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ELASTO PLASTIC ANALYSIS OF CASTELLATED BEAMS WITH VARIOUS PERFORATION PROFILE USING FEM

Sumit J Goswami[1], Jayant G Kulkarni[2]

[1]*PG Student, Department of civil Engineering, Arham Veerayatan Institute of Engineering, Technology & Research, Mandvi-Kutchh*

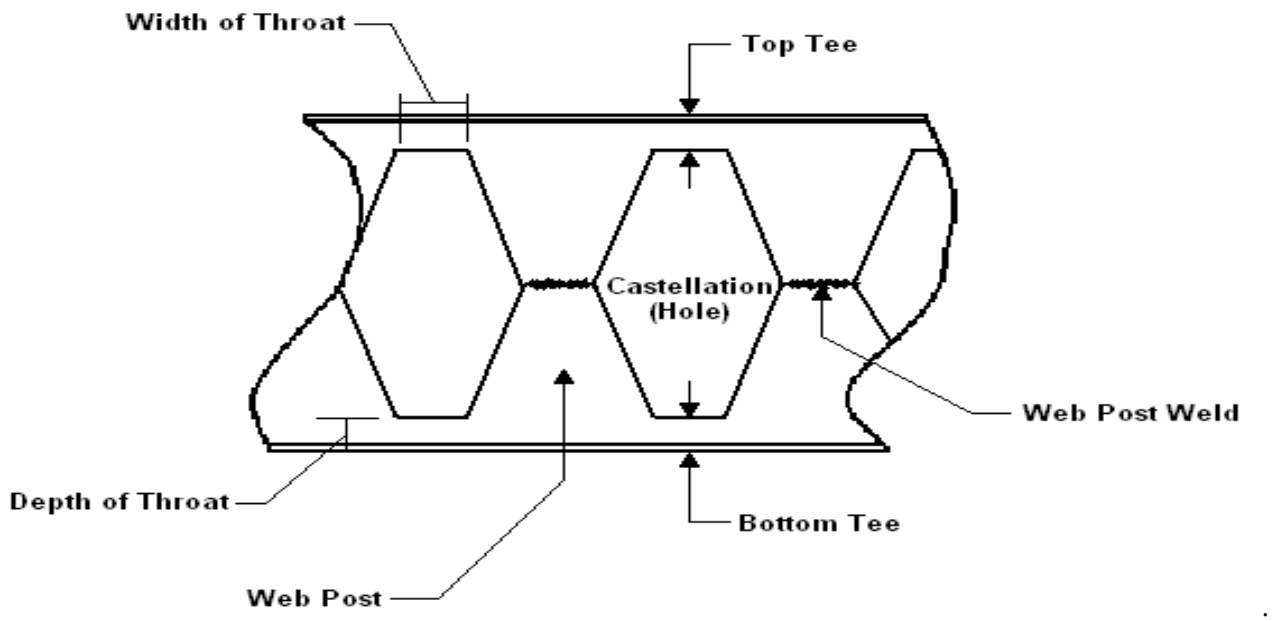
[2]*Department of Civil Engineering, Arham Veerayatan Institute of Engineering, Technology & Research, Mandvi-Kutchh*

Abstract:-The review report presents a procedure of make the best opening size ratio for castellated beam, in this this paper work is done for the finding out the best opening size based on deformation criteria as per the analysis it is found that consider to deformation criteria regular hexagon opening gives the best results consider to deformation of the beams, it is also found that if we take 1 (one) as a ratio of depth and width of opening in rectangle type opening then it's also giving good results for deformation criteria for this purpose Ansis software is used which give the good results for the finite element method.

Keywords:- Castellated beam,FEM.

I. INTRODUCTION

Now a days as we know growth of industrial structure increasing day to day and specially using of steel structure is more, so as an engineer we have to looking that structure should not be costly so for this this purpose we are trying to make the different type of section or we are modifying the section or member of steel structure. Castellated beam is also one part of modifying beam section in this beam regular beam is cutting in the particular method and after this cutting it is arranged in the manner that after arranging it gives the more depth of beam which is useful for increasing the moment carrying capacity of beam, so for this purpose we have taken the several model of the beam and we analyses the castellated beam with use of Ansis software which gives the good results for FEM.



II. GEOMETRY

Geometry of parent beam ISLB 450 @640.6 N/m

Height	Width of flange	Thickness of flange	Thickness of web	Span
450 mm	170 mm	13.4 mm	8.6 mm	6000 mm

Types of support of beam

- Simply support
- Fixed support

Types of loading on beam

- Concentration - 150 kN
- Uniformly distributed load - 35 kN/m

Geometry of castellated beam

Parent beam height mm	Castellated height (Increasing 0.5h as per **(**M. R. Wakchaure and A.V. Sagad **)**	Opening type	Depth of openin g(D)	D/B ratio	Top width (B)	S/B Ratio	Middle width (S)
450	675	Regular hexagon	450	1.733	259.8076	2	519.61
450	675	Non regular hexagon	450	0.8	562.5	1.5	843.75
450	675	Non regular hexagon	450	0.6	750	1.5	1125
450	675	Square	450	1	450	1(ALWAY S)	450
450	675	Rectangle	450	1.5	300	1	300
450	675	Rectangle	450	2	225	1	225

III. ANALYSIS AND RESULTS

Different cases of analysis perform on castellated simply supported beam

Type of castellated	Type of support	Type of loading	Value
Regular hexagon (D/B=1.733)	Simply	Concentration	150kN
Non Regular hexagon(D/B=0.8)	Simply	Concentration	150kN
Non Regular hexagon(D/B=0.6)	Simply	Concentration	150kN
Regular hexagon (D/B=1.733)	Simply	UDL	35kN/m
Non Regular hexagon(D/B=0.8)	Simply	UDL	35kN/m
Non Regular hexagon(D/B=0.6)	Simply	UDL	35kN/m

Different cases of analysis perform on castellated fixed supported beam

Type of castellated	Type of support	Type of loading	Value
Regular hexagon (D/B=1.733)	Fixed	Concentration	150kN
Non Regular hexagon(D/B=0.8)	Fixed	Concentration	150kN
Non Regular hexagon(D/B=0.6)	Fixed	Concentration	150kN
Regular hexagon (D/B=1.733)	Fixed	UDL	35kN/m
Non Regular hexagon(D/B=0.8)	Fixed	UDL	35kN/m
Non Regular hexagon(D/B=0.6)	Fixed	UDL	35kN/m

Different cases of analysis perform on castellated simple supported beam

Type of castellated	Type of support	Type of loading	Value
Square (D/B=1)	Simple	Concentration	150kN
Rectangle (D/B=1.5)	Simple	Concentration	150kN
Rectangle (D/B=2)	Simple	Concentration	150kN
Square (D/B=1)	Simple	UDL	35kN/m
Rectangle (D/B=1.5)	Simple	UDL	35kN/m
Rectangle (D/B=2)	Simple	UDL	35kN/m

Different cases of analysis perform on castellated fixed supported beam

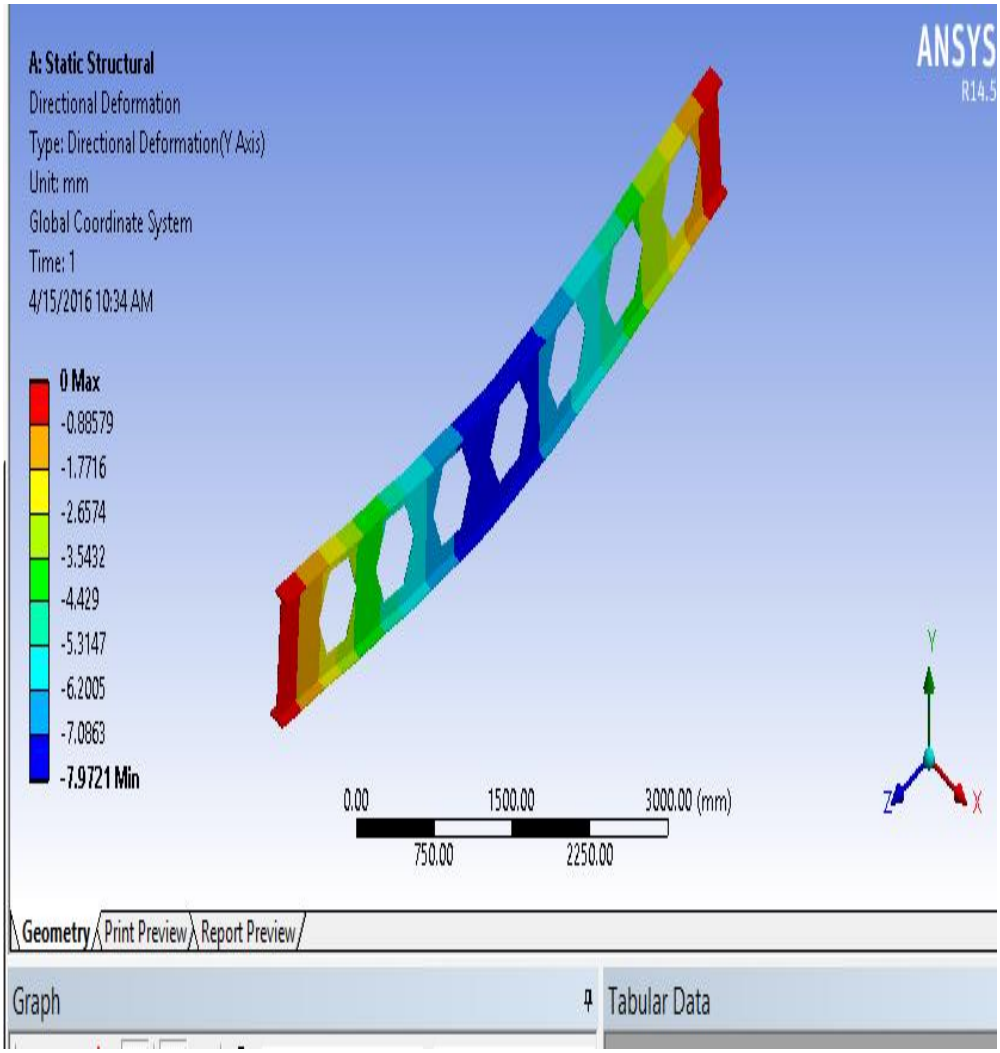
Type of castellated	Type of support	Type of loading	Value
Square (D/B=1)	Fixed	Concentration	150kN
Rectangle (D/B=1.5)	Fixed	Concentration	150kN
Rectangle (D/B=2)	Fixed	Concentration	150kN
Square (D/B=1)	Fixed	UDL	35kN/m
Rectangle (D/B=1.5)	Fixed	UDL	35kN/m
Rectangle (D/B=2)	Fixed	UDL	35kN/m

