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LATREAL LOAD BEHAVIOR OF LIGHT GAUGE STEEL SECTION ENCHASED WITH LIGHT WEIGHT CONCRETE FRAME

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ABSTRACT

This project is aimed to reduce the conventional properties by including palm kernel shell, light gauge steel sections. Cold-formed steel has been widely used in modern day construction industry. The property of the cold-formed steel makes it economic and feasible. Cold-Formed Steel Column has provided its usefulness in the structural applications of the constructions like individual structural framing members and panel decks. The advantage of cold rolled steel is that it can be utilized for the production of elements with required shape to length of required dimensions. High strength to weight proportion is accomplished in cool rolled items. In my study, analysis of composite frame 2 storey, single bay. Ansys software is used for modelling and analysis of composite frame. The analysis and result in terms of stress, strain and displacement with respect of time and ductility.

Keywords: palm kernel shell, I section.

INTRODUCTION

In the present imaginative and inquire about arranged advancement of development materials, the most extreme need is given towards safeguarding characteristic assets to accomplish supportability. The utilization of lightweight development substantial is gainful towards create lightweight cement (LWC); these are available to prompt a composite material that are able to utilized in a few basic operations upon specialized along with monetary focal points contrasted with ordinary heavy concrete. Advancement of LWC utilizing waste materials got prompted significant upgrades in the solid execution, condition, development cost along working conditions [1]. With plan to lessen measure of waste arranged to the earth and furthermore decline measure of common assets from being collected to be utilized in solid creation, analysts endeavour to investigate the capability of these palm oil industry products to be utilized in concrete industry. Thus, the two decay materials were observed to can possibly be utilized as a blending fixing in cement. The revelation of Palm oil fuel ash gives has a potential strengthening to their cementitious materials [2] Although palm oil clinker concrete (POCC) has a low-set modulus of elasticity, avoidance of single reinforcement POCC bars, along less reinforcement ratio covered by 0.524 under the structure administration load fulfilled BS 8110 [3]. The fundamental goal of utilizing LWC as a part of the structures situated in seismic zones is to decrease seismic conduct of those constructed structures. Be that as it may, because of the short coming and weakness of lightweight total there are a few imperfections in mechanical properties of solidified lightweight total cement. In any case, if lightweight totals are brought into a solid blend, they are the weakest parts, which surprisingly influence the flexible and mechanical properties of LWC. Due to decrease in sizes of the members stresses developed were enhanced and can withstand the forces coming on the structure. [4] The benefits of cold-framed steel individuals contrasted and materials, for example, timber and cement were given below. Light weight, High stiffness and strength, Ease fabrication, Easy to introduce and erect, Economical in Transportation. In the development the upsides of cold-shaped steel members contrasted and materials, for example, timber and cement were given beneath. Light weight, High stiffness and strength, Ease fabrication, Easy to install and erect, Economical in Transportation. In the construction [5] the composite activity of concrete filled steel segments gives a critical increment in stiffness, strength, along the ductility with respect to concrete - only or steel - only sections. Solid center gives axial stiffness, compression strength, and improves the buckling capacity of the encasing steel. Encasing steel gives containment to the concrete along in this manner expands the axial strength and ductility. Typically, these frameworks comprise of thick steel segments where nearby local buckling are anything but a controlling act criteria. [6] Light gauge steel sheets or strips act normally delivered aside cold rolling, along a few based on their experience consequent tempering procedure. Cold-rolled carbon steel sheets having round-house type nonlinear pressure strain conduct in the time pressure strain bend for iced decreased toughened steel sheets shows yield point among yield plateau. In spite of the fact that various stress strain models have come about because of these examinations, the vast majority (Gardner and Nethercot 2004; Macdonald *et al.*, 2000; Mirambell along with the Real 2000; Olsson 2001) are fit for expectations or for a restricted strain extend either under the necessity of numerous extra info specifications whichever commonly indicated with it extant plan codes. [7].

The frame has under gone both analytical and experimental investigation through ansys analytical investigation has been done. In experimental investigation the steel frame is encased with light weight concrete and through lateral load method (static). The experimental investigation has been done.

