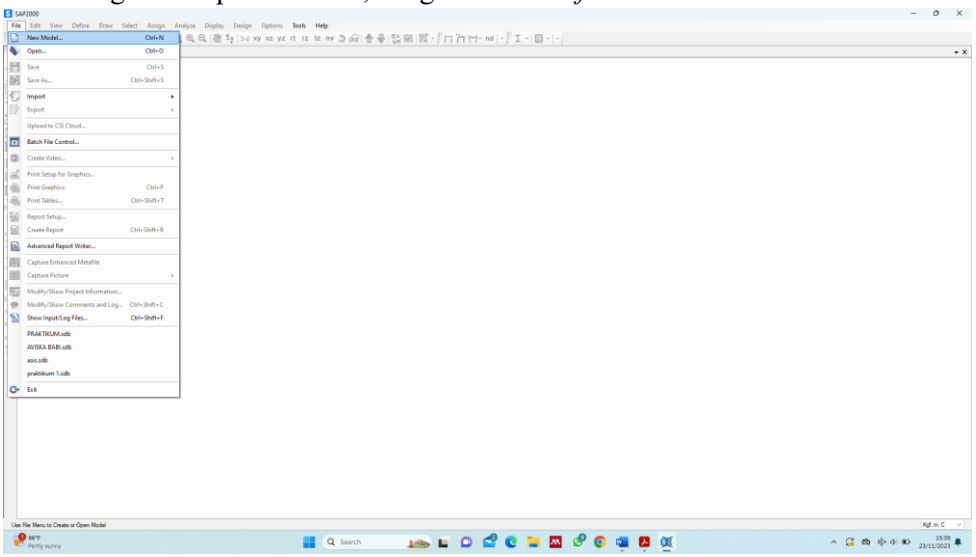
LAMPIRAN I

PERMODELAN STRUKTUR MENGGUNAKAN SAP2000

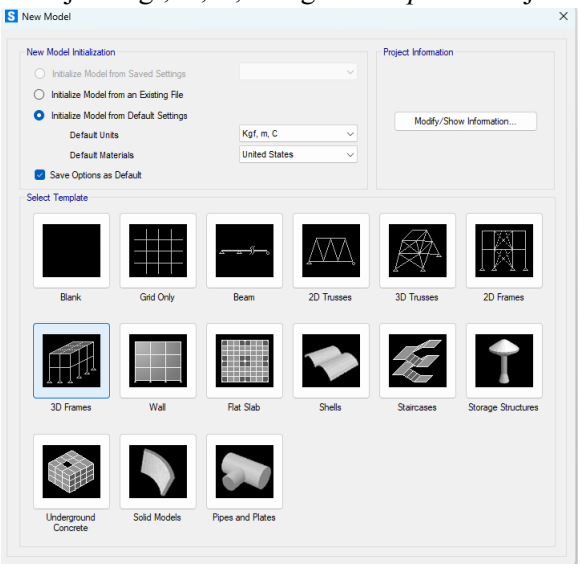
Langkah-1: Pembuatan Model Bangunan

Pada tahap permodelan SAP2000 v.22.0.0, langkah awal yaitu membuat permodelan sesuai dengan data perencanaan, dengan cara klik *file – new model*.



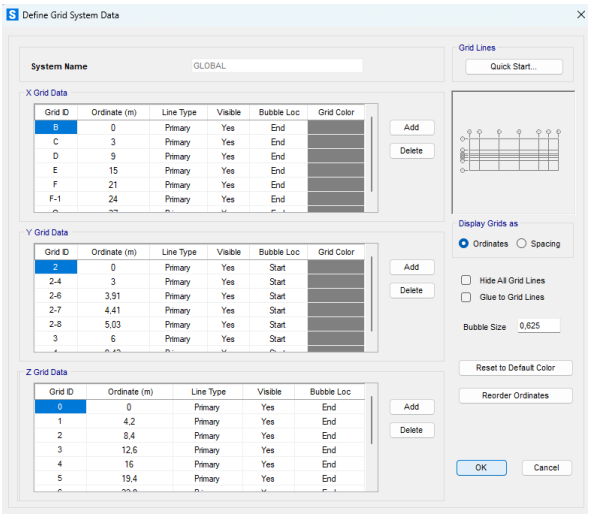
Langkah-2: Ubah Satuan dan Template

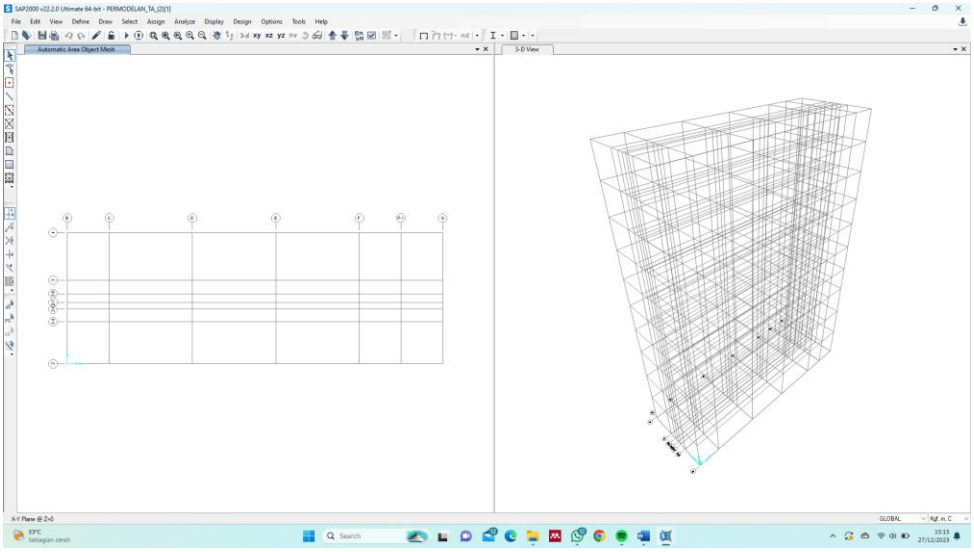
Ubah satuan menjadi Kgf, m, C, lalu ganti *template* menjadi *3D Frames*.



Langkah-3: Menentukan Ukuran Permodelan

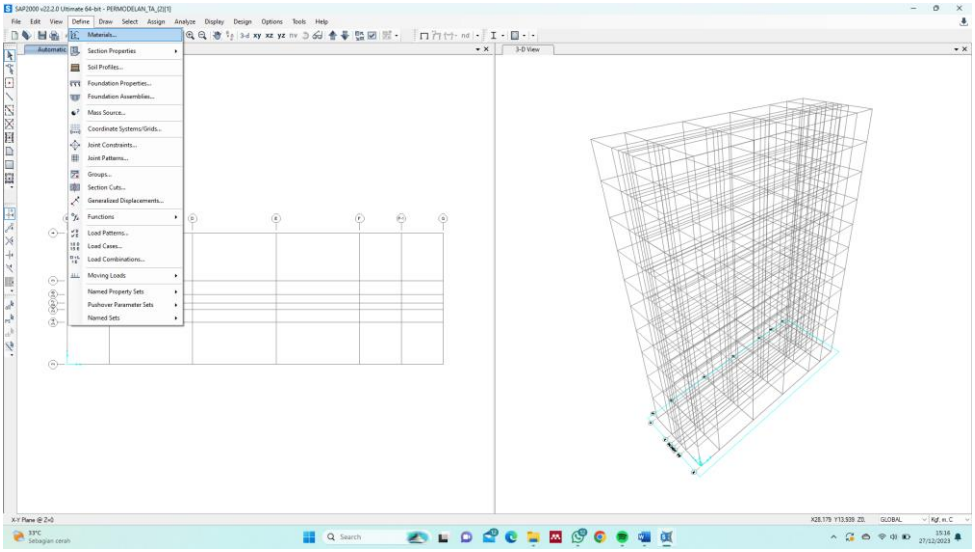
Setelah memilih *template* menjadi *3D Frames,* lalu klik *Modify/Show Information – Checklist "Use Custome Grid Spacing and Locate Origin" – edit grid*. Lalu tentukan ukuran permodelan sesuai data perencanaan pada masing-masing arah *x*, *y*, dan *z*.



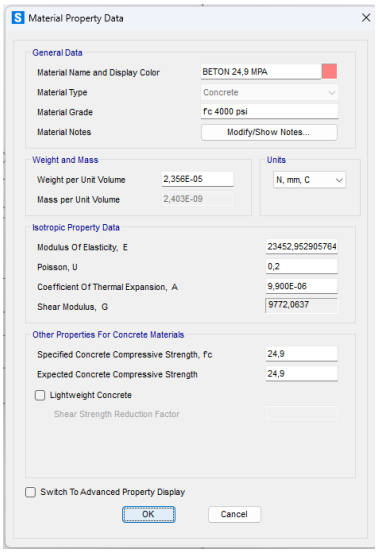


Langkah-4: Menentukan Material yang digunakan

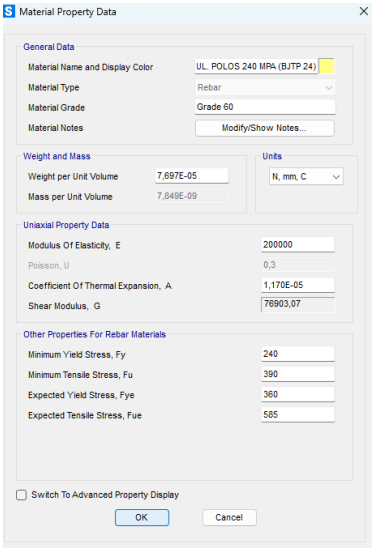
Langkah selanjutnya yaitu menentukan jenis material yang digunakan dengan cara klik *Define – Materials – Add New Materials – Modify/Show Material.*



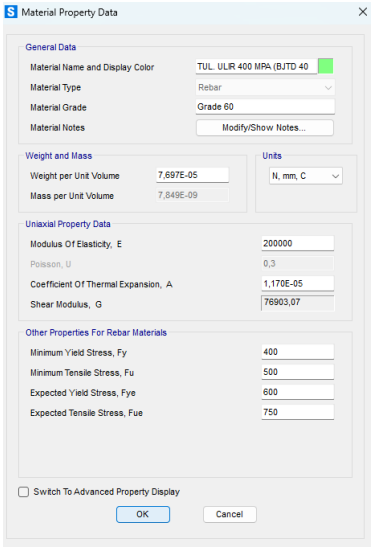
(Spesifikasi material beton)



(Spesifikasi material baja tulangan polos)

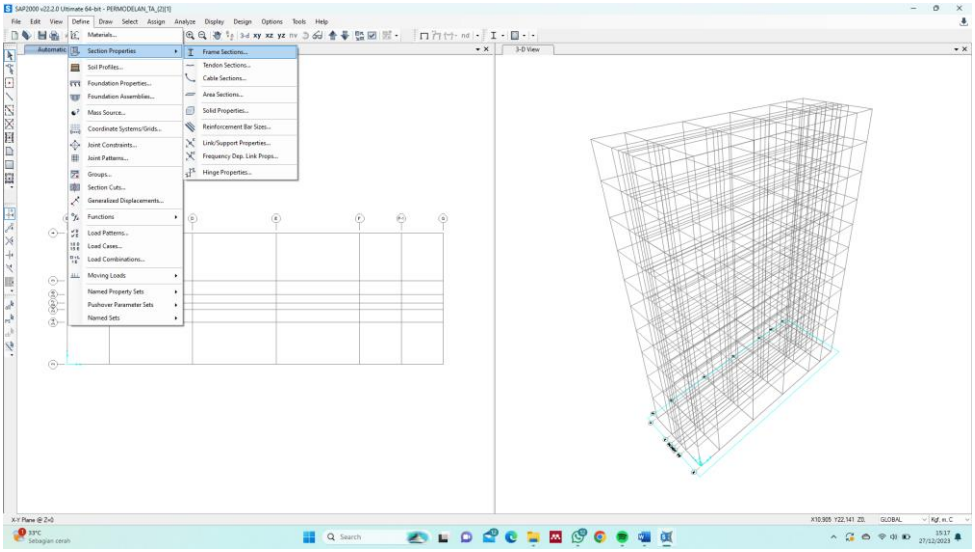


(Spesifikasi material baja tulangan ulir)

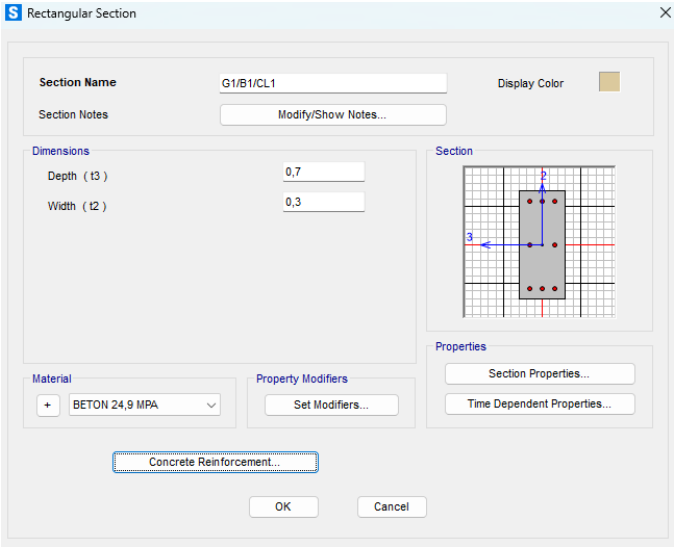


<u>Langkah-5: Memasukkan Dimensi Balok dan Kolom</u>

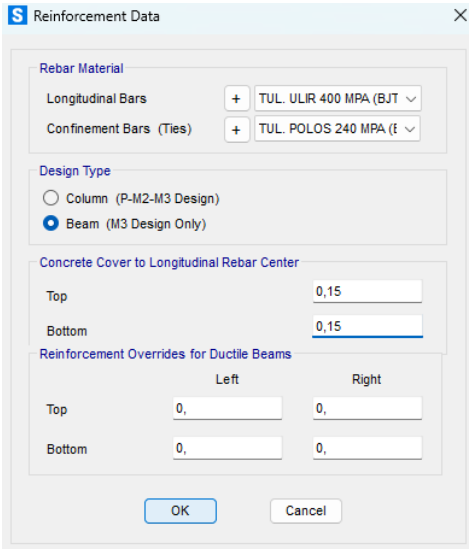
Masukkan dimensi balok dan kolom dengan cara klik *Define – Section Properties – Frame Sections – Add New Property – Concrete – Rectangular.*



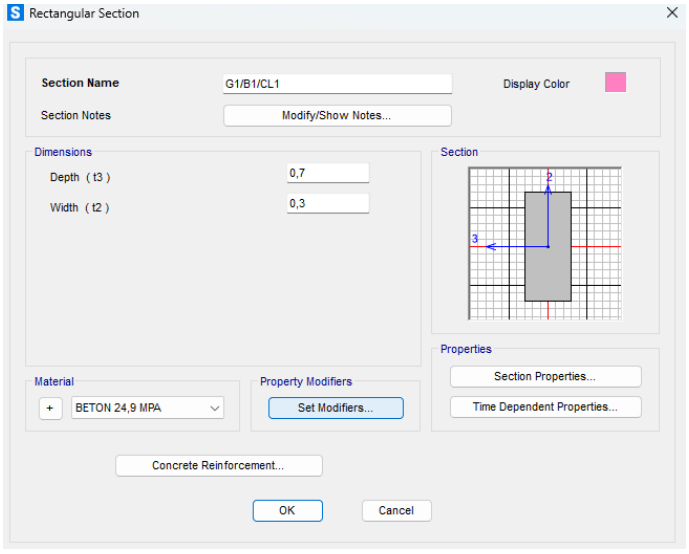
(Dimensi Balok)



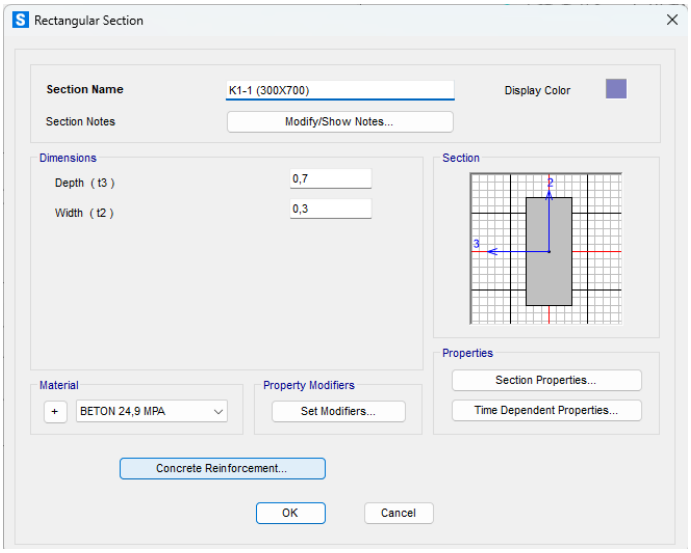
Klik *Reinforcement Data* dan ubah sesuai data perencanaan.



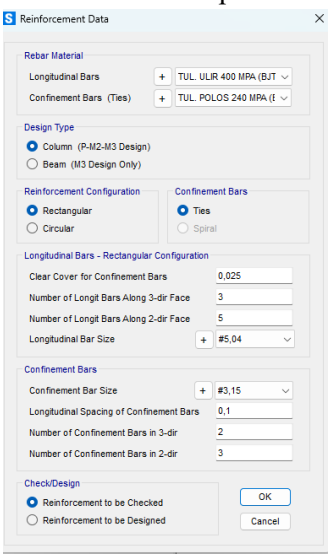
Klik *Set Modifiers* dan ubah sesuai data perencanaan



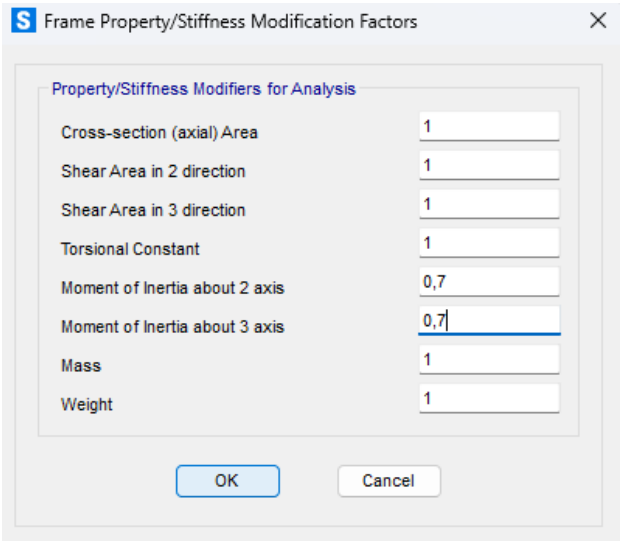
(Dimensi Kolom)



Klik *Reinforcement Data* dan ubah sesuai data perencanaan.



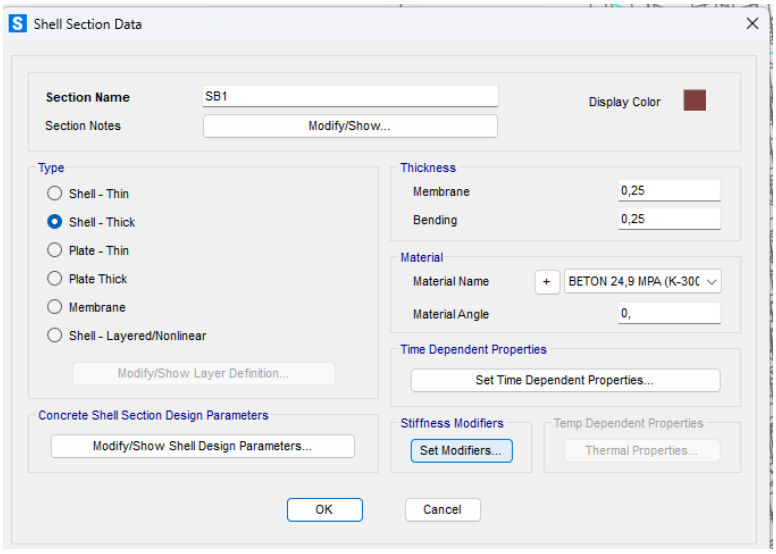
Klik *Set Modifiers* dan ubah sesuai data perencanaan



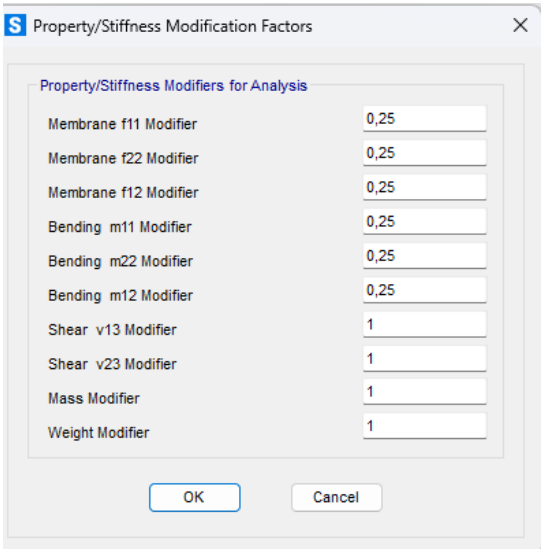
Langkah-6: Memasukkan Dimensi Pelat dan *Shearwall*

Masukkan dimensi pelat dan *shearwall* dengan cara klik *Define – Section Properties – Area Sections – Add New Property – Shell.*

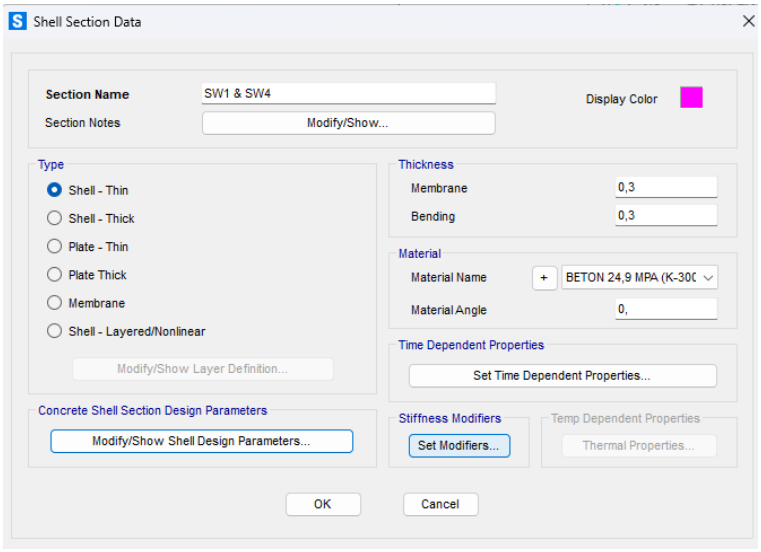
(Dimensi Pelat)



Klik *Set Modifiers* dan ubah sesuai data perencanaan

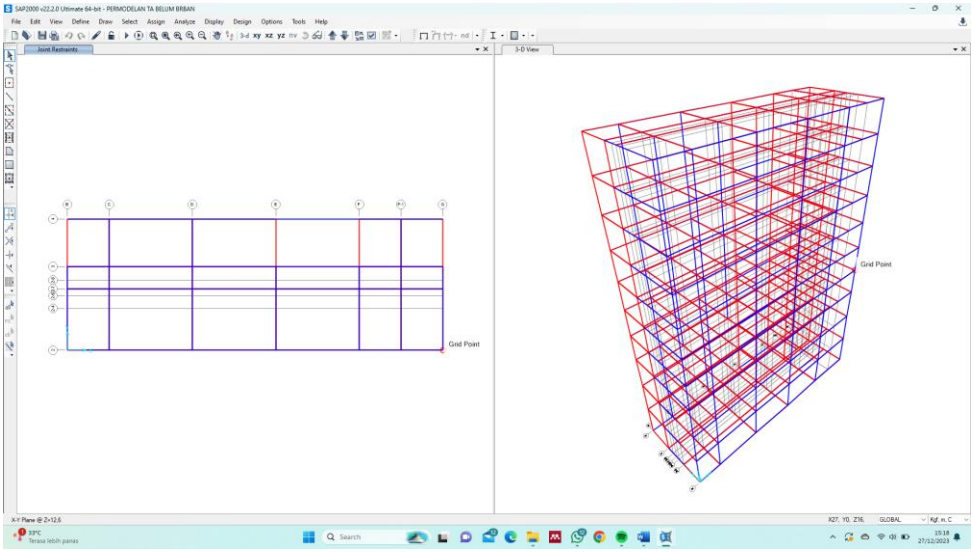


(Dimensi *Shearwall*)

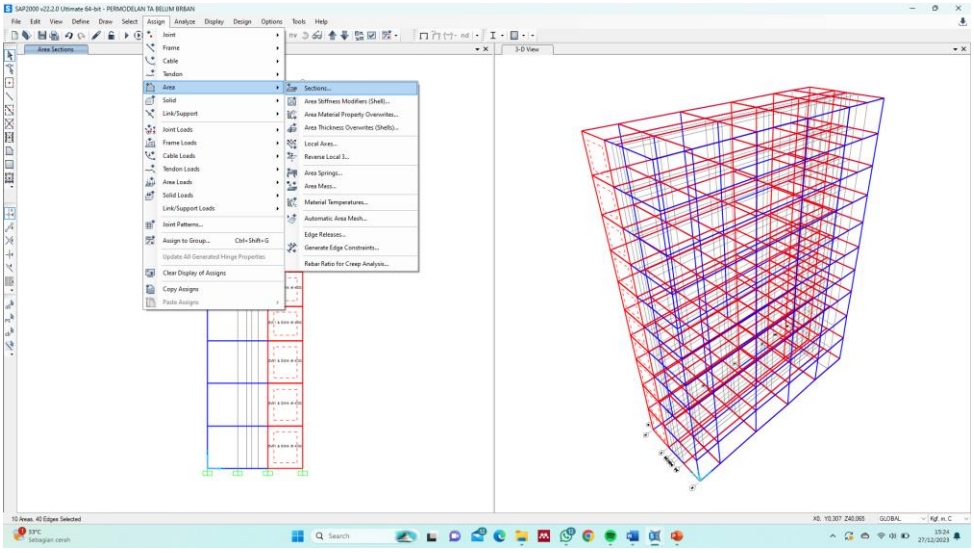


<u>Langkah-7: Membuat Balok, Kolom, dan Pelat</u>

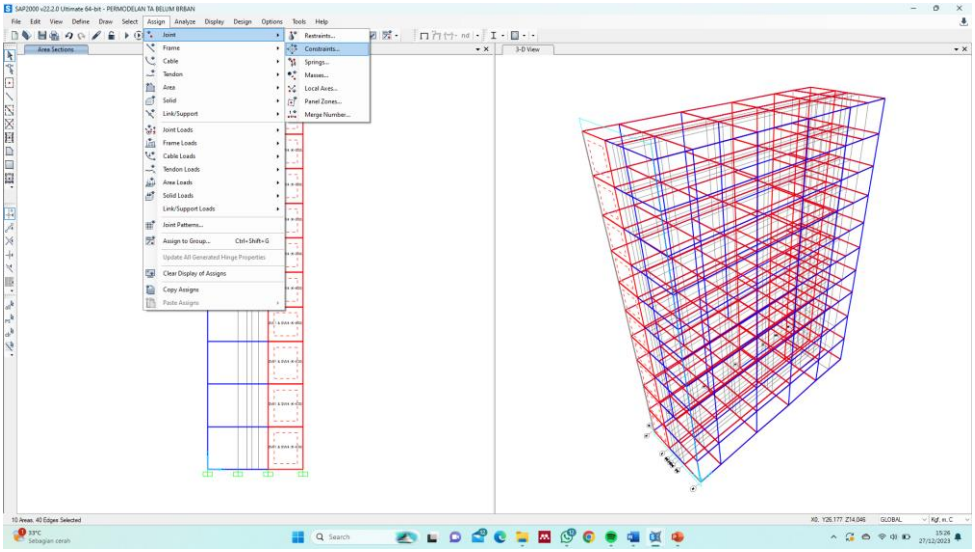
Langkah selanjutnya yaitu menggambar balok, kolom, dan pelat pada grid yang telah dibuat dengan cara klik *Draw – Draw Frame* (untuk kolom) – *Quick Draw Frame* (untuk balok) – *Draw Rectangular Area* (untuk pelat).