Results

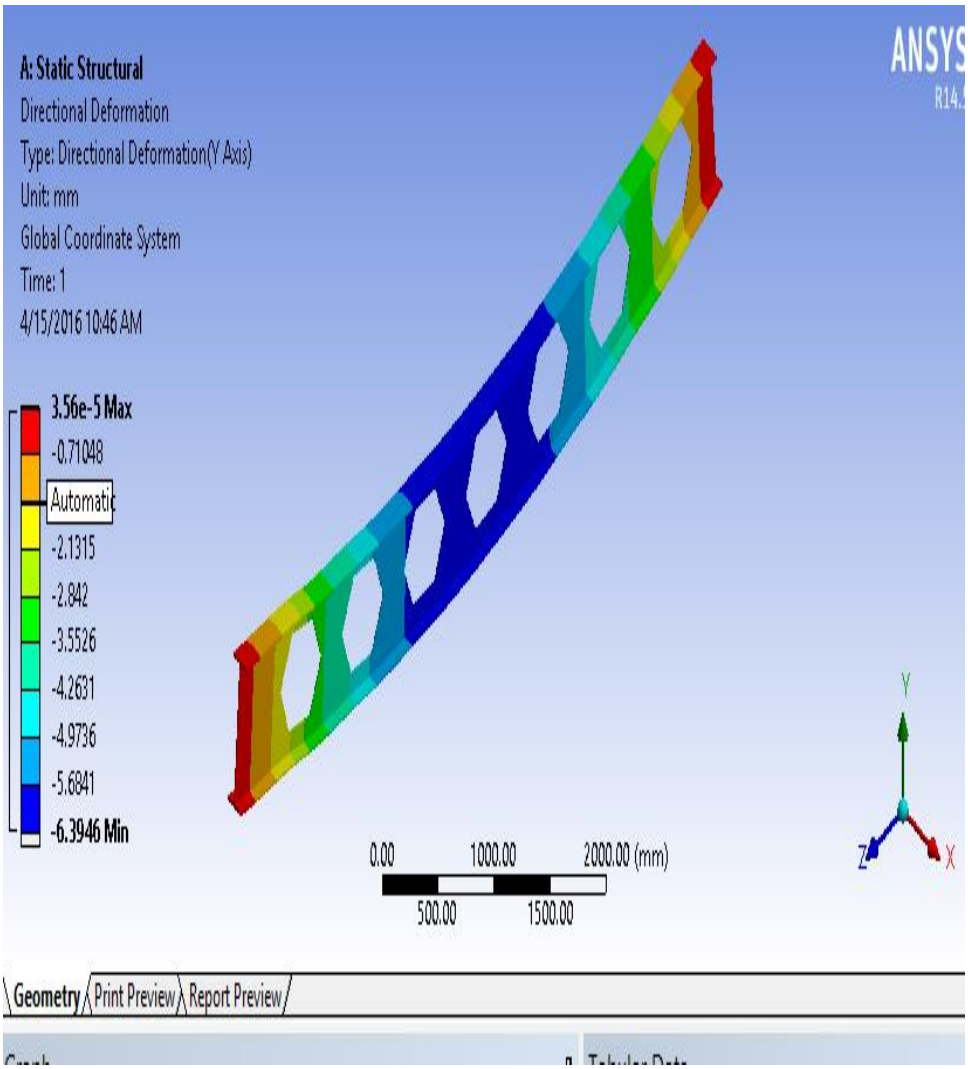
Simply supported hexagonal case

Case -1 simply supported castellated beam with regular hexagon pattern and point load

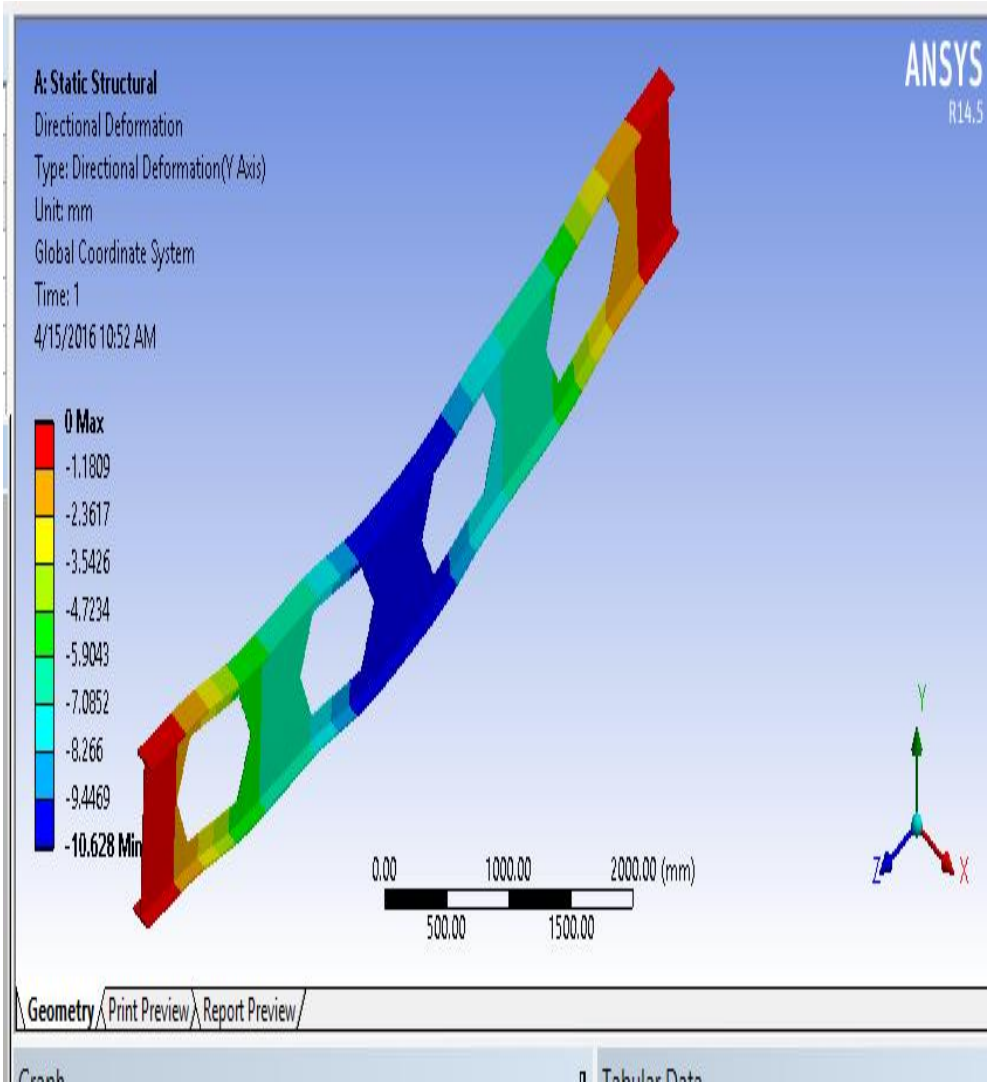
Deformation(Y Axis) Directional



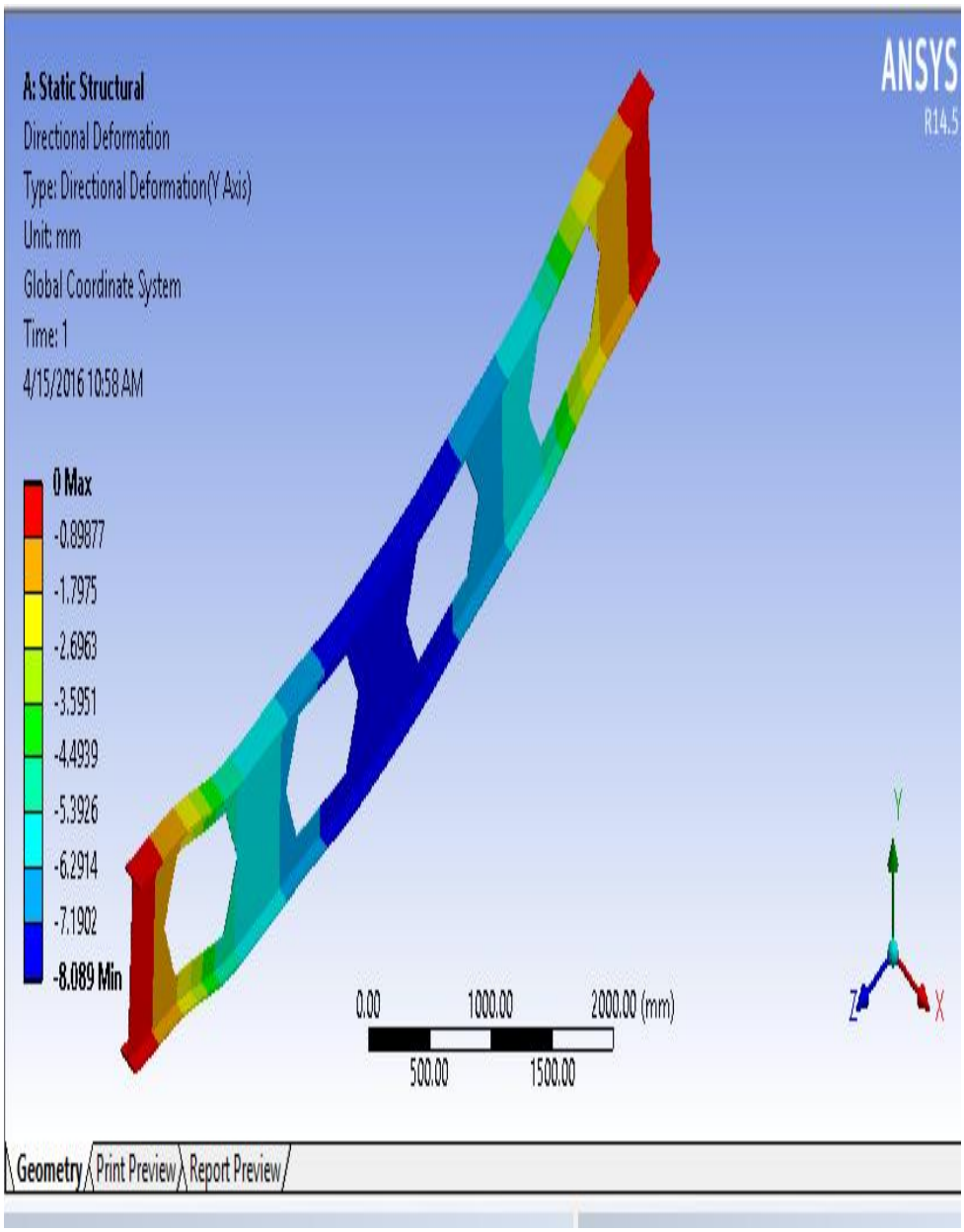
Case -2 simply supported castellated beam with Regular hexagon pattern and UDl
Directional Deformation(Y Axis)