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ANALYTICAL STUDY

Material properties and concrete composition modelling of structure

- Height of structure =1.2m
- Number of storeys=2
- Number of bays=1
- Height of each of storey=0.6m
- Width of each of storey=1.2m

Dimensions of beam

- Length of the of beam=1.2m
- Width of beam=120mm
- Depth of beam=120mm.

Dimensions of column

- Height of column=1.2m
- Width of column=120mm
- Thickness of column=120mm

Properties

- Modulus of elasticity of concrete=$3.16*10^4$ N/mm^2
- Moudulus of elasticity of steel=$2*10^5$ N/mm^2
- Poisson ratio concrete=0.2
- Poisson ratio steel=0.3
- Yield strength of steel=210N/mm^2
- Compressive strength of concrete=44KN/m^2

Assembly of structure

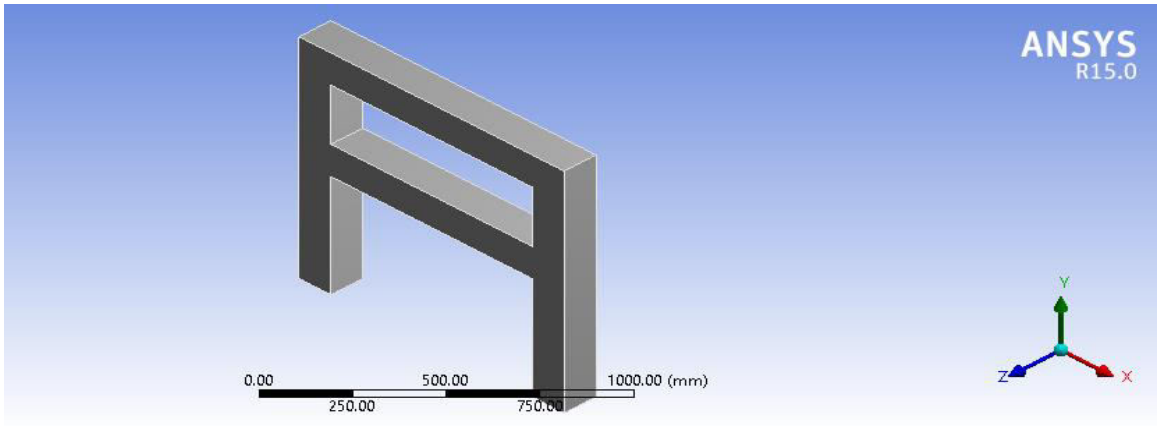

Figure-1. Assembling of beams and columns.

MESHING OF STRUCTURE

Type of meshing

Geometry based the mesh is related to the geometry. In the event that the geometry is modified, the work likewise changed (automatically). The boundary conditions could be connected on the geometry like a surface or edge and so on. Finite component based the work is non acquainted. The boundary conditions are connected on the components such as elements and nodes only.

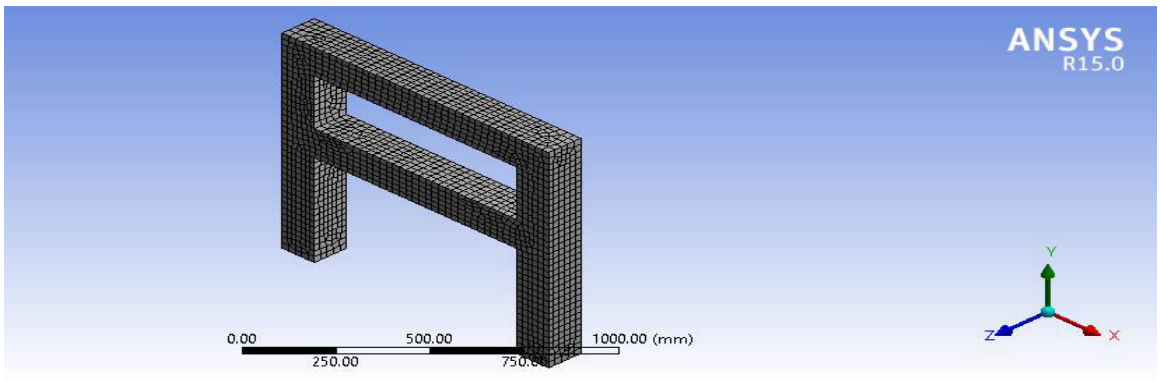

Figure-2. Meshing of Frame.

