SAP - Etabs 2016

Structural Analysis Program

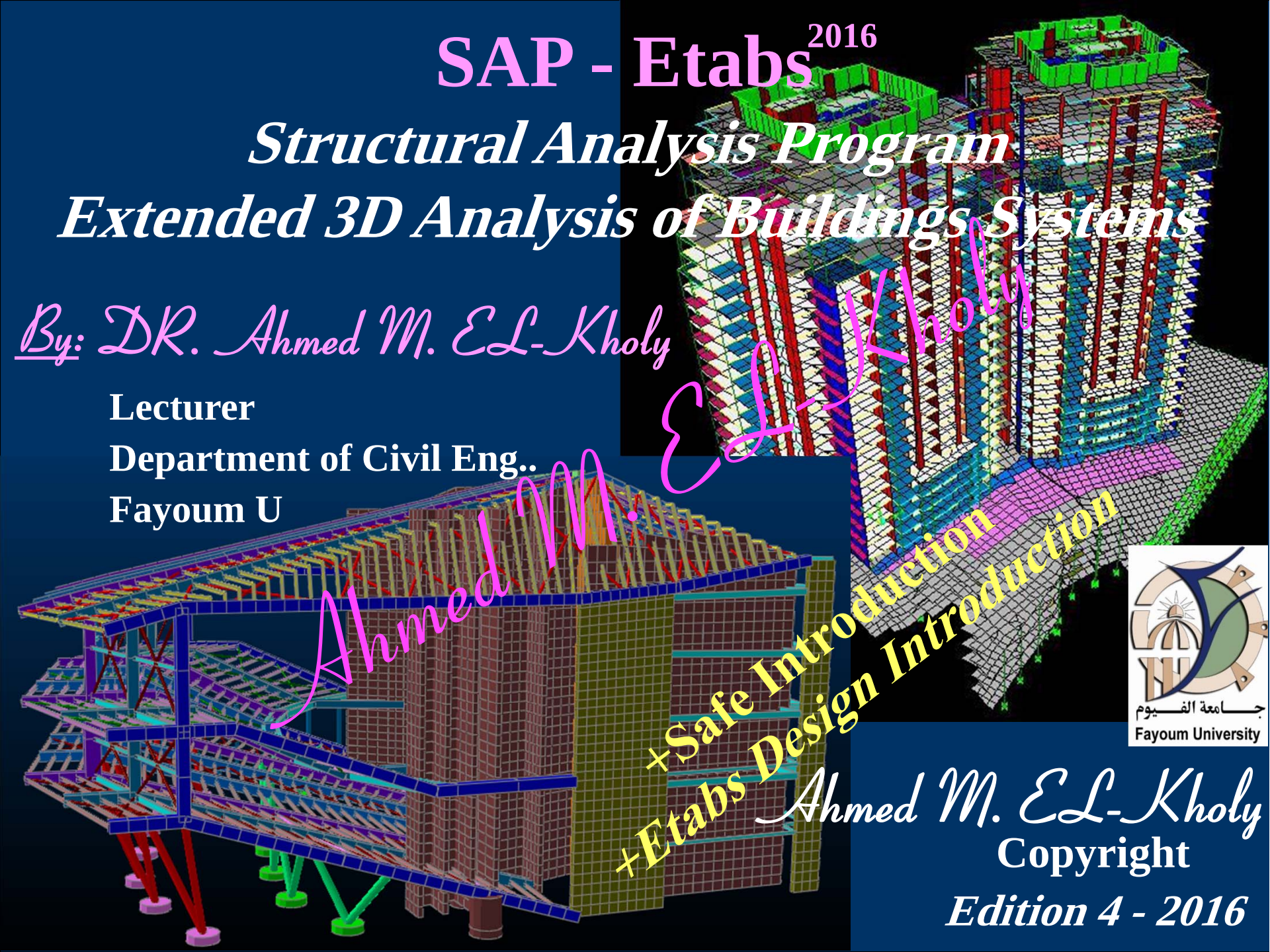
Extended 3D Analysis of Buildings Systems

By: DR. Ahmed M. EL-Kholy

Lecturer

Department of Civil Eng..

Fayoum U



Edition 4 - 2016

Brief Introduction to ECL 2012

Code ECL 2012

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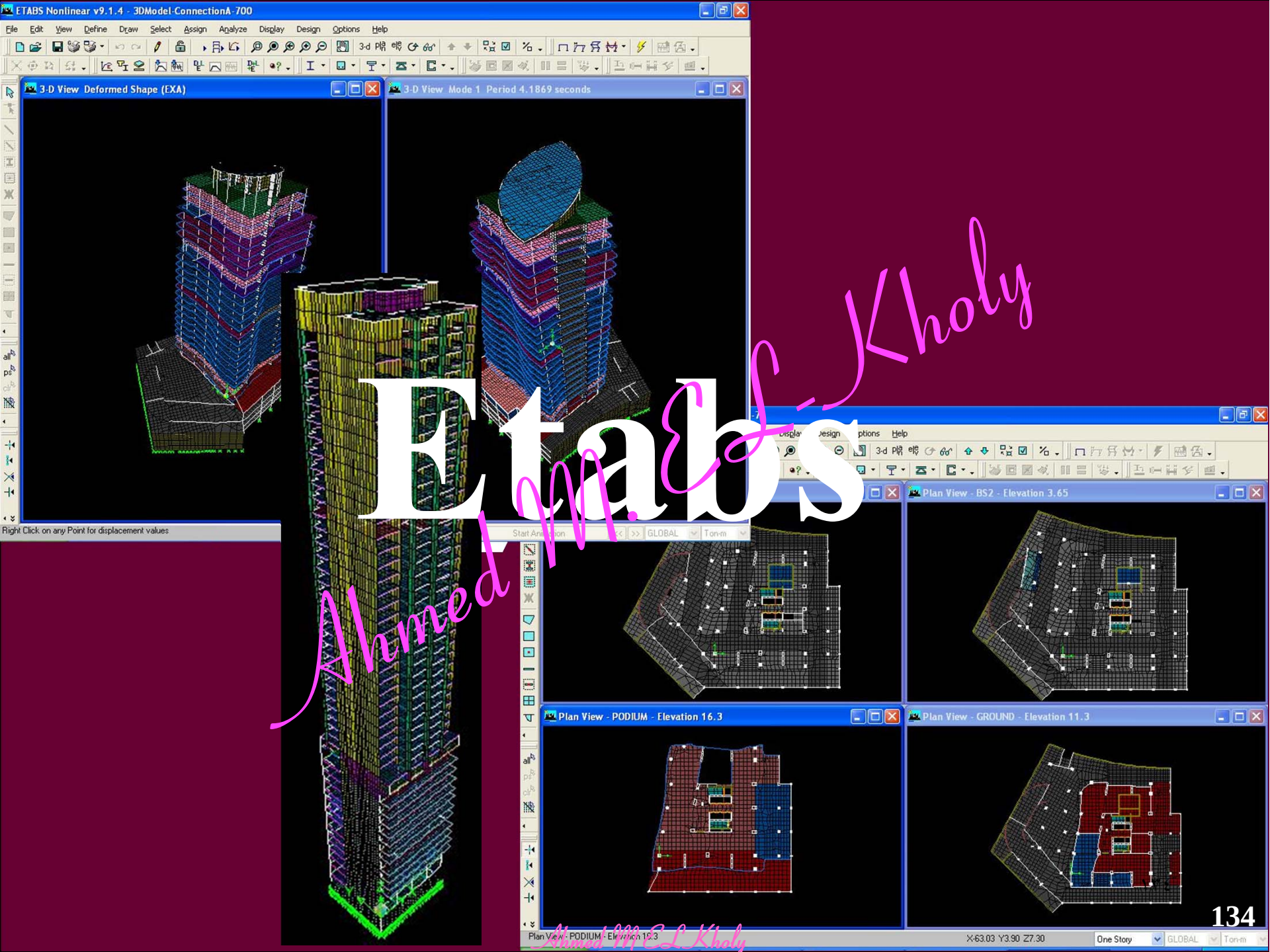

ETABS Nonlinear v9.1.4 - 3DModel-ConnectionA-700
File Edit View Define Draw Select Assign Analyze Display Design Options Help
3-D View Deformed Shape (EXA)
3-D View Mode 1 Period 4.1869 seconds
Right Click on any Point for displacement values
Plan View - BS2 - Elevation 3.65
Plan View - PODIUM - Elevation 16.3
Plan View - GROUND - Elevation 11.3
X-63.03 Y3.90 Z7.30
One Story
Etabs
Ahmed M.El-Kholy
Ahmed M.El-Kholy
134

Etabs

DXF

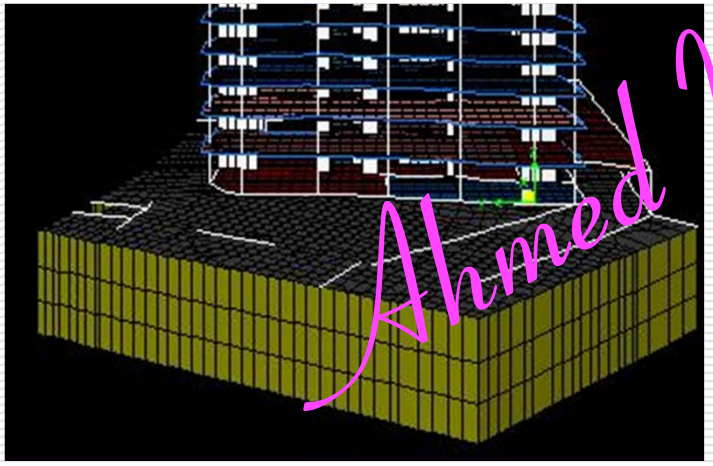
1. **Prepare DXF for different floors in Autocad as shown in the given practice in lecture.**

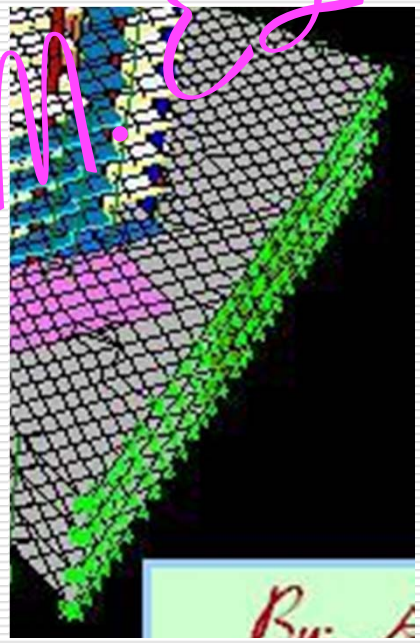
1. **Try to avoid triangle and irregular elements shapes as much as possible**
2. **Choose carefully & fix (0,0) point in Cad & Etabs**
3. **The mesh should be applicable for continuity of the columns and shear walls in all floors**
4. **Check your mesh in Cad many times before working on Etabs**
5. **Delete any thing on layer 0**
6. **Draw Slabs in Cad & (Col, beams, SW) in Etabs**

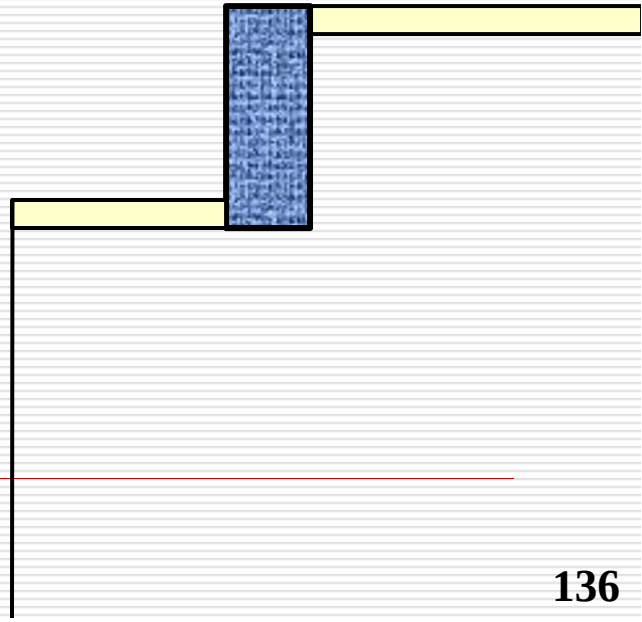
Etabs

DXF

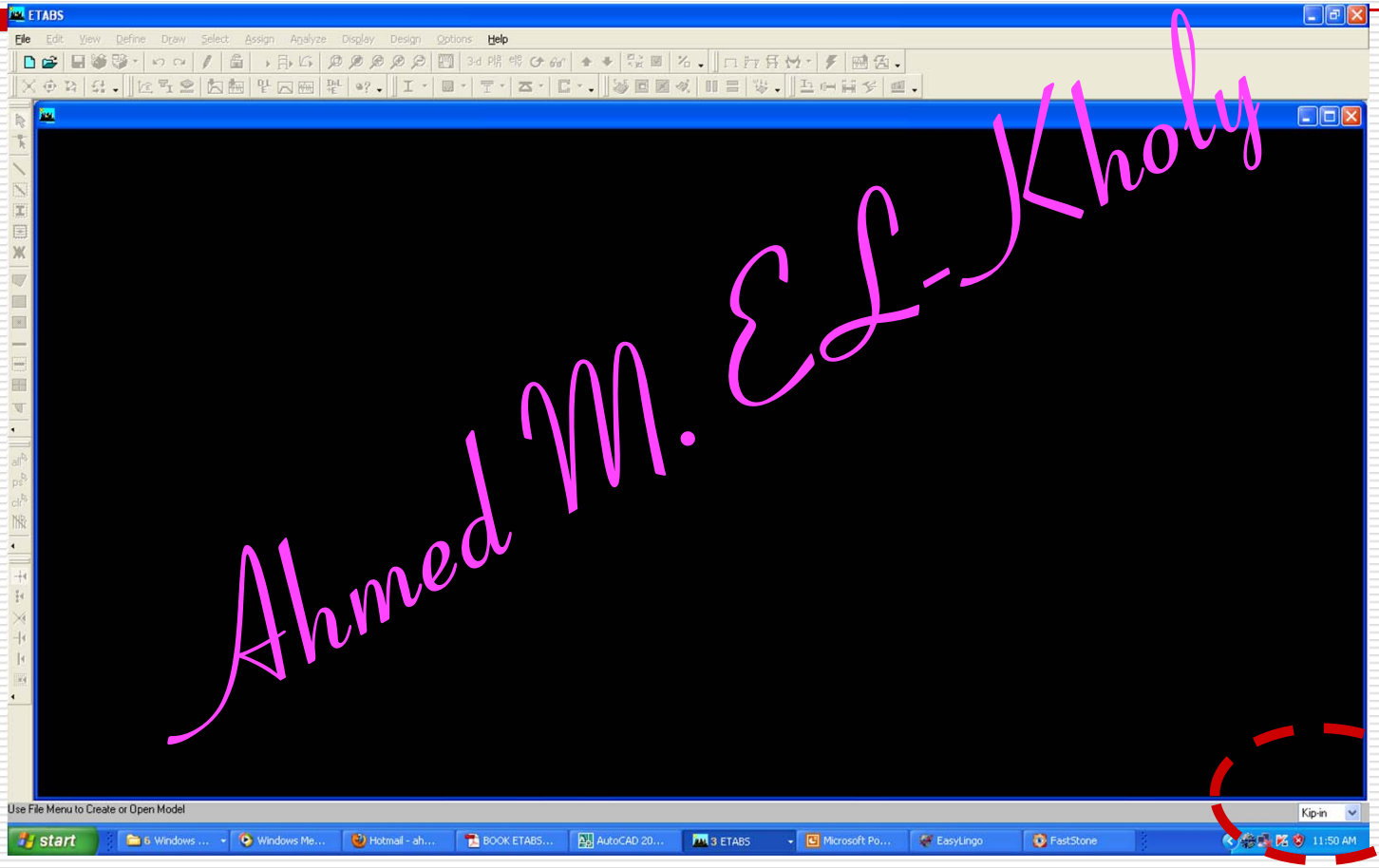
7. **Large Columns supporting spaced parallel beams may be modeled using area elements.**
8. **Two alternatives to model the retaining wall.**







2-Units


ETABS
File Edit View Define Draw Select Assign Analyze Display Design Options Help
Ahmed M. El-Kholy
Use File Menu to Create or Open Model
start
11:50 AM

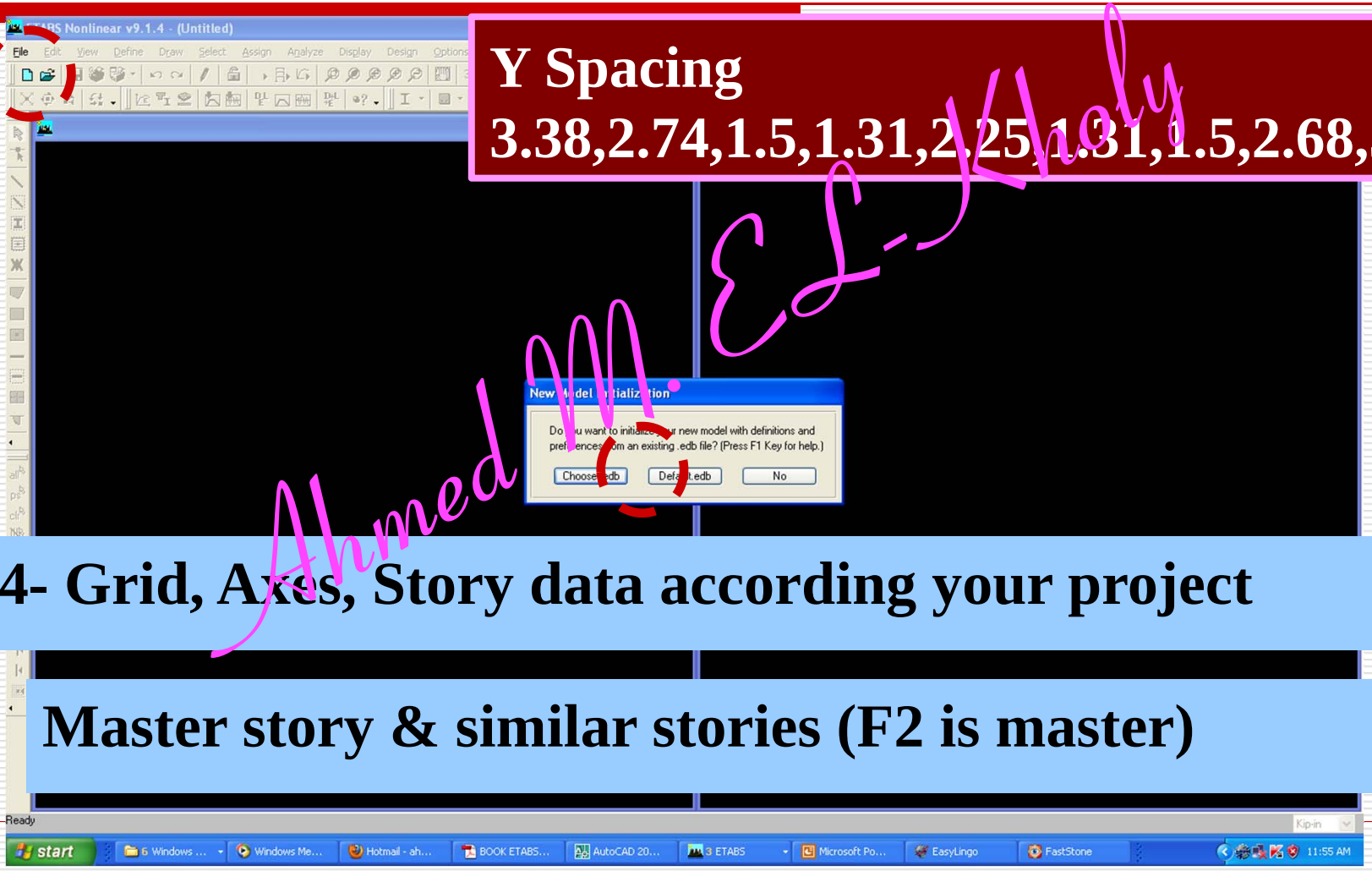
Ton-m

Grid 9,10

3- New,… edb

X Spacing
1.82,3.87,2.87,1.63,1.63,2.87,3.87,1.82

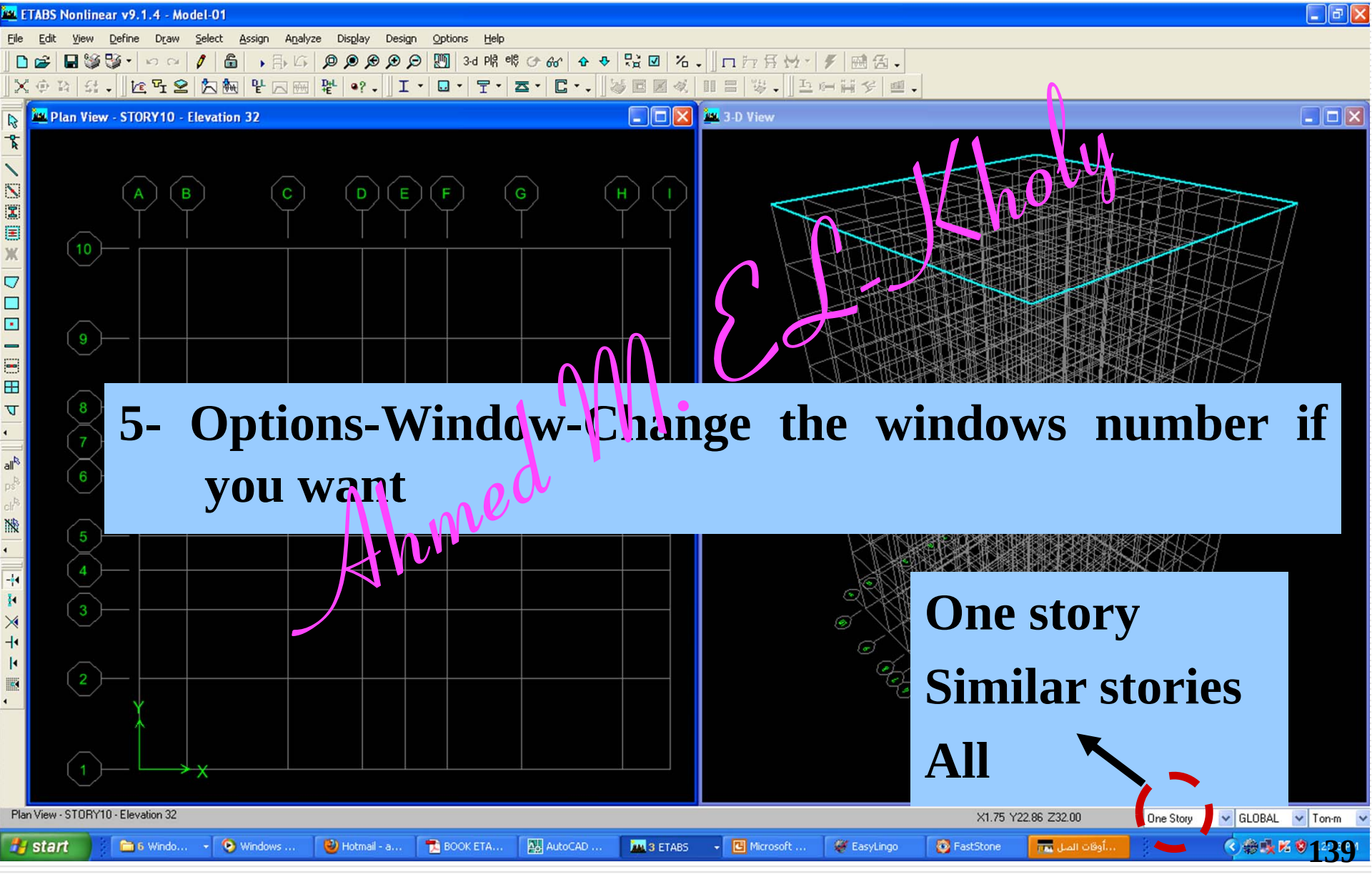
Y Spacing
3.38,2.74,1.5,1.31,2.25,1.31,1.5,2.68,3.44



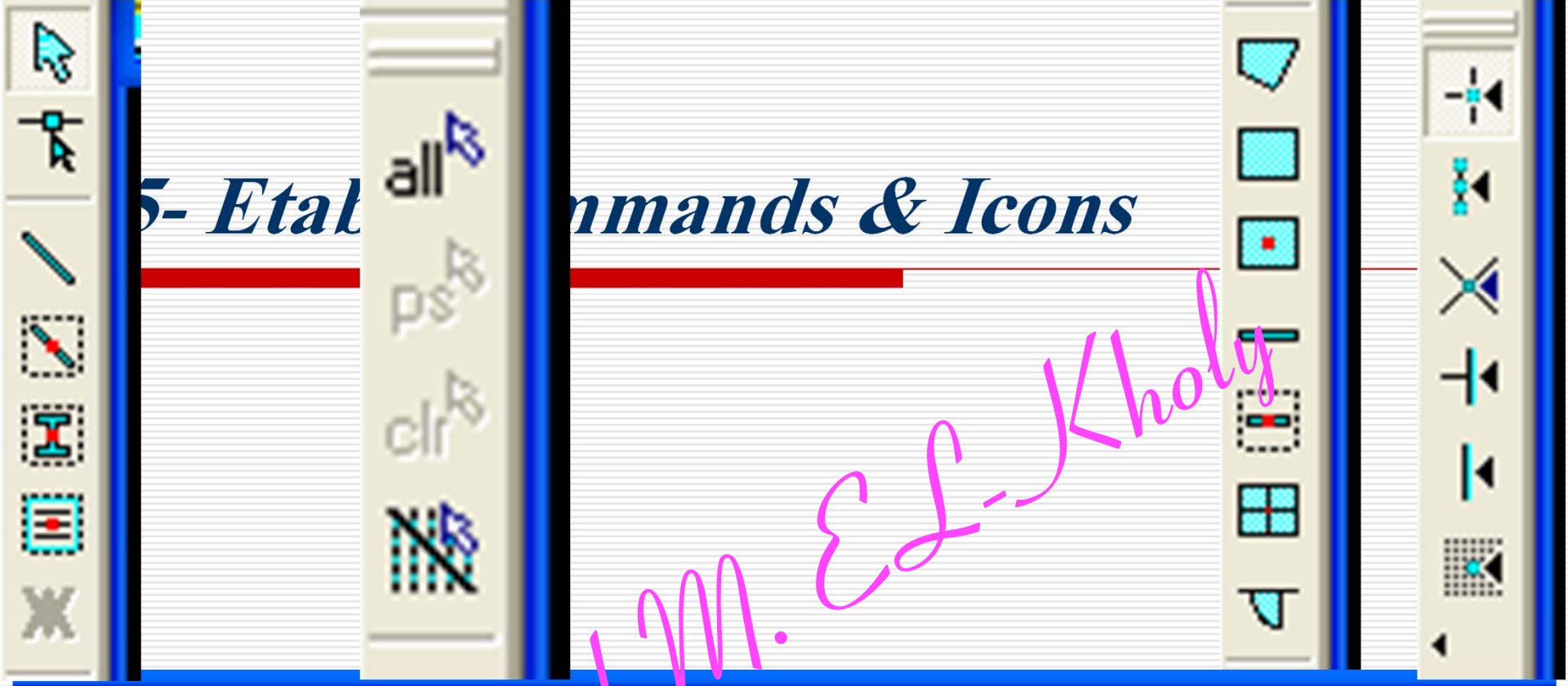
4- Grid, Axes, Story data according your project

Master story & similar stories (F2 is master)

5- Etabs Commands & Icons



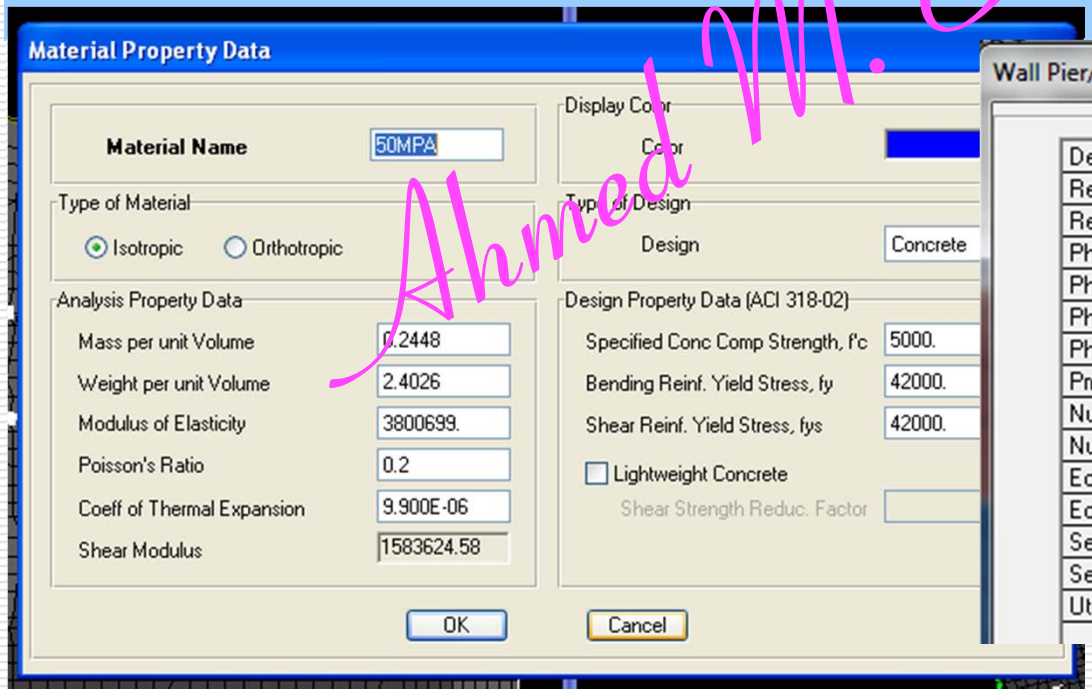
5- Etab nmands & Icons

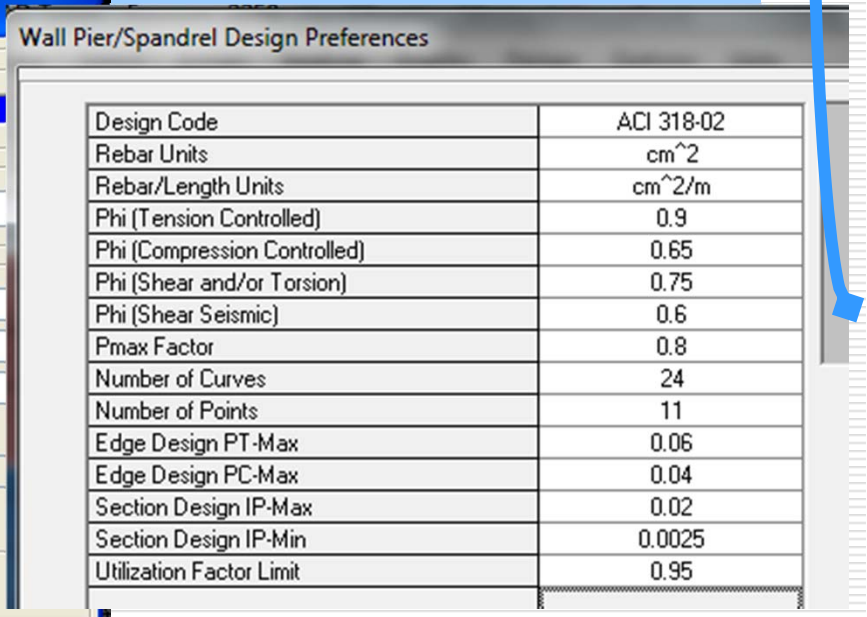


7- Define Design Data and Material (Slab, Columns, Core..)

7- Design data (Options-Preferences-Concrete Frame Design/Shear Wall Design) ACI318-02 – Cm² - Cm²/m

8- Material properties (Define-Material Properties-Concrete 350) according the considered code





9- Define Wall, Column, Beam, Slab Sections

9- beams…. Define-Frame sections (Add Rectangular) .. Make C30x100, C40x90, B25x60, B12x60

9- slabs…. Define-Wall/Slab/..sections (Add slab, add wall) Make W30, W40, Slb20, Slb22 according the considered code

9- Define Wall, Column, Beam, Slab Sections

Columns Modifier Ieff=0.7Ig

Shear Walls Ieff=(0.70) or 0.50Ig (2008) 0.35Ig(2012)

Beams Ieff=0.5Ig (0.35Ig ACI)

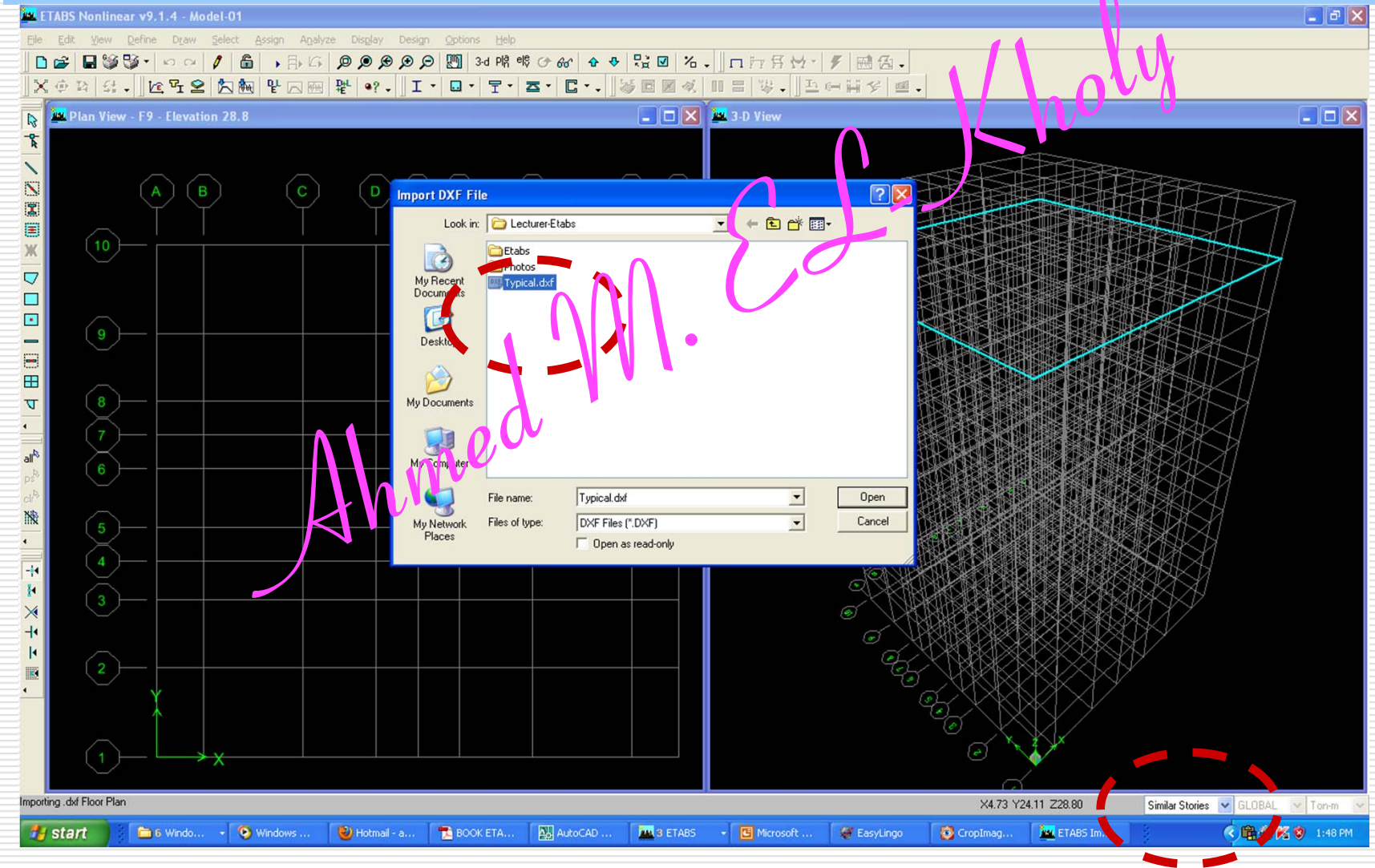
Slabs Ieff=0.25Ig

Chapter 6 in Egyptian RC Code– Ch 8 Egy Code loads

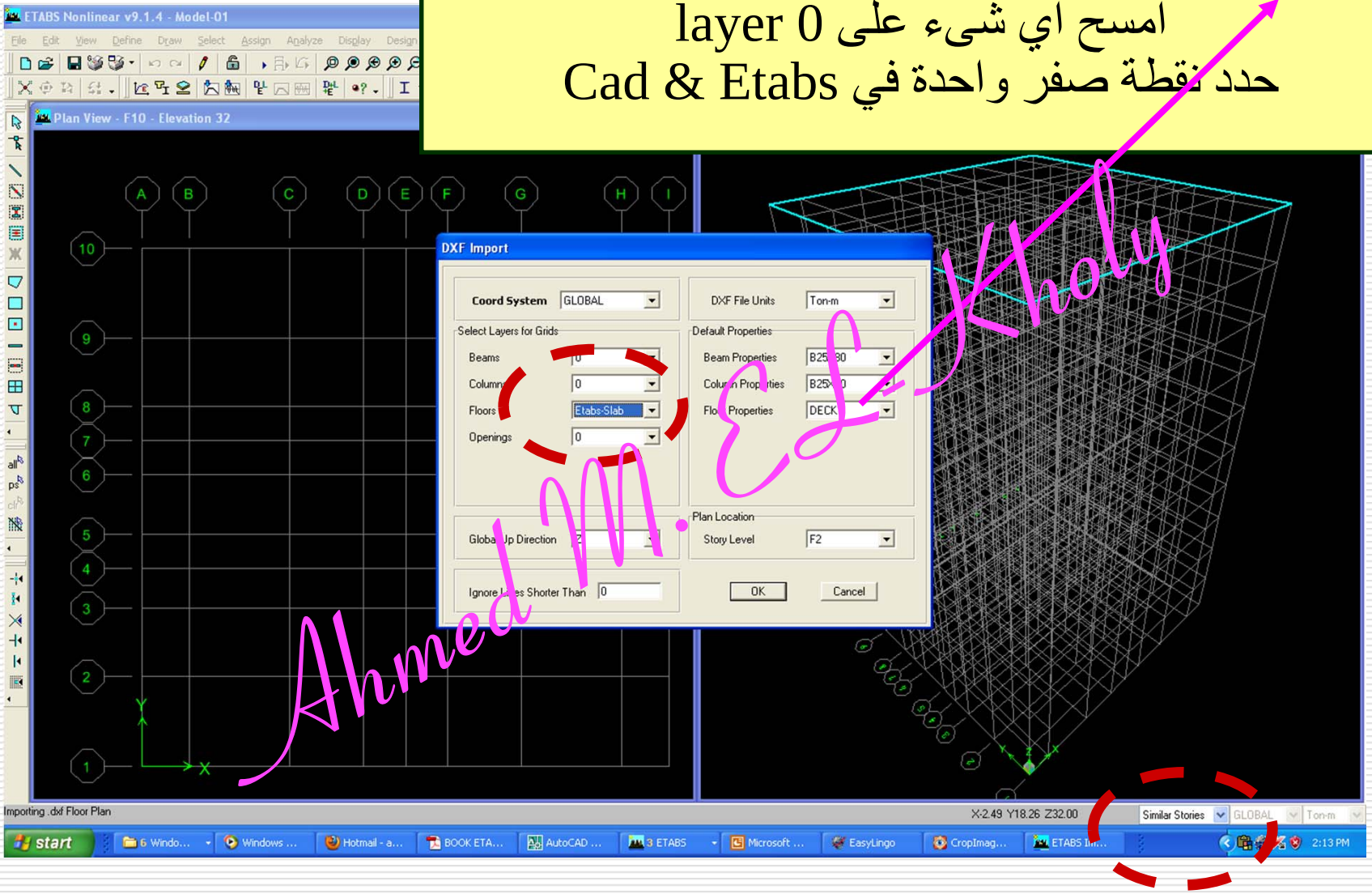
These modifier for M1,M2,M12

10- Import your DXF floors

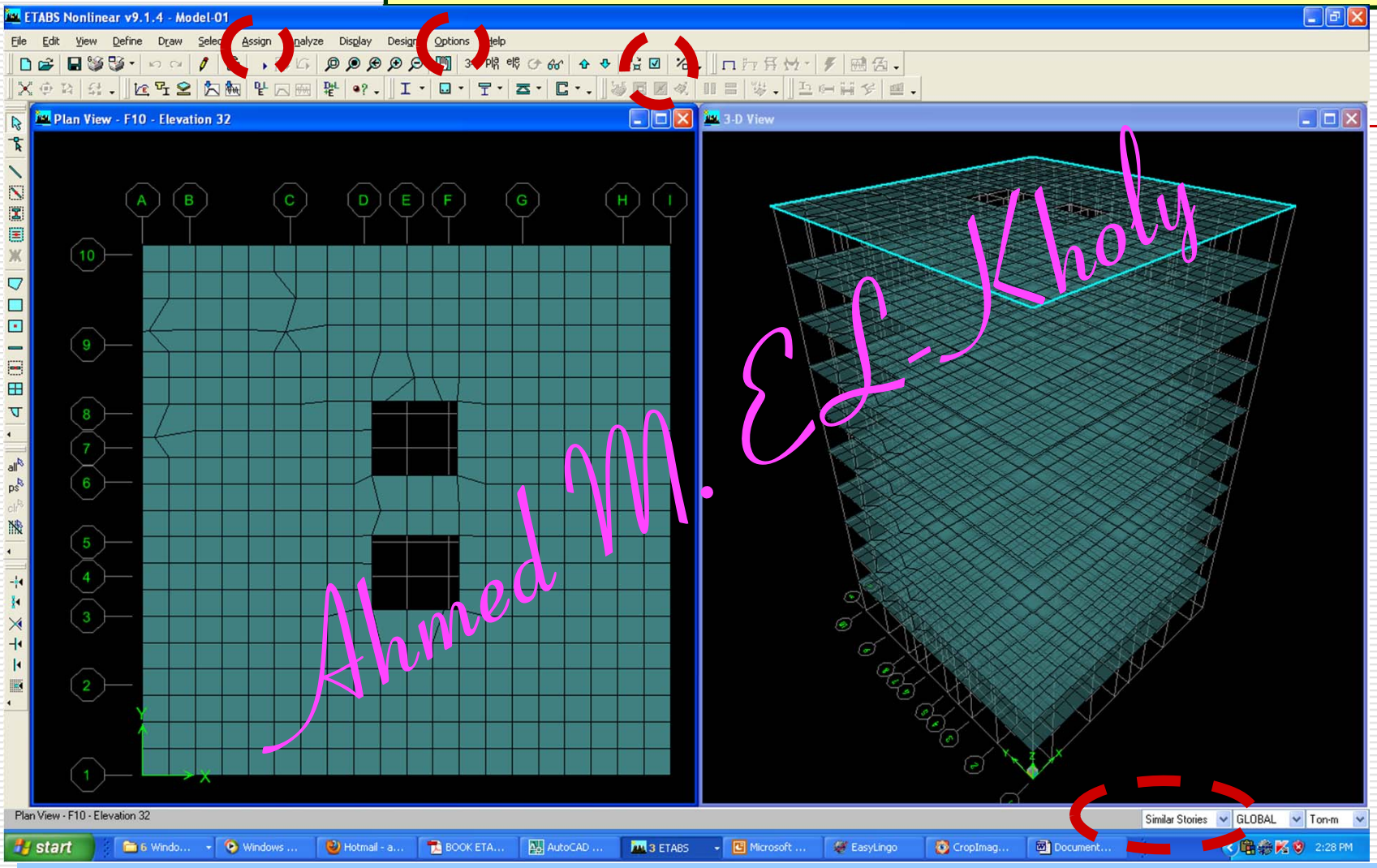
File-Import-DXF floor plan



قطاعات مبدئية غير ها بعد سحب المودل بالقطاعات الفعلية
امسح اي شيء على layer 0
حدد نقطة صفر واحدة في Cad & Etabs



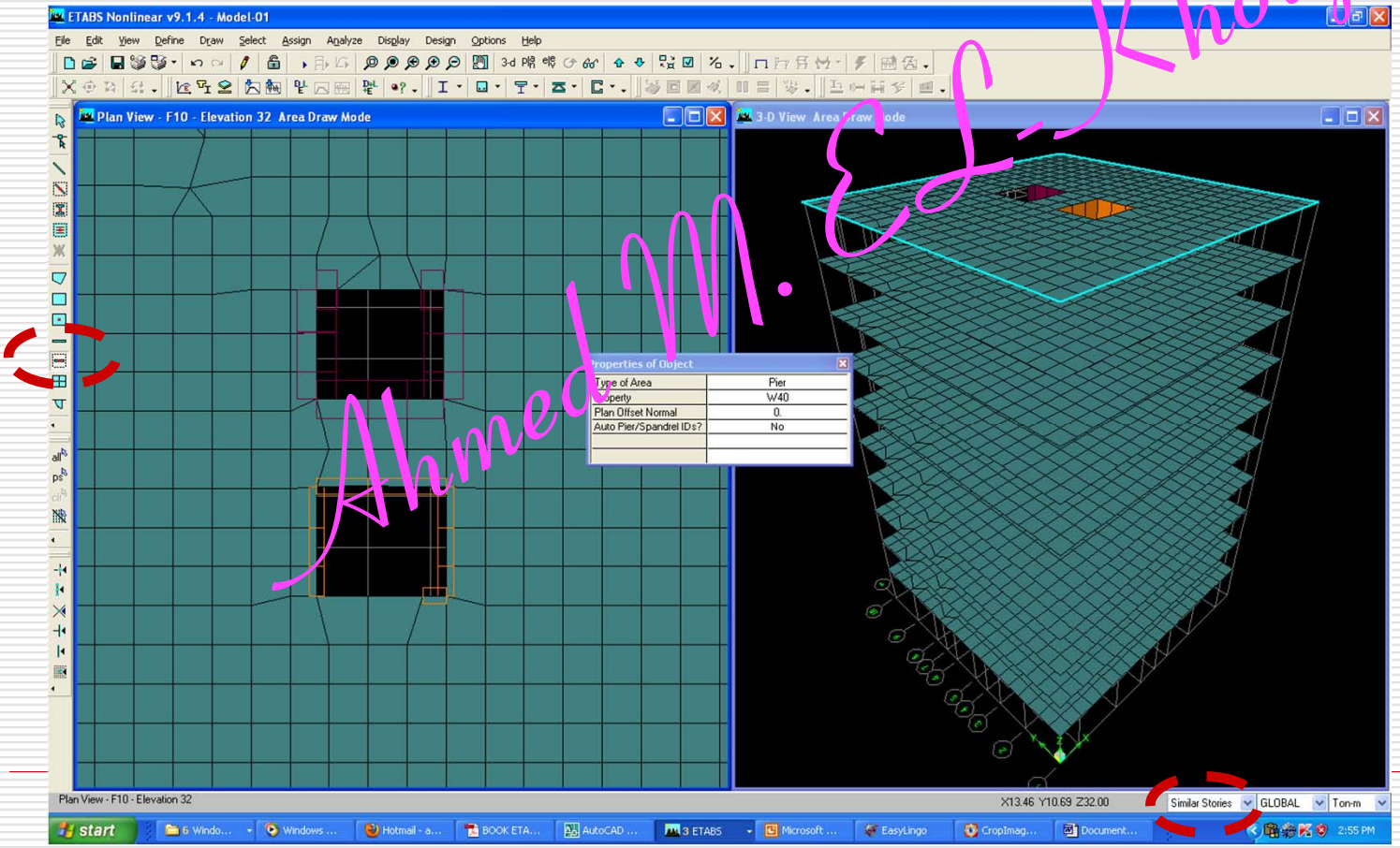
المودل بعد سحبه و تغير قطاع البلاطة بالقطاع الفعلى



