Republic of Iraq
Ministry of Higher Education & Scientific Research
University of Technology
Department of Building & Construction
Structural Division

Study of Unsymmetrical Reinforcement of the RC Rectangular Slender Columns under Eccentric Loading

A study presented to the University of Technology
Department of Building and construction
As a requirement for
BSc degree in civil engineering

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under supervision of
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بسم الله الرحمن الرحيم

وقل اعملوا فسيرى الله عملكم ورسوله والمؤمنين

صدق الله العظيم

Acknowledgement

I would like to express my sincere thanks and gratitude to my supervisor Dr. Bassman R. Muhammad department of building and construction, University of Technology for his encouragement, facilitation, instructions, and supervision throughout the period of preparation of this study

Ahmed Fouad

Dedication

I dedicate this work to my dear parents who supported me in my life ...

To my dear sister & my brothers who stood beside me

To my friends Ali Al_Asadi who helped me by all means

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Chapter I – Introduction and general discussion

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1. Introduction

A structural element subjected predominantly to compressive force with or without bending moment is termed as compression member .when a compression member is vertical, it is called a column and, when inclined or horizontal, it is termed as strut. The vertical members of multi-storey building that transmit the loads on floors and beams to the foundation are the columns of the building. These are important elements in the sense that their failure may endanger the whole structure.

2. Classification of columns

Depending upon the architectural requirements, the columns may have cross-sections of regular shapes such as rectangular. Square. Hexagonal, octagonal or circular .the cross-shaped (swastika), T-shaped, and L-shaped columns have been extensively used .typical cross-sections are shown in fig 1-1.

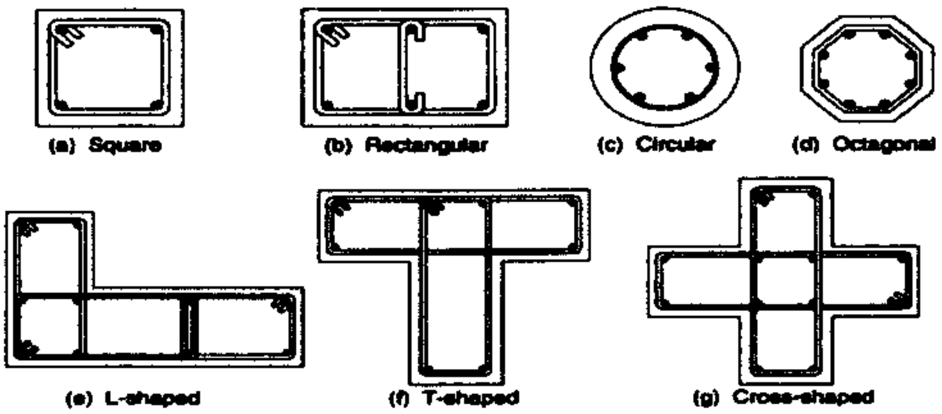


Fig (1-1) typical cross-sections of columns

2.1 Classification according to transverse reinforcement

A concrete column is reinforced with longitudinal bars (also called main reinforcement) held position by separate closed loops called ties spaced at equal close intervals along length, as shown in fig 1-2(a). Such a column is called <u>tied column</u>. The longitudinal bars contribute, to the load-carrying of the section and the transverse ties provide lateral support to the longitudinal bars and also confines the concrete. The other function of the lateral ties is to prevent the buckling of main longitudinal bars. Sometimes, in circular column, the longitudinal bars are wrapped by a closely spaced wire or helix called spiral column as shown in fig 1-2(b) .in some situations the columns may have either embedded rolled steel sections or in-filled cast iron or steel pipes with both longitudinal and transverse reinforcement, as illustrated in fig 1-2 (c). The former is known as composite column and the latter as an in-filled column.

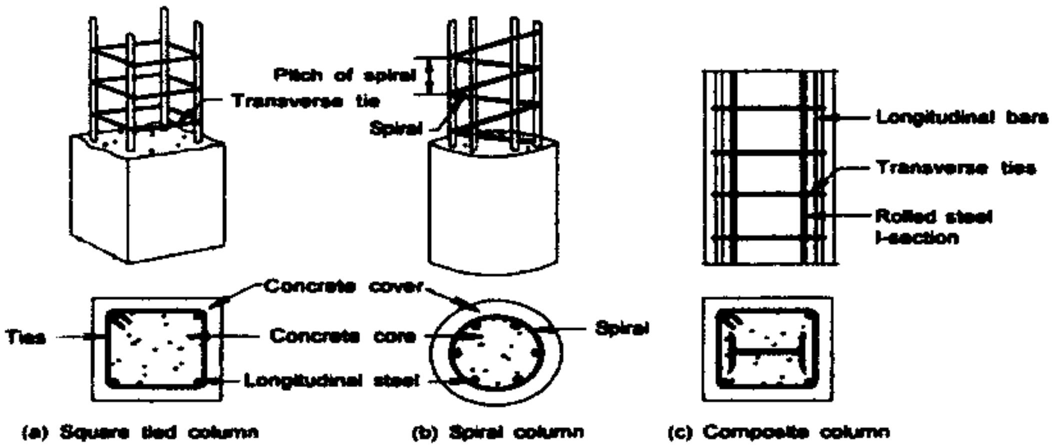


Fig (1-2) types of column based on the farm and types of reinforcement

2.2 *Classification according to the type of loading*

The column shown in fig 1-3 (a), which carries a purely axial load, is termed as concentrically loaded column. Such an ideal column is rarely encountered in practice. The columns in industrial buildings are not only subjected to high compression but also to bending and shear forces.If a column carries an axial load and bending moment about either the x- or y- axis only, it is classified as a uniaxially eccentrically loaded column, as shown in Fig. 1-3 (b). The peripheral columns located on the sides of a building are of this category.

A column subjected to an axial load along with moments about both the axes is termed as biaxial eccentrically loaded columns e.g. corner columns of a building carry axial loads along with moments about the x-and y-axes ,as illustrated in Fig 1-3 (c)

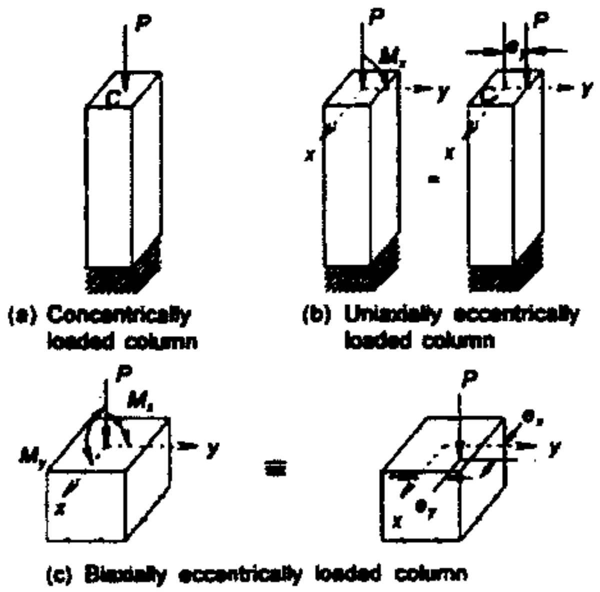


Fig (1-3) Classification of columns according to the type of loading

2.3 Sway and Nonsway columns

A nonsway column is one in which the side sway is insignificant, i.e. there is no significant relative displacement between the two ends of the column in the direction under consideration. Such columns do not resist any significant horizontal load like wind or earthquake loads. Columns of water towers with bracings at different heights and columns in tall buildings provided with shear walls are examples of such columns. On the other hand, columns resisting lateral loads in addition to vertical loads are considered sway or partially nonsway column restrained from rotation is subjected to sidesway or lateral drift ie. there is significant lateral displacement between the ends.

2.4 Classification according to the slenderness ratio

1. Short column
2. Slender column

3. Behavior of reinforced concrete columns

When the column is subjected to an axial load within elastic limits, just like any other composite section,the stresses induced in steel and concrete are in proportion to their moduli of elasticity , E_S and E respectively. However, the subsequent creep and shrinkage result in an increase in stress on steel and adecrease in stress on concrete . With an increase in load , the steel will attain its yield strength before the concrete reaches its ultimate strength. Thus, the column will carry a small additional load until the concrete develops its full strength, while the stress in steel remains the same (i.e at yield stress). Up to the yield point, the tied and spirally reinforced columns behave identically , as shown in Fig (1-4) the failure of the tied column occurs suddenly with the breaking down of concrete and the buckling of longitudinal bars between the ties in a pattern similar to that for a concrete cylinder in a compression test. On the other hand a column reinforced with a spiral exhibits considerable deformation before complete failure on reaching the yield point, with the concrete shell outside the spiral spalling off . this reduces the load-carrying capacity because of the reduction of the concrete area,but the spiral prevents buckling of the longitudinal bars and confines the crushed concrete in the core. Thus the spiral may offset the loss sustained due to loss of cover by an increase in the load-carrying capacity of the concrete core. An optimum volume of spiral shall result in the

value of the failure load to be equal to the load carried at the time of the spalling of the cover concrete. Thus the spiral steel yields and undergoes large deformations.

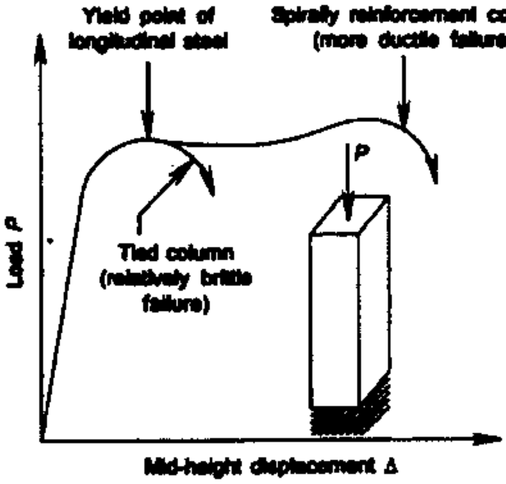
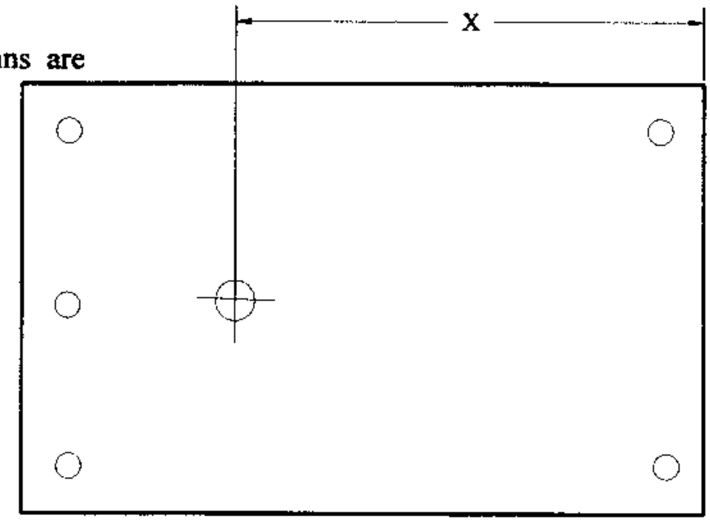


Fig (1-4) load-deformation behavior of a column

4. Unsymmetrical reinforcement



Most reinforced concrete columns are symmetrically reinforced about the axis of bending. However, for some cases, such as the columns of rigid portal frames in which the moments are uniaxial and the eccentricity is large, it is more economical to use an unsymmetrical pattern of bars, with most of the bars on tension side; such columns can be analyzed by the same strain compatibility approach. However , for an unsymmetrically reinforced column to be loaded concentrically the load must pass through a point known as the plastic centroid, the plastic centroid is defined as the point of application of the resultant force for the column cross section (including concrete and steel force) if compressed uniformly to the failure strain □cu = 0.003 over its entire cross section according to the ACI 318 Code. Eccentricity of the applied load must be measured with respect to the plastic centroid, because only when e = 0 will correspond to axial thrust with no moment. The location of the plastic centroid for the column is the resultant of the three internal forces to be accounted for. Its distance:

$$\overline{X} = \frac{0.85 f_C' b\, h^2/2 + \sum A_S f_y d}{0.85 f_C' bh + \sum A_S f_y}$$

Clearly, in a symmetrically reinforced cross section, the plastic centroid and the geometric center coincide.

5. ACI Code requirement

Concerning column design here below some of the American Concrete Institute Code (ACI 318) requirements:

1- The longitudinal reinforcement cross-sectional area should be not less than 1% and not more than 8% of the gross area (Ag) of column section.
2- The longitudinal reinforcement should consist of at least 4 bars in the column with lateral ties, and should consist at least 6 bars in the column with circular ties or spiral.
3- The longitudinal reinforcement bars should not be less than 16 mm in diameter.
4- The clear spacing between spirals should not exceed 80 mm and not less than 25 mm, where the spiral bars are spliced, the length of lap should be not less than 48 times the spliced bar diameter nor 300 mm
5- Spacing between ties should be the smaller value of:
   A- 16 times the longitudinal bars diameter.
   B- 48 times the diameter of the ties bar.
   C- The least dimension of the column cross section.

6. Column Failure Modes

6.1 Crushing

Relatively short columns are more apt to fail by the material crushing. Every building material material can withstand a distinct amount of compressive stress before it crushes. This value has been determined by laboratory tests and is known as the compressive strength of a material. This strength is dependent upon the internal structure of the material and/or its components. Steel has a very homogeneous, finely crystalled internal structure and has a relatively high compressive strength. Hard woods are fine-grained and have a higher compressive strength than soft-woods. Wood is unique in that it has two compressive strengths; one when loaded parallel to the grain and another when loaded perpendicular to the grain. Why is that? When a wood column crushes the fibers of the wood actually split apart. In every case, crushing is a strength failure and does not depend upon the shape of the section.

6.2 Buckling

Relatively slender columns are more apt to fail by buckling. A column is slender when it has a "small" cross-section compared to its effective length. Small is placed in quotes due to the fact that the important information about the cross section is both the actual size and more importantly, the shape of the cross-section. This is then compared to the effective length to determine whether or not the column is slender. If it is, this means that the column will probably fail in bending! As a column is loaded, it is likely to bend about the weak axis of the cross-section (the one with the lowest Moment of Inertia). A column buckles when it bends about an axis. This is a stability failure.