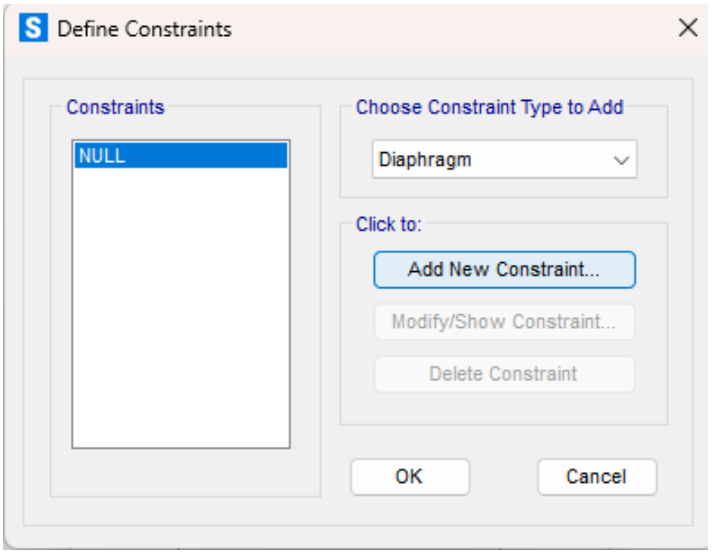


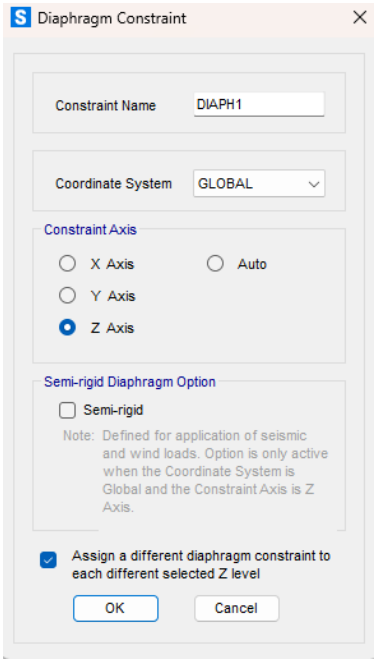
Untuk *shearwall* klik *Assign – Area – Sections – Shearwall* pada area *shearwall.*



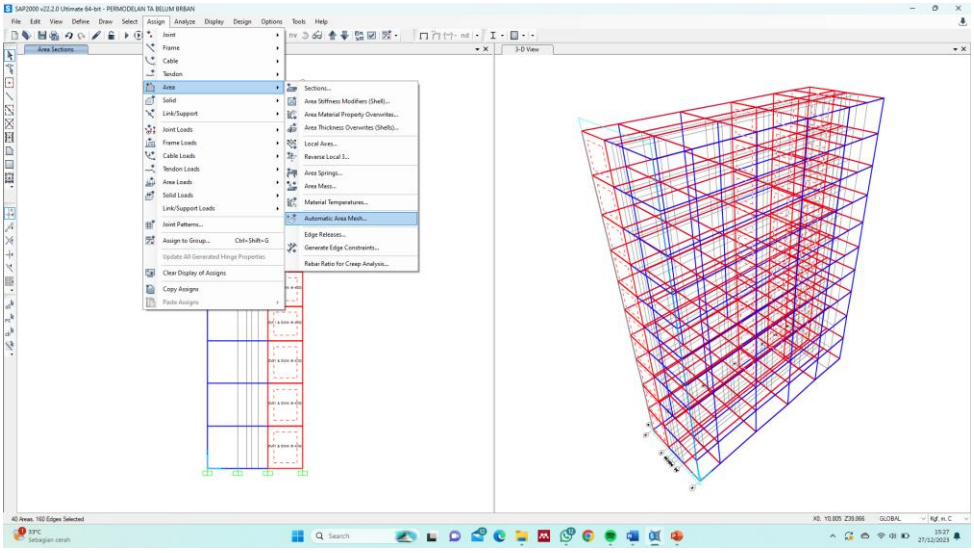
Blok area *shearwall*, lalu klik *Assign – Joint – Constrant – Define – Joint Constrant – Constrant Type* diganti menjadi *Diaphragm – Add New Constraint – Checklist "Assign Different Diaphragm Constraint to each Different Selected Z Level".*

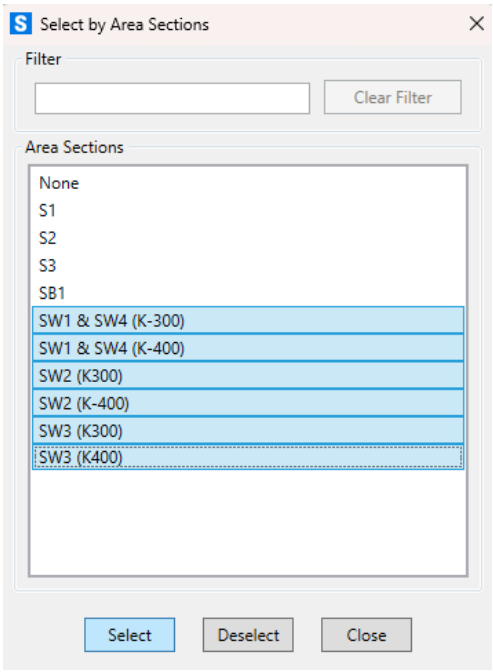


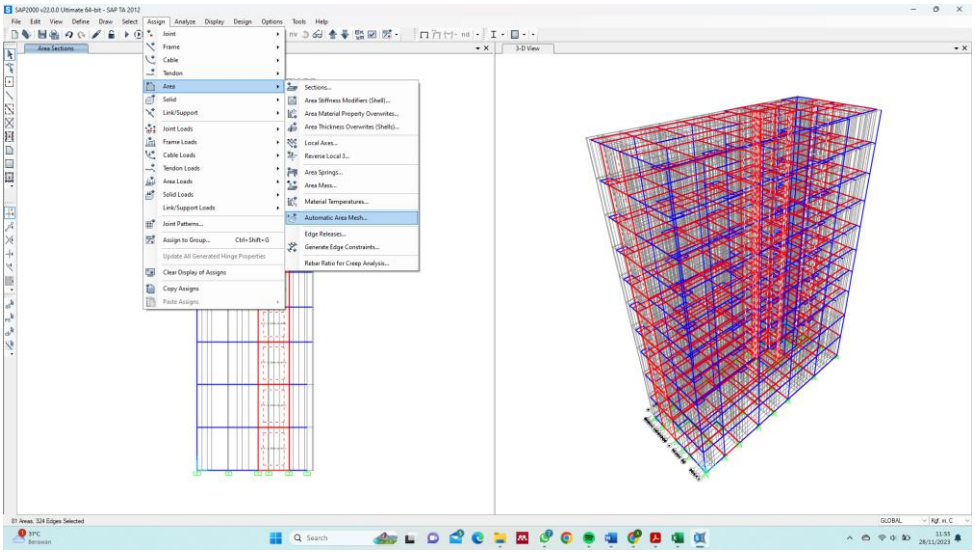

Define Constraints
Constraints
NULL
Choose Constraint Type to Add
Diaphragm
Click to:
Add New Constraint...
Modify/Show Constraint...
Delete Constraint
OK
Cancel

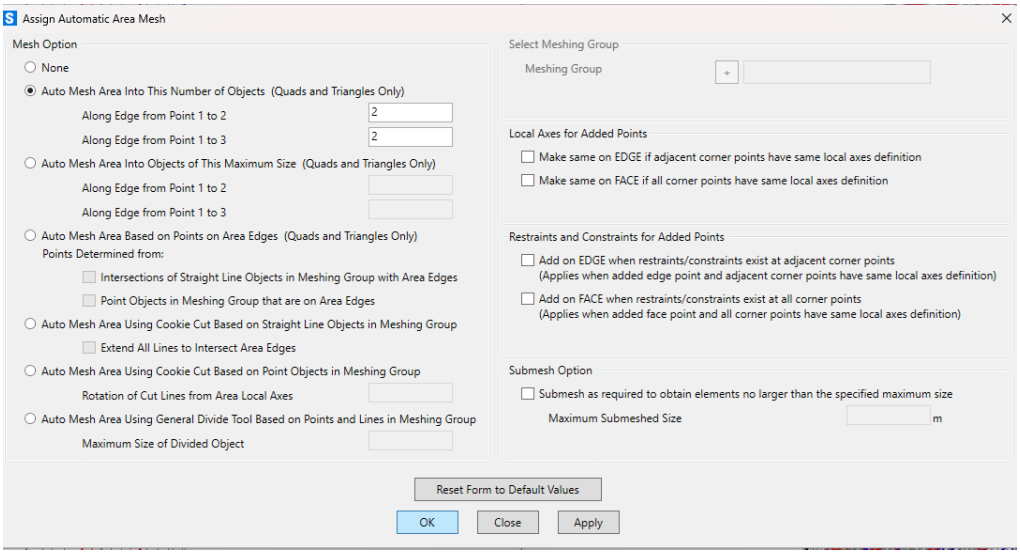


Klik *Select – Properties – Area Sections – Shearwall.* Lalu klik *Assign – Area – Automatic Area Mesh* – pilih "*Auto Mesh Area into this Number of Object".*



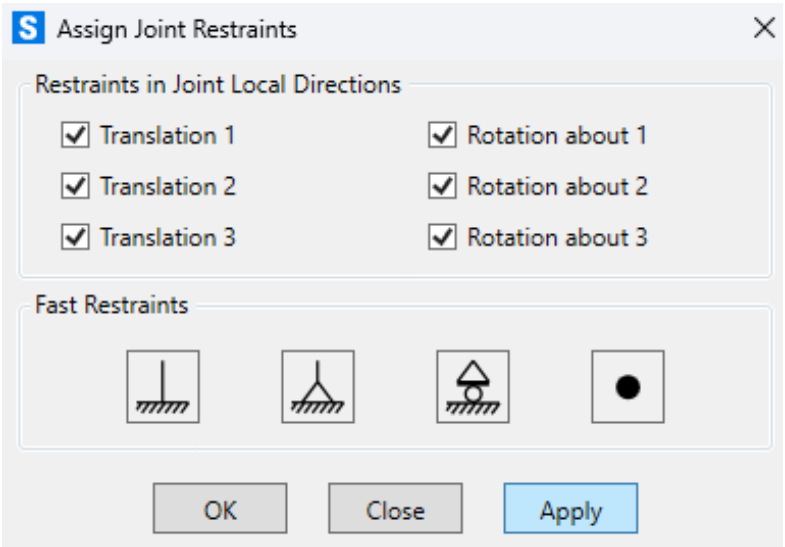

Select by Area Sections
Filter
Clear Filter
Area Sections
None
S1
S2
S3
SB1
SW1 & SW4 (K-300)
SW1 & SW4 (K-400)
SW2 (K300)
SW2 (K-400)
SW3 (K300)
SW3 (K400)
Select
Deselect
Close





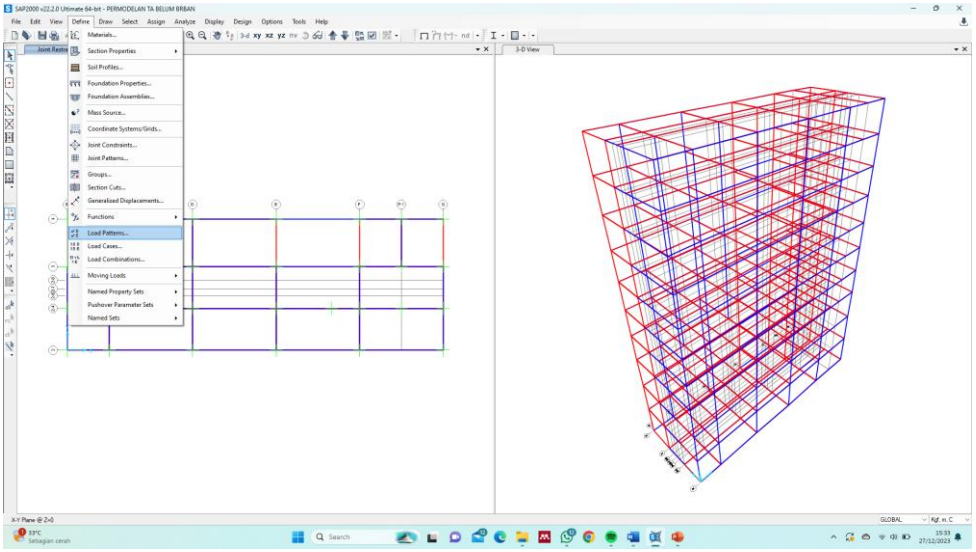
Langkah-8: Membuat Perletakan

Membuat perletakan dapat dilakukan dengan cara pilih dan blok *joint* pada area paling dasar lalu klik *Assign – Joint – Restraints* – pilih perletakan jepit.

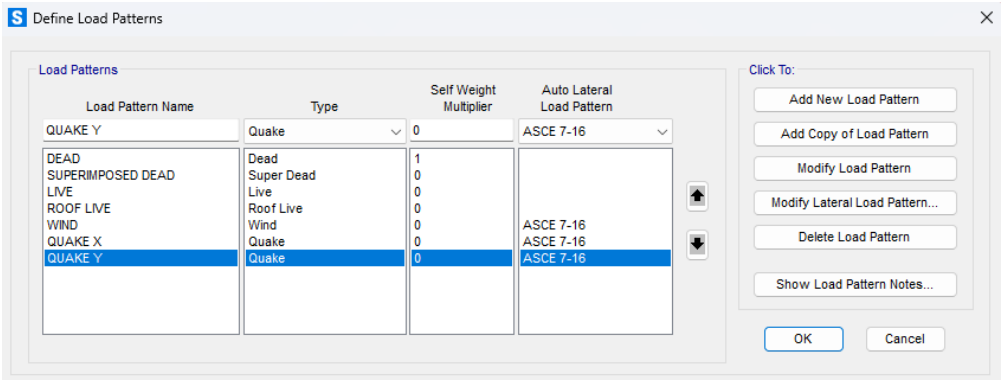


Langkah-9: *Load Patterns*

Distribusi pembebanan dilakukan dengan cara klik *Define – Load Patterns*.

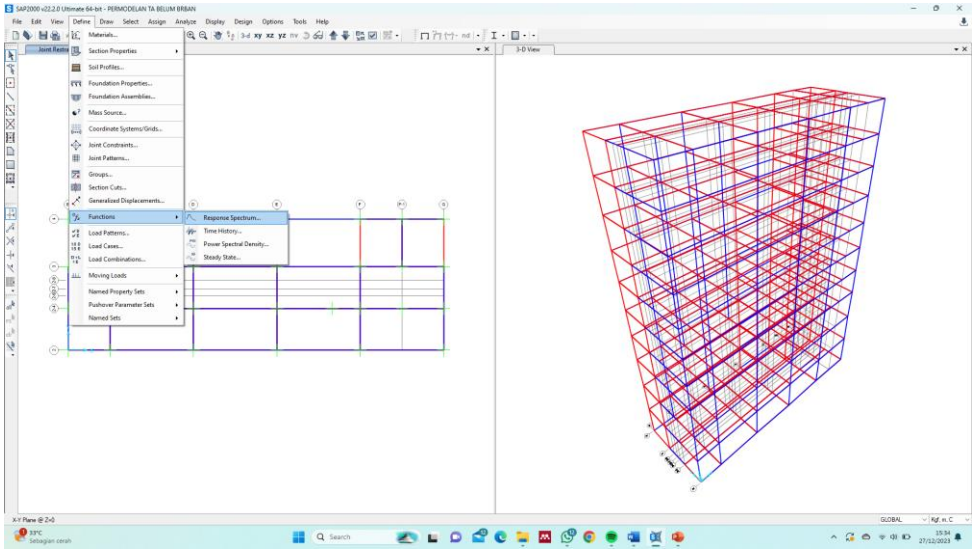


Tambahkan beban-beban yang diperlukan

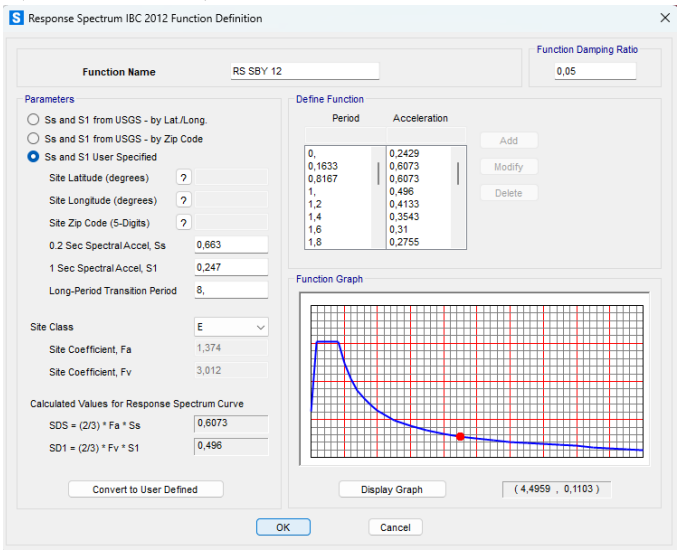


<u>Langkah-10: *Response Spectrum Functions*</u>

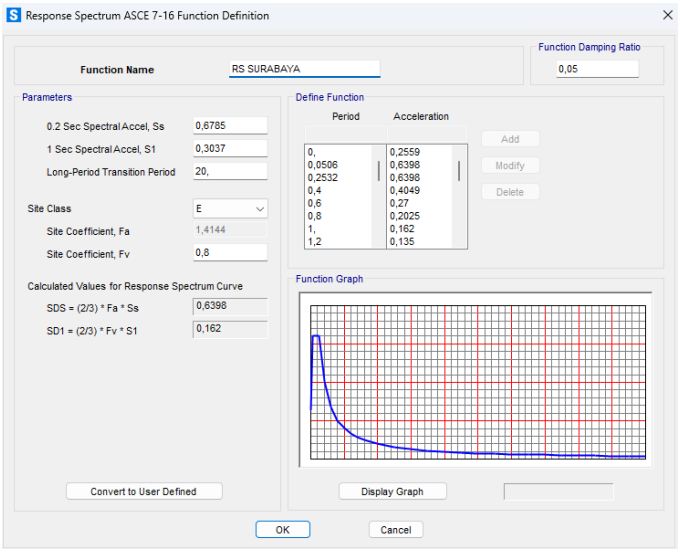
Memasukkan beban gempa respon spektra dengan cara klik *Define – Functions – Response Spectrum – Add New System.*



Klik *Add New Function* dan ganti *Type to Add* menjadi IBC 2012, ubah nilai S_s, S_1, dan *Site Class* (SNI 1726:2012)



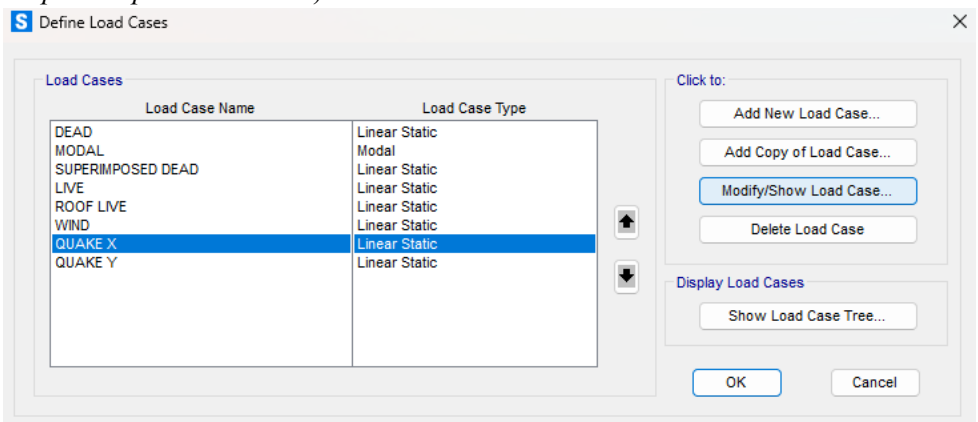
Klik *Add New Function* dan ganti *Type to Add* menjadi ASCE 7-16, ubah nilai S_s, S_1, *PGA*, dan *Site Class* (SNI 1726:2019)



Langkah-11: *Load Cases*

Setelah fungsi gempa dimasukkan, klik *Define – Load Cases – Add New Load Cases* lalu tambahkan beban-beban yang diperlukan. Klik *Modify/Show Load Case* di salah satu beban gempa yang telah ditambahkan sebelumnya.