11-Select slabs then, Assign-Shell/Area-Wall/Slab Section-Slb22

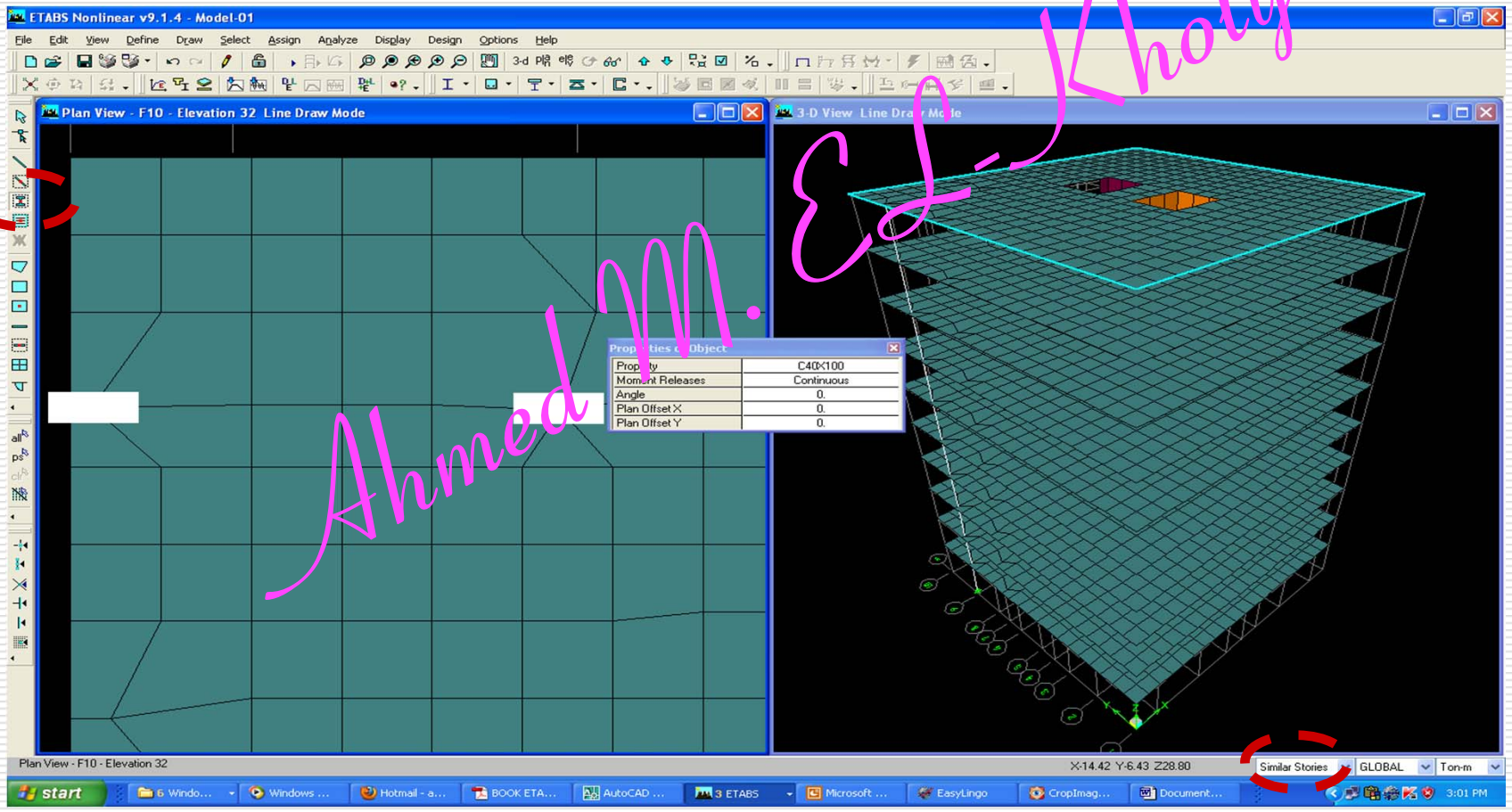
12- Draw Beams, Col, Shear walls

Draw beams, columns, shear walls with exact cross sections in Etabs



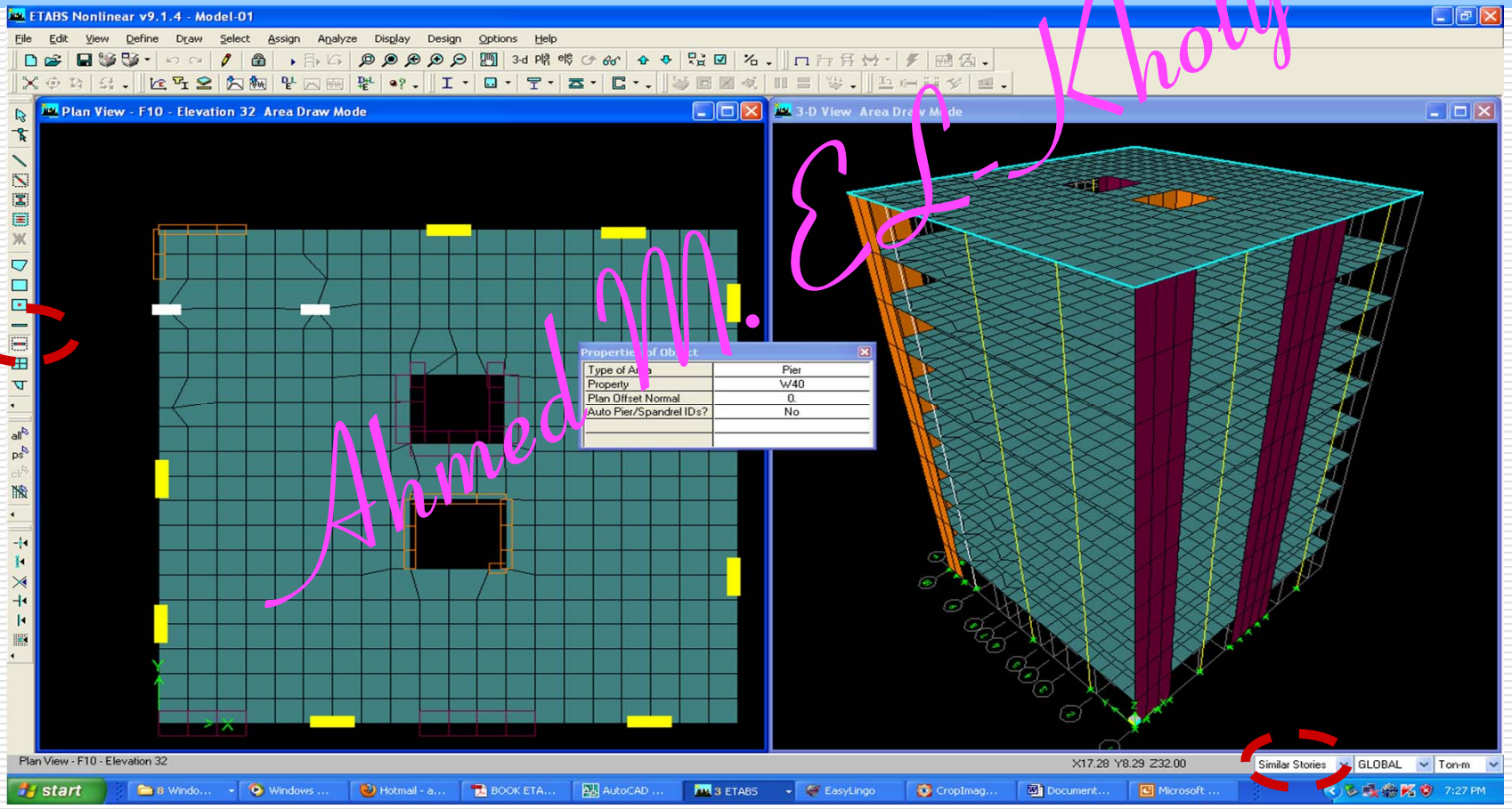
12- Draw Beams, Col, Shear walls

Draw beams, columns, shear walls with exact cross sections in Etabs



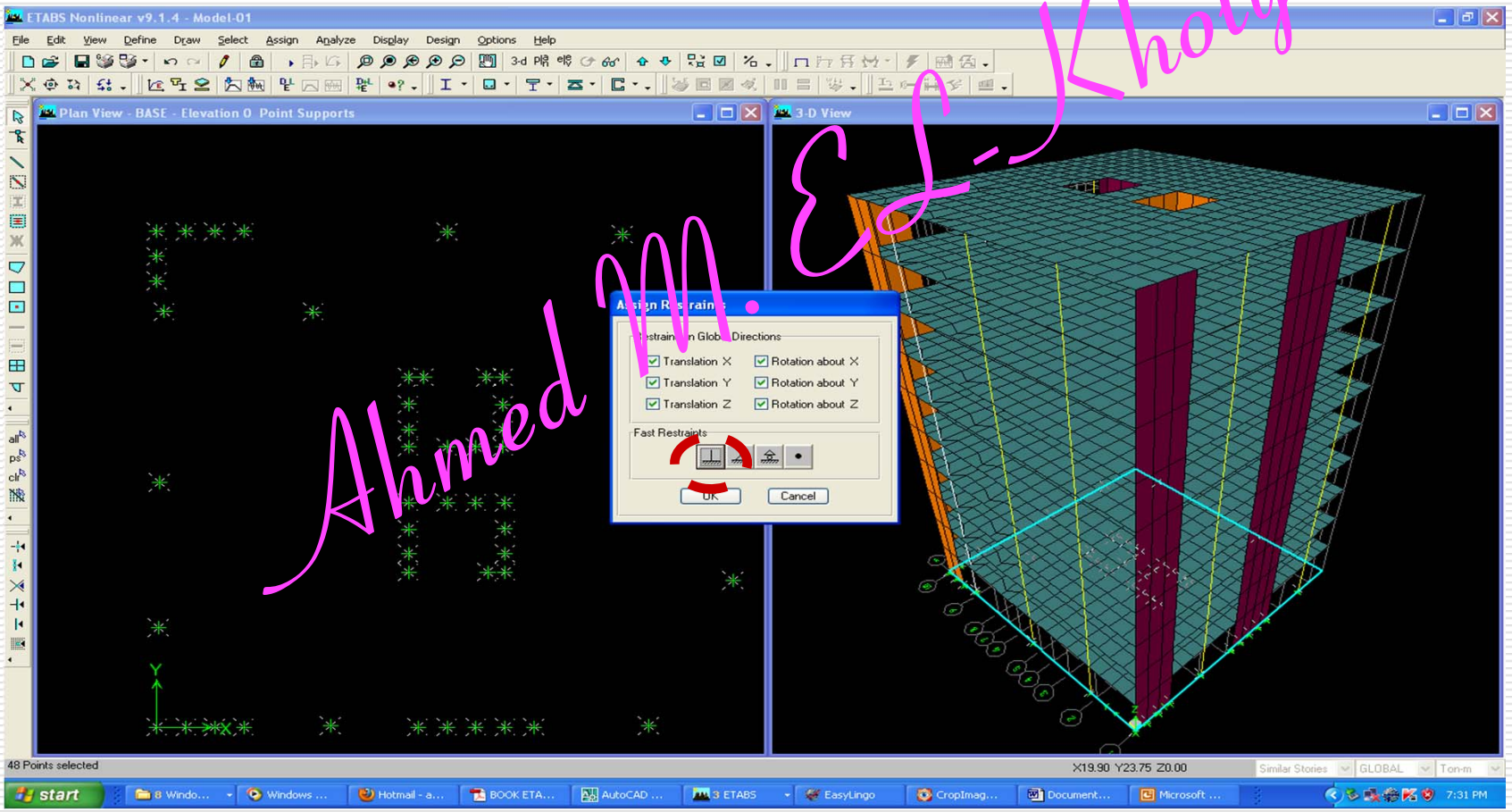
12- Draw Beams, Col, Shear walls

Draw beams, columns, shear walls with exact cross sections in Etabs



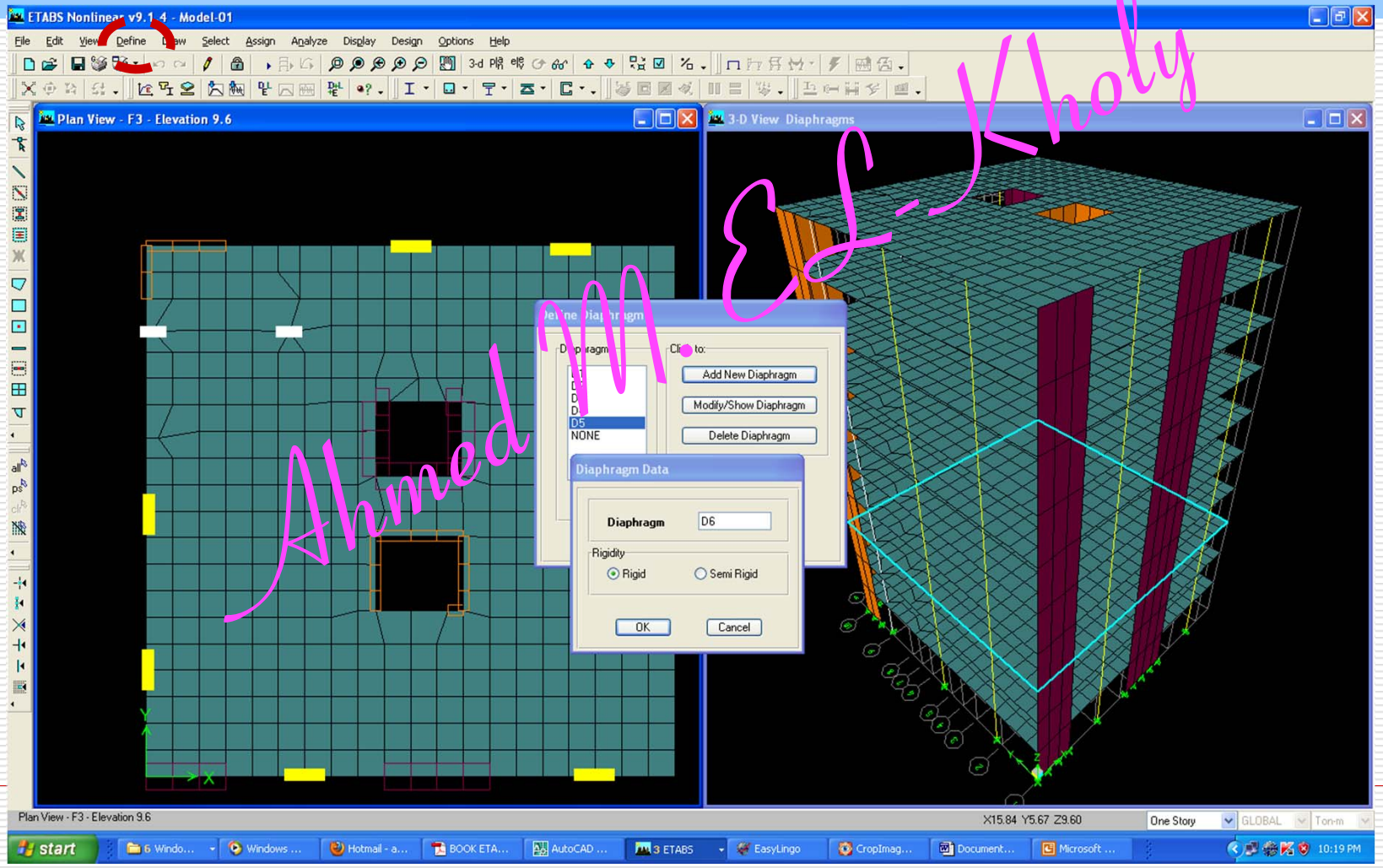
13- Fix the base points

Select the base points and then, Assign-joints-restraints and choose fixed



14- Define Diaphragms for floors

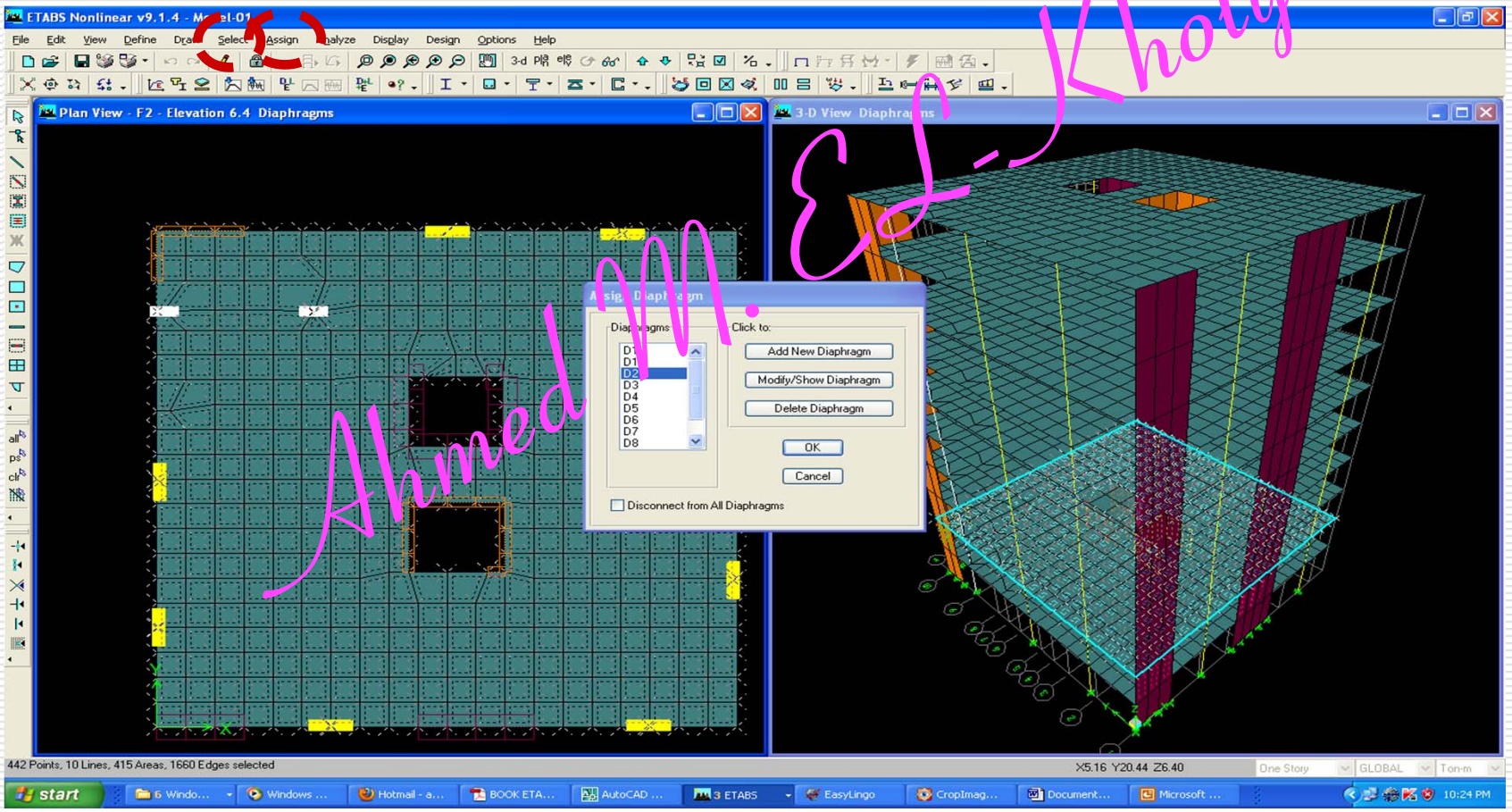
Menu: Define-diaphragm-D1,D2,D3,D4…..D10



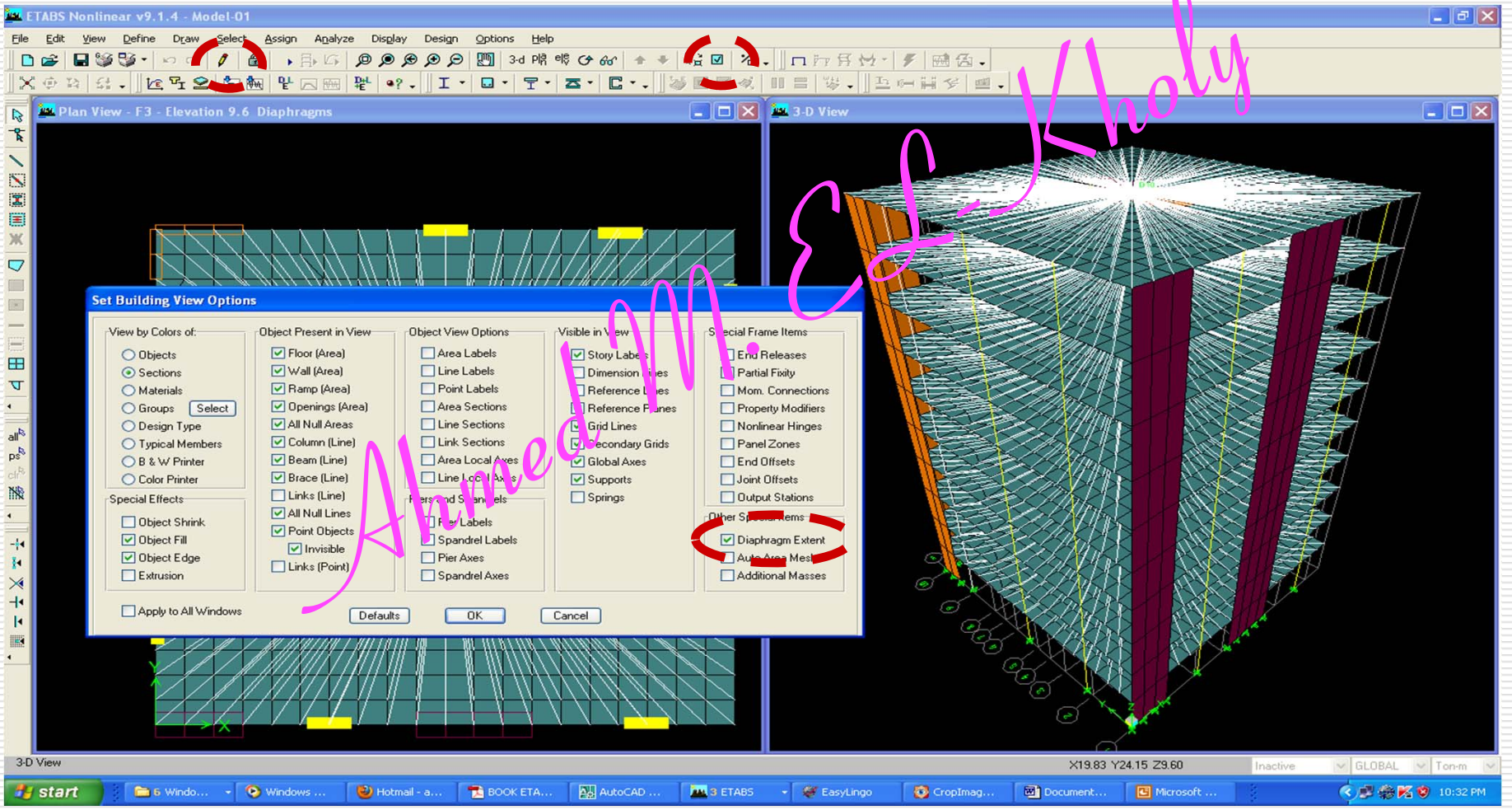
14- Assign Diaphragms for floors

Menu: Select-by story- strory2

Assign-Shell-D2



After assigning all diaphrams



15- Mesh Shear Wall Areas

16- Define Static Load Cases → D, L, Equivalent Static EQ ,…Temp, H, Wind, Snow

17-Define Response Spectrum Functions } Only for Spectra Method

18-Define Response Spectrum Cases

19-Define Load Combinations ??Spectra or not?

20-Assign Loads …D, L, …

21- P-delta Effect/Dynamic Analysis

22- Define Mass source

23- Assign Piers

24- Check model

25- Run Analysis & Check Log File

Retaining Wall !!..
Scale level

26- If Spectra Method is utilized, Scale the Base Shear of Spectra Method to the 0.85 Base Shear of Equivalent Static. …ECL2012 P141

27- Re-Run & Check Log File…

26 26 26 26 26 26 26 26 26 26

28- Checks: Mass Ratio, Drift, Overturning & Sliding

29- Read Straining Actions

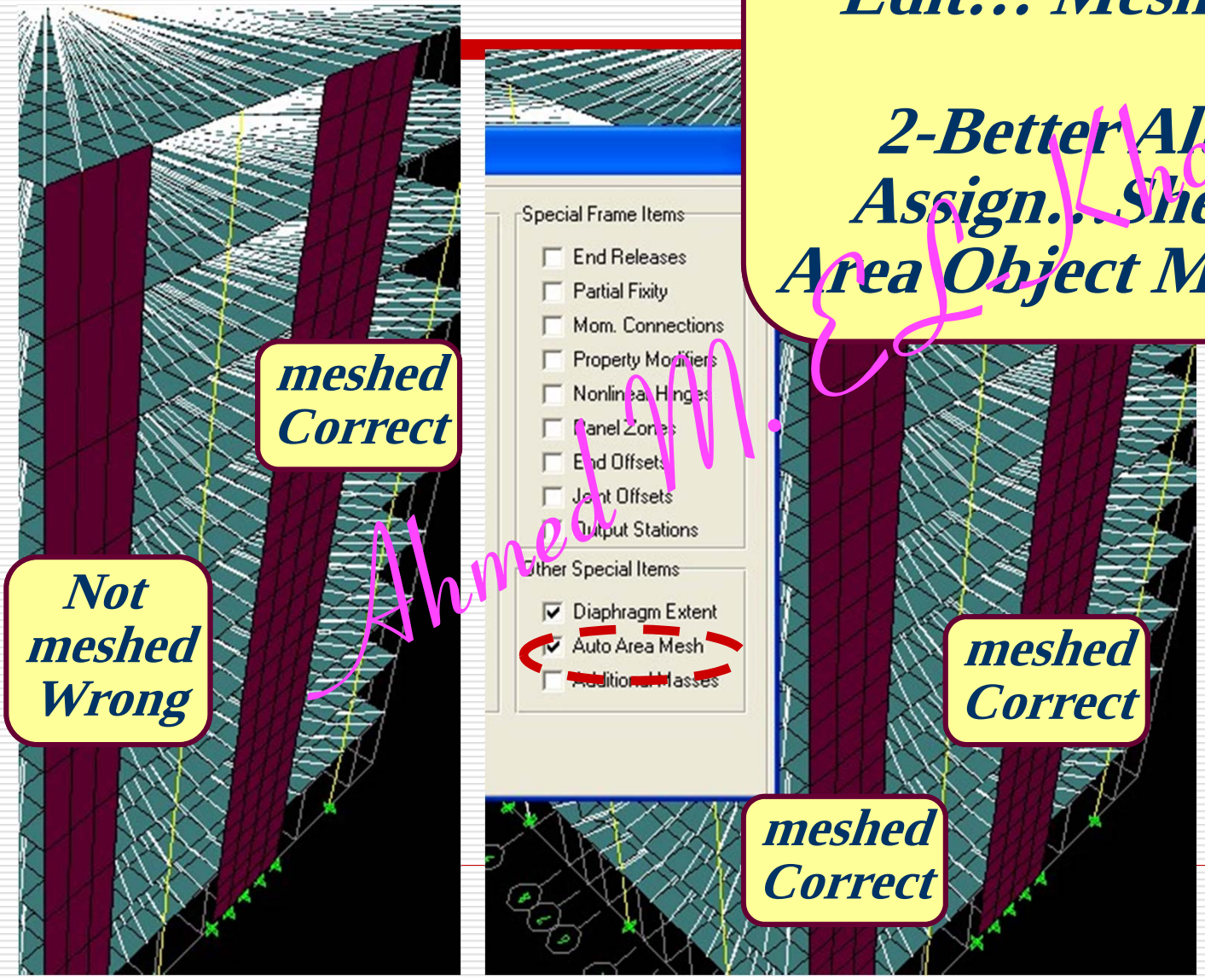
30- Design

15-Mesh (Vertically) Shear Wall Areas

..Two Alternatives

1- Bad Alternative
Edit… Mesh Areas ….

2-Better Alternative
Assign…Shell/Area…
Area Object Mesh Options



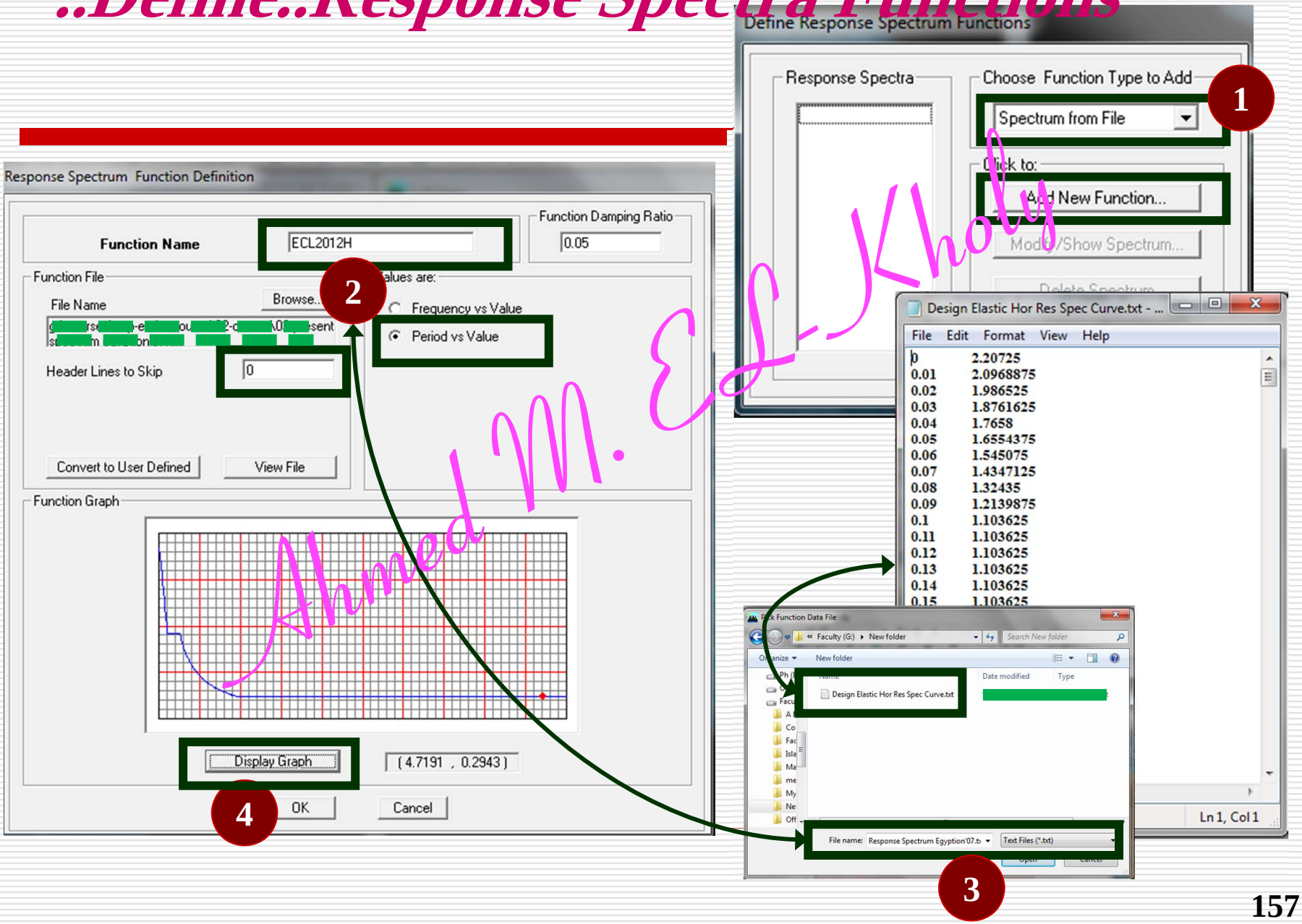
16-Static Load Cases

..Define..Static Load Cases

	Load	Type	SWM	Auto Lateral Loads	Comment
1	OW	Dead	1		Own Wight
2	SID	Dead	0		Flooring+Walls+….
3	LN	Live	0		ψ=0.25, Table 8-7
4	LG	Live	0		ψ=0.5, Table 8-7
5	LGT	Live	0		ψ=1.0, Table 8-7
6	EXA	Quake	0	User Loads	+X dir & Ecc=+0.05
7	EXB	Quake	0	User Loads	+X dir & Ecc=-0.05
8	EYA	Quake	0	User Loads	+Y dir & Ecc=+0.05
9	EYB	Quake	0	User Loads	+Y dir & Ecc=-0.05

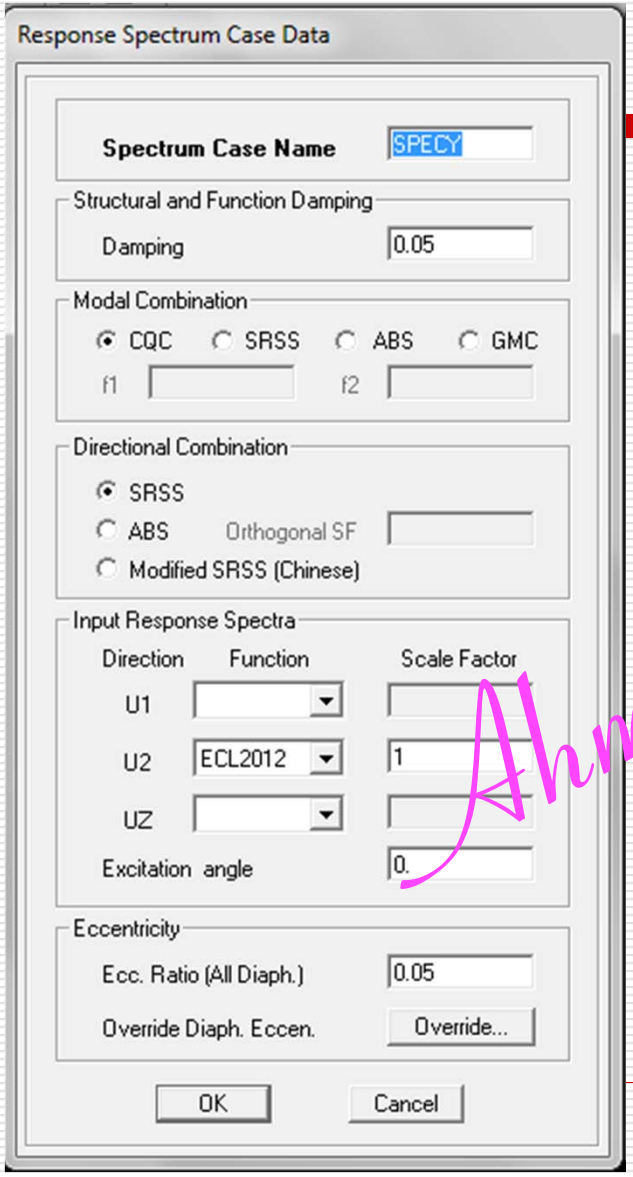
17-Response Spectra Functions

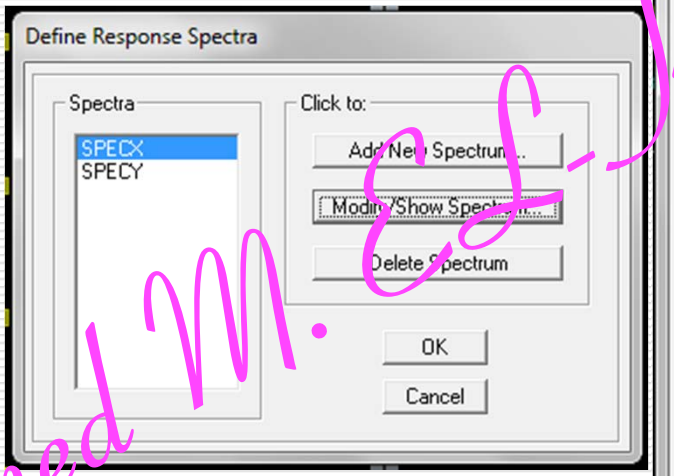
..Define..Response Spectra Functions

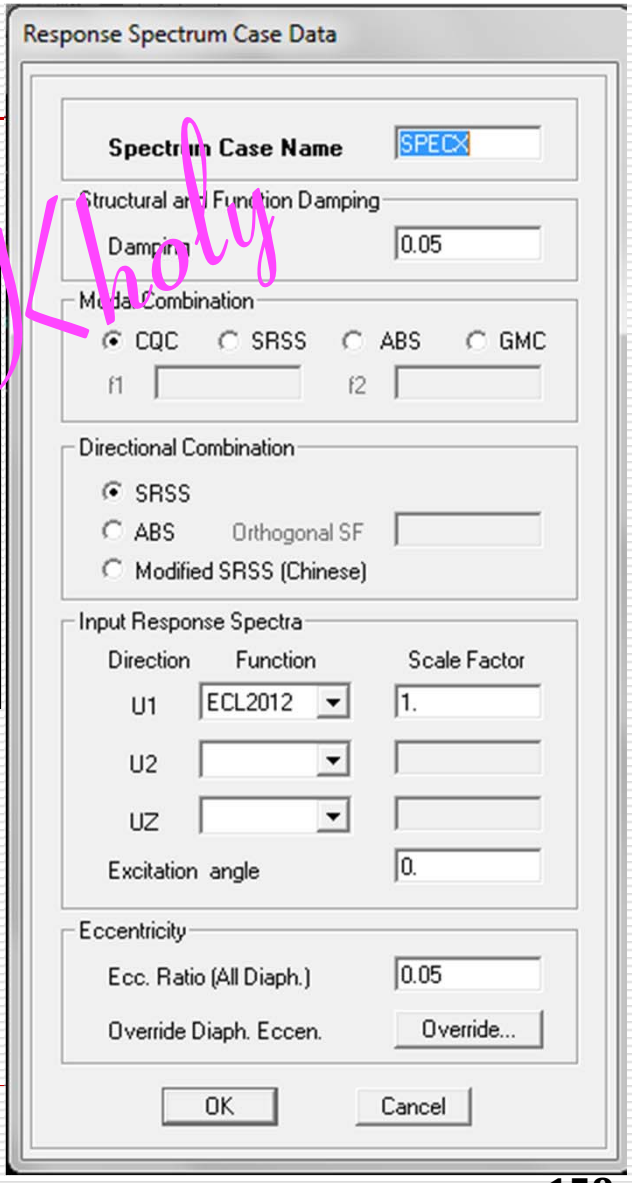


18-Response Spectra Cases

..Define..Response Spectra Cases







19-Load Combinations..Define..Load Combinations

	Combination	Equation	Comment	Equ
1	SD	OW+SID	Service Dead (Deflection)	
2	SL	LN+LG+LGT	Serivce Live (Deflection)	
3	SDL	OW+SID+LN+LG+LGT	Serivce Dead+Live	
4	UD	0.9OW+0.9SID	Ultimated Dead	
5	UDL	1.4(OW+SID)+1.6(LN+LG+LGT)	Ultimated Dead+Live	
6	UDLEXA	1.12SD+α SL+EXA	Ultimate Dead+Live+EX+ECC	(3-5)
7	UDLEXAN	1.12SD+α SL-EXA	Ultimate Dead+Live-EX+ECC	
8	UDLEXB	1.12SD+α SL+EXB	Ultimate Dead+Live+EX-ECC	
9	UDLEXBN	1.12SD+α SL-EXB	Ultimate Dead+Live-EX-ECC	
10	UDLEYA	1.12SD+α SL+EYA	Ultimate Dead+Live+EY+ECC	(3-5)
11	UDLEYAN	1.12SD+α SL-EYA	Ultimate Dead+Live-EY+ECC	
12	UDLEYB	1.12SD+α SL+EYB	Ultimate Dead+Live+EY-ECC	
13	UDLEYBN	1.12SD+α SL-EYB	Ultimate Dead+Live-EY-ECC	
14	UDEXA	0.9SD+EXA	Ultimate Dead+EX+ECC	(3-9)
15	UDEXAN	0.9SD-EXA	Ultimate Dead-EX+ECC	
16	UDEXB	0.9SD+EXB	Ultimate Dead+EX-ECC	
17	UDEXBN	0.9SD-EXB	Ultimate Dead-EX-ECC	
18	UDEYA	0.9SD+EYA	Ultimate Dead+EY+ECC	(3-9)
19	UDEYAN	0.9SD-EYA	Ultimate Dead-EY+ECC	
20	UDEYB	0.9SD+EYB	Ultimate Dead+EY-ECC	
21	UDEYBN	0.9SD-EYB	Ultimate Dead-EY-ECC	159

Static Load Combinations

19-Load Combinations

…Define..Load Combinations

	Combination	Equation	Comment	Equ
22	UDLSpecX	1.12SD+α SL+SpecX	Ultimate Dead+Live+SpecX+ECC	(3-5)
23	UDLSpecY	1.12SD+α SL+SpecY	Ultimate Dead+Live+SpecY+ECC	(3-5)
24	UDSpecX	0.9SD+SpecX	Ultimate Dead+SpecX+ECC	(3-9)
25	UDSpecY	0.9SD+SpecY	Ultimate Dead+SpecY+ECC	(3-9)

Dynamic Load Combinations

20-Assign Loads

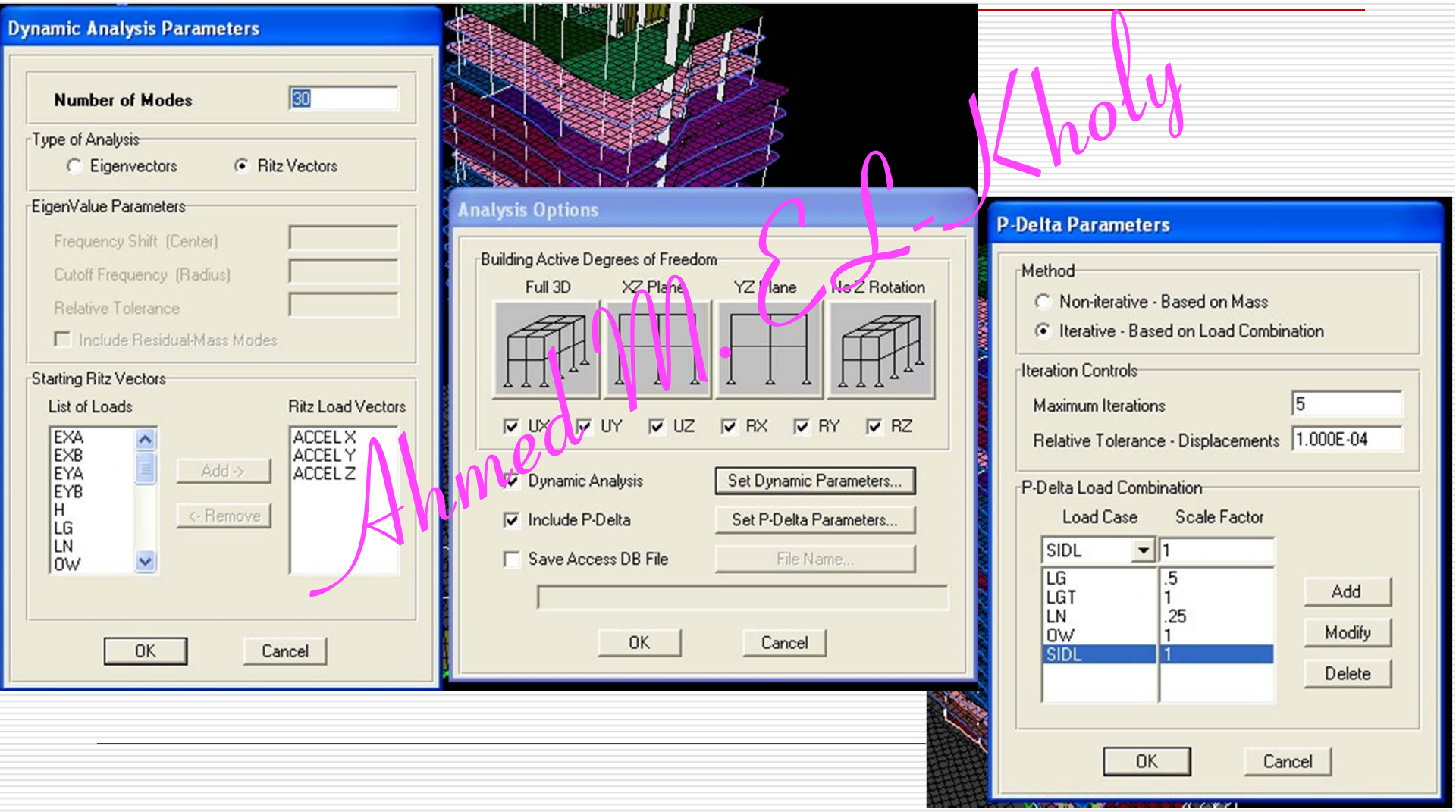
…Assign..Area Loads… Uniform

Assign the loads for the slabs in the cases SID, LN, LG & LGT

Be careful and avoid selecting the walls when assigning loads.
Assign the loads to ONLY the slabs.
DO NOT Assign loads to walls.

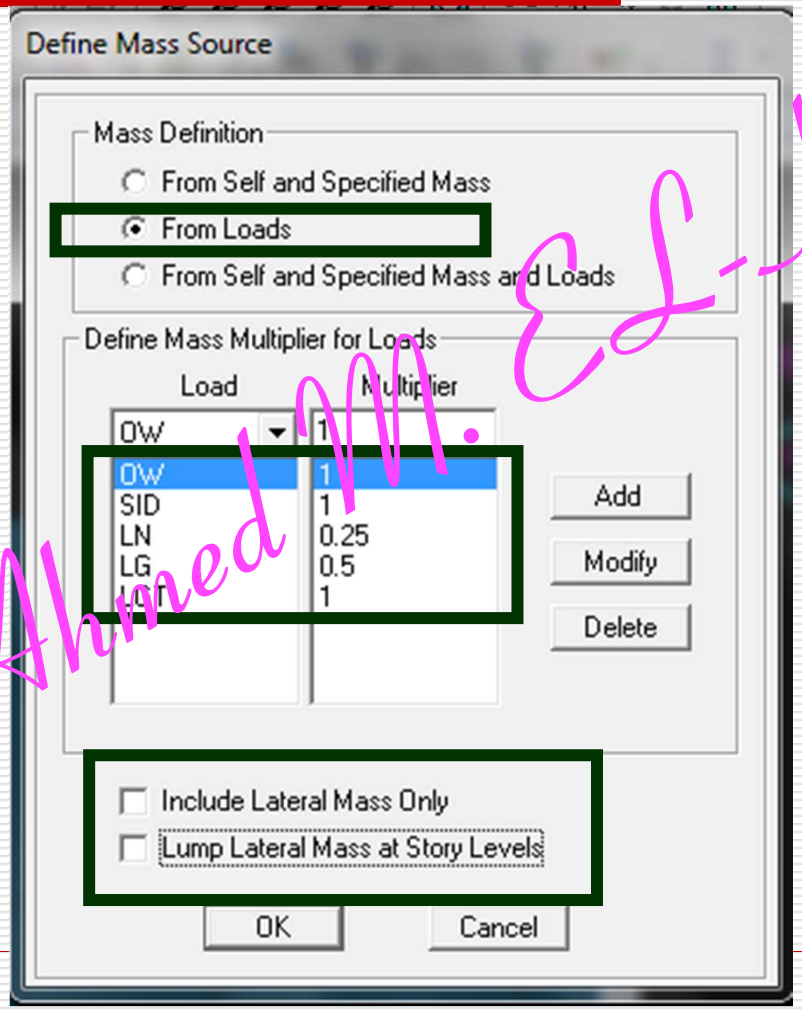
21- Dynamic & P-Δ Parameters

…Analyze..Set Analysis Options..



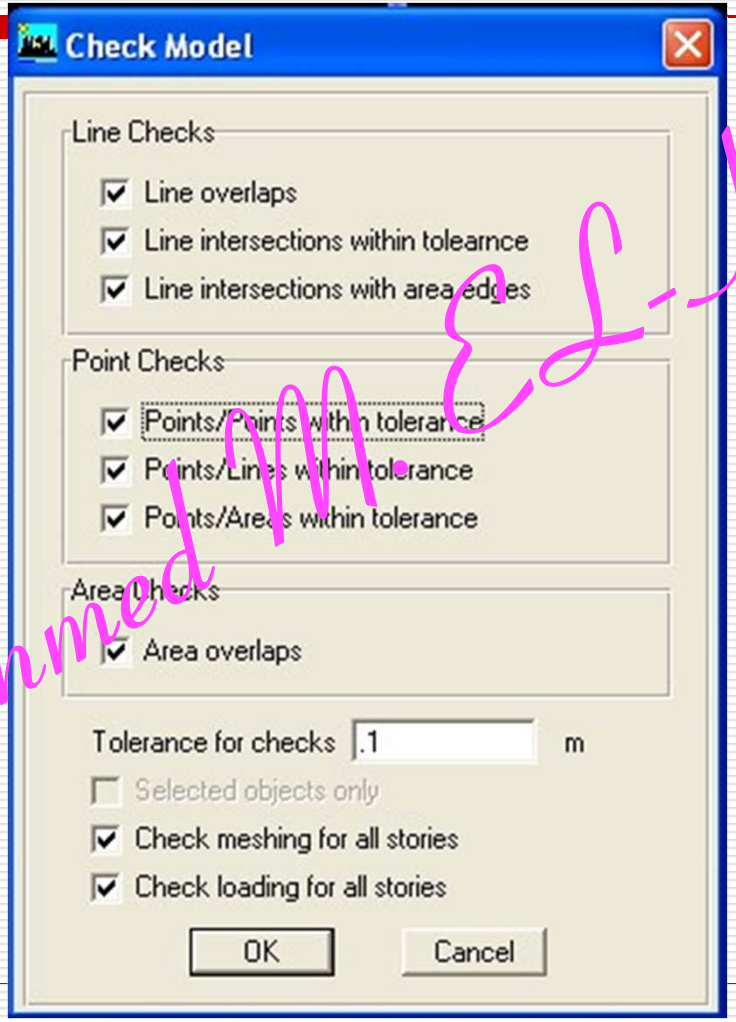
22- Mass Source

…Define..Mass Source..