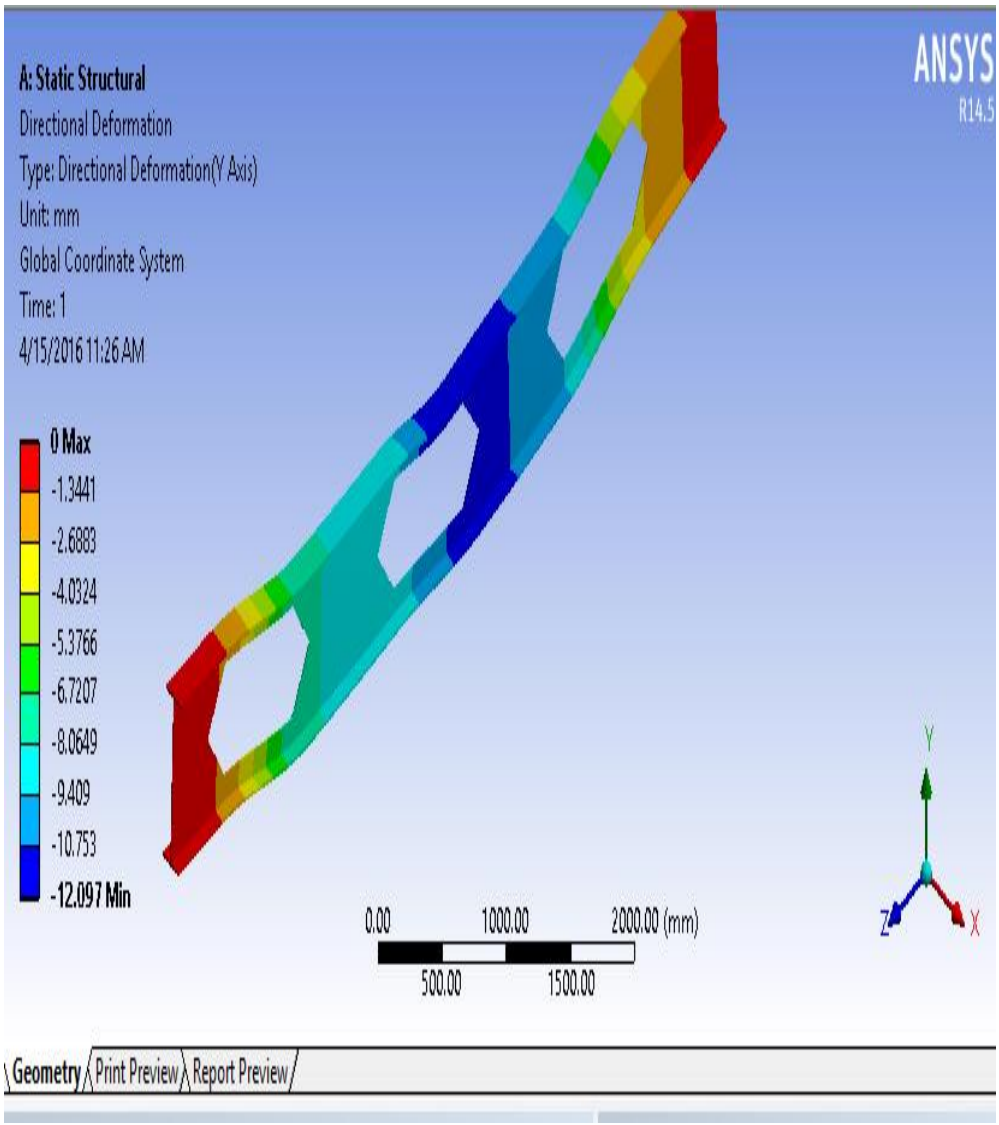
Case -3 Simply supported castellated beam with Non Regular hexagon (D/B= 0.8) pattern and point load Directional Deformation(Y Axis)



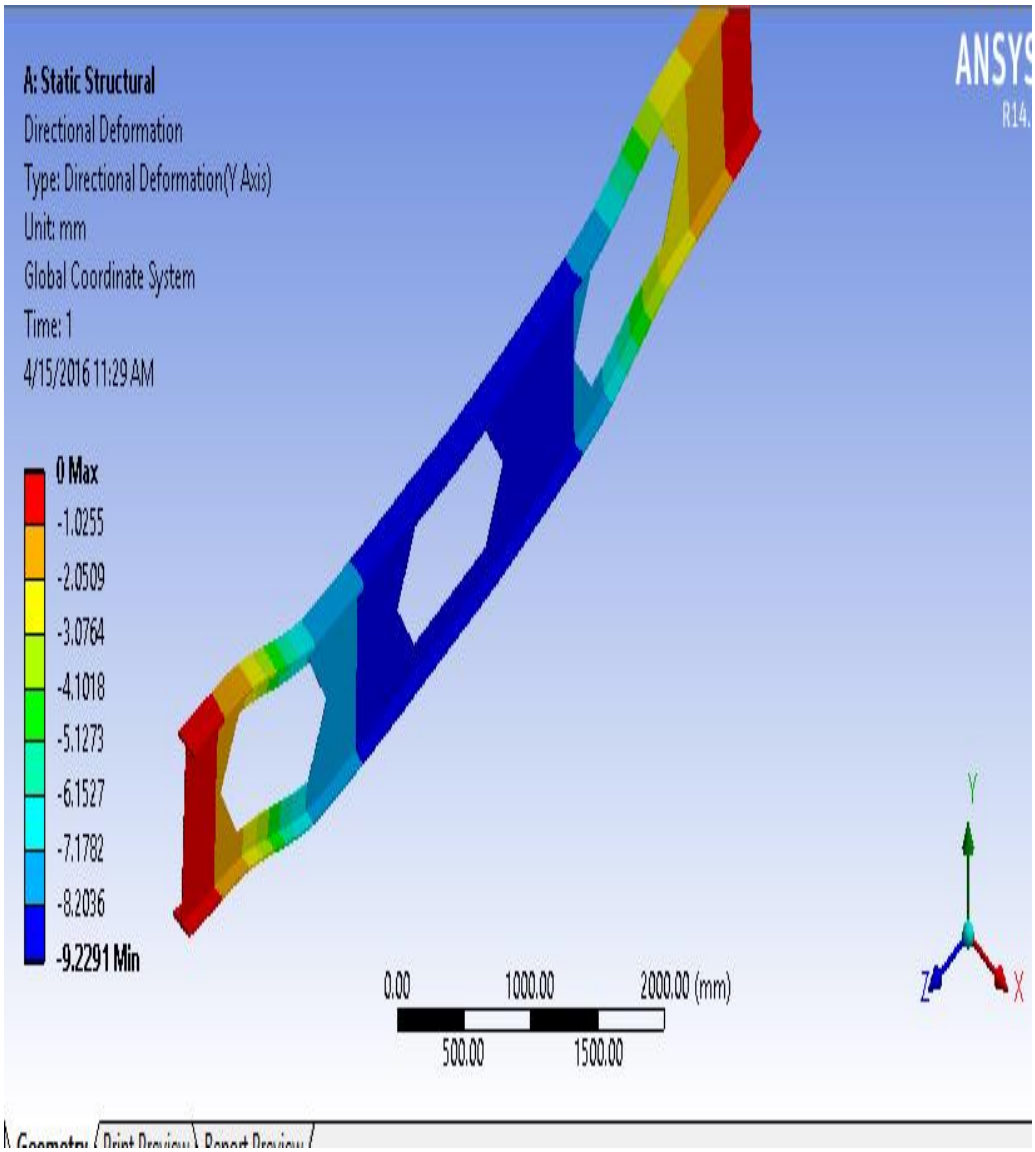
Case -4 Simply supported castellated beam with Non Regular hexagone (D/B= 0.8) pattern and UDL
Directional Deformation(Y Axis)



Case -5 simply supported castellated beam with Non Regular hexagon (D/B= 0.6) pattern and Point load
Directional Deformation(Y Axis)

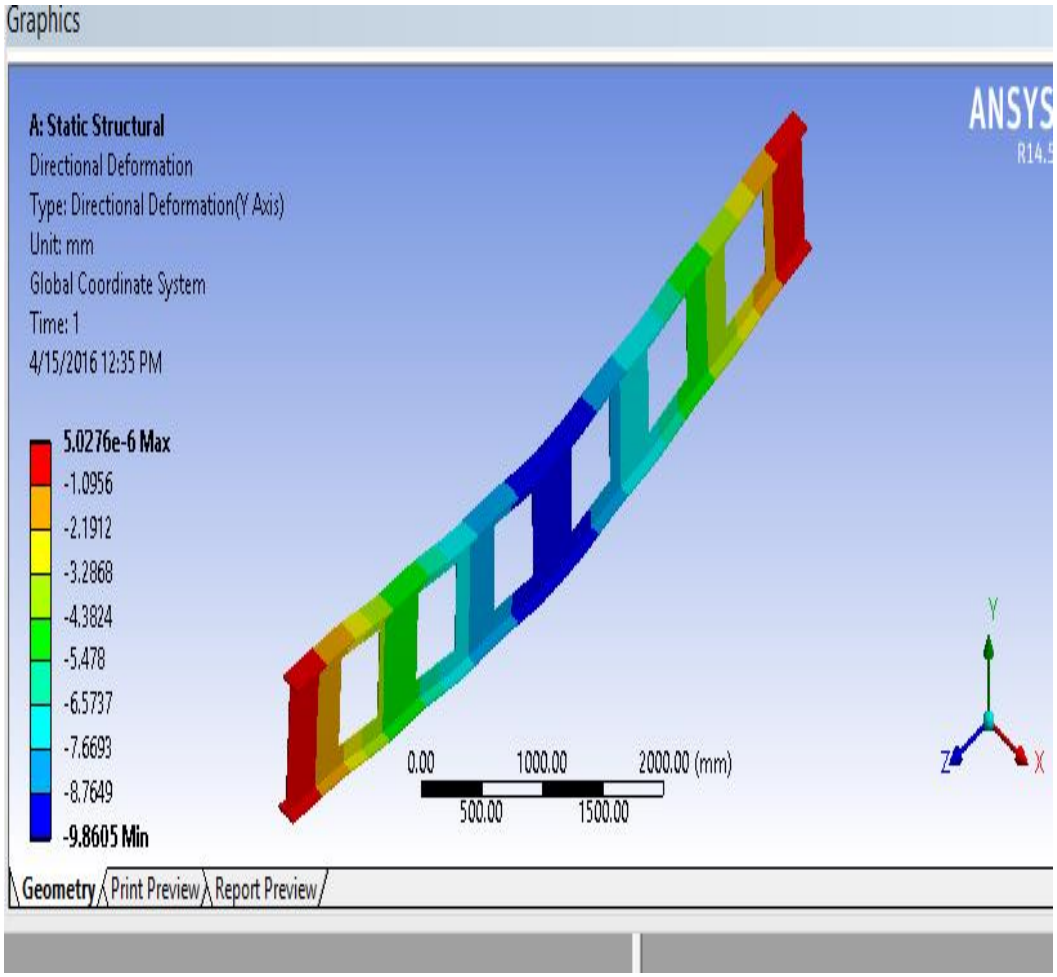


Case -6 simply supported castellated beam with Non Regular hexagon (D/B= 0.6) pattern and UDL Directional Deformation(Y Axis)