Chapter II – Slender Columns

Chapter II – Slender Columns

1. Introduction

Slender column is compression member may be considered as slender or long when the slenderness ratios l_{ex} / D or and l_{ey} / D are more than **12**. Thus if l_{ex} / D > 12 the column is considered to be slender for bending about x-x axis, while if l_{ey} / D >12, the column is considered to be slender for bending about y-y axis. The difference between a short column and slender column should be clearly understood. When a short column is loaded even with an axial load, the lateral deflection is either zero or very small, in contrast to this, when a slender column is loaded even with an axial load, the lateral deflection **Δ, measured** from the original centre line along its length. becomes appreciable this makes the axial .load eccentric at the central section of the column by a value **Δ** , subjecting the section to a **B.M** equal to $P_u \times \Delta$ in addition to an axial load . Hence separate consideration of this additional **B.M** has to be made. The axial compression due to axial

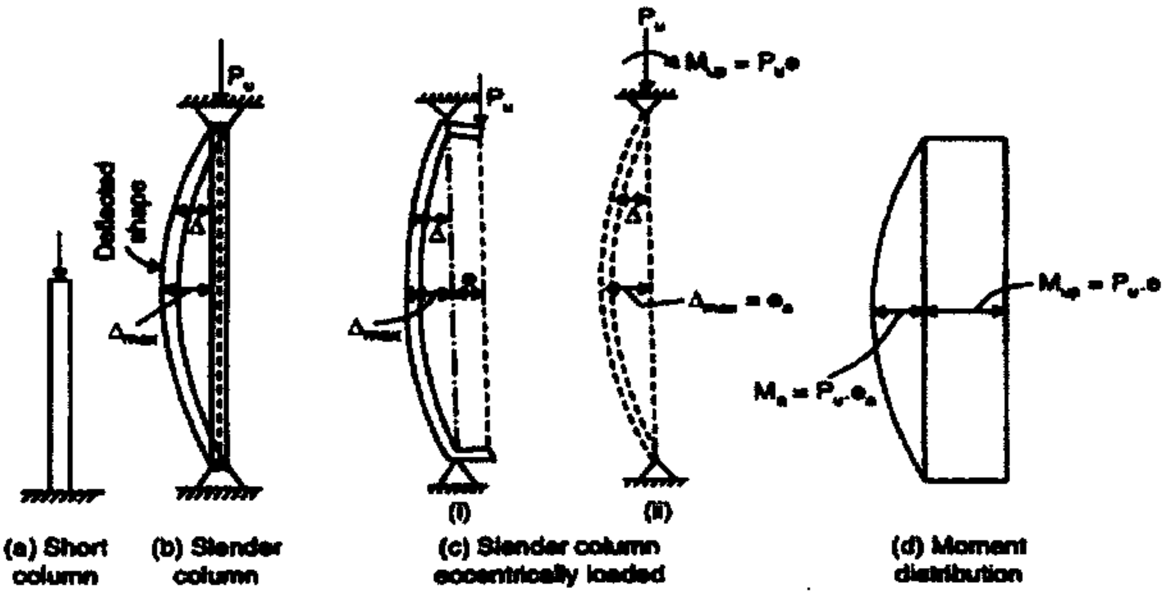


Fig (2-1) Effects of slender column

load is called the primary effect while the bending caused due to lateral deflection of slender column is called the secondary effect.

Similar effect takes place on an eccentrically loaded slender column. The moment due to the primary effect is $M_u = P_u . e$ where e is the original eccentricity of loading since the column deflects appreciably. The column is subjected to additional eccentricity $e_a = \Delta_{max}$ giving rise to additional moment $M_a = P_u . e_a$ due to this secondary effect. This secondary moment is known as ***P-Δ***
Moment, which has a variation along the height of the column. thus at any height.

$$M_u = P_u (e + \Delta)$$

And maximum moment is

$$M_{u.max} = P_u . e + P_u . \Delta_{max} = P_u . e + P_u . e_a$$

A short compression member is not in danger of buckling prior to its ultimate strength based on the material properties. In contrast to this, the buckling and addition deflection effects are more pronounced in slender column , thus reducing their ultimate strength.

2. Theory of slender columns

The design of slender columns is appreciably more complicated than the design of short columns. The avoidance of slender columns will depend on if the column is part of non sway frame or a sway frame and on the effective slenderness ratio (KL /R)

- k = effective length factor
- l = unsupported length of column (clear distance)
- r = radius of gyration

2.1 Nonsway or Sway Frame

• **ACI 318M-08 Equation 10-10:**

$$Q = \frac{(\sum P).\Delta}{\sum V.l}$$

Where:

Q =Stability Index

$\sum P$= total factored vertical load for all the columns of the story in question

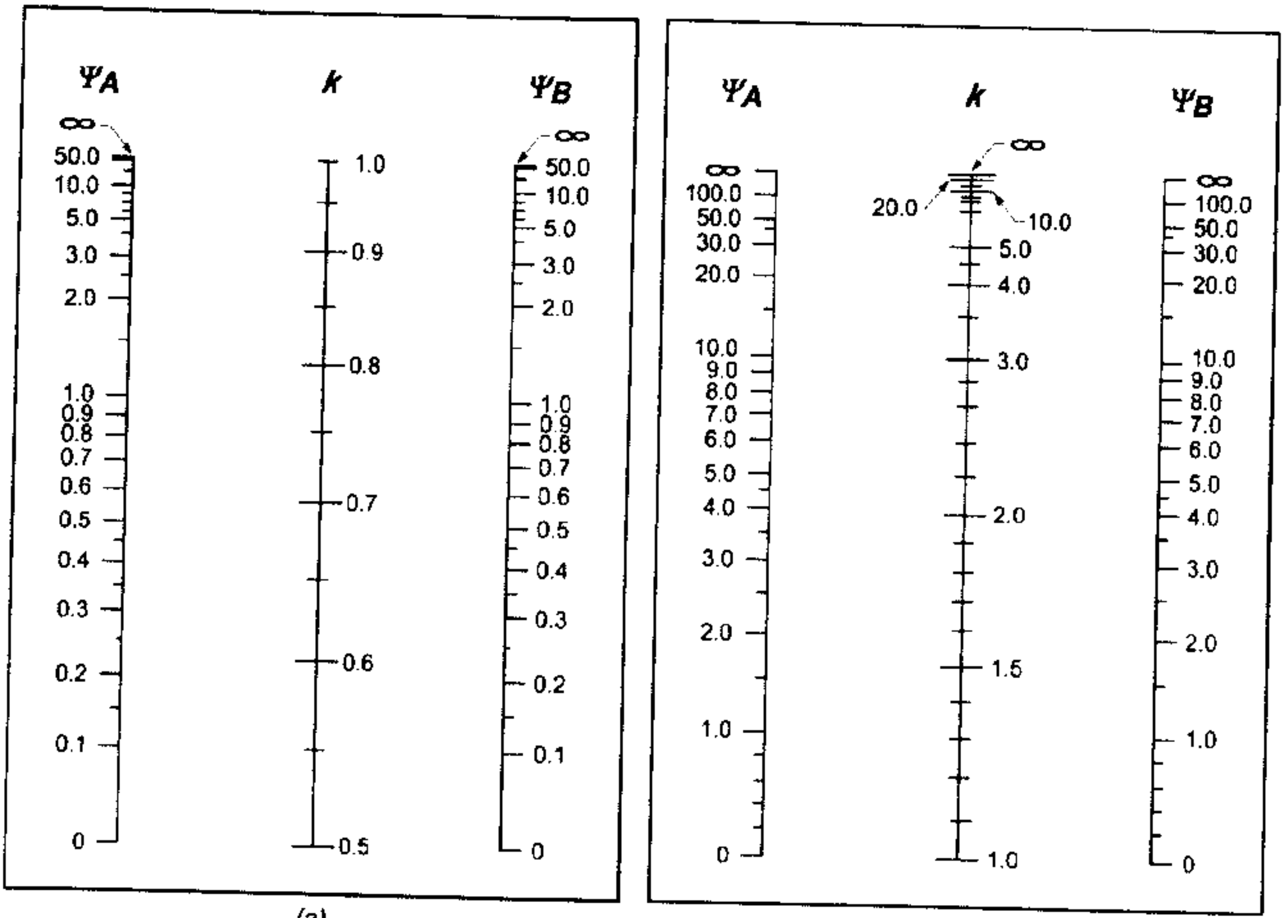
$\sum V$=total factored horizontal load for all the columns of the story in question

Δ=the elastically determined first - order lateral deflection due to V at the top of the story

l=the height of a compression member in a frame measured from center to center of the frame joist

If $Q \leq 0.05$ the frame may be classified as nonsway.

2. 2 Effective Length Factors



(a)
Nonsway Frames

(b)
Sway Frames

Ψ = ratio of $\Sigma(EI/\ell_c)$ of compression members to $\Sigma(EI/\ell)$ of flexural members in a plane at one end of a compression member

ℓ = span length of flexural member measured center to center of joints

Fig. R10.10.1.1—Effective length factors **k**.

2.3 Moments of Inertia:

-Columns: $I = 0.70I_g$

- Beams: $I = 0.35I_g$

For pin support:

$\psi = \infty$ theoretically, but taken as 10.

For fixed support:

$\psi = 0$ theoretically, but taken as 1.0.

2.4 Radius of gyration

• ACI 318M-08 Equation 10-10.1.2:

– For rectangular columns: r = 0.30 times

The overall dimension in the direction

Stability is being considered

– For circular columns: r = 0.25 times the diameter

– For other shapes: $r = \sqrt{I_g / A_g}$

2.5 Short or slender

ACI (318M-08)10.10.1: Columns in sway frames can be designed as short if:

$$\frac{k.l}{r} \leq 22$$

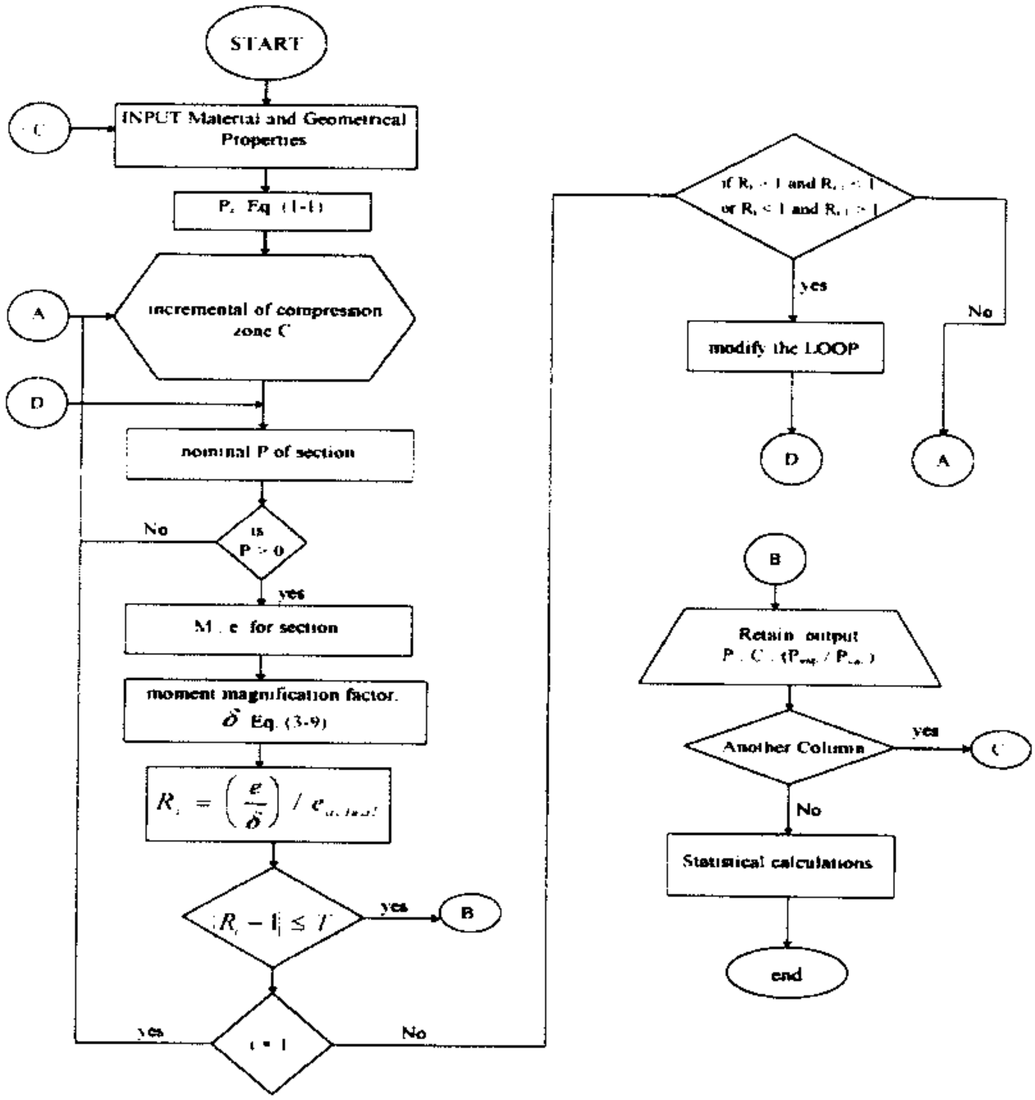
ACI (318-08) 10.10.1: Columns in no sway frames can be designed as short if:

$$\frac{k.l}{r} \leq 34 - 12(\frac{m_1}{m_2})$$

M1 is the smallest factored end moment, and *M2* is the largest factored end moment. (*M1 / M2*) is positive for single curvature (C-shaped) and negative in double curvature (S-shaped).

3. Computer Programmed

A computer programmed is developed to obtain the capacities of each column using the ACI 318 M-08 that are considered in this work. This programmed is developed in Microsoft office Excel 2007 – Microsoft Visual Basic 6.5 version 1040. The programmed has been developed for moment magnifier approach for column stability with rectangular stress block used for sectional analysis.



Algorithm for moment magnification approach analytical procedure

Chapter III – Calculation and results

Chapter III – Calculation and results

1. Introduction

The procedure that have been carried-out regarding the above-mentioned coculations was as follows :

A tied concrete column at $f_{c=32\ Mpa}$ wih a rectangular cross sectional area of 800x500 mm, reimforced by longitudinal bars of $f_{y=400\ Mpa}$ with $\rho = 1\%$ and L=12 M has been considerd in the beginning of the calculations.

Steel bars which have been assumed in the faces of the column parallel to the bending moment axis have been considered in 5 different situations, starting with symmetrical distribution i.e 50% on each face and then as an unsymmetrical distribiton starting with (40% and 60%) then (30% and 70%), (10% and 90%) and at last (0% and 100%) i.e all steel bars are in one side (tension side) of the column only .

Then the same calculations have been done and repeated 3 more times with different values of ρ which has been taken as 3% , 5% and 8%.

Then the same calculations have been done and repeated 2 more times with different Values of l which has been taken as 10m and 8m

Calculations has been carried as shown on the typical calculations sheet included in the study. The results of the said calculations have been included in the herewith attached tables and charts sheets.

Finally in the end of this study ther is a conclution showing the items got as result of the study.

2.Notation

Ag = gross area of concrete section, mm2 For a hollow section, ***Ag*** is the area of the concrete only and does not include the area of the void(s).