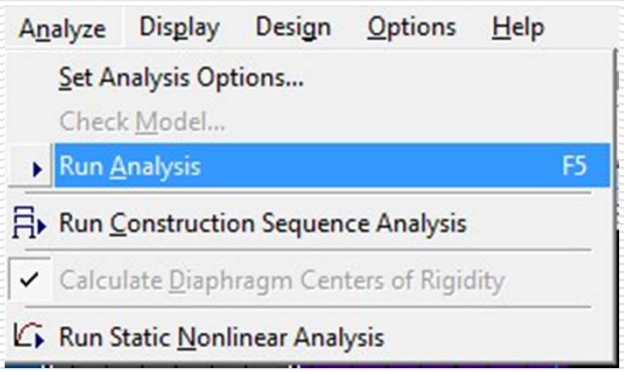
24- Check Model

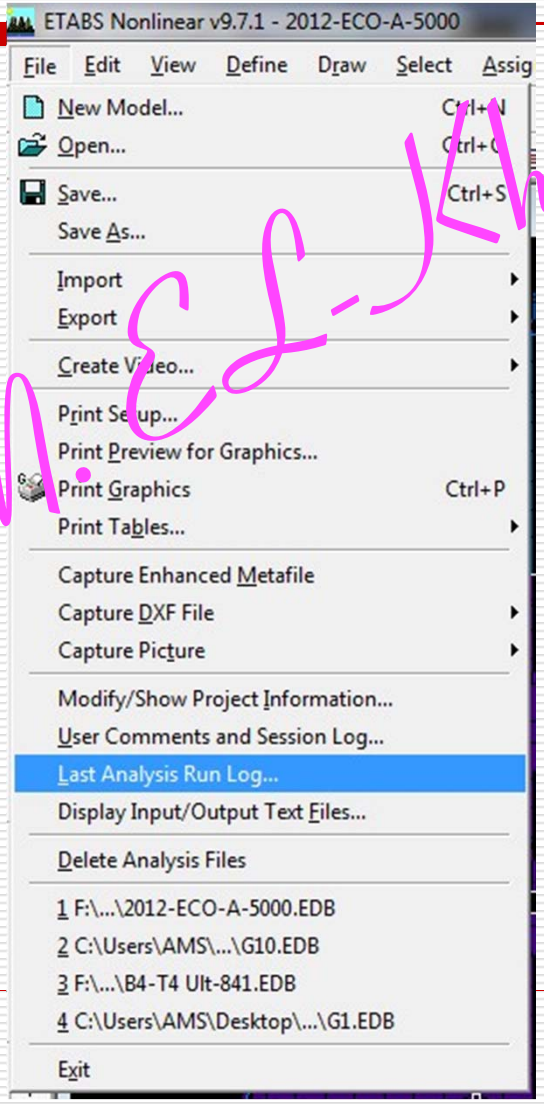
…Analyze..Check Model..



25- Run …Check log file

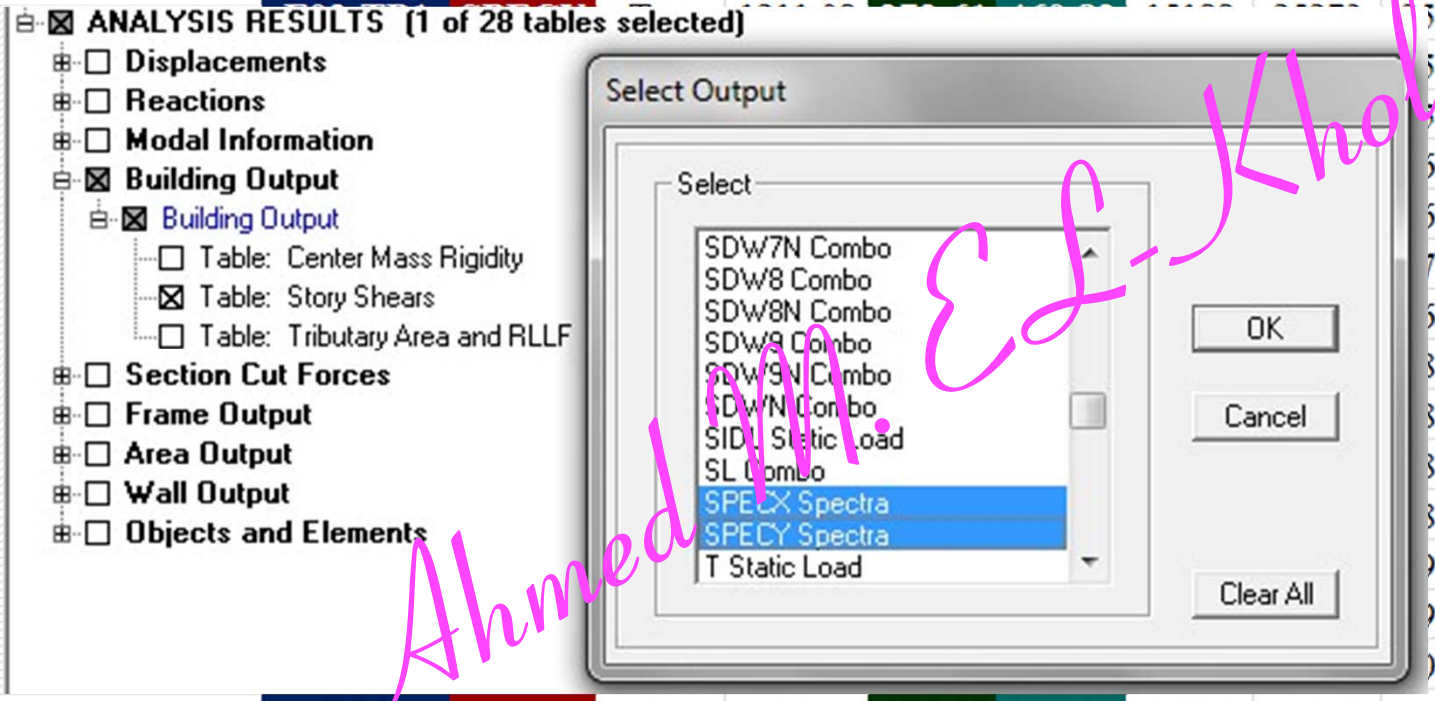
…Analyze.. Run..//// …File..Last Analysis log File





26- Scale the Base Shear for Spectra Method

Story	Load	Loc	P	VX	VY	T	MX	MY
ROOF	SPECX	Top	107.15	156.66	45.99	2900.4	2566.3	3776.6
ROOF	SPECX	Bottom	114.50	161.48	48.35	3004.8	2652.2	3902.4
ROOF	SPECY	Top	129.63	73.96	160.78	4434.3	3387.1	3335.7
ROOF	SPECY	Bottom	133.82	77.32	168.13	4616.3	3191.4	3322.6
F02-TP1	SPECX	Top	1000.26	480.77	213.44	10200	18714	23759
F02-TP1	SPECX	Bottom	1001.73	484.26	214.27	10232	19030	24433
BS1	SPECX	Top	1207.96	676.67	248.22	13402	23108	30132
BS1	SPECX	Bottom	1222.49	679.62	250.86	13571	23830	31332
BS1	SPECY	Top	1463.22	325.39	705.29	22258	32078	30615
BS1	SPECY	Bottom	1480.90	327.88	706.75	22391	33568	31119
BS2	SPECX	Top	1302.42	722.48	314.20	16713	25262	31749
BS2	SPECX	Bottom	1325.96	738.81	332.40	17658	26175	33099
BS2	SPECY	Top	1578.37	397.70	734.71	23113	35072	31737
BS2	SPECY	Bottom	1607.10	419.72	756.40	23273	36796	32304



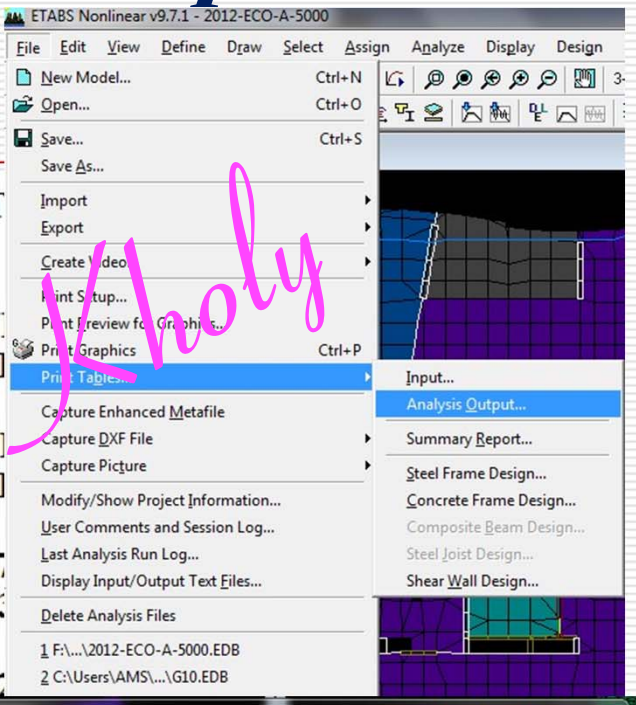
Vdynamic

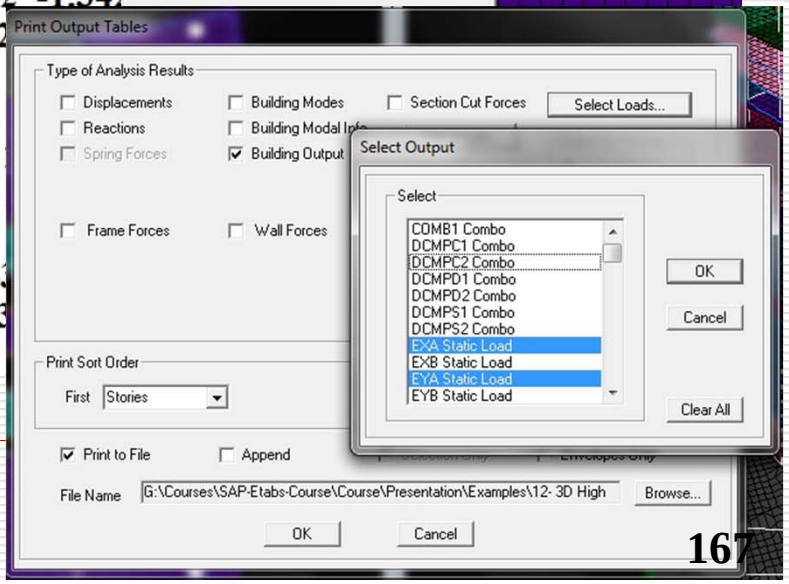
26- Scale the Base Shear for Spectra Method

STORY	LOAD	LOC	P	VX	VY	T
ROOF	EXA	Top	-3.906E-06	-4.281E+02	4.307E-07	8.097
		Bottom	-3.905E-06	-4.372E+02	4.306E-07	8.255
ROOF	EYA	Top	4.882E-06	2.510E-07	-4.281E+02	-8.921
		Bottom	4.881E-06	2.502E-07	-4.372E+02	-9.106
F19-TP32	EXA	Top	-3.907E-06	-6.494E+02	2.482E-09	1.227
		Bottom	-3.907E-06	-6.587E+02	8.665E-10	1.243
F19-TP32	EYA	Top	4.900E-06	-4.221E-07	-6.494E+02	-1.342
		Bottom	4.900E-06	-4.227E-07	-6.587E+02	-1.361
BS2	EXA	Top	-3.740E-06	-1.548E+03	-1.778E-05	
		Bottom	-3.740E-06	-1.549E+03	-1.778E-05	
BS2	EYA	Top	8.090E-06	8.468E-06	-1.548E+03	-3
		Bottom	8.090E-06	8.468E-06	-1.549E+03	-3

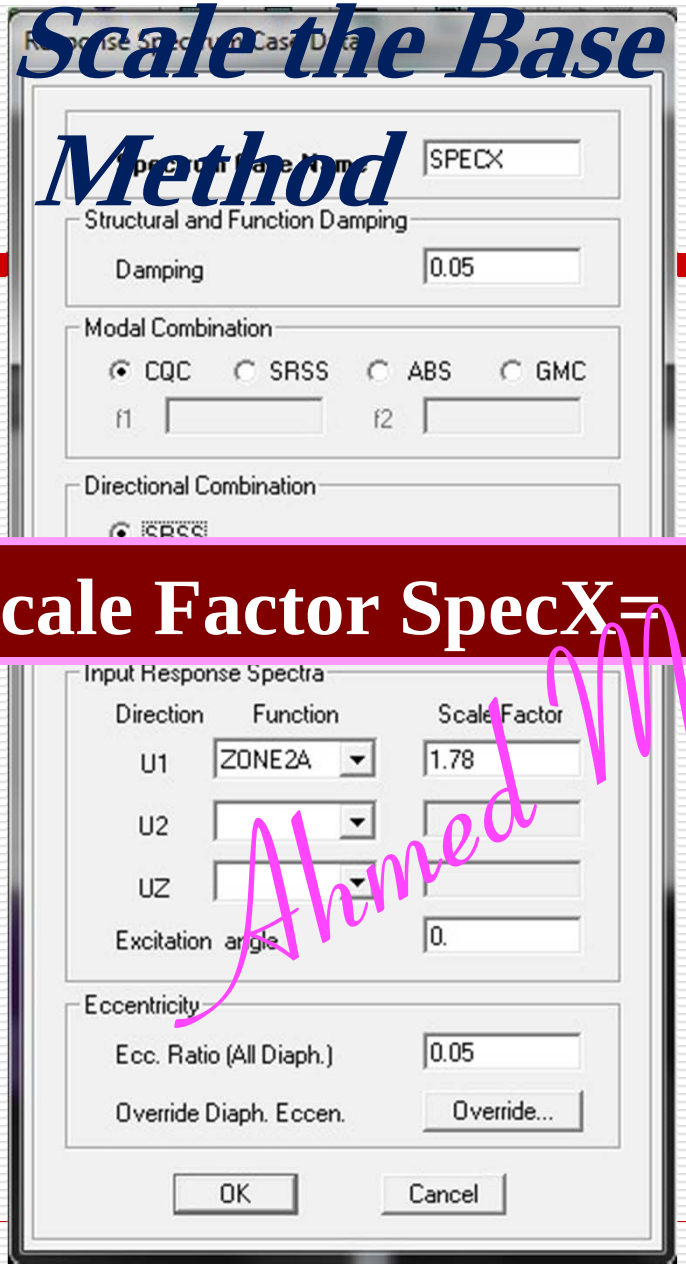
V static

Must be equal to Base Shear estimated manually





26- Scale the Base Shear for Spectra Method



Item 8-7-3-3-1-8 ECL 2012

Scale Factor SpecX= Scale Factor SpecX

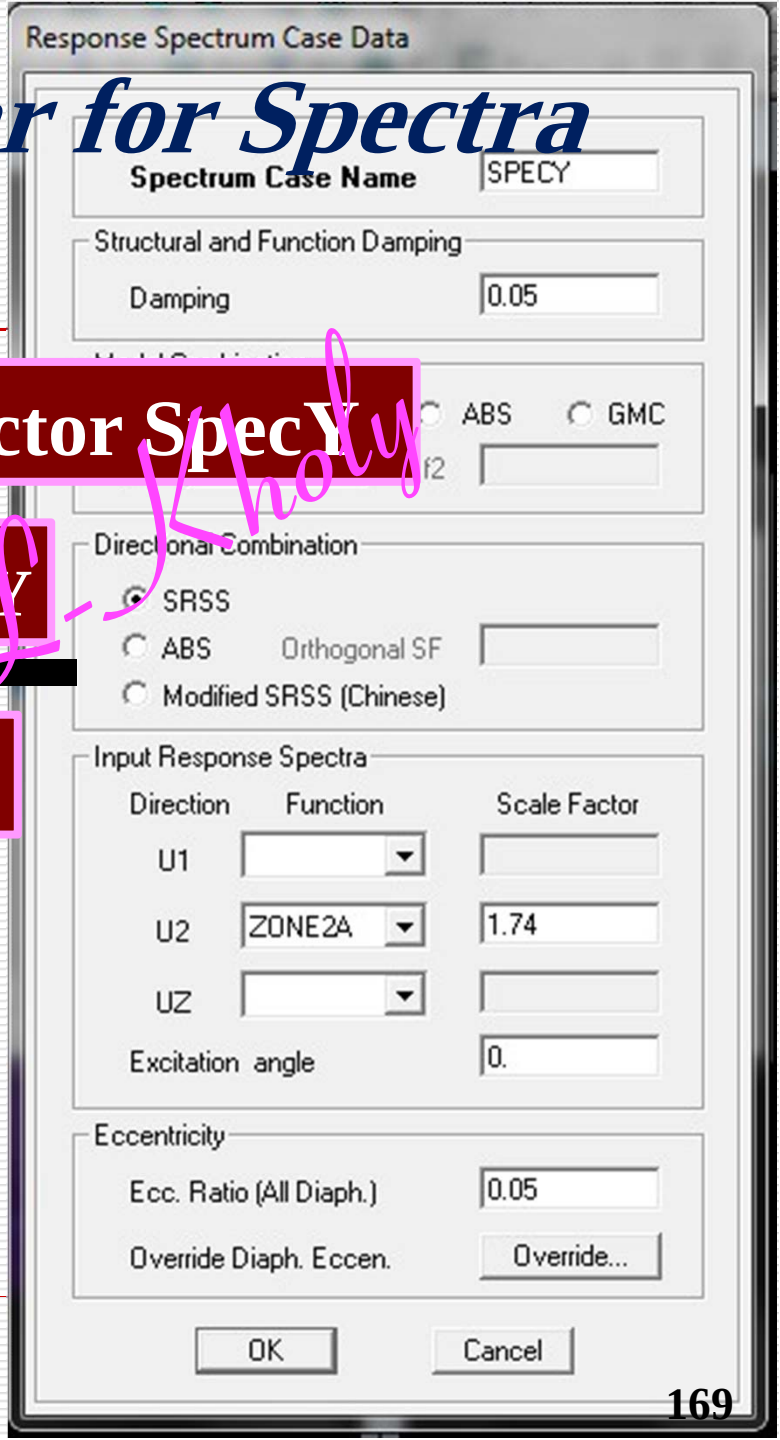
$$* \frac{0.85\ V_{static\ X}}{V_{dynamic\ X}}$$

26- Scale the Base Shear for Spectra Method

Scale Factor SpecY= Scale Factor SpecY

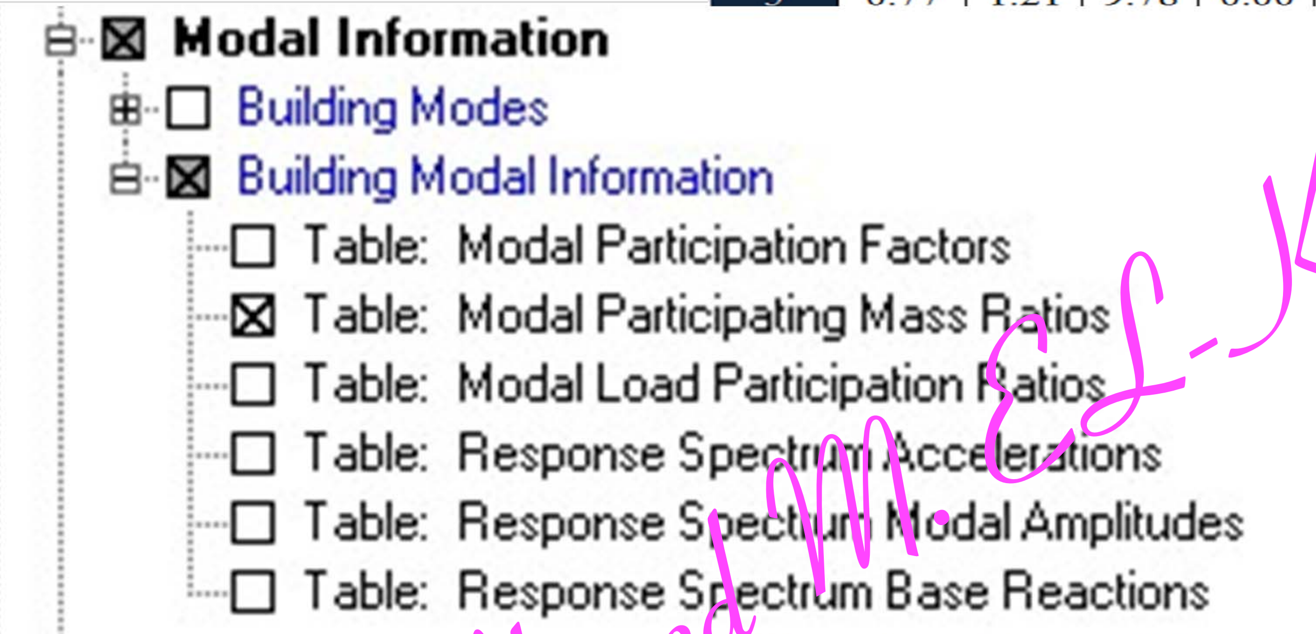
$$\frac{0.85\ V_{static\ Y}}{V_{dynamic\ Y}} * \text{Item 8-7-3-3-1-8 ECL 2012}$$

Re-Run !!! Check Log File Check Base Shear



28- Check Mass Participating Ratios

Mode	Period	UX	UY	UZ	SumUX	SumUY	SumUZ
1	4.07	0.12	7.35	0.00	0.12	7.35	0.00
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	2.88	38.57	[illegible]	0.00	[illegible]	55.32	0.00
4	1.07	0.01	0.53	0.00	54.44	55.85	0.00
5	0.77	1.21	9.78	0.00	55.65	65.63	0.00
					67.37	66.72	0.00
					67.37	66.72	0.00
					67.37	66.72	0.00
					67.37	66.92	0.00
					67.45	71.79	0.01
					67.46	71.79	1.36
					67.71	72.26	1.37
					67.82	72.28	24.99
					67.84	72.30	26.03
					71.58	72.52	37.36
					72.91	72.54	40.30
					73.80	72.74	51.87
					73.82	72.83	58.34
19	0.24	0.38	0.09	0.00	74.20	72.92	58.34
20	0.22	0.01	0.01	8.31	74.21	72.93	66.65
21	0.21	0.01	3.85	0.03	74.22	76.78	66.68
22	0.17	5.08	0.12	0.30	79.30	76.90	66.98
23	0.17	0.07	0.03	9.54	79.38	76.93	76.52
24	0.15	0.03	3.04	0.05	79.40	79.97	76.57
25	0.12	0.09	0.05	8.03	79.49	80.03	84.60
26	0.11	7.46	0.11	0.16	86.95	80.14	84.77
27	0.11	0.42	6.94	0.07	87.37	87.08	84.84
28	0.07	7.32	3.57	0.00	94.69	90.65	84.84
29	0.06	2.73	6.99	0.03	97.42	97.64	84.87
30	0.05	0.00	0.04	8.37	97.42	97.67	93.24

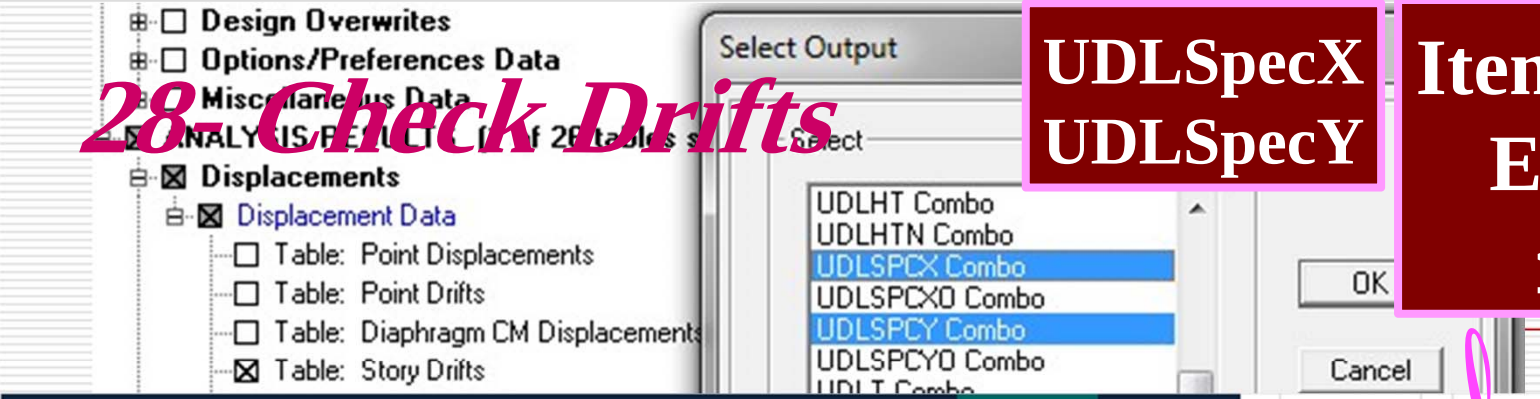


Item 8-7-3-3-1-5
ECL 2012
≥ 90%

28-Check Drifts

UDLSpecX
UDLSpecY

Item 8-8-3-1-a
ECL 2012
≤ 0.005

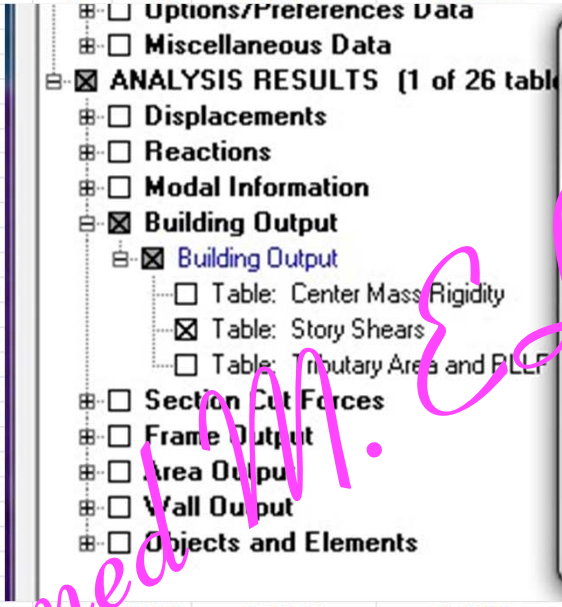


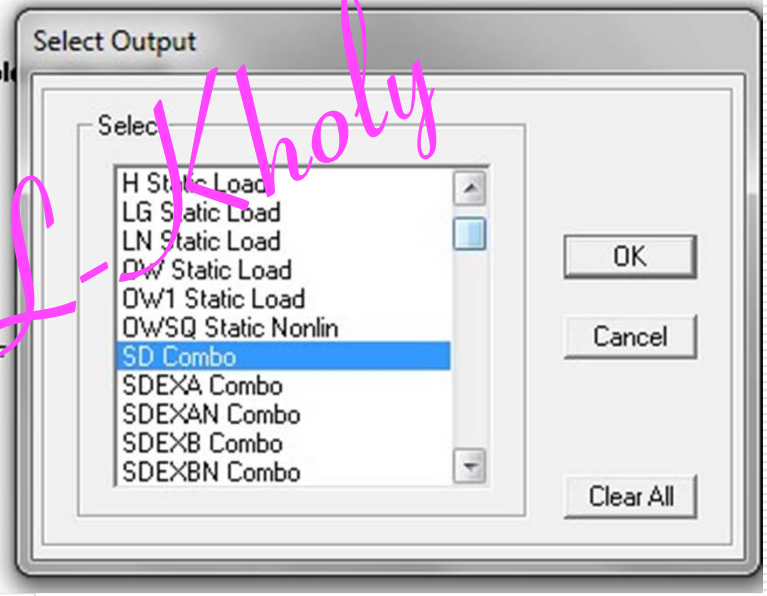
Story	Item	Load	Point	X	Y	Z	DriftX	DriftY
ROOF	Max Drift X	UDLSPCX	278	2.988	-5.471	86.95	0.00076	
ROOF	Max Drift Y	UDLSPCX	3023	35.988	38.25	86.95		0.00043
ROOF	Max Drift X	UDLSPCY	3021	34.35	38.25	86.95	0.00069	
ROOF	Max Drift Y	UDLSPCY	3023	35.988	38.25	86.95		0.00074
F21-TP3	Max Drift X	UDLSPCX	3124	36.896	39.459	83.25	0.00090	
F21-TP3	Max Drift Y	UDLSPCX	2792	37.585	33.91	83.25		0.00054
F21-TP3	Max Drift X	UDLSPCY	3124	36.896	39.459	83.25	0.00086	
F21-TP3	Max Drift Y	UDLSPCY	2792	37.585	33.91	83.25		0.00093
F20-TP3	Max Drift X	UDLSPCX	3124	36.896	39.459	79.55	0.00099	
F20-TP3	Max Drift Y	UDLSPCX	2792	37.585	33.91	79.55		0.00060
F20-TP3	Max Drift X	UDLSPCY	3124	36.896	39.459	79.55	0.00097	
F20-TP3	Max Drift Y	UDLSPCY	2792	37.585	33.91	79.55		0.00105
F19-TP32	Max Drift X	UDLSPCX	3192	37.402	40.139	75.85	0.00111	
F19-TP32	Max Drift Y	UDLSPCX	2775	37.884	33.586	75.85		0.00068
F19-TP32	Max Drift X	UDLSPCY	3192	37.402	40.139	75.85	0.00111	
F19-TP32	Max Drift Y	UDLSPCY	2775	37.884	33.586	75.85		0.00116
F18-TP2	Max Drift X	UDLSPCX	3192	37.402	40.139	72.15	0.00123	
F18-TP2	Max Drift Y	UDLSPCX	2775	37.884	33.586	72.15		0.00076
F18-TP2	Max Drift X	UDLSPCY	3192	37.402	40.139	72.15	0.00125	
F18-TP2	Max Drift Y	UDLSPCY	2775	37.884	33.586	72.15		0.00129
F17-TP2	Max Drift X	UDLSPCX	3192	37.402	40.139	68.45	0.00132	

	Max Drift X	Max Drift Y
	0.00205	0.00215
X 0.7 R	0.00716	0.00752
X v	0.00358	0.00376
	Safe	Safe
Code	0.00500	0.00500

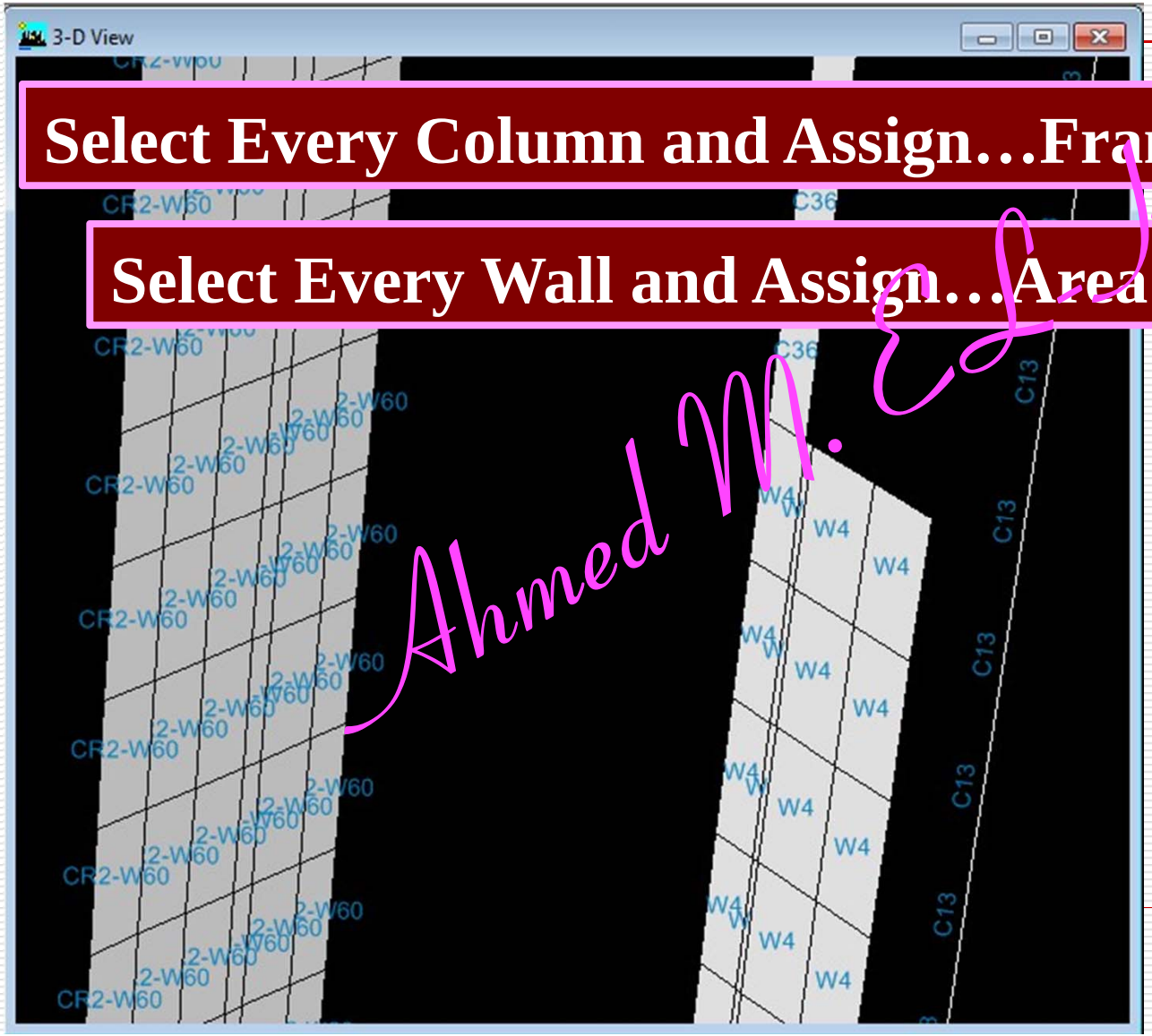
28- Check Sliding, Overturning

Story	Load	Loc	P	VX	VY	T	MX	MY
TOR	SD	Top	0	-56.65	47.42	-426.647	0	0
TOR	SD	Bottom	1648.83	0	0	-4.827	26514.645	-36701.675
ROOF	SD	Top	4609.65	0	0	-4.827	81835.903	-94649.2
ROOF	SD	Bottom	4969.36	0	0	-5.379	85[illegible]09	-103503.247
F21-TP3	SD	Top	6526.81	0	0	-5.379	115004.828	-131985.054
F21-TP3	SD	Bottom	7030.2	0	0	-5.822	124244.26	-142028.047
F20-TP3	SD	Top	8587.63	0	0	-5.822	150764.997	-170509.854
F20-TP3	SD	Bottom	9091.91	0	0	-6.307	159341.436	-180571.941
F19-TP32	SD	Top	11205.29	0	0	-6.307	193887.539	-218584.742
F19-TP32	SD	Bottom	11708.67	0	0	-6.886	202483.671	-228851.961
F18-TP2	SD	Top	13677.32	0	0	-6.886	232299.385	-265629.634
F18-TP2	SD	Bottom	14187.38	0				
F17-TP2	SD	Top	16156.03	0				
F17-TP2	SD	Bottom	16667.87	0				
F16-TP2	SD	Top	18636.52	0				
F16-TP2	SD	Bottom	19148.35	0				
F15-TP3	SD	Top	20705.84	0				
F15-TP3	SD	Bottom	21231.64	0				
F14-TP31	SD	Top	23138.5	0				
F14-TP31	SD	Bottom	23671.49	0				
F13-TP1	SD	Top	25488.08	0				
F13-TP1	SD	Bottom	26021.64	0				
F12-TP1	SD	Top	27838.23	0				
F12-TP1	SD	Bottom	28371.22	0				
F11-TP1	SD	Top	30187.81	0				
F11-TP1	SD	Bottom	30720.81	0				
F10-TP1	SD	Top	32537.4	0				
F10-TP1	SD	Bottom	33083.63	0				
F09-TP2	SD	Top	34917.5	0				
F09-TP2	SD	Bottom	35463.73	0				
F08-TP1	SD	Top	37280.32	0				
F08-TP1	SD	Bottom	37826.54	0				
F07-TP1	SD	Top	39643.13	0				
F07-TP1	SD	Bottom	40189.36	0				
F06-TP1	SD	Top	42005.95	0				
F06-TP1	SD	Bottom	42567.23	0	0	-12.902	703543.55	-814937.684
F05-TP1	SD	Top	44383.82	0	0	-12.902	733155.65	-849021.305
F05-TP1	SD	Bottom	44945.11	0	0	-12.935	742312.798	-860272.76
F04-TP1	SD	Top	46761.7	0	0	-12.935	771924.898	-894356.381
F04-TP1	SD	Bottom	47322.98	0	0	-12.909	781082.114	-905608.287
F03-TP1	SD	Top	49139.57	0	0	-12.909	810694.214	-939691.909
F03-TP1	SD	Bottom	49700.85	0	0	-12.839	819851.783	-950944.111
F02-TP1	SD	Top	51517.44	0	0	-12.839	849463.883	-985027.732
F02-TP1	SD	Bottom	52078.73	0	0	-12.766	858622.302	-996280.637
F01	SD	Top	54375.85	0	0	-12.766	895722.767	-1050533.56
F01	SD	Bottom	55121.7	0	0	-12.685	907778.895	-1066458.405
PODIUM	SD	Top	57896.93	0	0	-12.685	929323.982	-1130610.169
PODIUM	SD	Bottom	58788.65	0	0	-12.667	942701.728	-1149856.485
GROUND	SD	Top	63892.79	0	0	-12.667	1018848.553	-1200110.218
GROUND	SD	Bottom	65651.56	0	0	-12.68	1056718.602	-1212918.137
BS1	SD	Top	69459.71	0	0	-12.68	1117378.052	-1250412.685
BS1	SD	Bottom	70901.17	0	0	-12.674	1148390.569	-1261839.498
BS2	SD	Top	75801.19	0	0	-12.674	1233765.51	-1301045.575
BS2	SD	Bottom	77246	0	0	-13	1264548	-1312539



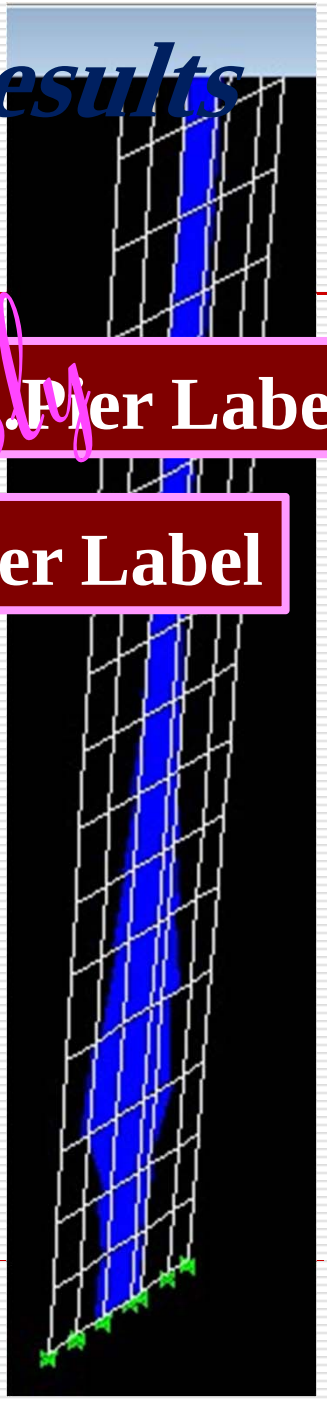


23 & 29- Assign Piers, Read Results

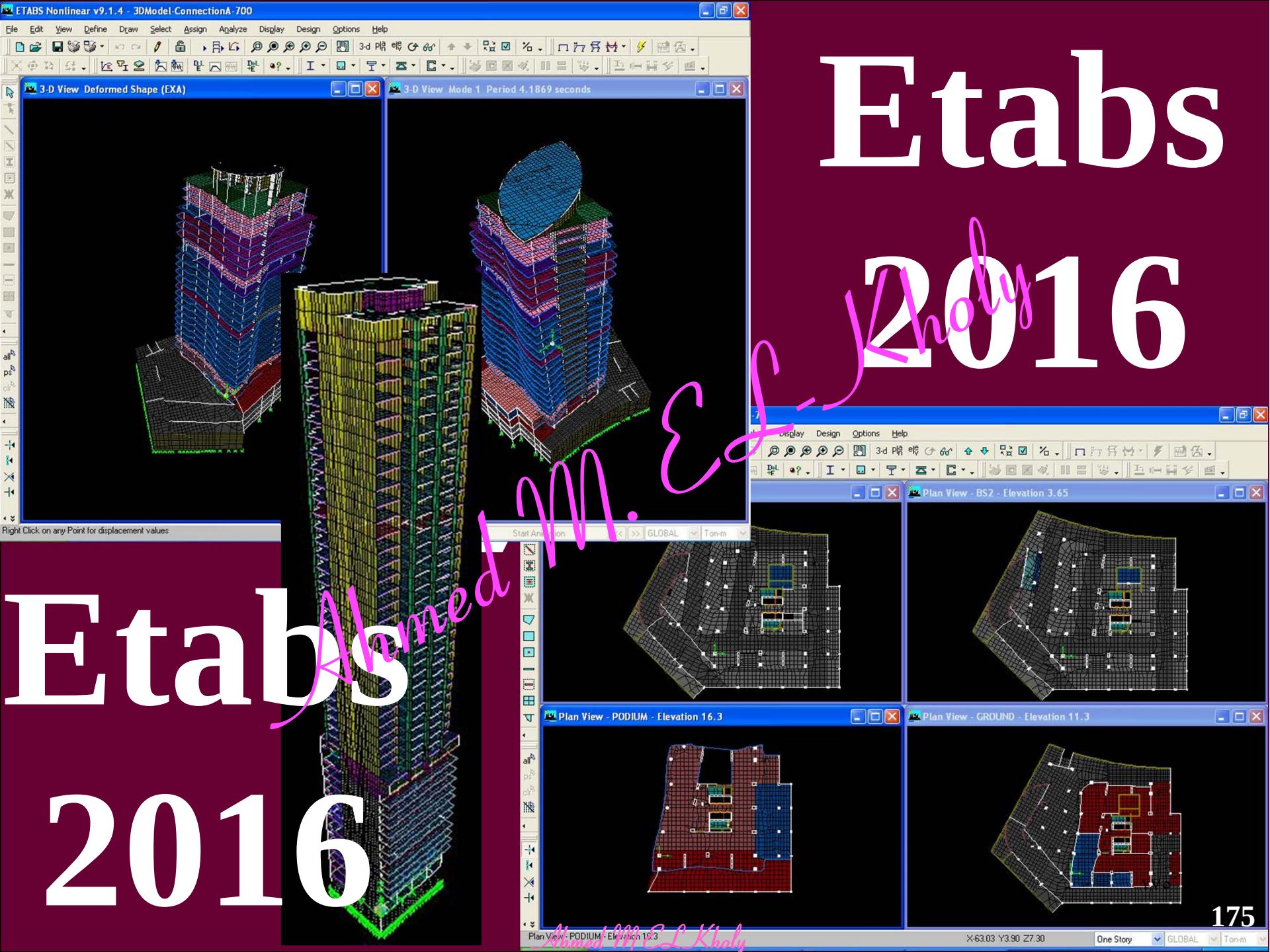


Select Every Column and Assign…Frame…Pier Label

Select Every Wall and Assign…Area….Pier Label



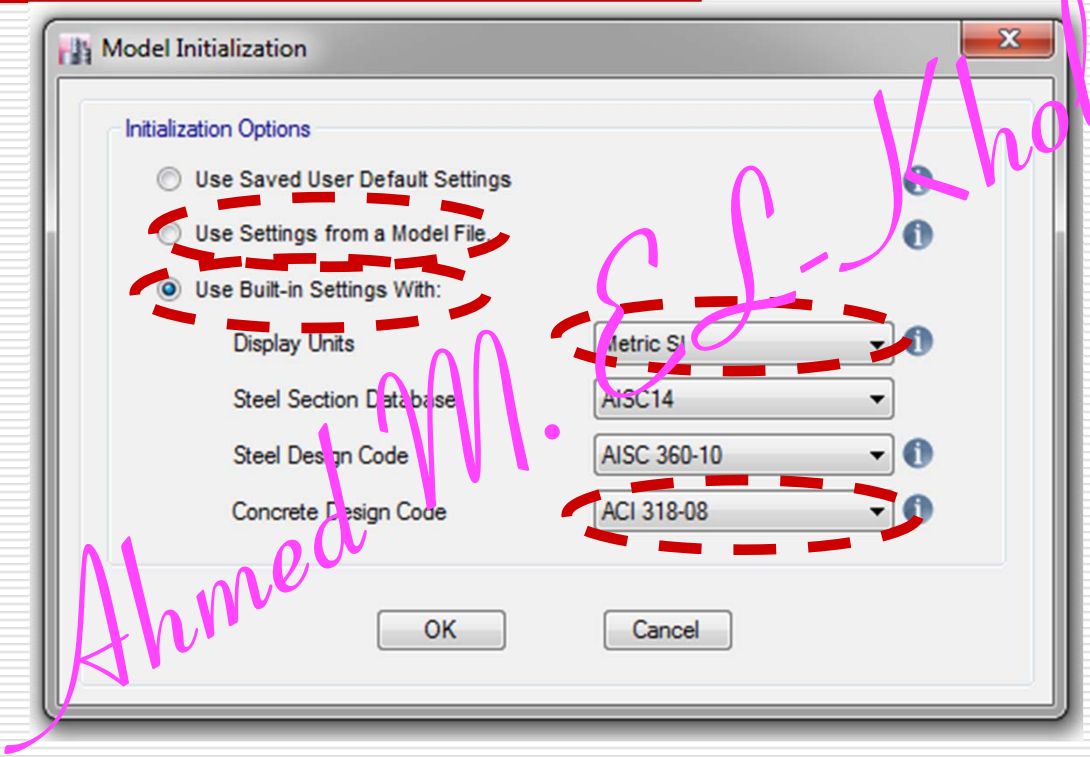
Read Results of Columns
Read Results of Shear Walls
Exporting Results to Excel & CSI
Pier Local Axes
Design of Columns
Design of Shear Walls
Using Etabs (ACI 318)


ETABS Nonlinear v9.1.4 - 3DModel-ConnectionA-700
3-D View Deformed Shape (EXA)
3-D View Mode 1 Period 4.1869 seconds
Plan View - BS2 - Elevation 3.65
Plan View - PODIUM - Elevation 16.3
Plan View - GROUND - Elevation 11.3
Etabs 2016
Etabs 2016
Ahmed M.E.L-Kholy
Ahmed M.E.L-Kholy
175

