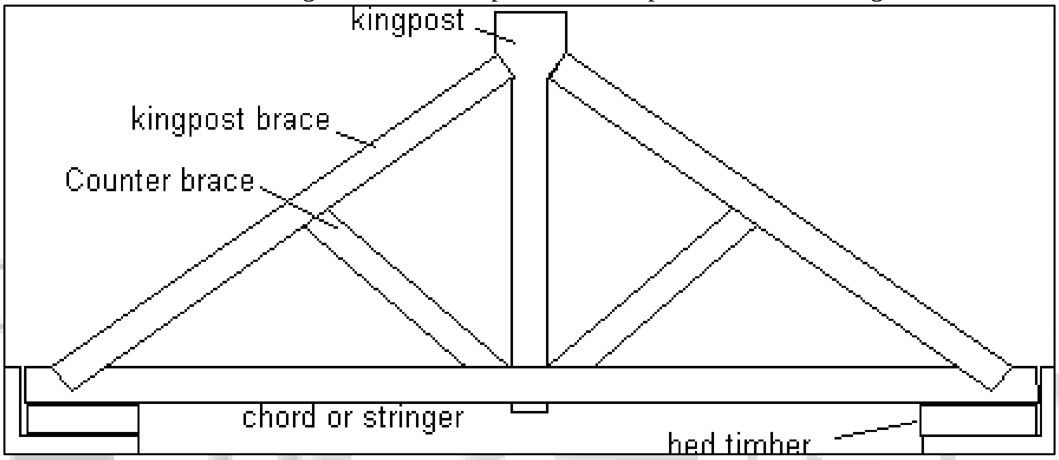
The Fink support in its most essential structure has web individuals that pursue a V-design which can be rehashed a few times. As the top harmonies are slanting descending from the inside, the V example turns out to be discernibly littler. As Fink brackets depend more on corner to corner individuals, they can be extremely productive at transmitting burdens to the help.



Flink Truss

6) King post Truss:

King post truss is utilized when there is a need to help the heaviness of an extensive rooftop. This rooftop gives practically, yet additionally includes excellence also. The ruler post truss is likewise utilized for straightforward rooftop lines and limited ability to focus. It is utilized in flying machine construction. In planes, the lord post bolsters the top links and supports the heaviness of the plane's wings. Trusses are components where its whole part takes either just pressure or strain part are not in bowing.



King post Truss

IV. Analysis & Results

A. Flink Truss:

1) Flink truss with angel section

Analysis of Flink Truss (Angel Section)						
Output Case	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-1.2407	3.921	8.7607	0.34	1.35	0.98
NODAL	-3601.175	1.3506	0.033	0.25	1.21	1.05
NODAL	-7.3106	-802.93	-1.54905	0.16	1.07	1.12
NODAL	133.13	-15.071	-9.561	0.07	0.93	0.32
NODAL	180.773	-5.1605	-339.059	-0.02	0.79	0.21
NODAL	680.661	1.8605	2.082	-0.11	0.65	0.1
NODAL	1090	-826.638	-0.011	-0.2	0.51	-0.01
NODAL	159.906	0.001067	1742.263	-0.29	0.37	-0.12
NODAL	-13957.37	7.6105	-34.765	-0.38	0.23	-0.23
NODAL	-1275.911	33.13	-279.003	0.47	0.09	-0.34
NODAL	-2.03E-05	3.162	0.001781	0.56	-0.05	-0.45
NODAL	910.178	-0.0001389	-5621.168	-0.65	-0.19	-0.56

Discussion:

As shown in table flink truss with angel section as members shows moderate stability and deflection which can be consider as a stable condition combition.

2) Flink truss with Channel section

Analysis of Flink Truss (Channel Section)						
Output Case	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-2.2407	1.921	5.2307	0.34	0.75	1.03
NODAL	1094	1.98	-3.497	0.25	0.89	0.96
NODAL	-7.3106	38.06	-5.07905	0.16	1.03	0.89
NODAL	0.01333	-13.071	-13.091	0.07	1.17	0.82
NODAL	10.773	-6.1605	-342.589	-0.02	1.31	0.75
NODAL	106.661	2.605	-1.448	1.3	0.55	0.68
NODAL	-0.184	-716.638	-3.541	2.66	0.12	0.61
NODAL	739.906	0.001067	1738.733	2.17	-0.31	0.54
NODAL	- 121.365	6.105	-38.295	1.68	-0.74	0.47
NODAL	-13.911	1.05	-282.533	1.19	-1.17	0.4
NODAL	-2.0305	15.162	-3.528219	0.7	-0.05	-0.45
NODAL	43.178	- 0.0001389	- 59624.698	0.21	-0.19	-0.56

Discussion:
It is observed that in table flink truss is analyzed assigning channel section which shows weak stability and undistributed forces at members.