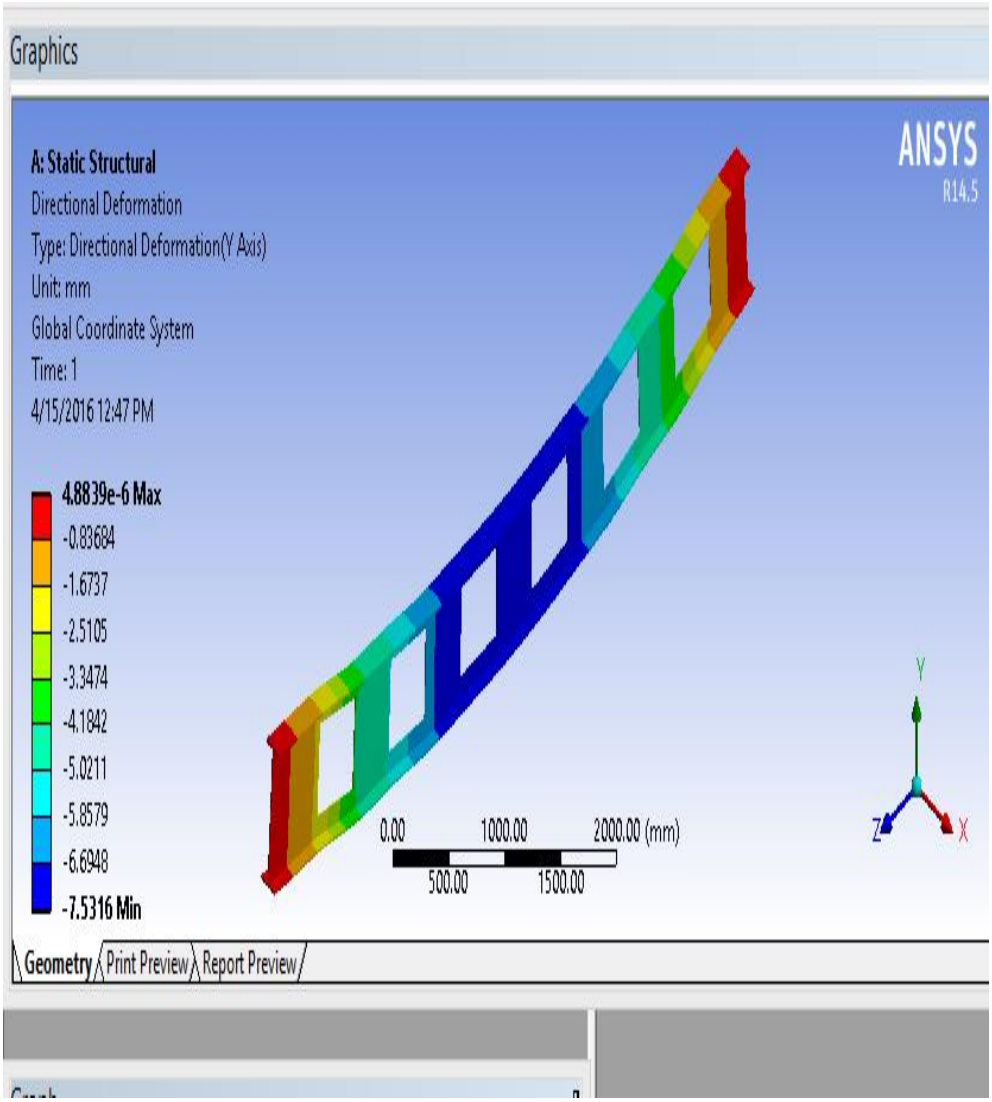


Simply supported rectangle case

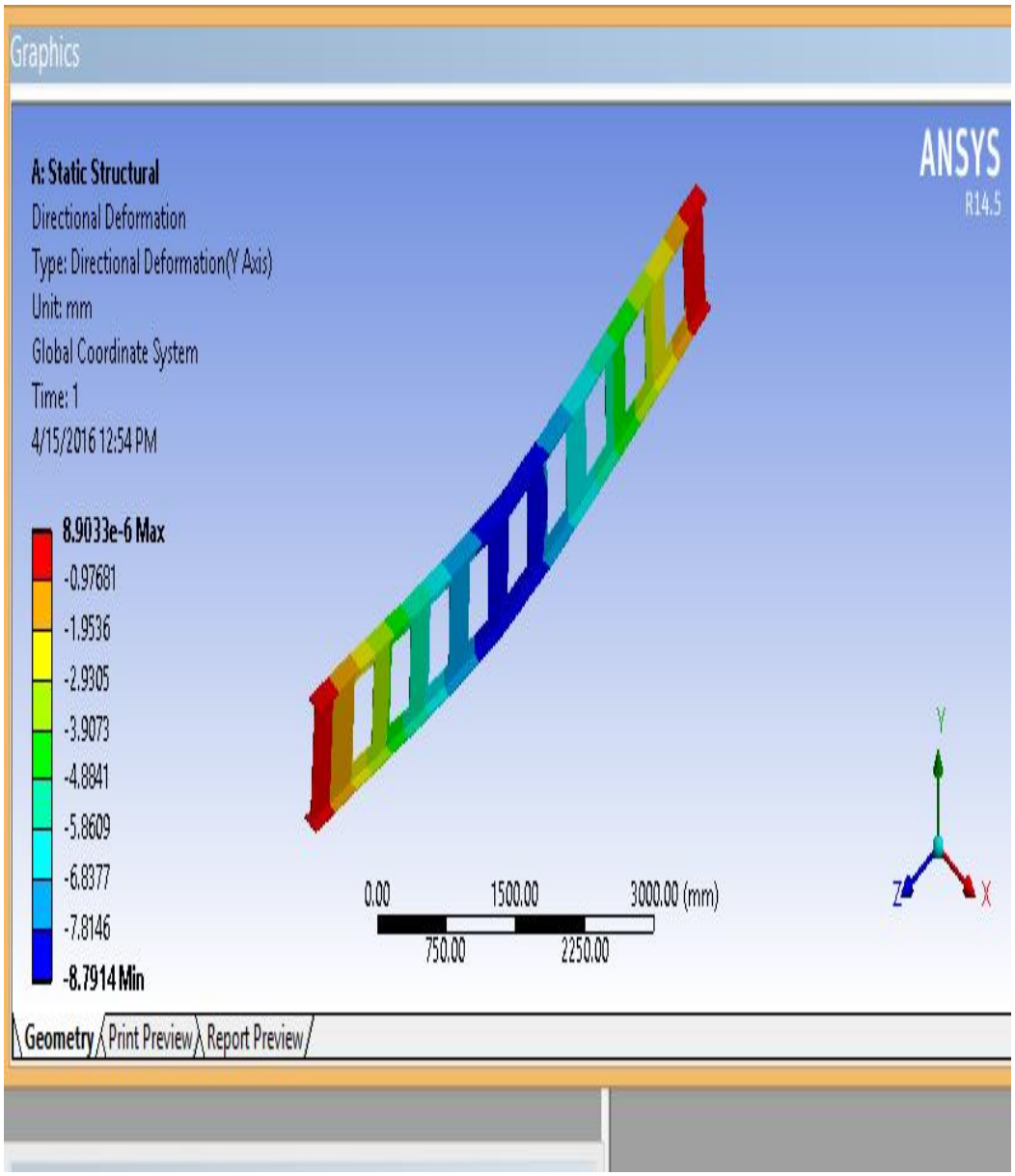
Case-1 Simply supported castellated beam with square opening (D/B= 1) pattern and point load
Directional Deformation(Y Axis)



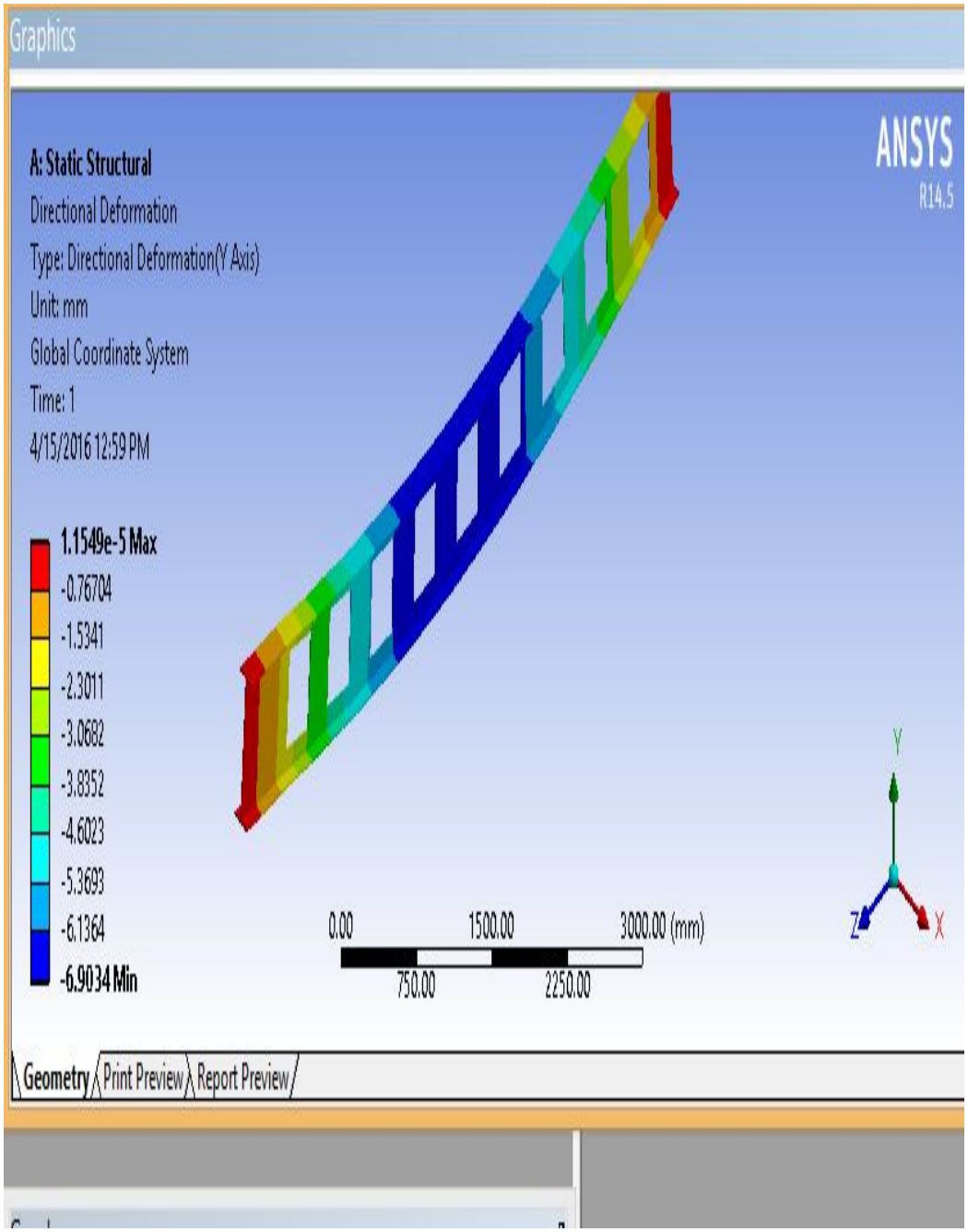
Case-2 Simply supported castellated beam with square opening (D/B= 1) pattern and UDL
Directional Deformation(Y Axis)