0-DXF

As done in Etabs 9.7

1-New Model

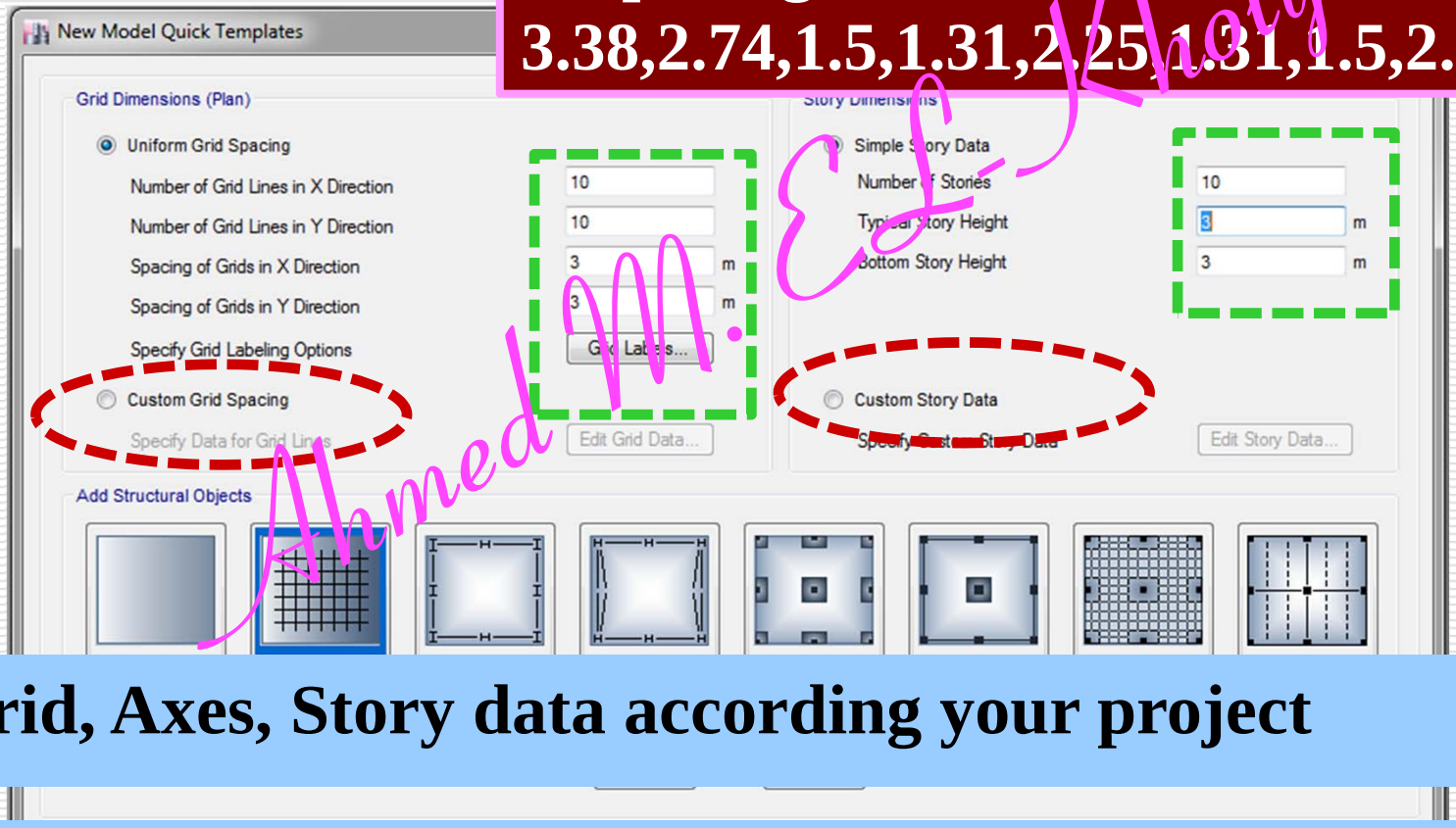


Grid 9,10

2- New,… edb

X Spacing
1.82,3.87,2.87,1.63,1.63,2.87,3.87,1.82

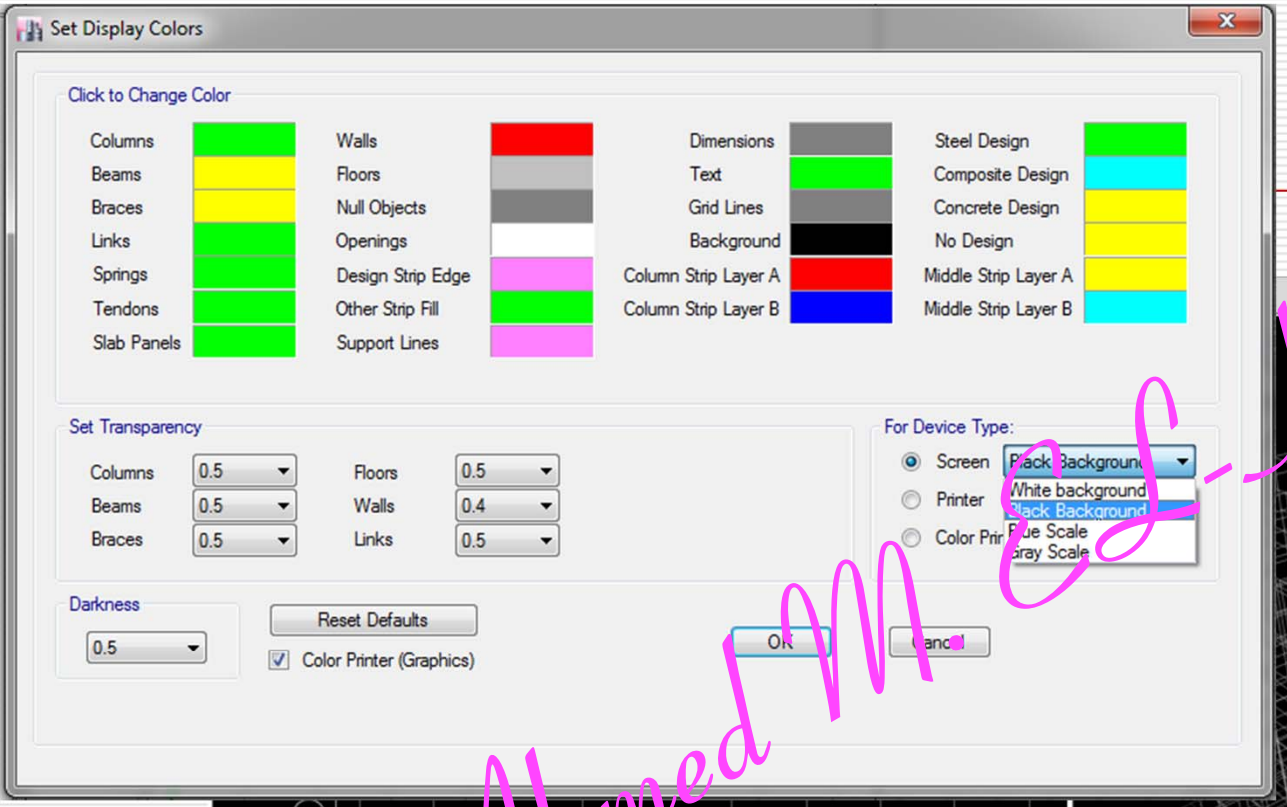
Y Spacing
3.38,2.74,1.5,1.31,2.25,1.31,1.5,2.68,3.44

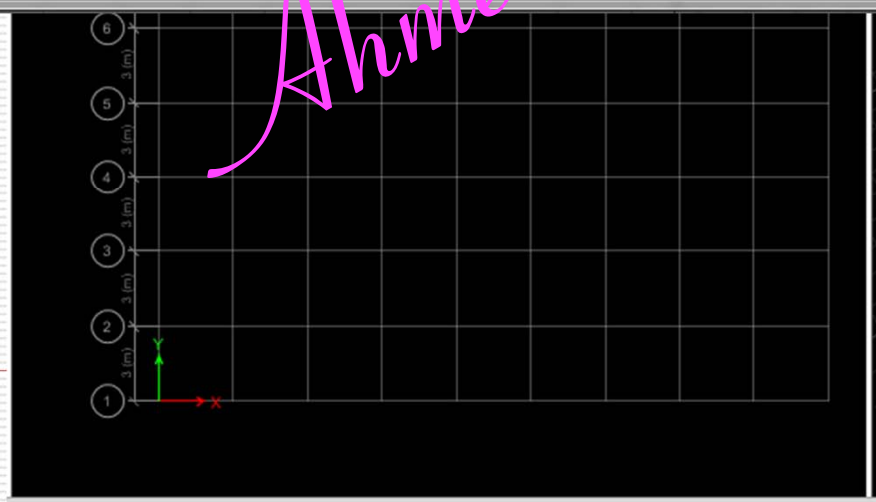


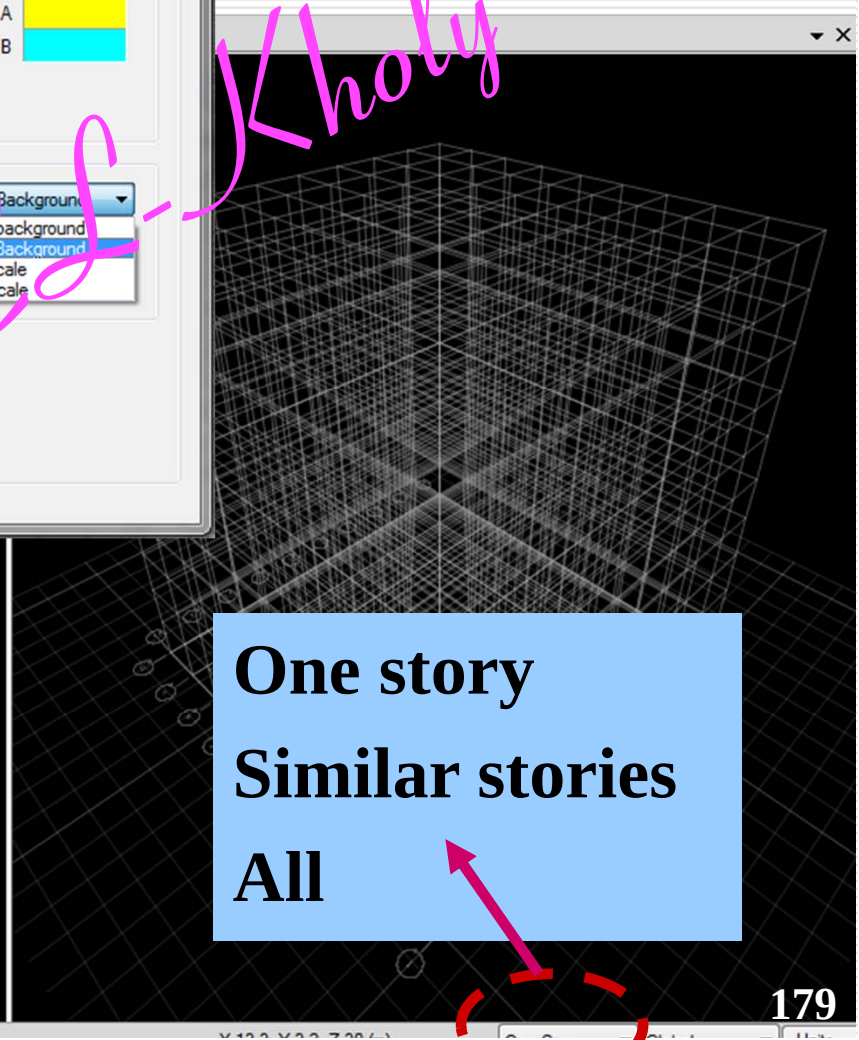
4- Grid, Axes, Story data according your project

Master story & similar stories (F2 is master)

3- Options – Graphic Colors - Display





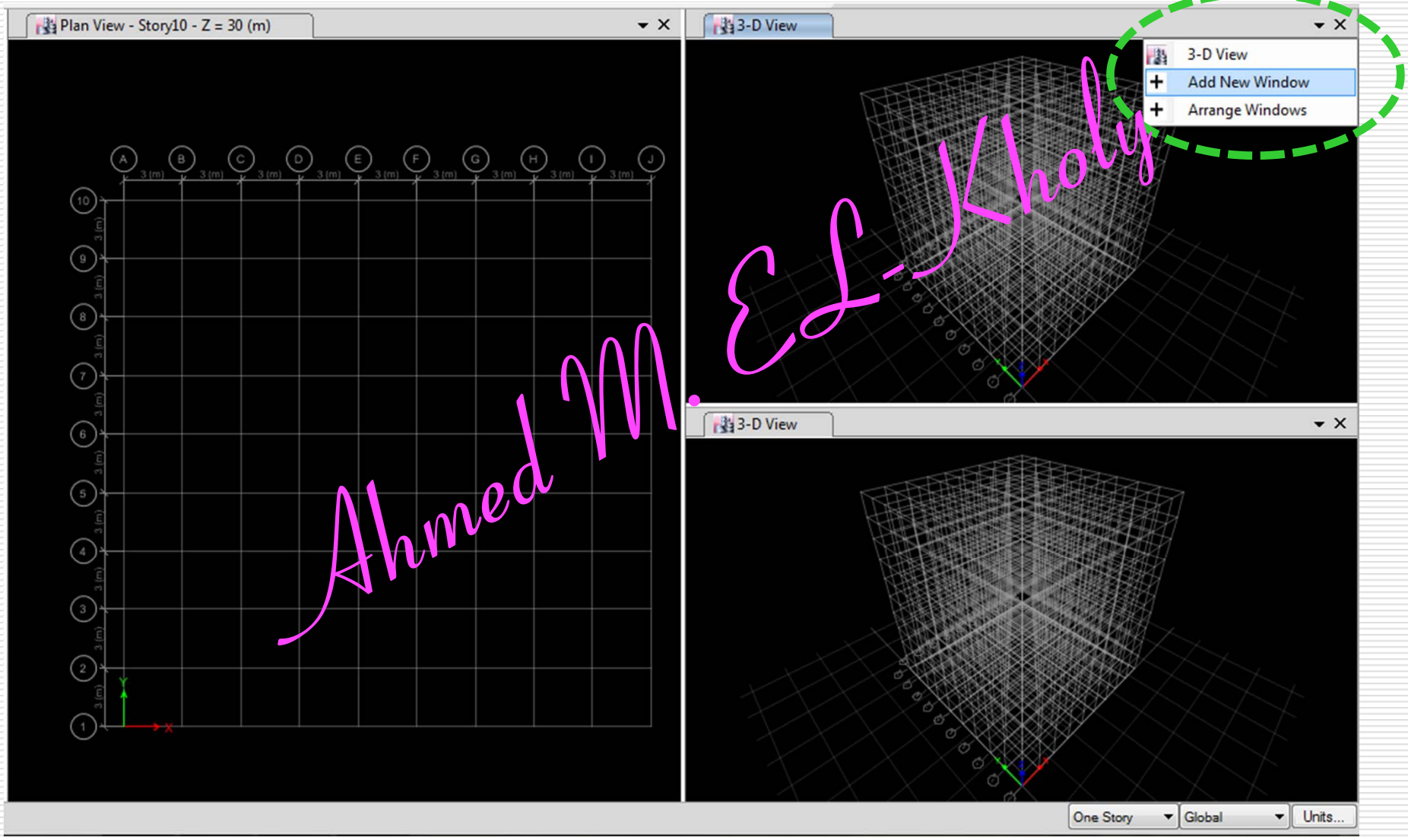


One story

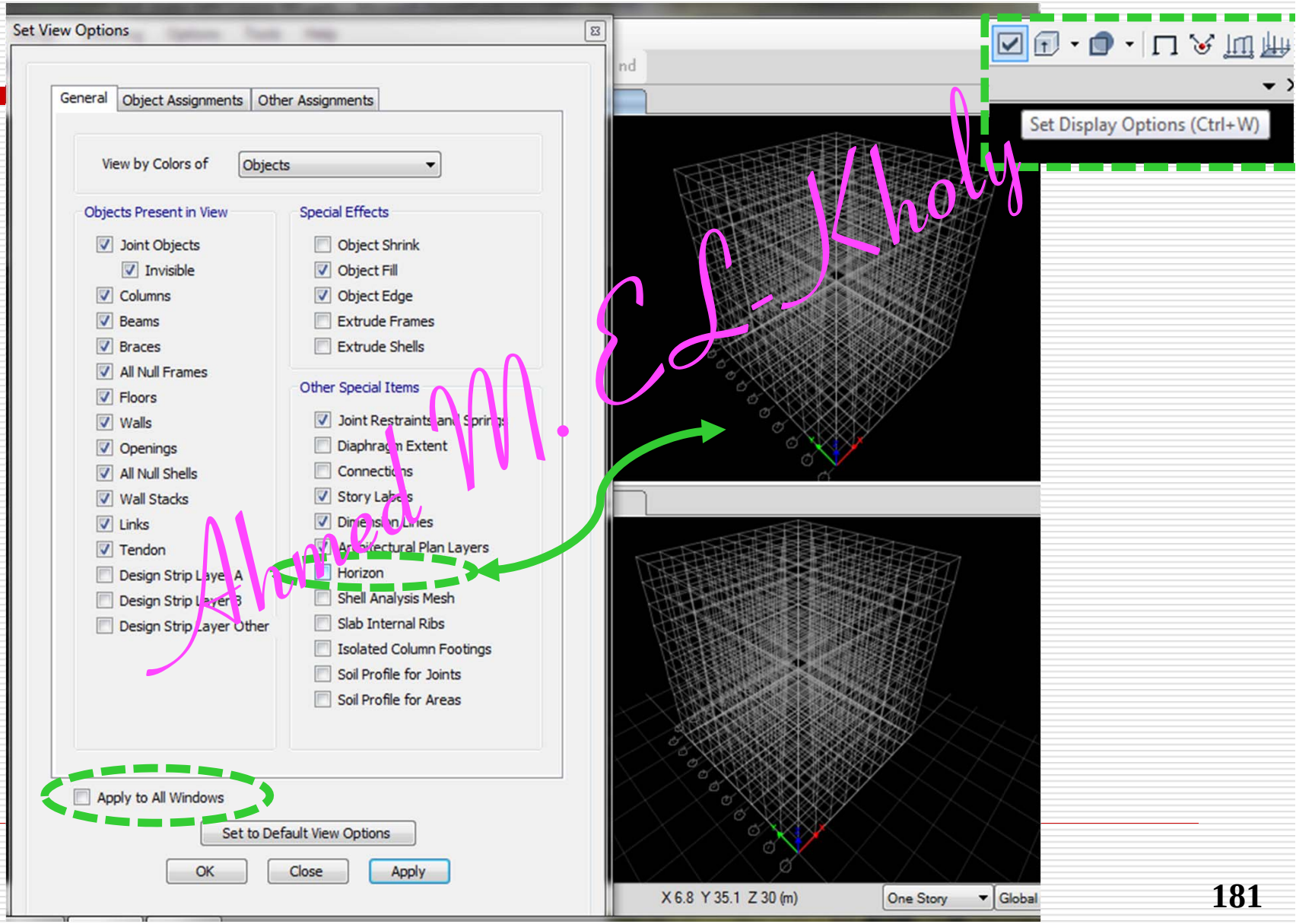
Similar stories

All

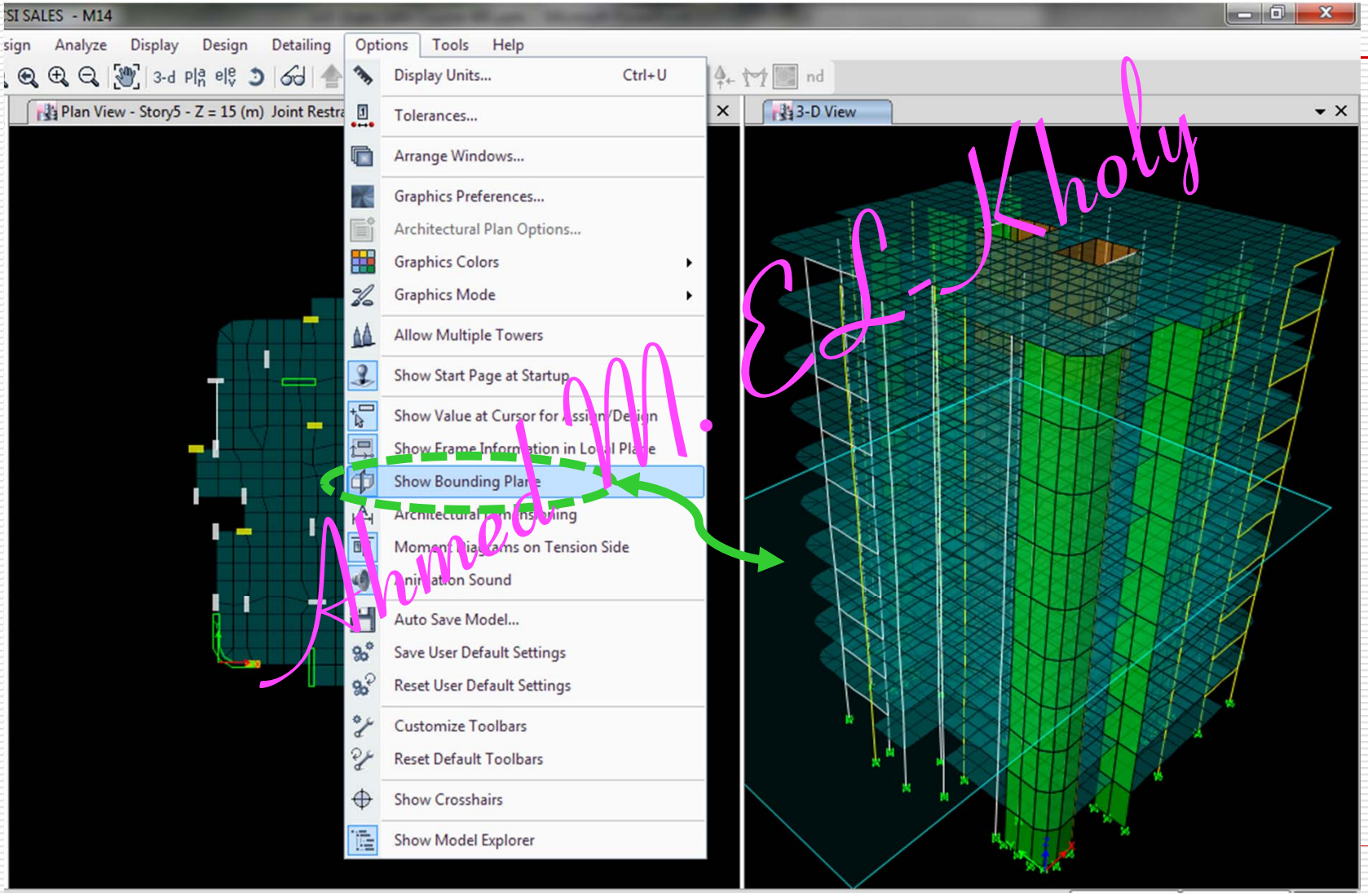
3- Change the windows number if you want