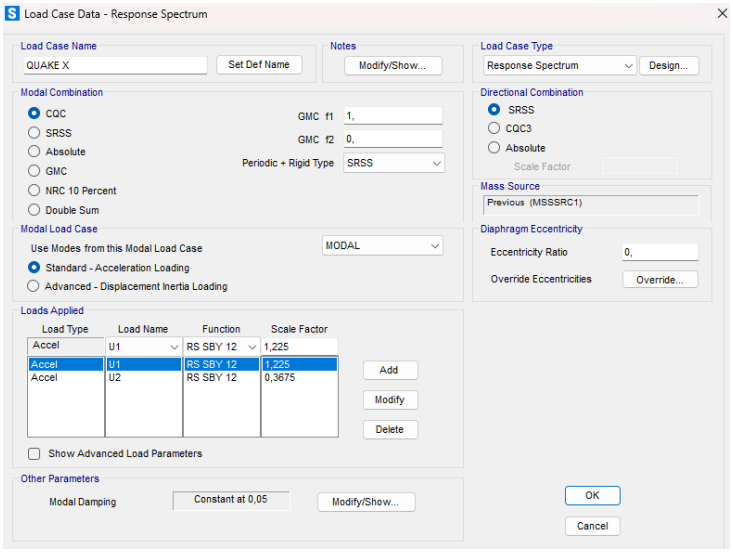
(*Response Spectrum* arah *X*)



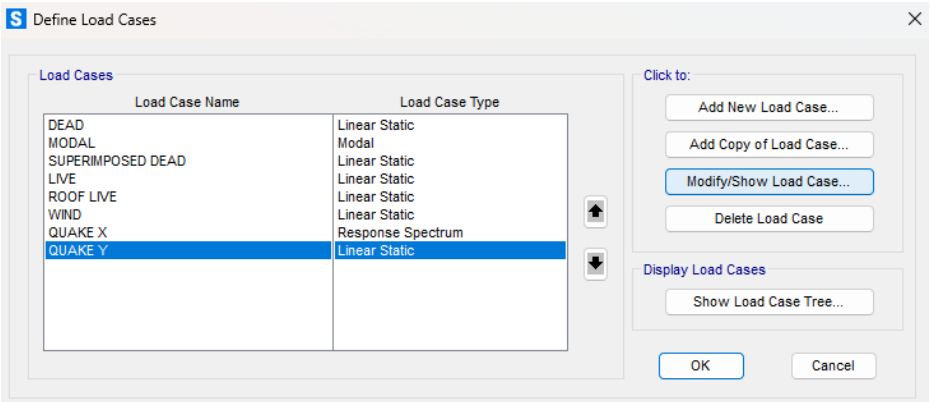
Kemudian ubah *Load Case Type* menjadi *Response Spectrum* kemudian *scale factor* pada *Load Name* diperoleh berdasarkan SNI 1726:2012 dengan faktor U1 = 100% dan U2 = 30%. Dengan perhitungan sebagai berikut:

$$Scale\ factor\ (U1) = \frac{g \times I_e}{R} = \frac{9{,}8\ m/s^2 \times 1{,}0}{8} = 1{,}225$$

$$Scale\ factor\ (U2) = 0{,}3 \times \frac{g \times I_e}{R} = 0{,}3 \times \frac{9{,}8\ m/s^2 \times 1{,}0}{8} = 0{,}3675$$



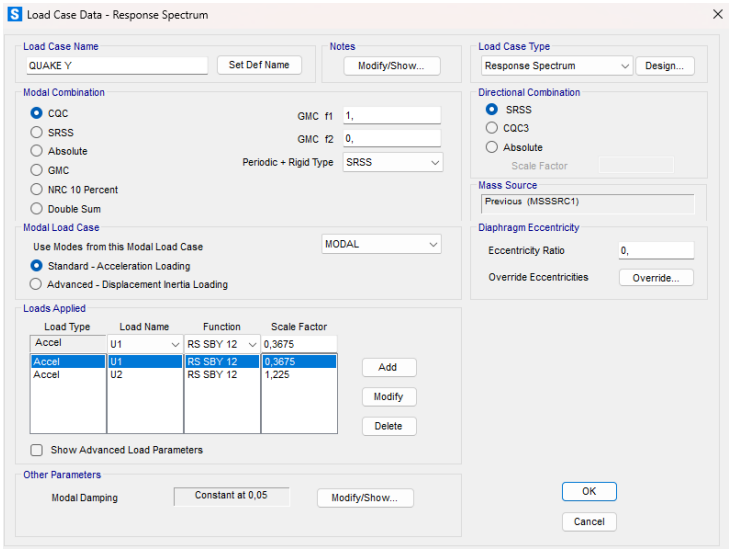
(*Response Spectrum* arah *Y*)

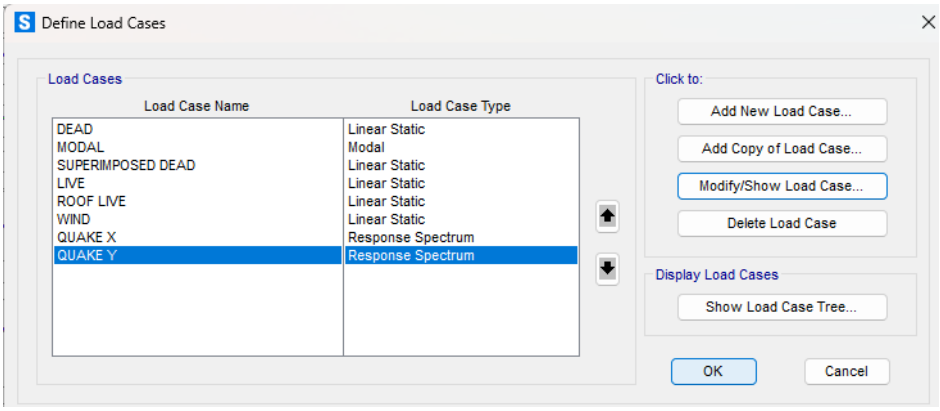


Kemudian ubah *Load Case Type* menjadi *Response Spectrum* kemudian *scale factor* pada *Load Name* diperoleh berdasarkan SNI 1726:2012 dengan faktor U1 = 30% dan U2 = 100%. Dengan perhitungan sebagai berikut:

$$Scale\ factor\ (U1) = 0{,}3 \times \frac{g \times I_e}{R} = 0{,}3 \times \frac{9{,}8\,m/s^2 \times 1{,}0}{8} = 0{,}3675$$

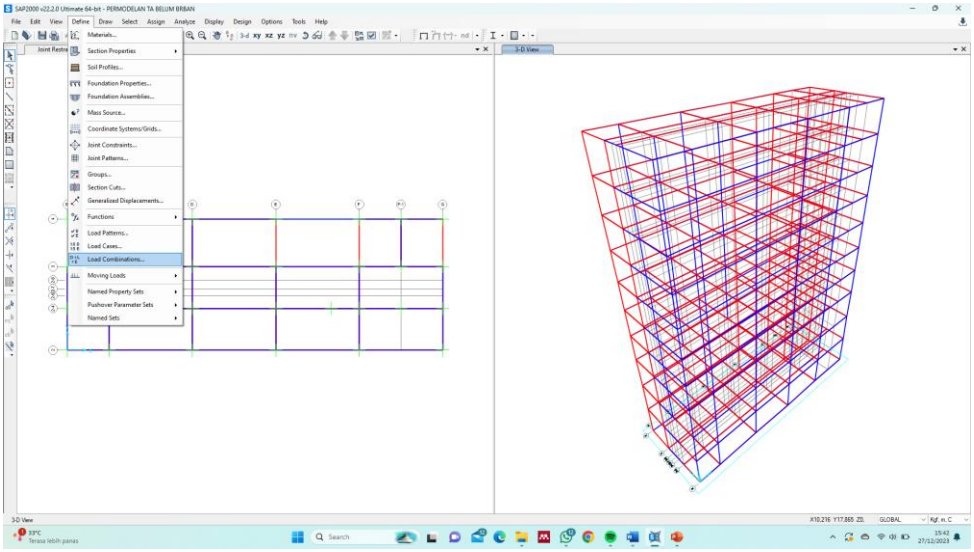
$$Scale\ factor\ (U2) = \frac{g \times I_e}{R} = \frac{9{,}8\,m/s^2 \times 1{,}0}{8} = 1{,}225$$



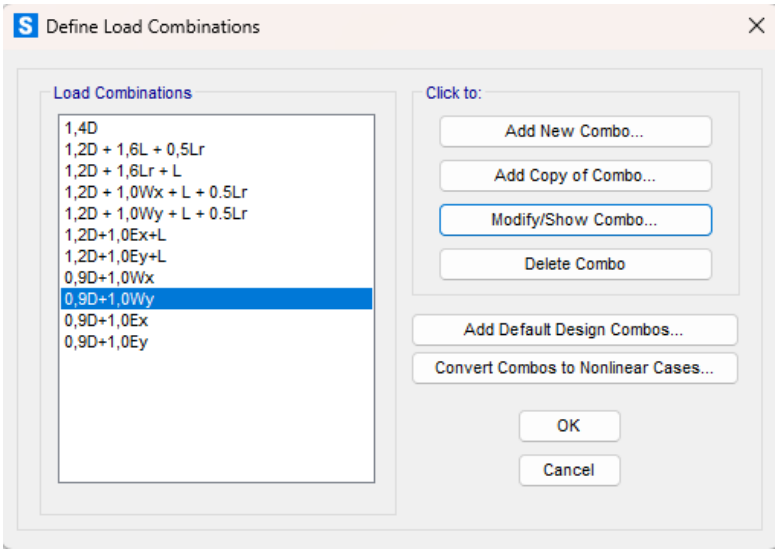


Langkah-12: *Load Combinations*

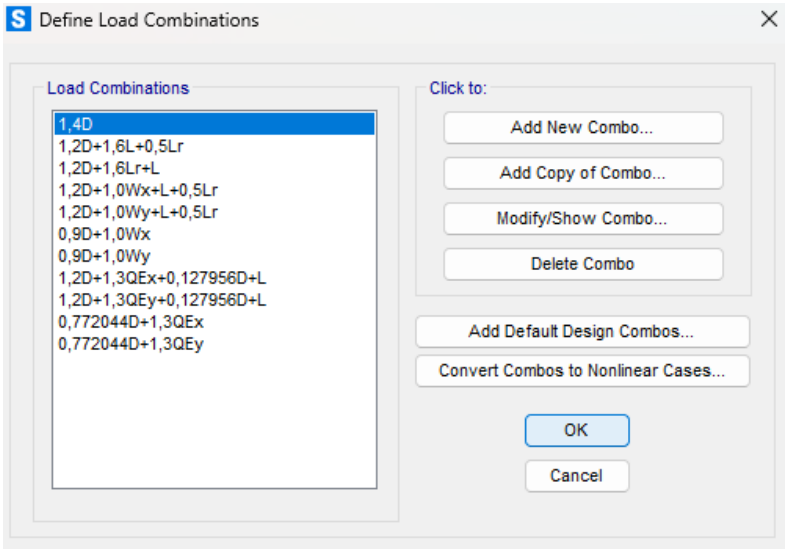
Selanjutnya memasukkan beban gempa dari *Load Combinations* dengan cara klik *Define – Load Combinations – Add New Combo.*



Kemudian membuat beban gempa sesuai dengan SNI 1726:2012.

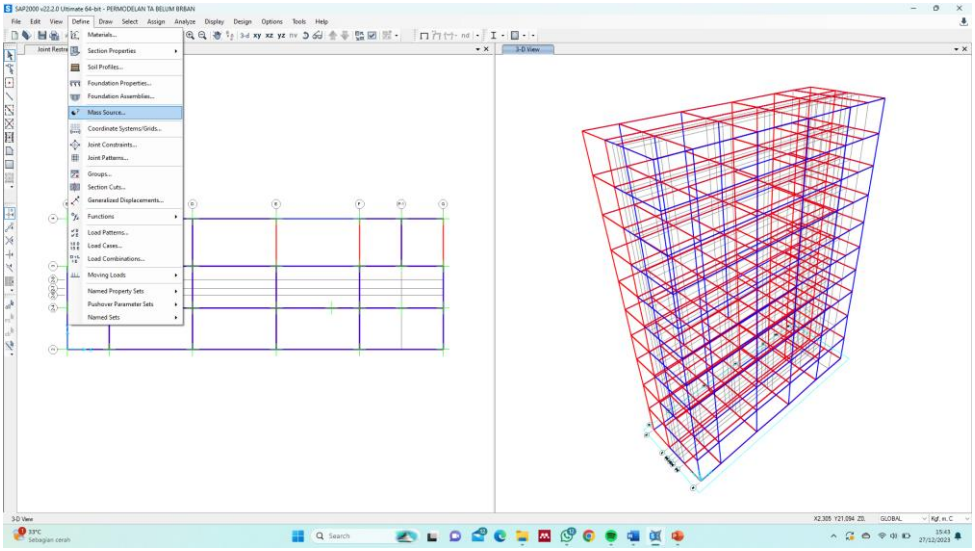


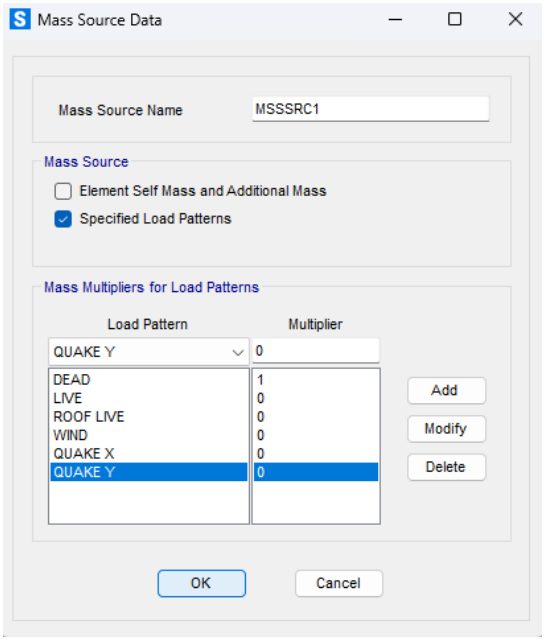
Kemudian membuat beban gempa sesuai dengan SNI 1726:2019.



Langkah-13: *Mass Source*

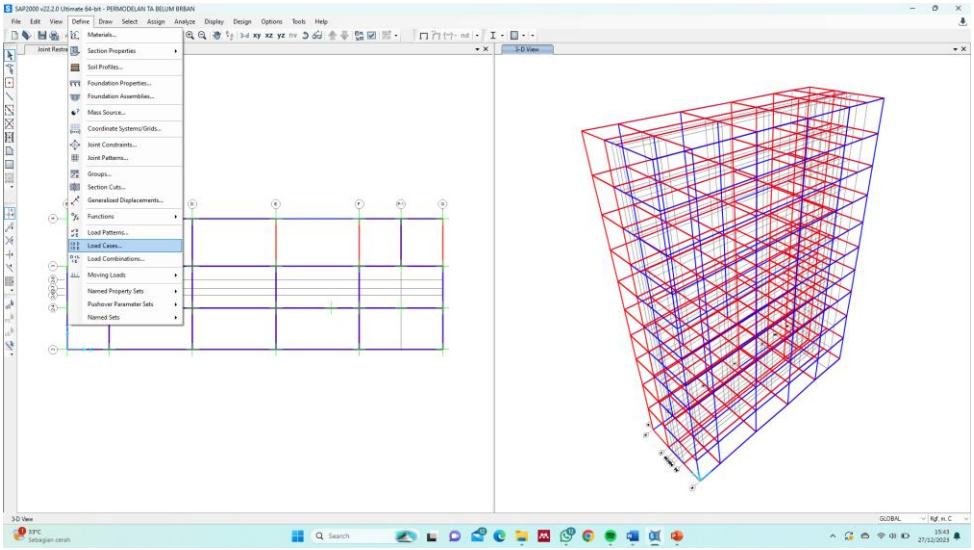
Setelah beban diinput langkah selanjutnya yaitu menentukan *Mass Source* (Faktor Reduksi Beban) dengan cara klik *Define – Mass Source – Add New Mass Source.*

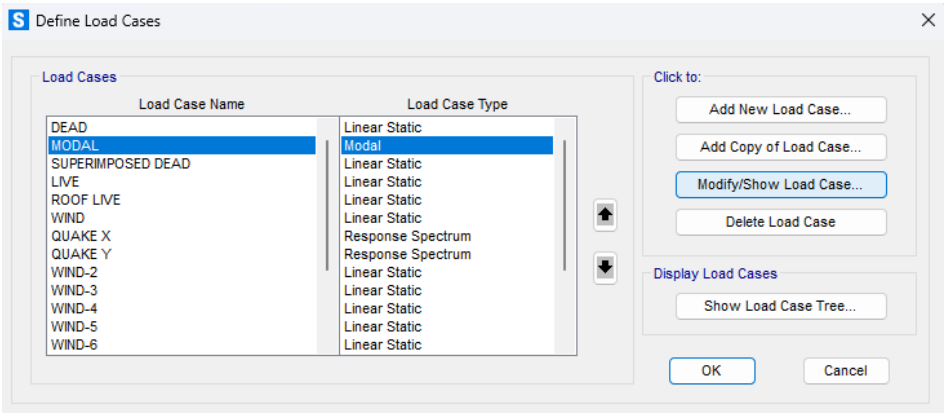




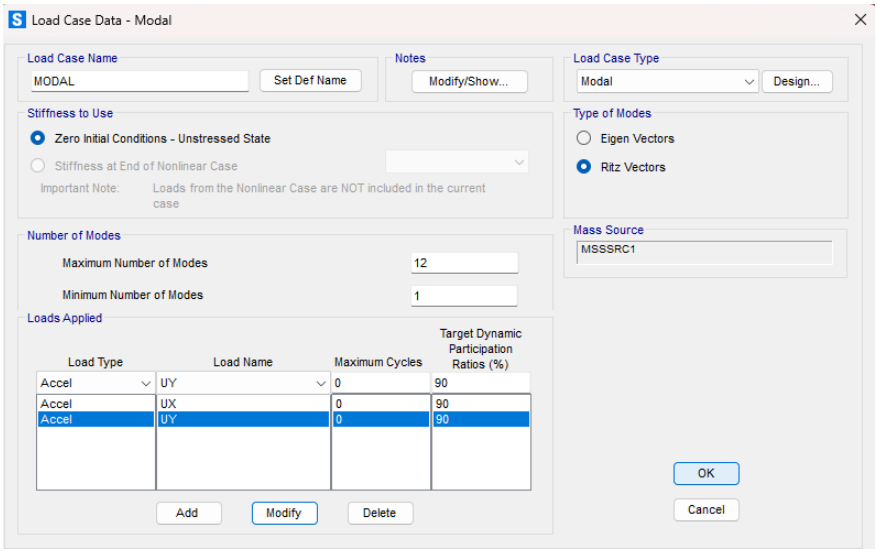
Langkah-14: Modal

Klik *Define – Load Cases – Modal – Modify/Show Load Case.*

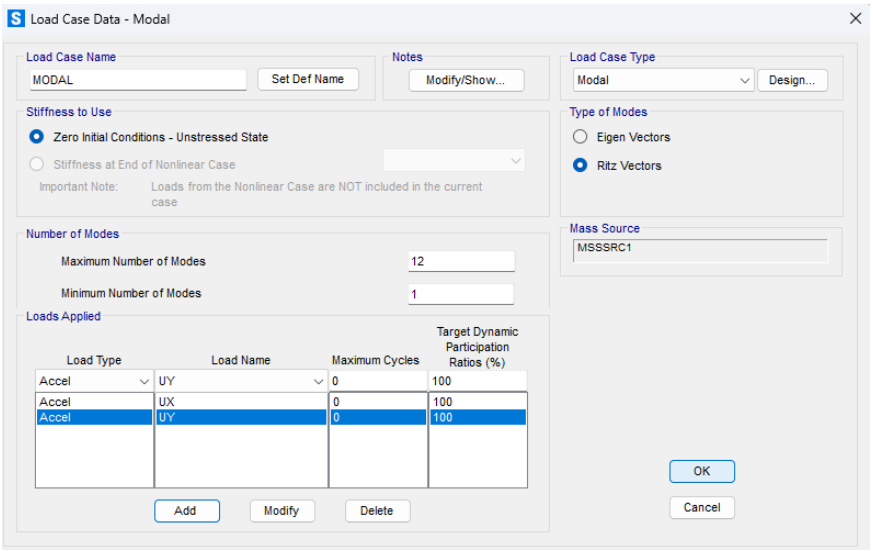




Ubah *Type of Modes* menjadi "*Ritz Vectors*" dan isi *Target Dynamic Participation Ratios* (%) menjadi 90 (berdasarkan SNI 1726:2012 Pasal 7.9.1).

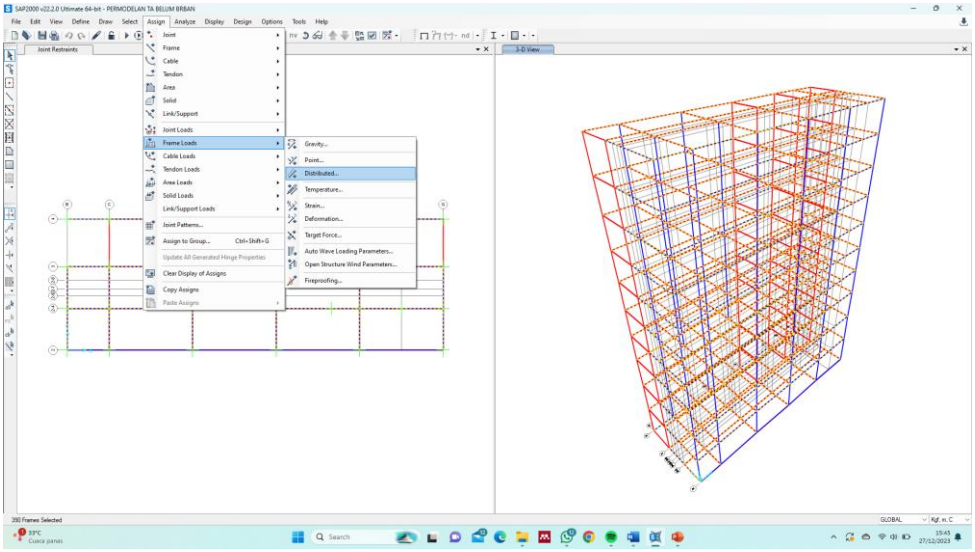


Ubah *Type of Modes* menjadi "*Ritz Vectors*" dan isi *Target Dynamic Participation Ratios* (%) menjadi 100 (berdasarkan SNI 1726:2019 Pasal 7.9.1.1).

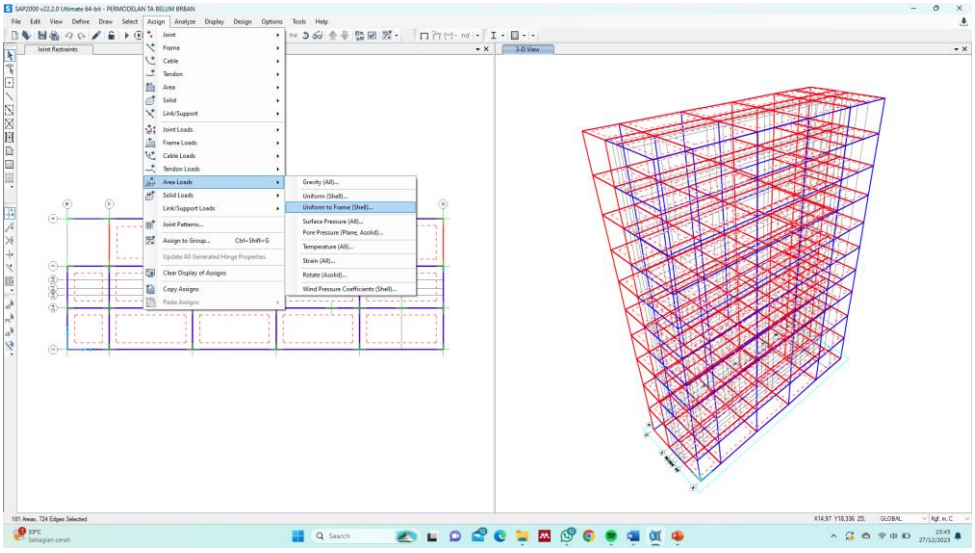


Langkah-15: Distribusi Beban Mati dan Beban Hidup

Langkah selanjutnya yaitu memasukkan beban hidup dan beban mati yang telah dihitung sebelumnya, kemudian masukkan ke dalam pembebanan balok dan pelat. Untuk pembebanan balok dilakukan dengan cara klik *Select – Properties – Frame Sections.* Lalu pilih balok yang ditinjau kemudian klik *Assign – Frame Loads – Distributed.* Isi kolom *Uniform Load* dengan beban yang sudah dihitung sebelumnya. Untuk pembebanan pelat dilakukan dengan cara klik *Select – Properties – Area Sections.* Lalu pilih pelat yang ditinjau kemudian klik *Assign – Area Loads – Uniform Area (Shell).* Lalu isi dikolom *Load* beban pelat yang sudah dihitung sebelumnya.
(Contoh pembebanan balok)

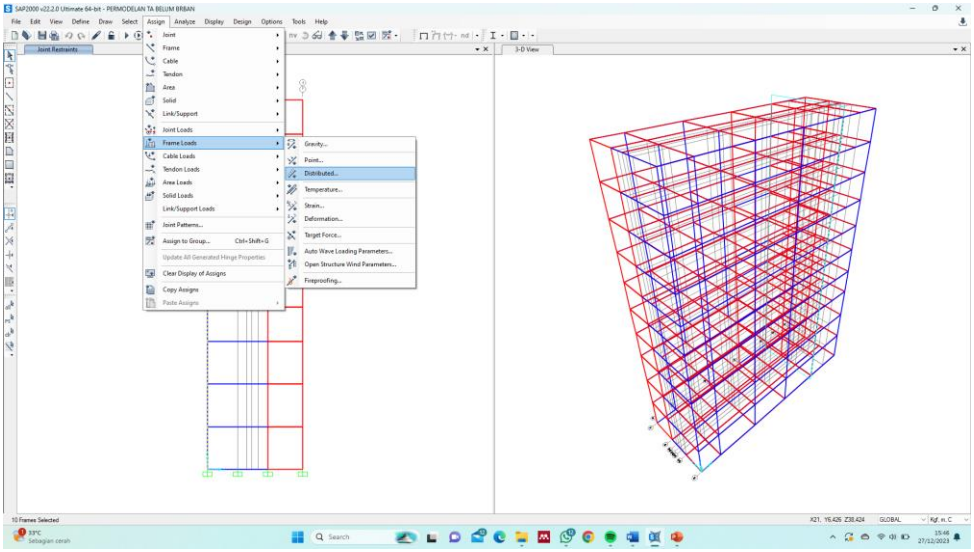


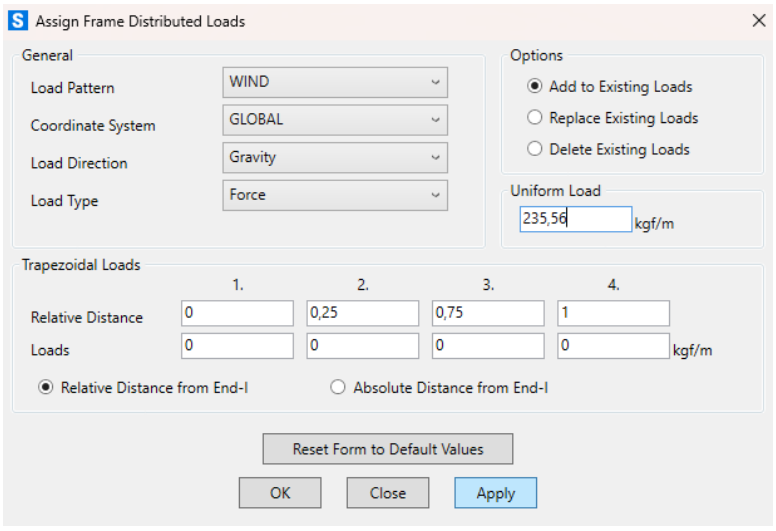
(Contoh pembebanan pelat)

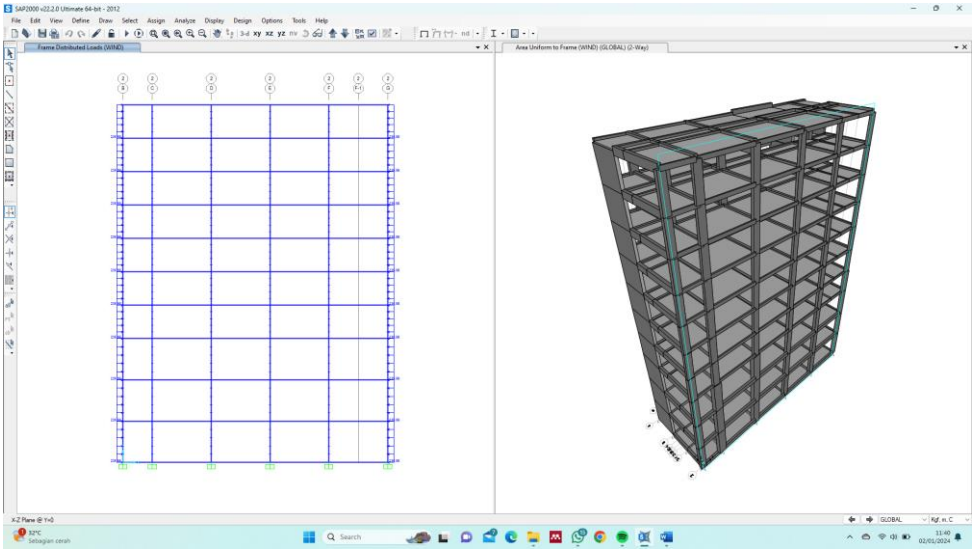


Langkah-16: Distribusi Beban Angin

Beban angin didistribusikan pada tiap as sesuai dengan Tabel 4.18, Tabel 4.19, dan Tabel 4.20. Kemudian pilih as yang akan didistribusikan beban angin tersebut, klik *Assign – Frame Loads – Distributed.*

