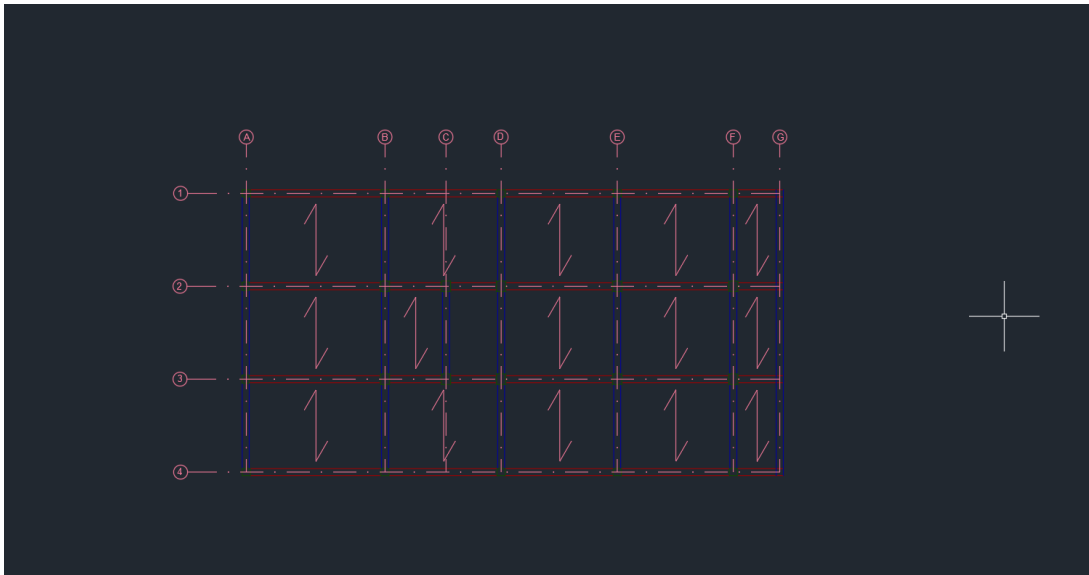


II ESERCITAZIONE:



Grid only

X-Y plane (Z=3) ci indica il piano sul quale stiamo lavorando, quindi z=3 è il piano delle travi

Define → Section properties → Frame sections : per poter iniziare a definire le travi

TRAVI PRINCIPALI:

Add new property → Concrete → Rectangular → assegno un nome TRAVE PRINCIPALE → Material + → Add new material → Italy, Material, Standard, Classe di resistenza (C 28/35 quella che viene generalmente utilizzata) → OK → lo seleziono → Assegno dimensioni (es: h 60 cm e b 30 cm) → Assegno Display color

TRAVI SECONDARIE:

Add copy of property → modifico alcuni parametri

PILASTRI:

Add copy of property → modifico alcuni parametri

Draw frame table → ci dirà le proprietà che vado ad assegnare all'oggetto che stò per disegnare → Straight frame → section: TRAVE PRINCIPALE → vado a definire quali sono le travi principali → INVIO → ripeto l'operazione per tutti gli altri gruppi

Per controllare clicco con il dx sul frame → Line information

Set display options → View by color of → section

Doppio click/ tasto dx → Edit grid data → Modify/Show system → posso aggiungere ulteriori campate al mio modello → copio le proprietà

I nodi, nelle costruzioni in cemento armato, corrispondono molto di più ad un incastro che ad una cerniera, devo quindi garantire la continuità della trasmissione del MOMENTO

Divido per gruppi

PILASTRI:

Assign → Assign to group → Add new group → assegno un nome PILASTRI PT → lascio le spunte di default

TRAVI PRINCIPALI:

Assign → Assign to group → Add new group → assegno un nome TRAVI P_PT → lascio le spunte di default

TRAVI SECONDARIE:

Assign → Assign to group → Add new group → assegno un nome TRAVI S_PT → lascio le spunte di default