3) Flink truss with Beam section

Analysis of Flink Truss (Beam Section)						
OutputCase	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	mm	mm	mm
NODAL	-5.7707	-16.601	1.7007	0.03	0.21	0.043
NODAL	1024.21	-9.6905	-7.027	0.1	-0.25	0.098
NODAL	-10.8406	-0.925	-8.60905	0.16	-0.71	0.153
NODAL	-3.51667	-720.168	-16.621	0.07	-1.17	0.208
NODAL	7.243	-3.528933	-346.119	0.135	1.32	0.263
NODAL	103.131	2.575	-4.978	0.153	1.25	0.318
NODAL	- 3.530184	-2.48	-7.071	0.171	1.18	0.373
NODAL	736.376	11.632	1735.203	0.189	1.11	0.428
NODAL	-124.895	- 3.5301389	-41.825	0.207	1.04	0.483
NODAL	- 1349.441	30.605	-286.063	1.19	0.97	0.538
NODAL	-3.53002	2003.162	-7.058219	0.7	0.9	0.593
NODAL	39.648	- 0.0001389	- 59628.228	0.21	0.83	0.648

Discussion:
As shown in table flink truss arrangement with beam section is resulting as a most stable and resisting structure, since moment and forces are less can be consider suitable.

B. Howe Truss

1) Howe truss with Angel section

Analysis of Howe Truss (Angel Section)						
OutputCase	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-7.6207	-18.451	-0.1493	0.56	2.56	0.57
NODAL	1022.36	-11.5405	-8.877	0.6	2.32	0.89
NODAL	-12.6906	-2.775	-10.45905	0.64	2.08	1.21
NODAL	-5.36667	-722.018	-18.471	0.68	1.84	1.53
NODAL	5.393	-5.378933	-347.969	0.72	1.6	-0.29
NODAL	1082	0.725	-6.828	0.76	1.36	-0.45
NODAL	-5.3801837	-4.33	-8.921	0.8	1.12	-0.61
NODAL	734.526	9.782	1733.353	0.84	0.88	-0.77
NODAL	-126.745	- 5.3801389	-43.675	0.88	0.64	-0.93
NODAL	-1351.291	23.13	-287.913	1.2	0.4	-1.09
NODAL	- 5.38002033	30.35	-8.908219	-1.41	0.16	-1.25
NODAL	37.798	- 1.8501389	- 59630.078	-1.58	-0.045	-1.41

Discussion:
As shown in table analysis of howe truss arrangement with angel section results in stable structure observing less unbalanced forces at the joints.

2) Howe truss with Channel section

Analysis of Howe Truss (Channel Section)						
OutputCase	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-4.8407	-15.671	2.6307	0.29	1.34	0.24
NODAL	1088	-8.7605	-6.097	0.12	1.21	0.15
NODAL	-9.9106	0.005	-7.67905	-0.05	1.08	0.55
NODAL	-2.58667	-719.238	-15.691	-0.22	0.95	0.13
NODAL	8.173	-2.598933	-345.189	-0.39	0.82	-0.29
NODAL	104.061	3.505	-4.048	-0.56	0.69	-0.71
NODAL	-2.6001837	-1.55	-6.141	-0.73	0.56	-1.13
NODAL	737.306	12.562	1736.133	-0.9	0.43	-1.55
NODAL	-123.965	- 2.6001389	-40.895	-1.07	0.3	-1.97
NODAL	-1348.511	32.5	-285.133	-1.24	0.17	-2.39
NODAL	- 2.60002033	2004.092	-6.128219	-1.41	0.04	-2.81
NODAL	40.578	0.9298611	- 59627.298	-1.58	-0.09	-3.23

Discussion:
As shown in table Channel section in howe truss arrangement is resulting as weak section as it is resulting more forces which is causing un-stability of the structure.