Load applied

Lateral load applied on x-direction this load was applied to the columns separately and the results were captured. It was done to observe the displacement, stress, strain in a frame.

The properties for concrete & steel of frame analysis have to specify in the software. For this type software requires modulus of elasticity & Poisson ration for analysis which is given above.

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TOTAL DEFORMATION

Absolute deformation is vector aggregate all directional displacement of the framework deformation results generally can be in ansys work as all out distortion or directional disfigurement both them are utilized to obtain displacement from stress the thing that matters is the directional deformation calculation for the X, Y, Z planes for a given framework in all total deformation.

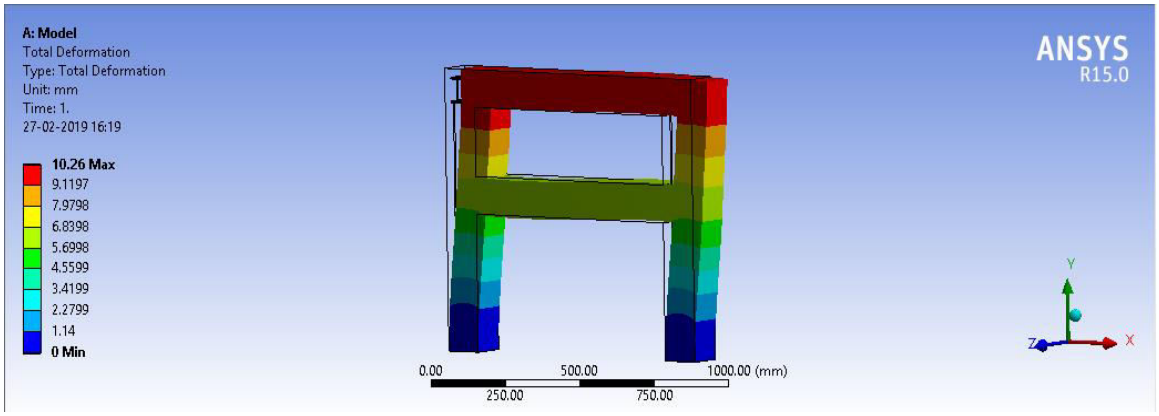

Figure-3. Total Deformation of Frame.

EQUIVALENT STRESSES

Equivalent stresses is frequently utilized in configuration work since it permits any arbitrary three dimensional pressure state to be presented as a individual positive pressure value. Equivalent stress is the piece of the greatest identical anxieties stresses failure theory used to anticipate yielding in ductile material. For this situation a material is set to begin yielding von mises stresses achieves an value know as yield quality. The von mises pressure is ultizied to foresee yielding of materials under complex loading from the consequence of uniaxaial tests the von mises fulfills the property where two anxieties state with distortion vitality have an equivalent von mises stresses. It is relevant for the investigation of plastic distortion for ductile materials, for example, metals as beginning of yield for these materials does not rely upon hydrostatic segment of the stress tensor.