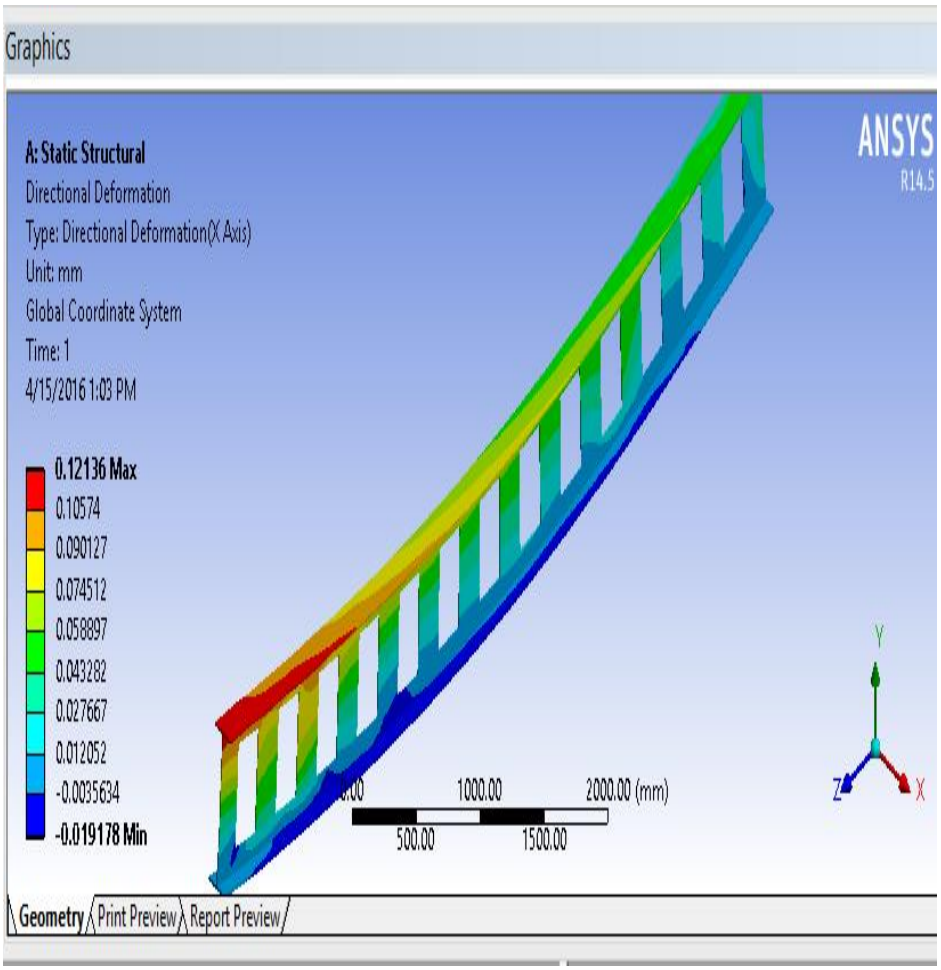
Case-3 Simply supported castellated beam with square opening (D/B= 1.5) pattern and POINT LOAD
Directional Deformation(Y Axis)



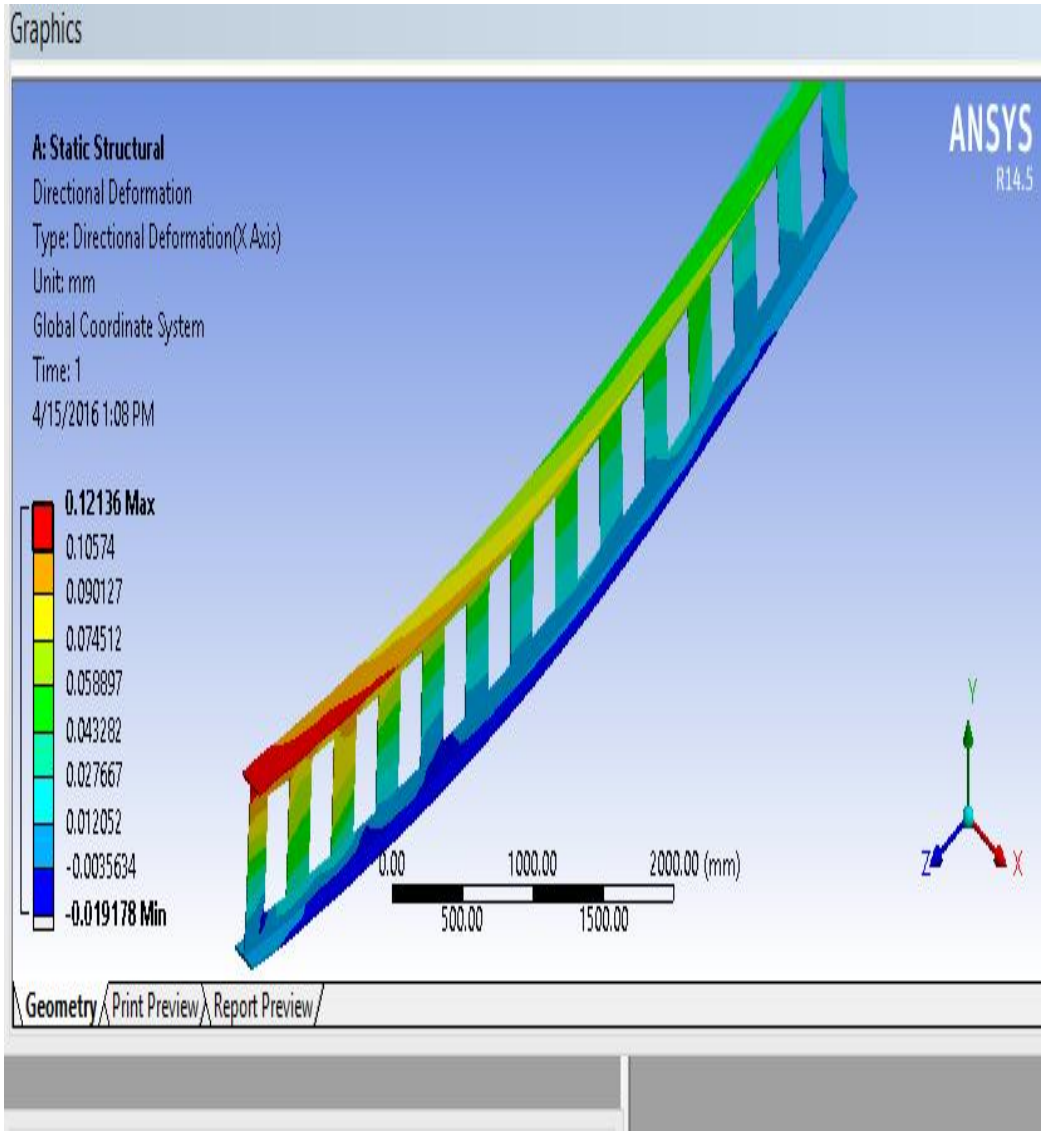
Case-4 Simply supported castellated beam with square opening (D/B= 1.5) pattern and UDL
Directional Deformation(Y Axis)



Case-5 Simply supported castellated beam with square opening(D/B= 2) pattern and point load
Directional Deformation(Y Axis)

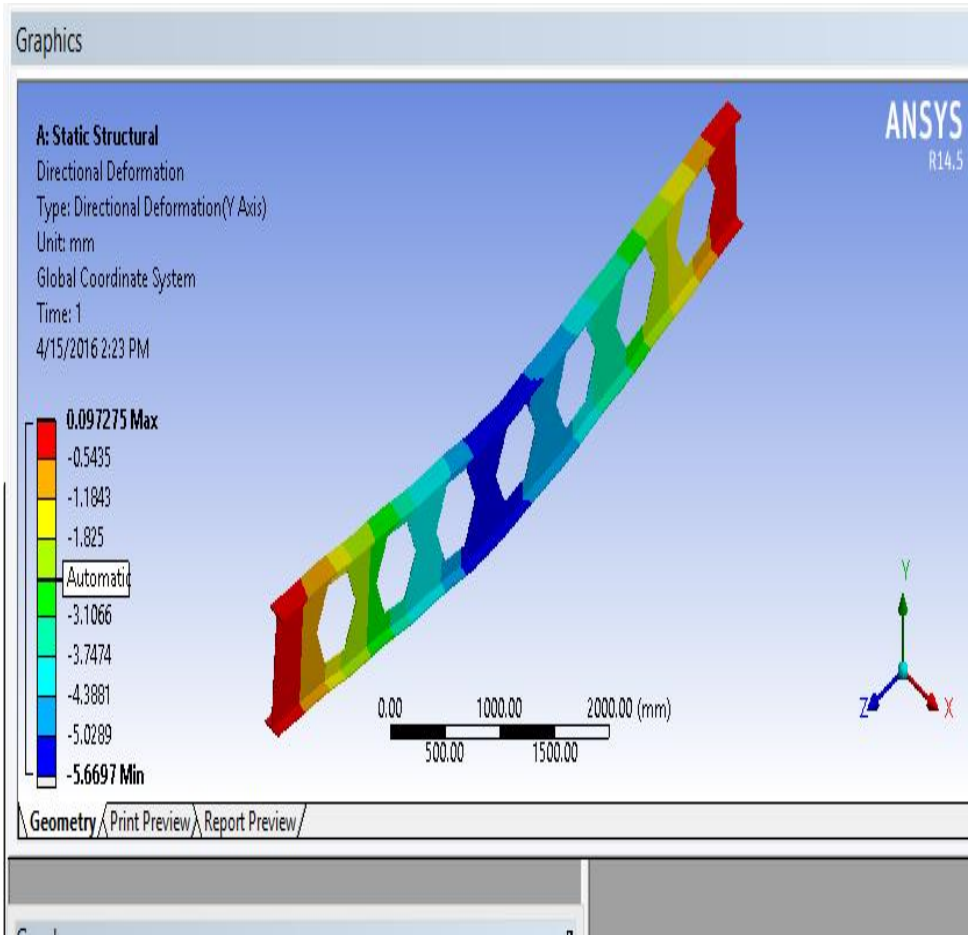


Case-6 Simply supported castellated beam with square opening (D/B= 2) pattern and UDL
Directional Deformation(Y Axis)