3) Howe truss with Beam section

Analysis of Howe Truss (Beam Section)						
OutputCase	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-7.1507	-17.981	-0.3207	0.021	0.19	0.021
NODAL	1018	-11.0705	8.407	0.09	0.24	-0.24
NODAL	-12.2206	-2.305	9.98905	0.159	0.29	-0.501
NODAL	-4.89667	-721.548	18.001	0.228	0.34	-0.762
NODAL	5.863	-4.908933	347.499	0.297	0.39	0.14
NODAL	101.751	1.195	6.358	0.366	0.44	0.05
NODAL	-4.9101837	-3.86	8.451	0.435	0.49	-0.04
NODAL	734.996	10.252	-1733.823	0.504	0.54	-0.13
NODAL	-126.275	- 4.9101389	43.205	0.573	0.59	-0.22
NODAL	-1350.821	19.85	287.443	0.642	0.64	-0.31
NODAL	- 4.91002033	20.05	8.438219	0.711	0.69	-0.4
NODAL	38.268	- 1.3801389	59629.608	0.78	0.74	-0.49

Discussion:
As shown in table Analysis of howe truss with beam section results in suitable structure resulting in stable and resisting structure observing less forces and deflection.

C. King Post Truss:

1) King post truss with Angel section

Analysis of King post Truss (Angel Section)						
OutputCase	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-1.2407	3.921	8.7607	0.051	0.12	1.23
NODAL	-3601.175	1.3506	0.033	0.42	0.32	0.67
NODAL	-7.3106	-802.93	-1.54905	0.789	0.52	0.89
NODAL	133.13	-15.071	-9.561	1.158	0.72	0.98
NODAL	180.773	-5.1605	-339.059	1.527	0.92	1.07
NODAL	680.661	1.8605	2.082	-0.552	-0.71	1.16
NODAL	1087	-826.638	-0.011	0.23	-0.79	1.25
NODAL	159.906	0.001067	1742.263	0.12	-0.87	1.34
NODAL	-13957.365	7.6105	-34.765	0.01	-0.95	1.43
NODAL	-1275.911	28.13	-279.003	-0.1	-1.03	1.52
NODAL	- 0.00002033	3.162	0.001781	-0.21	0.69	1.61
NODAL	910.178	- 0.0001389	- 59621.168	-0.32	0.71	1.7

Discussion:
As shown in table analysis of King post truss arrangement with angel section results in stable structure observing less unbalanced forces at the joints.

2) King post truss with Channel section

Analysis of King post Truss (Channel Section)						
OutputCase	Global FX	Global FY	Global FZ	Deflection X	Deflection Y	Deflection Z
Unit	KN	KN	KN	Mm	mm	mm
NODAL	-1.2427	3.884	7.496	0.057	0.45	0.45
NODAL	-3611.121	1.2967	0.029	0.42	0.21	0.67
NODAL	-8.111	-898.21	-1.59547	0.783	-0.03	0.89
NODAL	132.49	-16.451	-10.979	1.146	-0.27	1.11
NODAL	178.243	-7.3124	-340.01	0.297	-0.51	0.14
NODAL	675.745	1.671	1.921	-0.552	-0.75	-0.83
NODAL	1090	-819.398	-0.069	-1.401	-0.99	-1.8
NODAL	154.74	0.001045	1741.263	0.504	0.54	-0.13
NODAL	- 13967.757	6.156	-35.452	0.409	0.59	-0.2
NODAL	-1281.633	35.69	-287.55	0.314	0.44	-0.11
NODAL	- 0.0000214	2.789	0.001756	0.219	0.69	-0.24
NODAL	901.545	- 0.0001411	- 60121.168	0.124	0.71	-0.41

Discussion:
As shown in table Channel section in King post truss arrangement is resulting as weak section as it is resulting more forces which is causing un-stability of the structure.

3) King post truss with Beam section

Analysis of King Post Truss (Beam Section)						
OutputCase	Global FX	Global FY	Global FZ	Global MX	Global MY	Global MZ
Unit	KN	KN	KN	KN	KN-m	KN-m
NODAL	-3.8127	1.314	4.926	-2.513	-2.12	-2.12
NODAL	-3613.691	-1.2733	-2.541	-2.15	-2.36	2690.59
NODAL	-10.681	-900.78	-4.16547	-1.787	-2.6	-1.68
NODAL	129.92	-19.021	-13.549	-1.424	-2.84	-1.46
NODAL	175.673	-9.8824	-342.58	-2.273	-3.08	-2.43
NODAL	673.175	-0.899	-0.649	-3.122	-3.32	-3.4
NODAL	1020	-821.968	-2.639	-3.971	-3.56	-4.37
NODAL	152.17	-2.568955	1738.693	-2.066	-2.03	-2.7
NODAL	- 13970.327	3.586	-38.022	-2.161	-1.98	-2.77
NODAL	-1284.203	30.65	-290.12	-2.256	-2.13	-2.68
NODAL	- 2.5700214	0.219	-2.568244	-2.351	-1.88	-2.81
NODAL	898.975	- 2.5701411	- 60123.738	-2.446	-1.86	-2.98