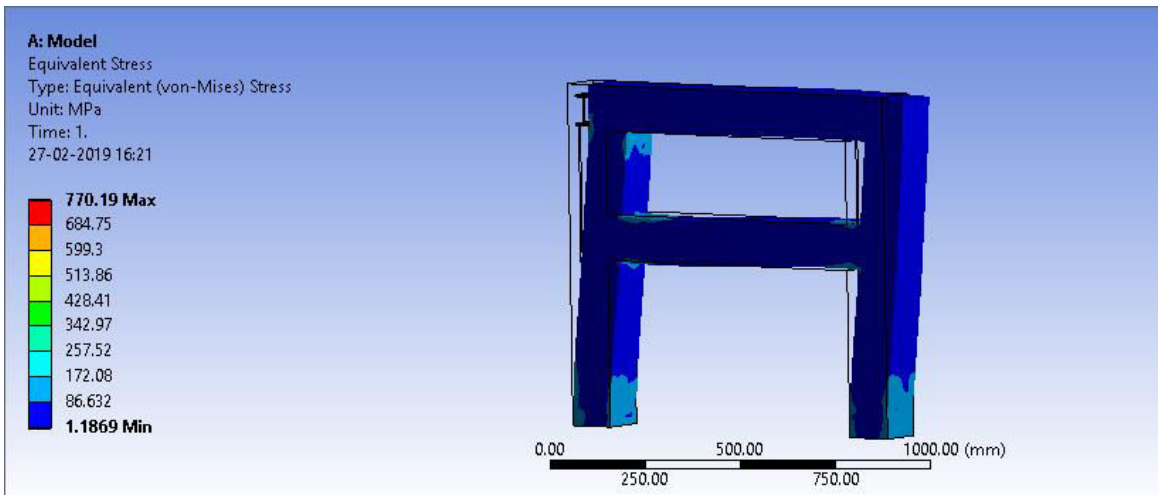

Figure-4. Equivalent Stress of Frame.

MAXIMUM PRINCIPLE STRAIN

The theoretical procedure states that the failure happens when the greatest shear strain vitality segment for complex condition of pressure framework is equivalent that at the yield point in the tensile test yielding in part exposed to complex compound stress framework starts when most extreme principal strain of the framework ends up equivalent to the strain comparing to yield point under tension test of a similar material.

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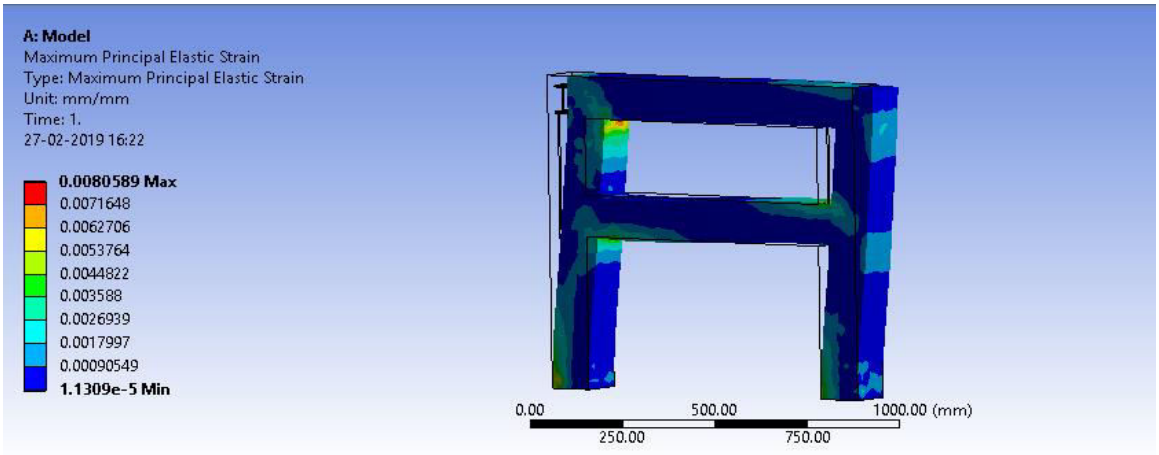

Figure-5. Maximum Principle Strain of Frame.

RESULT AND DISCUSSIONS

General

The two dimensional frame model is analyzed and the deformation results are observed from lateral static load applied in X-Direction the analytical investigation carried out on the A-type frame of single bay, two storey reinforced concrete frame, with I-section encased with concrete and also to study the behaviour of the frame is presented. The various parameters like load Vs deformation, stress and strain intensity were considered for study of the behaviour of the frame.

Deformation

The frame is analyzed for lateral static load applied in X-Direction. The load with the increment of 10KN has been applied to the model and the corresponding deformation is observed. The deformation has been varied from 1.02mm and 10.26mm for a maximum load of 45KN to 395KN respectively for frame the load Vs deformation results for lateral static load is tabulated in Table-1.