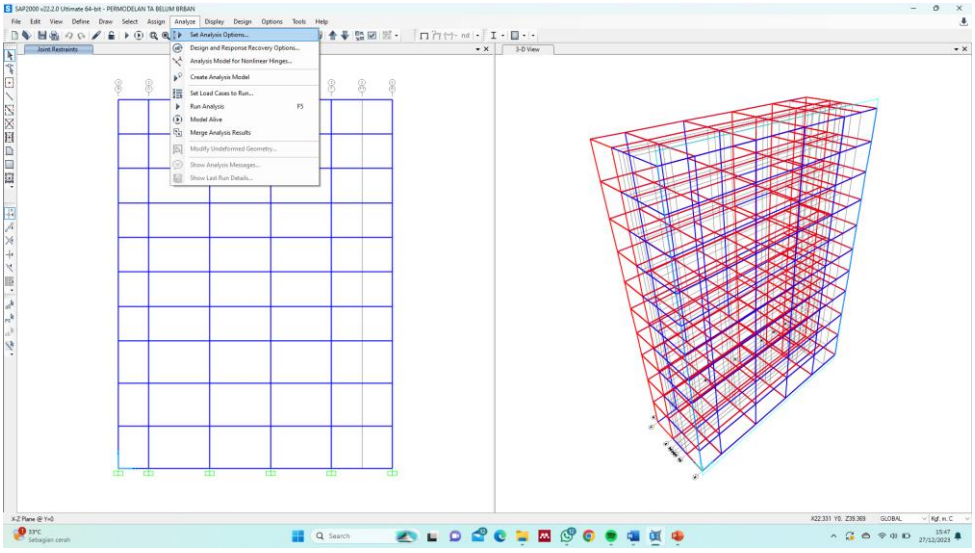


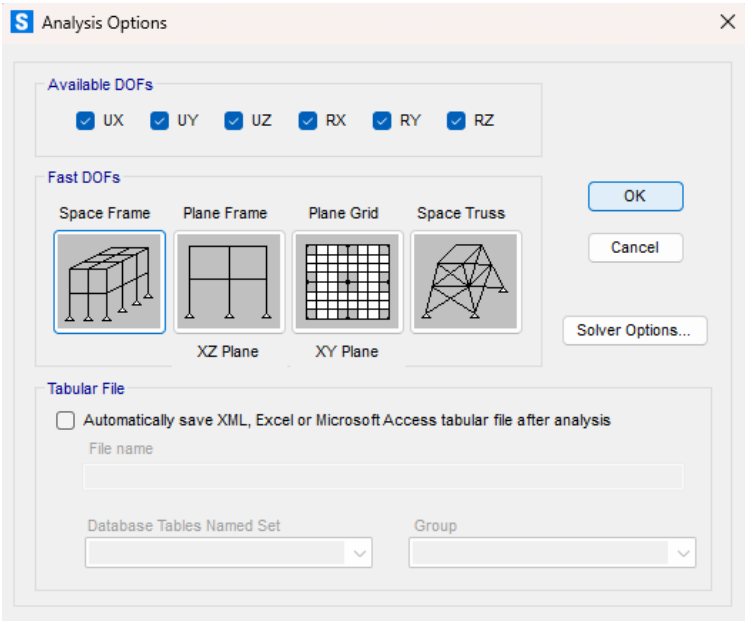

Assign Frame Distributed Loads
General
Load Pattern
WIND
Coordinate System
GLOBAL
Load Direction
Gravity
Load Type
Force
Options
Add to Existing Loads
Replace Existing Loads
Delete Existing Loads
Uniform Load
235,56
kgf/m
Trapezoidal Loads
1.
2.
3.
4.
Relative Distance
0
0,25
0,75
1
Loads
0
0
0
0
kgf/m
Relative Distance from End-I
Absolute Distance from End-I
Reset Form to Default Values
OK
Close
Apply



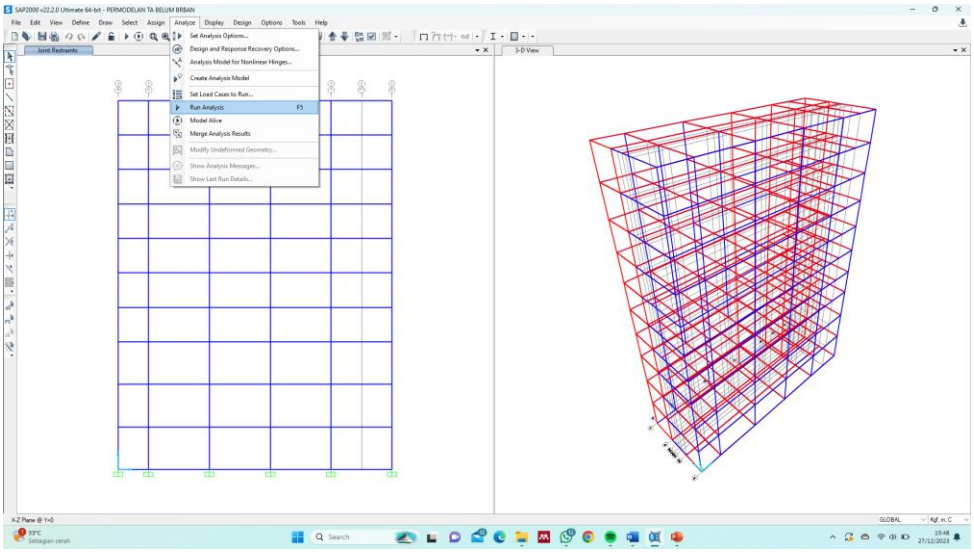
Langkah-17: *Running Analysis* Permodelan

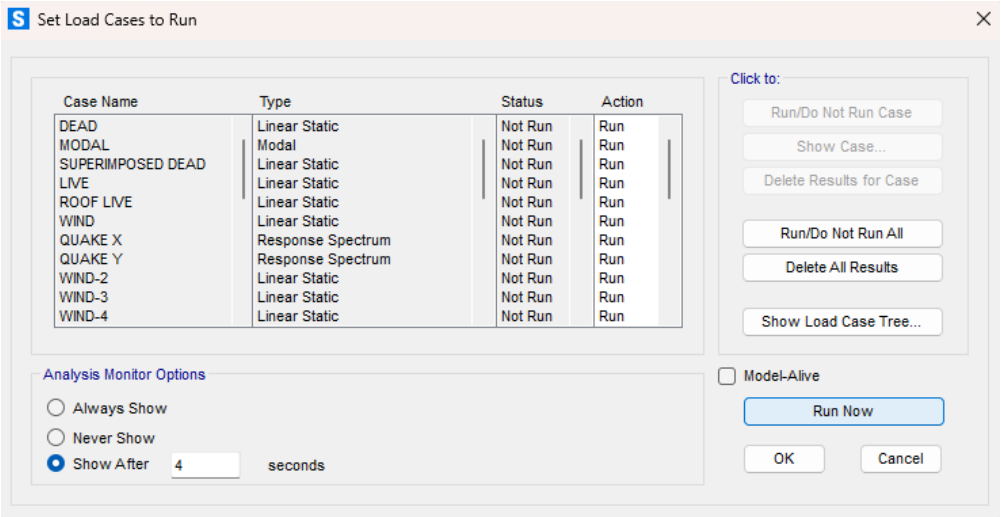
Setelah semua langkah selesai dimasukkan, tahap selanjutnya yaitu *running analysis* permodelan dengan cara klik *Analyze – Set Analysis Option –* klik *Space Frame.*





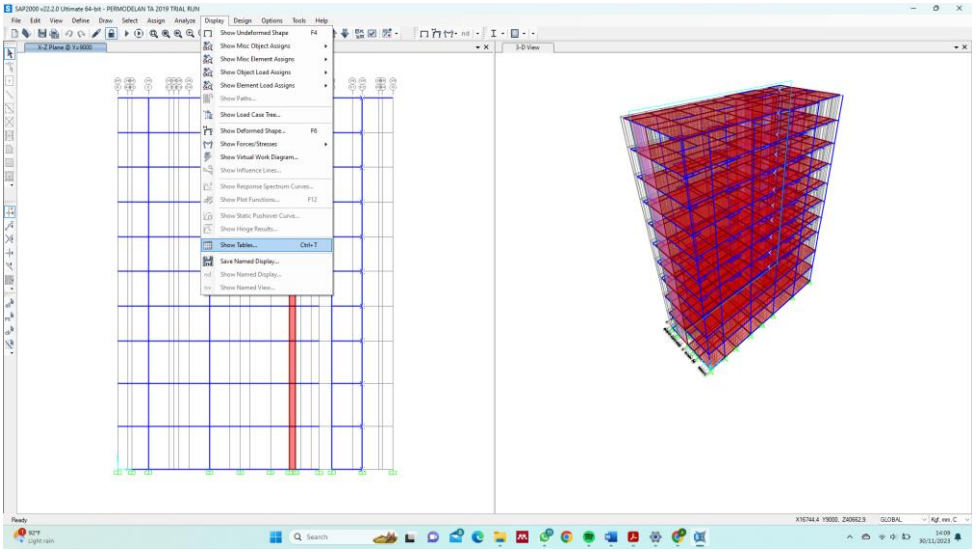
Run Analysis – Run Now (untuk menghindari kesalahan saat proses *running* sebaiknya *save as file* terlebih dahulu).

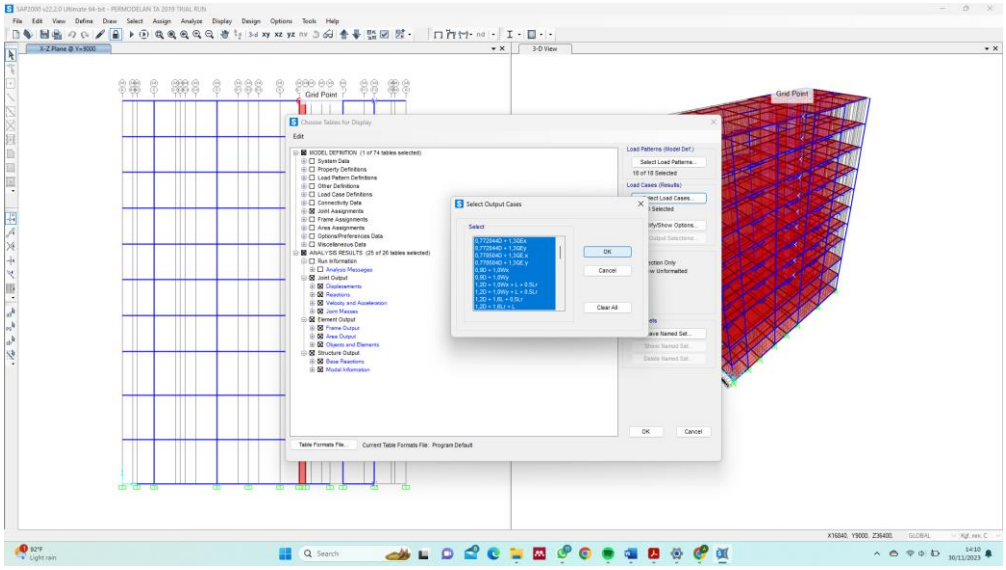




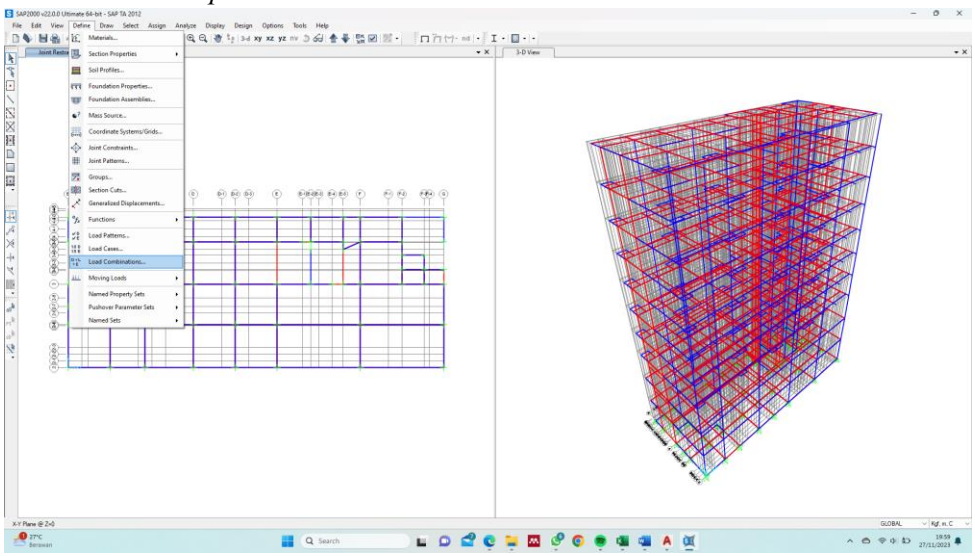
Langkah-18: *Export Table*

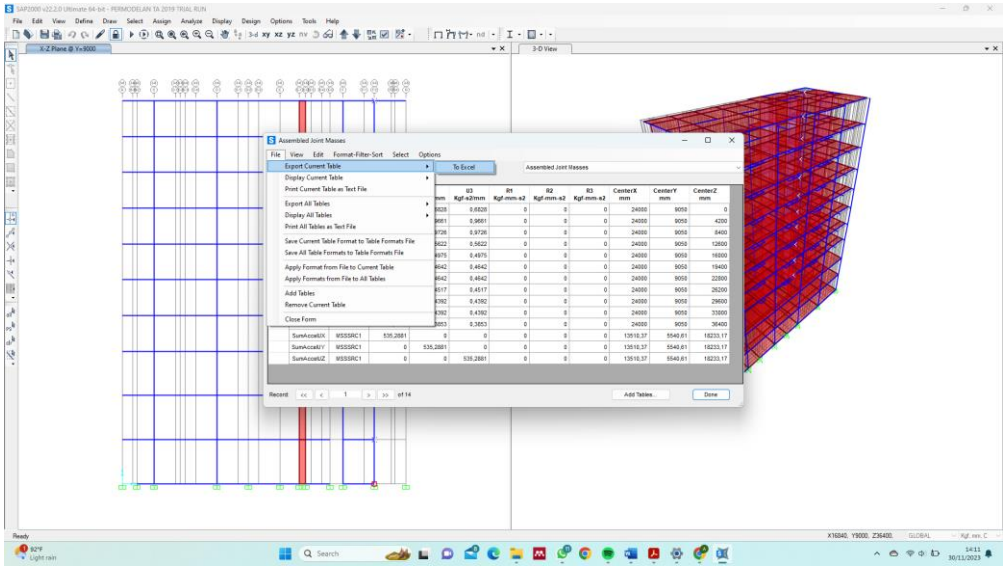
Langkah terakhir yaitu setelah proses *Run* klik *Display – Show Tables* (Ctrl+T) – *Analysis Result – Element Output – Frame Output – Select Load Cases* – pilih semua kombinasi pembebanan.





Lalu klik *File – Export All Tables to Excel.*




Assembled Joint Masses
File View Edit Format-Filter-Sort Select Options
Export Current Table
Display Current Table
Print Current Table as Text File
Export All Tables
Display All Tables
Print All Tables as Text File
Save Current Table Format to Table Formats File
Save All Table Formats to Table Formats File
Apply Format from File to Current Table
Apply Formats from File to All Tables
Add Tables
Remove Current Table
Close Form
To Excel
Assembled Joint Masses
Add Tables...
Done

LAMPIRAN II

PERHITUNGAN SIMPANGAN

SNI 1726:2012 (Arah X)

$$\delta_{1e} = \delta_{1e} - \delta_{0e}$$
$$= 3{,}122488\ mm - 0$$
$$= 3{,}122488\ mm$$

$$\delta_{2e} = \delta_{2e} - \delta_{1e}$$
$$= 9{,}211323\ mm - 3{,}122488\ mm$$
$$= 6{,}088835\ mm$$

$$\delta_{3e} = \delta_{3e} - \delta_{2e}$$
$$= 16{,}754321\ mm - 9{,}211323\ mm$$
$$= 7{,}542998\ mm$$

$$\delta_{4e} = \delta_{4e} - \delta_{3e}$$
$$= 22{,}878135\ mm - 16{,}754321\ mm$$
$$= 6{,}123814\ mm$$

$$\delta_{5e} = \delta_{5e} - \delta_{4e}$$
$$= 29{,}102049\ mm - 22{,}878135\ mm$$
$$= 6{,}223914\ mm$$

$$\delta_{6e} = \delta_{6e} - \delta_{5e}$$
$$= 35{,}075179\ mm - 29{,}102049\ mm$$
$$= 5{,}97313\ mm$$

$$\delta_{7e} = \delta_{7e} - \delta_{6e}$$
$$= 40{,}577087\ mm - 35{,}075179\ mm$$
$$= 5{,}501908\ mm$$

SNI 1726:2019 (Arah X)

$$\delta_{1e} = \delta_{1e} - \delta_{0e}$$
$$= 3{,}744073\ mm - 0$$
$$= 3{,}744073\ mm$$

$$\delta_{2e} = \delta_{2e} - \delta_{1e}$$
$$= 11{,}06743\ mm - 3{,}744073\ mm$$
$$= 7{,}323357\ mm$$

$$\delta_{3e} = \delta_{3e} - \delta_{2e}$$
$$= 20{,}13704\ mm - 11{,}06743\ mm$$
$$= 9{,}069606\ mm$$

$$\delta_{4e} = \delta_{4e} - \delta_{3e}$$
$$= 27{,}49513\ mm - 20{,}13704\ mm$$
$$= 7{,}358092\ mm$$

$$\delta_{5e} = \delta_{5e} - \delta_{4e}$$
$$= 34{,}95397\ mm - 27{,}495128\ mm$$
$$= 7{,}458837\ mm$$

$$\delta_{6e} = \delta_{6e} - \delta_{5e}$$
$$= 42{,}074286\ mm - 34{,}953965\ mm$$
$$= 7{,}120321\ mm$$

$$\delta_{7e} = \delta_{7e} - \delta_{6e}$$
$$= 48{,}576497\ mm - 42{,}074286\ mm$$
$$= 6{,}502211\ mm$$

$$\delta_{8e} = \delta_{8e} - \delta_{7e}$$
$$= 45{,}606565\ mm - 40{,}577087\ mm$$
$$= 5{,}029478\ mm$$

$$\delta_{9e} = \delta_{9e} - \delta_{8e}$$
$$= 49{,}952583\ mm - 45{,}606565\ mm$$
$$= 4{,}346018\ mm$$

$$\delta_{10e} = \delta_{10e} - \delta_{9e}$$
$$= 53{,}430259\ mm - 49{,}952583\ mm$$
$$= 3{,}477676\ mm$$

$$\delta_{8e} = \delta_{8e} - \delta_{7e}$$
$$= 54{,}445151\ mm - 48{,}576497\ mm$$
$$= 5{,}868654\ mm$$

$$\delta_{9e} = \delta_{9e} - \delta_{8e}$$
$$= 59{,}423962\ mm - 54{,}445151\ mm$$
$$= 4{,}978811\ mm$$

$$\delta_{10e} = \delta_{10e} - \delta_{9e}$$
$$= 63{,}30101\ mm - 59{,}423962\ mm$$
$$= 3{,}877048\ mm$$

SNI 1726:2012 (Arah X)

$$\delta_1 = \frac{C_d \times \delta_{1e}}{I_e}$$
$$= \frac{5{,}5 \times 3{,}122488\ mm}{1{,}00}$$
$$= 17{,}174\ mm$$

$$\delta_2 = \frac{C_d \times \delta_{2e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}088835\ mm}{1}$$
$$= 33{,}489\ mm$$

$$\delta_3 = \frac{C_d \times \delta_{3e}}{I_e}$$
$$= \frac{5{,}5 \times 7{,}542998\ mm}{1}$$
$$= 41{,}486\ mm$$

SNI 1726:2019 (Arah X)

$$\delta_1 = \frac{C_d \times \delta_{1e}}{I_e}$$
$$= \frac{5{,}5 \times 3{,}744073\ mm}{1{,}00}$$
$$= 20{,}5924\ mm$$

$$\delta_2 = \frac{C_d \times \delta_{2e}}{I_e}$$
$$= \frac{5{,}5 \times 7{,}323357\ mm}{1}$$
$$= 40{,}2785\ mm$$

$$\delta_3 = \frac{C_d \times \delta_{3e}}{I_e}$$
$$= \frac{5{,}5 \times 9{,}069606\ mm}{1}$$
$$= 49{,}8828\ mm$$

$$\delta_4 = \frac{C_d \times \delta_{4e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}123814\ mm}{1}$$
$$= 33{,}681\ mm$$

$$\delta_4 = \frac{C_d \times \delta_{4e}}{I_e}$$
$$= \frac{5{,}5 \times 7{,}358092\ mm}{1}$$
$$= 40{,}4695\ mm$$

$$\delta_5 = \frac{C_d \times \delta_{5e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}223914\ mm}{1}$$
$$= 34{,}232\ mm$$

$$\delta_5 = \frac{C_d \times \delta_{5e}}{I_e}$$
$$= \frac{5{,}5 \times 7{,}458837\ mm}{1}$$
$$= 41{,}0236\ mm$$

$$\delta_6 = \frac{C_d \times \delta_{6e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}97313\ mm}{1}$$
$$= 32{,}852\ mm$$

$$\delta_6 = \frac{C_d \times \delta_{6e}}{I_e}$$
$$= \frac{5{,}5 \times 7{,}120321\ mm}{1}$$
$$= 39{,}1618\ mm$$

$$\delta_7 = \frac{C_d \times \delta_{7e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}501908\ mm}{1}$$
$$= 30{,}260\ mm$$

$$\delta_7 = \frac{C_d \times \delta_{7e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}502211\ mm}{1}$$
$$= 35{,}7622\ mm$$

$$\delta_8 = \frac{C_d \times \delta_{8e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}029478\ mm}{1}$$
$$= 27{,}662\ mm$$

$$\delta_8 = \frac{C_d \times \delta_{8e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}868654\ mm}{1}$$
$$= 32{,}2776\ mm$$

$$\delta_9 = \frac{C_d \times \delta_{9e}}{I_e}$$
$$= \frac{5{,}5 \times 4{,}346018\ mm}{1}$$
$$= 23{,}903\ mm$$

$$\delta_9 = \frac{C_d \times \delta_{9e}}{I_e}$$
$$= \frac{5{,}5 \times 4{,}978811\ mm}{1}$$
$$= 27{,}3835\ mm$$

$$\delta_{10} = \frac{C_d \times \delta_{10e}}{I_e}$$
$$= \frac{5{,}5 \times 3{,}477676\ mm}{1}$$
$$= 19{,}127\ mm$$

$$\delta_{10} = \frac{C_d \times \delta_{10e}}{I_e}$$
$$= \frac{5{,}5 \times 3{,}877048\ mm}{1}$$
$$= 21{,}3238\ mm$$

SNI 1726:2012 (Arah X)

$\Delta_1 \leq \Delta_{ijin}$

$17{,}174\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$\Delta_2 \leq \Delta ijin$

$33{,}489\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$\Delta_3 \leq \Delta_{ijin}$

$41{,}486\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$\Delta_4 \leq \Delta_{ijin}$

$33{,}681\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_5 \leq \Delta_{ijin}$

$34{,}232\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_6 \leq \Delta_{ijin}$

$32{,}852\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

SNI 1726:2019 (Arah X)

$\Delta_1 \leq \Delta_{ijin}$

$20{,}592\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$\Delta_2 \leq \Delta ijin$

$40{,}278\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$\Delta_3 \leq \Delta_{ijin}$

$49{,}883\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$\Delta_4 \leq \Delta_{ijin}$

$40{,}470\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_5 \leq \Delta_{ijin}$

$41{,}024\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_6 \leq \Delta_{ijin}$

$39{,}162\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_7 \leq \Delta_{ijin}$

$30{,}260\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_8 \leq \Delta_{ijin}$

$27{,}662\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_9 \leq \Delta_{ijin}$

$23{,}903\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_{10} \leq \Delta_{ijin}$

$19{,}127\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_7 \leq \Delta_{ijin}$

$35{,}762\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_8 \leq \Delta_{ijin}$

$32{,}278\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_9 \leq \Delta_{ijin}$

$27{,}383\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

$\Delta_{10} \leq \Delta_{ijin}$

$21{,}324\ mm \leq 52{,}308\ mm$

(Memenuhi Persyaratan)

SNI 1726:2012 (Arah Y)

$\delta_{1e} = \delta_{1e} - \delta_{0e}$

$= 1{,}540086\ mm - 0$

$= 1{,}540086\ mm$

$\delta_{2e} = \delta_{2e} - \delta_{1e}$

$= 5{,}395003\ mm - 1{,}540086\ mm$

$= 3{,}854917\ mm$

$\delta_{3e} = \delta_{3e} - \delta_{2e}$

$= 10{,}855469\ mm - 5{,}395003\ mm$

$= 5{,}460466\ mm$

$\delta_{4e} = \delta_{4e} - \delta_{3e}$

$= 16{,}056182\ mm - 10{,}855469\ mm$

$= 5{,}200713\ mm$

SNI 1726:2019 (Arah Y)