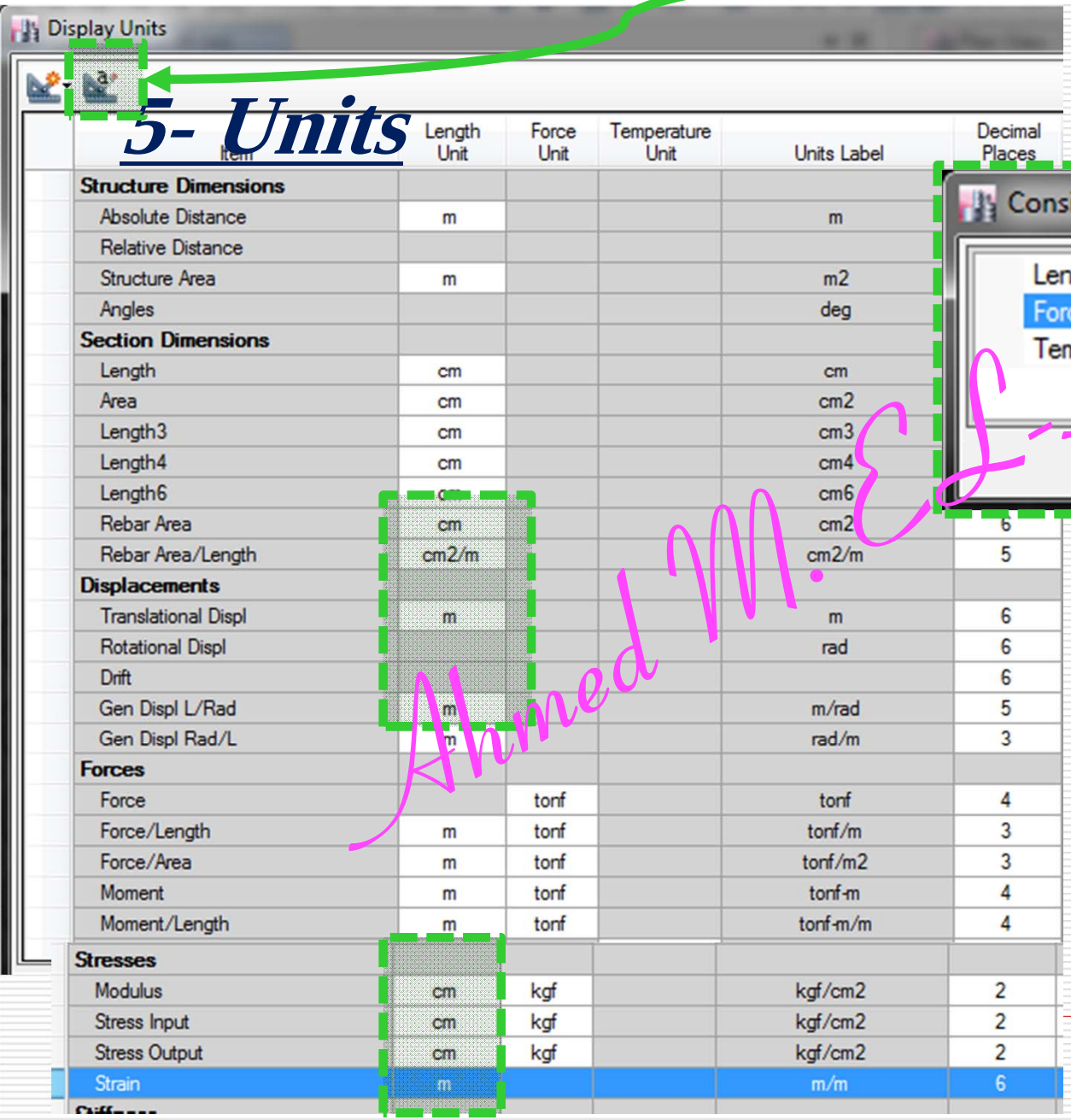
4- Change the Horizon if you want

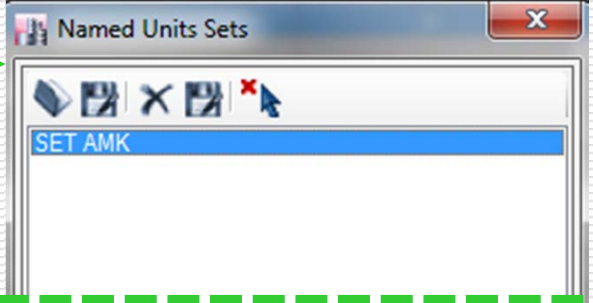


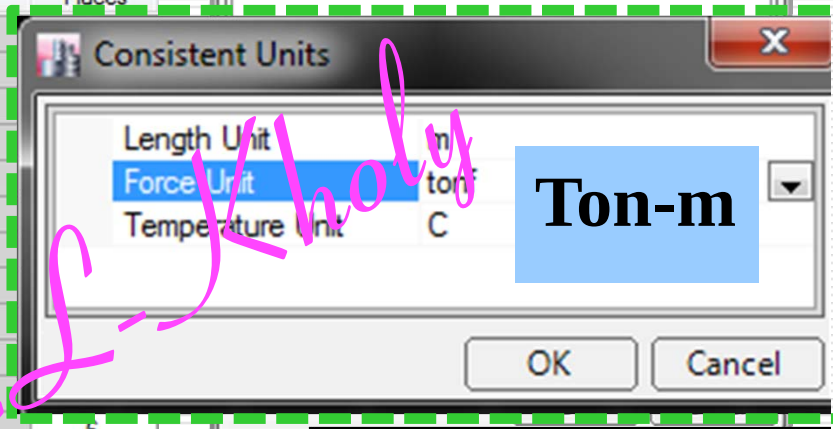
4- Show bounding Plane if you want

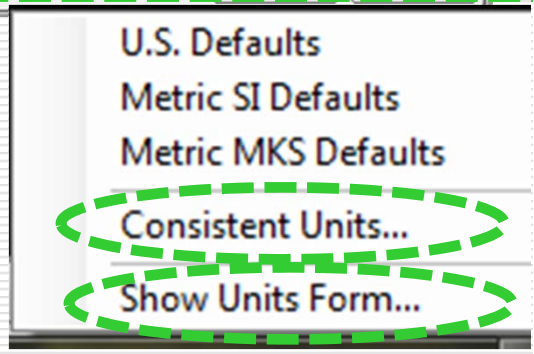


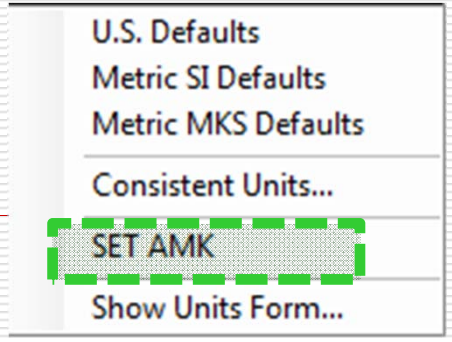
5- Units



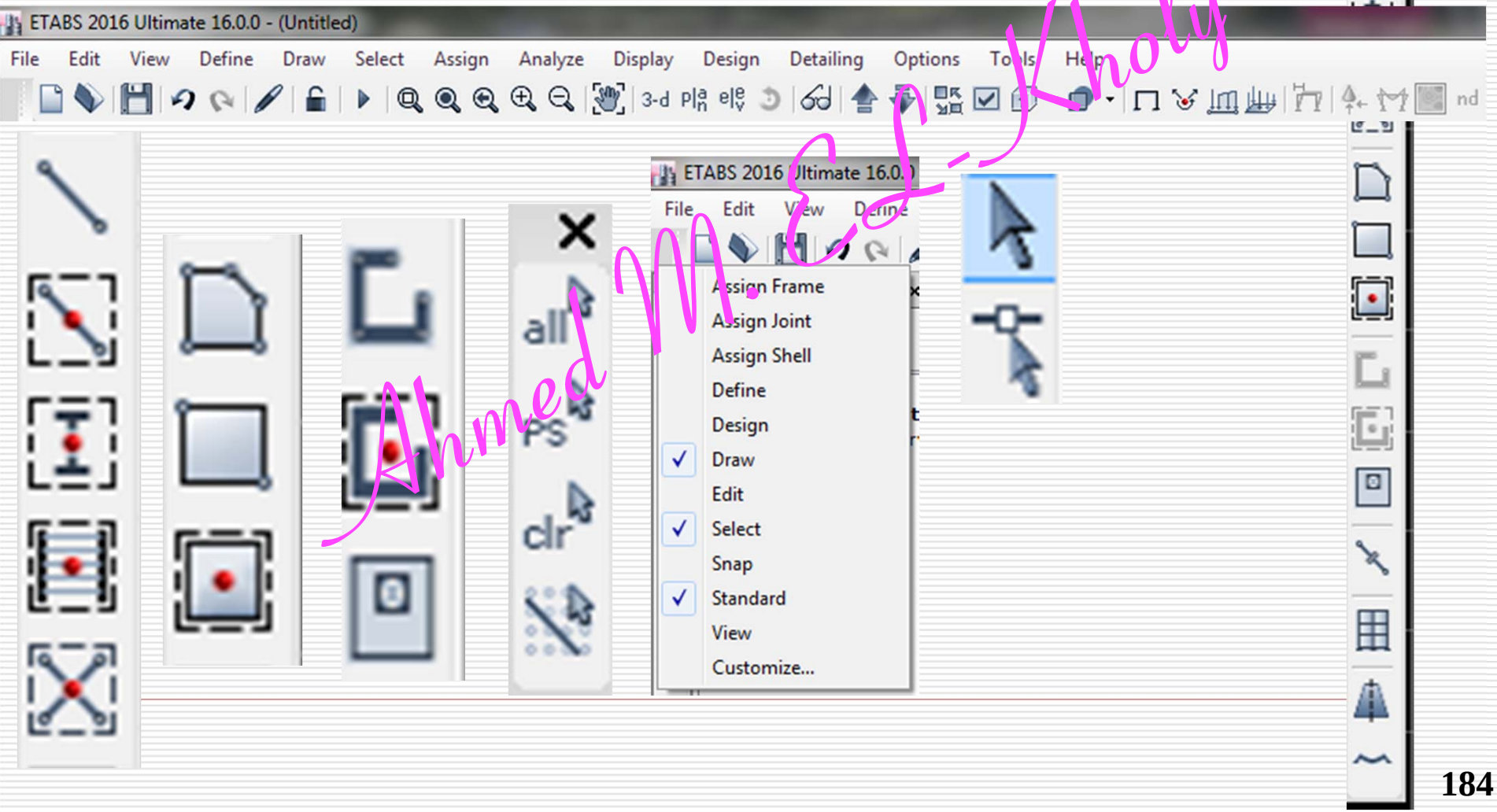




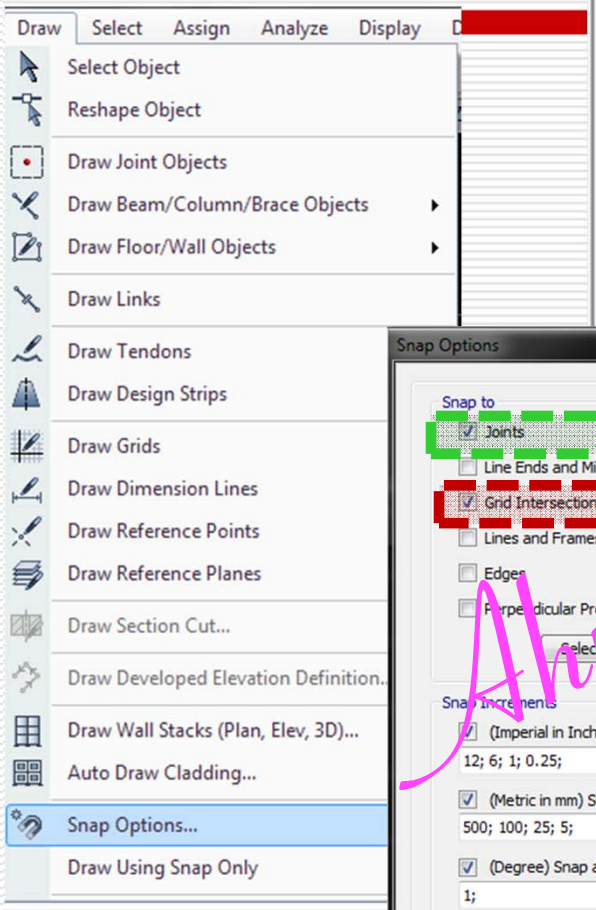


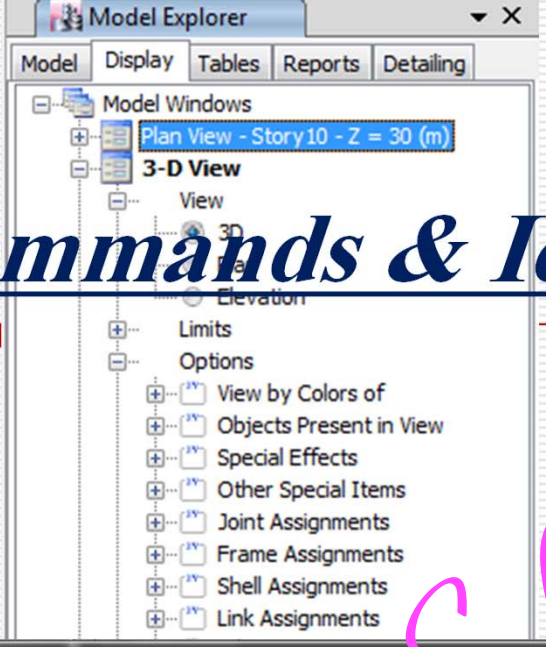


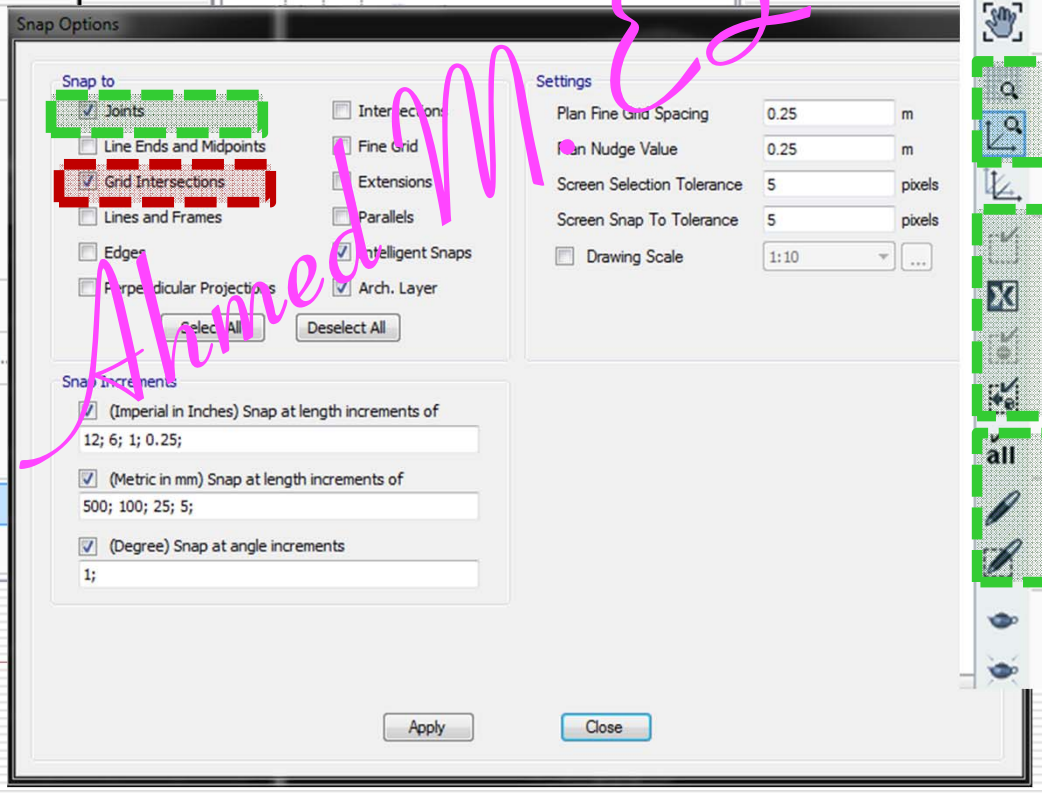
6- Etabs Commands & Icons

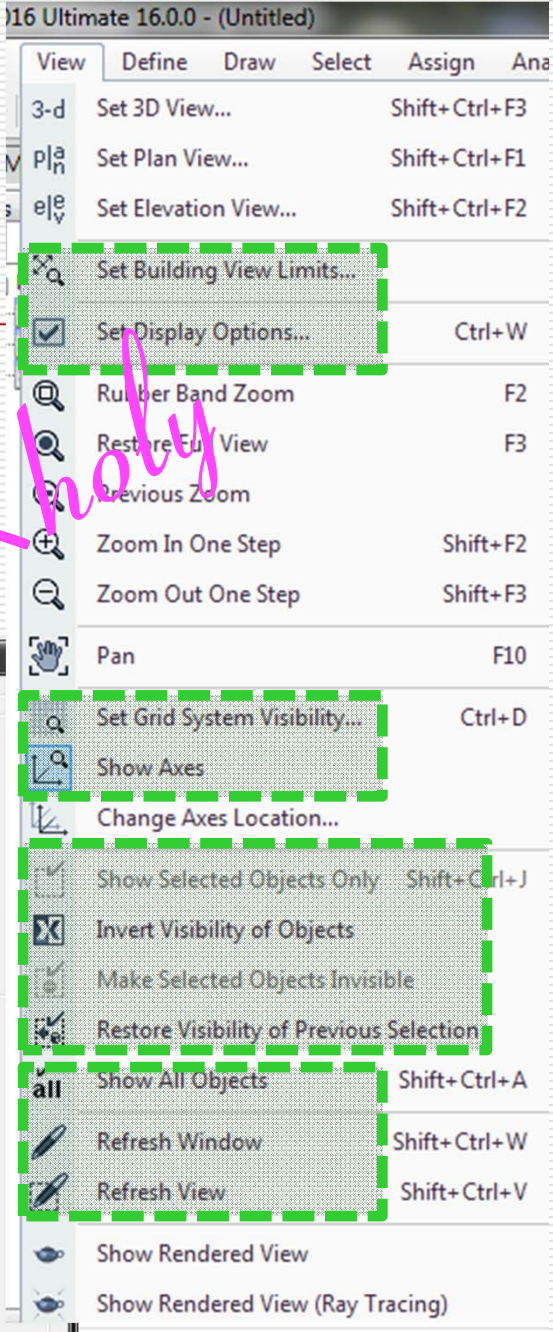


6- Etabs Commands & Icons

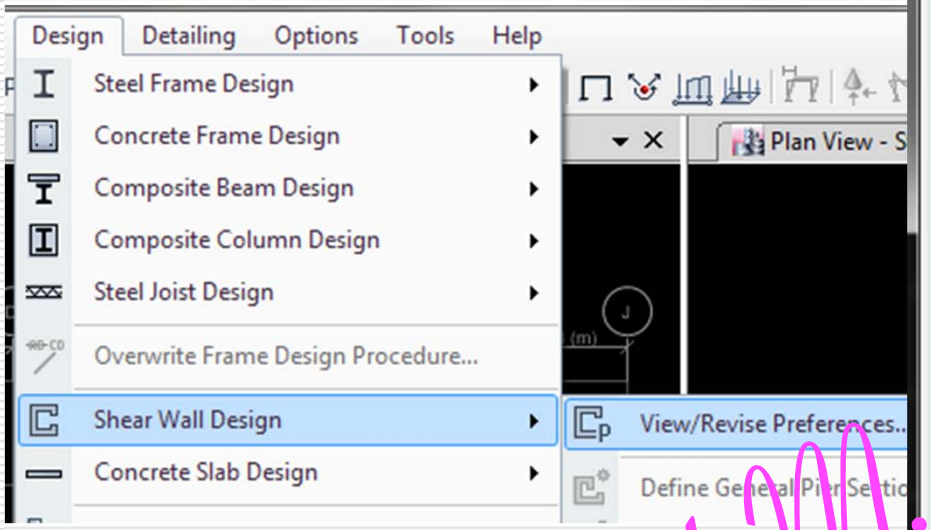


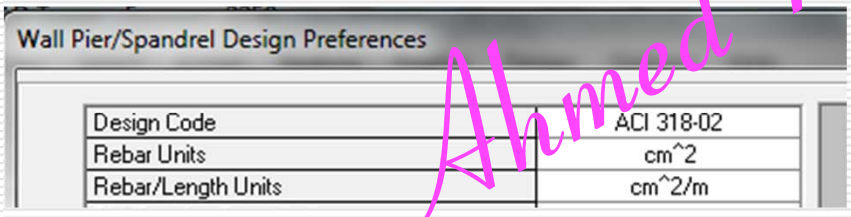


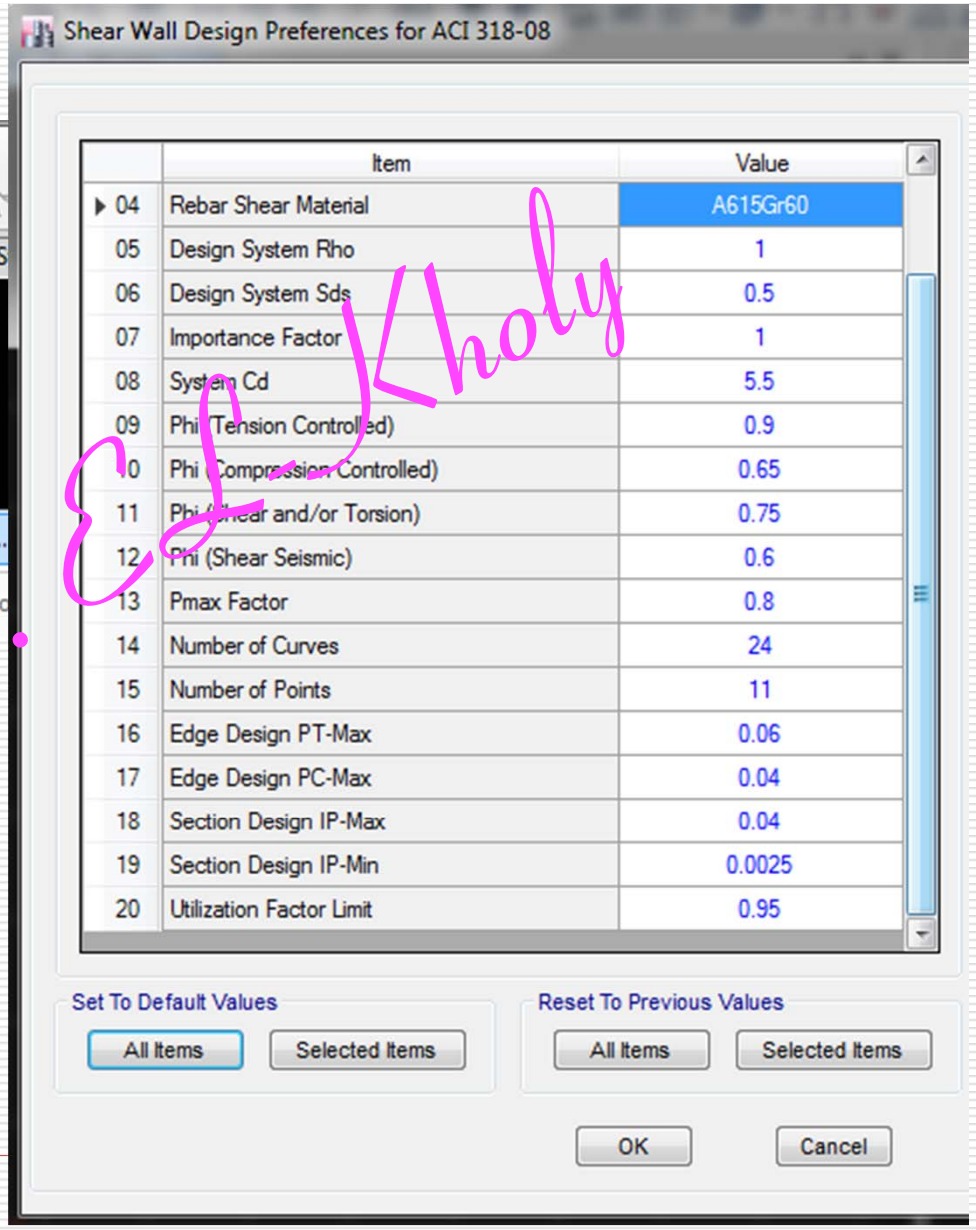




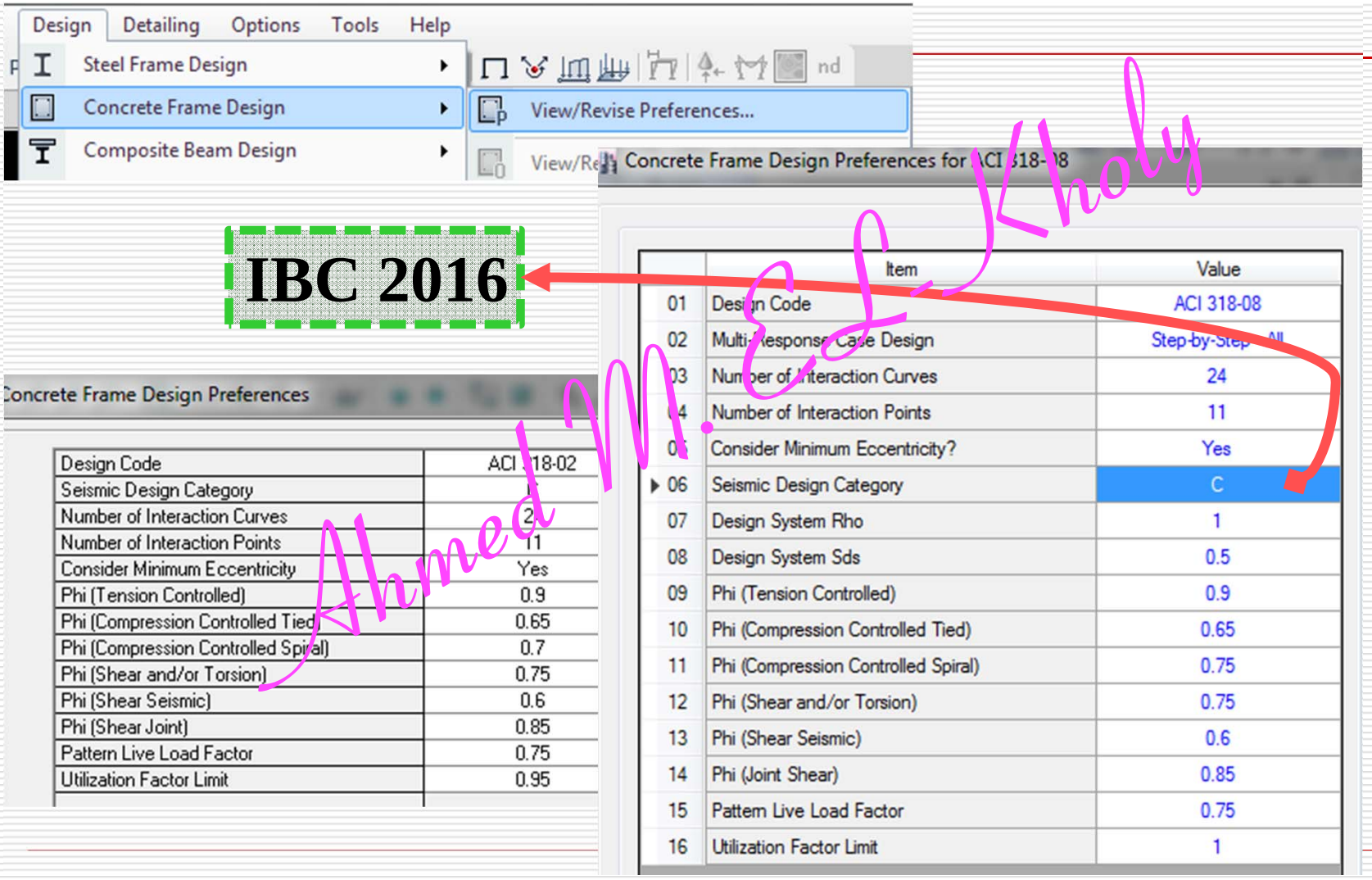
7- Define Design Data for Shear Walls





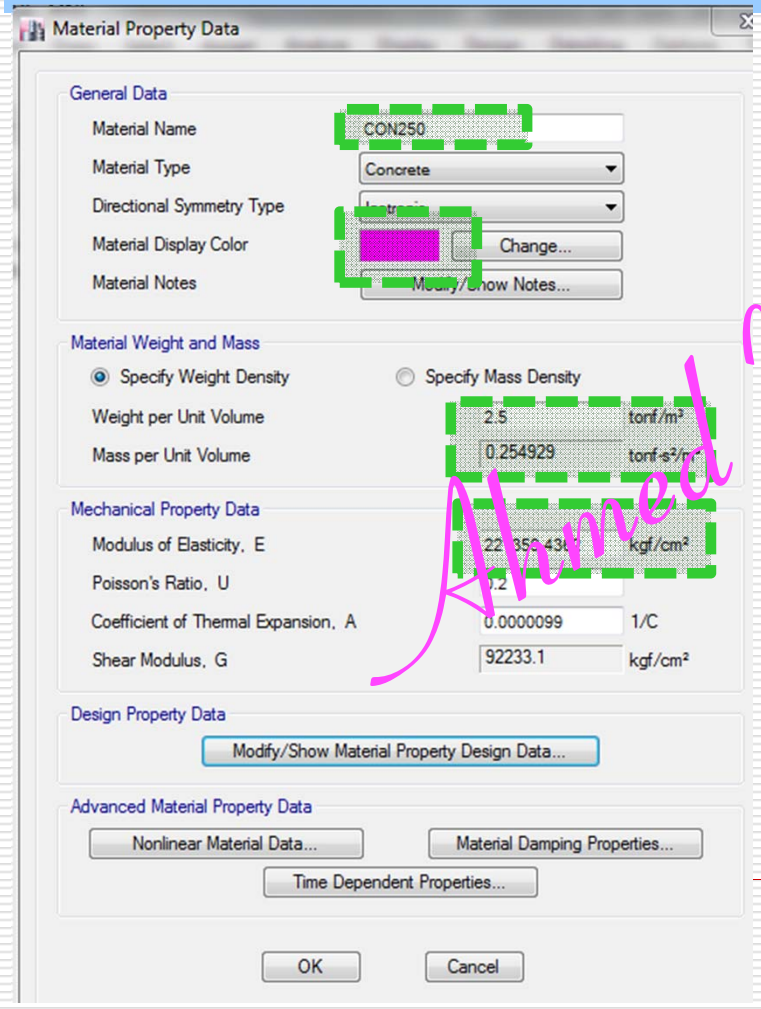


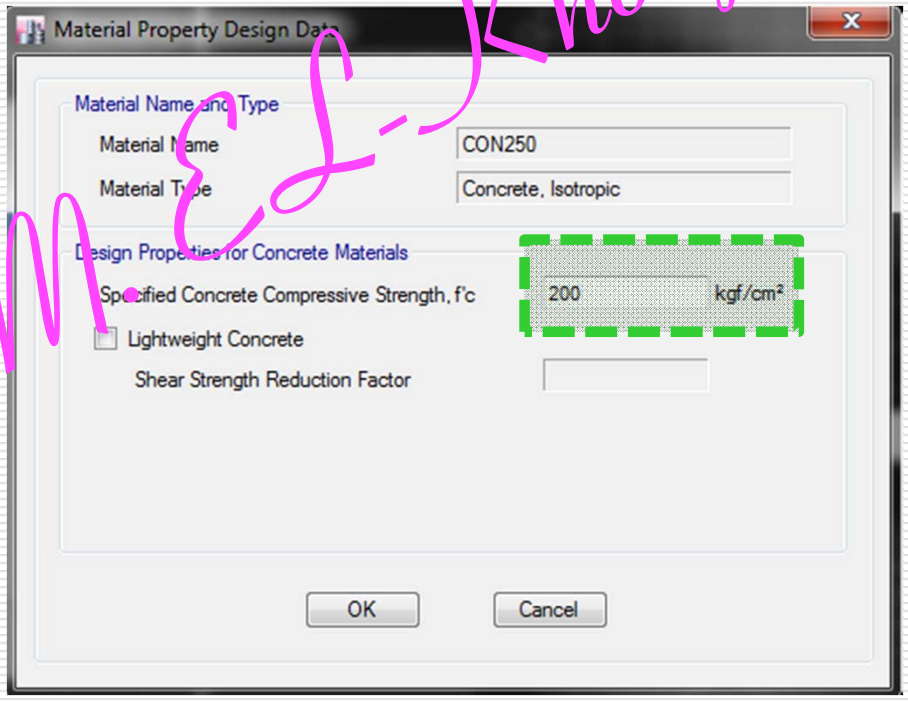
7- Define Design Data For Columns



8- Define Material

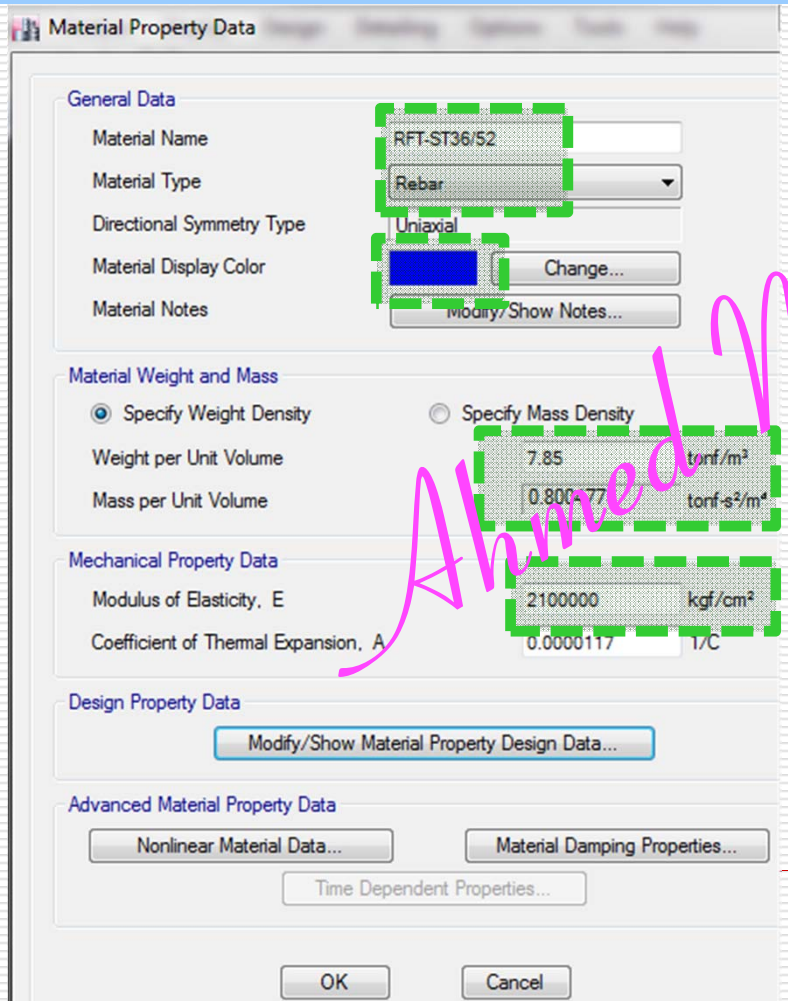
8- Material properties (Define-Material Properties-Concrete 350 for vertical elements and 250 for horizontal elements) according the considered code

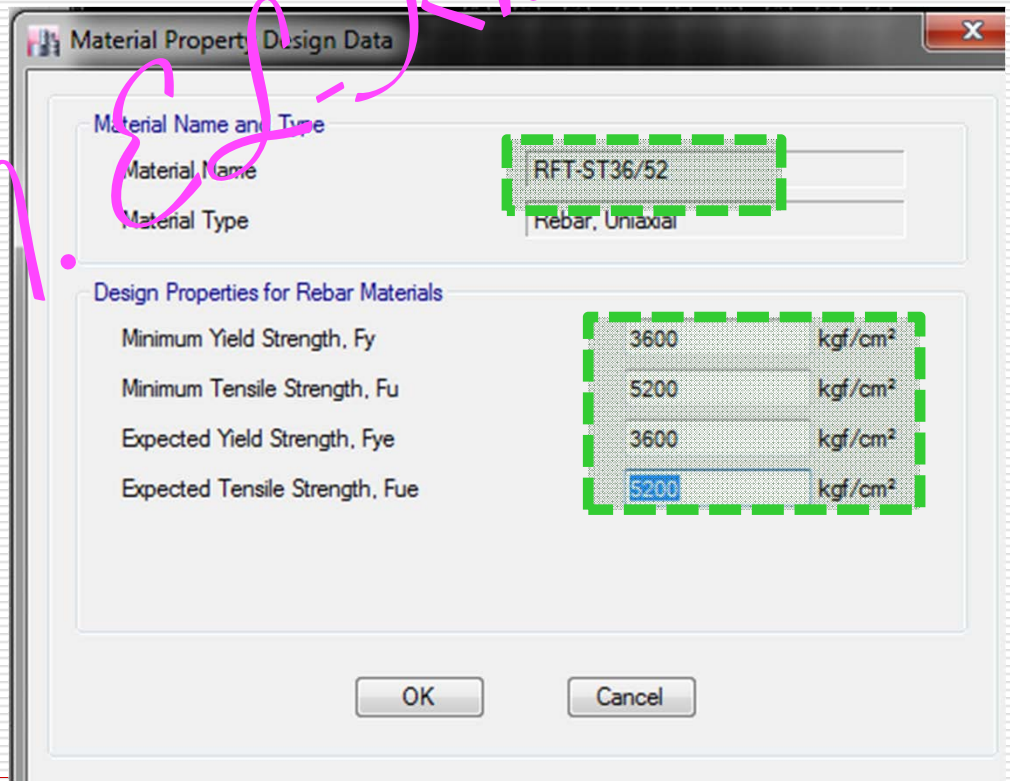




8- Define Material

8- Material properties (Define - Material Properties – Steel RFT 36/52 for ribbed bars and Steel RFT 24/48 for smooth bars such as ties in columns)

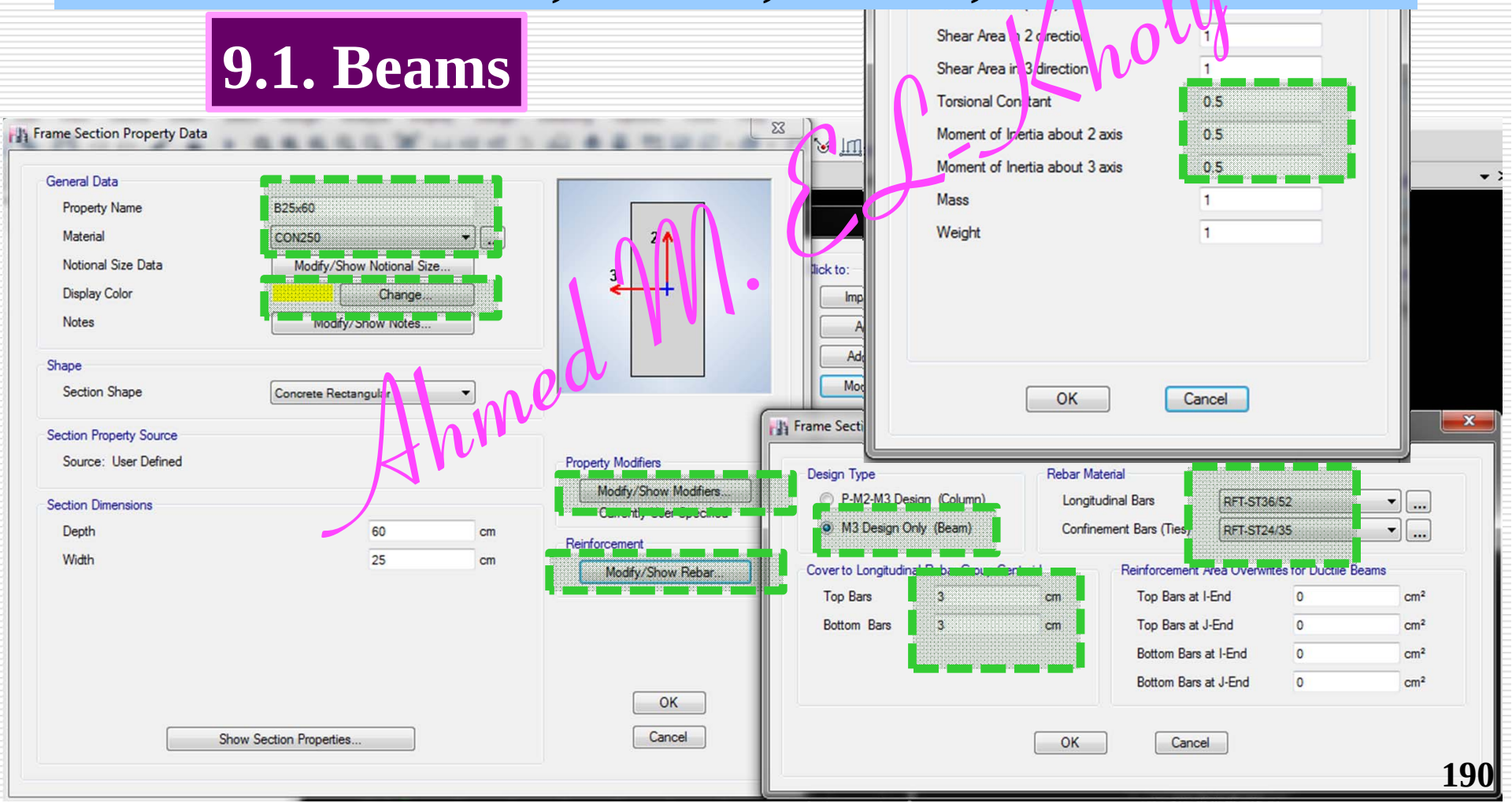




9- Define Wall, Column, Beam, Slab Sections

9-beams…. Define-Frame sections (Add Rectangular) .. Create C30x100, C40x90, B25x60, B12x60

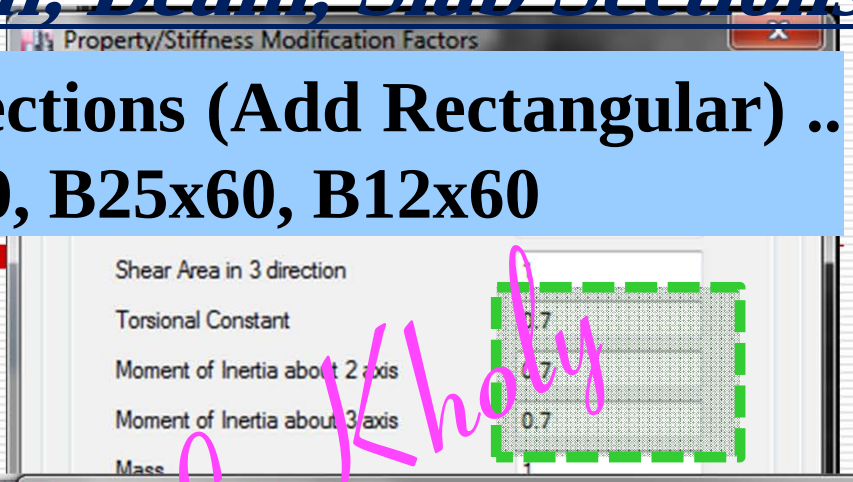
9.1. Beams

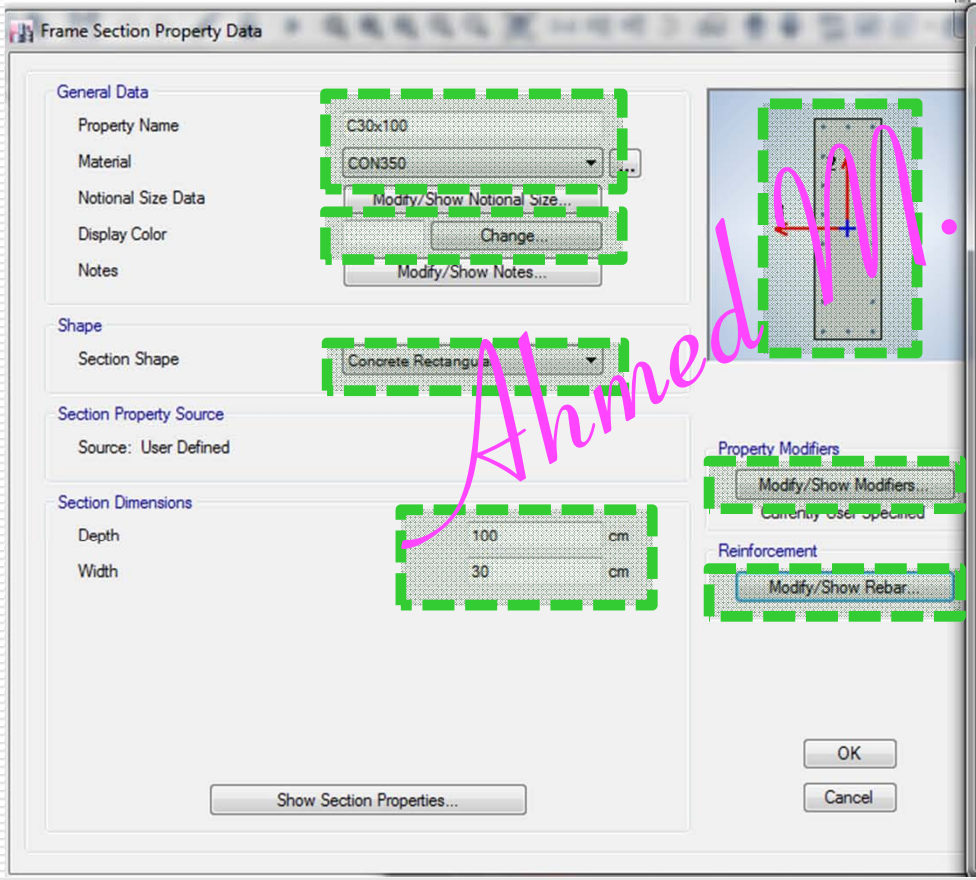


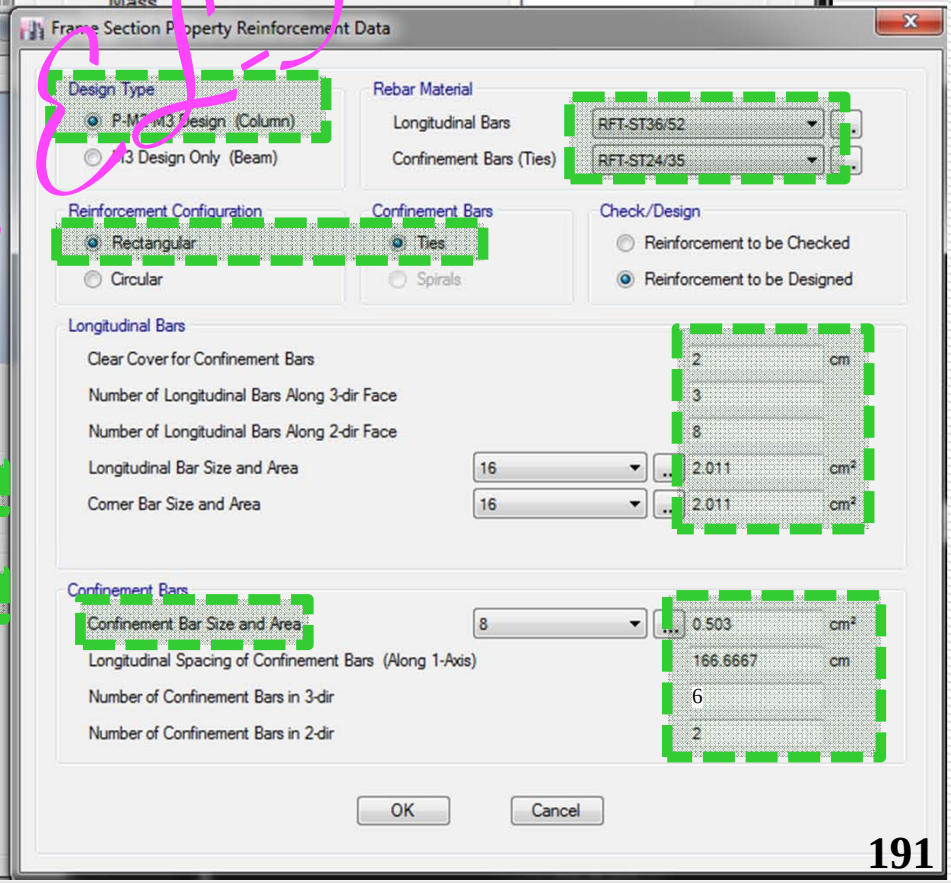
9- Define Wall, Column, Beam, Slab Sections

9-beams…. Define-Frame sections (Add Rectangular) .. Create C30x100, C40x90, B25x60, B12x60

9.2. Columns

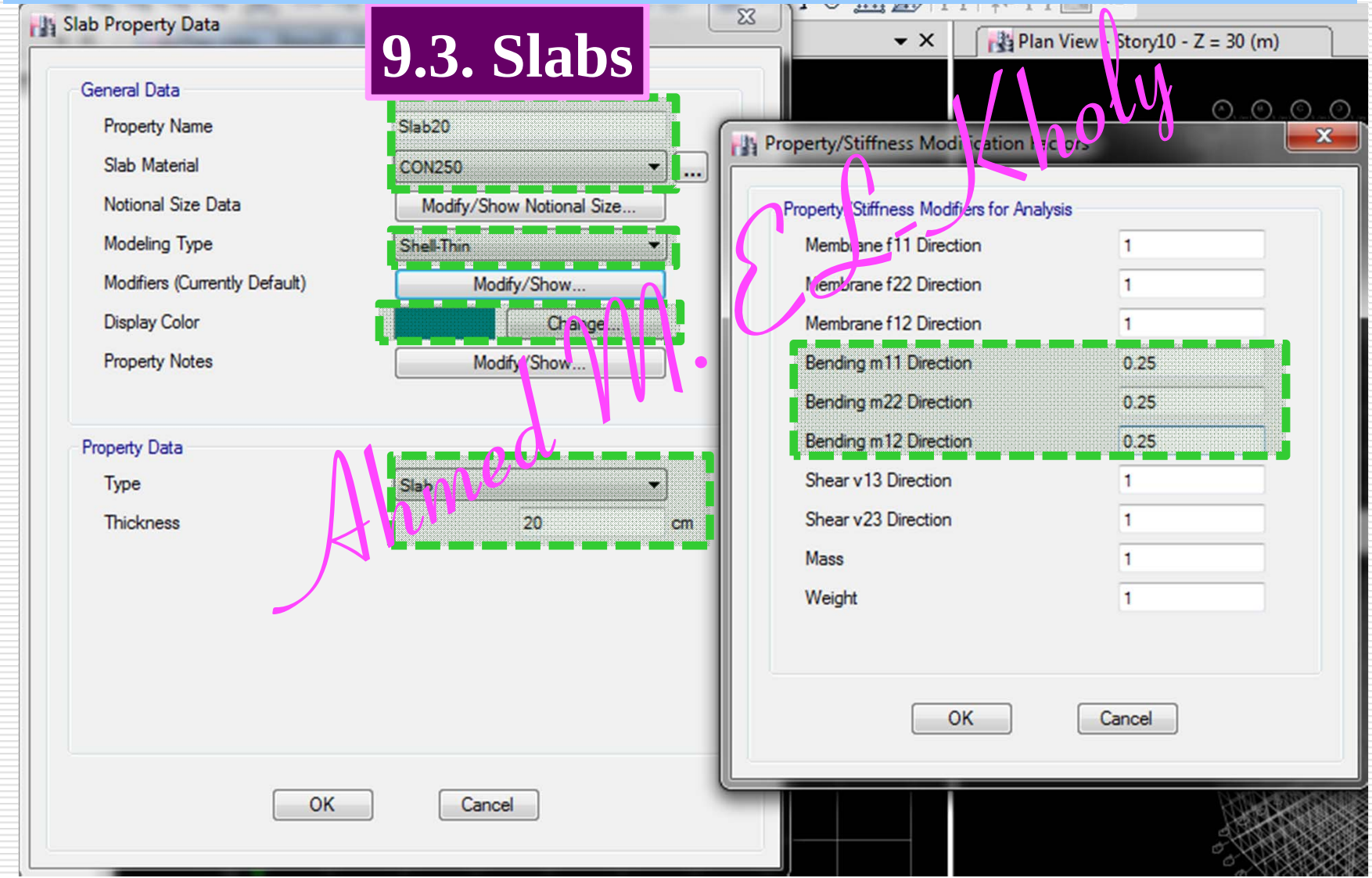






9- Define Wall, Column, Beam, Slab Sections

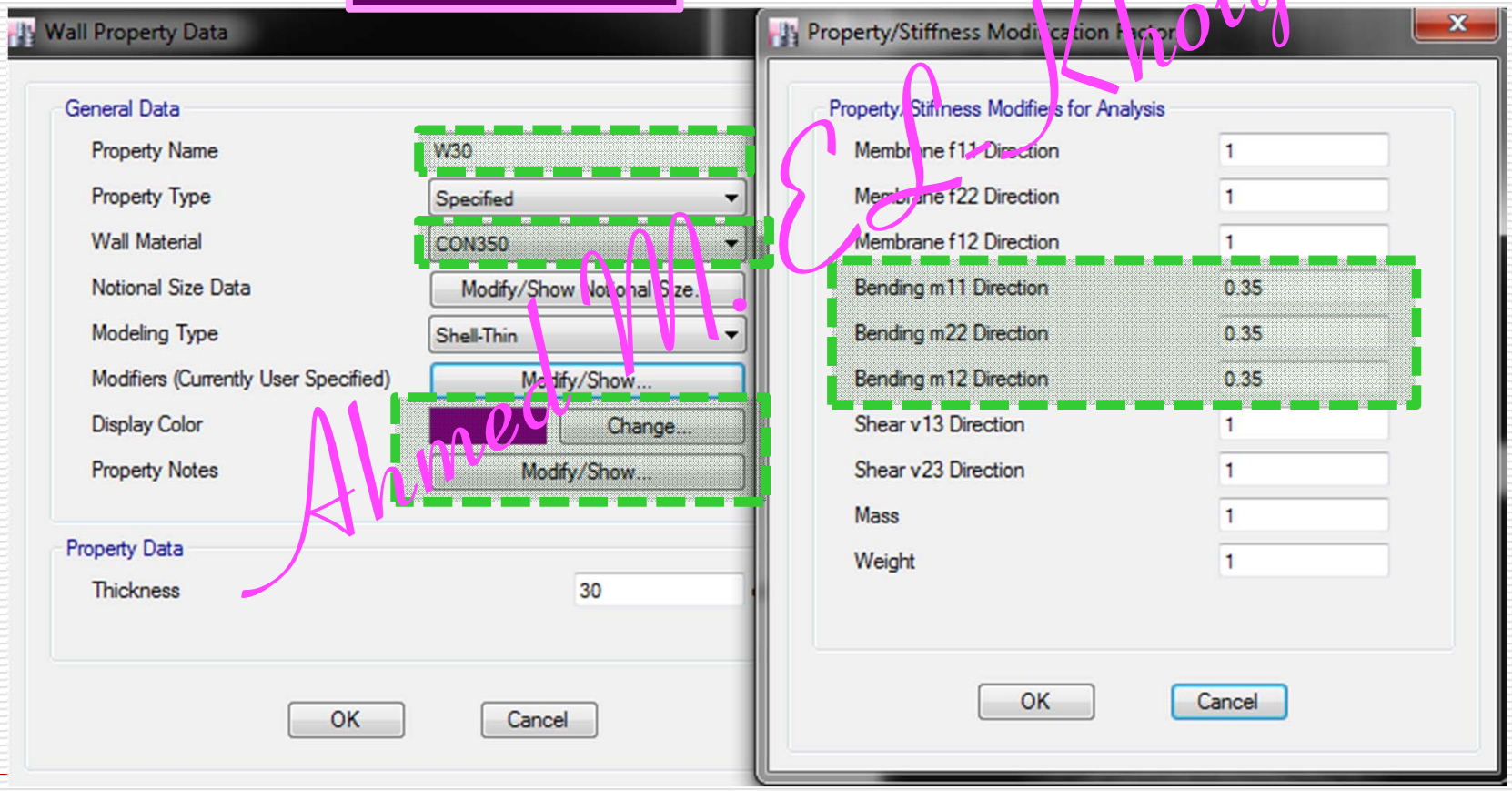
9- Slabs…. Define- Slab.. sections …. Slab20 and Slab22



9- Define Wall, Column, Beam, Slab Sections

9- Walls…. Define- Wall.. sections …. W30 and W40

9.4. Walls



9- Define Wall, Column, Beam, Slab Sections

Modifiers….

	ECL 12	Euro Code 8	IBC 2015	UBC 97
Column	0.7	0.5	0.7	0.7
Shear Wall	0.35	0.5	0.35	0.35
Beam	0.5	0.5	0.35	0.35
Slab	0.25	0.5	0.25	0.25

These modifier for M1,M2,M12

Egyptian RC Code - Chapter 6

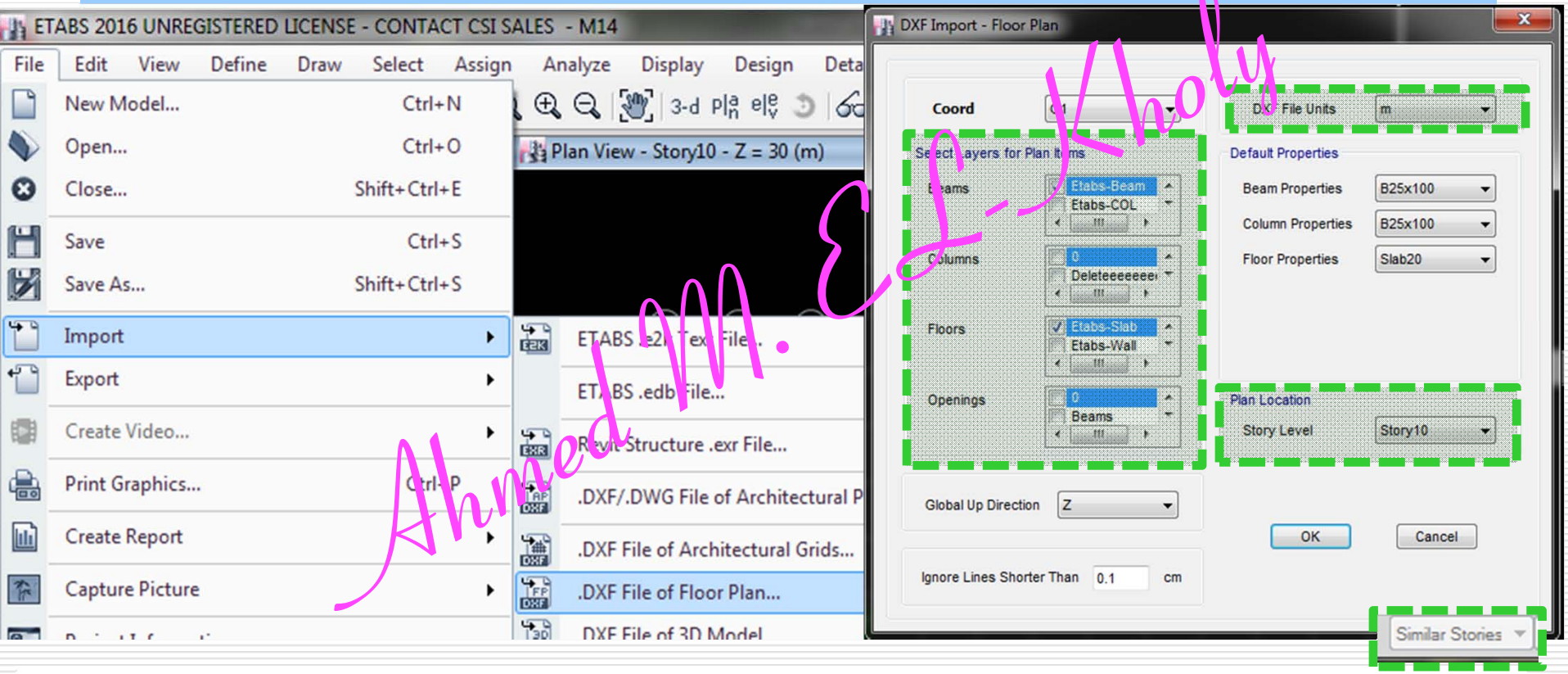
Egyptian Loads Code - Chapter 8

International Building Code 2015

Uniform Building Code 1997

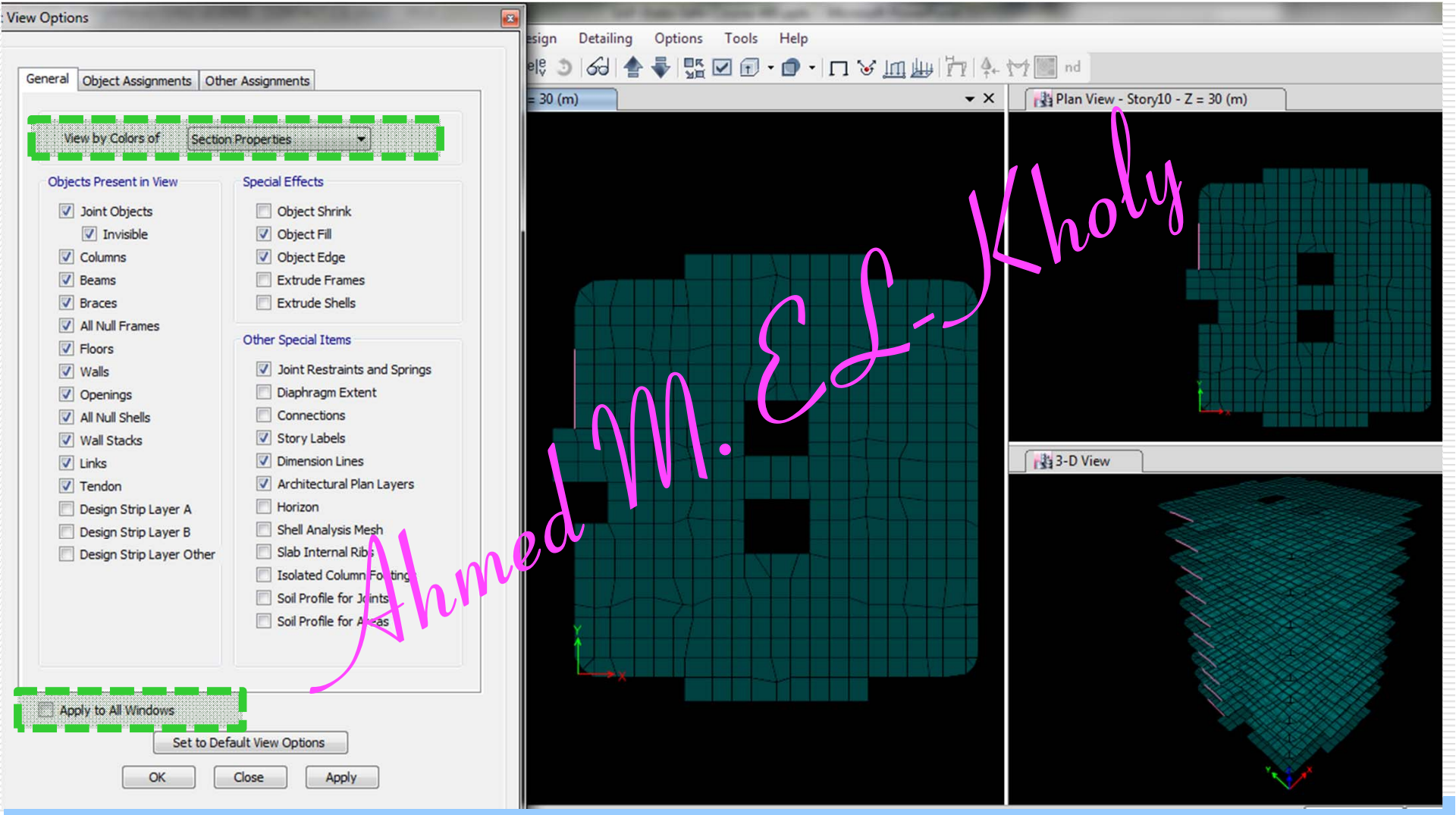
10- Import your DXF floors

File-Import-DXF floor plan



- **Select Layers for Plan Items** options. Check the check boxes to select beams, columns, floors and openings to be imported into ETABS, or select the zero check box to exclude that layer type from the import. Use the **Default Properties** drop-down lists to select properties for the beams, columns and floors, which will be imported into ETABS as assignments. ETABS will import 3dFace and Polyline entities in the DXF drawing as floors or openings and line entities as beams/columns.