Table-1. Load vs Deformation

LOAD (KN)	DEFORMATION (mm)
45	1.02
90	2.05
133	3.07
177	4.10
221	5.13
264	6.15
308	7.18
351	8.20
394	9.23
438	10.26

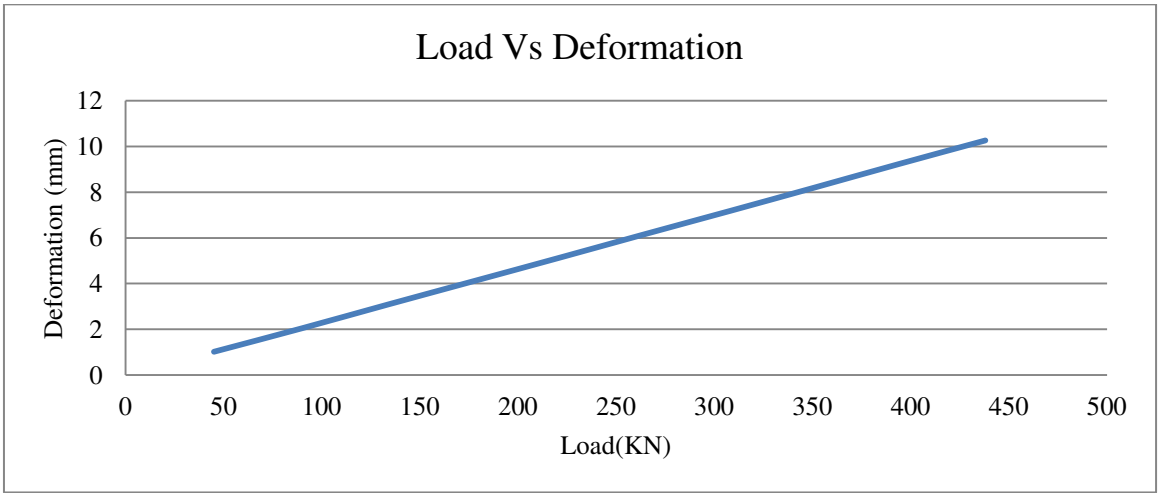

Figure-6. Load vs Deformation.

Stress and strain

The frame is analyzed for lateral static load applied in X-Direction. The load with the increment of 10KN has been applied to the model and the corresponding stress and strain is observed. The stress and strain has been varied from 74.131MPa and 0.00806mm

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for a maximum load of 45KN to 438KN respectively for frame the load Vs deformation results for lateral static load is tabulated in Table-2.

Table-2. Comparision of Force Reaction, Vonmises Stress, Principle Strain.

Force Reaction (Total) [KN]	Vonmises stress	Principle strain
45	74.131	8.07E-04
90	148.46	1.61E-03
134	233.8	2.41E-03
178	312.39	3.22E-03
221	390.05	4.01E-03
265	465.65	4.81E-03
308	541.29	5.61E-03
351	617.72	6.46E-03
395	693.95	7.26E-03
438	770.19	8.06E-03