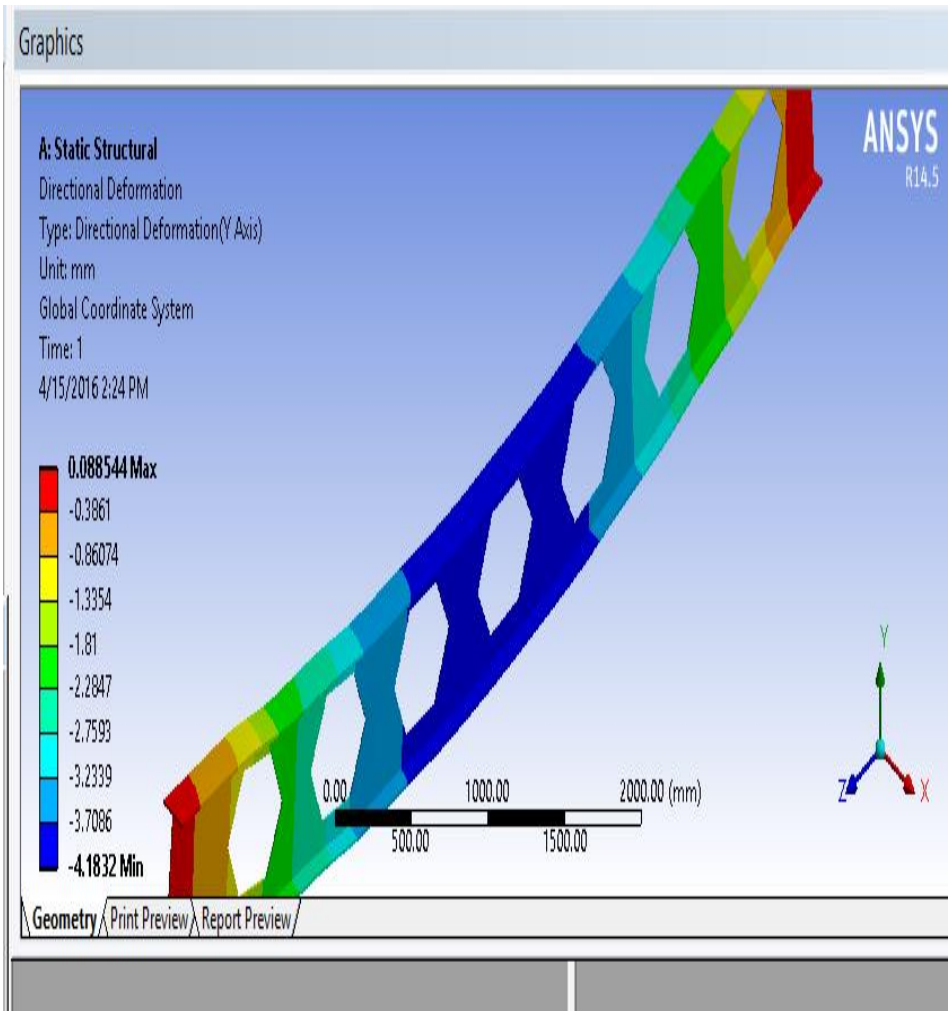


Fixed supported hexagonal case

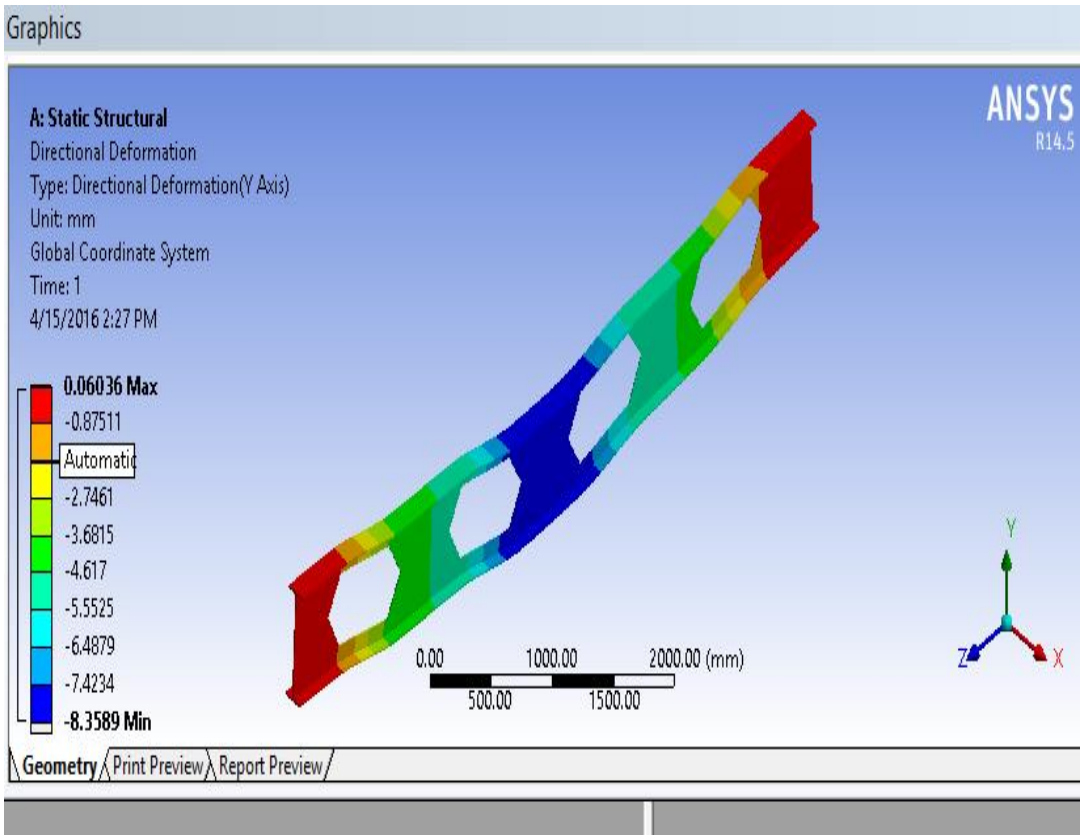
Case -1 Fixed supported castellated beam with regular hexagon Pattern and point load Directional Deformation(Y Axis).



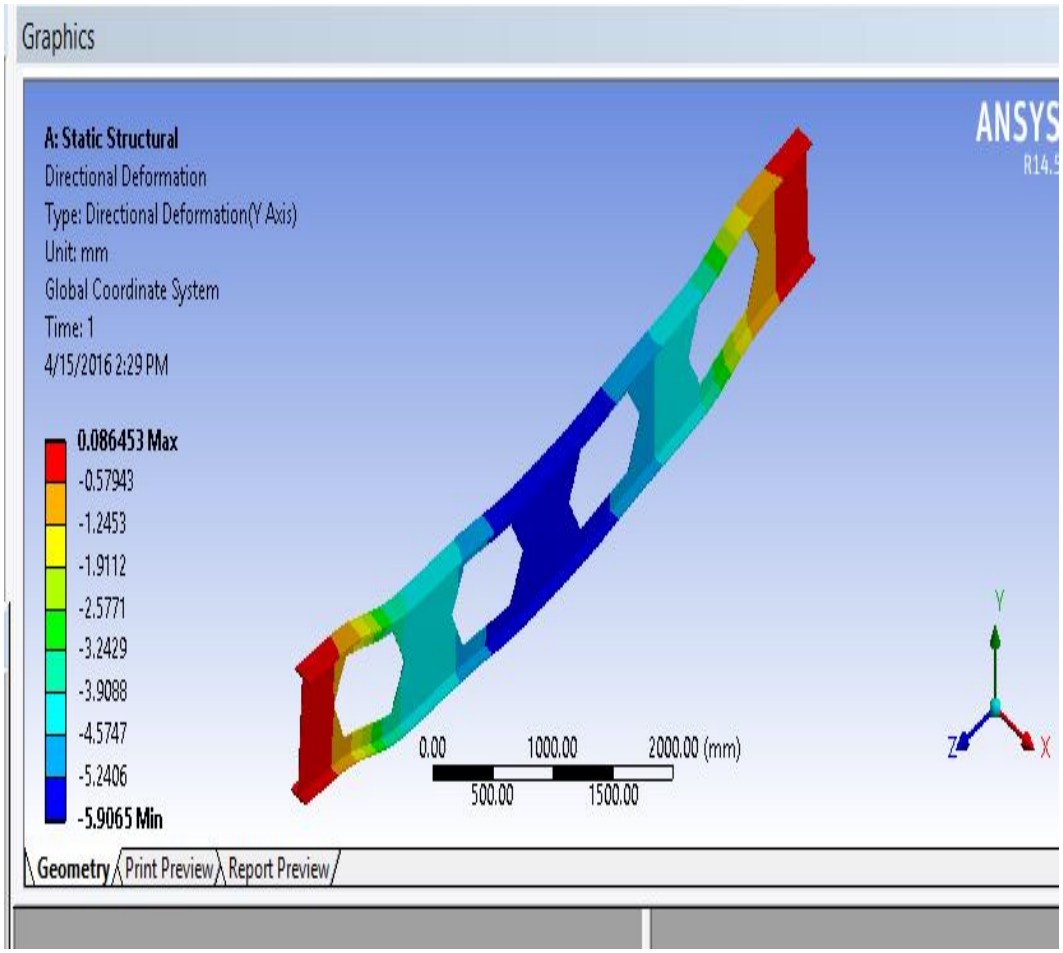
Case 2 Fixed supported castellated beam with regular hexagon Pattern and udl
Directional Deformation(Y Axis)



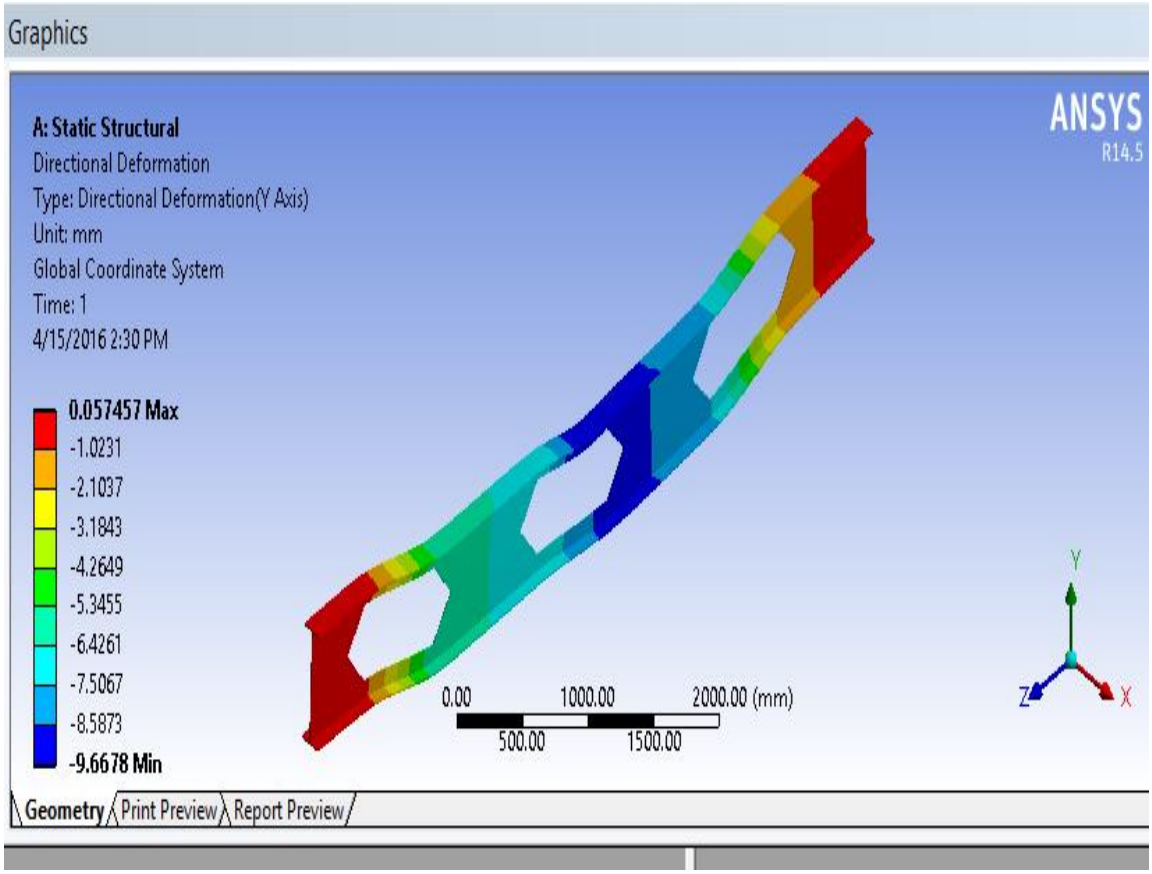
Case 3 Fixed supported castellated beam with non-regular hexagon (D/B = 0.8) pattern and POINT LOAD Directional Deformation(Y Axis)