$\delta_{1e} = \delta_{1e} - \delta_{0e}$

$= 1{,}849059\ mm - 0$

$= 1{,}849059\ mm$

$\delta_{2e} = \delta_{2e} - \delta_{1e}$

$= 6{,}421049\ mm - 1{,}849059\ mm$

$= 4{,}57199\ mm$

$\delta_{3e} = \delta_{3e} - \delta_{2e}$

$= 20{,}137036\ mm - 11{,}06743\ mm$

$= 9{,}069606\ m$

$\delta_{4e} = \delta_{4e} - \delta_{3e}$

$= 19{,}037296\ mm - 12{,}905046\ mm$

$= 6{,}13225\ mm$

$$\delta_{5e} = \delta_{5e} - \delta_{4e}$$
$$= 21{,}733125\ mm - 16{,}056182\ mm$$
$$= 5{,}676943\ mm$$

$$\delta_{6e} = \delta_{6e} - \delta_{5e}$$
$$= 27{,}715595\ mm - 21{,}733125\ mm$$
$$= 5{,}98247\ mm$$

$$\delta_{7e} = \delta_{7e} - \delta_{6e}$$
$$= 33{,}851268\ mm - 27{,}715595\ mm$$
$$= 6{,}135673\ mm$$

$$\delta_{8e} = \delta_{8e} - \delta_{7e}$$
$$= 40{,}013505\ mm - 33{,}851268\ mm$$
$$= 6{,}162237\ mm$$

$$\delta_{9e} = \delta_{9e} - \delta_{8e}$$
$$= 46{,}115335\ mm - 40{,}013505\ mm$$
$$= 6{,}10183\ mm$$

$$\delta_{10e} = \delta_{10e} - \delta_{9e}$$
$$= 52{,}157517\ mm - 46{,}115335\ mm$$
$$= 6{,}042182\ mm$$

$$\delta_{5e} = \delta_{5e} - \delta_{4e}$$
$$= 25{,}748034\ mm - 19{,}037296\ mm$$
$$= 6{,}710738\ mm$$

$$\delta_{6e} = \delta_{6e} - \delta_{5e}$$
$$= 32{,}790471\ mm - 25{,}748034\ mm$$
$$= 7{,}042437\ mm$$

$$\delta_{7e} = \delta_{7e} - \delta_{6e}$$
$$= 39{,}981901\ mm - 32{,}790471\ mm$$
$$= 7{,}19143\ mm$$

$$\delta_{8e} = \delta_{8e} - \delta_{7e}$$
$$= 47{,}190193\ mm - 39{,}981901\ mm$$
$$= 7{,}208292\ mm$$

$$\delta_{9e} = \delta_{9e} - \delta_{8e}$$
$$= 54{,}24308\ mm - 47{,}190193\ mm$$
$$= 7{,}052887\ mm$$

$$\delta_{10e} = \delta_{10e} - \delta_{9e}$$
$$= 61{,}239029\ mm - 54{,}24308\ mm$$
$$= 1{,}749917\ mm$$

SNI 1726:2012 (Arah Y)

$$\delta_1 = \frac{C_d \times \delta_{1e}}{I_e}$$
$$= \frac{5{,}5 \times 1{,}540086\ mm}{1{,}00}$$
$$= 8{,}470\ mm$$

SNI 1726:2019 (Arah Y)

$$\delta_1 = \frac{C_d \times \delta_{1e}}{I_e}$$
$$= \frac{5{,}5 \times 1{,}849059\ mm}{1{,}00}$$
$$= 10{,}1698\ mm$$

$$\delta_2 = \frac{C_d \times \delta_{2e}}{I_e}$$
$$= \frac{5{,}5 \times 3{,}854917\ mm}{1}$$
$$= 21{,}202\ mm$$

$$\delta_2 = \frac{C_d \times \delta_{2e}}{I_e}$$
$$= \frac{5{,}5 \times 4{,}57199\ mm}{1}$$
$$= 25{,}1459\ mm$$

$$\delta_3 = \frac{C_d \times \delta_{3e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}460466\ mm}{1}$$
$$= 30{,}033\ mm$$

$$\delta_3 = \frac{C_d \times \delta_{3e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}483997\ mm}{1}$$
$$= 35{,}6620\ mm$$

$$\delta_4 = \frac{C_d \times \delta_{4e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}200713\ mm}{1}$$
$$= 28{,}604\ mm$$

$$\delta_4 = \frac{C_d \times \delta_{4e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}13225\ mm}{1}$$
$$= 33{,}7274\ mm$$

$$\delta_5 = \frac{C_d \times \delta_{5e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}676943\ mm}{1}$$
$$= 31{,}223\ mm$$

$$\delta_5 = \frac{C_d \times \delta_{5e}}{I_e}$$
$$= \frac{5{,}5 \times 6{,}710738\ mm}{1}$$
$$= 36{,}9091\ mm$$

$$\delta_6 = \frac{C_d \times \delta_{6e}}{I_e}$$
$$= \frac{5{,}5 \times 5{,}98247\ mm}{1}$$
$$= 32{,}904\ mm$$

$$\delta_6 = \frac{C_d \times \delta_{6e}}{I_e}$$
$$= \frac{5{,}5 \times 7{,}042437\ mm}{1}$$
$$= 38{,}7334\ mm$$

$$\delta_7 = \frac{C_d \times \delta_{7e}}{I_e} = \frac{5{,}5 \times 6{,}135673\ mm}{1} = 33{,}746\ mm$$

$$\delta_7 = \frac{C_d \times \delta_{7e}}{I_e} = \frac{5{,}5 \times 7{,}19143\ mm}{1} = 39{,}5529\ mm$$

$$\delta_8 = \frac{C_d \times \delta_{8e}}{I_e} = \frac{5{,}5 \times 6{,}162237\ mm}{1} = 33{,}892\ mm$$

$$\delta_8 = \frac{C_d \times \delta_{8e}}{I_e} = \frac{5{,}5 \times 7{,}208292\ mm}{1} = 39{,}6456\ mm$$

$$\delta_9 = \frac{C_d \times \delta_{9e}}{I_e} = \frac{5{,}5 \times 6{,}10183\ mm}{1} = 33{,}560\ mm$$

$$\delta_9 = \frac{C_d \times \delta_{9e}}{I_e} = \frac{5{,}5 \times 7{,}052887\ mm}{1} = 38{,}7909\ mm$$

$$\delta_{10} = \frac{C_d \times \delta_{10e}}{I_e} = \frac{5{,}5 \times 6{,}042182\ mm}{1} = 33{,}232\ mm$$

$$\delta_{10} = \frac{C_d \times \delta_{10e}}{I_e} = \frac{5{,}5 \times 1{,}749917\ mm}{1} = 6{,}995949\ mm$$

SNI 1726:2012 (Arah Y)

$\Delta_1 \leq \Delta_{ijin}$

$8{,}470\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

SNI 1726:2019 (Arah Y)

$\Delta_1 \leq \Delta_{ijin}$

$10{,}170\ mm \leq 64{,}615\ mm$

(Memenuhi Persyaratan)

$$\Delta_2 \leq \Delta_{ijin}$$

$$21{,}202\ mm \leq 64{,}615\ mm$$

(Memenuhi Persyaratan)

$$\Delta_3 \leq \Delta_{ijin}$$

$$30{,}033\ mm \leq 64{,}615\ mm$$

(Memenuhi Persyaratan)

$$\Delta_4 \leq \Delta_{ijin}$$

$$33{,}681\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_5 \leq \Delta_{ijin}$$

$$31{,}223\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_6 \leq \Delta_{ijin}$$

$$32{,}904\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_7 \leq \Delta_{ijin}$$

$$33{,}746\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_8 \leq \Delta_{ijin}$$

$$33{,}892\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_9 \leq \Delta_{ijin}$$

$$33{,}560\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_2 \leq \Delta_{ijin}$$

$$25{,}146\ mm \leq 64{,}615\ mm$$

(Memenuhi Persyaratan)

$$\Delta_3 \leq \Delta_{ijin}$$

$$35{,}662\ mm \leq 64{,}615\ mm$$

(Memenuhi Persyaratan)

$$\Delta_4 \leq \Delta_{ijin}$$

$$33{,}727\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_5 \leq \Delta_{ijin}$$

$$36{,}909\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_6 \leq \Delta_{ijin}$$

$$38{,}733\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_7 \leq \Delta_{ijin}$$

$$39{,}553\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_8 \leq \Delta_{ijin}$$

$$39{,}646\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_9 \leq \Delta_{ijin}$$

$$38{,}791\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_{10} \leq \Delta_{ijin}$$

$$33{,}232\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

$$\Delta_{10} \leq \Delta_{ijin}$$

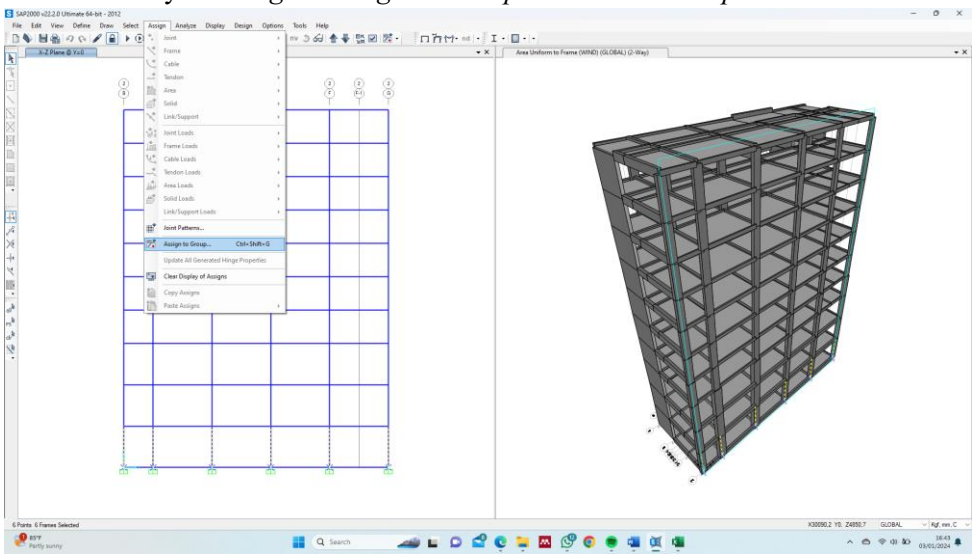
$$38{,}478\ mm \leq 52{,}308\ mm$$

(Memenuhi Persyaratan)

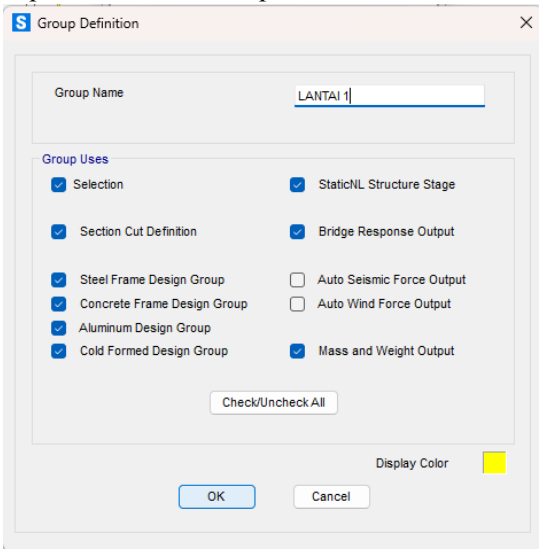
LAMPIRAN III

CARA MENAMPILKAN *OUTPUT* P-DELTA

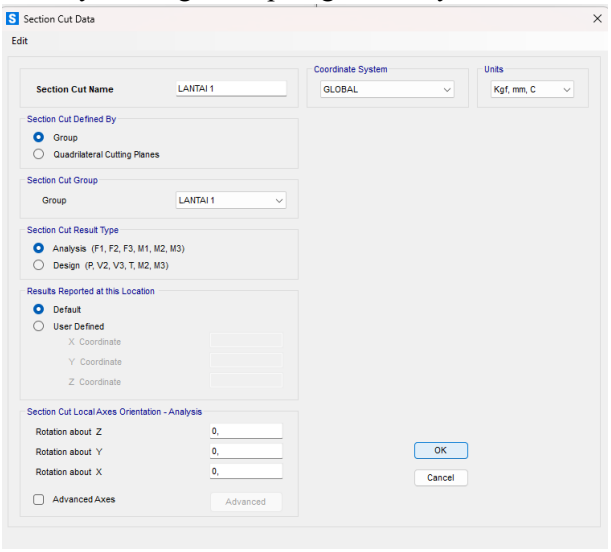
Untuk mengetahui nilai P-Delta yang telah dianalisis pada *software* SAP2000 v.22.2.0, dapat dilakukan dengan cara klik seluruh kolom pada tiap tingkat beserta *joint* dibawahnya – *Assign – Assign to Group – Add New Group.*



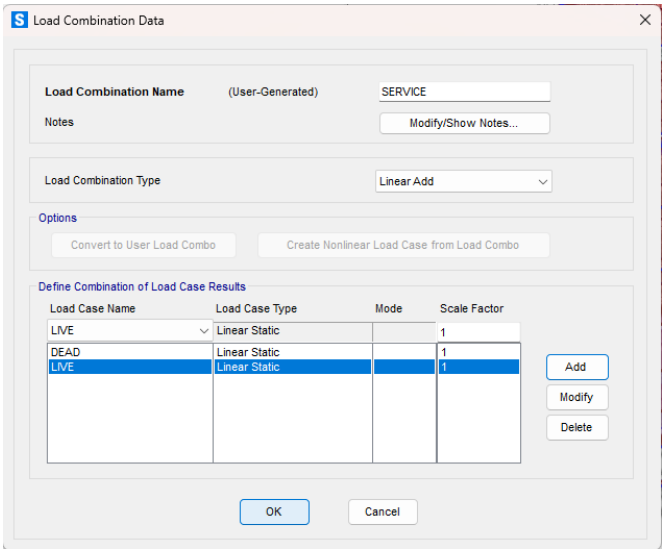
Lalu klik *Define Groups – Add New Groups* – Definisikan Nama Grup – Ok.



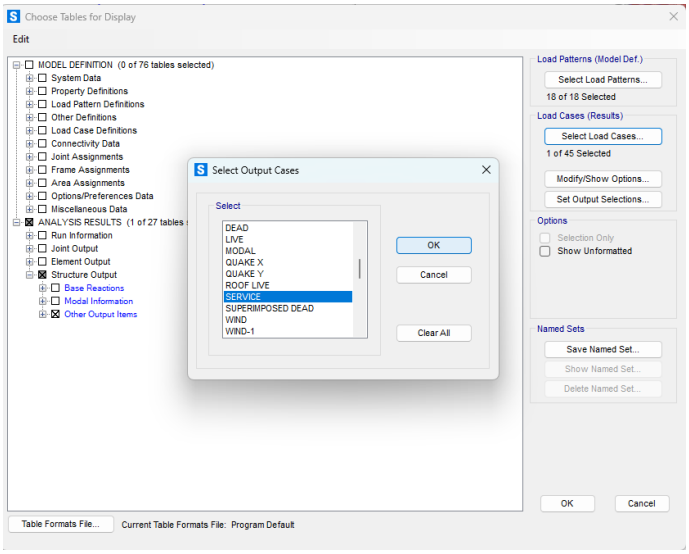
Lalu definisikan setiap grup yang telah dibuat ke dalam menu *Section Cut* dengan cara klik *Define – Section Cut – Add New Section Cut* – Masukkan grup yang telah didefinisikan sebelumnya. Ulangi di tiap tingkat lainnya.



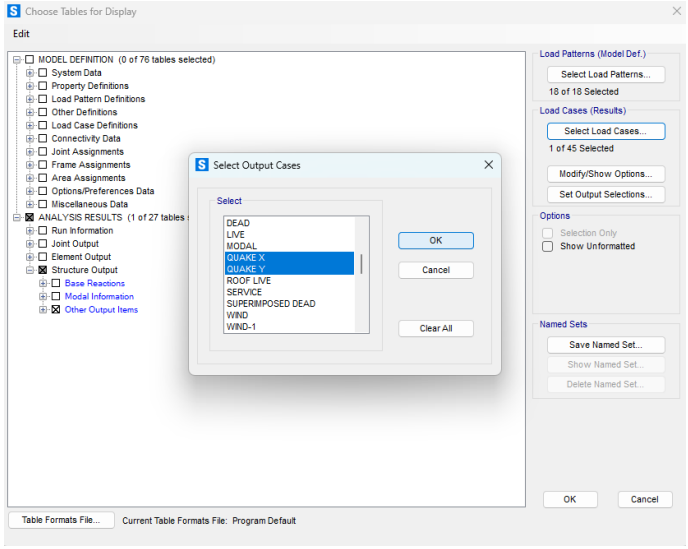
Selanjutnya membuat *Load Combinations* beban *services* dengan mengisi beban mati dan beban hidup yang dikombinasikan.



Lalu ekspor nilai *P* dari *Load Combination* tersebut dengan cara klik *Display – Show Tables – Other Output Items – Section Cut Forces.*



Lalu ekspor nilai *Quake X* dan *Quake Y* untuk memperoleh nilai V_x dan V_y dengan cara klik *Display – Show Tables* – pilih *Quake X* dan *Quake Y* pada *Load Case*.



LAMPIRAN IV

PERHITUNGAN P-DELTA ARAH X DAN Y

SNI 1726:2012 (Arah X)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{35713{,}807\ kN \times 17{,}174\ mm \times 1{,}00}{739{,}617\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}03590 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{31397{,}918\ kN \times 33{,}489\ mm \times 1{,}00}{700{,}351\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}06499 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{27211{,}186\ kN \times 41{,}486\ mm \times 1{,}00}{703{,}184\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}06950 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{23259{,}429\ kN \times 33{,}681\ mm \times 1{,}00}{785{,}904\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}05331 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{19448{,}531\ kN \times 34{,}232\ mm \times 1{,}00}{695{,}127\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}05122 \leq 0{,}090909$$

(Memenuhi Persyaratan)

SNI 1726:2019 (Arah X)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{36321{,}801\ kN \times 20{,}592\ mm \times 1{,}00}{875{,}167\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}03700 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{32005{,}17\ kN \times 40{,}278\ mm \times 1{,}00}{837{,}382\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}06664 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{27817{,}119\ kN \times 49{,}883\ mm \times 1{,}00}{845{,}992\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}07100 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{23874{,}857\ kN \times 40{,}470\ mm \times 1{,}00}{944{,}054\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}05473 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{20073{,}819\ kN \times 41{,}024\ mm \times 1{,}00}{831{,}641\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}05295 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{15701{,}453\ kN \times 32{,}852\ mm \times 1{,}00}{664{,}272\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}04153 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{16337{,}212\ kN \times 39{,}162\ mm \times 1{,}00}{788{,}84\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}04337 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{12024{,}464\ kN \times 30{,}260\ mm \times 1{,}00}{612{,}315\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}03178 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{12671{,}617\ kN \times 35{,}762\ mm \times 1{,}00}{717{,}12\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}03379 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{8356{,}835\ kN \times 27{,}662\ mm \times 1{,}00}{511{,}433\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}02417 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{9017{,}02\ kN \times 32{,}278\ mm \times 1{,}00}{587{,}512\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}02649 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{4733{,}056\ kN \times 23{,}903\ mm \times 1{,}00}{452{,}46\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}01337 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{5408{,}452\ kN \times 27{,}383\ mm \times 1{,}00}{506{,}668\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}01563 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{1157{,}944\ kN \times 19{,}127\ mm \times 1{,}00}{332{,}853\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}00356 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_x \times \Delta_x \times I_e}{V_x \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{1853{,}405\ kN \times 21{,}324\ mm \times 1{,}00}{350{,}889\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}00602 \leq 0{,}090909$$

(Memenuhi Persyaratan)

SNI 1726:2012 (Arah Y)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{35713{,}807\ kN \times 8{,}470\ mm \times 1{,}00}{153{,}123\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}08552 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{31397{,}918\ kN \times 21{,}202\ mm \times 1{,}00}{289{,}98\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}09938 \leq 0{,}090909$$

(Tidak Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{27211{,}186\ kN \times 30{,}033\ mm \times 1{,}00}{357{,}423\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}09898 \leq 0{,}090909$$

(Tidak Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{23259{,}429\ kN \times 28{,}604\ mm \times 1{,}00}{468{,}092\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}07601 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{19448{,}531\ kN \times 31{,}223\ mm \times 1{,}00}{473{,}19\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}06863 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{15701{,}453\ kN \times 32{,}904\ mm \times 1{,}00}{379{,}1\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}07288 \leq 0{,}090909$$

(Memenuhi Persyaratan)

SNI 1726:2019 (Arah Y)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{36321{,}801\ kN \times 10{,}170\ mm \times 1{,}00}{186{,}591\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}08570 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{32005{,}17\ kN \times 25{,}146\ mm \times 1{,}00}{349{,}625\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}09965 \leq 0{,}090909$$

(Tidak Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{27817{,}119\ kN \times 35{,}662\ mm \times 1{,}00}{433{,}768\ kN \times 4200\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}09900 \leq 0{,}090909$$

(Tidak Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{23874{,}857\ kN \times 33{,}727\ mm \times 1{,}00}{551{,}268\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}07811 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{20073{,}819\ kN \times 36{,}909\ mm \times 1{,}00}{555{,}841\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}07128 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{16337{,}212\ kN \times 38{,}733\ mm \times 1{,}00}{442{,}865\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}07641 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{12024{,}464\ kN \times 33{,}746\ mm \times 1{,}00}{383{,}96\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}05651 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{12671{,}617\ kN \times 39{,}553\ mm \times 1{,}00}{444{,}96\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}06023 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{8356{,}835\ kN \times 33{,}892\ mm \times 1{,}00}{353{,}065\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}04290 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{9017{,}02\ kN \times 39{,}646\ mm \times 1{,}00}{405{,}038\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}04720 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{4733{,}056\ kN \times 33{,}560\ mm \times 1{,}00}{356{,}672\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}02382 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{5408{,}452\ kN \times 38{,}791\ mm \times 1{,}00}{404{,}989\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}02770 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{1157{,}944\ kN \times 33{,}232\ mm \times 1{,}00}{209{,}658\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}00982 \leq 0{,}090909$$

(Memenuhi Persyaratan)

$$\frac{P_y \times \Delta_y \times I_e}{V_y \times h_{sx} \times C_d} \leq \theta_{max}$$

$$\frac{1853{,}405\ kN \times 9{,}625\ mm \times 1{,}00}{234{,}392\ kN \times 3400\ mm \times 5{,}5} \leq 0{,}090909$$

$$0{,}01627 \leq 0{,}090909$$

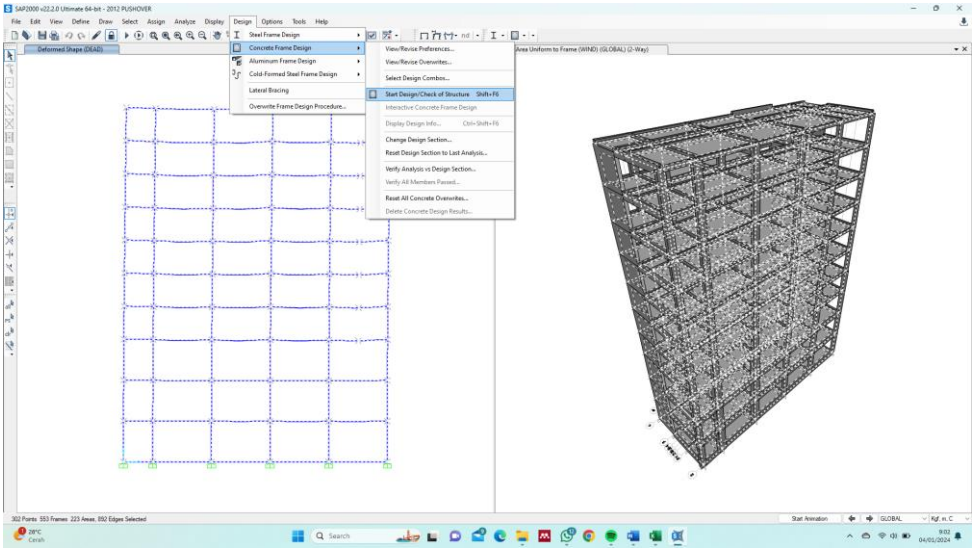
(Memenuhi Persyaratan)

LAMPIRAN V

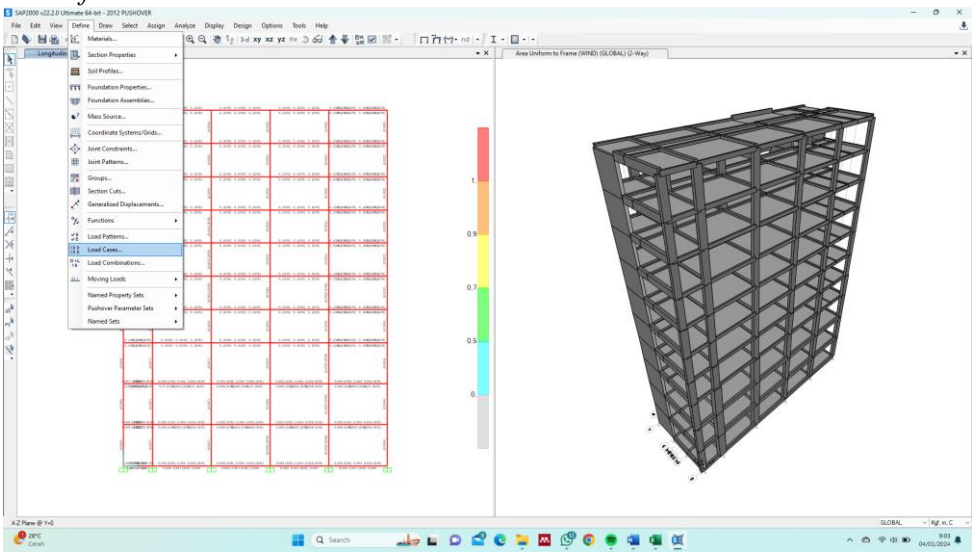
CARA PEMBUATAN *HINGES* PADA ANALISA *PUSHOVER*

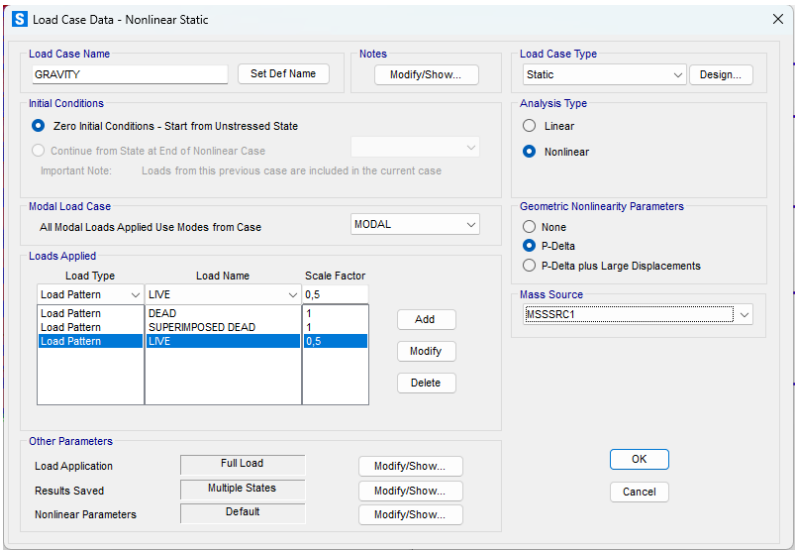
Langkah-1: Membuat *Load Cases*

Cek permodelan struktur yang sudah dirunning sebelumnya, blok semua *frame*, klik *Design – Concrete Frame Design – Start Concrete Design/Check of Structure*.