Discussion:
As shown in table Analysis of King post truss with beam section results in suitable structure resulting in stable and resisting structure observing less forces and deflection

D. Comparative Analysis

1) Angel Section

a) Shear Force KN

Shear Force

Shear Force in Angel Section (kN)		
Flink Type	King Post	Howe Type
33.13	28.13	23.13

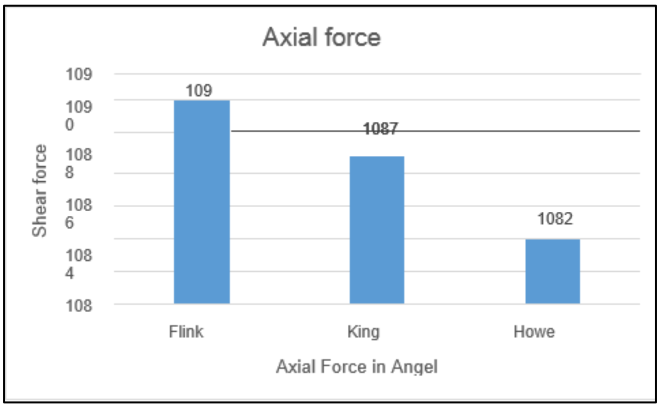
Comparison of Shear Force (KN) for Different trusses with Angel Section

Discussion:
As shown in Figure unbalance forces are maximum in Flink type truss arrangement in Angel section case, whereas minimum in Howe type truss arrangement.

b) Axial Force (KN)

Axial Force

Axial Force in Angel Section (kN)		
Flink Type	King Post	Howe Type
1090	1087	1082



Comparison of Axial Force (KN) for Different trusses with Angel Section

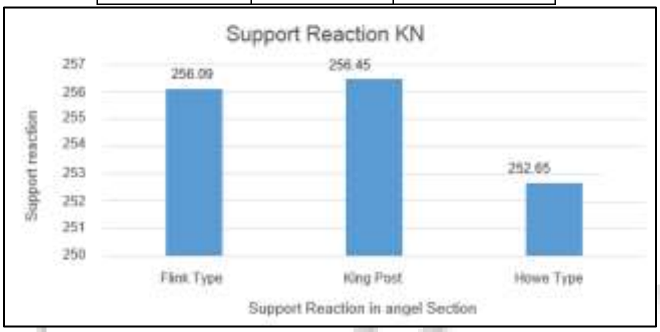
Discussion:

As Shown in figure Vertical Forces are observed in Flink Type truss whereas minimum and linear distribution is observed in howe type truss.

c) Support Reaction

Support Reaction (KN)

Support Reaction in Angel Section (kN)		
Flink Type	King Post	Howe Type
256.09	256.45	252.65



Comparison of Support reaction (KN) for Different trusses with Angel Section

Discussion:

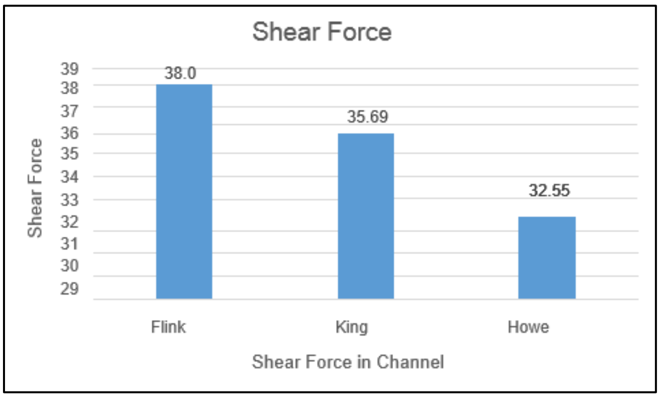
As shown in Figure Support reactions in angel section structure at the base of the structure is maximum in king post type of truss due to its geometrical arrangement whereas minimum in Howe type truss which results in stability and distribution of the load.