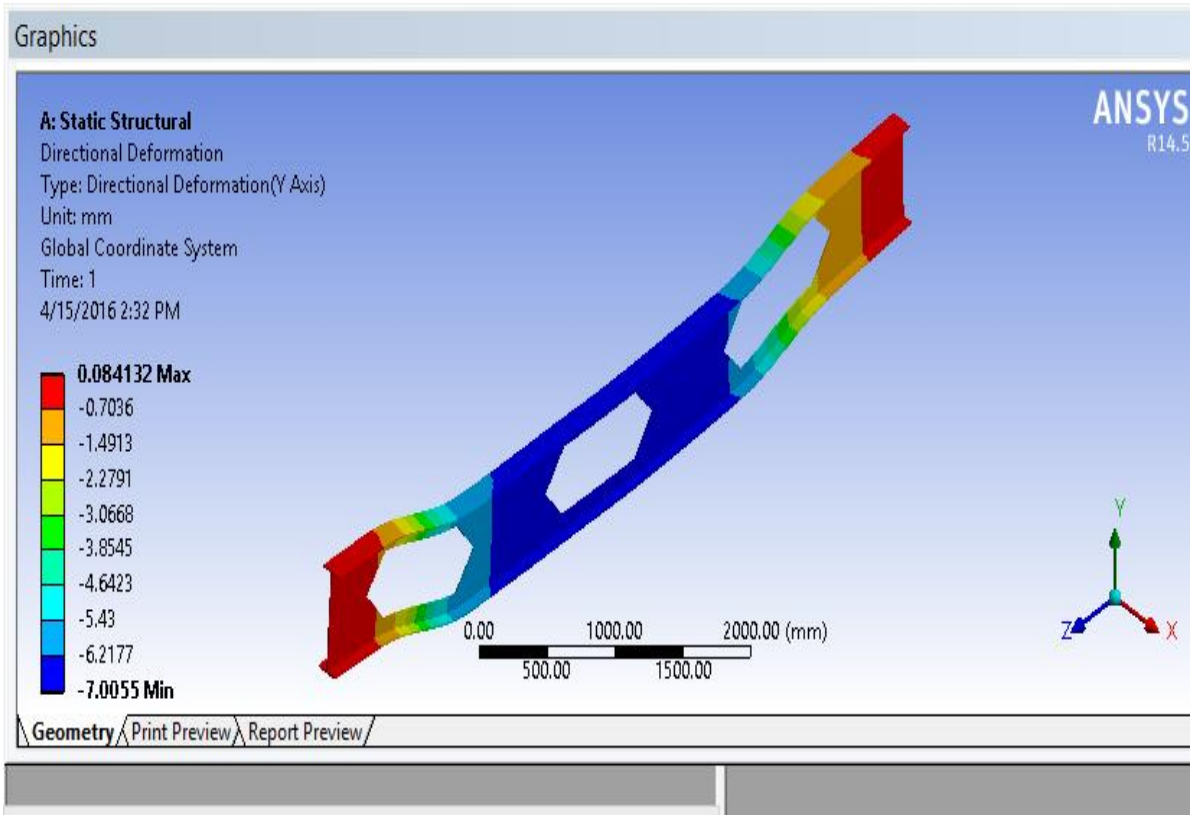
Case 4 Fixed supported castellated beam with non-regular hexagon (D/B = 0.8) pattern and UDL
Directional Deformation(Y Axis)



Case 5 Fixed supported castellated beam with non-regular hexagon (D/B = 0.6) pattern and POINT LOAD Directional Deformation(Y Axis)

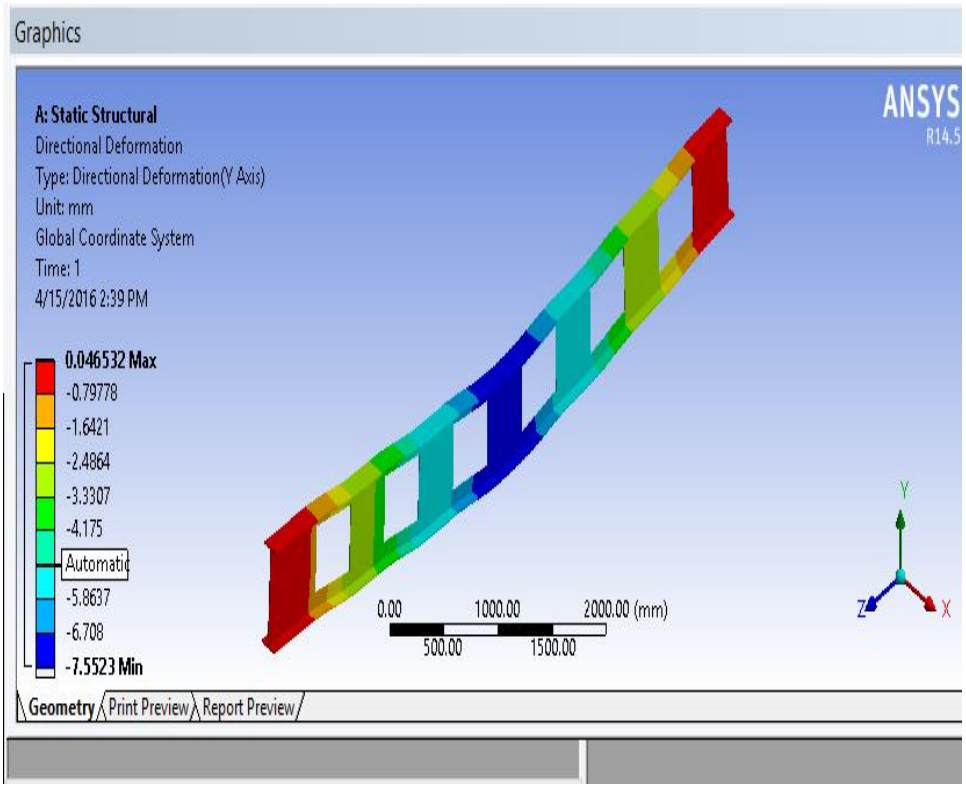


Case 6 Fixed supported castellated beam with non-regular hexagon (D/B = 0.6) pattern and UDL
Directional Deformation(Y Axis)

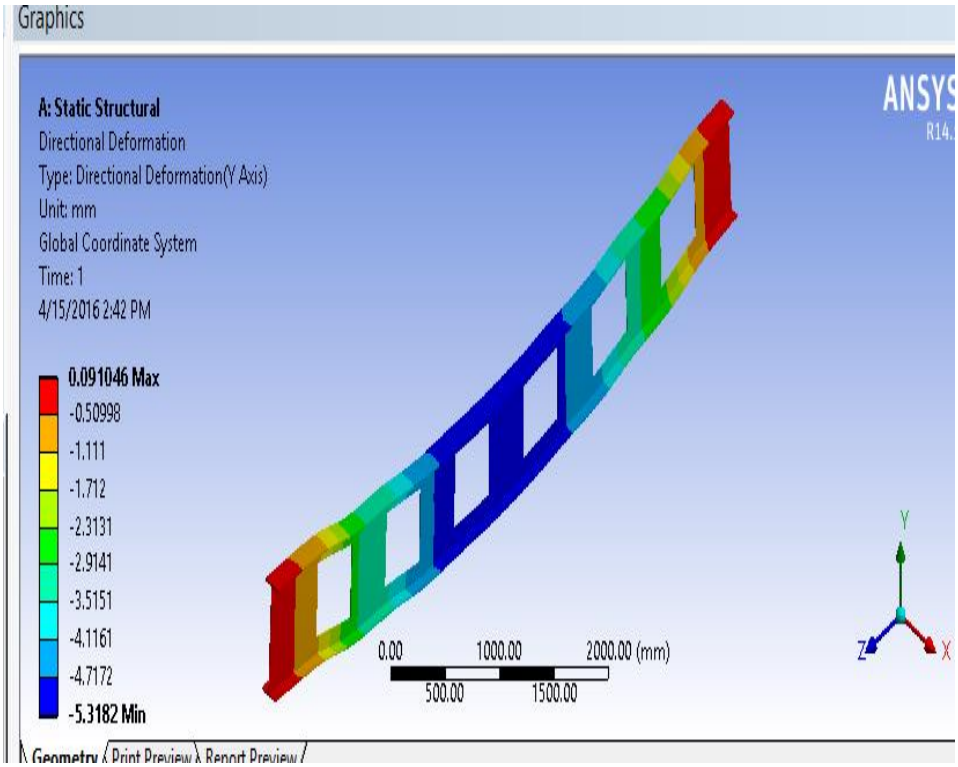


Fixed supported rectangle case

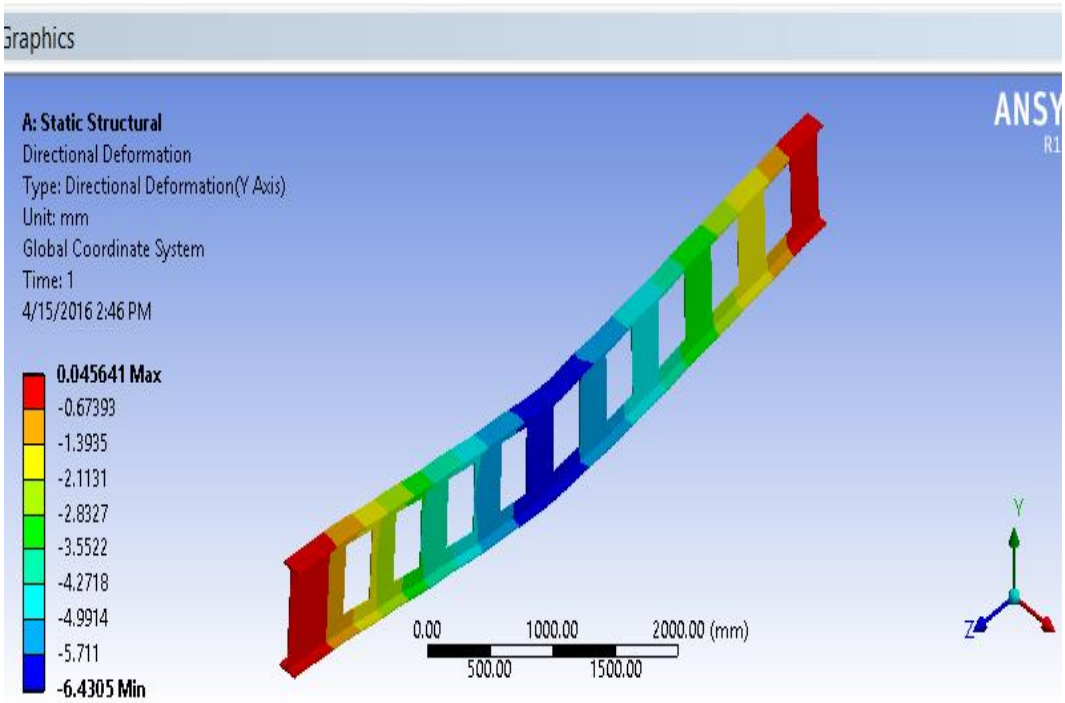
Case 1 Fixed supported castellated beam with square (D/B = 1) pattern and point load
Directional Deformation(Y Axis)