As = area of nonprestressed longitudinal tension reinforcement, mm2

h = overall thickness or height of member, mm

b = width of compression face of member, mm

fc' = specified compressive strength of concrete, MPa

fy = specified yield strength of reinforcement, MPa

fs = calculated tensile stress in reinforcement at service loads, MPa

Mn = nominal flexural strength at section, N·mm

Pn = nominal axial strength of cross section, N

β*t* = ratio of torsional stiffness of edge beam section to flexural stiffness of a width of slab equal to span length of beam, center-tocenter of supports

ρ = ratio of *As* to ***bd***

d = distance from extreme compression fiber to centroid of longitudinal tension reinforcement, mm

c = distance from extreme compression fiber to neutral axis, mm

3. Calculations sheet

Ex:-

a rectangular shape reinforced concrete column with the following dimensions and specifications has been taken as an example :-

h= 800 mm ***b= 500 mm*** ***fc= 32 Mpa*** ***fy= 400 Mpa*** ***L= 14000 mm***

Ast= 16000 mm² ***for sawy case Cm = 1***

Solution:-

$$P= \frac{A_s}{A_g} = \frac{16000}{800\times500} = 0.04$$

$$d1 = 40 + 12 + \frac{25}{2} = 64.5\ mm$$

$$d2 = 800 - d1 = 735.5\ mm$$

$$B1 = 0.85 - \frac{32-28}{140} = 0.821$$

$$F_{c^{\approx}} = 32 \times 0.85 = 27.2\ Mpa$$

$$\overline{X} = \frac{0.85 f_c' b\, h^2/2 + \sum A_S f_y d}{0.85 f_c' b h + \sum A_S f_y}$$

$$X = \frac{8000\times400\times64.5+8000\times400\times735.5+(400000-16000)\times27.2\times400}{8000\times400+8000\times400+384000\times27.2} = 400\ mm$$

Assume C= 100 m

$$C_c = B1\times C\times b\times F_{c^{\approx}} / 1000 = .82142857\times100\times500\times27.2/1000 = 1117.1428$$

$$f_{s1} = \frac{c-d}{c} * 600$$

$$f_{s1} = \frac{100-64.5}{100} = 213\ mm$$

$f_{1}=\frac{8000\times(213-27.2)}{1000}=1486$

$f_{s2}=\frac{c-d}{c}*600$

$f_{s2}=\frac{100-735.5}{100}\times600=-3813$ $\therefore f=-400\ Mpa$

$f_{2}=\frac{8000\times -400}{1000}=-3200$

$p_{n}=\sum f_{s+C_c}$

$p_{n}=-3200+1486+1117.1428=-596.457$

$M_{n}=C_C\times X-\frac{B1\times C}{2}+\sum f*(x-d)$

$M_{n}=1117.1428\,(400-41.05)+1486(400-64.5)-3200(400-735.5)=1973.262$

$P_{s}=\frac{P_{n\times10^3}}{hbf_c}=\frac{-596.457*10^3}{800*500*32}=-0.0466$

$M_{s}=\frac{M_{n*10^6}}{bh^2f_c}=\frac{11973.262*10^6}{500*800^2*32}=0.1927$

$EI=0.2E_C*I_g+E_s*I_s$

$E_{c}=4700\times\sqrt{32}=26587.2197$

$I_{g}=\frac{bh^2}{12}=21.33*10^9\ mm^4$

$E_{s}=200000$

$I_{s}=8000*(400-64.5)^2+8000\,(400-735.5)^2=1800964000\ mm^4$

$$EI = 0.2*26587.2197*21.33*10^9 + 200000*1800964000 = 4.7*10^{14}$$

$$P_{cr} = \frac{\pi^2 * EI}{L^2} = \frac{\pi^2 * 4.7 * 10^{14}}{(14000)^2} = 23666908.51$$

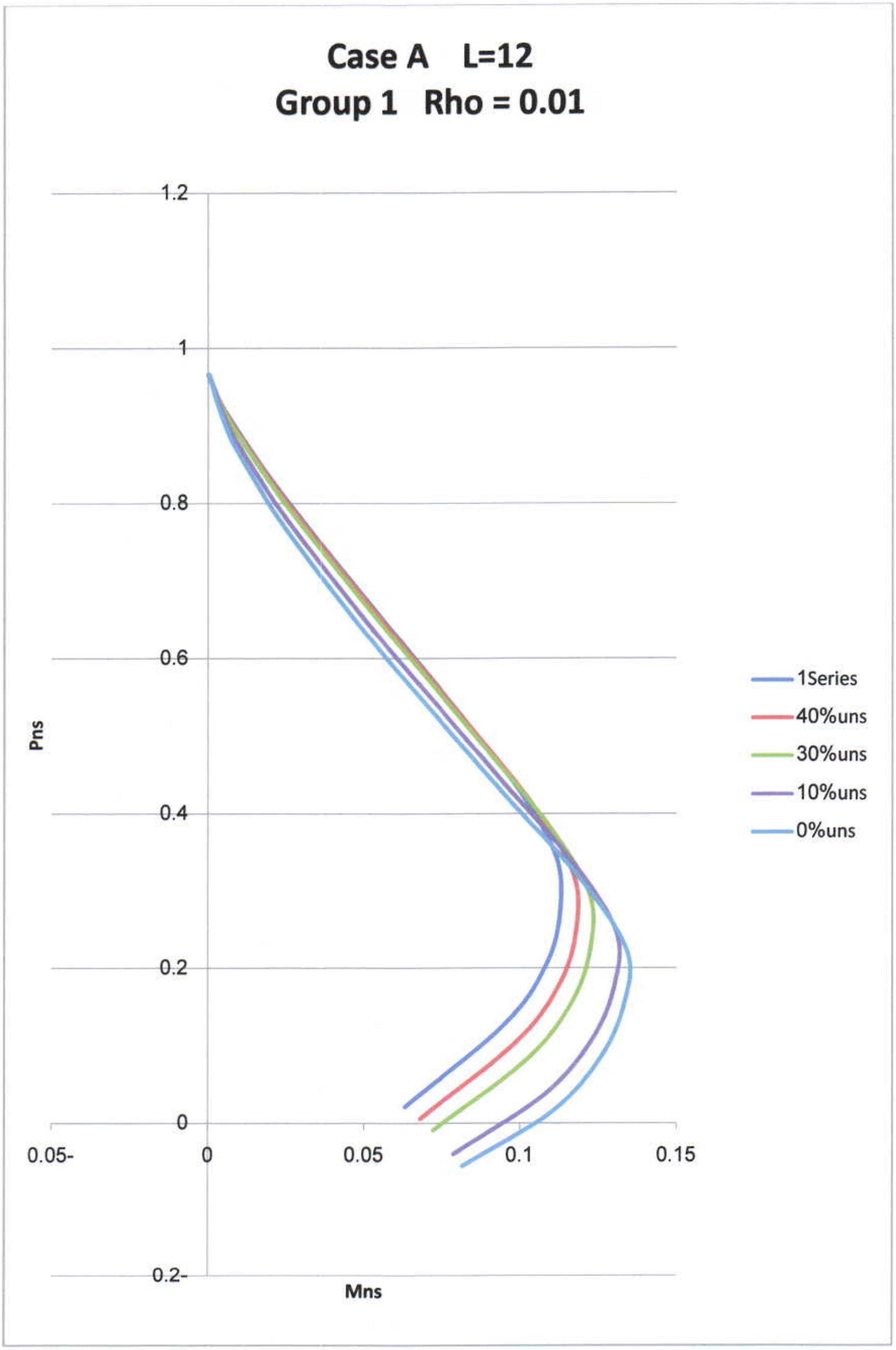
$$\delta = \frac{C_m}{1 - \frac{P_N}{.75 * P_{cr}}} = \frac{1}{1 - \frac{-596.457}{.75 * 23666908.51}} = .99 \approx 1$$

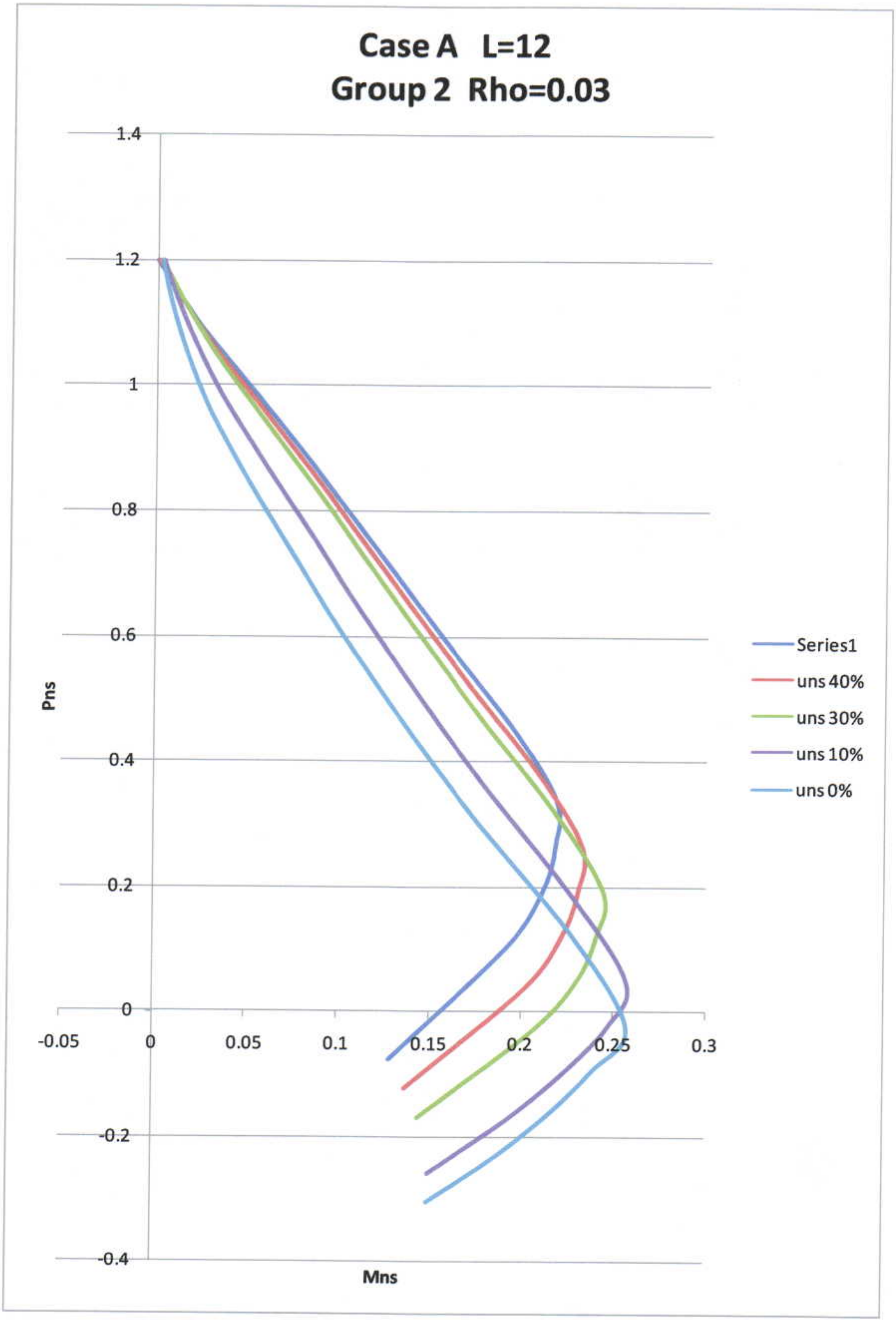
$\therefore$ ***short column***

$$M_C = M_n / \delta = 1973.262 / 1 = 1973.262$$

Now choose another **C** and repeat the same calculation procedure to determine another magnitude for P_S , M_S and M_c

4. Charts


Case A L=12
Group 1 Rho = 0.01
1.2
1
0.8
0.6
0.4
0.2
0
0.2-
Pns
0.05-
0
0.05
0.1
0.15
Mns
1Series
40%uns
30%uns
10%uns
0%uns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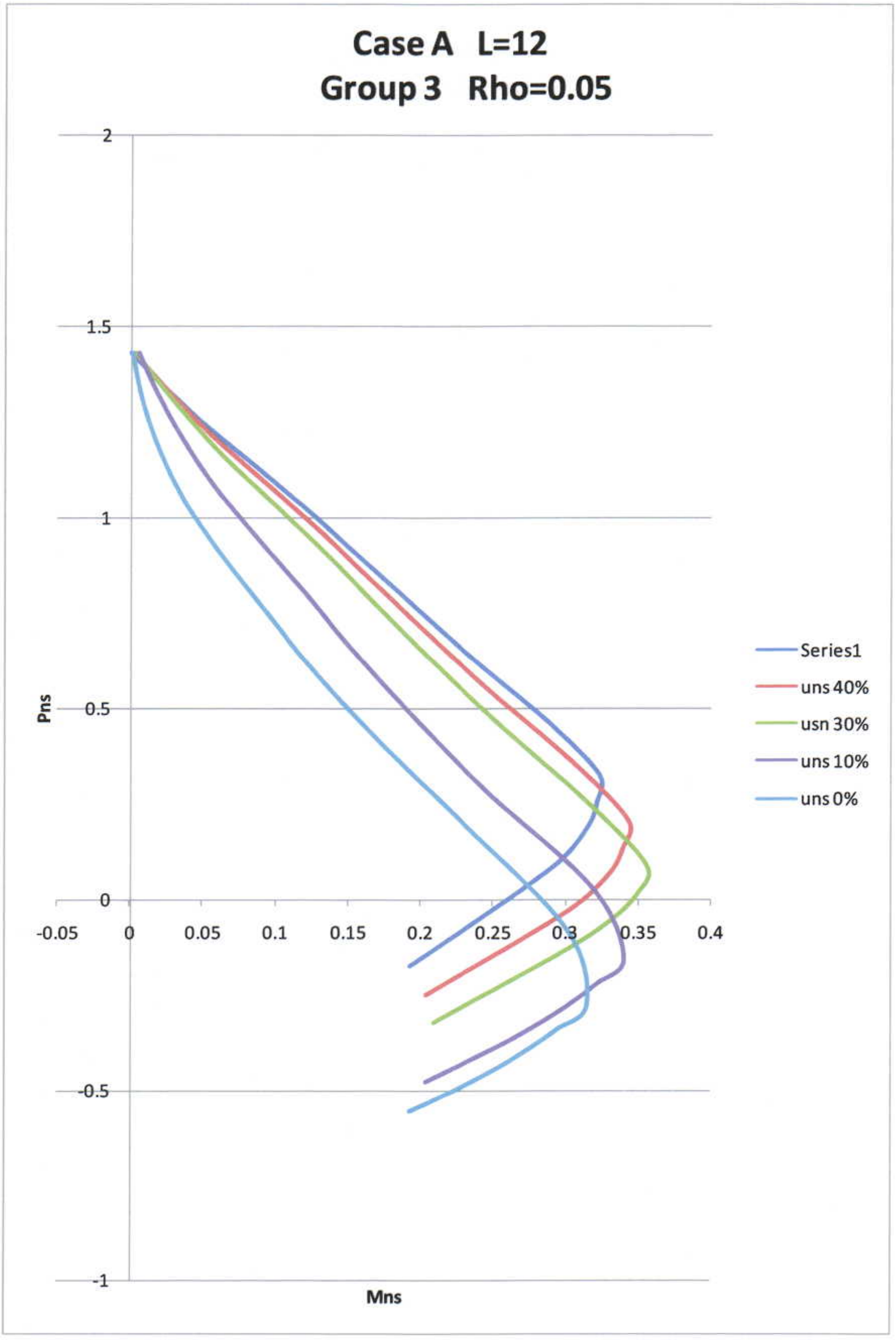
Group 2 Rho=0.03
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
Pns
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
Mns
Series1
uns 40%
uns 30%
uns 10%
uns 0%