المودل بعد سحبه و تغير قطاع البلاطة بالقطاع الفعلى

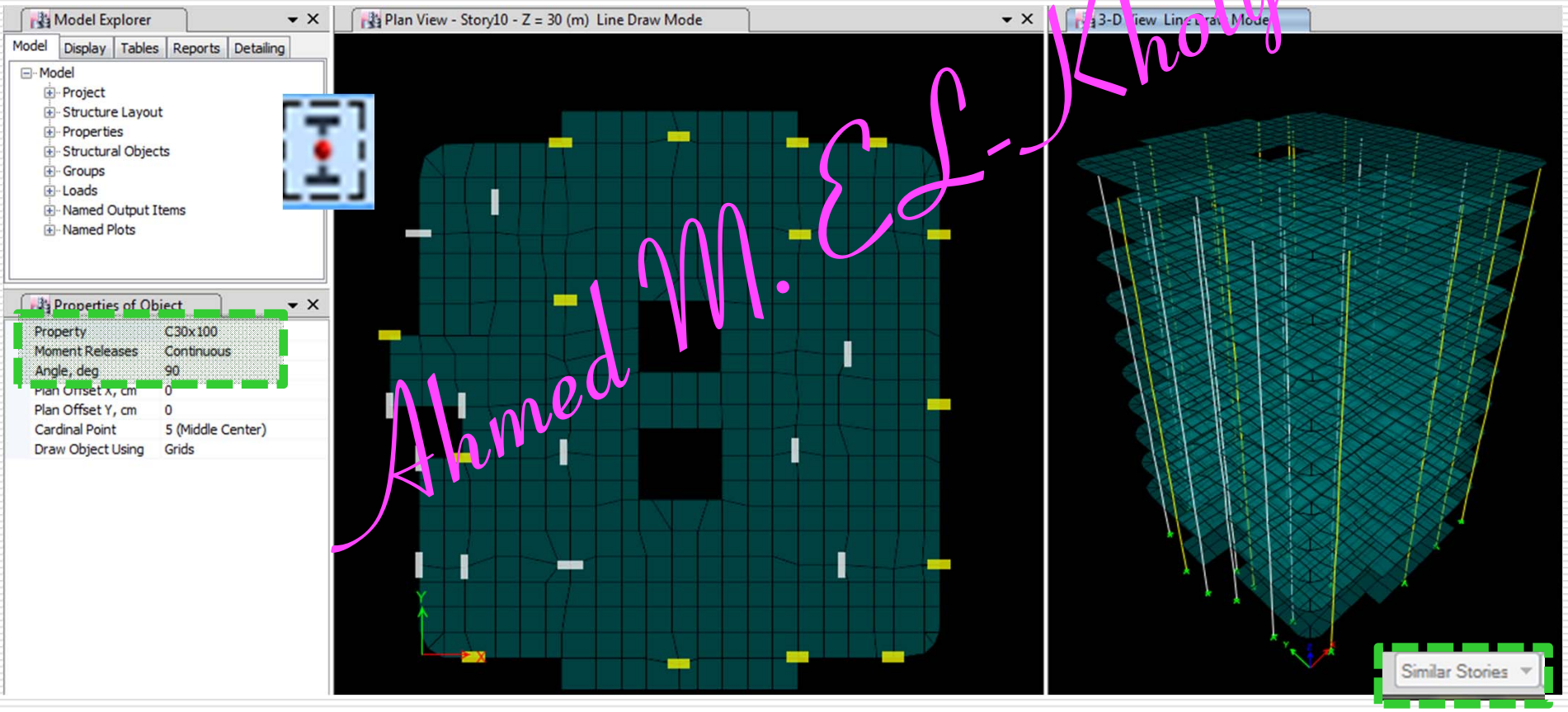


11-Select All ….and then goto Assign… Shell …. Slab Section

….. and choose Slab20

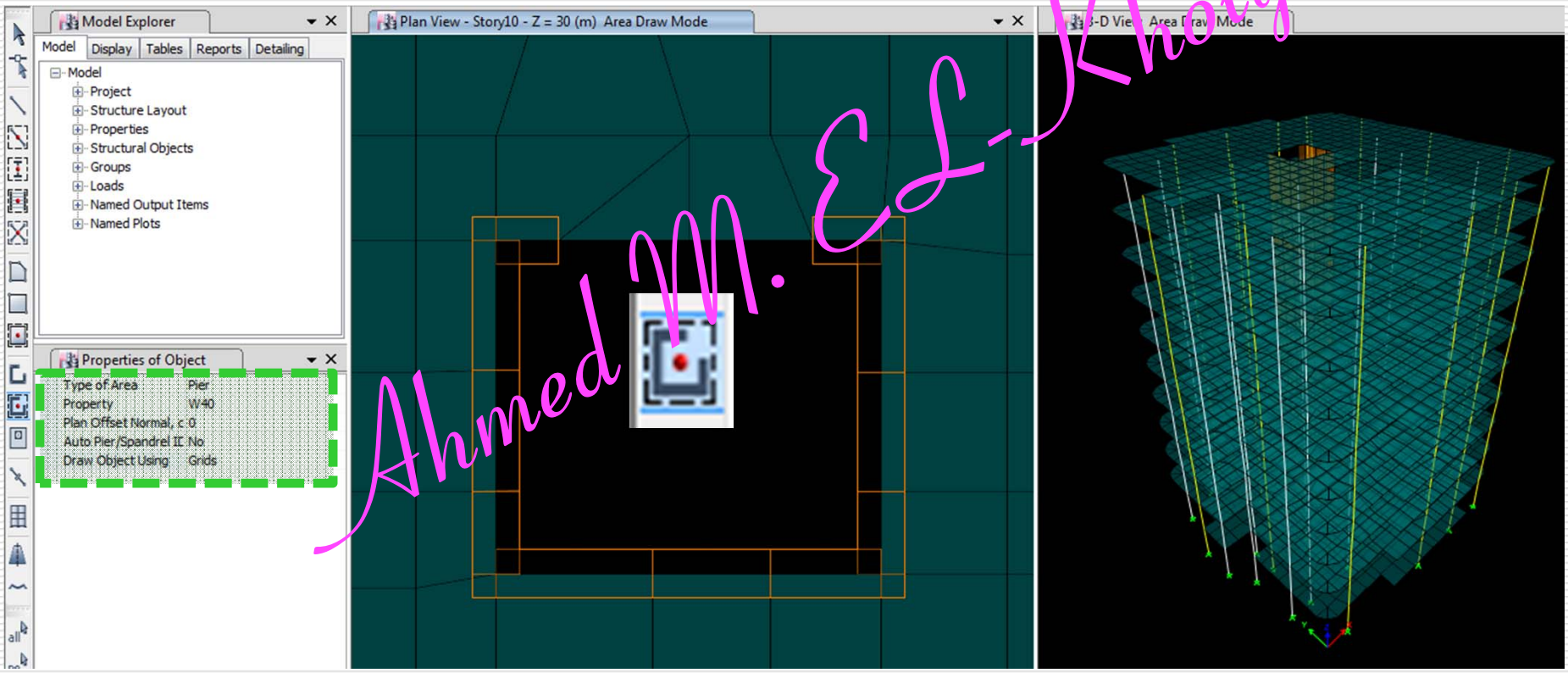
12- Draw Beams, Col, Shear walls

Draw beams, columns, shear walls with exact cross sections in Etabs



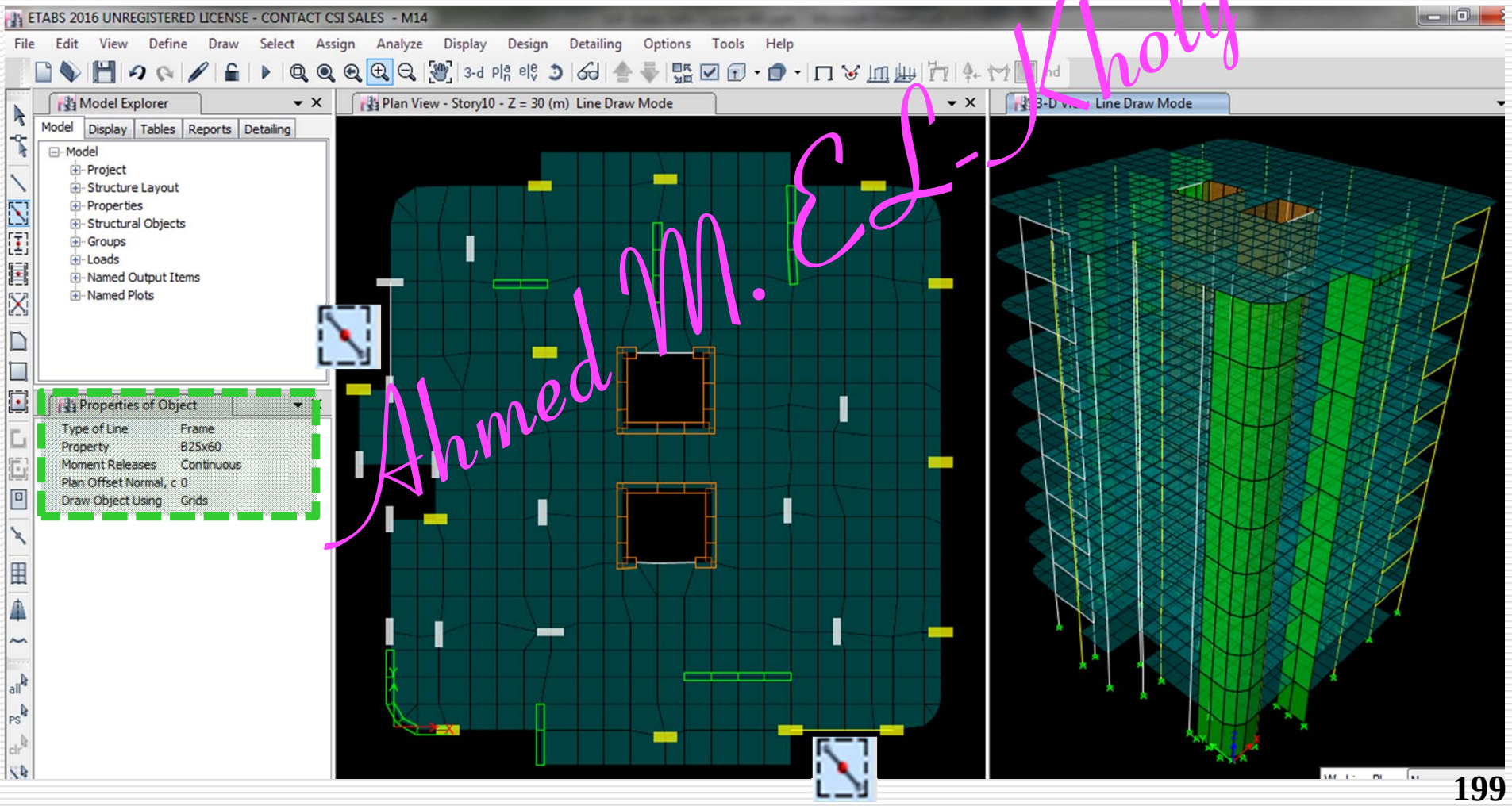
12- Draw Beams, Col, Shear walls

Draw beams, columns, shear walls with exact cross sections in Etabs



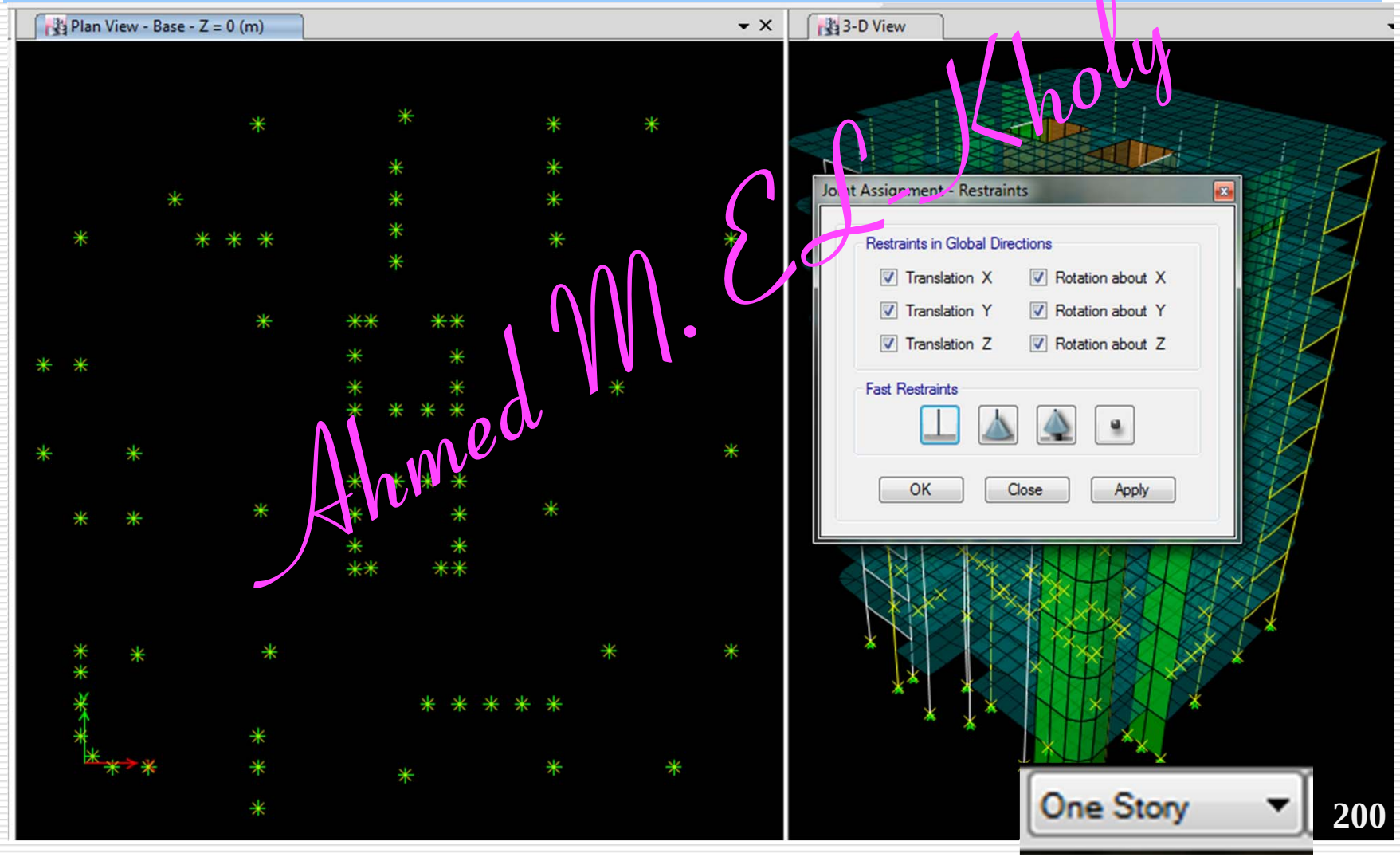
12- Draw Beams, Col, Shear walls

Draw beams, columns, shear walls with exact cross sections in Etabs

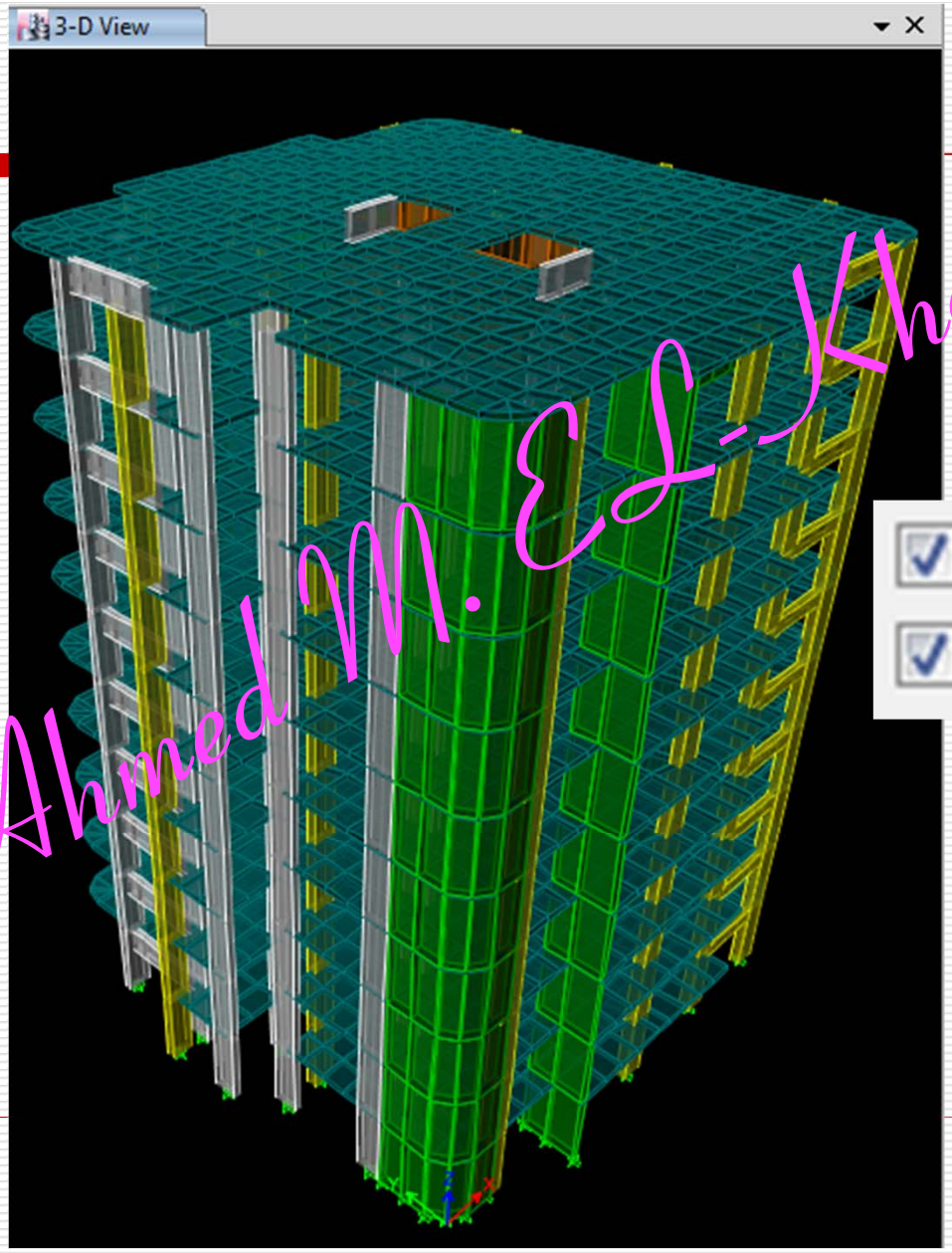


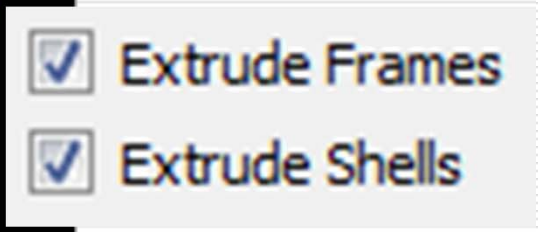
13- Fix the base points

Select the base points and then, Assign-joints-restraints and choose fixed



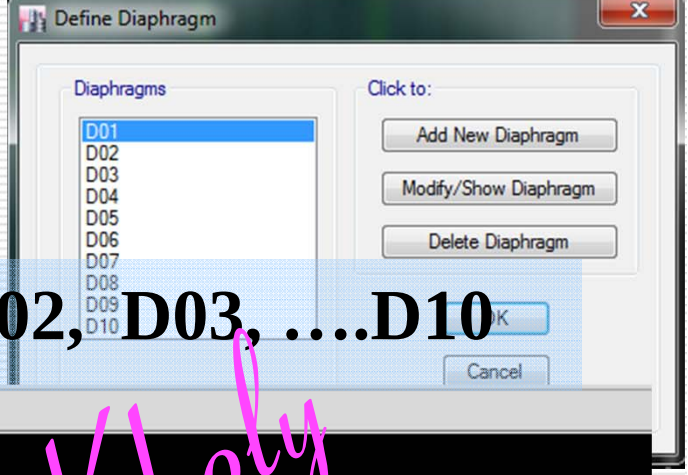
...Extrude

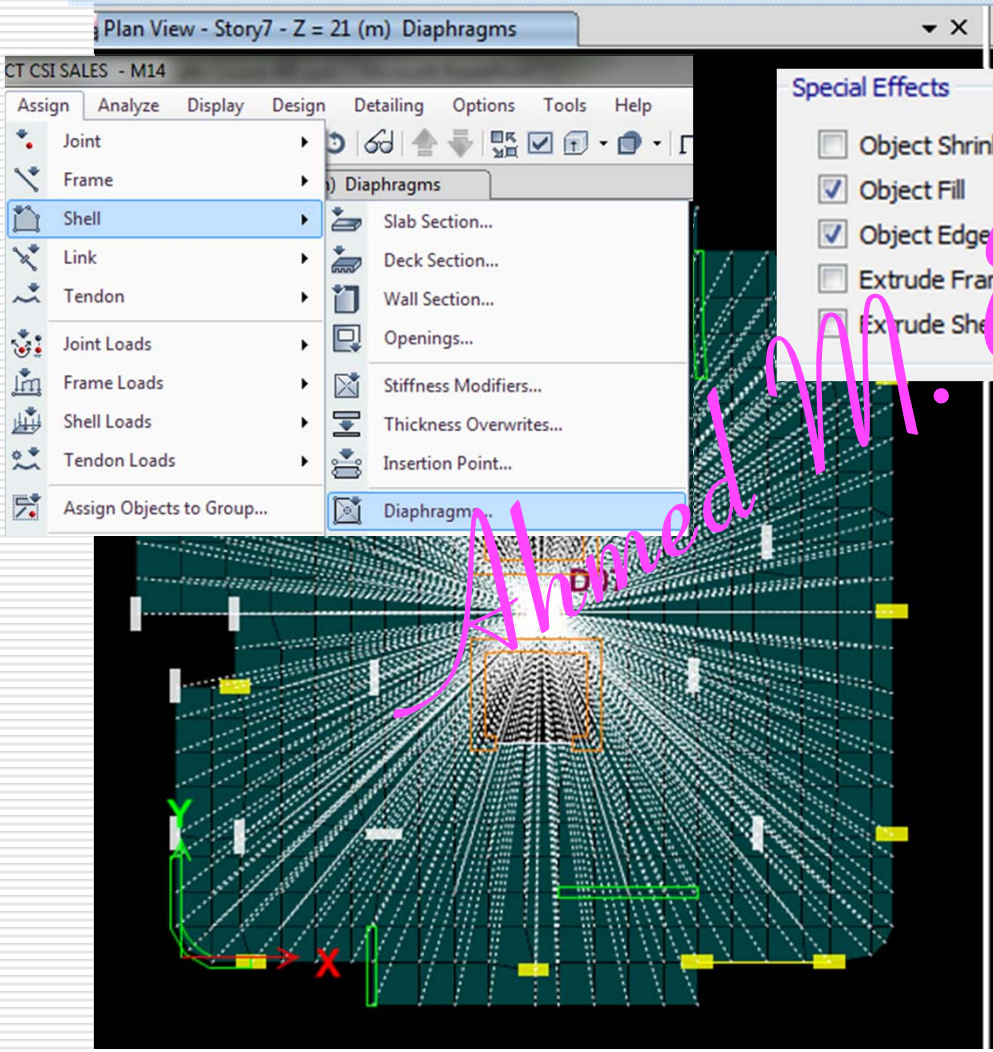


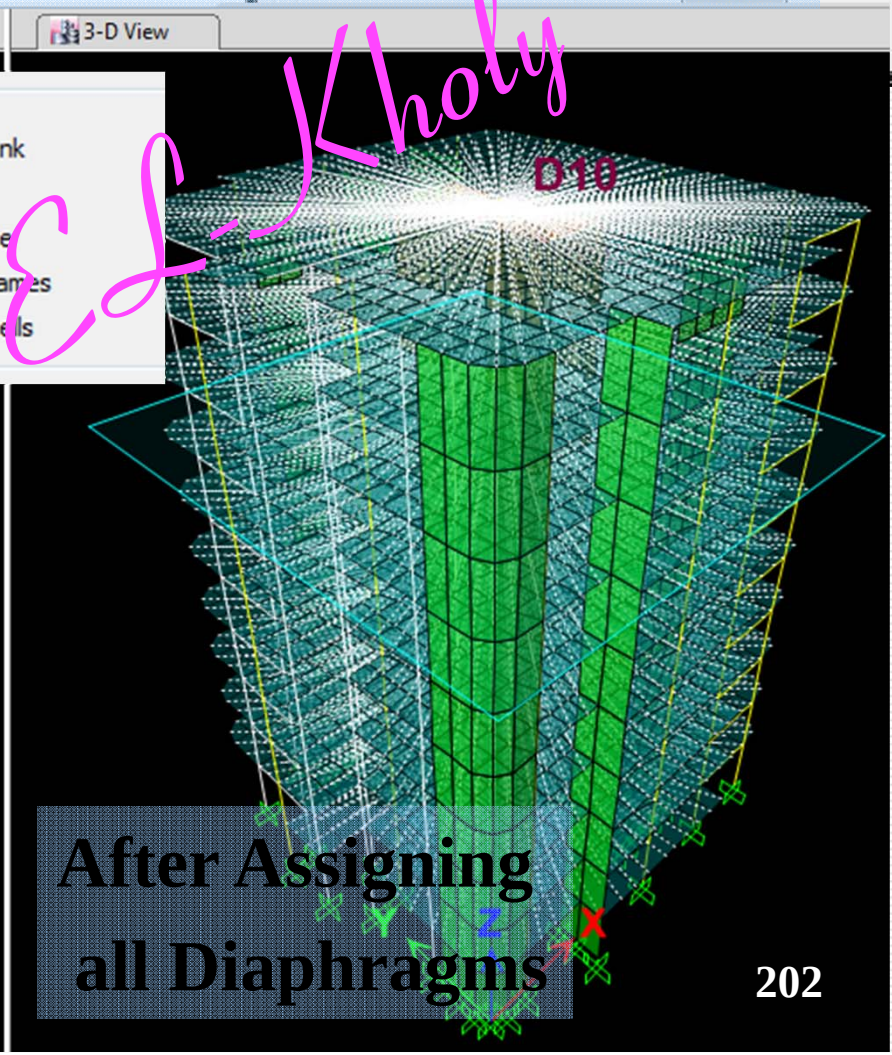


14- Define & Assign Diaphragms for floors

Menu: Define-diaphragm …. D01, D02, D03, ….D10



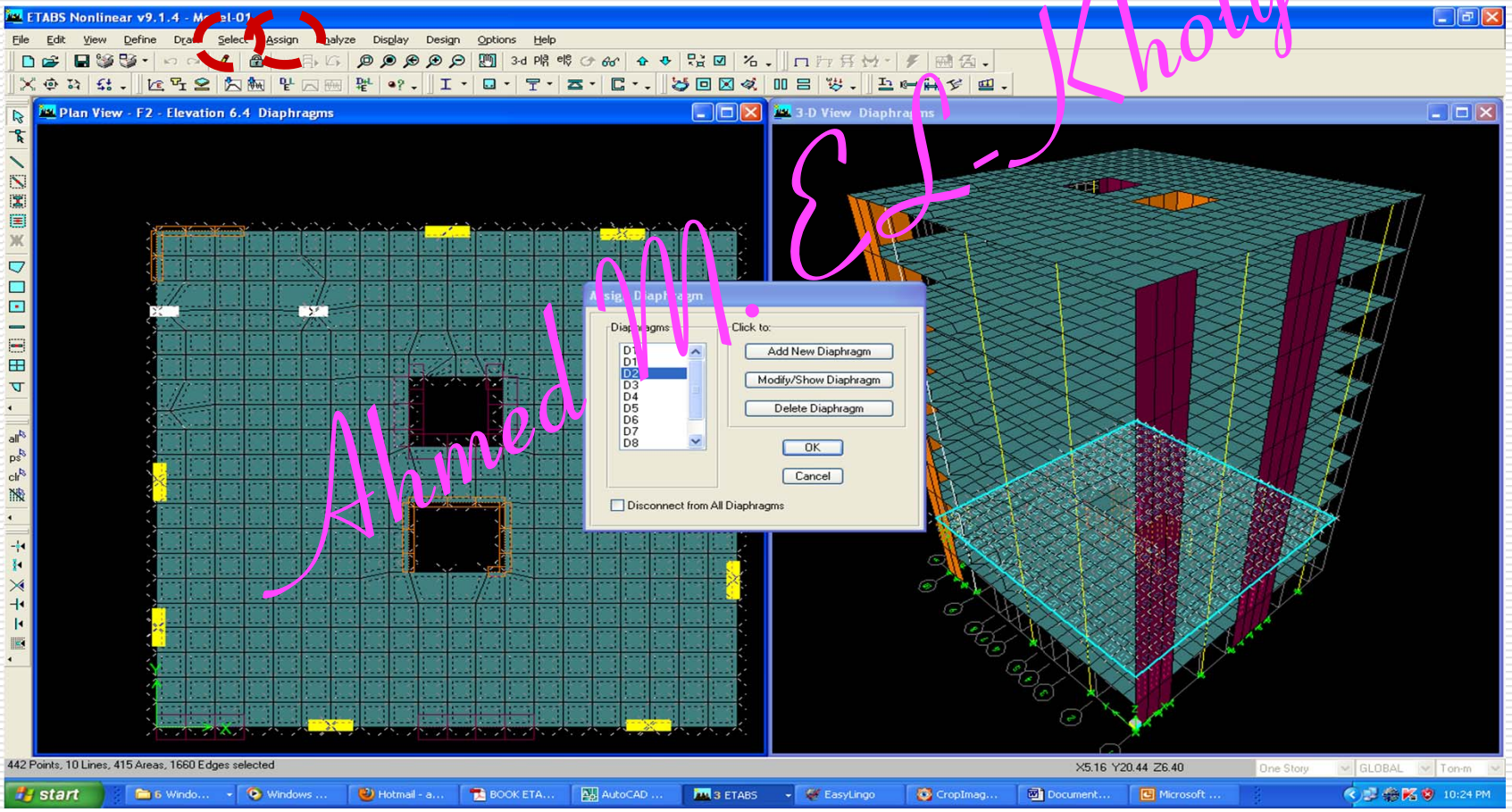




14- Assign Diaphragms for floors

Menu: Select-by story- strory2

Assign-Shell- Diaphragm …. D02



15- Mesh Shear Wall Areas

16- Define Static Load Cases → D, L, Equivalent Static EQ ,…Temp, H, Wind, Snow

17-Define Response Spectrum Functions

18-Define Response Spectrum Cases

} Only for Spectra Method

19-Define Load Combinations ??Spectra or not?

20-Assign Loads …D, L, …

21- P-delta Effect/Dynamic Analysis

22- Define Mass source

23- Assign Piers

24- Check model

25- Run Analysis & Check Log File

Retaining Wall !!..
Scale level

26- If Spectra Method is utilized, Scale the Base Shear of Spectra Method to the 0.85 Base Shear of Equivalent Static. …ECL2012 P141

27- Re-Run & Check Log File…

26 26 26 26 26 26 26 26 26 26

28- Checks: Mass Ratio, Drift, Overturning & Sliding

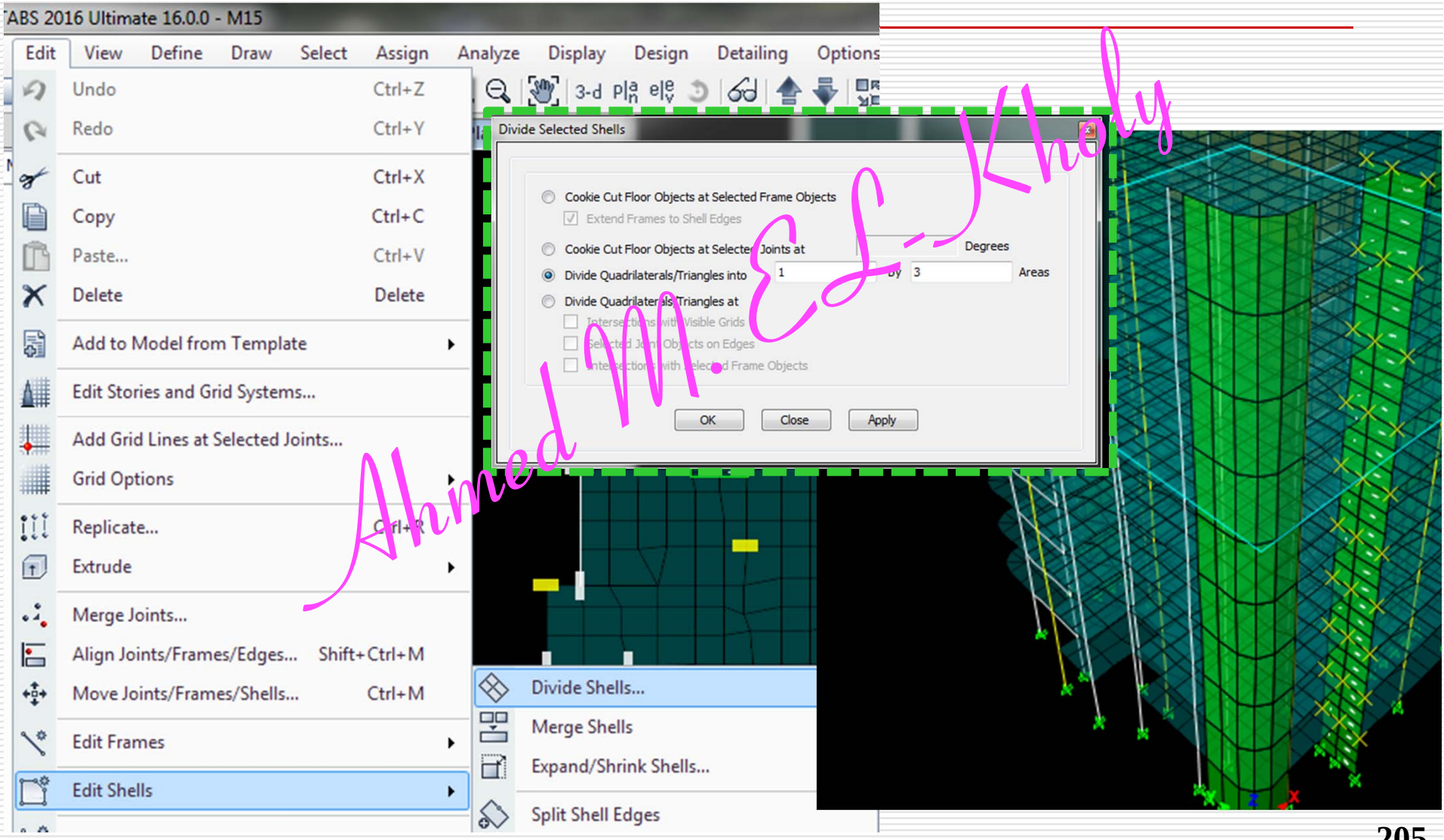
29- Read Straining Actions

30- Design

15-Mesh (Vertically) Shear Wall Areas

..Two Alternatives

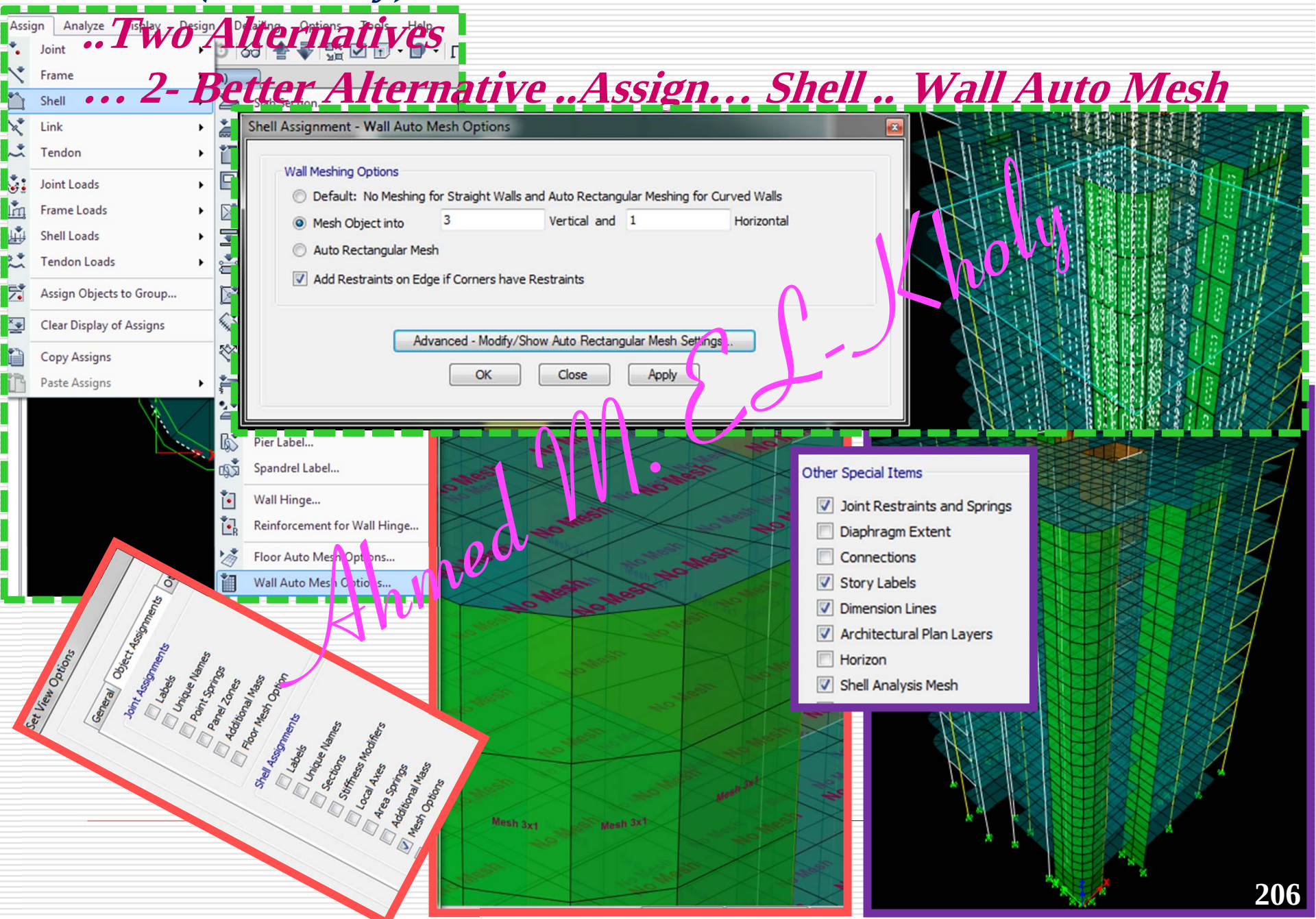
… 1- Bad Alternative ..Edit… Shell .. Divide Shells



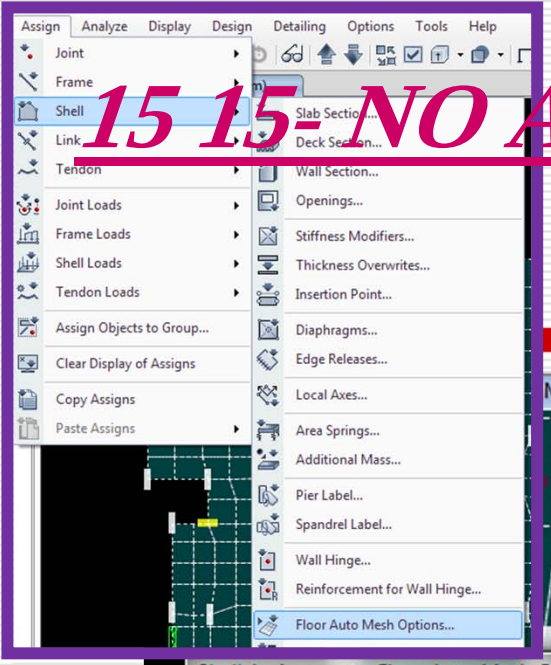
15-Mesh (Vertically) Shear Wall Areas

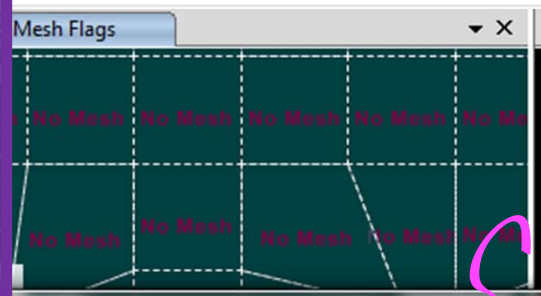
..Two Alternatives

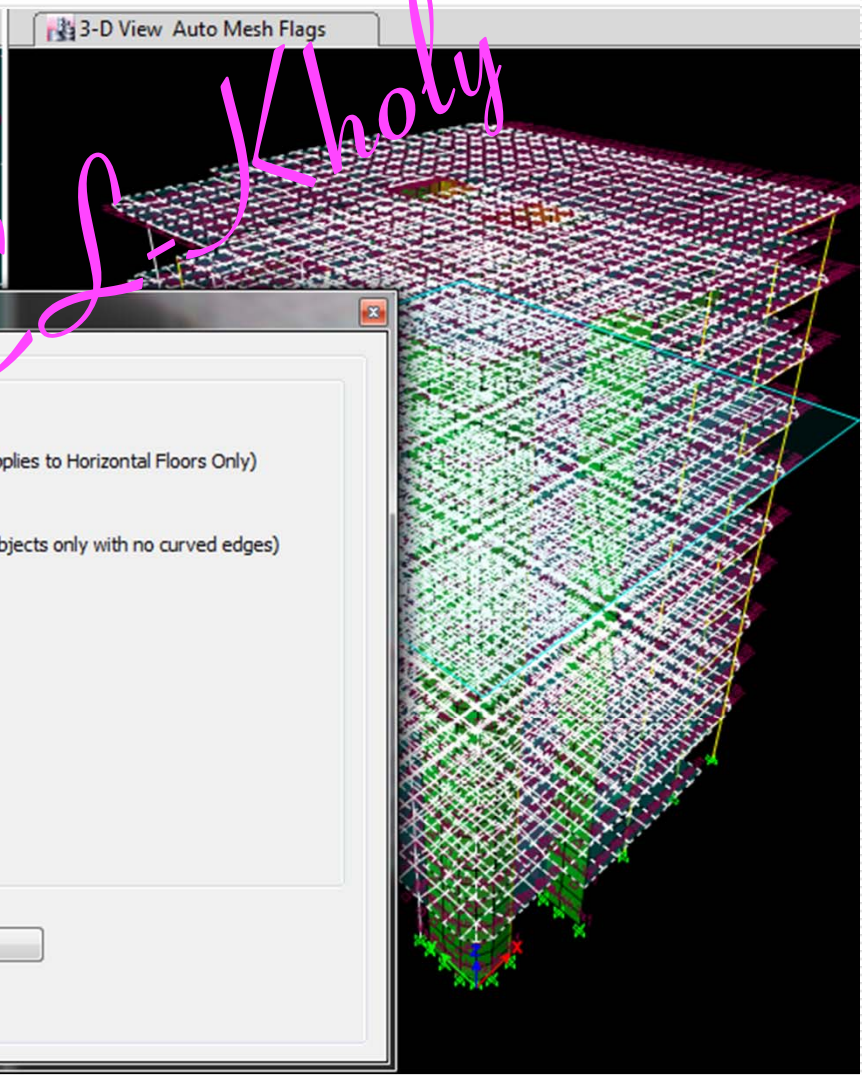
… 2- Better Alternative ..Assign… Shell .. Wall Auto Mesh

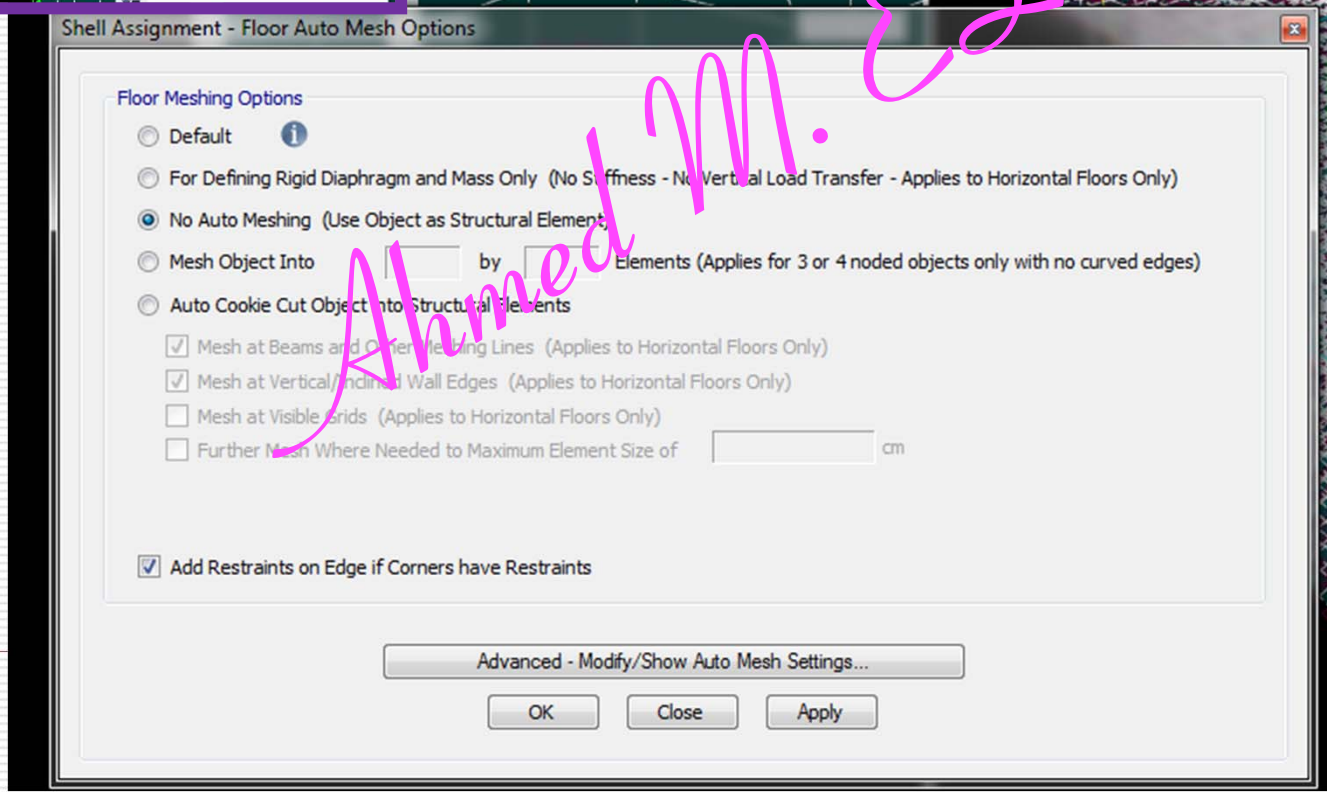


15 15- NO Auto Mesh for ALL floors



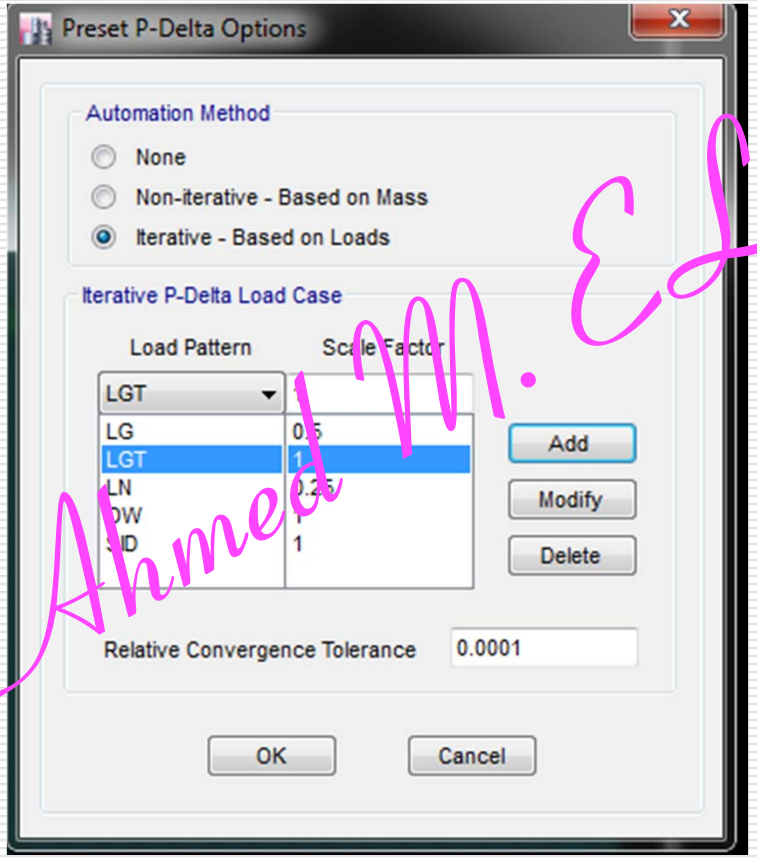






16- P-Δ Parameters

…Define.. P-Delta Options..



17- Static Load Cases

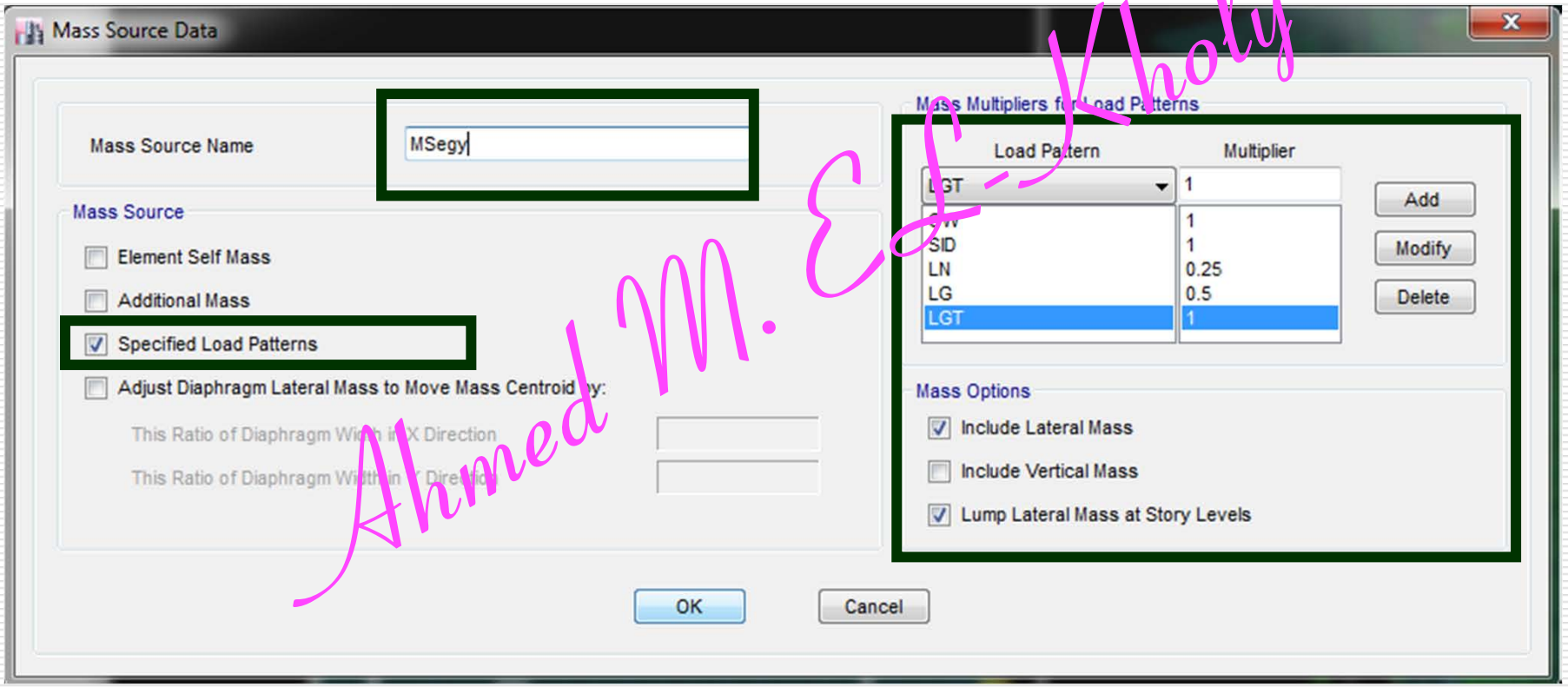
..Define.. Load Patterns

	Load	Type	SWM	Auto Lateral Loads	Comment
1	OW	Dead	1		Own Wight
2	SID	Dead	0		Flooring+Walls+….
3	LN	Live	0		ψ=0.25, Table 8-7
4	LG	Live	0		ψ=0.5, Table 8-7
5	LGT	Live	0		ψ=1.0, Table 8-7
6	EXA	Quake	0	User Loads	+X dir & Ecc=+0.05
7	EXB	Quake	0	User Loads	+X dir & Ecc=-0.05
8	EYA	Quake	0	User Loads	+Y dir & Ecc=+0.05
9	EYB	Quake	0	User Loads	+Y dir & Ecc=-0.05

17 17
..Define….
.Load Cases
&
check
every case

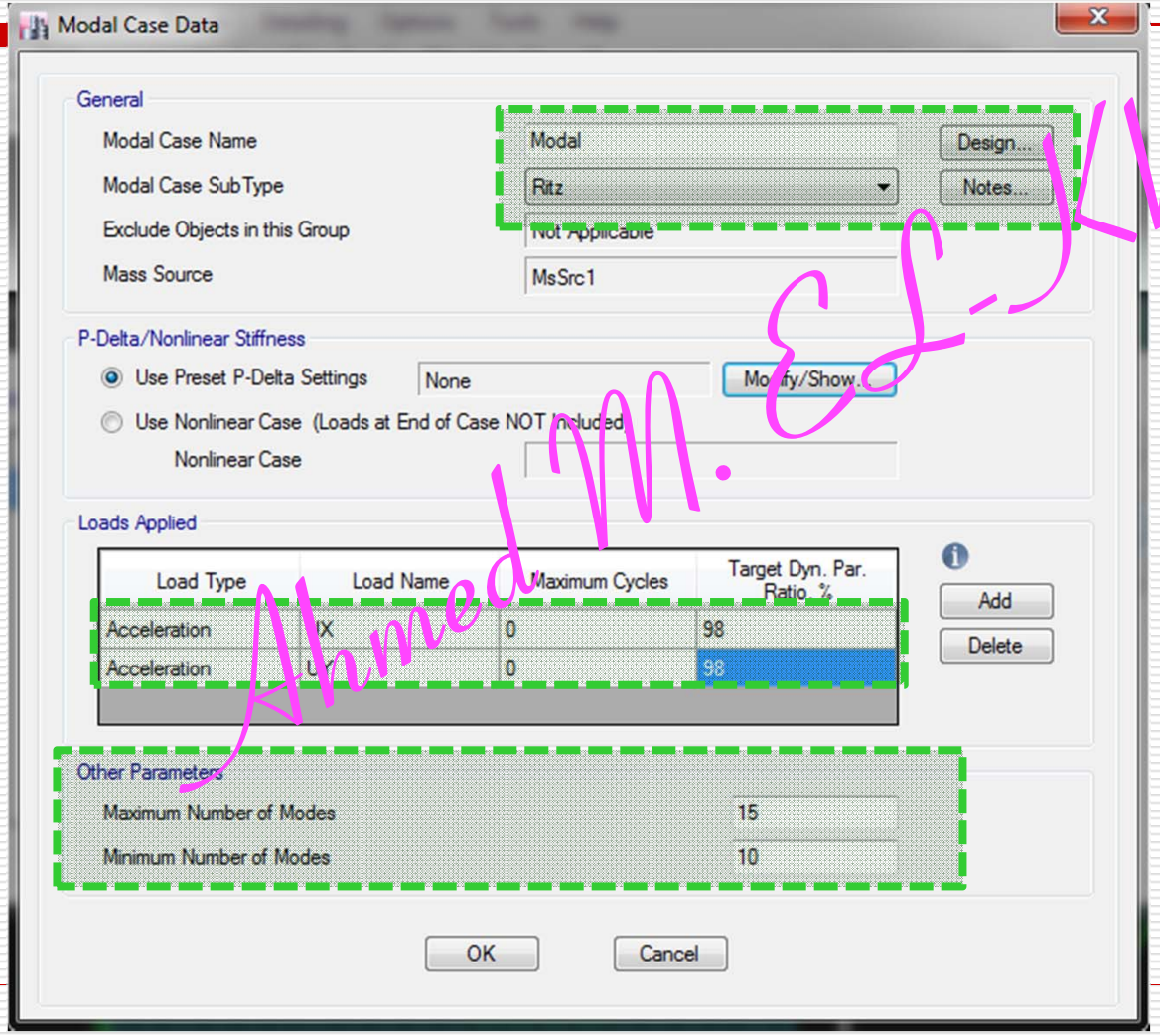
18- Mass Source

…Define..Mass Source..