2) Channel Section:

a) Shear Force

Shear Force (KN)

Channel Section in Shear Force kN		
Flink Type	King Post	Howe Type
38.06	35.69	32.55



Comparison of Shear Force (KN) for Different trusses with Channel Section

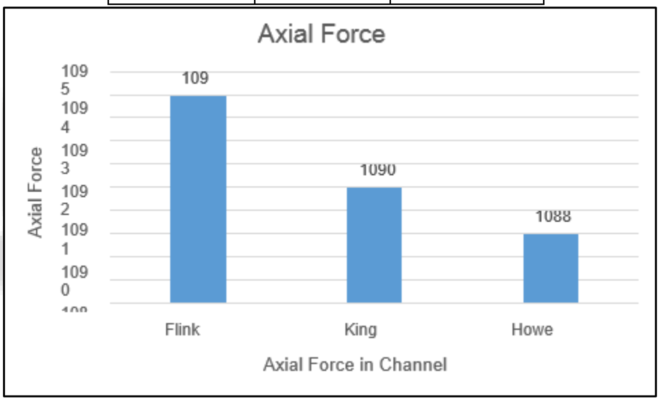
Discussion:

As shown in Figure unbalance forces are maximum in Flink type truss arrangement in Channel section case, whereas minimum in Howe type truss arrangement.

b) Axial Force (KN)

Axial Force (KN)

Axial Force in Channel Section (KN)		
Flink Type	King Post	Howe Type
1094	1090	1088



Comparison of Axial Force (KN) for Different trusses with Channel Section

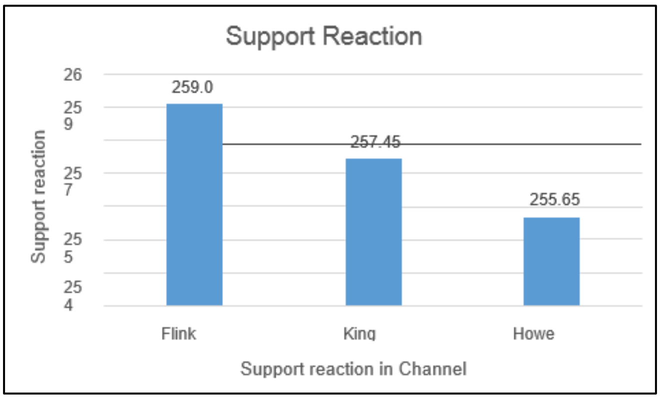
Discussion:

As Shown in figure Vertical Forces are observed in Flink Type truss whereas minimum and linear distribution is observed in howe type truss.

c) Support Reaction (KN)

Support reaction (KN)

Support Reaction in Channel Section (KN)		
Flink Type	King Post	Howe Type
259.09	257.45	255.65



Comparison of Support Reaction (KN) for Different trusses with Channel Section

Discussion:

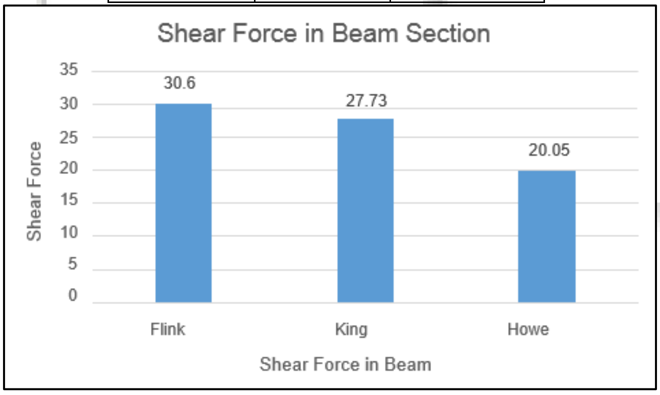
As shown in Figure Support reactions in Channel section structure at the base of the structure is maximum in Flink post type of truss due to its geometrical arrangement whereas minimum in Howe type truss which results in stability and distribution of the load.