Case A L=12
Group 3 Rho=0.05
Pns
Mns
2
1.5
1
0.5
0
-0.5
-1
-0.05
0
0.05
0.1
0.15
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Series1
uns 40%
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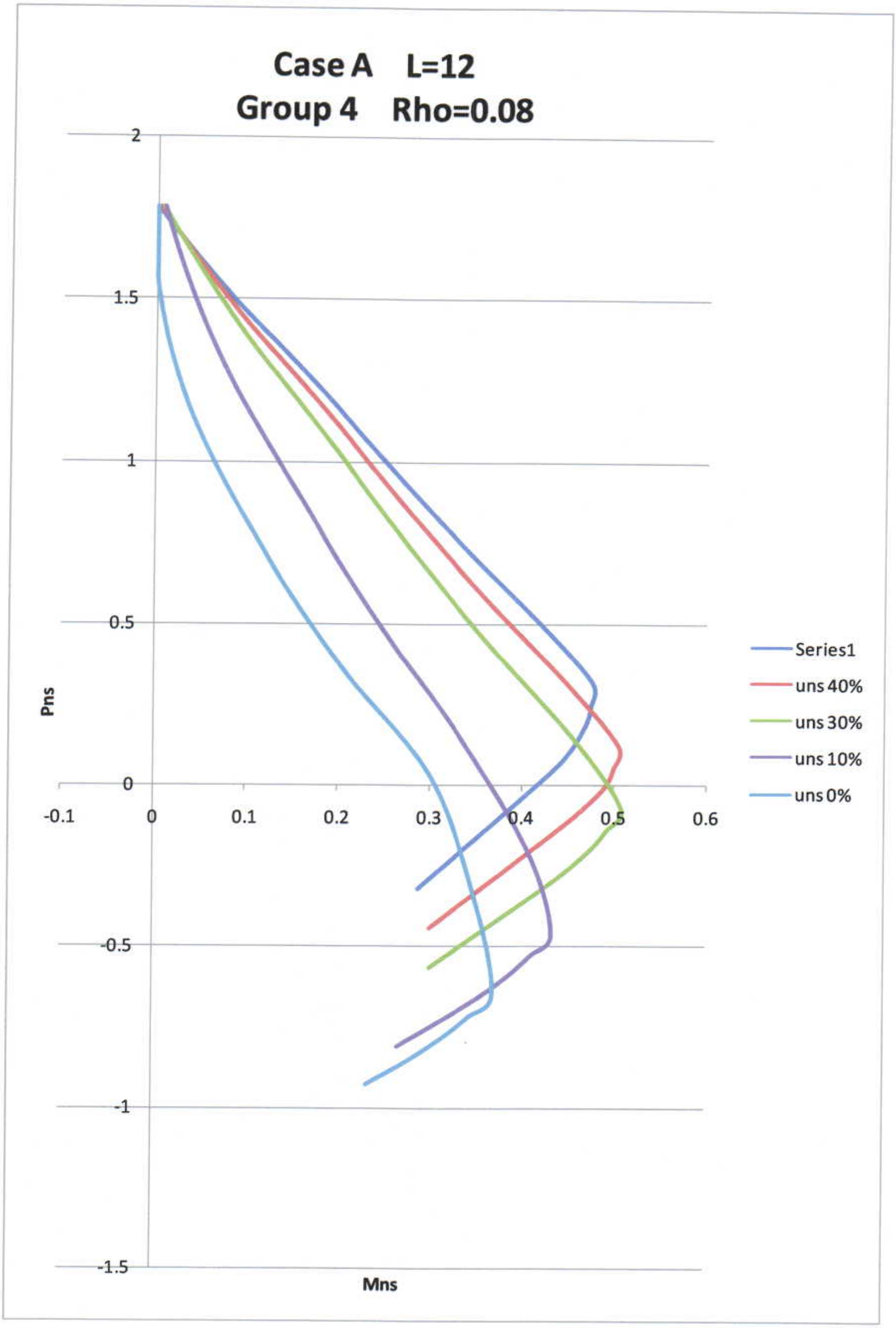
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Group 4 Rho=0.08
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1.5
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0
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-1
-1.5
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Pns
Mns
Series1
uns 40%
uns 30%
uns 10%
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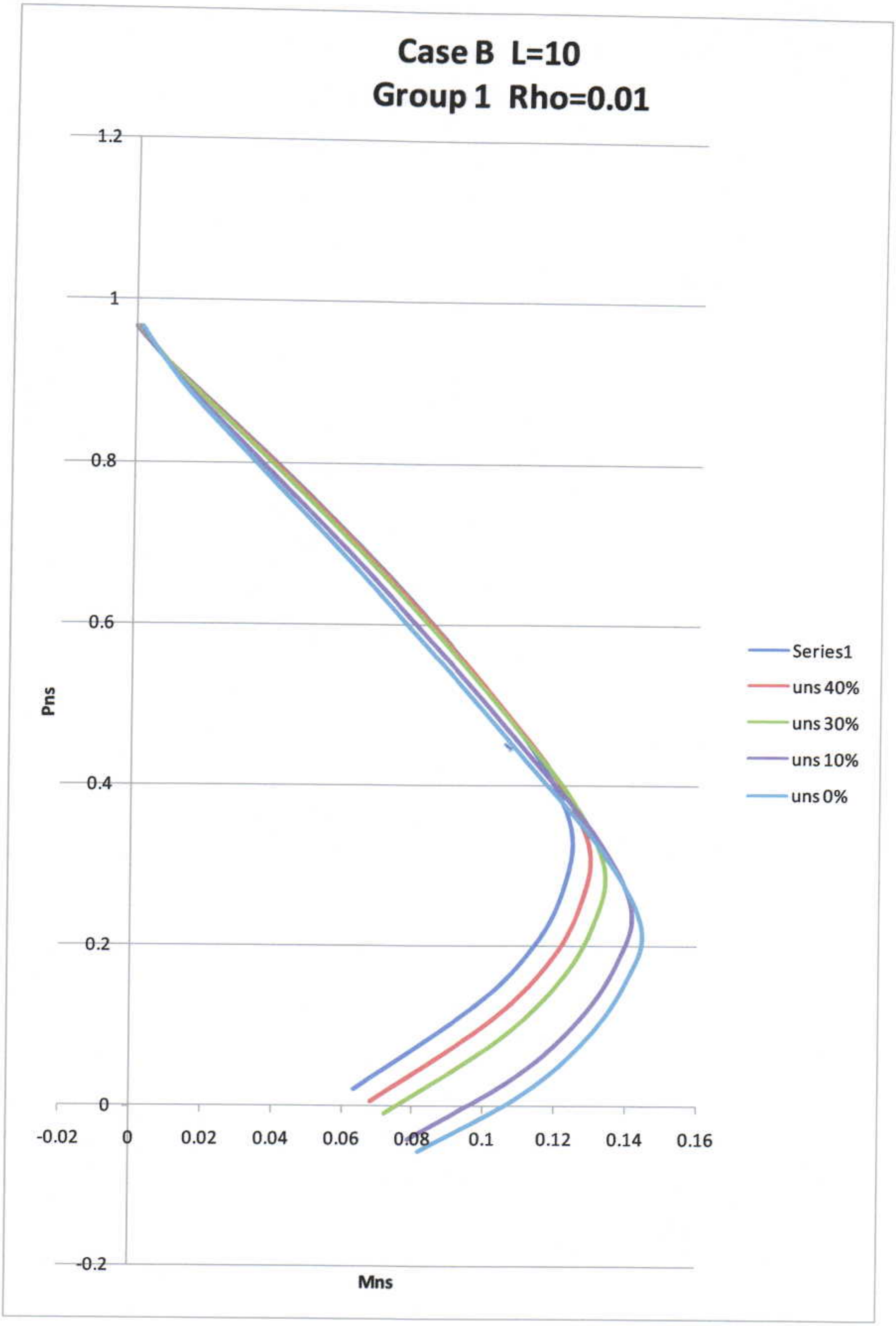
Case B L=10
Group 1 Rho=0.01
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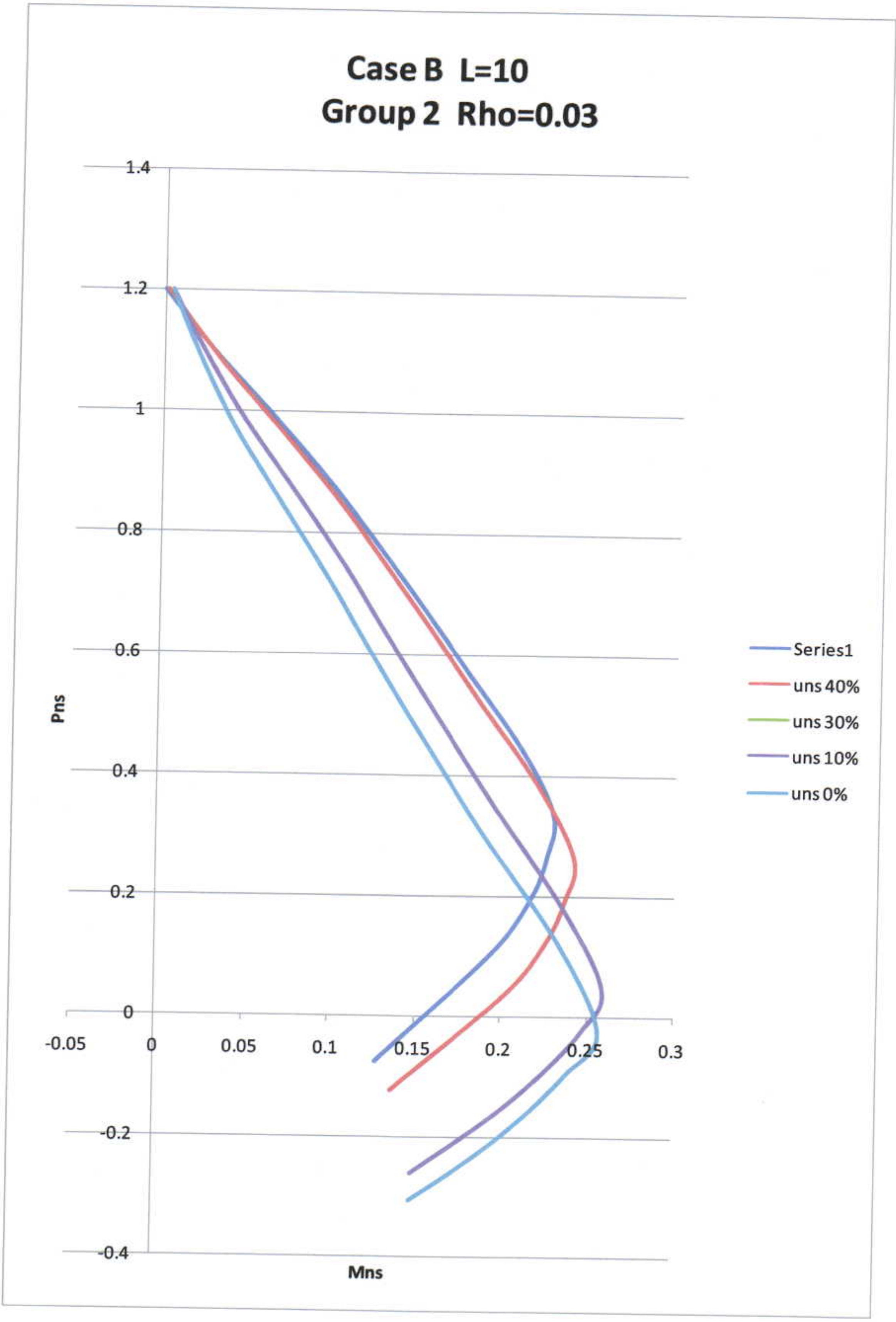
1
0.8
0.6
0.4
0.2
0
-0.2
Pns
-0.02
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
Mns
Series1
uns 40%
uns 30%
uns 10%
uns 0%