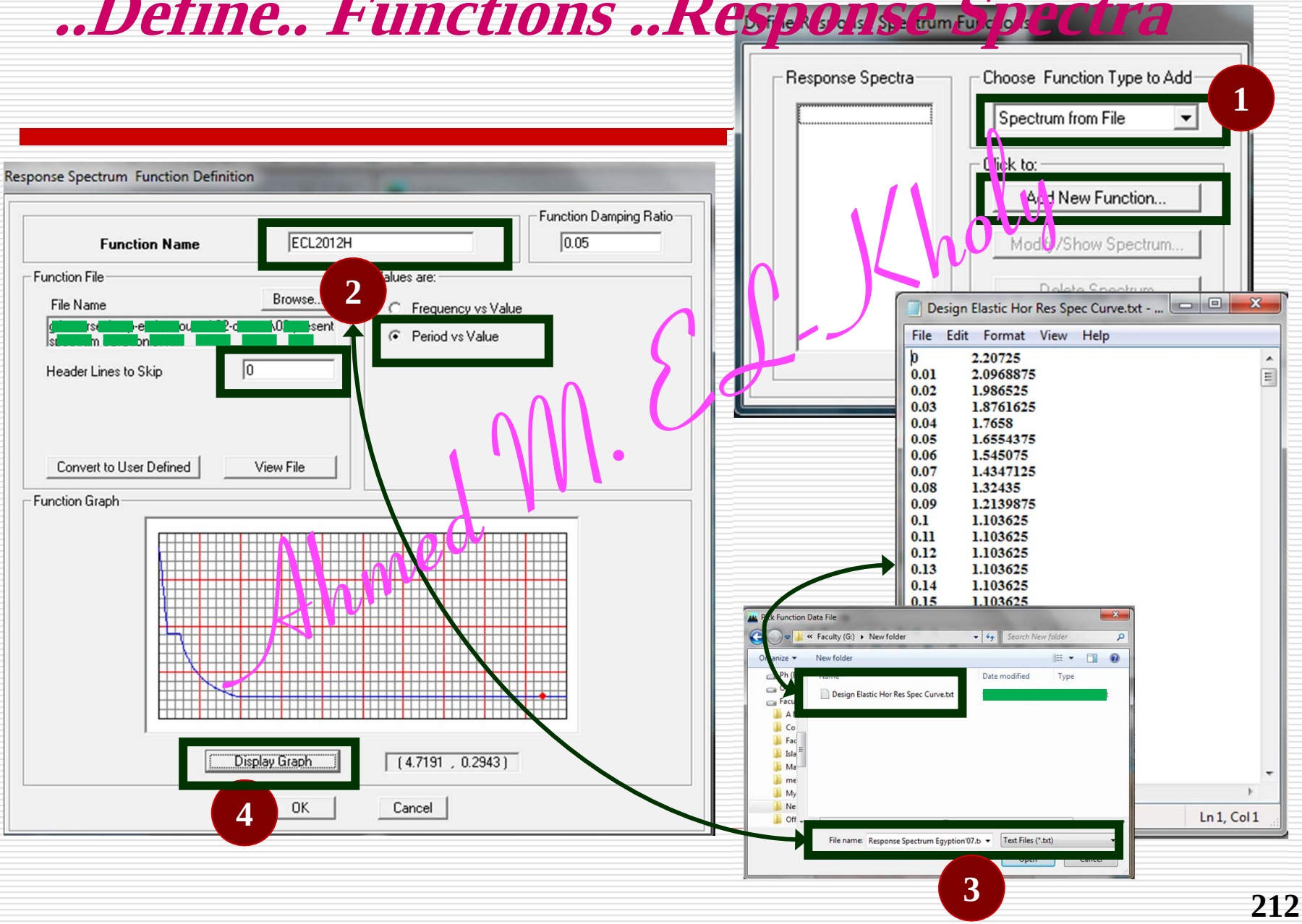
19- Modal Analysis

…Define … Modal Case



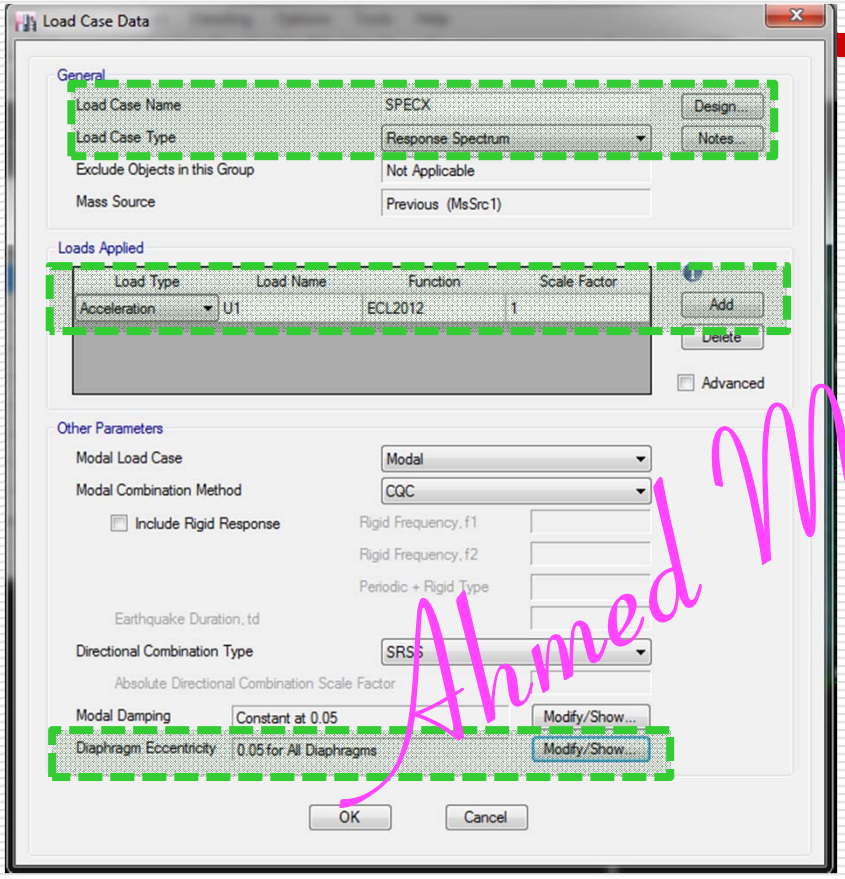
20-Response Spectra Functions

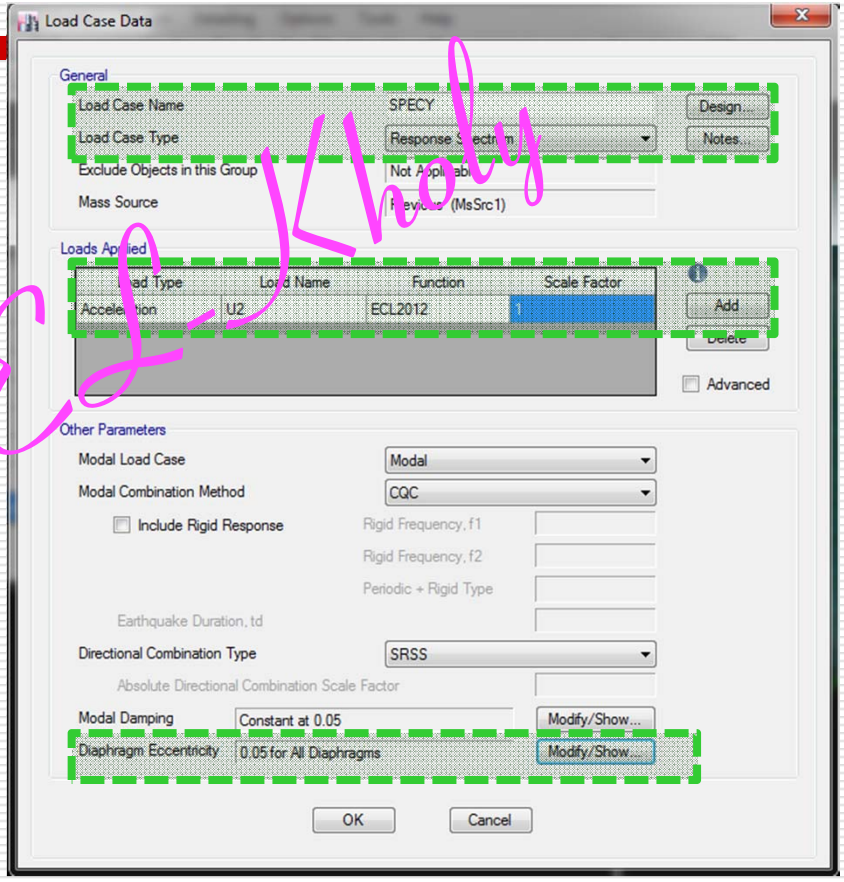
..Define.. Functions ..Response Spectra



21-Response Spectra Load Cases

..Define.. Load Cases .. Response Spectrum





SPECX

SPECY

22-Load Combinations..Define..Load Combinations

	Combination	Equation	Comment	Equ
1	SD	OW+SID	Service Dead (Deflection)	
2	SL	LN+LG+LGT	Serivce Live (Deflection)	
3	SDL	OW+SID+LN+LG+LGT	Serivce Dead+Live	
4	UD	0.9OW+0.9SID	Ultimated Dead	
5	UDL	1.4(OW+SID)+1.6(LN+LG+LGT)	Ultimated Dead+Live	
6	UDLEXA	1.12SD+α SL+EXA	Ultimate Dead+Live+EX+ECC	(3-5)
7	UDLEXAN	1.12SD+α SL-EXA	Ultimate Dead+Live-EX+ECC	
8	UDLEXB	1.12SD+α SL+EXB	Ultimate Dead+Live+EX-ECC	
9	UDLEXBN	1.12SD+α SL-EXB	Ultimate Dead+Live-EX-ECC	
10	UDLEYA	1.12SD+α SL+EYA	Ultimate Dead+Live+EY+ECC	(3-5)
11	UDLEYAN	1.12SD+α SL-EYA	Ultimate Dead+Live-EY+ECC	
12	UDLEYB	1.12SD+α SL+EYB	Ultimate Dead+Live+EY-ECC	
13	UDLEYBN	1.12SD+α SL-EYB	Ultimate Dead+Live-EY-ECC	
14	UDEXA	0.9SD+EXA	Ultimate Dead+EX+ECC	(3-9)
15	UDEXAN	0.9SD-EXA	Ultimate Dead-EX+ECC	
16	UDEXB	0.9SD+EXB	Ultimate Dead+EX-ECC	
17	UDEXBN	0.9SD-EXB	Ultimate Dead-EX-ECC	
18	UDEYA	0.9SD+EYA	Ultimate Dead+EY+ECC	(3-9)
19	UDEYAN	0.9SD-EYA	Ultimate Dead-EY+ECC	
20	UDEYB	0.9SD+EYB	Ultimate Dead+EY-ECC	
21	UDEYBN	0.9SD-EYB	Ultimate Dead-EY-ECC	

Static Load Combinations

22-Load Combinations

…Define..Load Combinations

	Combination	Equation	Comment	Equ
22	UDLSpecX	1.12SD+α SL+SpecX	Ultimate Dead+Live+SpecX+ECC	(3-5)
23	UDLSpecY	1.12SD+α SL+SpecY	Ultimate Dead+Live+SpecY+ECC	(3-5)
24	UDSpecX	0.9SD+SpecX	Ultimate Dead+SpecX+ECC	(3-9)
25	UDSpecY	0.9SD+SpecY	Ultimate Dead+SpecY+ECC	(3-9)

Dynamic Load Combinations

23-Assign Loads

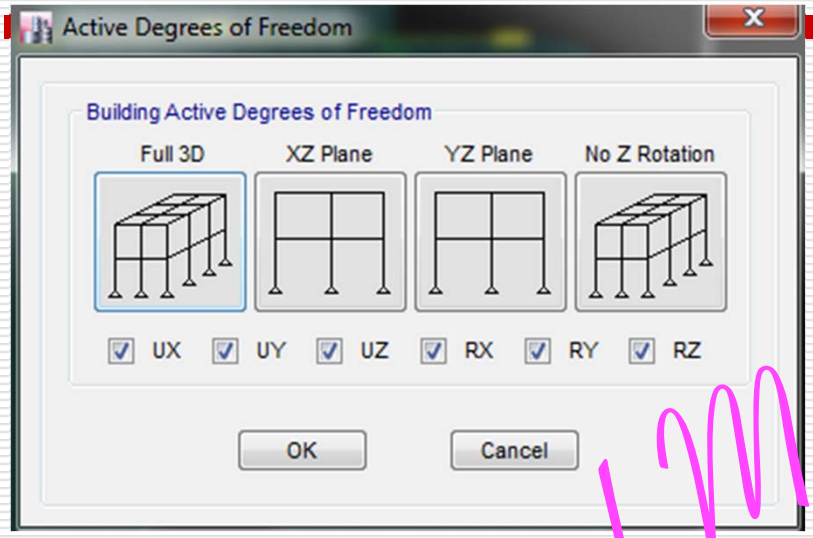
…Assign.. Shell Loads… Uniform

Assign the loads for the slabs in the cases SID, LN, LG & LGT

Be careful and avoid selecting the walls when assigning loads.
Assign the loads to ONLY the slabs.
DO NOT Assign loads to walls.

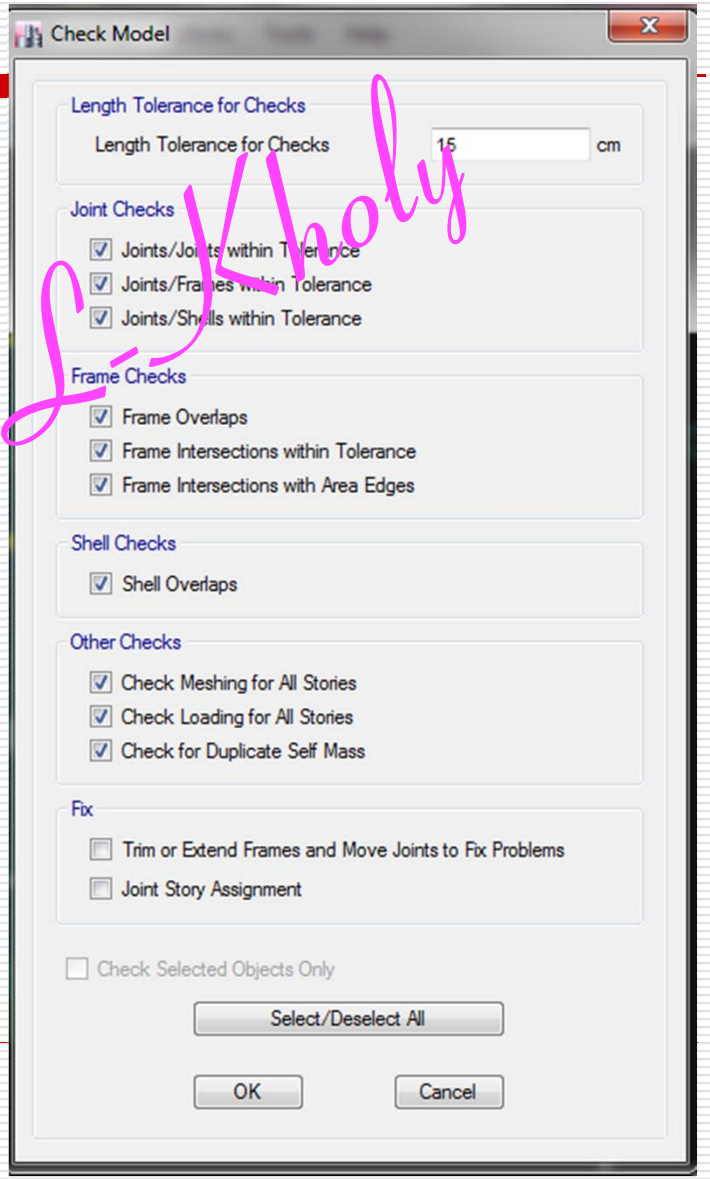
24- DOF

…Analyze.. Set DOF..



24 24- Check Model

…Analyze..Check Model..

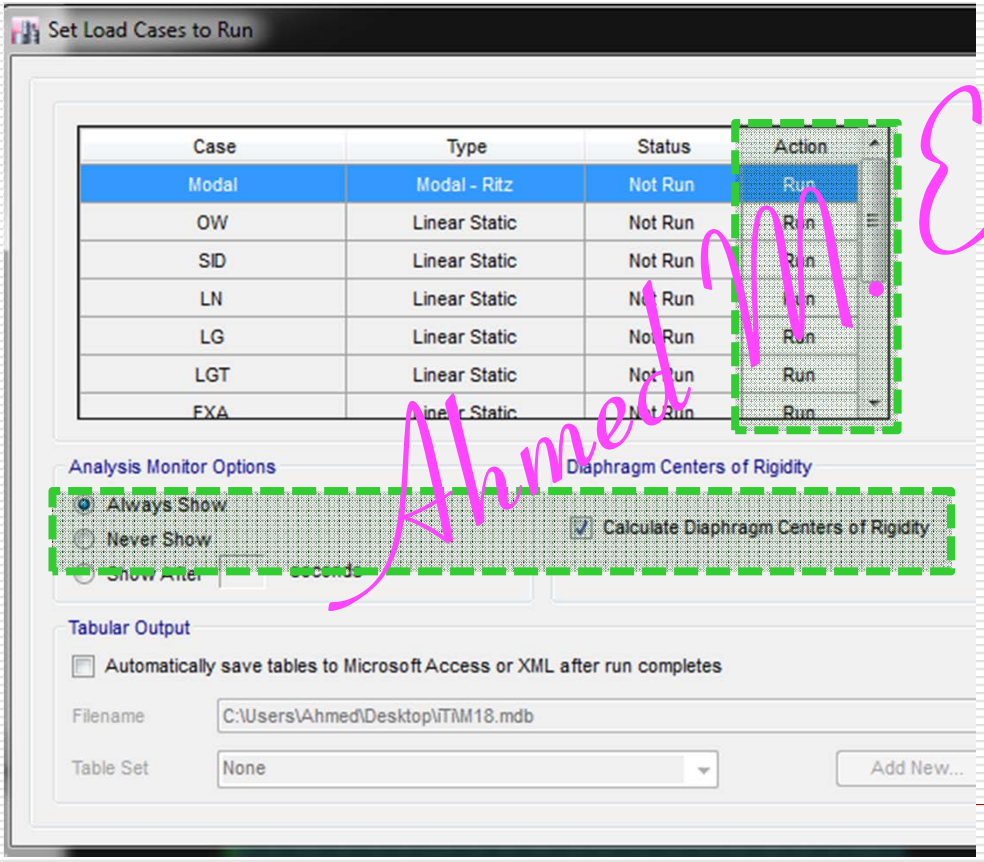


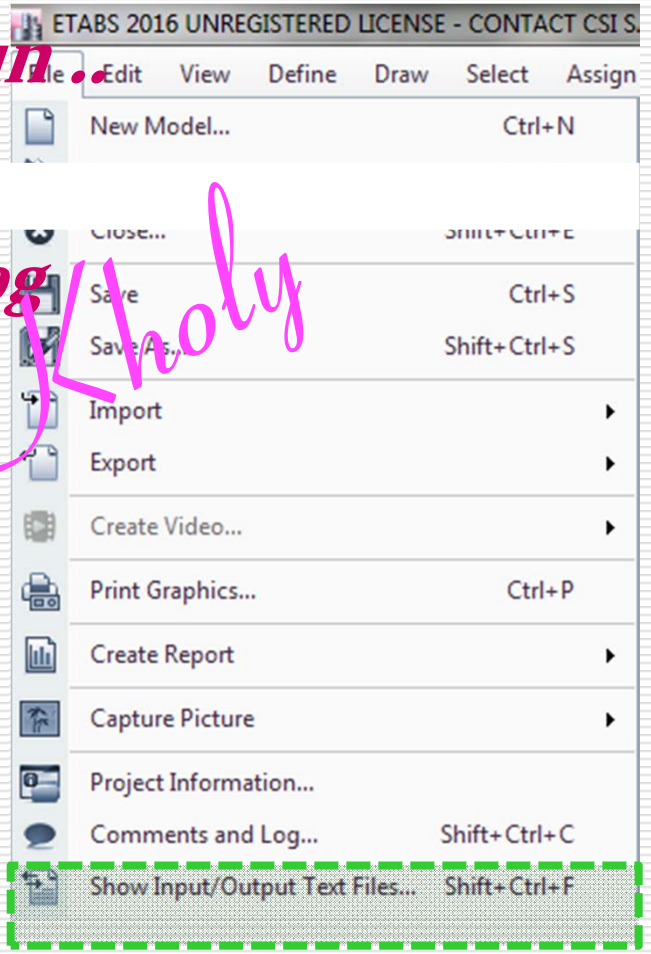
25- Run …Check log file

…Analyze ... Set Load Cases to Run ..

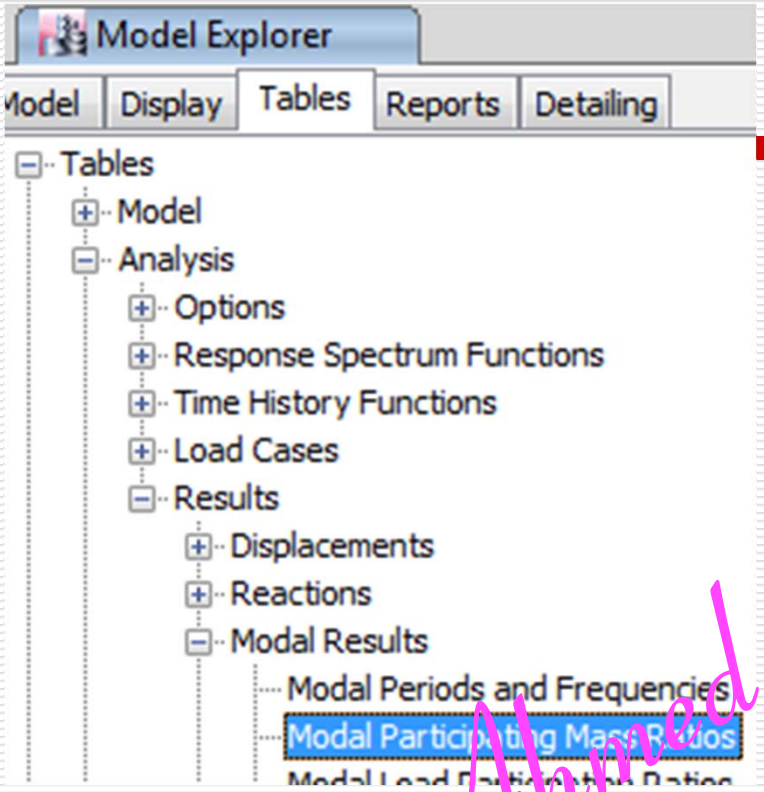
….Analyze … Run

…File .. Show Input & Output file .log





26- Check Mass Participating Ratios

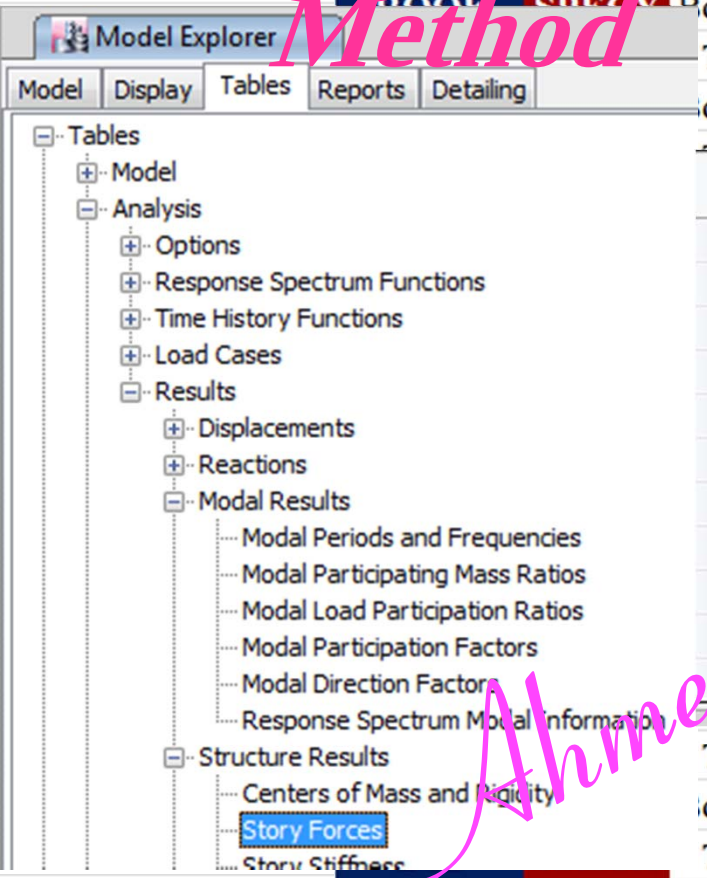


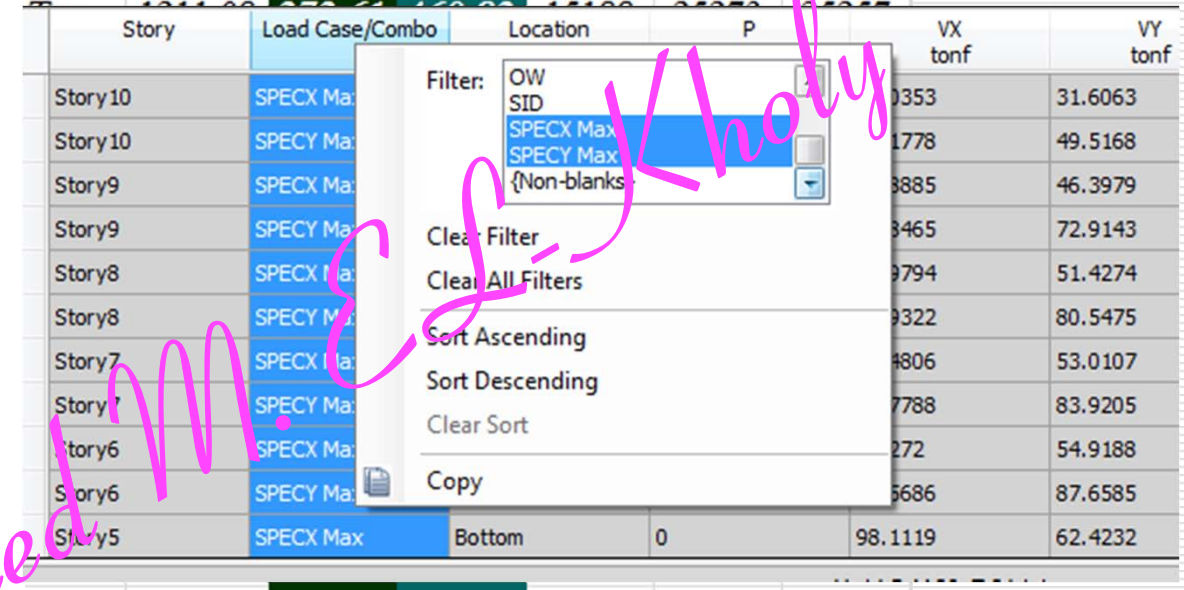
Item 8-7-3-3-1-5
ECL 2012
≥ 90%

Mode	Period	UX	UY	UZ	SumUX	SumUY	SumUZ
1	4.07	0.12	7.35	0.00	0.12	7.35	0.00
2	3.33	67.74	3.65	0.00	67.86	11.00	0.00
3	2.88	38.57	15.32	0.00	106.43	26.32	0.00
4	1.07	0.01	0.53	0.00	106.44	26.85	0.00
5	0.77	1.21	9.78	0.00	107.65	36.63	0.00
6	0.64	11.72	1.08	0.00	119.37	37.72	0.00
7	0.55	0.00	0.00	0.00	119.37	37.72	0.00
8	0.55	0.00	0.00	0.00	119.37	37.72	0.00
9	0.53	0.00	0.21	0.00	119.37	37.92	0.00
10	0.36	0.08	4.87	0.00	119.45	42.79	0.01
11	0.34	0.00	0.00	1.36	119.46	42.79	1.36
12	0.33	0.25	0.47	0.01	119.71	43.26	1.37
13	0.32	0.12	0.01	23.62	119.82	43.28	24.99
14	0.30	0.02	0.02	1.04	119.84	43.30	26.03
15	0.29	3.73	0.22	11.34	123.58	43.52	37.36
16	0.28	1.33	0.02	2.94	124.91	43.54	40.30
17	0.27	0.89	0.20	11.56	125.80	43.74	51.87
18	0.25	0.02	0.09	6.47	125.82	43.83	58.34
19	0.24	0.38	0.09	0.00	126.20	43.92	58.34
20	0.22	0.01	0.01	8.31	126.21	43.93	66.65
21	0.21	0.01	3.85	0.03	126.22	47.78	66.68
22	0.17	5.08	0.12	0.30	131.30	47.90	66.98
23	0.17	0.07	0.03	9.54	131.38	47.93	76.52
24	0.15	0.03	3.04	0.05	131.40	50.97	76.57
25	0.12	0.09	0.05	8.03	131.49	51.03	84.60
26	0.11	7.46	0.11	0.16	138.95	51.14	84.77
27	0.11	0.42	6.94	0.07	139.37	58.08	84.84
28	0.07	7.32	3.57	0.00	146.69	61.65	84.84
29	0.06	2.73	6.99	0.03	149.42	68.64	84.87
30	0.05	0.00	0.04	8.37	149.42	68.67	93.24

27- Scale the Base Shear for Spectra Method

Story	Load	Loc	P	VX	VY	T	MX	MY
ROOF	SPECX	Top	107.15	156.66	45.99	2900.4	2566.3	3776.6
ROOF	SPECX	Bottom	114.50	161.50	48.35	3004.8	2652.2	3902.4
ROOF	SPECY	Top	129.63	73.96	160.78	4434.3	3387.1	3335.7
ROOF	SPECY	Bottom	133.82	77.32	168.13	4616.3	3191.4	3322.6
		Top	1000.26	480.77	213.44	10200	18714	23759
		Bottom	1001.73	484.26	214.27	10232	19030	24433





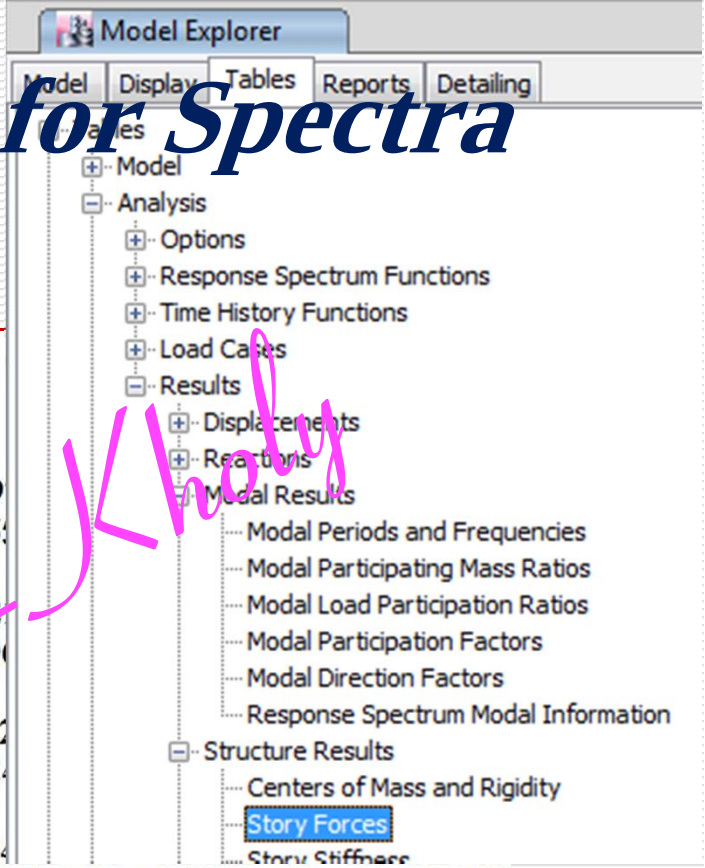
		Top	1379.18	318.39	632.82	20304	29819	29554
		Bottom	1391.24	320.97	651.32	20648	31137	30071
		Top	1207.96	676.67	248.22	13402	23108	30132
BS1	SPECX	Bottom	1222.49	679.62	250.86	13571	23830	31332
BS1	SPECY	Top	1463.22	325.39	705.29	22258	32078	30615
BS1	SPECY	Bottom	1480.90	327.88	706.75	22391	33568	31119
BS2	SPECX	Top	1302.42	722.48	314.20	16713	25262	31749
BS2	SPECX	Bottom	1325.96	738.81	332.40	17658	26175	33099
BS2	SPECY	Top	1578.37	397.70	734.71	23113	35072	31737
BS2	SPECY	Bottom	1607.10	419.72	756.40	23273	36796	32304

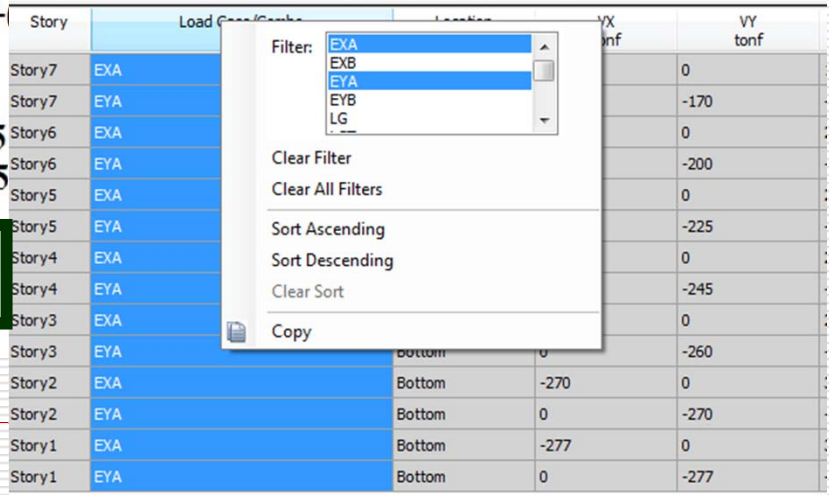
Vdynamic

27- Scale the Base Shear for Spectra Method

STORY	LOAD	LOC	P	VX	VY	
ROOF	EXA	Top	-3.906E-06	-4.281E+02	4.307E-07	8.09
		Bottom	-3.905E-06	-4.372E+02	4.306E-07	8.25
ROOF	EYA	Top	4.882E-06	2.510E-07	-4.281E+02	8.92
		Bottom	4.881E-06	2.502E-07	-4.372E+02	9.10
F19-TP32	EXA	Top	-3.907E-06	-6.494E+02	2.482E-09	1.22
		Bottom	-3.907E-06	-6.587E+02	8.665E-10	1.24
F19-TP32	EYA	Top	4.900E-06	-4.221E-07	-6.494E+02	-1.34
		Bottom	4.900E-06	-4.227E-07	-6.587E+02	
BS2	EXA	Top	-3.740E-06	-1.548E+03	-1.778E-05	
		Bottom	-3.740E-06	-1.549E+03	-1.778E-05	
BS2	EYA	Top	8.090E-06	8.468E-06	-1.548E+03	
		Bottom	8.090E-06	8.468E-06	-1.549E+03	

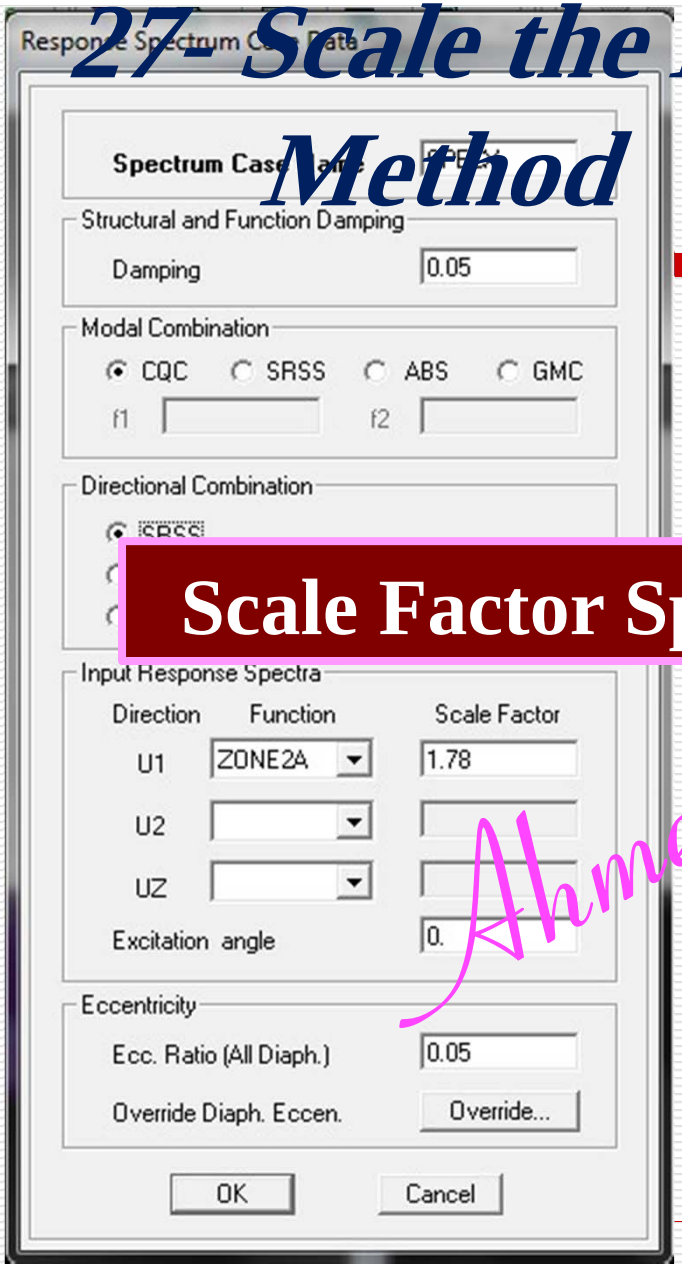
V static

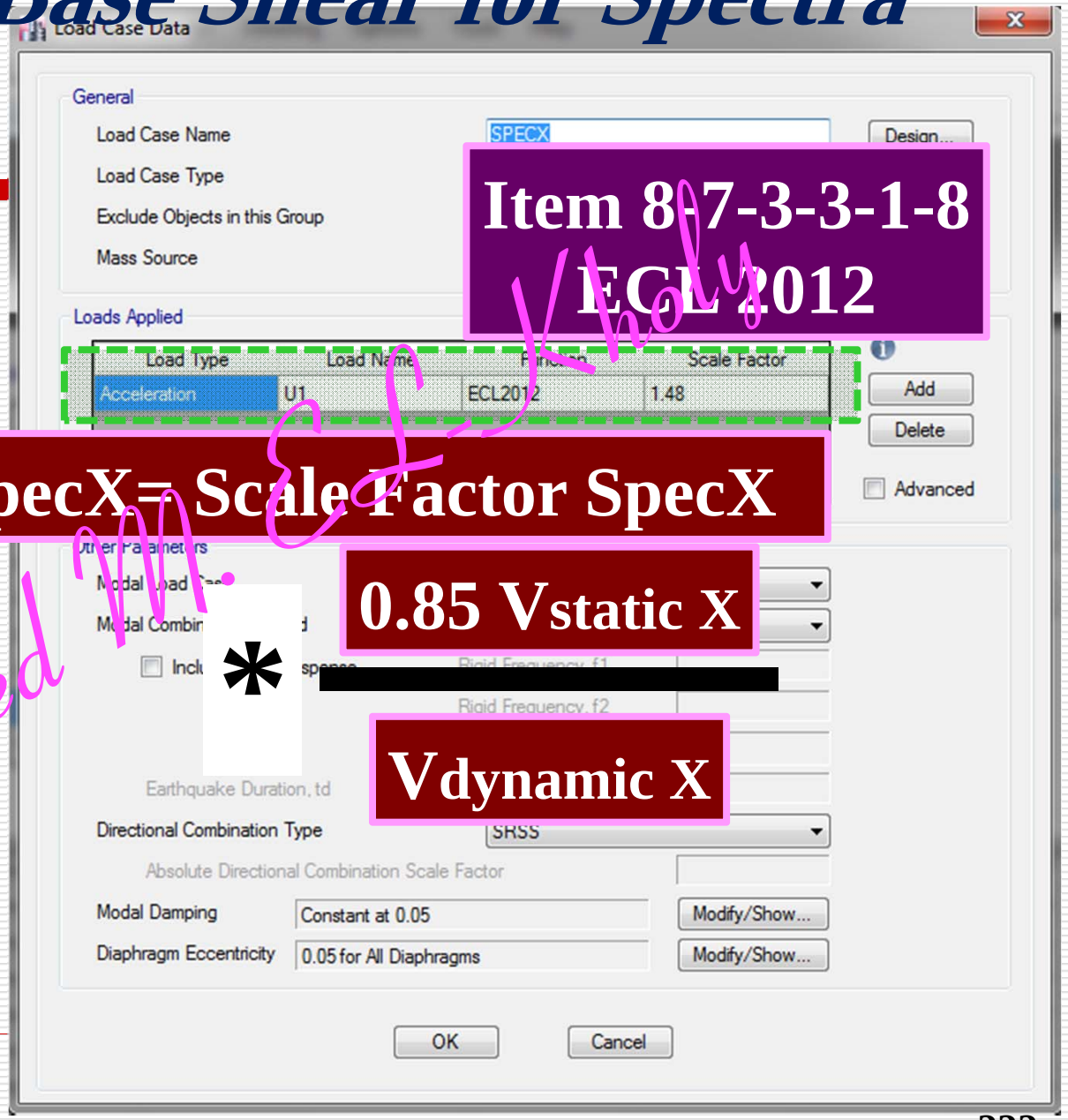




Must be equal to Base Shear estimated manually

27- Scale the Base Shear for Spectra Method





Item 8-7-3-3-1-8 ECL 2012

Scale Factor SpecX= Scale Factor SpecX

0.85 Vstatic X

*

Vdynamic X

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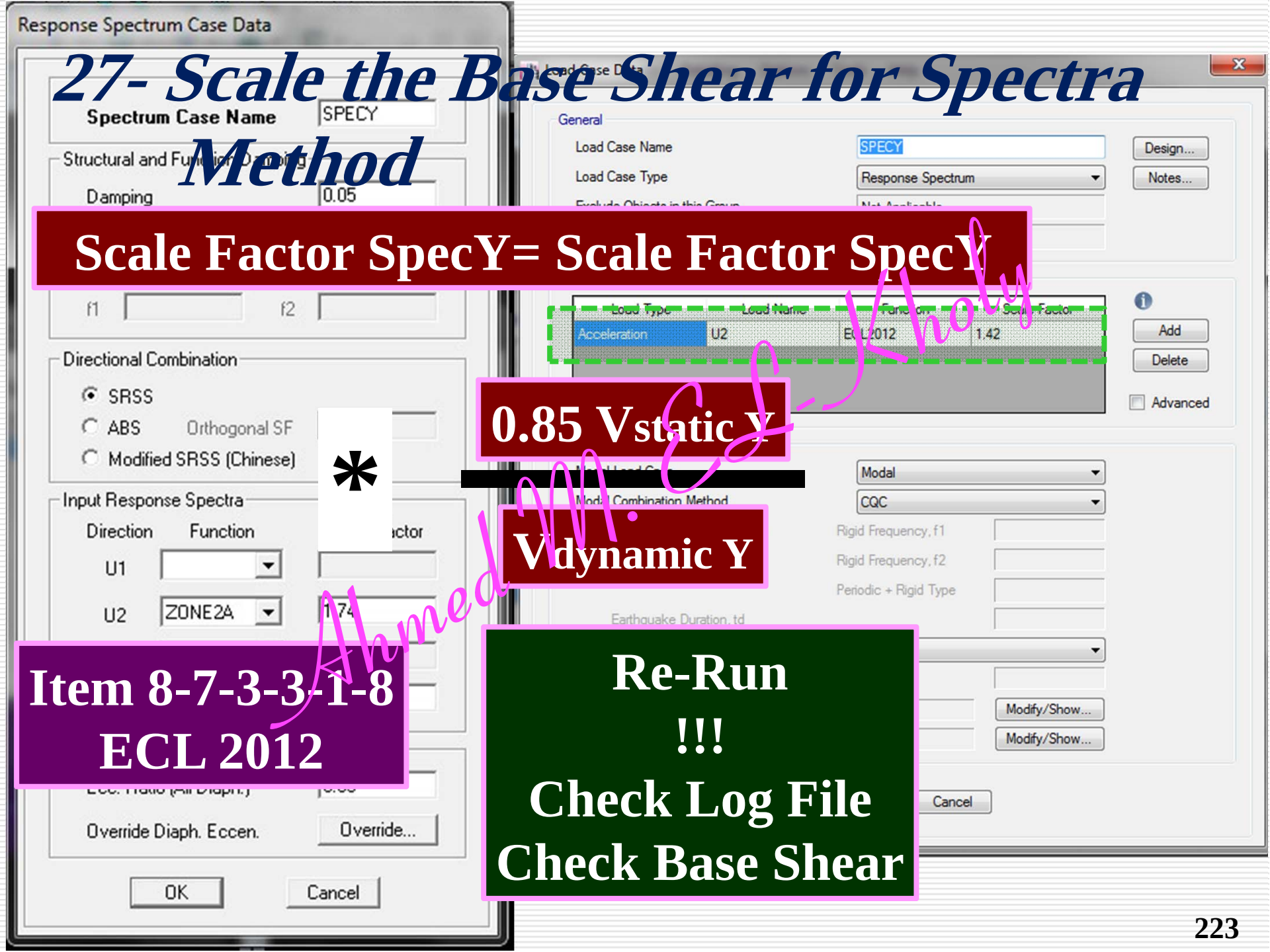
27- Scale the Base Shear for Spectra Method



Scale Factor SpecY= Scale Factor SpecY

0.85 Vstatic Y

Vdynamic Y

Item 8-7-3-3-1-8
ECL 2012

Re-Run
!!!
Check Log File
Check Base Shear

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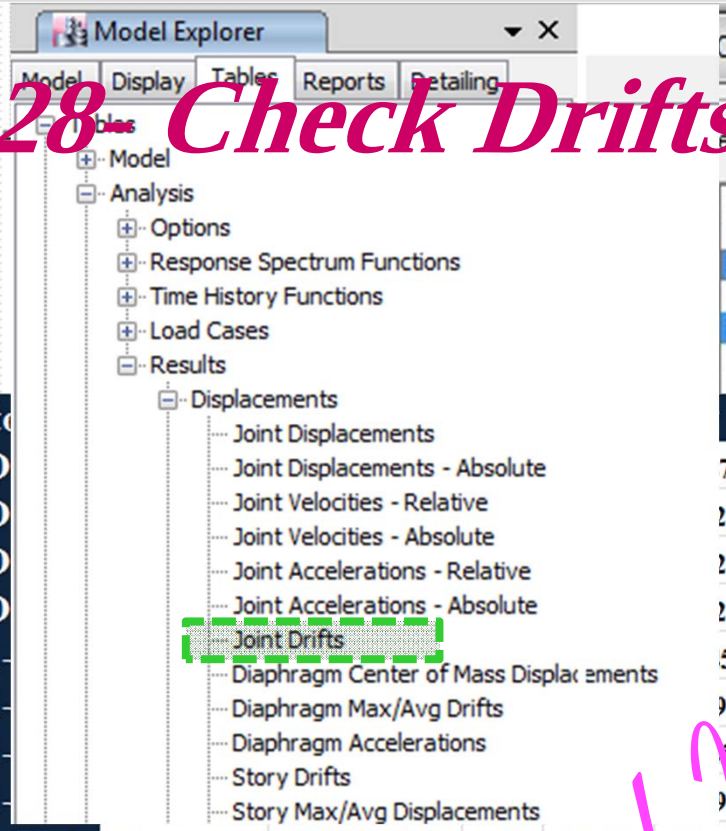
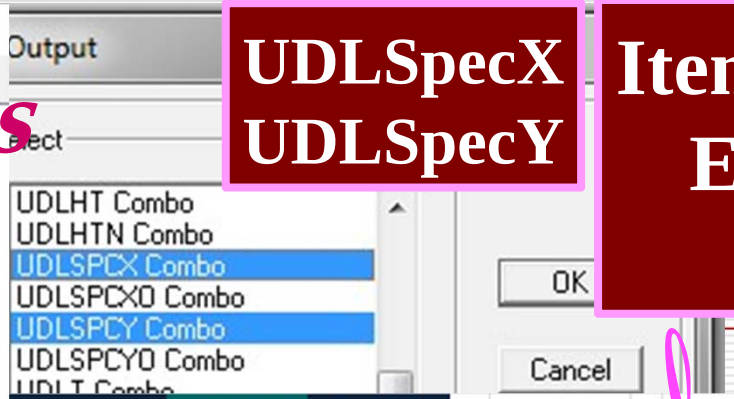
28 Check Drifts

UDLSpecX
UDLSpecY

Item 8-8-3-1-a
ECL 2012
≤ 0.005





					z	DriftX	DriftY
RO					86.95	0.00076	
RO					86.95		0.00043
RO					86.95	0.00069	
RO					86.95		0.00074
F21-					83.25	0.00090	
F21-					83.25		0.00054
F21-					83.25	0.00086	
F21-					83.25		0.00093
F20-TP3	Max Drift X	UDLSPCX	3124	36.896	39.459	79.55	0.00099
F20-TP3	Max Drift Y	UDLSPCX	2792	37.585	33.91	79.55	0.00060
F20-TP3	Max Drift X	UDLSPCY	3124	36.896	39.459	79.55	0.00097
F20-TP3	Max Drift Y	UDLSPCY	2792	37.585	33.91	79.55	0.00105
F19-TP32	Max Drift X	UDLSPCX	3192	37.402	40.139	75.85	0.00111
F19-TP32	Max Drift Y	UDLSPCX	2775	37.884	33.586	75.85	0.00068
F19-TP32	Max Drift X	UDLSPCY	3192	37.402	40.139	75.85	0.00111
F19-TP32	Max Drift Y	UDLSPCY	2775	37.884	33.586	75.85	0.00116
F18-TP2	Max Drift X	UDLSPCX	3192	37.402	40.139	72.15	0.00123
F18-TP2	Max Drift Y	UDLSPCX	2775	37.884	33.586	72.15	0.00076
F18-TP2	Max Drift X	UDLSPCY	3192	37.402	40.139	72.15	0.00125
F18-TP2	Max Drift Y	UDLSPCY	2775	37.884	33.586	72.15	0.00129
F17-TP2	Max Drift X	UDLSPCX	3192	37.402	40.139	68.45	0.00132