3) Beam Section:

a) Shear force (KN)

Shear Force (KN)

Shear Force in Beam Section (KN)		
Flink Type	King Post	Howe Type
30.65	27.73	20.05



Comparison of Shear Force (KN) for Different trusses with Beam Section

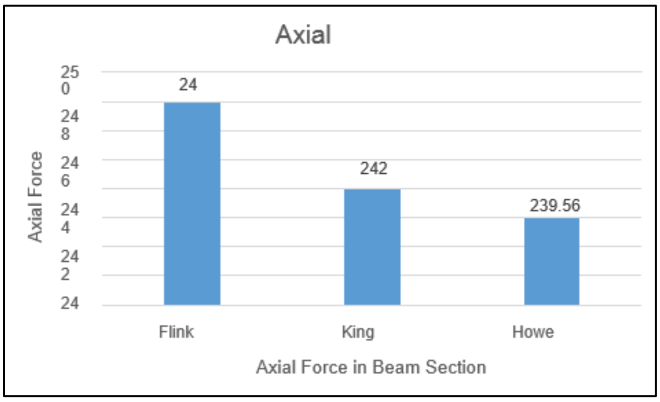
Discussion:

As shown in Figure unbalance forces are maximum in Flink type truss arrangement in Beam section case, whereas minimum in Howe type truss arrangement.

b) Axial Force (KN)

Axial Force (KN)

Axial Force in Beam Section (KN)		
Flink Type	King Post	Howe Type
1024	1020	1018



Comparison of Axial Force (KN) for Different trusses with Beam Section.

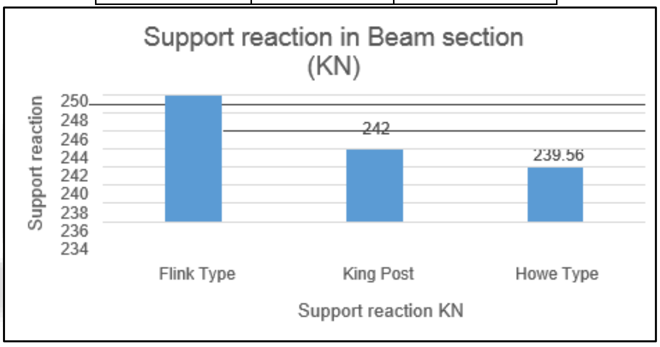
Discussion:

As Shown in figure 5.8 Vertical Forces are observed in Flink Type truss whereas minimum and linear distribution is observed in howe type truss.

c) Support Reaction

Support Reaction (KN)

Support Reaction in Beam Section (KN)		
Flink Type	King Post	Howe Type
248	242	239.56



Comparison of Support Reaction (KN) for Different trusses with Beam Section.

Discussion:

As shown in Figure 5.9, Support reactions in Beam section structure at the base of the structure is maximum in Flink post type of truss due to its geometrical arrangement whereas minimum in Howe type truss which results in stability and distribution of the load.

d) Cost Analysis

Cost Analysis

Cost Analysis				
Section	Truss	Qty KN	Rate/KN	Total Cost
Angel Section	Flink Truss	438.97	470	206316
	King Post Truss	439.21	470	206429
	Howe Truss	411.45	470	193382
Channel Section	Flink Truss	464.85	470	218480
	King Post Truss	437.2	470	205484
	Howe Truss	423.55	470	199069

Beam Section	Flink Truss	461.99	470	217135
	King Post Truss	428.68	470	201480
	Howe Truss	395.37	470	185824

Discussion:
As shown in Table it has been observed that in terms of cost analysis howe type truss arrangement with beam section can be consider as the most economical.

V. Conclusions & Future Scope

A. *Conclusions*

Following Conclusions are made as per the results observed in above chapter are:

1) It has been observed that stability in terms of resisting axial force and shear force is comparatively 18.5% more in Howe type truss arrangement in comparison to other two types.
2) As observed in above chapter Beam section is best suitable for truss arrangement than angel and channel section.
3) It is observed that howe type truss arrangement with beam section is comparatively more economical by 14.95% than others. Whereas Flink type truss with channel section is observed as most costly.
4) In this study it is observed that deflection is 4.8% less in beam section than other two.

B. *Summary:*

In this study, it is concluded that in truss arrangement howe type truss is comparatively best suitable whereas in terms of sections beam section is more resistible and economical.

C. *Future Scope*

1) In the present study Long span truss arrangement is considered whereas in future long span truss with unsymmetrical divisions can be consider.
2) The effect of seismic analysis can be include in future as in this study wind pressure is considered.
3) In this study cost analysis is done as per S.O.R whereas in future it can include the cost of construction, material and maintenance too.

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