Case B L=10
Group 2 Rho=0.03
1.4
1.2
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0.8
0.6
0.4
0.2
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-0.2
-0.4
-0.05
0
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Series1
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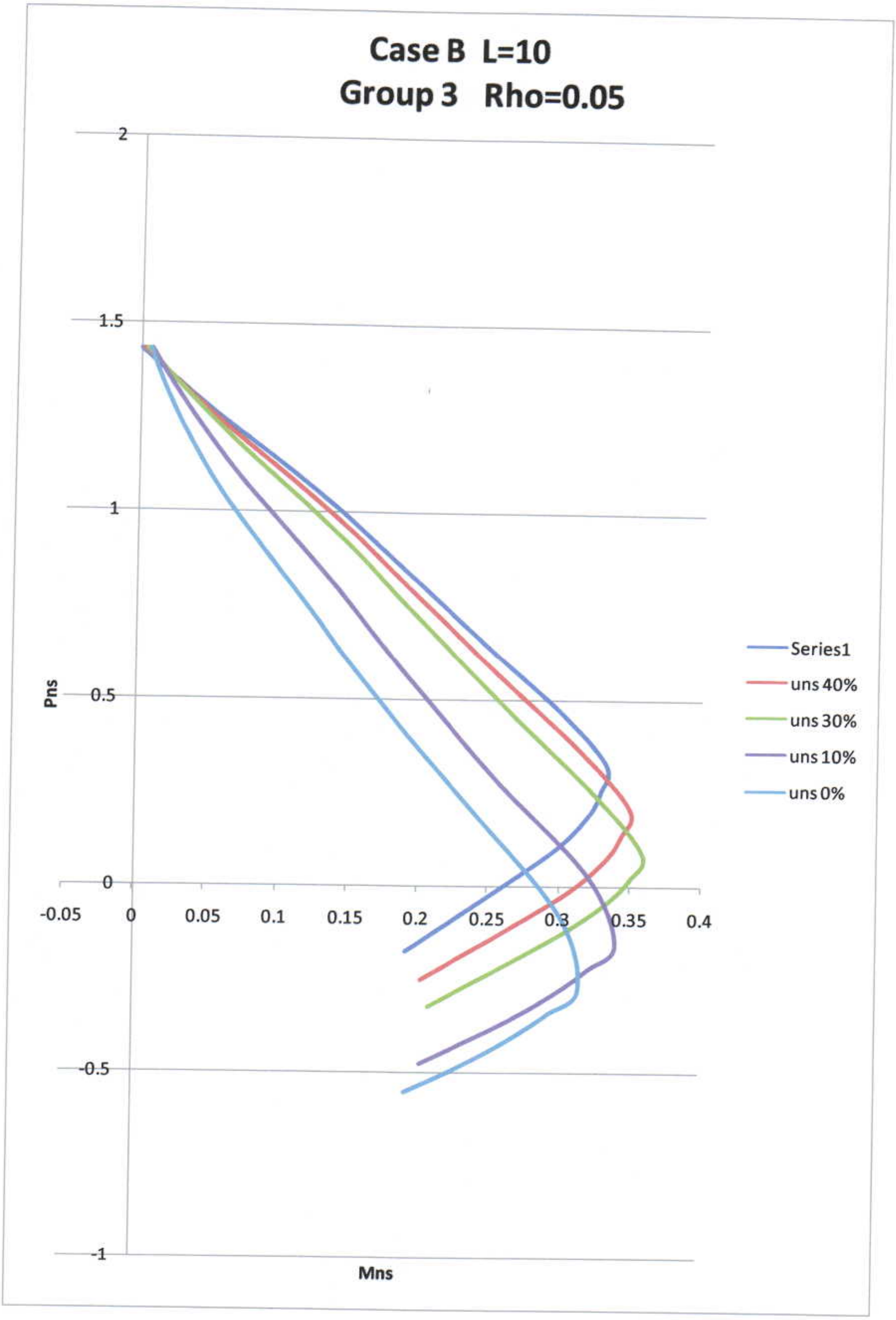
Case B L=10
Group 3 Rho=0.05
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1
0.5
0
-0.5
-1
Pns
-0.05
0
0.05
0.1
0.15
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Mns
Series1
uns 40%
uns 30%
uns 10%
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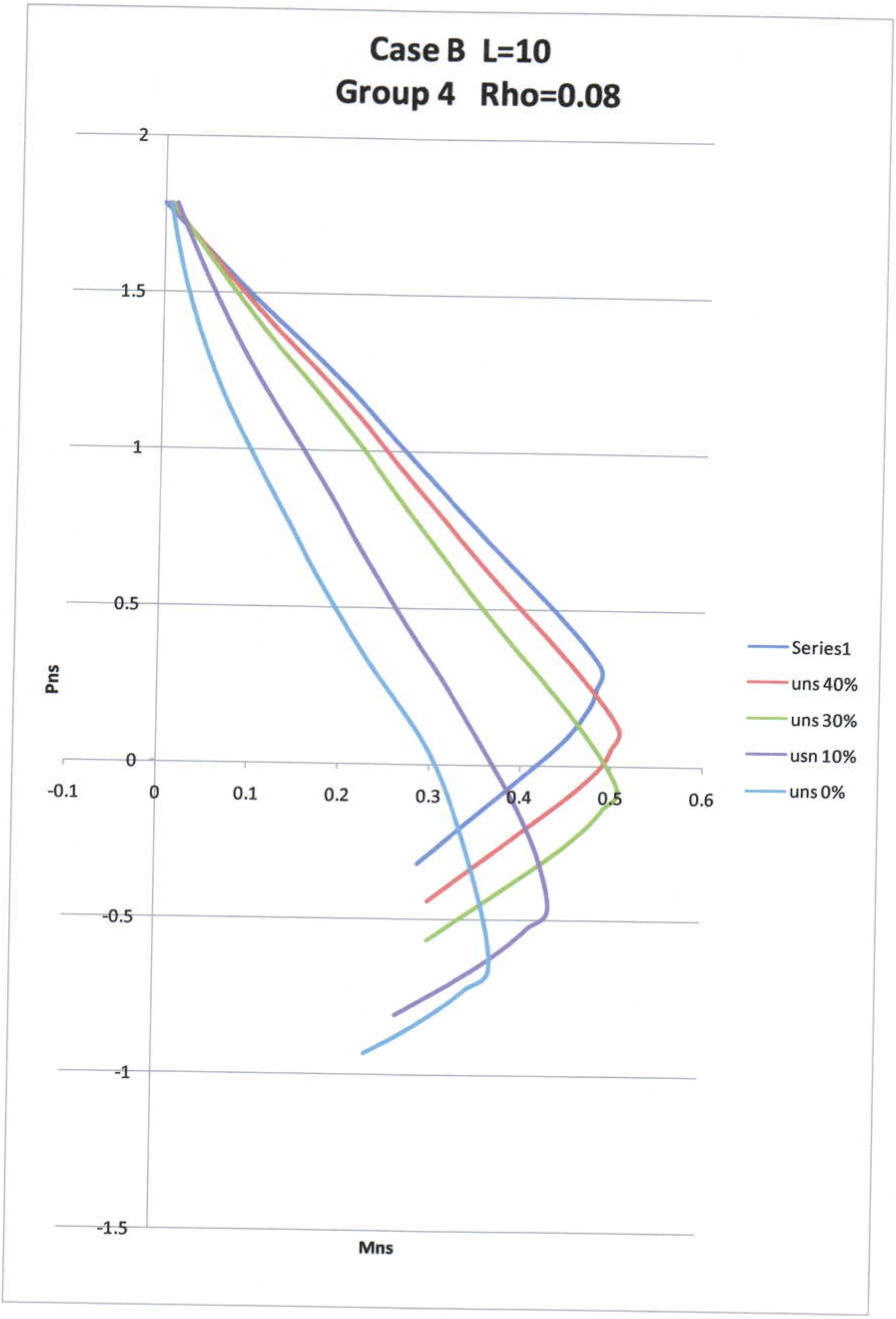
Case B L=10
Group 4 Rho=0.08
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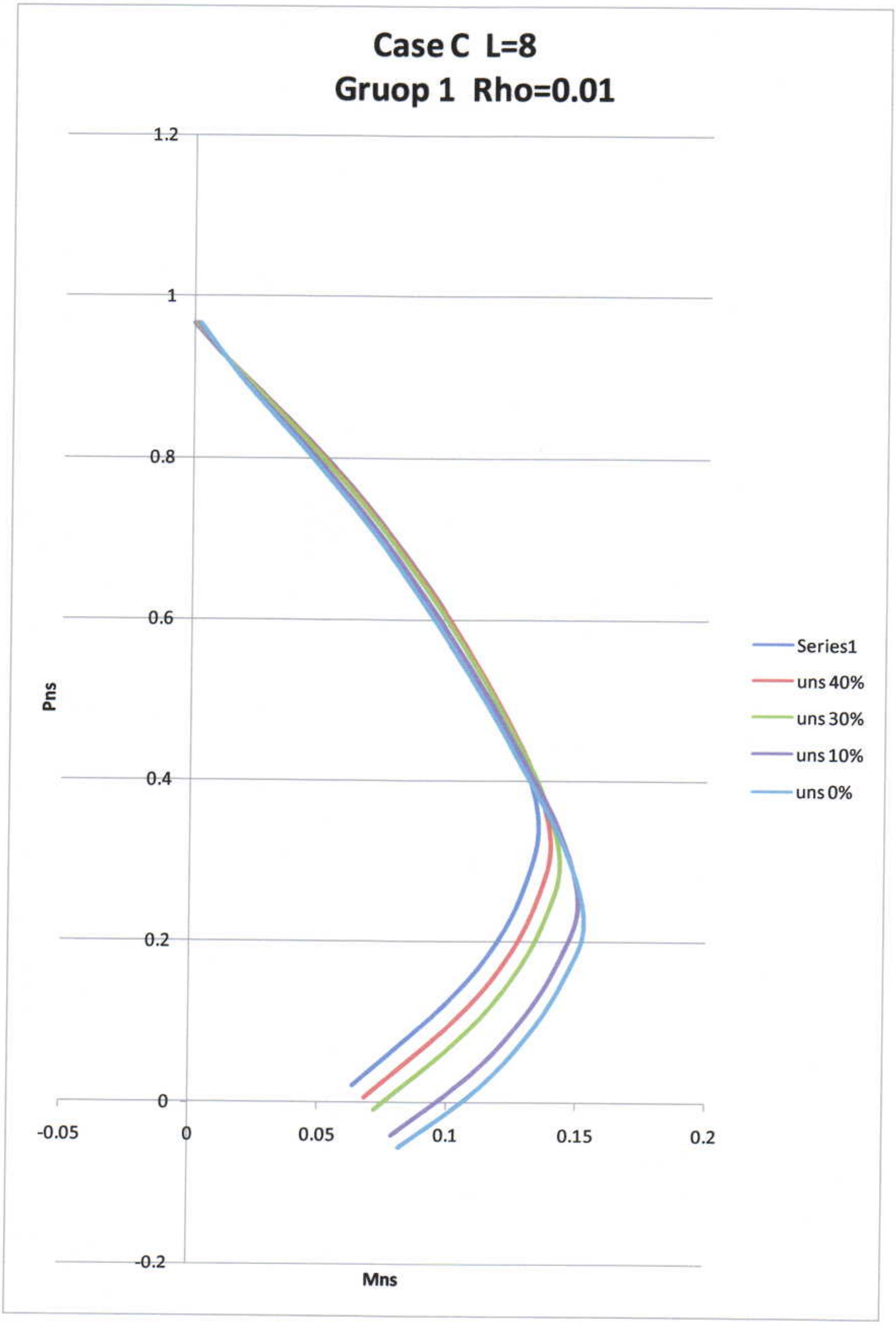
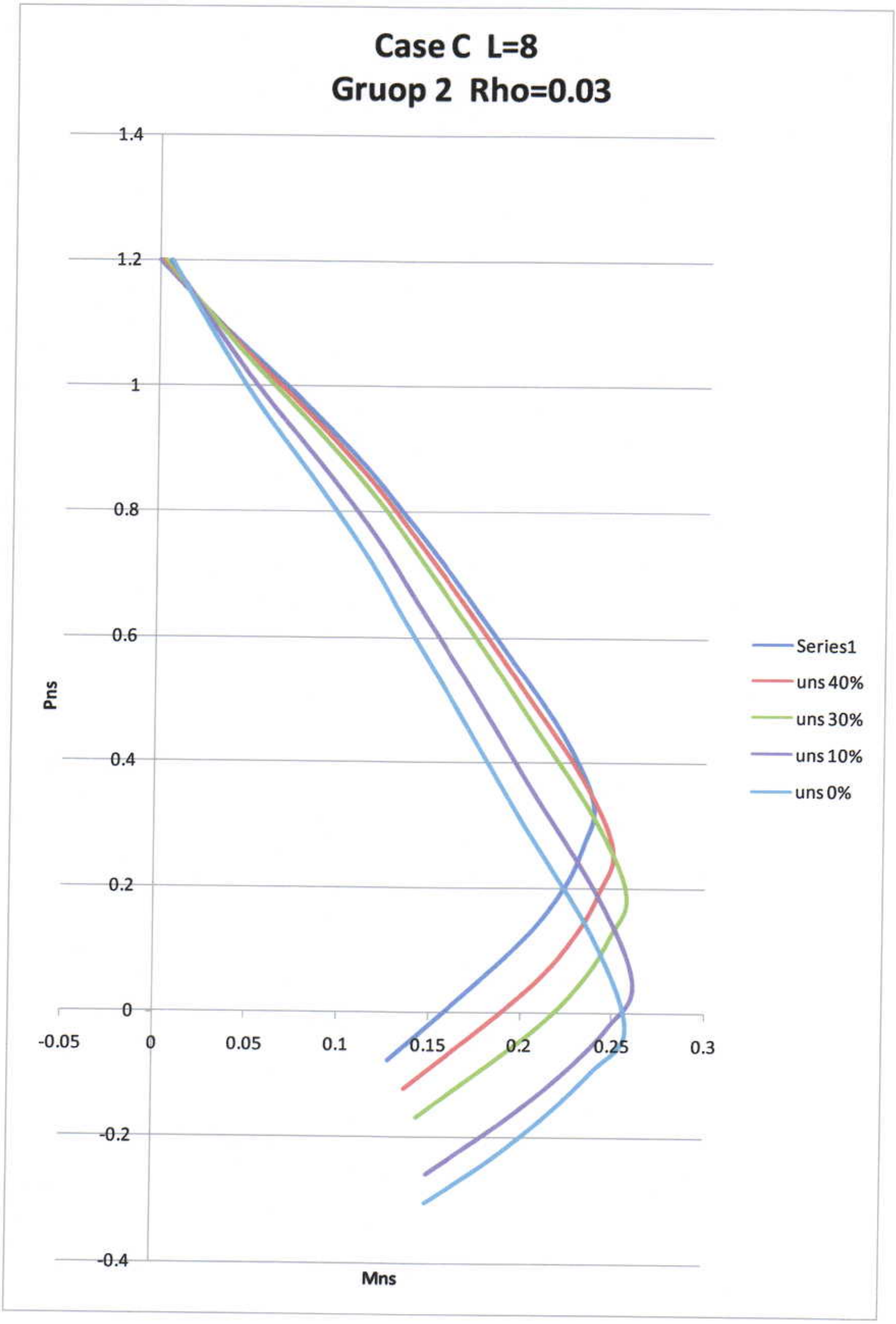
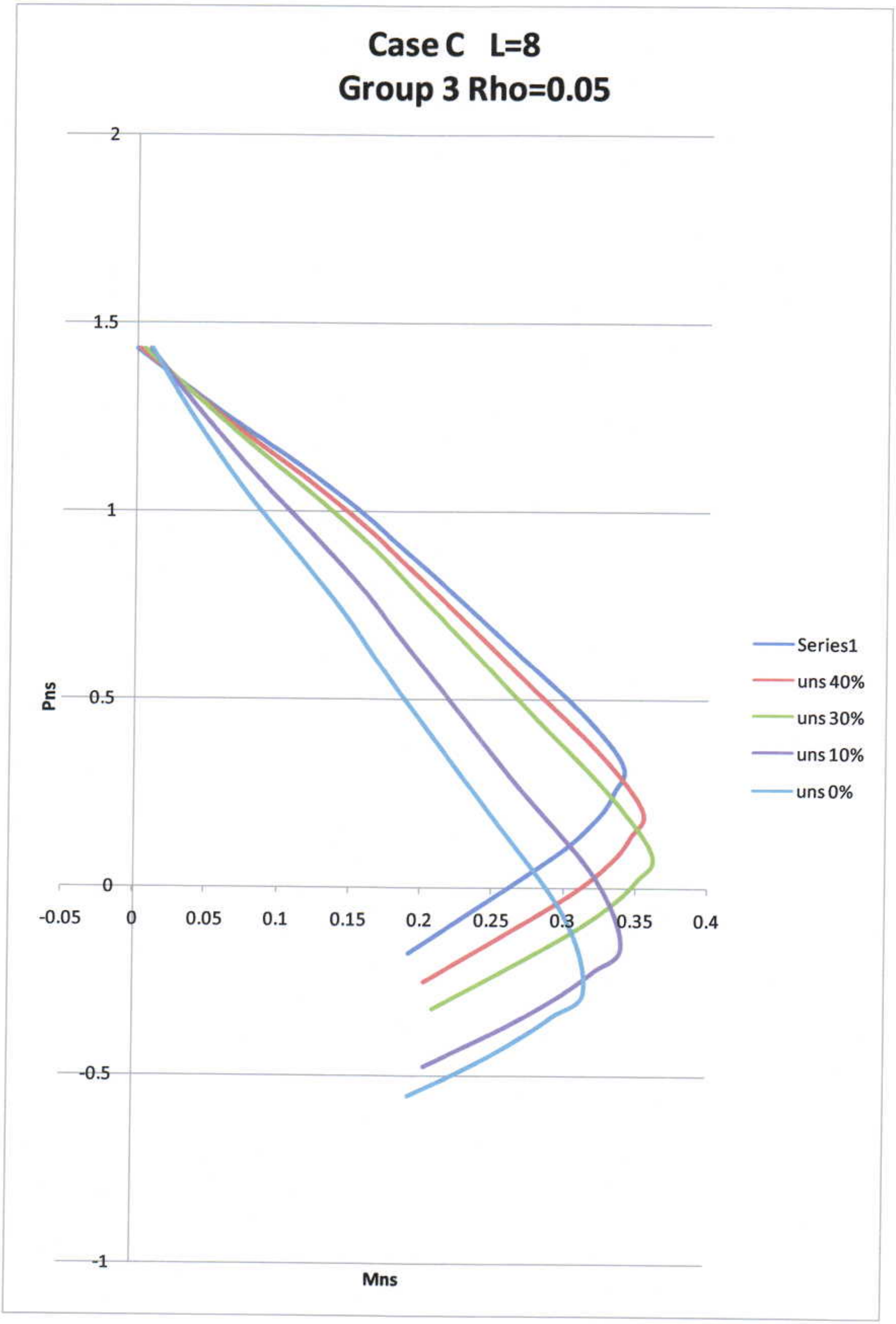
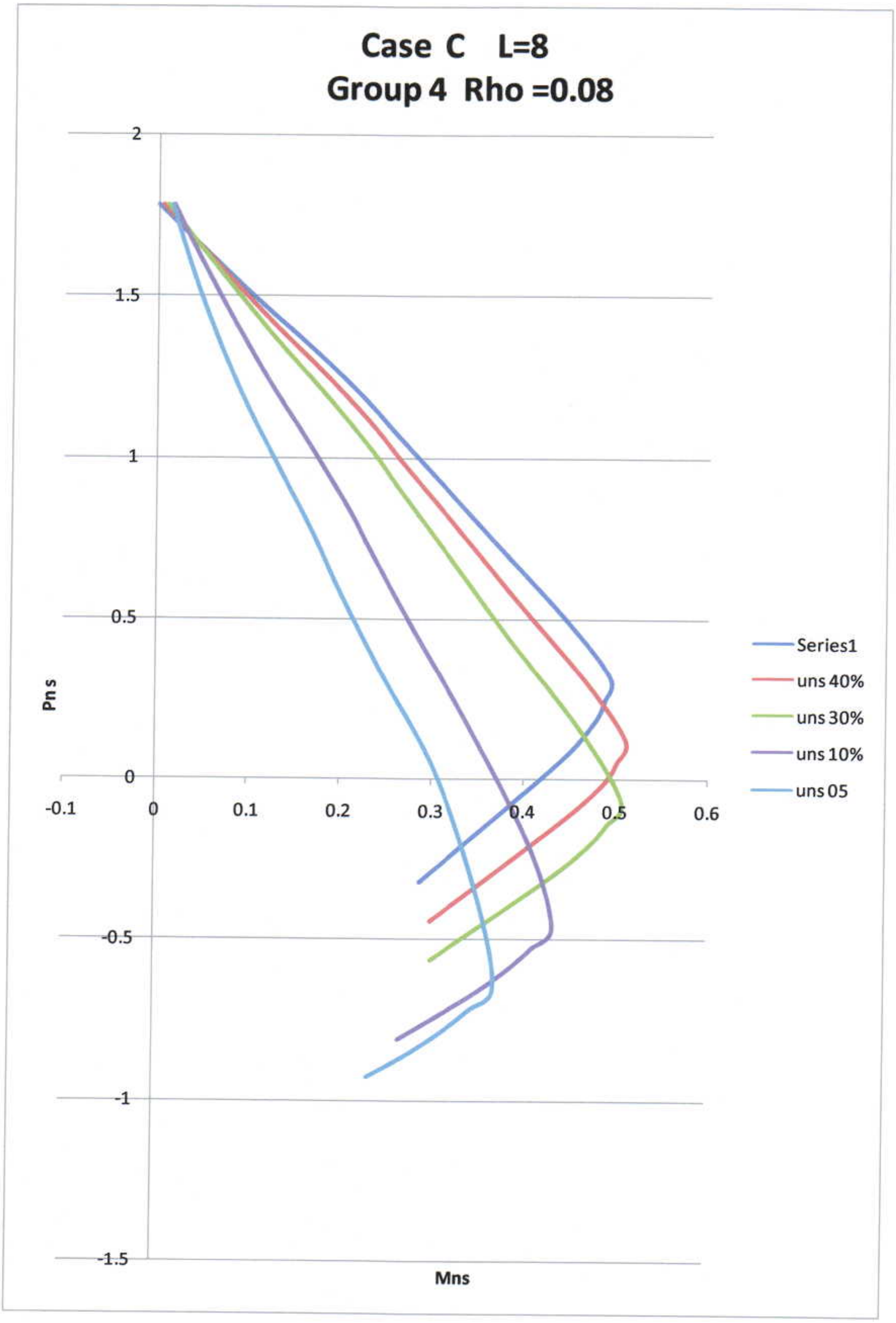
1.5
1
0.5
0
-0.5
-1
-1.5
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Pns
Mns
Series1
uns 40%
uns 30%
usn 10%
uns 0%