	Max Drift X	Max Drift Y
	0.00205	0.00215
X 0.7 R	0.00716	0.00752
X v	0.00358	0.00376
	Safe	Safe
Code	0.00500	0.00500

OR
SpecX
SpecY

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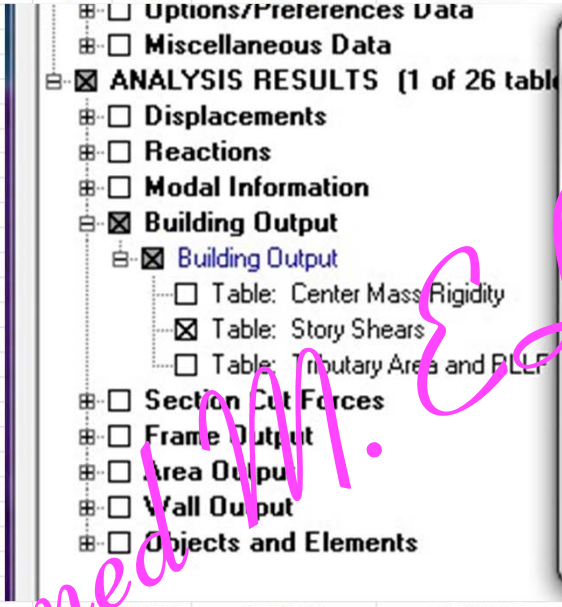
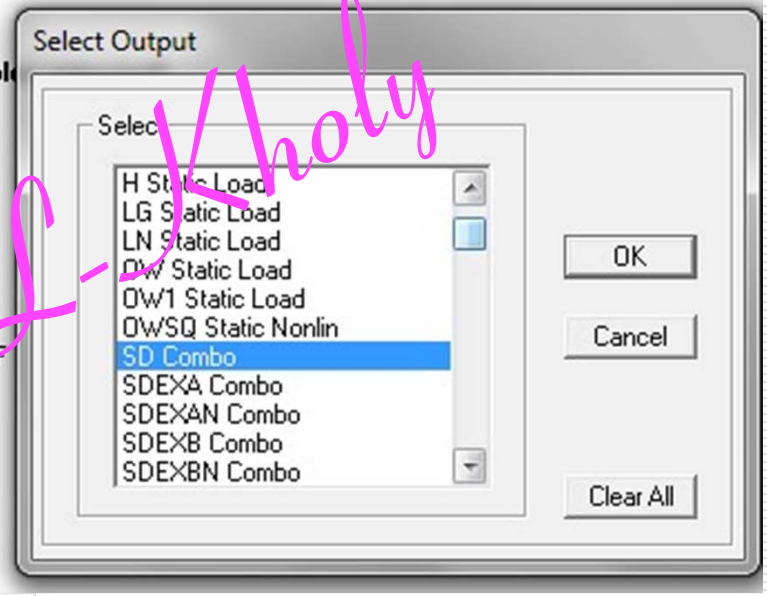
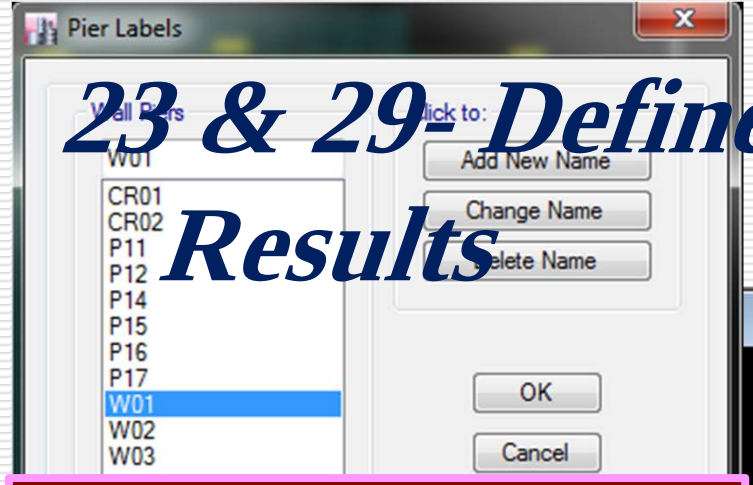
28- Check Sliding, Overturning

Story	Load	Loc	P	VX	VY	T	MX	MY
TOR	SD	Top	0	-56.65	47.42	-426.647	0	0
TOR	SD	Bottom	1648.83	0	0	-4.8[illegible]	26514.645	36701.675
ROOF	SD	Top	4[illegible]09.65	0	0	-4[illegible]32	81[illegible]903	-94[illegible]49.2
ROOF	SD	Bottom	4969.36	0	0	-5.379	8[illegible]09	-103503.247
F21-TP3	SD	Top	6526.81	0	0	-5.379	115004.828	-131985.054
F21-TP3	SD	Bottom	7030.2	0	0	-5.822	124244.26	-142028.047
F20-TP3	SD	Top	8587.63	0	0	-5.822	150764.997	-170509.854
F20-TP3	SD	Bottom	9091.91	0	0	-6.307	159341.436	-180571.941
F19-TP32	SD	Top	11205.29	0	0	-6.307	193887.539	-218584.742
F19-TP32	SD	Bottom	11708.67	0	0	-6.886	202483.671	-228851.961
F18-TP2	SD	Top	13677.32	0	0	-6.886	232299.385	-265629.634
F18-TP2	SD	Bottom	14187.38	0				
F17-TP2	SD	Top	16156.03	0				
F17-TP2	SD	Bottom	16667.87	0				
F16-TP2	SD	Top	18636.52	0				
F16-TP2	SD	Bottom	19148.35	0				
F15-TP3	SD	Top	20705.84	0				
F15-TP3	SD	Bottom	21231.64	0				
F14-TP31	SD	Top	23138.5	0				
F14-TP31	SD	Bottom	23671.49	0				
F13-TP1	SD	Top	25488.08	0				
F13-TP1	SD	Bottom	26021.64	0				
F12-TP1	SD	Top	27838.23	0				
F12-TP1	SD	Bottom	28371.22	0				
F11-TP1	SD	Top	30187.81	0				
F11-TP1	SD	Bottom	30720.81	0				
F10-TP1	SD	Top	32537.4	0				
F10-TP1	SD	Bottom	33083.63	0				
F09-TP2	SD	Top	34917.5	0				
F09-TP2	SD	Bottom	35463.73	0				
F08-TP1	SD	Top	37280.32	0				
F08-TP1	SD	Bottom	37826.54	0				
F07-TP1	SD	Top	39643.13	0				
F07-TP1	SD	Bottom	40189.36	0				
F06-TP1	SD	Top	42005.95	0				
F06-TP1	SD	Bottom	42567.23	0	0	-12.902	703543.55	-814937.684
F05-TP1	SD	Top	44383.82	0	0	-12.902	733155.65	-849021.305
F05-TP1	SD	Bottom	44945.11	0	0	-12.935	742312.798	-860272.76
F04-TP1	SD	Top	46761.7	0	0	-12.935	771924.898	-894356.381
F04-TP1	SD	Bottom	47322.98	0	0	-12.909	781082.114	-905608.287
F03-TP1	SD	Top	49139.57	0	0	-12.909	810694.214	-939691.909
F03-TP1	SD	Bottom	49700.85	0	0	-12.839	819851.783	-950944.111
F02-TP1	SD	Top	51517.44	0	0	-12.839	849463.883	-985027.732
F02-TP1	SD	Bottom	52078.73	0	0	-12.766	858622.302	-996280.637
F01	SD	Top	54375.85	0	0	-12.766	895722.767	-1050533.56
F01	SD	Bottom	55121.7	0	0	-12.685	907778.895	-1066458.405
PODIUM	SD	Top	57896.93	0	0	-12.685	929323.982	-1130610.169
PODIUM	SD	Bottom	58788.65	0	0	-12.667	942701.728	-1149856.485
GROUND	SD	Top	63892.79	0	0	-12.667	1018848.553	-1200110.218
GROUND	SD	Bottom	65651.56	0	0	-12.68	1056718.602	-1212918.137
BS1	SD	Top	69459.71	0	0	-12.68	1117378.052	-1250412.685
BS1	SD	Bottom	70901.17	0	0	-12.674	1148390.569	-1261839.498
BS2	SD	Top	75801.19	0	0	-12.674	1233765.51	-1301045.575
BS2	SD	Bottom	77246	0	0	-13	1264548	-1312539





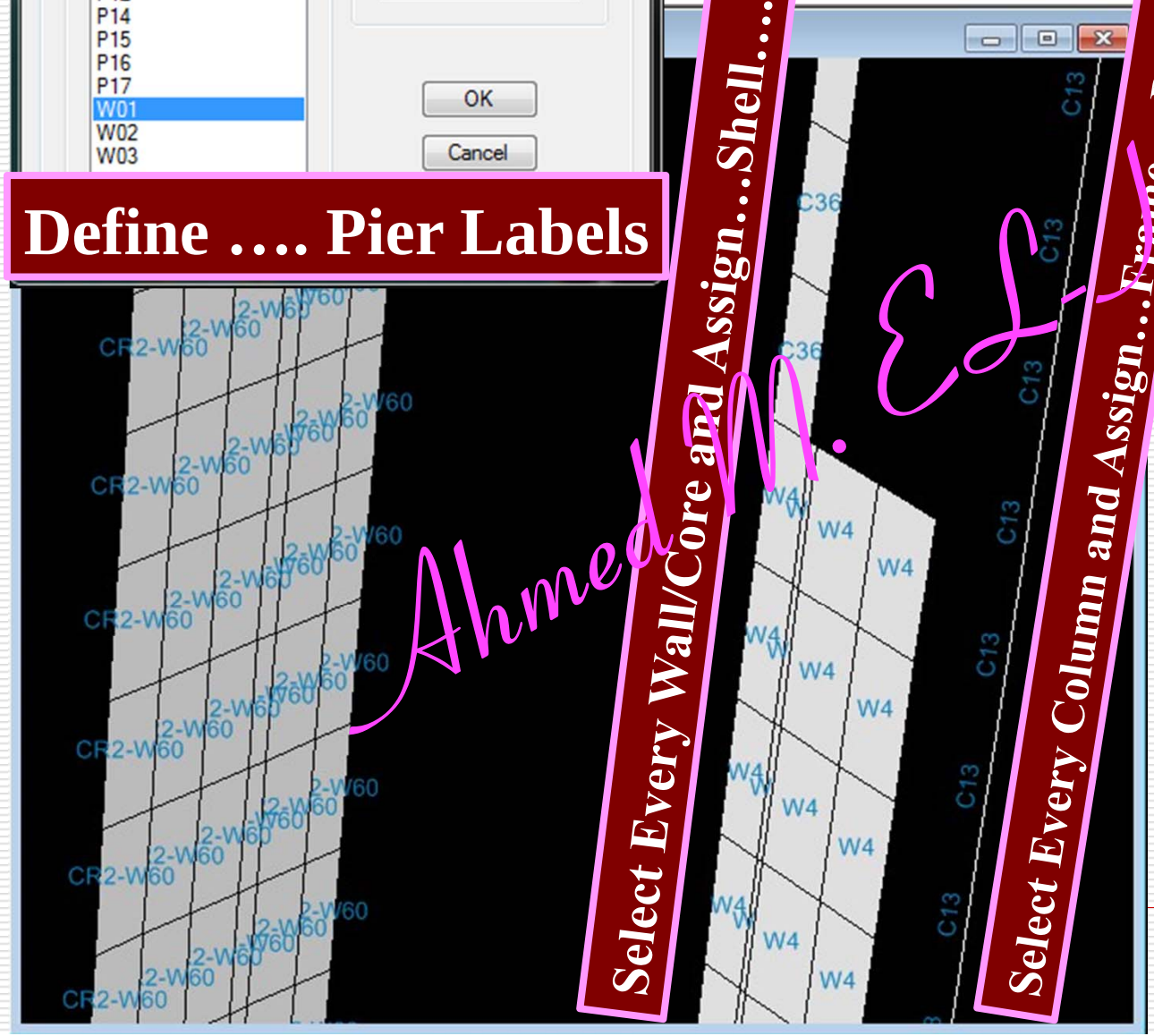
23 & 29- Define & Assign Piers, Read Results

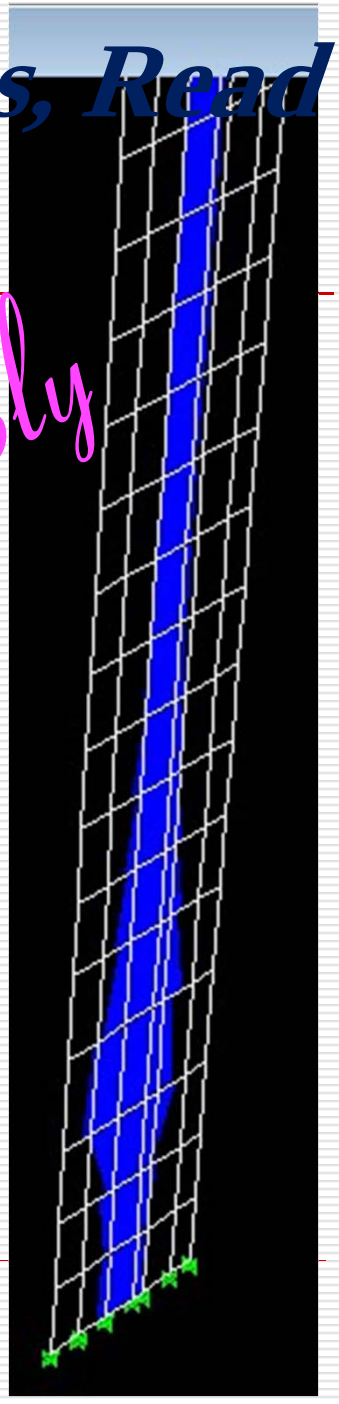


Define …. Pier Labels

Select Every Wall/Core and Assign…Shell…Pier Label

Select Every Column and Assign…Frame…Pier Label





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Read Results of Columns

Read Results of Shear Walls

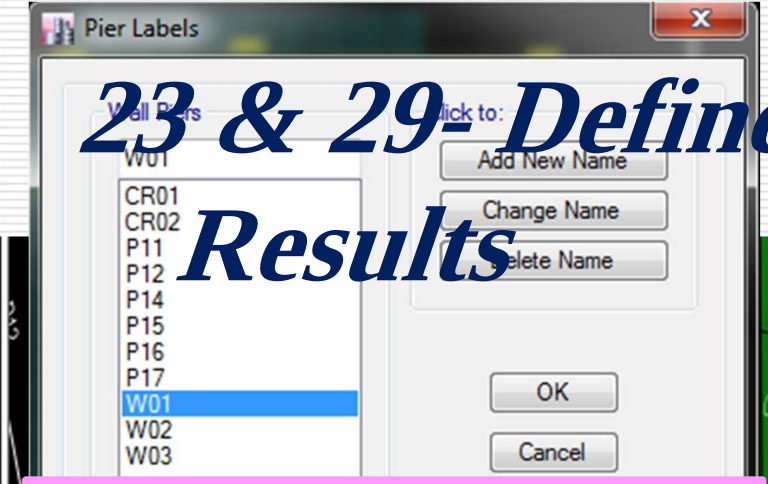
Exporting Results to Excel & CSI Pier Local Axes

Design of Columns

Design of Shear Walls

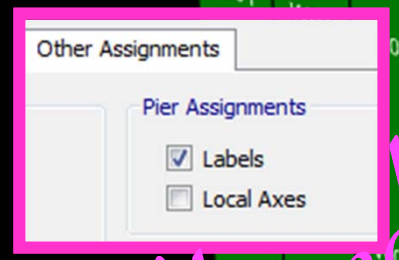
Using Etabs (ACI 318)

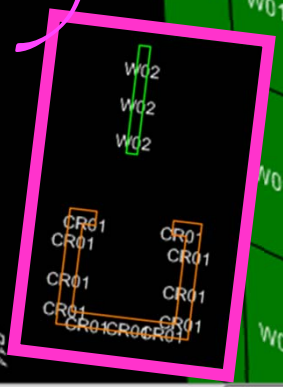
23 & 29- Define & Assign Piers, Read Results



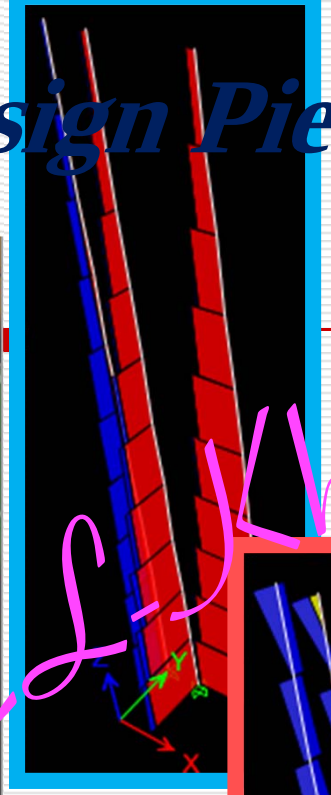
Define …. Pier Labels

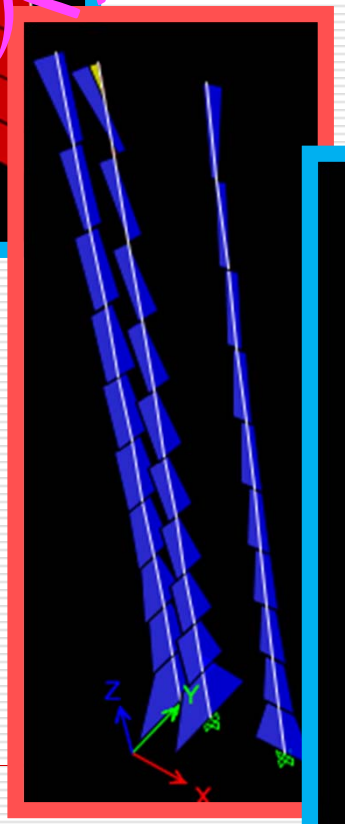
Select Every Column and Assign…Frame…Pier Label

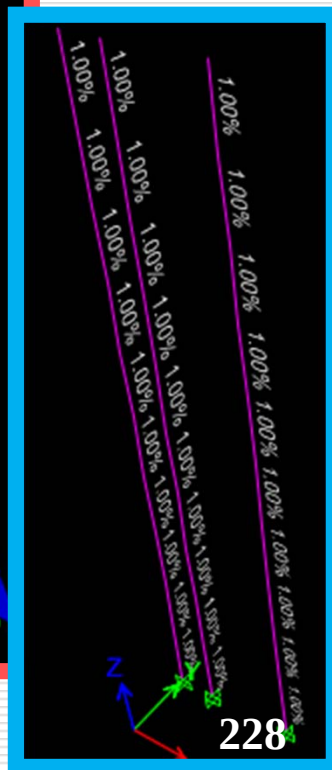




Select Every Wall/Core and Assign…Shell…Pier Label







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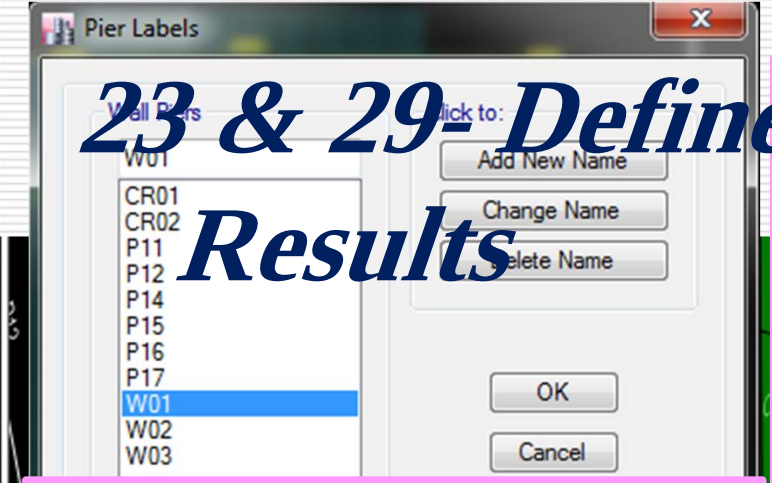
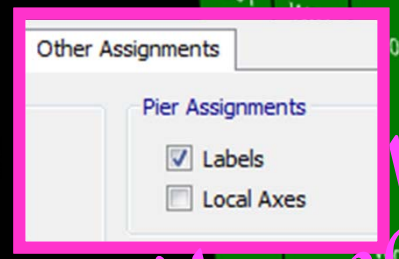
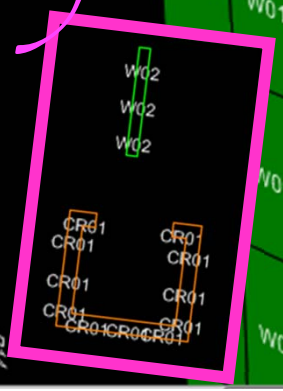
23 & 29- Define & Assign Piers, Read Results



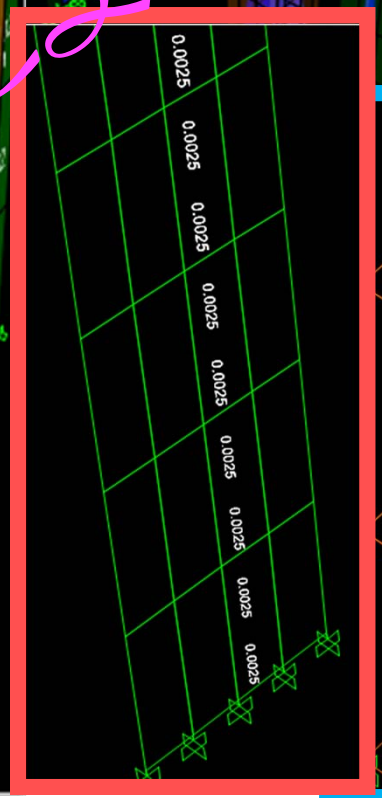
Define …. Pier Labels

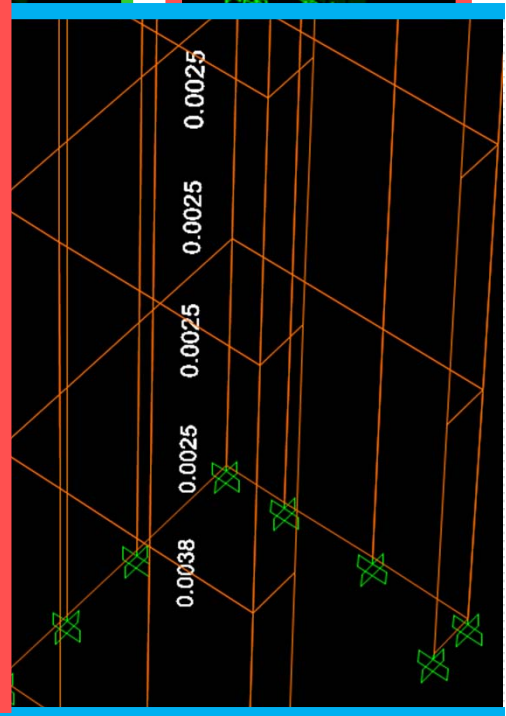
Select Every Column and Assign…Frame…Pier Label





Select Every Wall/Core and Assign…Shell…Pier Label





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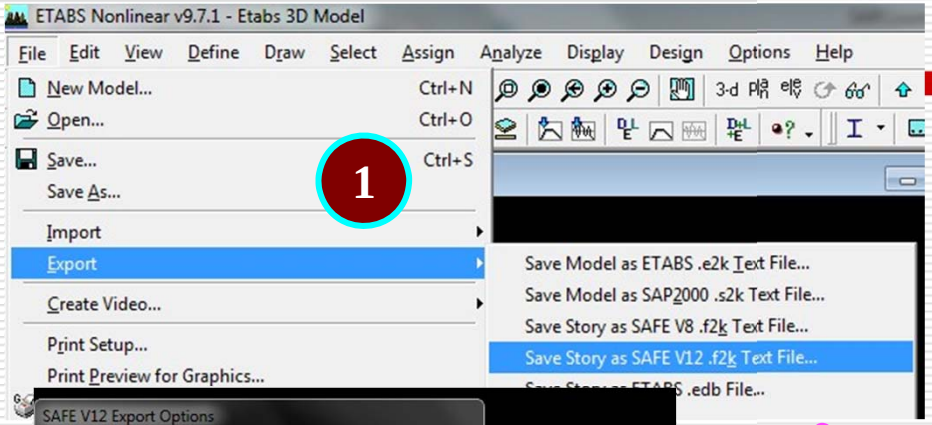
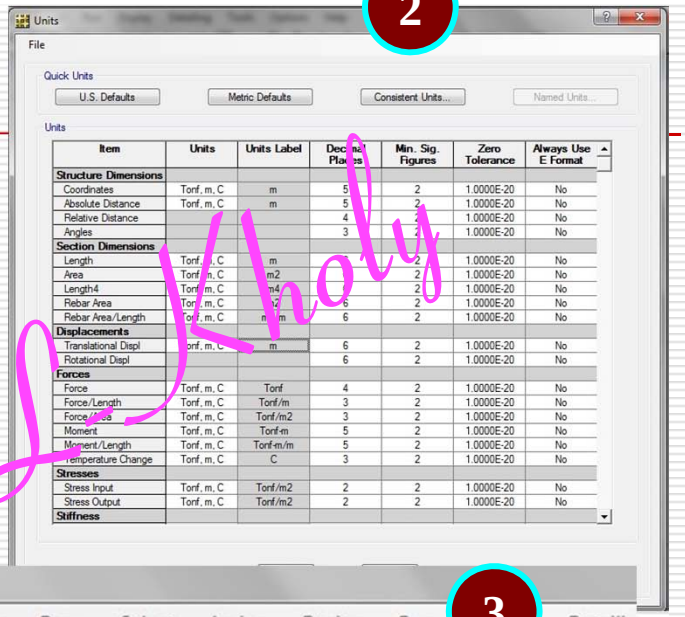
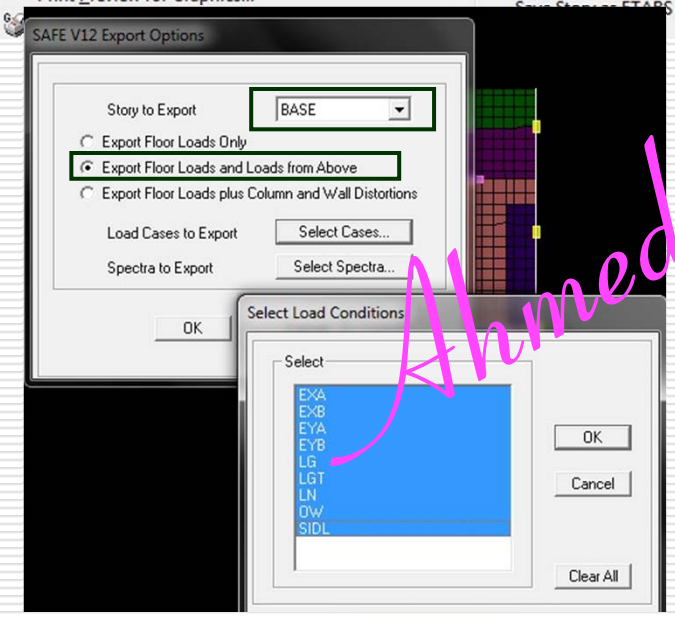
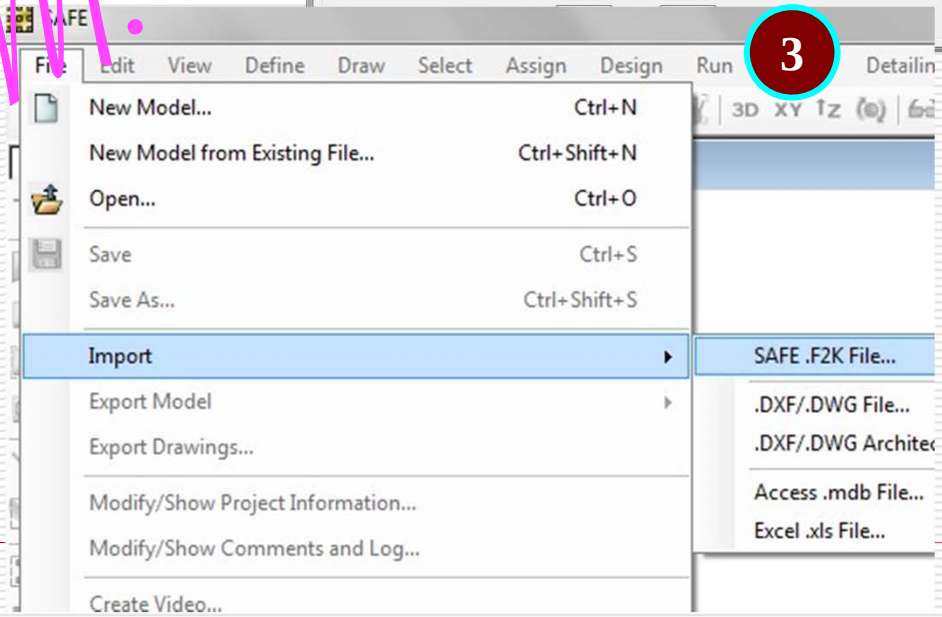
SAFE Introduction Raft

Export Base Level to SAFE, New Safe File, Import F2K file into SAFE

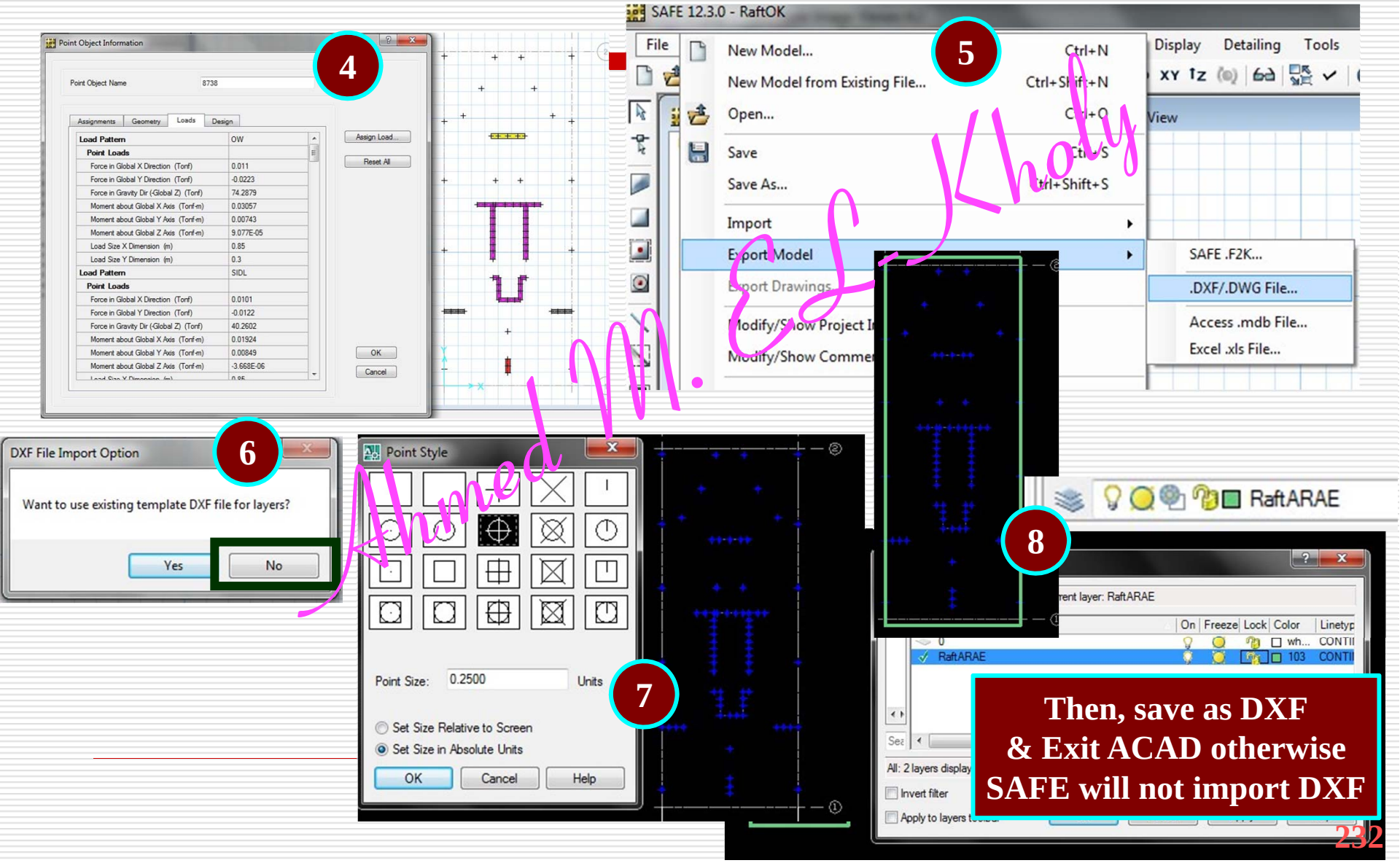




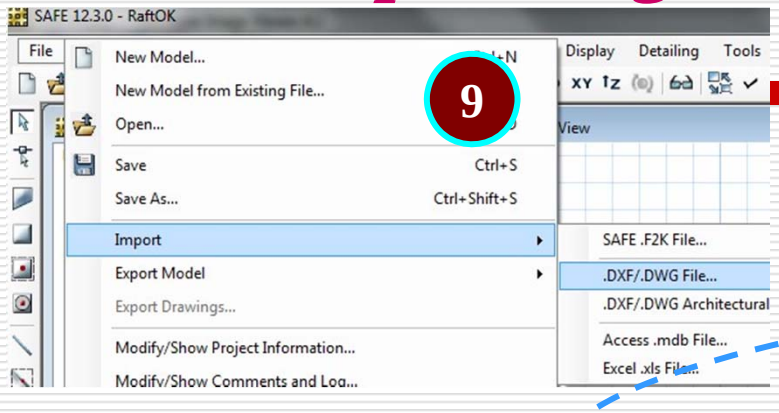


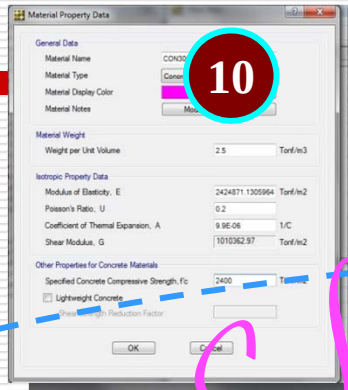


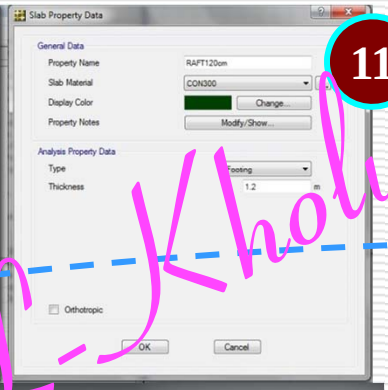
Check Columns Loads, Export to ACAD, Adjust Point Style, Draw Raft boundaries, DXF..

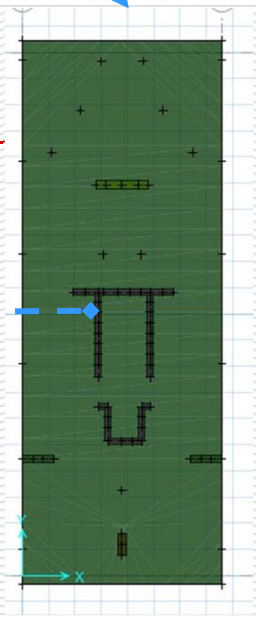


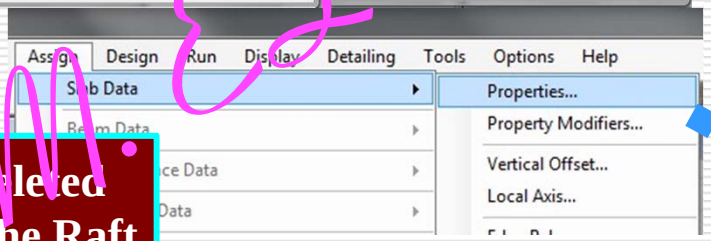
Import DXF to SAFE, Define Material; Raft Section &Soil Prop., Assign Section & Support Data ..



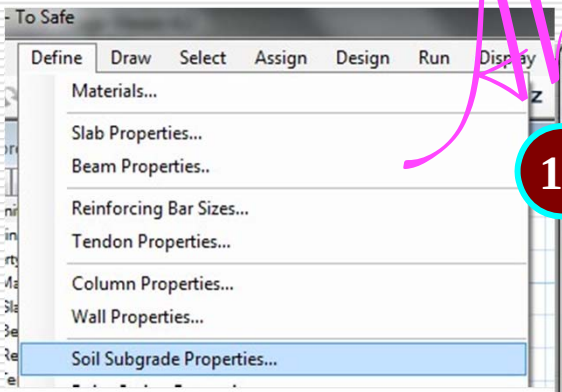


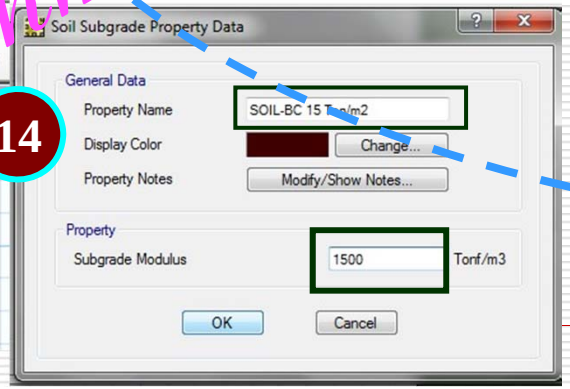


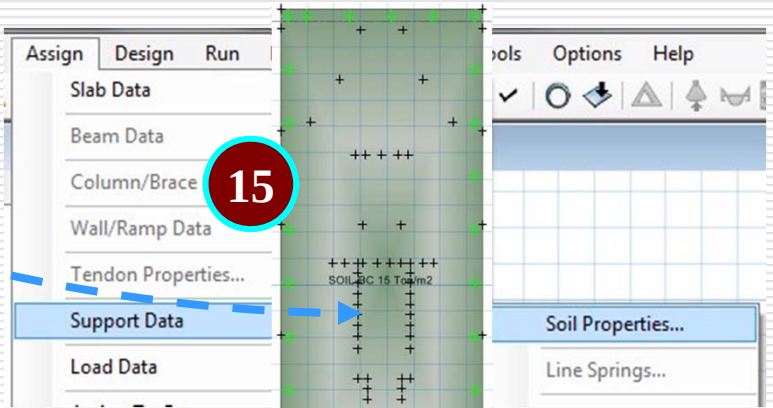




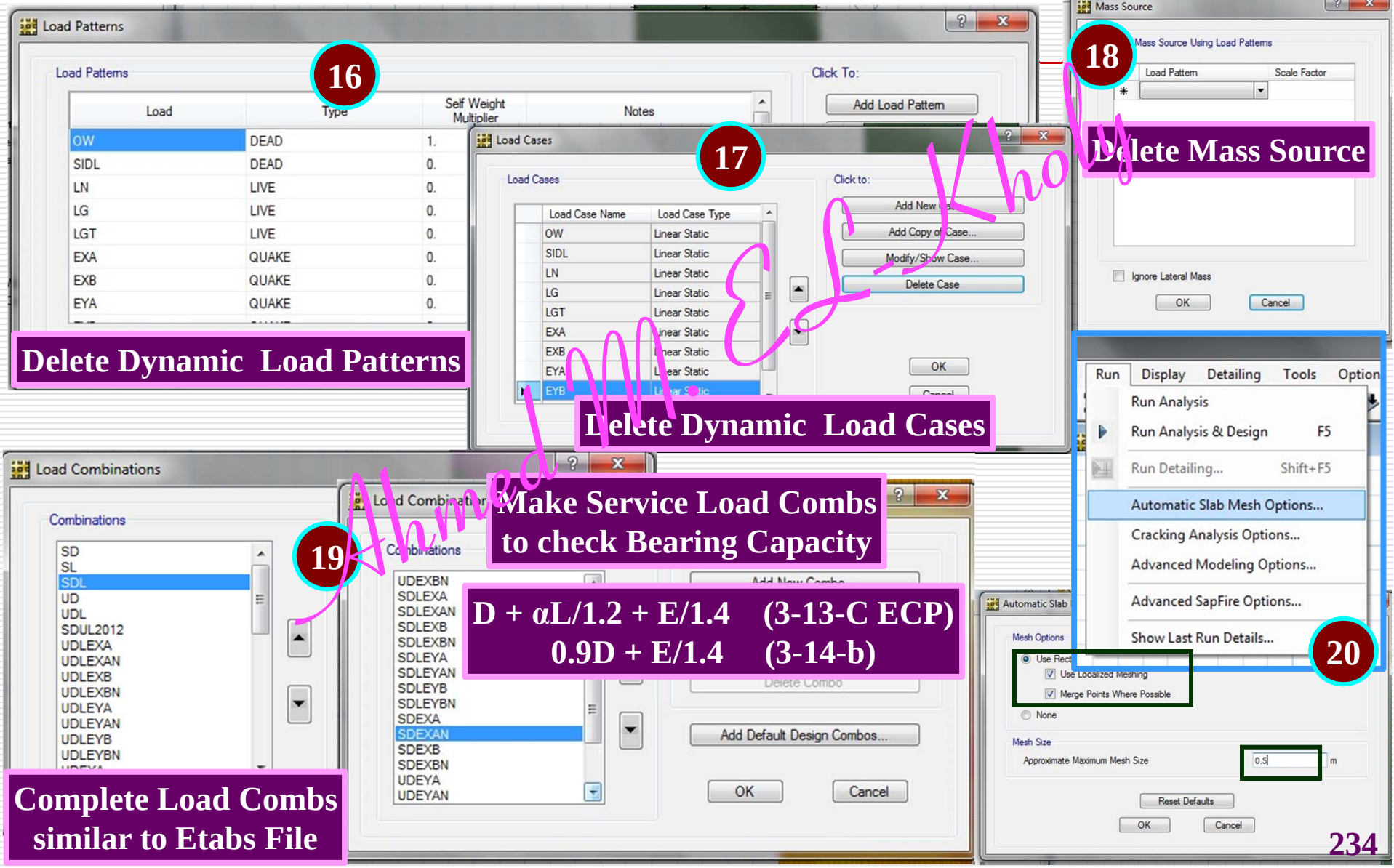
Columns & Walls Sections may be Deleted to Provide Conservative Solution for the Raft



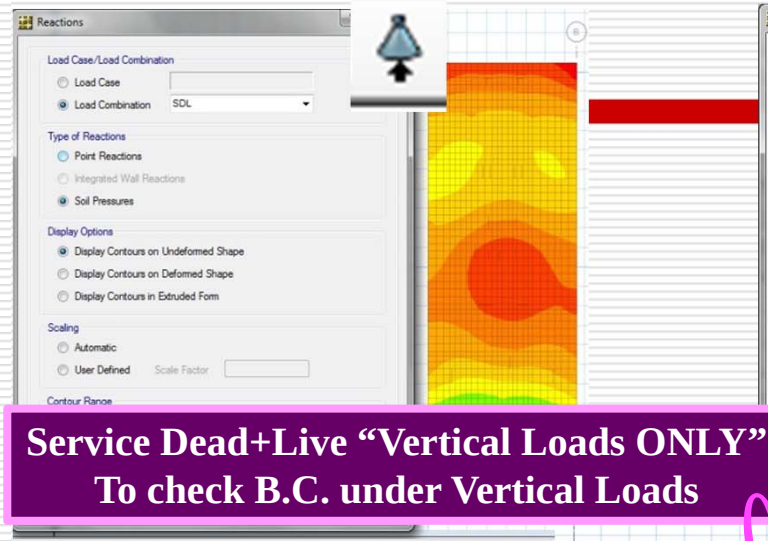




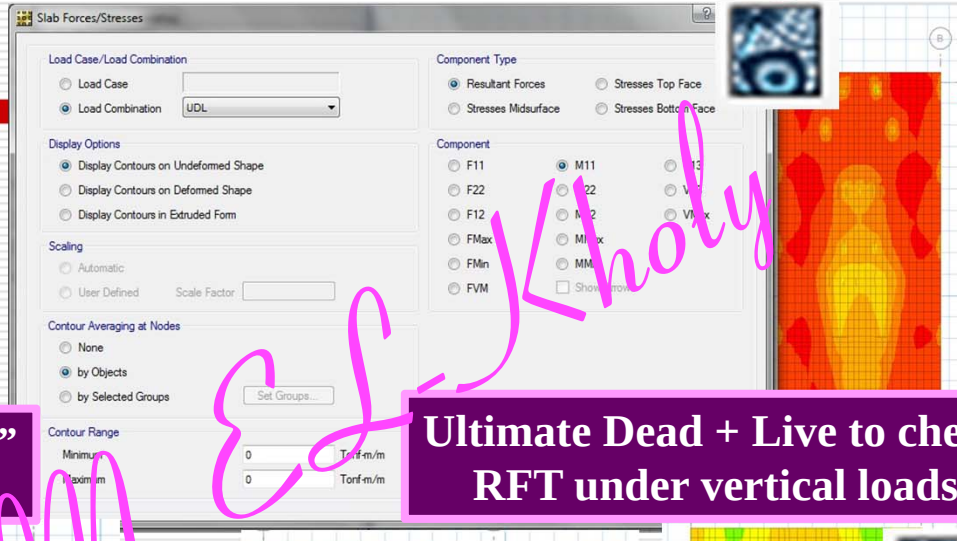
Define Load Patterns, Load Cases, Mass Source, Load Combinations (Working & Ult.), Auto Mesh …



Run, Check Bearing Capacity, Design the Raft and find RFT meshes form M_{11} & M_{22}, Punching..

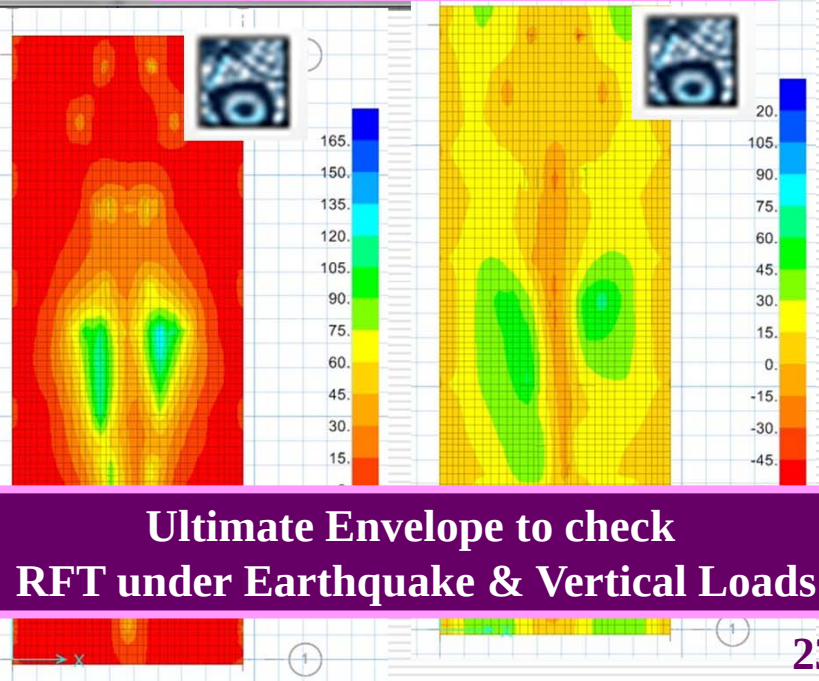


Service Dead+Live "Vertical Loads ONLY"
To check B.C. under Vertical Loads



Ultimate Dead + Live to check
RFT under vertical loads

Service Envelope to check
B.C. under Earthquake & Vertical Loads



Ultimate Envelope to check
RFT under Earthquake & Vertical Loads