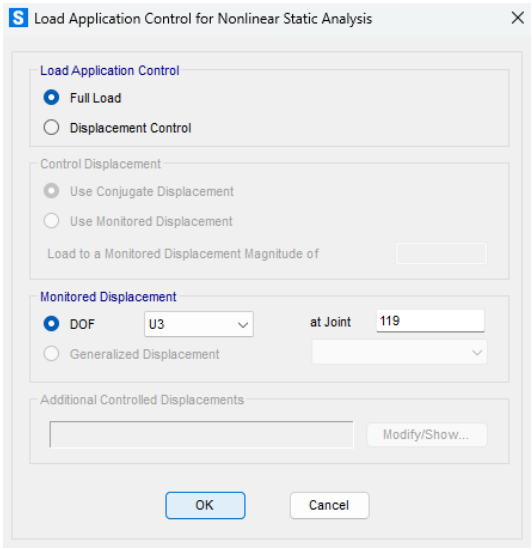


Klik *Define – Load Cases – Add New Load Case.*

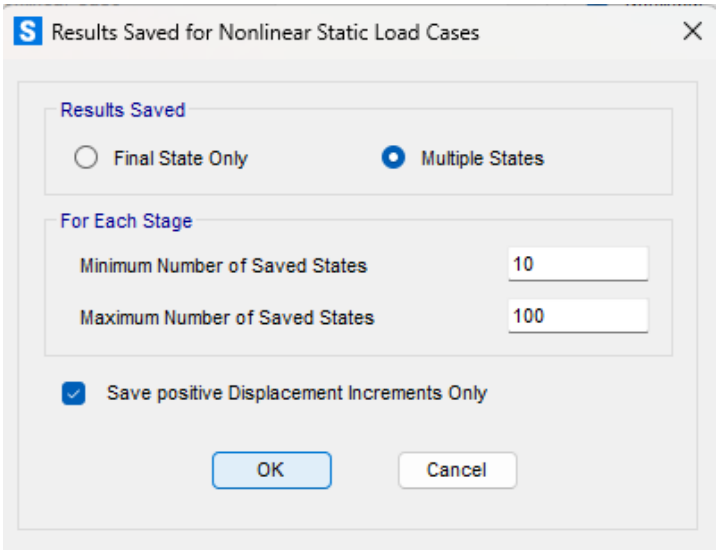




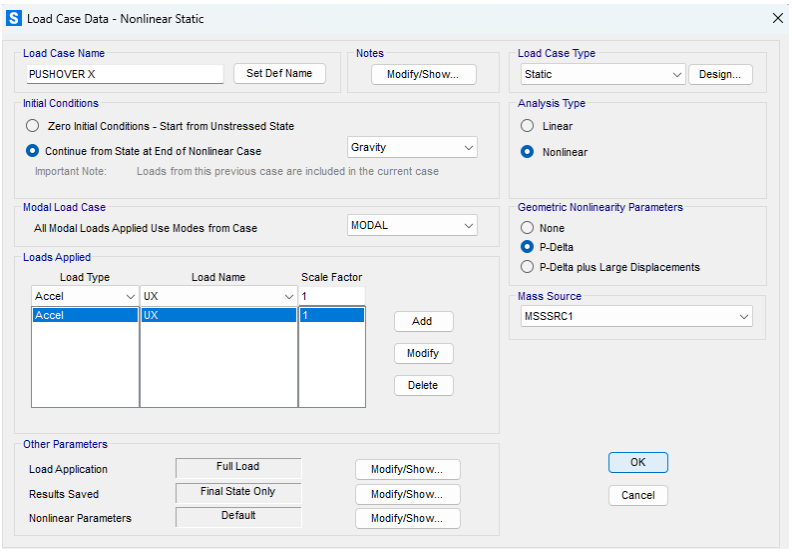
Isikan *Load Application* sesuai gambar, dikarenakan gravitasi merupakan beban arah z maka U3 = UZ.



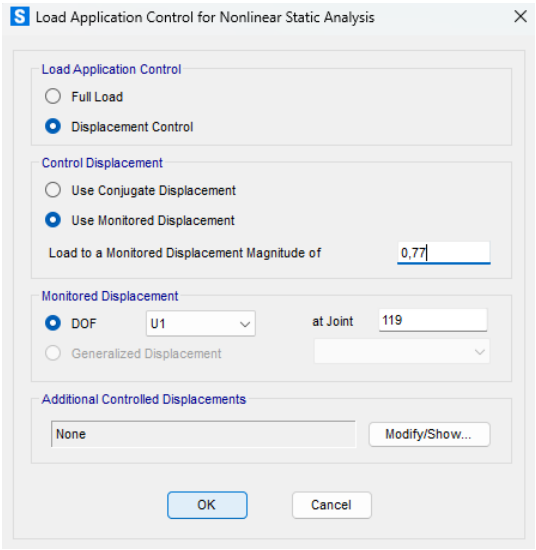
Ganti *Result Saved* menjadi *Multiple States*



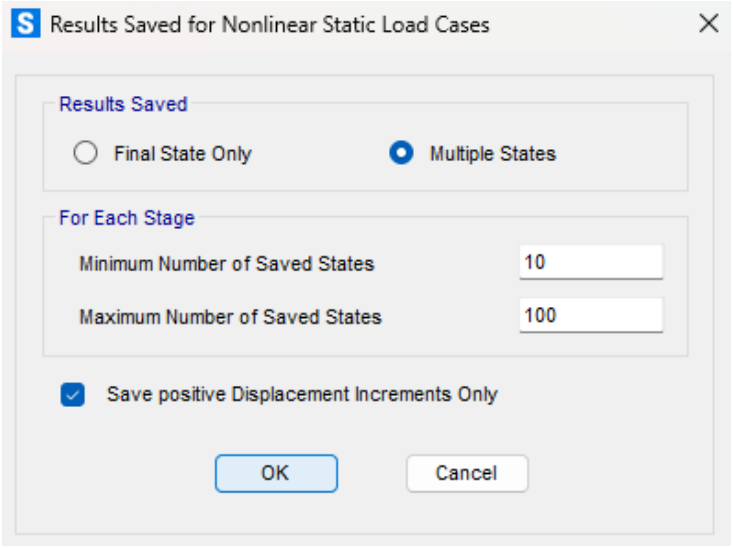
Selanjutnya, buat *pushover* untuk arah X dengan cara klik *Define – Load Cases – Add New Load* Case.



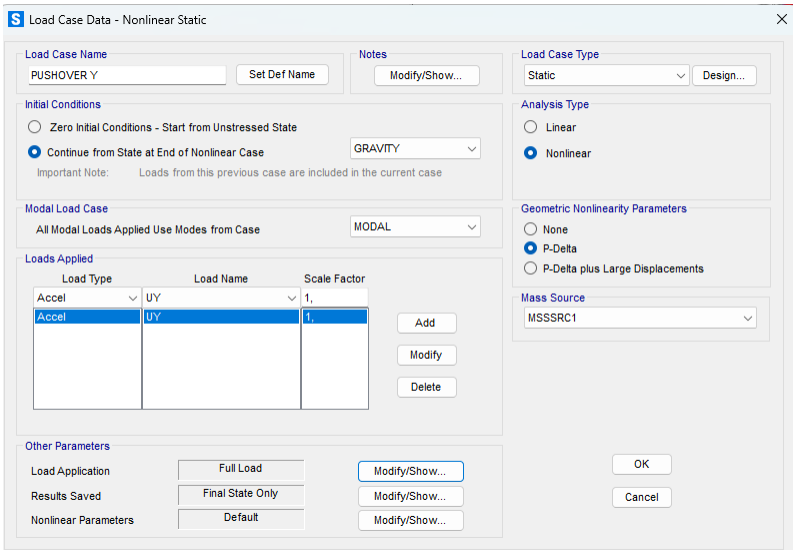
Klik *Modify/Show* pada *Load Application* lalu ganti nilai DOF U1 = UX.



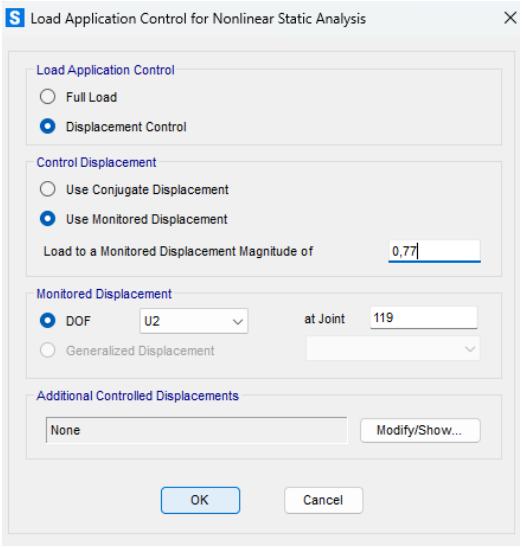
Klik *Modify/Show* pada *Results Saved* dan ganti menjadi *Multiple States*.



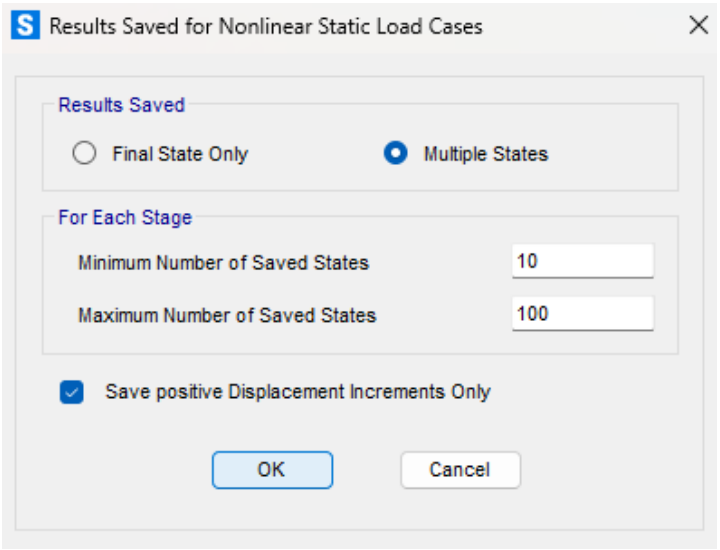
Buat juga *pushover* arah y dengan cara klik *Define – Load Cases – Add New Load* Case lalu ganti nilai DOF pada *Load Aplication* U2 = UY.



Klik *Modify/Show* pada *Load Application* lalu ganti nilai DOF U2 = UY.

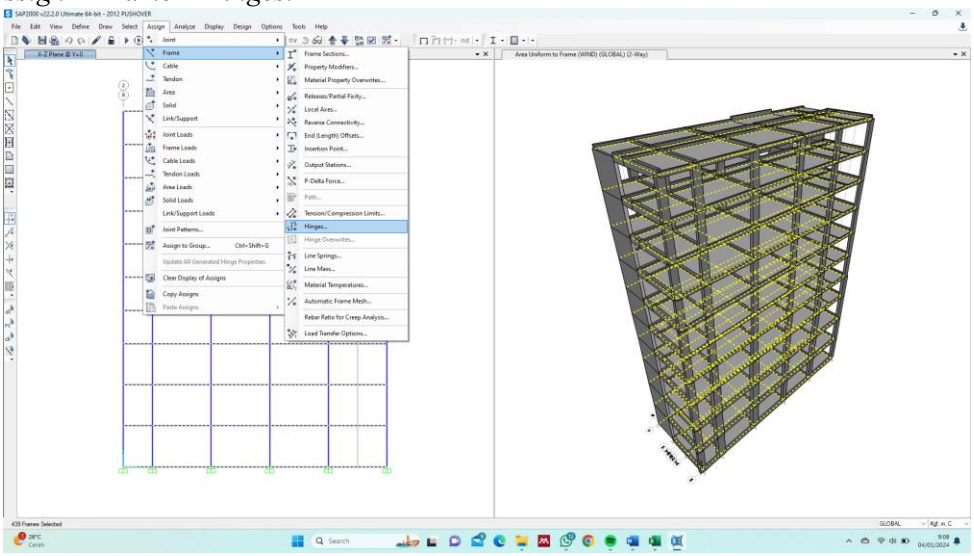


Klik *Modify/Show* pada *Results Saved* dan ganti menjadi *Multiple States*.

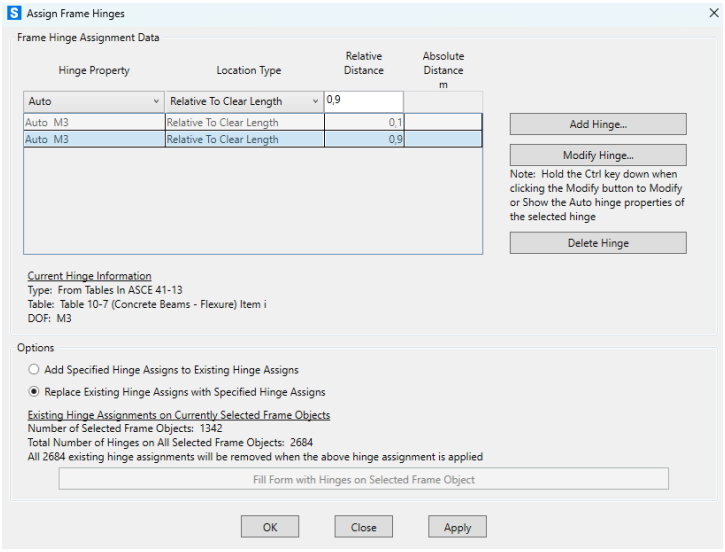


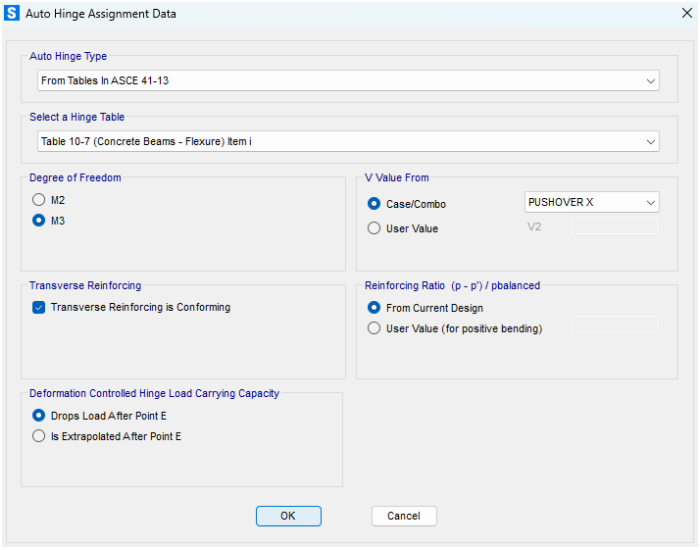
Langkah-2: Membuat *Hinges*

Klik *Select – Properties – Frame Sections* – pilih semua balok – *Select* kemudian klik *Assign – Frame – Hinges*.

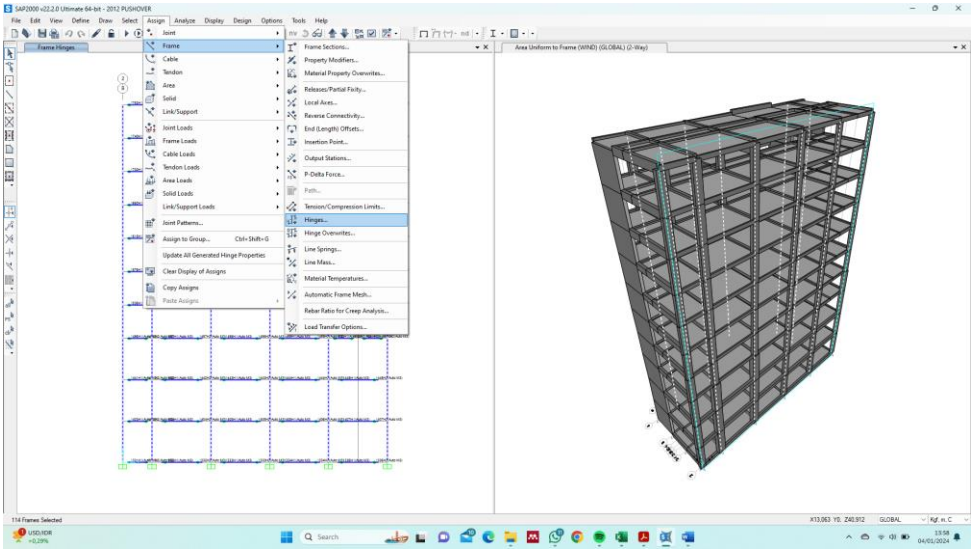


Perlu diketahui nilai *Relative Distance Frame Hinges* sebesar 0,1 dan 0,9 untuk masing-masing *pushover* arah X dan arah Y.

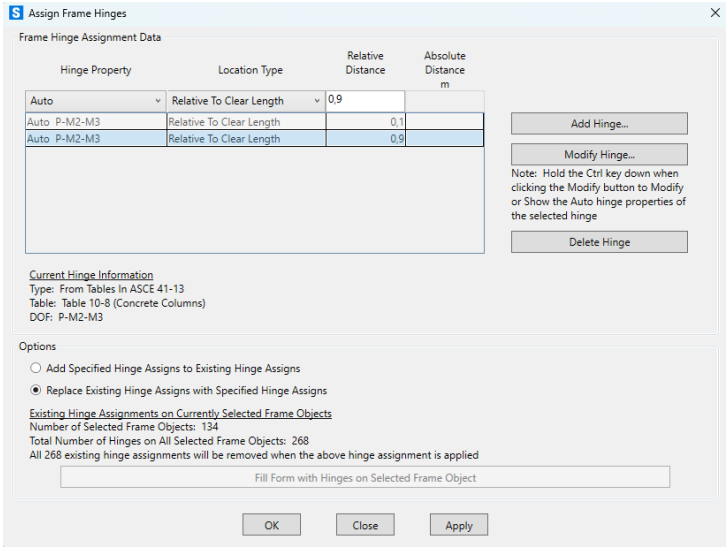


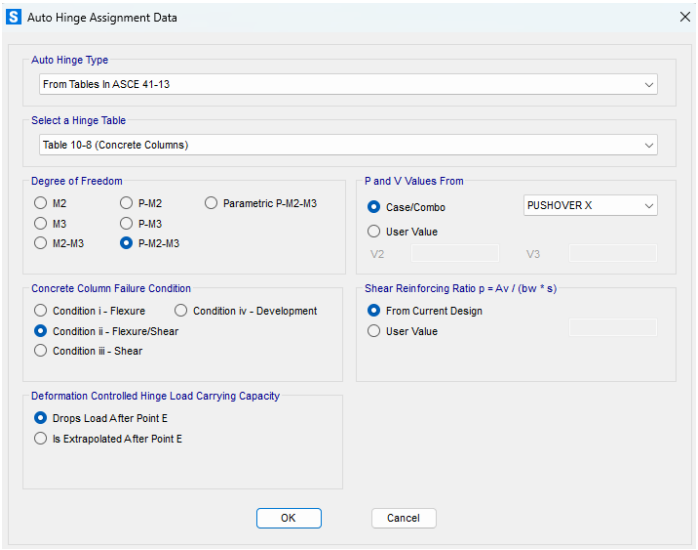


Klik *Select – Properties – Frame Sections* – pilih semua kolom – *Select* kemudian klik *Assign – Frame – Hinges*.

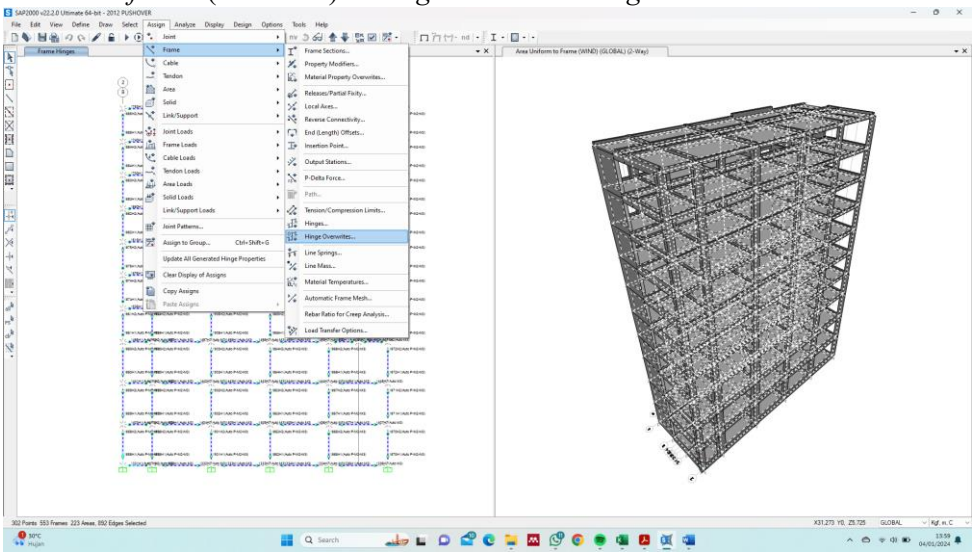


Perlu diketahui nilai *Relative Distance Frame Hinges* sebesar 0,1 dan 0,9 untuk masing-masing *pushover* arah X dan arah Y.

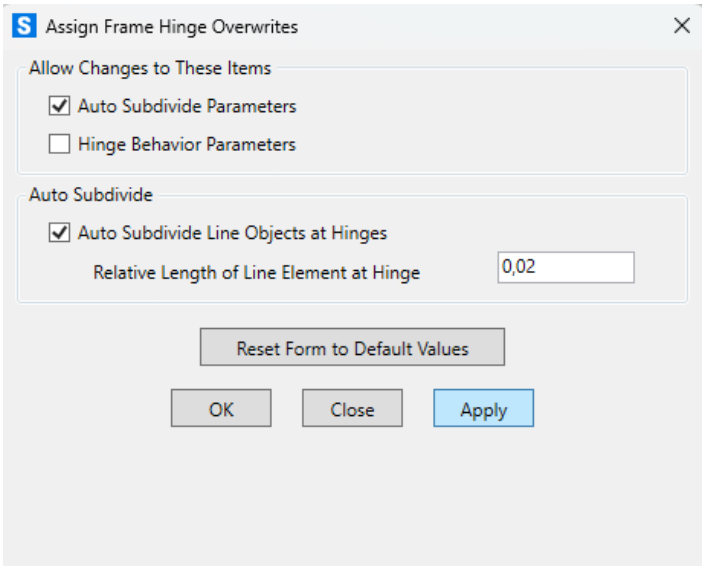




Klik semua *frame* (CTRL+A) – *Assign – Frame – Hinges Overwrites.*

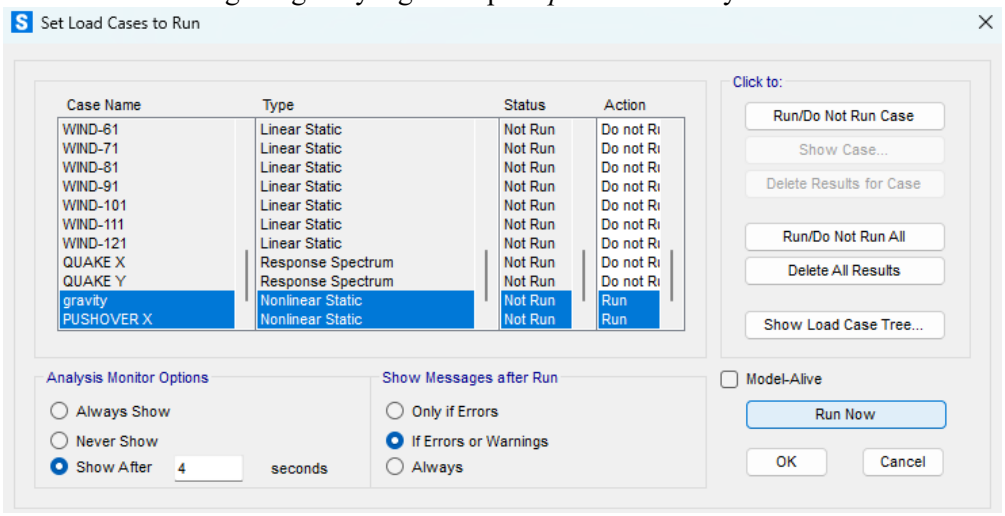


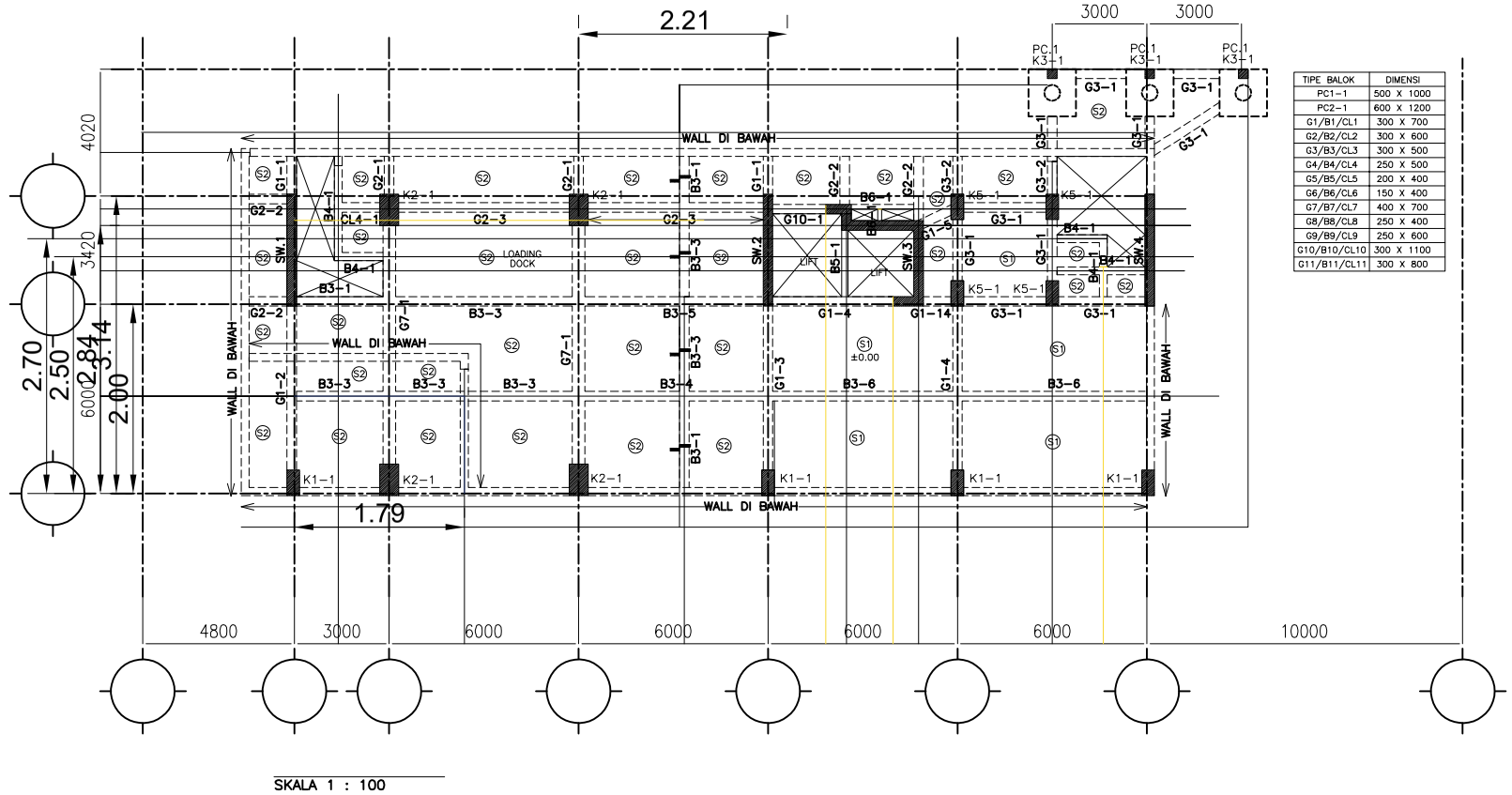
Checklist Auto Subdivide Line Objective at Hinges – Unchecklist Hinge Behavior.