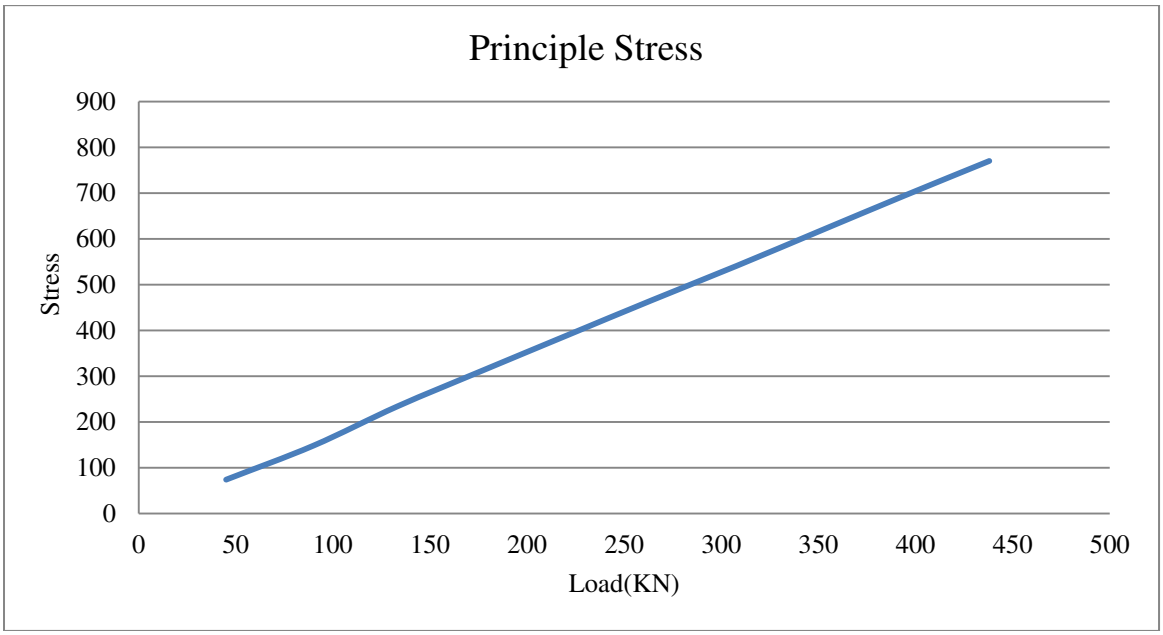

Figure-7. Load vs Principle Stress.

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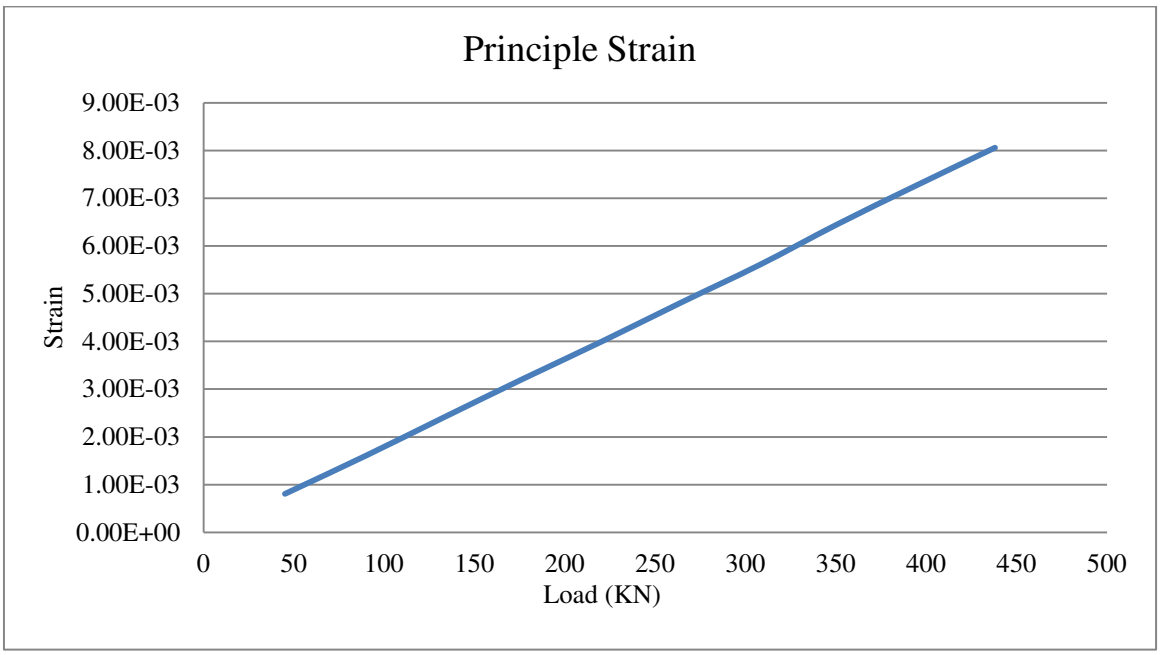

Figure-8. Load vs Strain.

CONCLUSIONS

The behavior of One-Bay two storey reinforced concrete frame, with I-section encased with concrete is analyzed and the results are compared for load Vs deformation for lateral static load with stress and strain intensity is compared. The following observation is presented below:

A. Comparison of load Vs deformation for lateral static load

a) The initial ultimate load for the frame is 45KN which shows a deformation of 1.02mm.

b) The final ultimate load for the frame is 438KN which shows a deformation of 10.26mm.

B. Comparison of stress and strain intensity for lateral static load.

a) The initial ultimate load for the frame is 45KN which shows 74.131 and 8.07E-04 for stress and strain respectively.

b) The final ultimate load for the frame is 438KN which shows 770.19 and 8.06E-03 for stress and strain respectively.

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