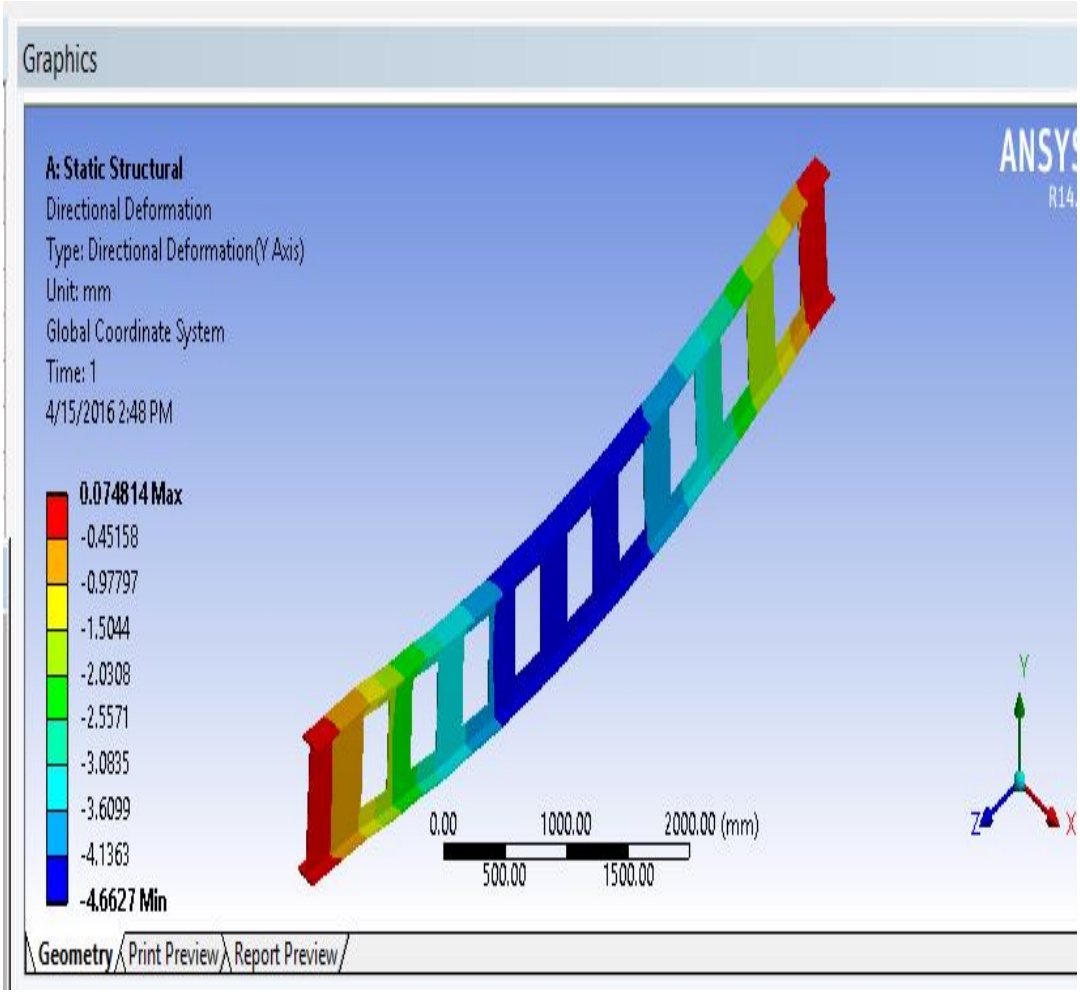
Case 2 Fixed supported castellated beam with square (D/B = 1) pattern and udl load
Directional Deformation(Y Axis)



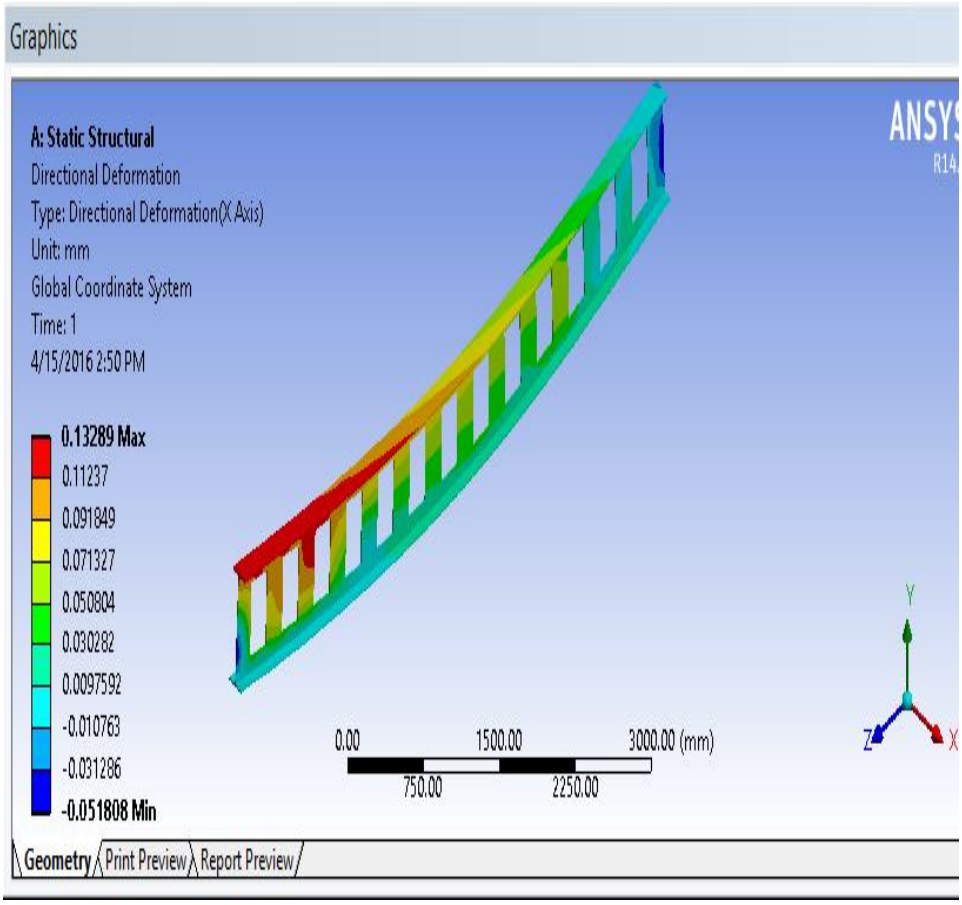
Case 3 Fixed supported castellated beam with Rectangle (D/B = 1.5) pattern and point load
Directional Deformation(Y Axis)



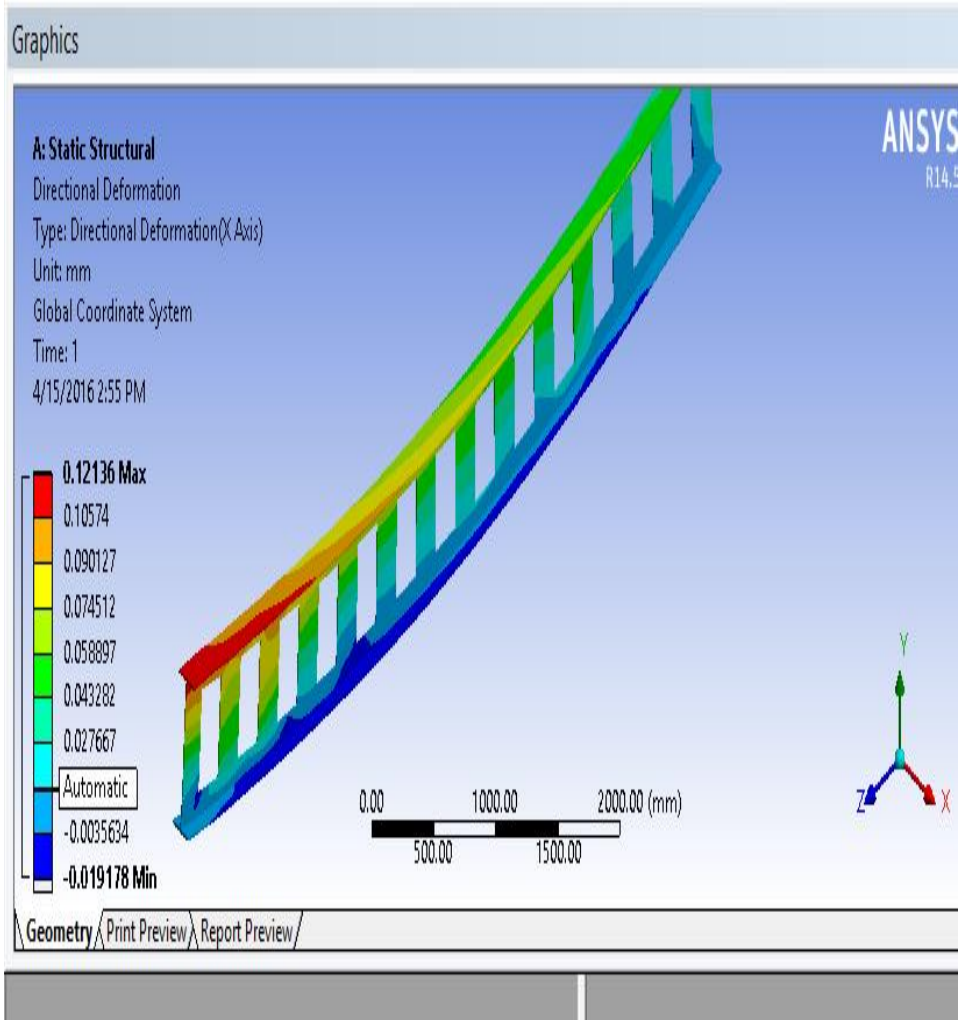
Case 4 Fixed supported castellated beam with rectangle (D/B = 1) pattern and udl
Directional Deformation(Y Axis**)**



Case 5 Fixed supported castellated beam with square (D/B = 2) pattern and point load
Directional Deformation(Y Axis)



Case 6 Fixed supported castellated beam with rectangle (D/B = 2) pattern and udl load
Directional Deformation(Y Axis)



IV CONCLUSION

After the analysis and study of result here we can conclude that for the castellated beam with rectangle profile opening best ratio of opening (depth and width ratio of opening) is 1 (one) for the deformation criteria and for the hexagon opening best opening ration is 1.73 (regular hexagon) consider to deformation criteria

Based on this analysis we can say that for castellated beam with hexagon opening, regular hexagon opening is best and for rectangle opening ratio of opening is 1 is the best.

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