Case C L=8
Gruop 1 Rho=0.01
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
Pns
-0.05
0
0.05
0.1
0.15
0.2
Mns
Series1
uns 40%
uns 30%
uns 10%
uns 0%


Case C L=8
Gruop 2 Rho=0.03
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
Pns
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
Mns
Series1
uns 40%
uns 30%
uns 10%
uns 0%


Case C L=8
Group 3 Rho=0.05
2
1.5
1
0.5
0
-0.5
-1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Pns
Mns
Series1
uns 40%
uns 30%
uns 10%
uns 0%


Case C L=8
Group 4 Rho =0.08
2
1.5
1
0.5
0
-0.5
-1
-1.5
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Pn s
Mns
Series1
uns 40%
uns 30%
uns 10%
uns 05

5. Conclusion

Studying the results shown in the tables and charts included in this study, it has been noticed that:

1- In case of ρ =0.01 the resistant moment increases as the tensile steel portion increases.

2- In case of ρ =0.08 the resistant moment also increases as the tensile steel portion increases, but to a certain limit after which the resistant moment starts decreasing as the tensile steel portion increases.

3- The limits mentioned in item 2 above vary as ρ of the steel varies.

4- As the unsymmetrical ratio increase, the bending moment resistance will increase in significant values when the axial load is small.

5- When the column length increase, the effect of unsymmetrical reinforcement will increase the resistance of bending moment at small values of axial load.

6. References

1- Nilson A. H. and Winter G.1988.Chapter 12. In “Design of Concrete Structures”, tenth edition, McGraw-Hill Book Company, New York.

2- Dunham C. (1966). Chapter 6& 7. In “The Theory and practice of reinforced concrete”; fourth edition. McGraw-Hill Book Company.

3- Urquhart L.C., O’Rourke C.E. and Winter G. (1958). Chapter 4. In “Design of concrete structures” sixth edition. McGraw-Hill Book Company.

4- ACI committee 318 (2008). Building code requirements for structural concrete (ACI 318M-08) & commentary. American concrete institute.

Appendix A
Numerical Result

				Case A		L=12			
				Group 1		Rho=0.01			
		h=800		b=500		fy=400		f'c=32	
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.06301	0.02124	0.0679	0.00595	0.07204	-0.0093	0.07866	-0.0399	0.08147	-0.0552
0.09536	0.12885	0.09913	0.10601	0.10247	0.08317	0.10793	0.03748	0.11011	0.01464
0.10841	0.20521	0.11281	0.18106	0.1167	0.15691	0.12312	0.10861	0.1257	0.08446
0.11281	0.27504	0.11792	0.25089	0.1225	0.22674	0.13017	0.17844	0.13331	0.15429
0.1114	0.34486	0.11703	0.32071	0.12209	0.29656	0.13057	0.24826	0.13401	0.22411
0.10007	0.42728	0.10497	0.40565	0.10925	0.38402	0.11597	0.34075	0.11838	0.31912
0.08272	0.51762	0.08624	0.50009	0.08913	0.48257	0.09289	0.44751	0.09367	0.42999
0.06561	0.60283	0.06822	0.58838	0.0702	0.57394	0.07209	0.54504	0.07186	0.53059
0.04882	0.68462	0.05079	0.67257	0.05217	0.66052	0.05293	0.63641	0.05214	0.62436
0.03378	0.75977	0.0355	0.74878	0.03669	0.7378	0.03724	0.71582	0.03639	0.70483
0.01896	0.83743	0.0203	0.82801	0.02123	0.81859	0.02163	0.79975	0.02088	0.79032
0.00628	0.91378	0.00732	0.90567	0.00814	0.89755	0.00885	0.88132	0.00856	0.8732
0.00381	0.93145	0.00468	0.92444	0.00539	0.91743	0.00607	0.90341	0.00588	0.8964
0.00325	0.93618	0.004	0.93012	0.00462	0.92406	0.00517	0.91193	0.00496	0.90587
0.00277	0.94029	0.00343	0.93505	0.00397	0.9298	0.00443	0.91932	0.00422	0.91408
0.00236	0.94388	0.00295	0.93936	0.00341	0.93483	0.0038	0.92578	0.0036	0.92126
0.00201	0.94705	0.00253	0.94316	0.00294	0.93927	0.00328	0.93149	0.00309	0.9276
0.00171	0.94987	0.00216	0.94654	0.00253	0.94321	0.00283	0.93656	0.00265	0.93323
0.00144	0.95239	0.00184	0.94956	0.00217	0.94674	0.00244	0.94109	0.00228	0.93827
0.0012	0.95465	0.00156	0.95229	0.00185	0.94992	0.0021	0.94518	0.00196	0.94281
0.00098	0.95671	0.00131	0.95475	0.00157	0.95279	0.0018	0.94887	0.00168	0.94691
0.00079	0.95857	0.00108	0.95699	0.00132	0.9554	0.00154	0.95223	0.00143	0.95064
0.00062	0.96028	0.00088	0.95903	0.0011	0.95779	0.0013	0.9553	0.00122	0.95405
0.00046	0.96184	0.0007	0.9609	0.0009	0.95997	0.00109	0.95811	0.00103	0.95717
0.00032	0.96327	0.00053	0.96263	0.00071	0.96198	0.0009	0.96069	0.00086	0.96005
0.00019	0.9646	0.00038	0.96422	0.00055	0.96384	0.00073	0.96308	0.00071	0.9627
6.5E-05	0.96583	0.00024	0.96569	0.00039	0.96556	0.00058	0.96529	0.00057	0.96515
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665
1.6E-17	0.9665	0.00016	0.9665	0.00031	0.9665	0.0005	0.9665	0.0005	0.9665

				Case A		L=12			
				Group 2		Rho=0.03			
		h=800		b=500		fy=400		f'c=32	
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.12818	-0.0759	0.13721	-0.1218	0.14384	-0.1676	0.14988	-0.2593	0.1493	-0.3052
0.19289	0.10726	0.20235	0.03874	0.20591	-0.0298	0.1954	-0.1668	0.18476	-0.2354
0.21168	0.19671	0.22265	0.12426	0.23022	0.05181	0.22536	-0.0931	0.21449	-0.1655
0.21805	0.26654	0.2309	0.19409	0.24033	0.12164	0.24752	-0.0233	0.23848	-0.0957
0.21862	0.33636	0.23307	0.26391	0.24403	0.19146	0.25714	0.04656	0.25673	-0.0259
0.19691	0.44397	0.20952	0.37908	0.21869	0.31419	0.22739	0.18441	0.22761	0.11951
0.16213	0.57536	0.17117	0.52278	0.17694	0.4702	0.17821	0.36504	0.17286	0.31247
0.13219	0.69135	0.13907	0.64801	0.14289	0.60467	0.1401	0.51798	0.13162	0.47464
0.10469	0.79709	0.11024	0.76093	0.11301	0.72477	0.10833	0.65244	0.09837	0.61628
0.08249	0.88289	0.08793	0.84993	0.0908	0.81696	0.08663	0.75103	0.07673	0.71807
0.05663	0.97622	0.06159	0.94795	0.06438	0.91969	0.06109	0.86316	0.05206	0.8349
0.03139	1.06563	0.03614	1.04128	0.03924	1.01694	0.03813	0.96825	0.03123	0.9439
0.02374	1.09435	0.02796	1.07332	0.03078	1.05229	0.03001	1.01022	0.02395	0.98919
0.0203	1.10855	0.02401	1.09036	0.02647	1.07218	0.02561	1.0358	0.02	1.01761
0.01738	1.12087	0.02066	1.10514	0.02284	1.08941	0.02199	1.05796	0.01682	1.04223
0.01487	1.13164	0.0178	1.11807	0.01974	1.1045	0.01896	1.07735	0.01424	1.06378
0.01269	1.14115	0.01532	1.12948	0.01708	1.11781	0.01639	1.09447	0.01211	1.0828
0.01078	1.1496	0.01315	1.13962	0.01475	1.12964	0.0142	1.10968	0.01033	1.0997
0.00909	1.15716	0.01123	1.14869	0.01271	1.14022	0.0123	1.12328	0.00883	1.11482
0.00758	1.16396	0.00954	1.15686	0.01091	1.14975	0.01065	1.13553	0.00756	1.12843
0.00624	1.17012	0.00802	1.16424	0.0093	1.15837	0.0092	1.14661	0.00647	1.14074
0.00503	1.17572	0.00666	1.17096	0.00787	1.1662	0.00792	1.15669	0.00553	1.15193
0.00393	1.18083	0.00543	1.17709	0.00657	1.17336	0.00678	1.16589	0.00472	1.16215
0.00293	1.18551	0.00431	1.18271	0.0054	1.17992	0.00576	1.17432	0.004	1.17152
0.00202	1.18982	0.00329	1.18788	0.00433	1.18595	0.00485	1.18208	0.00338	1.18014
0.00119	1.1938	0.00236	1.19266	0.00335	1.19152	0.00403	1.18924	0.00283	1.1881
0.00042	1.19748	0.00151	1.19708	0.00246	1.19667	0.00328	1.19587	0.00234	1.19546
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995
0	1.1995	0.00104	1.1995	0.00198	1.1995	0.00287	1.1995	0.00208	1.1995

		Case A		L=12					
		Group 3		Rho=0.05					
	h=800		b=500		fy=400		f'c=32		
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.19227	-0.1731	0.20352	-0.2495	0.20917	-0.3259	0.2037	-0.4788	0.19257	-0.5552
0.2905	0.08568	0.30131	-0.0285	0.29643	-0.1427	0.26161	-0.3712	0.23165	-0.4854
0.31417	0.18821	0.32971	0.06746	0.33179	-0.0533	0.2961	-0.2948	0.265	-0.4155
0.32125	0.25804	0.33951	0.13729	0.3499	0.01654	0.32116	-0.225	0.29261	-0.3457
0.32254	0.32786	0.34321	0.20711	0.356	0.08636	0.34048	-0.1551	0.31449	-0.2759
0.28896	0.46067	0.30698	0.35251	0.31746	0.24436	0.31912	0.02806	0.30085	-0.0801
0.23533	0.6331	0.24816	0.54547	0.25414	0.45784	0.24559	0.28257	0.23042	0.19494
0.19187	0.77988	0.20169	0.70764	0.20532	0.6354	0.19185	0.49092	0.17	0.41868
0.15389	0.90955	0.16199	0.84928	0.16455	0.78902	0.14938	0.66848	0.12427	0.60821
0.12626	1.00601	0.13446	0.95107	0.13752	0.89612	0.12372	0.78624	0.09816	0.7313
0.09233	1.11501	0.10008	1.0679	0.1034	1.02079	0.09169	0.92658	0.0673	0.87948
0.05923	1.21748	0.06696	1.1769	0.07104	1.13632	0.06319	1.05517	0.04228	1.0146
0.04696	1.25724	0.05391	1.22219	0.05769	1.18714	0.05094	1.11704	0.03194	1.08199
0.04019	1.28092	0.04632	1.25061	0.04966	1.22029	0.04337	1.15966	0.02572	1.12935
0.03442	1.30145	0.03989	1.27523	0.04289	1.24902	0.03716	1.1966	0.02086	1.17039
0.02946	1.3194	0.03438	1.29678	0.03712	1.27416	0.03199	1.22892	0.01703	1.2063
0.02515	1.33525	0.02961	1.3158	0.03214	1.29634	0.02765	1.25744	0.01396	1.23799
0.02137	1.34933	0.02543	1.3327	0.0278	1.31606	0.02395	1.28279	0.01149	1.26616
0.01802	1.36193	0.02174	1.34782	0.02399	1.3337	0.02077	1.30547	0.00948	1.29136
0.01504	1.37327	0.01847	1.36143	0.02062	1.34958	0.01801	1.32589	0.00783	1.31404
0.01238	1.38353	0.01555	1.37374	0.01762	1.36395	0.01561	1.34436	0.00647	1.33456
0.00998	1.39286	0.01292	1.38493	0.01493	1.377	0.01349	1.36115	0.00534	1.35322
0.0078	1.40138	0.01055	1.39515	0.01251	1.38893	0.01162	1.37648	0.0044	1.37025
0.00582	1.40918	0.00839	1.40452	0.01031	1.39986	0.00995	1.39053	0.00362	1.38587
0.00401	1.41637	0.00642	1.41314	0.00832	1.40991	0.00846	1.40346	0.00296	1.40023
0.00236	1.423	0.00462	1.4211	0.0065	1.4192	0.00712	1.4154	0.00241	1.41349
0.00083	1.42914	0.00297	1.42846	0.00483	1.42779	0.0059	1.42645	0.00195	1.42577
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325
0	1.4325	0.00207	1.4325	0.00392	1.4325	0.00525	1.4325	0.00171	1.4325