Langkah-3: *Run Analysis*

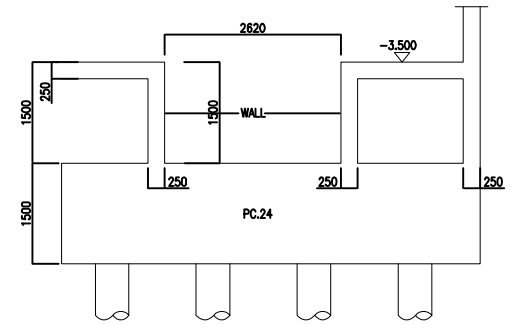
Jika semua langkah telah dilakukan, klik *Analyze – Run Analysis* – pilih *pushover* arah x – *Run Now.* Ulangi langkah yang sama pada *pushover* arah y.



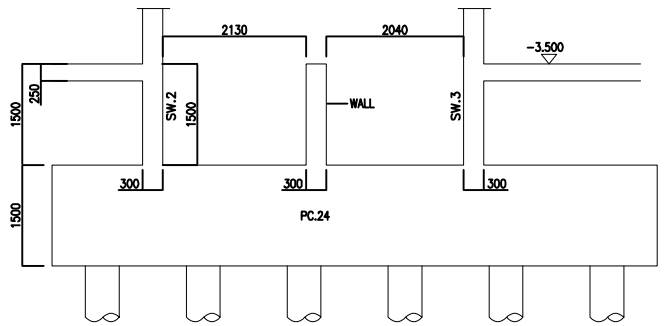


TIPE BALOK	DIMENSI
PC1–1	500 X 1000
PC2–1	600 X 1200
G1/B1/CL1	300 X 700
G2/B2/CL2	300 X 600
G3/B3/CL3	300 X 500
G4/B4/CL4	250 X 500
G5/B5/CL5	200 X 400
G6/B6/CL6	150 X 400
G7/B7/CL7	400 X 700
G8/B8/CL8	250 X 400
G9/B9/CL9	250 X 600
G10/B10/CL10	300 X 1100
G11/B11/CL11	300 X 800

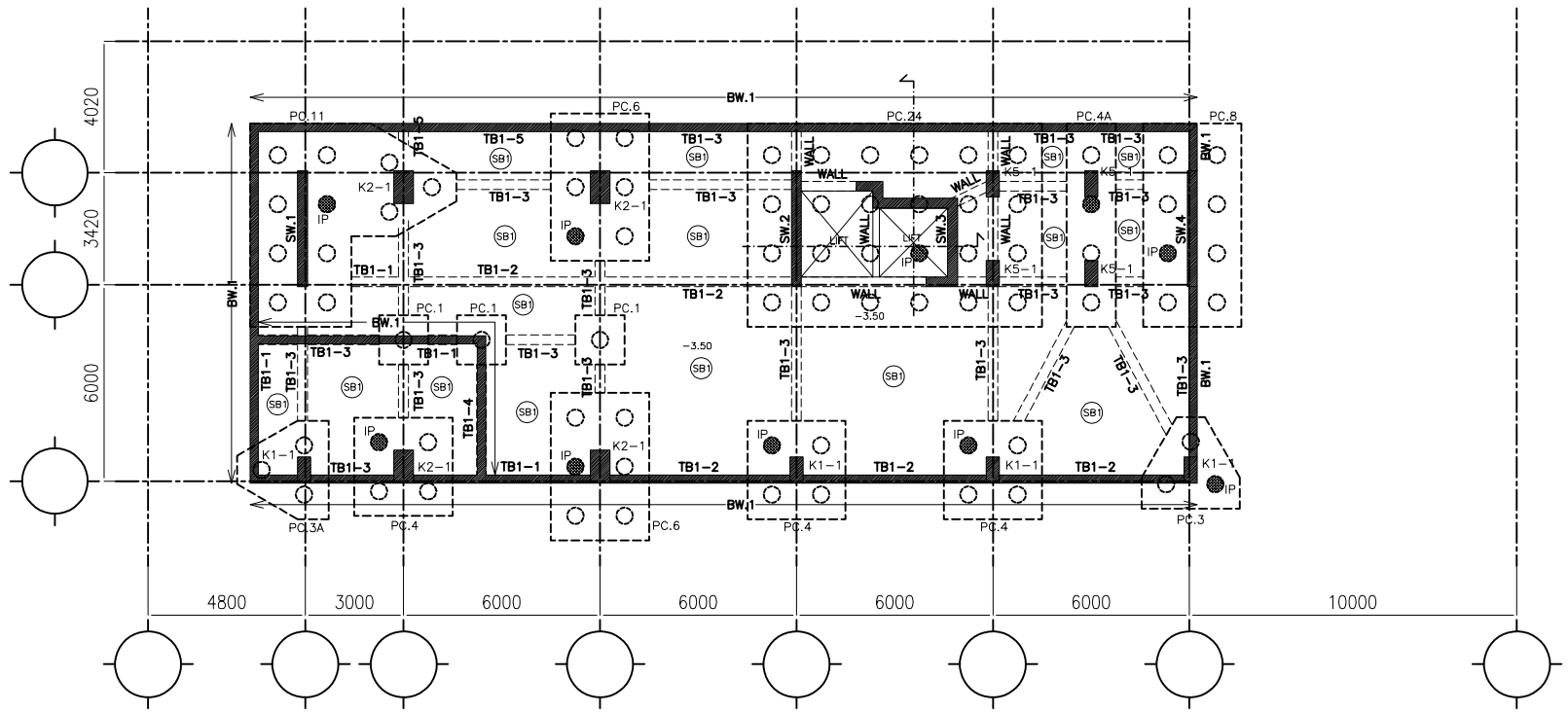
SKALA 1 : 100



POTONGAN B–B
1 : 20

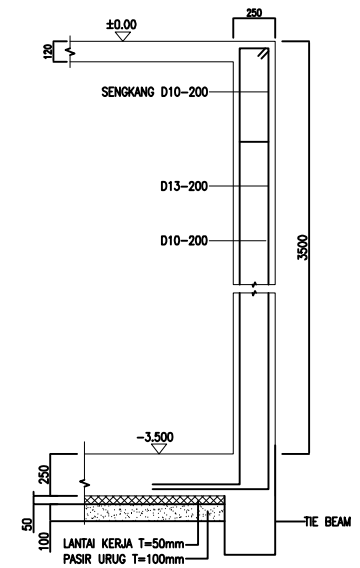


POTONGAN A–A
1 : 20



SKALA 1 : 100

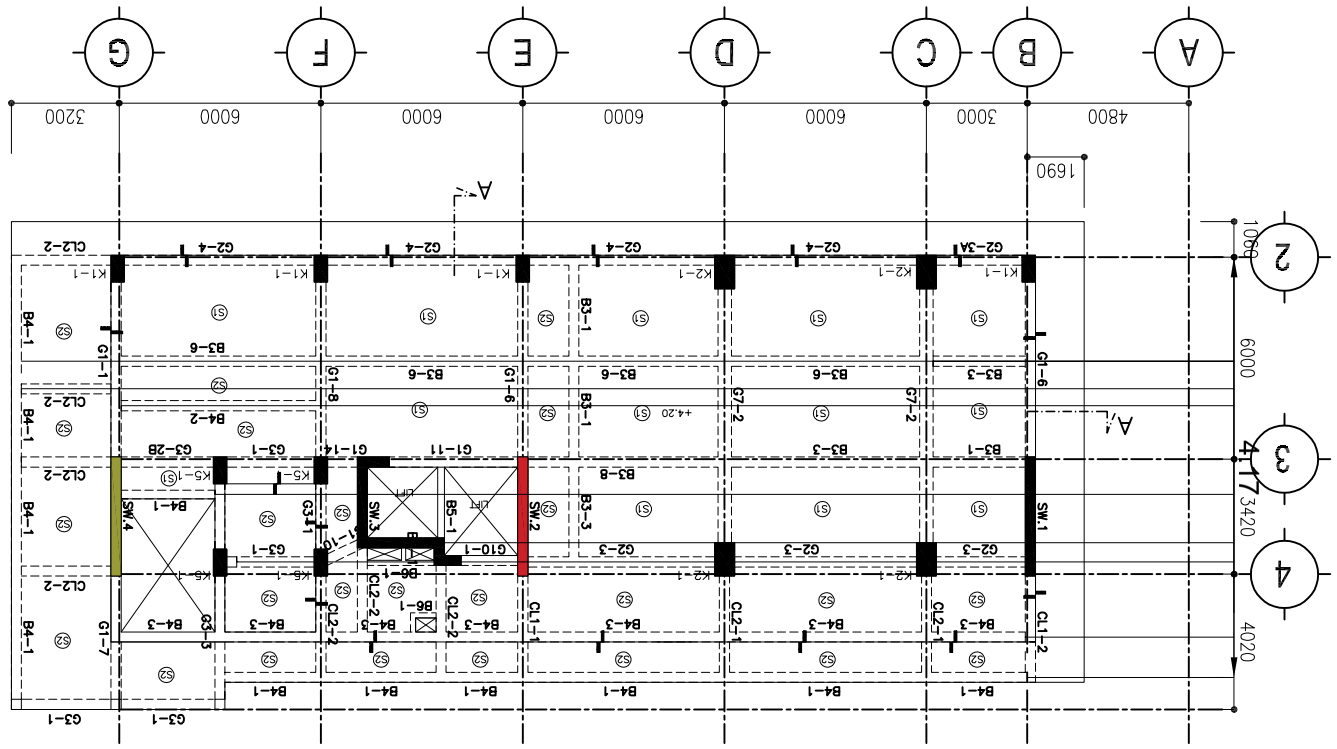
= INDIKATOR PILE



DETAIL BW1
1 : 20

DENAH LANTAI 2

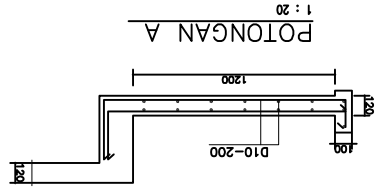
SKALA 1 : 100



TIPE BALOK	DIMENSI
PC1-1	500 X 1000
PC2-1	600 X 1200
G1/B1/CL1	300 X 700
G2/B2/CL2	300 X 600
G3/B3/CL3	300 X 500
G4/B4/CL4	250 X 500
G5/B5/CL5	200 X 400
G6/B6/CL6	150 X 400
G7/B7/CL7	400 X 700
G8/B8/CL8	250 X 400
G9/B9/CL9	250 X 600
G10/B10/CL10	300 X 1100
G11/B11/CL11	300 X 800

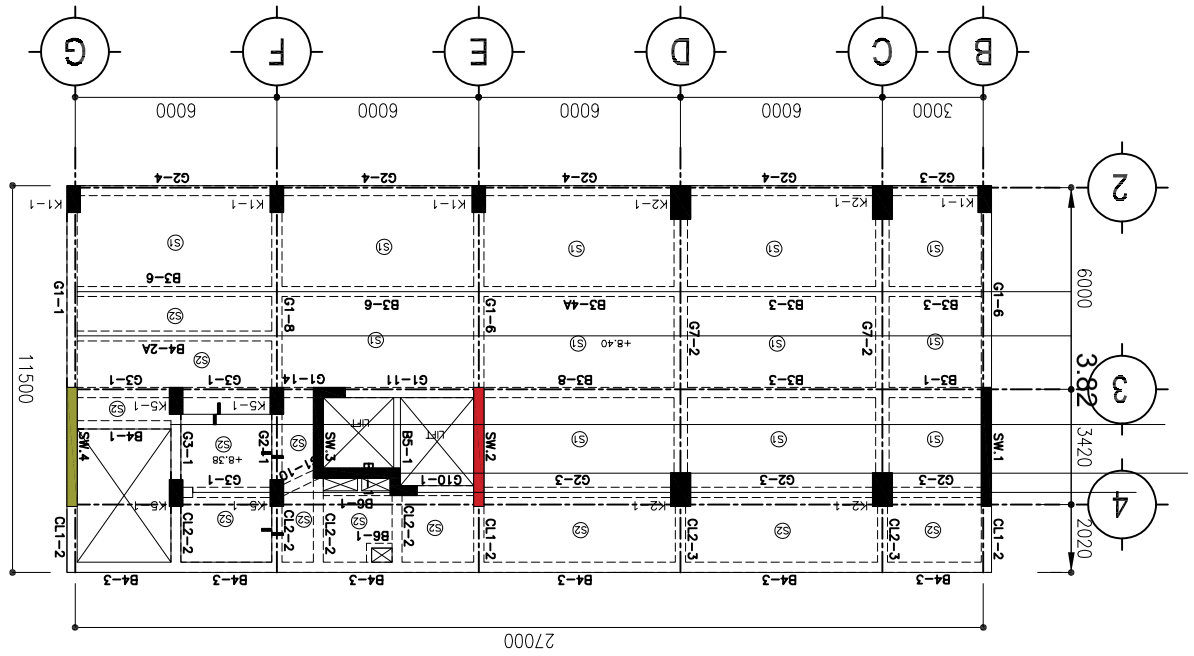
POTONGAN A

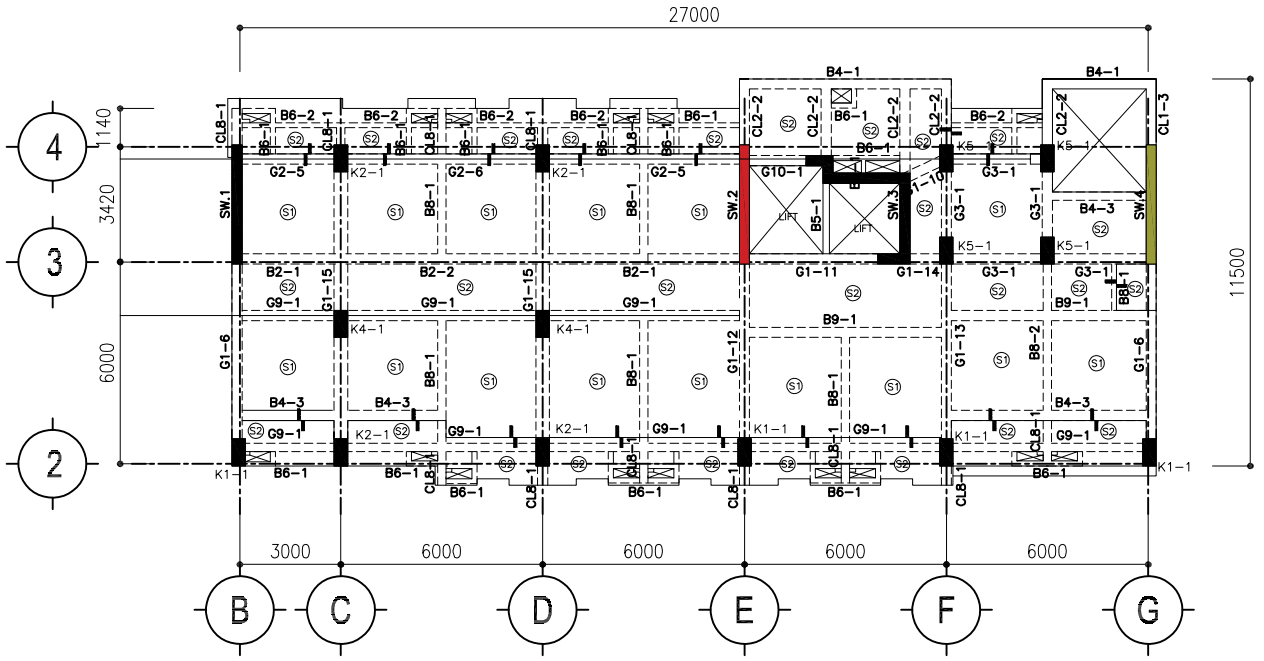
1 : 20



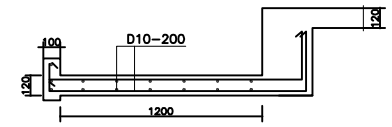
DENAH LANTAI 3

SKALA 1 : 100

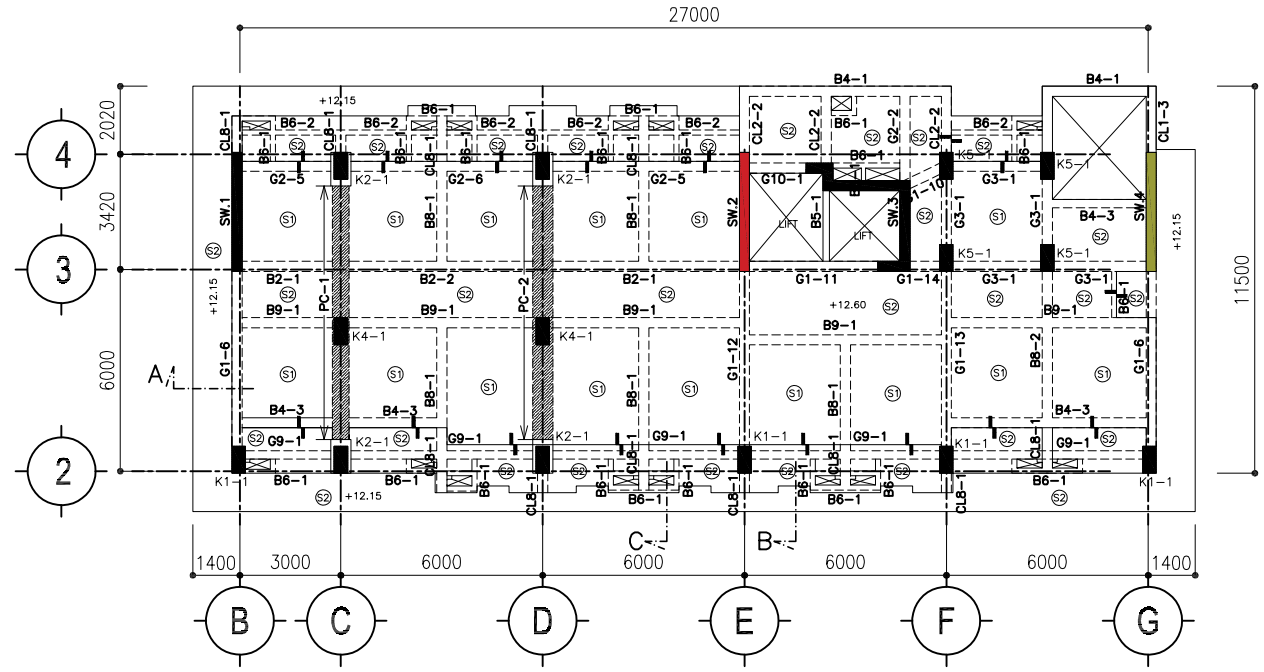




DENAH LANTAI 5 - 10
SKALA 1 : 100

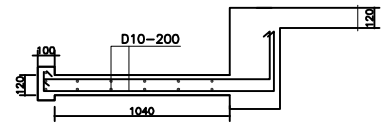


POTONGAN A
1 : 20

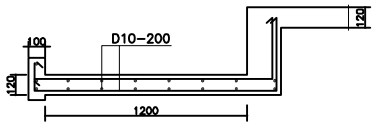


DENAH LANTAI 4
SKALA 1 : 100

TIPE BALOK	DIMENSI
PC1-1	500 X 1000
PC2-1	600 X 1200
G1/B1/CL1	300 X 700
G2/B2/CL2	300 X 600
G3/B3/CL3	300 X 500
G4/B4/CL4	250 X 500
G5/B5/CL5	200 X 400
G6/B6/CL6	150 X 400
G7/B7/CL7	400 X 700
G8/B8/CL8	250 X 400
G9/B9/CL9	250 X 600
G10/B10/CL10	300 X 1100
G11/B11/CL11	300 X 800



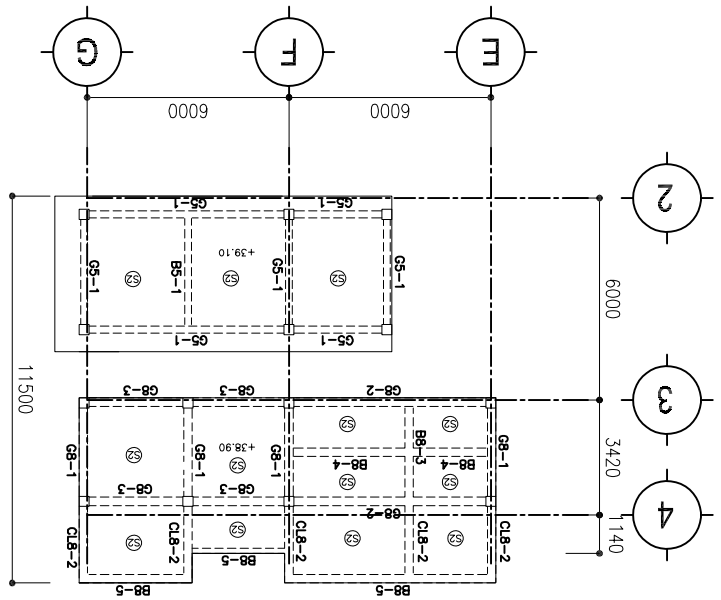
POTONGAN B
1 : 20



POTONGAN C
1 : 20

DENAH ATAP MESIN LIFT

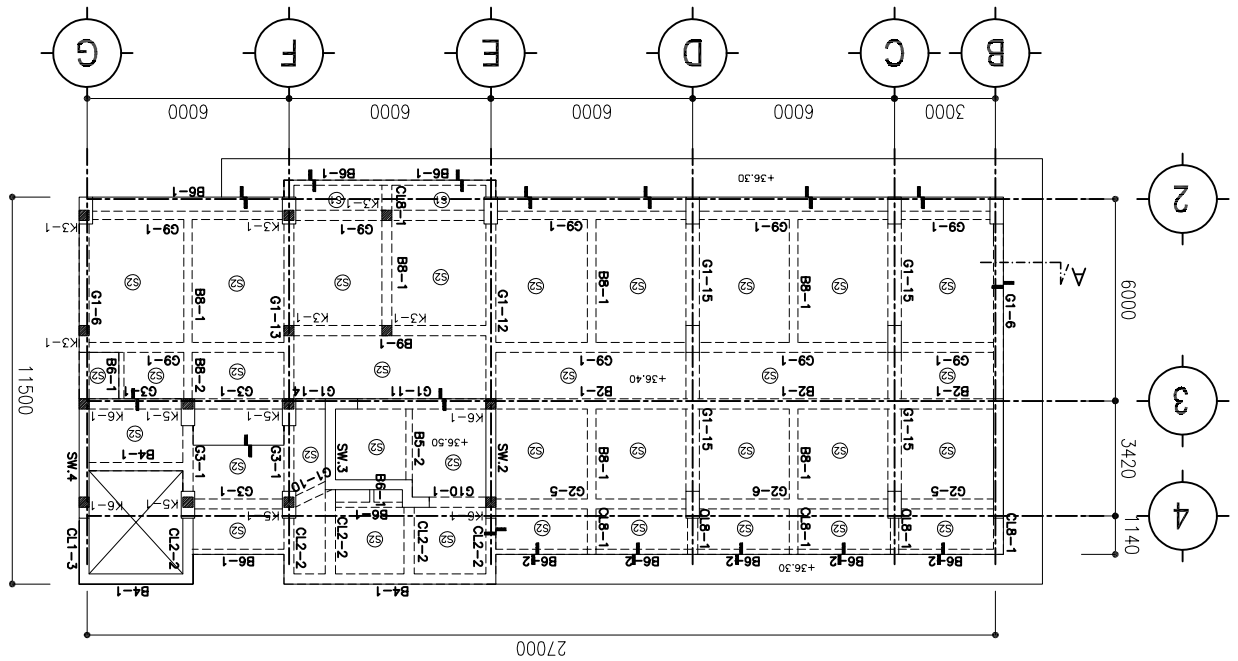
SKALA 1 : 100



TIPE BALOK	DIMENSI
PC1-1	500 X 1000
PC2-1	600 X 1200
G1/B1/CL1	300 X 700
G2/B2/CL2	300 X 600
G3/B3/CL3	300 X 500
G4/B4/CL4	250 X 500
G5/B5/CL5	200 X 400
G6/B6/CL6	150 X 400
G7/B7/CL7	400 X 700
G8/B8/CL8	250 X 400
G9/B9/CL9	250 X 600
G10/B10/CL10	300 X 1100
G11/B11/CL11	300 X 800

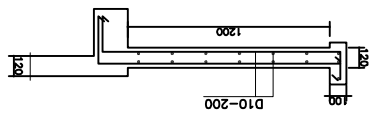
DENAH ATAP

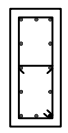
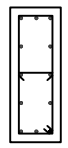
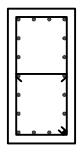
SKALA 1 : 100

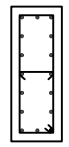
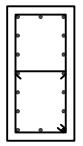
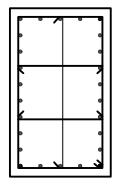


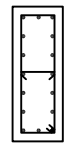
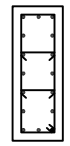
POTONGAN A

1 : 20

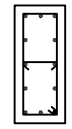
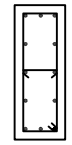
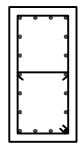


KOLOM / LEVEL	K1–1
DAK ATAP LANTAI 7	
DIMENSI	300 x 700
TULANGAN UTAMA	12 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–300
LANTAI 7 LANTAI 5	
DIMENSI	300 x 800
TULANGAN UTAMA	12 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–300
LANTAI 5 BASEMENT	
DIMENSI	400 x 800
TULANGAN UTAMA	18 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–400

KOLOM / LEVEL	K2–1
DAK ATAP LANTAI 5	
DIMENSI	300 x 800
TULANGAN UTAMA	16 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–300
LANTAI 5 LANTAI 4	
DIMENSI	400 x 800
TULANGAN UTAMA	16 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–400
LANTAI 4 BASEMENT	
DIMENSI	600 x 1000
TULANGAN UTAMA	26 D19
SENGKANG	D10–100 + 3 KAIT D10–100
MUTU	K–400

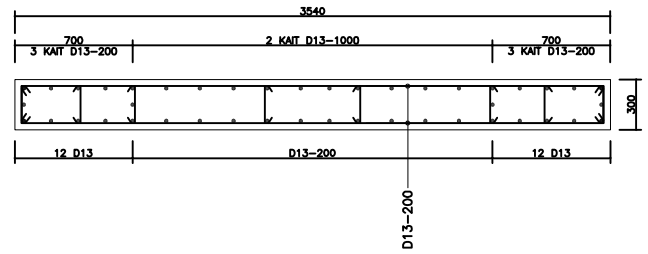
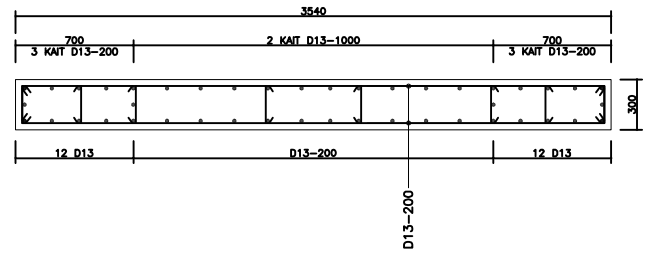
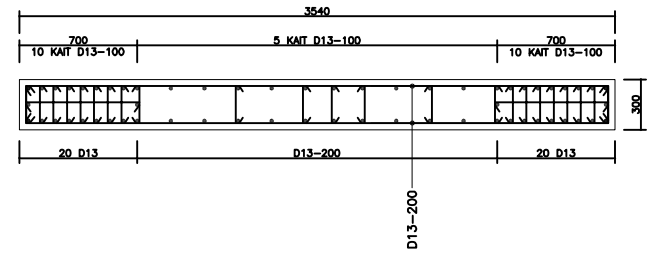
KOLOM / LEVEL	K4–1
DAK ATAP LANTAI 5	
DIMENSI	300 x 800
TULANGAN UTAMA	16 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–300
LANTAI 5 LANTAI 4	
DIMENSI	300 x 800
TULANGAN UTAMA	16 D16
SENGKANG	D10–100 + 2 KAIT D10–100
MUTU	K–400

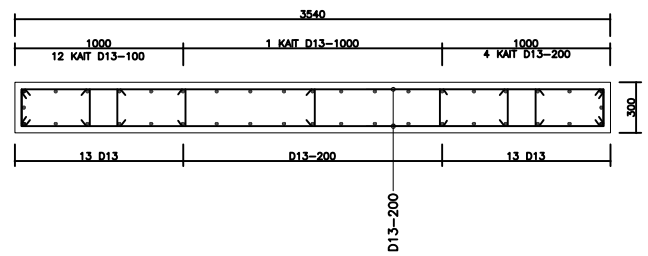
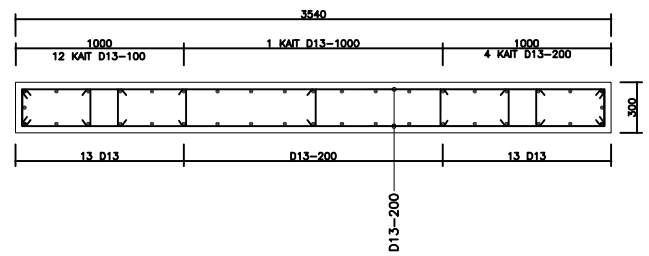
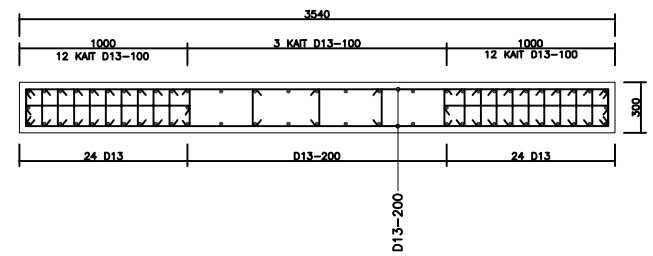
KOLOM / LEVEL	K3–1
LANTAI 2 LANTAI 1	
DIMENSI	300 x 300
TULANGAN UTAMA	8 D13
SENGKANG	D10–100
MUTU	K–300

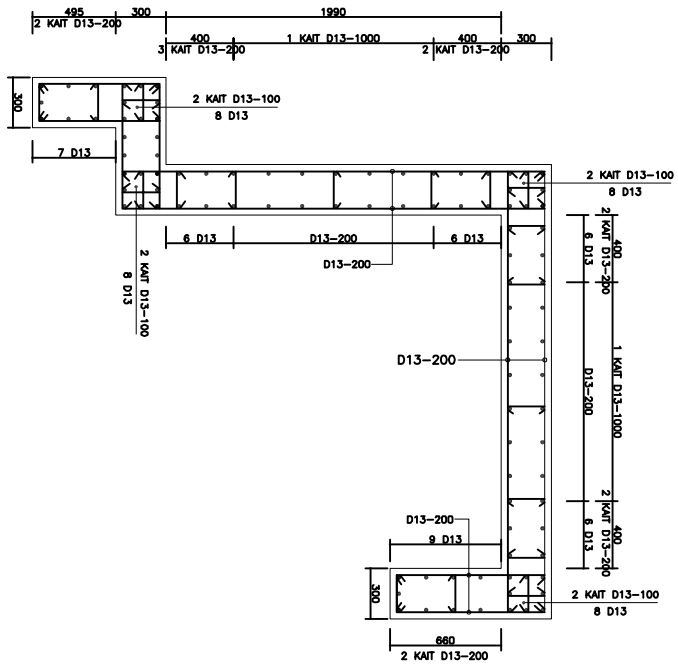
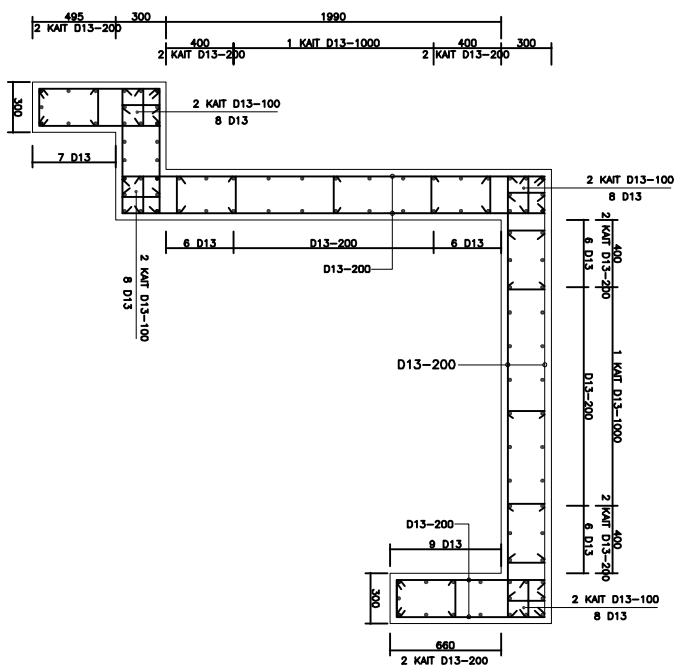
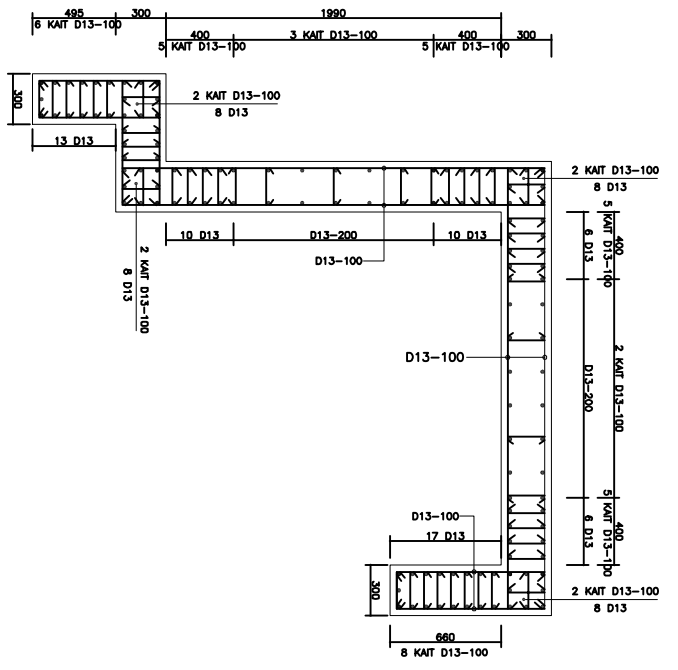
KOLOM / LEVEL	K5–1
ATAP DAK ATAP	
DIMENSI	300 x 300
TULANGAN UTAMA	12 D13
SENGKANG	D10–100
MUTU	K–300
DAK ATAP LANTAI 7	
DIMENSI	300 x 700
TULANGAN UTAMA	12 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–300
LANTAI 7 LANTAI 5	
DIMENSI	300 x 800
TULANGAN UTAMA	12 D16
SENGKANG	D10–100 + 1 KAIT D10–100
MUTU	K–300
LANTAI 5 BASEMENT	
DIMENSI	400 x 800
TULANGAN UTAMA	18 D16
SENGKANG	D10–100 + 2 KAIT D10–100
MUTU	K–400

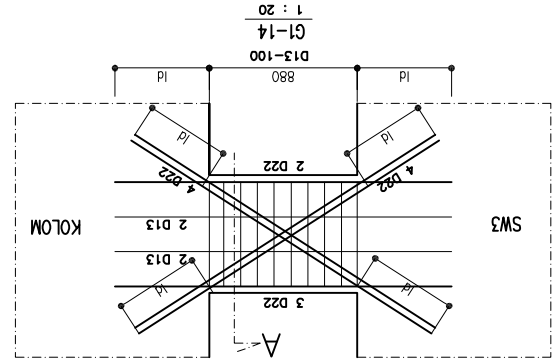
KOLOM / LEVEL	K6–1
ATAP DAK ATAP	
DIMENSI	300 x 300
TULANGAN UTAMA	12 D13
SENGKANG	D10–100
MUTU	K–300

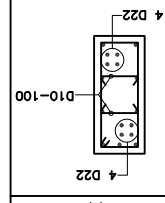
KOLOM / LEVEL	K7–1
LANTAI 1 BASEMENT	
DIMENSI	400 x 400
TULANGAN UTAMA	8 D16
SENGKANG	D10–100
MUTU	K–400

KOLOM / LEVEL						
SW.1 & SW.4		K–300		K–400		K–400
LANTAI ATAP / LANTAI 5		MUTU BETON	LANTAI 5 / LANTAI 2	MUTU BETON	LANTAI 2 / LT BASEMENT	MUTU BETON

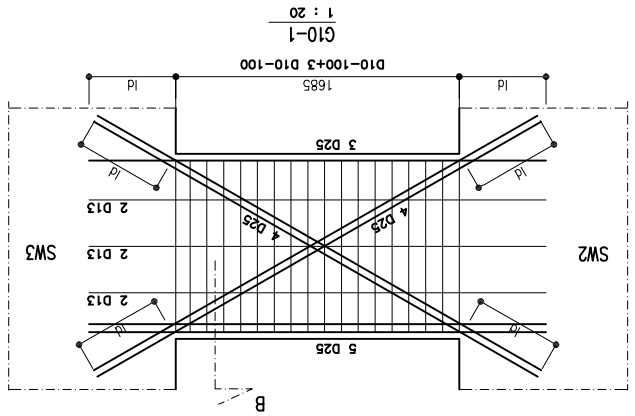
KOLOM / LEVEL						
SW.2		K–300		K–400		K–400
LANTAI ATAP / LANTAI 5		MUTU BETON	LANTAI 5 / LANTAI 2	MUTU BETON	LANTAI 2 / LT BASEMENT	MUTU BETON

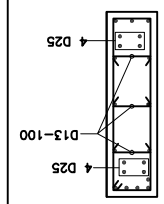
KOLOM / LEVEL	
LANTAI ATAP	
LANTAI 5	
MUTU BETON	K–300
LANTAI 5	
LANTAI 2	
MUTU BETON	K–400
LANTAI 2	
LT BASEMENT	
MUTU BETON	K–400



POTONGAN	A
	

DIMENSI	300 x 700
TULANGAN ATAS	3 D22
TULANGAN SAMPING	4 D13
TULANGAN BAWAH	2 D22
SENGKANG	D10–100



POTONGAN	B
	

DIMENSI	300 x 1000
TULANGAN ATAS	5 D25
TULANGAN SAMPING	6 D13
TULANGAN BAWAH	3 D25
SENGKANG	D13–100

TIPE BALOK	G1–11		G1–12		G1–13		G1–15	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
			SHEAR WALL		KOLOM	KOLOM		
DIMENSI	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700
TULANGAN ATAS	6 D16	4 D16	8 D22	3 D22	5 D22	4 D22	4 D22	3 D22
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	4 D16	4 D16	4 D22	4 D22	3 D22	2 D22	3 D22	3 D22
SENGKANG	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200	3 D10–100	D10–150

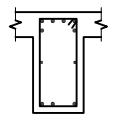
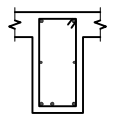
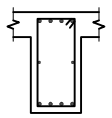
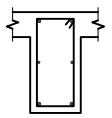
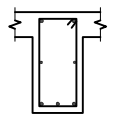
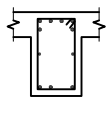
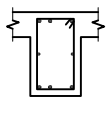
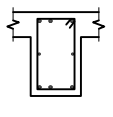
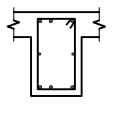
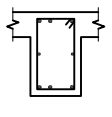
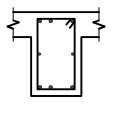
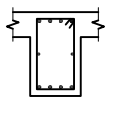
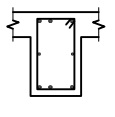
TIPE BALOK	G1–1			G1–2			G1–3			G1–4			G1–5	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN
	SHEAR WALL		WALL	KOLOM		SHEAR WALL	KOLOM		SHEAR WALL					
DIMENSI	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700
TULANGAN ATAS	8 D16	5 D16	5 D16	4 D16	4 D16	4 D16	5 D16	5 D16	6 D16	5 D16	5 D16	4 D16	4 D16	4 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	8 D16	5 D16	4 D16	4 D16	4 D16	6 D16	4 D16	4 D16	4 D16	4 D16	5 D16	5 D16	4 D16	4 D16
SENGKANG	3 D10–100	3 D10–100	3 D10–100	D10–100	D10–100	D10–200	D10–100	D10–100	D10–100	D10–100	D10–200	D10–100	D10–100	D10–100

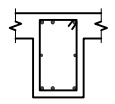
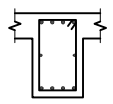
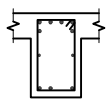
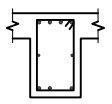
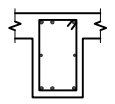
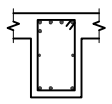
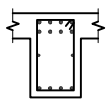
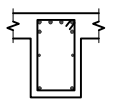
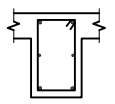
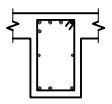
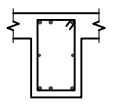
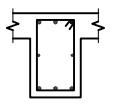
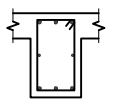
TIPE BALOK	G1–6			G1–7			G1–8			G1–9			G1–10	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN
	SHEAR WALL		KOLOM	KOLOM		SHEAR WALL			SW2	SW3		SHEAR WALL	KOLOM	
DIMENSI	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700
TULANGAN ATAS	6 D22	2 D22	3 D22	2 D22	2 D22	3 D22	4 D22	2 D22	5 D25	7 D25	4 D25	5 D25	3 D25	3 D25
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	3 D22	3 D22	2 D22	2 D22	2 D22	2 D22	3 D22	4 D25	4 D25	4 D25	3 D25	3 D25	3 D25	3 D25
SENGKANG	D10–100	D10–100	D10–100	D10–100	D10–100	D10–200	D10–100	D10–100	D10–100	D10–100	D10–100	D10–100	D10–100	D10–100

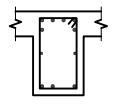
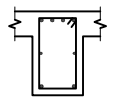
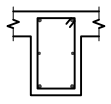
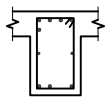
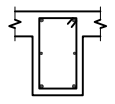
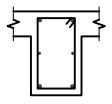
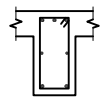
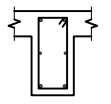
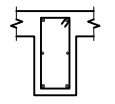
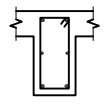
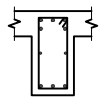
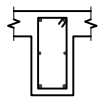
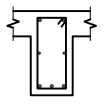
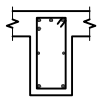
TIPE BALOK	G2–1			G2–2			G2–3		G2–3A		G2–4		G2–5		
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN
	KOLOM		WALL	SHEAR WALL		WALL							SHEAR WALL		KOLOM
DIMENSI	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600
TULANGAN ATAS	3 D22	3 D22	3 D22	3 D16	3 D16	3 D16	4 D16	3 D16	2 D22	2 D22	3 D22	2 D22	4 D19	2 D19	3 D19
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	3 D22	3 D22	3 D22	3 D16	3 D16	3 D16	3 D16	3 D16	2 D22	2 D22	2 D22	2 D22	2 D19	3 D19	2 D19
SENGKANG	3 D10–100	3 D10–100	3 D10–100	D10–100	D10–100	D10–100	D10–100	D10–150	D10–100	D10–150	D10–100	D10–200	D10–150	D10–150	D10–150

TIPE BALOK	G2–6		G3–1		G3–2			G3–2A			G3–2B			G3–3	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN
					KOLOM		SHEAR WALL	KOLOM		SHEAR WALL	KOLOM		SHEAR WALL		
DIMENSI	300 x 600	300 x 600	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500
TULANGAN ATAS	4 D19	2 D19	3 D16	3 D16	3 D16	3 D16	4 D16	3 D16	3 D16	4 D16	3 D16	3 D16	7 D16	3 D16	3 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	2 D19	3 D19	3 D16	3 D16	3 D16	3 D16	3 D16	3 D16	3 D16	3 D16	3 D16	3 D16	4 D16	3 D16	5 D16
SENGKANG	D10–150	D10–200	D10–100	D10–200	3 D10–100	3 D10–100	3 D10–100	D10–100	D10–200	D10–100	D10–100	D10–100	D10–100	D10–100	D10–200

TIPE BALOK	G7–1		G7–2		G8–1		G8–2		G8–3		G9–1	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
DIMENSI	400 x 700	400 x 700	400 x 700	400 x 700	250 x 400	250 x 400	250 x 400	250 x 400	250 x 400	250 x 400	250 x 600	250 x 600
TULANGAN ATAS	9 D22	3 D22	6 D22	3 D22	5 D16	2 D16	5 D16	2 D16	5 D16	2 D16	5 D16	3 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	–	–	–	–	–	–	2 D10	2 D10
TULANGAN BAWAH	3 D22	6 D22	3 D22	5 D22	3 D16	3 D16	3 D16	7 D16	2 D16	2 D16	3 D16	4 D16
SENGKANG	D10–100	D10–200	D10–150	D10–200	D10–100	D10–200	D10–100	D10–200	D10–100	D10–150	D10–100	D10–200

TIPE BALOK	B2–1			B2–2		B3–1			B3–2			B3–3	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN
	 SHEAR WALL					 SHEAR WALL / WALL			 WALL				
DIMENSI	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500
TULANGAN ATAS	6 D19	2 D19	4 D19	2 D19	2 D19	6 D16	3 D16	3 D16	3 D16	3 D16	3 D16	4 D16	3 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	3 D19	3 D19	4 D19	2 D19	3 D19	3 D16	3 D16	3 D16	3 D16	3 D16	3 D16	4 D16	4 D16
SENGKANG	D10–150	D10–200	D10–200	D10–200	D10–200	D10–100	D10–200	D10–200	D10–100	D10–200	D10–200	D10–200	D10–200

TIPE BALOK	B3–4			B3–4A			B3–5			B3–6		B3–7	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
	   AS E	  AS E	  SHEAR WALL	     								
DIMENSI	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500	300 x 500
TULANGAN ATAS	3 D16	4 D16	6 D16	4 D16	3 D16	5 D16	8 D19	6 D19	2 D19	5 D16	3 D16	3 D16	3 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	3 D16	4 D16	3 D16	3 D16	3 D16	3 D16	4 D19	2 D19	2 D19	3 D16	3 D16	3 D16	3 D16
SENGKANG	D10–100	D10–100	D10–100	D10–200	D10–200	D10–200	D10–100	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200

TIPE BALOK	B3–8			B3–8A			B4–1		B4–2			B4–2A		B4–3	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
	 SHEAR WALL			 SHEAR WALL											
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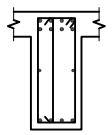
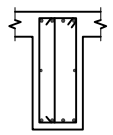
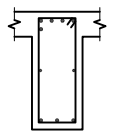
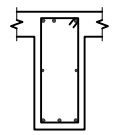
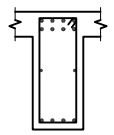
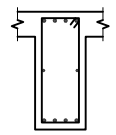
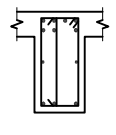
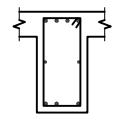
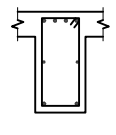
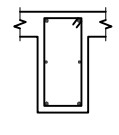
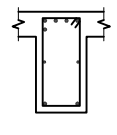
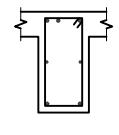
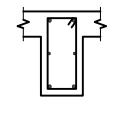
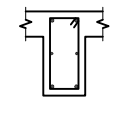
TULANGAN ATAS	6 D19	4 D19	2 D19	5 D19	2 D19	2 D19	3 D16	2 D16	2 D16	2 D16	5 D16	2 D16	2 D16	4 D16	2 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	3 D19	2 D19	2 D19	3 D19	2 D19	2 D19	2 D16	2 D16	2 D16	2 D16	3 D16	2 D16	3 D16	2 D16	3 D16
SENGKANG	D10–100	D10–200	D10–200	D10–100	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200

TIPE BALOK	B4–4			B5–1		B5–2		B6–1		B6–2		B8–1		B8–2	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
	SHEAR WALL														
DIMENSI	250 x 500	250 x 500	250 x 500	200 x 400	200 x 400	200 x 400	200 x 400	150 x 400	150 x 400	150 x 400	150 x 400	250 x 400	250 x 400	250 x 400	250 x 400
TULANGAN ATAS	4 D16	2 D16	2 D16	2 D16	2 D16	3 D16	2 D16	2 D13	2 D13	4 D13	2 D13	4 D16	2 D16	4 D16	2 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	–	–	–	–	–	–	–	–	–	–	–	–
TULANGAN BAWAH	2 D16	2 D16	2 D16	2 D16	2 D16	2 D16	2 D16	2 D13	2 D13	2 D13	2 D13	3 D16	2 D16	3 D16	2 D16
SENGKANG	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–100	D10–100

TIPE BALOK	B8–3		B8–4		B8–5		B9–1	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
DIMENSI	250 x 400	250 x 400	250 x 400	250 x 400	250 x 400	250 x 400	250 x 600	250 x 600
TULANGAN ATAS	3 D16	2 D16	3 D16	2 D16	2 D16	2 D16	4 D16	3 D16
TULANGAN SAMPING	–	–	–	–	–	–	2 D10	2 D10
TULANGAN BAWAH	2 D16	4 D16	3 D16	5 D16	2 D16	3 D16	4 D16	3 D16
SENGKANG	D10–200	D10–200	D10–200	D10–200	D10–200	D10–200	D10–150	D10–150

TIPE BALOK	CL1–1		CL1–2		CL1–3		CL2–1		CL2–2		CL2–3		CL4–1	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
														
DIMENSI	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 700	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	300 x 600	250 x 500	250 x 500
TULANGAN ATAS	8 D22	4 D22	5 D22	3 D22	8 D16	4 D16	7 D22	4 D22	4 D22	2 D22	5 D22	3 D22	2 D16	2 D16
TULANGAN SAMPING	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	4 D22	4 D22	3 D22	3 D22	4 D16	4 D16	3 D22	3 D22	2 D22	2 D22	2 D22	2 D22	2 D16	2 D16
SENGKANG	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200	D10–200	D10–200

TIPE BALOK	CL8–1		CL8–2		CL11–1		CL11–2	
POSISI	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN	TUMPUAN	LAPANGAN
DIMENSI	250 x 400	250 x 400	250 x 400	250 x 400	300 x 800	300 x 800	300 x 800	300 x 800
TULANGAN ATAS	3 D16	3 D16	6 D16	3 D16	6 D16	4 D16	4 D16	4 D16
TULANGAN SAMPING	–	–	–	–	2 D10	2 D10	2 D10	2 D10
TULANGAN BAWAH	3 D16	3 D16	3 D16	3 D16	4 D16	4 D16	4 D16	4 D16
SENGKANG	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200	D10–100	D10–200