				Case A		L=12			
				Group 4		Rho=0.08			
		h=800		b=500		fy=400		f'c=32	
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.28841	-0.3189	0.30025	-0.4411	0.30058	-0.5634	0.26671	-0.8079	0.23251	-0.9302
0.43695	0.0533	0.44267	-0.1294	0.42661	-0.3122	0.34291	-0.6776	0.27525	-0.8604
0.46755	0.17546	0.48606	-0.0177	0.46989	-0.2109	0.38299	-0.5973	0.31225	-0.7905
0.47512	0.24529	0.49894	0.05209	0.4913	-0.1411	0.41097	-0.5275	0.34352	-0.7207
0.47691	0.31511	0.50399	0.12191	0.50697	-0.0713	0.43321	-0.4577	0.36906	-0.6509
0.42485	0.48571	0.44834	0.31267	0.45665	0.13962	0.4078	-0.2065	0.35176	-0.3795
0.34228	0.71971	0.35881	0.5795	0.36203	0.43929	0.33077	0.15887	0.30174	0.01866
0.27822	0.91266	0.29088	0.79707	0.29182	0.68149	0.25608	0.45033	0.21073	0.33474
0.22465	1.07825	0.23523	0.98182	0.23551	0.88539	0.19957	0.69253	0.14555	0.5961
0.18966	1.19068	0.20062	1.10278	0.20203	1.01487	0.16897	0.83906	0.11233	0.75115
0.14497	1.32319	0.1556	1.24782	0.15792	1.17245	0.1291	1.02171	0.07261	0.94634
0.10225	1.44525	0.1131	1.38033	0.1169	1.3154	0.09439	1.18556	0.04242	1.12064
0.08332	1.50159	0.09317	1.44551	0.09686	1.38943	0.077	1.27726	0.02848	1.22118
0.07131	1.53948	0.0801	1.49097	0.08344	1.44247	0.06534	1.34546	0.01973	1.29696
0.0611	1.57231	0.06901	1.53038	0.07212	1.48844	0.05584	1.40456	0.01325	1.36263
0.0523	1.60104	0.0595	1.56485	0.06247	1.52866	0.048	1.45628	0.00842	1.42009
0.04466	1.62639	0.05126	1.59527	0.05415	1.56415	0.04144	1.50191	0.0048	1.47079
0.03794	1.64893	0.04405	1.62231	0.0469	1.5957	0.03589	1.54247	0.0021	1.51585
0.03201	1.66909	0.03769	1.64651	0.04053	1.62392	0.03115	1.57876	8.1E-05	1.55618
0.02673	1.68723	0.03204	1.66828	0.0349	1.64933	0.02707	1.61142	0	1.59247
0.02199	1.70365	0.02699	1.68798	0.02988	1.67231	0.02352	1.64097	0	1.6253
0.01773	1.71858	0.02244	1.70589	0.02538	1.69321	0.02042	1.66784	0	1.65515
0.01386	1.7322	0.01834	1.72224	0.02133	1.71229	0.0177	1.69237	0	1.68241
0.01035	1.7447	0.01461	1.73723	0.01766	1.72977	0.01528	1.71485	0	1.70739
0.00713	1.75619	0.01121	1.75103	0.01433	1.74586	0.01313	1.73554	0	1.73038
0.00419	1.7668	0.0081	1.76375	0.01128	1.76071	0.01121	1.75463	0	1.75159
0.00148	1.77662	0.00523	1.77554	0.00848	1.77447	0.00948	1.77231	0	1.77124
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782
8.4E-17	1.782	0.00367	1.782	0.00697	1.782	0.00856	1.782	0	1.782

				Case B		L=10			
				Group 1		Rho=0.01			
		h=800		b=500		fy=400		f'c=32	
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.06334	0.02124	0.068	0.00595	0.07204	-0.0093	0.07866	-0.0399	0.08147	-0.0552
0.09868	0.12885	0.10193	0.10601	0.10473	0.08317	0.10902	0.03748	0.11056	0.01464
0.11488	0.20521	0.11864	0.18106	0.12189	0.15691	0.12696	0.10861	0.12882	0.08446
0.12246	0.27504	0.12695	0.25089	0.13091	0.22674	0.13732	0.17844	0.1398	0.15429
0.12426	0.34486	0.12935	0.32071	0.13387	0.29656	0.14131	0.24826	0.14423	0.22411
0.11581	0.42728	0.12034	0.40565	0.12431	0.38402	0.13052	0.34075	0.13274	0.31912
0.10041	0.51762	0.10377	0.50009	0.10658	0.48257	0.11044	0.44751	0.11144	0.42999
0.08408	0.60283	0.08671	0.58838	0.0888	0.57394	0.09127	0.54504	0.09154	0.53059
0.06666	0.68462	0.06881	0.67257	0.07048	0.66052	0.07219	0.63641	0.0721	0.62436
0.04955	0.75977	0.05165	0.74878	0.0533	0.7378	0.05513	0.71582	0.05516	0.70483
0.03052	0.83743	0.03241	0.82801	0.03397	0.81859	0.03586	0.79975	0.03606	0.79032
0.01139	0.91378	0.01317	0.90567	0.01474	0.89755	0.01708	0.88132	0.01771	0.8732
0.00714	0.93145	0.00872	0.92444	0.01014	0.91743	0.01234	0.90341	0.01299	0.8964
0.00614	0.93618	0.00754	0.93012	0.0088	0.92406	0.01073	0.91193	0.0113	0.90587
0.00528	0.94029	0.00653	0.93505	0.00765	0.9298	0.00937	0.91932	0.00987	0.91408
0.00454	0.94388	0.00565	0.93936	0.00665	0.93483	0.00819	0.92578	0.00864	0.92126
0.00389	0.94705	0.00489	0.94316	0.00579	0.93927	0.00717	0.93149	0.00757	0.9276
0.00332	0.94987	0.00421	0.94654	0.00502	0.94321	0.00627	0.93656	0.00664	0.93323
0.00281	0.95239	0.00361	0.94956	0.00434	0.94674	0.00548	0.94109	0.00582	0.93827
0.00235	0.95465	0.00308	0.95229	0.00374	0.94992	0.00478	0.94518	0.00509	0.94281
0.00194	0.95671	0.00259	0.95475	0.0032	0.95279	0.00415	0.94887	0.00444	0.94691
0.00156	0.95857	0.00216	0.95699	0.0027	0.9554	0.00358	0.95223	0.00385	0.95064
0.00123	0.96028	0.00176	0.95903	0.00226	0.95779	0.00306	0.9553	0.00332	0.95405
0.00092	0.96184	0.0014	0.9609	0.00185	0.95997	0.00259	0.95811	0.00284	0.95717
0.00063	0.96327	0.00107	0.96263	0.00148	0.96198	0.00217	0.96069	0.0024	0.96005
0.00037	0.9646	0.00076	0.96422	0.00114	0.96384	0.00177	0.96308	0.002	0.9627
0.00013	0.96583	0.00048	0.96569	0.00082	0.96556	0.00141	0.96529	0.00163	0.96515
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665
3.2E-17	0.9665	0.00033	0.9665	0.00065	0.9665	0.00122	0.9665	0.00143	0.9665

		Case B		L=10					
		Group 2		Rho=0.03					
h=800		b=500		fy=400		f'c=32			
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.12818	-0.0759	0.13721	-0.1218	0.14384	-0.1676	0.14988	-0.2593	0.1493	-0.3052
0.19569	0.10726	0.2034	0.03874	0.20591	-0.0298	0.1954	-0.1668	0.18476	-0.2354
0.21754	0.19671	0.22648	0.12426	0.23189	0.05181	0.22536	-0.0931	0.21449	-0.1655
0.22649	0.26654	0.2373	0.19409	0.24456	0.12164	0.24752	-0.0233	0.23848	-0.0957
0.22967	0.33636	0.24214	0.26391	0.25104	0.19146	0.25922	0.04656	0.25673	-0.0259
0.21078	0.44397	0.22193	0.37908	0.22966	0.31419	0.23529	0.18441	0.23368	0.11951
0.17801	0.57536	0.18626	0.52278	0.19139	0.4702	0.192	0.36504	0.18689	0.31247
0.14883	0.69135	0.15539	0.64801	0.15914	0.60467	0.15731	0.51798	0.15043	0.47464
0.1209	0.79709	0.12653	0.76093	0.12964	0.72477	0.12704	0.65244	0.11958	0.61628
0.09745	0.88289	0.10331	0.84993	0.10685	0.81696	0.10547	0.75103	0.09856	0.71807
0.06875	0.97622	0.07445	0.94795	0.0782	0.91969	0.07817	0.86316	0.07234	0.8349
0.03923	1.06563	0.04503	1.04128	0.0493	1.01694	0.05159	0.96825	0.04774	0.9439
0.02996	1.09435	0.03523	1.07332	0.03918	1.05229	0.04164	1.01022	0.03843	0.98919
0.02575	1.10855	0.03044	1.09036	0.03396	1.07218	0.03613	1.0358	0.03318	1.01761
0.02215	1.12087	0.02634	1.10514	0.02951	1.08941	0.03148	1.05796	0.0288	1.04223
0.01902	1.13164	0.0228	1.11807	0.02567	1.1045	0.02752	1.07735	0.02511	1.06378
0.01629	1.14115	0.0197	1.12948	0.02232	1.11781	0.02409	1.09447	0.02195	1.0828
0.01388	1.1496	0.01698	1.13962	0.01939	1.12964	0.0211	1.10968	0.01923	1.0997
0.01174	1.15716	0.01456	1.14869	0.01678	1.14022	0.01848	1.12328	0.01686	1.11482
0.00982	1.16396	0.0124	1.15686	0.01446	1.14975	0.01616	1.13553	0.01478	1.12843
0.0081	1.17012	0.01046	1.16424	0.01238	1.15837	0.01408	1.14661	0.01294	1.14074
0.00654	1.17572	0.00871	1.17096	0.0105	1.1662	0.01223	1.15669	0.0113	1.15193
0.00512	1.18083	0.00712	1.17709	0.0088	1.17336	0.01055	1.16589	0.00983	1.16215
0.00383	1.18551	0.00566	1.18271	0.00725	1.17992	0.00904	1.17432	0.00851	1.17152
0.00264	1.18982	0.00434	1.18788	0.00583	1.18595	0.00766	1.18208	0.00732	1.18014
0.00155	1.1938	0.00312	1.19266	0.00453	1.19152	0.0064	1.18924	0.00624	1.1881
0.00055	1.19748	0.00199	1.19708	0.00333	1.19667	0.00524	1.19587	0.00525	1.19546
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995
0	1.1995	0.00138	1.1995	0.00268	1.1995	0.00461	1.1995	0.00471	1.1995

		Case B		L=10					
		Group 3		Rho=0.05					
	h=800		b=500		fy=400		f'c=32		
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.19227	-0.1731	0.20352	-0.2495	0.20917	-0.3259	0.2037	-0.4788	0.19257	-0.5552
0.29274	0.08568	0.30131	-0.0285	0.29643	-0.1427	0.26161	-0.3712	0.23165	-0.4854
0.31966	0.18821	0.33175	0.06746	0.33179	-0.0533	0.2961	-0.2948	0.265	-0.4155
0.32911	0.25804	0.34386	0.13729	0.35046	0.01654	0.32116	-0.225	0.29261	-0.3457
0.33278	0.32786	0.34999	0.20711	0.35904	0.08636	0.34048	-0.1551	0.31449	-0.2759
0.30242	0.46067	0.3178	0.35251	0.32554	0.24436	0.32034	0.02806	0.30085	-0.0801
0.2513	0.6331	0.26261	0.54547	0.26721	0.45784	0.25627	0.28257	0.2403	0.19494
0.20879	0.77988	0.21784	0.70764	0.22099	0.6354	0.20804	0.49092	0.18864	0.41868
0.17051	0.90955	0.17843	0.84928	0.18115	0.78902	0.16846	0.66848	0.14792	0.60821
0.14193	1.00601	0.15037	0.95107	0.15401	0.89612	0.14378	0.78624	0.12386	0.7313
0.10561	1.11501	0.11405	1.0679	0.11835	1.02079	0.11105	0.92658	0.09294	0.87948
0.06896	1.21748	0.07775	1.1769	0.08311	1.13632	0.07998	1.05517	0.06527	1.0146
0.05507	1.25724	0.06312	1.22219	0.06819	1.18714	0.06605	1.11704	0.05295	1.08199
0.04733	1.28092	0.05453	1.25061	0.05911	1.22029	0.05723	1.15966	0.0452	1.12935
0.0407	1.30145	0.04719	1.27523	0.05137	1.24902	0.04984	1.1966	0.03887	1.17039
0.03495	1.3194	0.04084	1.29678	0.0447	1.27416	0.04356	1.22892	0.03361	1.2063
0.02993	1.33525	0.0353	1.3158	0.0389	1.29634	0.03816	1.25744	0.02919	1.23799
0.02549	1.34933	0.03042	1.3327	0.0338	1.31606	0.03348	1.28279	0.02544	1.26616
0.02156	1.36193	0.02609	1.34782	0.02929	1.3337	0.02938	1.30547	0.02222	1.29136
0.01804	1.37327	0.02223	1.36143	0.02527	1.34958	0.02576	1.32589	0.01944	1.31404
0.01487	1.38353	0.01876	1.37374	0.02167	1.36395	0.02255	1.34436	0.01701	1.33456
0.01201	1.39286	0.01563	1.38493	0.01842	1.377	0.01968	1.36115	0.01488	1.35322
0.0094	1.40138	0.01278	1.39515	0.01547	1.38893	0.0171	1.37648	0.013	1.37025
0.00703	1.40918	0.01019	1.40452	0.01279	1.39986	0.01477	1.39053	0.01133	1.38587
0.00485	1.41637	0.00781	1.41314	0.01034	1.40991	0.01265	1.40346	0.00984	1.40023
0.00285	1.423	0.00563	1.4211	0.0081	1.4192	0.01073	1.4154	0.00849	1.41349
0.00101	1.42914	0.00362	1.42846	0.00603	1.42779	0.00896	1.42645	0.00728	1.42577
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325
0	1.4325	0.00252	1.4325	0.0049	1.4325	0.008	1.4325	0.00664	1.4325

		Case B		L=10					
		Group 4		Rho=0.08					
h=800		b=500		fy=400		f'c=32			
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.28841	-0.3189	0.30025	-0.4411	0.30058	-0.5634	0.26671	-0.8079	0.23251	-0.9302
0.43834	0.0533	0.44267	-0.1294	0.42661	-0.3122	0.34291	-0.6776	0.27525	-0.8604
0.47259	0.17546	0.48606	-0.0177	0.46989	-0.2109	0.38299	-0.5973	0.31225	-0.7905
0.48238	0.24529	0.50054	0.05209	0.4913	-0.1411	0.41097	-0.5275	0.34352	-0.7207
0.4864	0.31511	0.50784	0.12191	0.50697	-0.0713	0.43321	-0.4577	0.36906	-0.6509
0.43837	0.48571	0.45746	0.31267	0.46104	0.13962	0.4078	-0.2065	0.35176	-0.3795
0.35926	0.71971	0.37316	0.5795	0.37378	0.43929	0.33673	0.15887	0.30285	0.01866
0.29652	0.91266	0.3077	0.79707	0.30742	0.68149	0.27076	0.45033	0.22835	0.33474
0.24282	1.07825	0.25276	0.98182	0.25277	0.88539	0.21912	0.69253	0.17311	0.5961
0.20708	1.19068	0.21793	1.10278	0.21962	1.01487	0.1905	0.83906	0.14429	0.75115
0.16028	1.32319	0.17138	1.24782	0.17454	1.17245	0.15112	1.02171	0.10694	0.94634
0.11443	1.44525	0.12626	1.38033	0.13131	1.3154	0.11491	1.18556	0.07564	1.12064
0.09379	1.50159	0.10473	1.44551	0.10976	1.38943	0.09608	1.27726	0.06003	1.22118
0.0806	1.53948	0.09047	1.49097	0.09517	1.44247	0.08317	1.34546	0.04969	1.29696
0.0693	1.57231	0.07829	1.53038	0.08275	1.48844	0.0724	1.40456	0.0415	1.36263
0.05951	1.60104	0.06777	1.56485	0.07205	1.52866	0.0633	1.45628	0.03491	1.42009
0.05095	1.62639	0.05858	1.59527	0.06274	1.56415	0.05553	1.50191	0.02955	1.47079
0.0434	1.64893	0.0505	1.62231	0.05457	1.5957	0.04881	1.54247	0.02514	1.51585
0.0367	1.66909	0.04333	1.64651	0.04734	1.62392	0.04295	1.57876	0.02147	1.55618
0.0307	1.68723	0.03693	1.66828	0.0409	1.64933	0.03781	1.61142	0.0184	1.59247
0.02531	1.70365	0.03118	1.68798	0.03513	1.67231	0.03327	1.64097	0.0158	1.6253
0.02044	1.71858	0.02599	1.70589	0.02994	1.69321	0.02922	1.66784	0.0136	1.65515
0.01601	1.7322	0.02128	1.72224	0.02523	1.71229	0.02559	1.69237	0.01172	1.68241
0.01197	1.7447	0.01698	1.73723	0.02094	1.72977	0.02232	1.71485	0.0101	1.70739
0.00826	1.75619	0.01305	1.75103	0.01702	1.74586	0.01937	1.73554	0.0087	1.73038
0.00486	1.7668	0.00944	1.76375	0.01343	1.76071	0.01669	1.75463	0.00748	1.75159
0.00172	1.77662	0.00611	1.77554	0.01013	1.77447	0.01424	1.77231	0.00642	1.77124
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782
9.8E-17	1.782	0.00429	1.782	0.00832	1.782	0.01291	1.782	0.00587	1.782

				Case C		L=8			
				Group 1		Rho=0.01			
		h=800		b=500		fy=400		f'c=32	
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.06361	0.02124	0.06808	0.00595	0.07204	-0.0093	0.07866	-0.0399	0.08147	-0.0552
0.10141	0.12885	0.10423	0.10601	0.10657	0.08317	0.10991	0.03748	0.11092	0.01464
0.12016	0.20521	0.12341	0.18106	0.12614	0.15691	0.13011	0.10861	0.13138	0.08446
0.13036	0.27504	0.13434	0.25089	0.1378	0.22674	0.14317	0.17844	0.14511	0.15429
0.13479	0.34486	0.13942	0.32071	0.14351	0.29656	0.15009	0.24826	0.15258	0.22411
0.12869	0.42728	0.13292	0.40565	0.13662	0.38402	0.14242	0.34075	0.1445	0.31912
0.11488	0.51762	0.11811	0.50009	0.12085	0.48257	0.12481	0.44751	0.12598	0.42999
0.09919	0.60283	0.10183	0.58838	0.10402	0.57394	0.10696	0.54504	0.10764	0.53059
0.08125	0.68462	0.08356	0.67257	0.08546	0.66052	0.08794	0.63641	0.08844	0.62436
0.06245	0.75977	0.06486	0.74878	0.0669	0.7378	0.06977	0.71582	0.07051	0.70483
0.03997	0.83743	0.04232	0.82801	0.04438	0.81859	0.0475	0.79975	0.04848	0.79032
0.01557	0.91378	0.01795	0.90567	0.02014	0.89755	0.02381	0.88132	0.02521	0.8732
0.00986	0.93145	0.01202	0.92444	0.01403	0.91743	0.01746	0.90341	0.01881	0.8964
0.00851	0.93618	0.01043	0.93012	0.01222	0.92406	0.01528	0.91193	0.01649	0.90587
0.00734	0.94029	0.00906	0.93505	0.01066	0.9298	0.01341	0.91932	0.01449	0.91408
0.00632	0.94388	0.00787	0.93936	0.00931	0.93483	0.01178	0.92578	0.01276	0.92126
0.00543	0.94705	0.00682	0.94316	0.00811	0.93927	0.01035	0.93149	0.01124	0.9276
0.00463	0.94987	0.00589	0.94654	0.00706	0.94321	0.00909	0.93656	0.00991	0.93323
0.00393	0.95239	0.00506	0.94956	0.00612	0.94674	0.00797	0.94109	0.00872	0.93827
0.00329	0.95465	0.00432	0.95229	0.00528	0.94992	0.00697	0.94518	0.00766	0.94281
0.00272	0.95671	0.00364	0.95475	0.00452	0.95279	0.00607	0.94887	0.0067	0.94691
0.0022	0.95857	0.00304	0.95699	0.00383	0.9554	0.00525	0.95223	0.00583	0.95064
0.00172	0.96028	0.00248	0.95903	0.00321	0.95779	0.0045	0.9553	0.00505	0.95405
0.00129	0.96184	0.00198	0.9609	0.00263	0.95997	0.00382	0.95811	0.00433	0.95717
0.00089	0.96327	0.00151	0.96263	0.00211	0.96198	0.0032	0.96069	0.00367	0.96005
0.00053	0.9646	0.00108	0.96422	0.00162	0.96384	0.00263	0.96308	0.00307	0.9627
0.00019	0.96583	0.00069	0.96569	0.00118	0.96556	0.0021	0.96529	0.00251	0.96515
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665
4.5E-17	0.9665	0.00047	0.9665	0.00093	0.9665	0.00181	0.9665	0.0022	0.9665

			Case c		L=8				
			Group 2		Rho=0.03				
	h=800		b=500		fy=400		f'c=32		
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.12818	-0.0759	0.13721	-0.1218	0.14384	-0.1676	0.14988	-0.2593	0.1493	-0.3052
0.19797	0.10726	0.20425	0.03874	0.20591	-0.0298	0.1954	-0.1668	0.18476	-0.2354
0.22233	0.19671	0.22961	0.12426	0.23326	0.05181	0.22536	-0.0931	0.21449	-0.1655
0.2334	0.26654	0.24253	0.19409	0.24803	0.12164	0.24752	-0.0233	0.23848	-0.0957
0.23871	0.33636	0.24957	0.26391	0.25677	0.19146	0.26092	0.04656	0.25673	-0.0259
0.22212	0.44397	0.23209	0.37908	0.23863	0.31419	0.24175	0.18441	0.23864	0.11951
0.19101	0.57536	0.1986	0.52278	0.20322	0.4702	0.20328	0.36504	0.19836	0.31247
0.16244	0.69135	0.16875	0.64801	0.17244	0.60467	0.17139	0.51798	0.16582	0.47464
0.13416	0.79709	0.13985	0.76093	0.14325	0.72477	0.14236	0.65244	0.13694	0.61628
0.1097	0.88289	0.11589	0.84993	0.11998	0.81696	0.12088	0.75103	0.11641	0.71807
0.07867	0.97622	0.08498	0.94795	0.08951	0.91969	0.09214	0.86316	0.08894	0.8349
0.04564	1.06563	0.0523	1.04128	0.05753	1.01694	0.0626	0.96825	0.06125	0.9439
0.03505	1.09435	0.04118	1.07332	0.04606	1.05229	0.05116	1.01022	0.05027	0.98919
0.03021	1.10855	0.0357	1.09036	0.04009	1.07218	0.04474	1.0358	0.04396	1.01761
0.02604	1.12087	0.03098	1.10514	0.03497	1.08941	0.03925	1.05796	0.0386	1.04223
0.02242	1.13164	0.02688	1.11807	0.03052	1.1045	0.03452	1.07735	0.034	1.06378
0.01923	1.14115	0.02329	1.12948	0.02662	1.11781	0.03039	1.09447	0.03001	1.0828
0.01642	1.1496	0.02011	1.13962	0.02318	1.12964	0.02676	1.10968	0.02651	1.0997
0.0139	1.15716	0.01728	1.14869	0.02011	1.14022	0.02354	1.12328	0.02343	1.11482
0.01165	1.16396	0.01474	1.15686	0.01737	1.14975	0.02066	1.13553	0.02068	1.12843
0.00962	1.17012	0.01245	1.16424	0.0149	1.15837	0.01808	1.14661	0.01823	1.14074
0.00778	1.17572	0.01038	1.17096	0.01266	1.1662	0.01575	1.15669	0.01602	1.15193
0.0061	1.18083	0.0085	1.17709	0.01063	1.17336	0.01364	1.16589	0.01402	1.16215
0.00456	1.18551	0.00677	1.18271	0.00877	1.17992	0.01171	1.17432	0.0122	1.17152
0.00315	1.18982	0.00519	1.18788	0.00706	1.18595	0.00995	1.18208	0.01054	1.18014
0.00186	1.1938	0.00373	1.19266	0.00549	1.19152	0.00834	1.18924	0.00902	1.1881
0.00066	1.19748	0.00239	1.19708	0.00405	1.19667	0.00684	1.19587	0.00763	1.19546
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995
0	1.1995	0.00165	1.1995	0.00325	1.1995	0.00603	1.1995	0.00687	1.1995

				Case c		L=8			
				Group 3		Rho=0.05			
		h=800		b=500		fy=400		f'c=32	
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.19227	-0.1731	0.20352	-0.2495	0.20917	-0.3259	0.2037	-0.4788	0.19257	-0.5552
0.29457	0.08568	0.30131	-0.0285	0.29643	-0.1427	0.26161	-0.3712	0.23165	-0.4854
0.32414	0.18821	0.33341	0.06746	0.33179	-0.0533	0.2961	-0.2948	0.265	-0.4155
0.33553	0.25804	0.34743	0.13729	0.35092	0.01654	0.32116	-0.225	0.29261	-0.3457
0.34116	0.32786	0.35555	0.20711	0.36153	0.08636	0.34048	-0.1551	0.31449	-0.2759
0.31343	0.46067	0.32666	0.35251	0.33214	0.24436	0.32134	0.02806	0.30085	-0.0801
0.26437	0.6331	0.27444	0.54547	0.2779	0.45784	0.26501	0.28257	0.24838	0.19494
0.22263	0.77988	0.23106	0.70764	0.23382	0.6354	0.22129	0.49092	0.2039	0.41868
0.18411	0.90955	0.19188	0.84928	0.19473	0.78902	0.18407	0.66848	0.16727	0.60821
0.15475	1.00601	0.16339	0.95107	0.16751	0.89612	0.16019	0.78624	0.14489	0.7313
0.11648	1.11501	0.12547	1.0679	0.13058	1.02079	0.12688	0.92658	0.11392	0.87948
0.07692	1.21748	0.08659	1.1769	0.09299	1.13632	0.09373	1.05517	0.08407	1.0146
0.06171	1.25724	0.07066	1.22219	0.07679	1.18714	0.07841	1.11704	0.07013	1.08199
0.05318	1.28092	0.06125	1.25061	0.06684	1.22029	0.06858	1.15966	0.06115	1.12935
0.04583	1.30145	0.05315	1.27523	0.05831	1.24902	0.06021	1.1966	0.0536	1.17039
0.03944	1.3194	0.04612	1.29678	0.05091	1.27416	0.05302	1.22892	0.04718	1.2063
0.03384	1.33525	0.03996	1.3158	0.04443	1.29634	0.04676	1.25744	0.04165	1.23799
0.02887	1.34933	0.03451	1.3327	0.03871	1.31606	0.04127	1.28279	0.03685	1.26616
0.02445	1.36193	0.02965	1.34782	0.03362	1.3337	0.03642	1.30547	0.03265	1.29136
0.02049	1.37327	0.02531	1.36143	0.02907	1.34958	0.0321	1.32589	0.02894	1.31404
0.01691	1.38353	0.02139	1.37374	0.02498	1.36395	0.02823	1.34436	0.02564	1.33456
0.01367	1.39286	0.01784	1.38493	0.02127	1.377	0.02474	1.36115	0.02269	1.35322
0.01072	1.40138	0.01461	1.39515	0.0179	1.38893	0.02158	1.37648	0.02003	1.37025
0.00802	1.40918	0.01166	1.40452	0.01482	1.39986	0.01871	1.39053	0.01764	1.38587
0.00554	1.41637	0.00895	1.41314	0.012	1.40991	0.01608	1.40346	0.01546	1.40023
0.00326	1.423	0.00646	1.4211	0.00941	1.4192	0.01368	1.4154	0.01347	1.41349
0.00115	1.42914	0.00416	1.42846	0.00701	1.42779	0.01146	1.42645	0.01165	1.42577
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325
0	1.4325	0.0029	1.4325	0.0057	1.4325	0.01026	1.4325	0.01066	1.4325

		Case c		L=8					
		Group 4		Rho=0.08					
	h=800		b=500		fy=400		f'c=32		
Area steel 50%		Area steel 40%		Area steel 30%		Area steel 10%		Area steel 0%	
Symmtric		Unsymmetric		Unsymmetric		Unsymmetric		Unsymmetric	
Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns	Mns	Pns
0.28841	-0.3189	0.30025	-0.4411	0.30058	-0.5634	0.26671	-0.8079	0.23251	-0.9302
0.43949	0.0533	0.44267	-0.1294	0.42661	-0.3122	0.34291	-0.6776	0.27525	-0.8604
0.47671	0.17546	0.48606	-0.0177	0.46989	-0.2109	0.38299	-0.5973	0.31225	-0.7905
0.48832	0.24529	0.50185	0.05209	0.4913	-0.1411	0.41097	-0.5275	0.34352	-0.7207
0.49417	0.31511	0.51098	0.12191	0.50697	-0.0713	0.43321	-0.4577	0.36906	-0.6509
0.44942	0.48571	0.46493	0.31267	0.46463	0.13962	0.4078	-0.2065	0.35176	-0.3795
0.37316	0.71971	0.3849	0.5795	0.38339	0.43929	0.34161	0.15887	0.30377	0.01866
0.3115	0.91266	0.32146	0.79707	0.32018	0.68149	0.28276	0.45033	0.24277	0.33474
0.25769	1.07825	0.2671	0.98182	0.26689	0.88539	0.23513	0.69253	0.19566	0.5961
0.22133	1.19068	0.23209	1.10278	0.23401	1.01487	0.20811	0.83906	0.17043	0.75115
0.1728	1.32319	0.18429	1.24782	0.18814	1.17245	0.16914	1.02171	0.13503	0.94634
0.1244	1.44525	0.13701	1.38033	0.1431	1.3154	0.1317	1.18556	0.10281	1.12064
0.10236	1.50159	0.11418	1.44551	0.12032	1.38943	0.1117	1.27726	0.08584	1.22118
0.0882	1.53948	0.09896	1.49097	0.10477	1.44247	0.09776	1.34546	0.07421	1.29696
0.07601	1.57231	0.08589	1.53038	0.09144	1.48844	0.08595	1.40456	0.06461	1.36263
0.06541	1.60104	0.07453	1.56485	0.07988	1.52866	0.07583	1.45628	0.05659	1.42009
0.0561	1.62639	0.06457	1.59527	0.06977	1.56415	0.06705	1.50191	0.0498	1.47079
0.04787	1.64893	0.05578	1.62231	0.06084	1.5957	0.05938	1.54247	0.04399	1.51585
0.04053	1.66909	0.04794	1.64651	0.05291	1.62392	0.05261	1.57876	0.03897	1.55618
0.03396	1.68723	0.04093	1.66828	0.04582	1.64933	0.04661	1.61142	0.0346	1.59247
0.02803	1.70365	0.03461	1.68798	0.03944	1.67231	0.04124	1.64097	0.03076	1.6253
0.02265	1.71858	0.02889	1.70589	0.03366	1.69321	0.03641	1.66784	0.02737	1.65515
0.01776	1.7322	0.02368	1.72224	0.02841	1.71229	0.03205	1.69237	0.02436	1.68241
0.01329	1.7447	0.01892	1.73723	0.02362	1.72977	0.02809	1.71485	0.02167	1.70739
0.00919	1.75619	0.01456	1.75103	0.01923	1.74586	0.02448	1.73554	0.01925	1.73038
0.0054	1.7668	0.01054	1.76375	0.0152	1.76071	0.02117	1.75463	0.01707	1.75159
0.00191	1.77662	0.00683	1.77554	0.01147	1.77447	0.01813	1.77231	0.01509	1.77124
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782
1.1E-16	1.782	0.0048	1.782	0.00943	1.782	0.01648	1.782	0.01402	1.782