✓ → Set display options → View type → Estruded

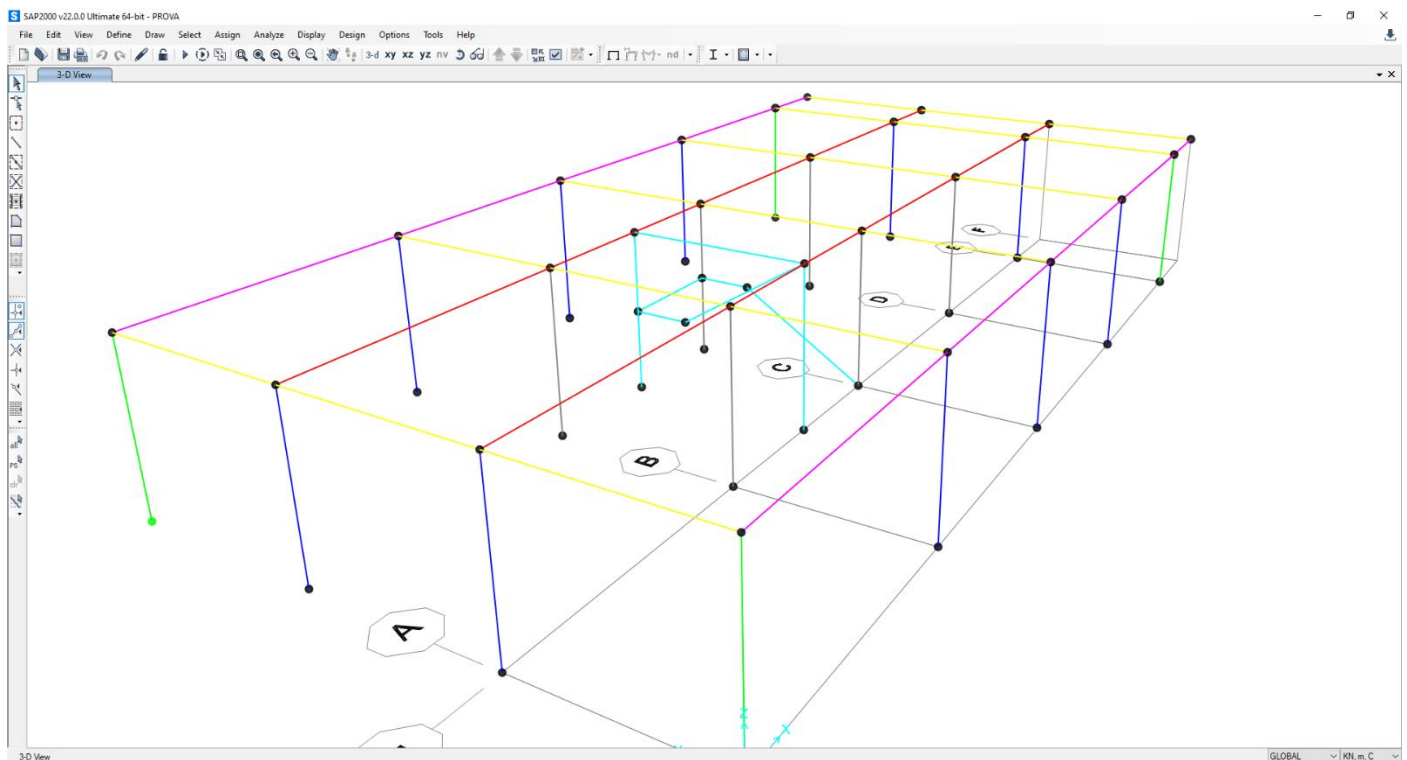
E' possibile ruotare l'orientamento dei pilastri perimetrali

Assing → Frame → Local Axis (ci sarà una rotazione intorno all'asse 1, in questo caso l'asse verticale es:90°)

VANO SCALE:

Utilizzo il metodo con i punti

Draw spacial joint → si apre la tabella → assegno una misura lungo x o y, success. da qualsiasi punto io cliccherò mi farà un offset (es: x -3 y 2.4 / + o - in base alla direzione) → assegno i punti alla quota di 3 m → disegno i pilastri



Define → Section properties → Frame sections → Add copy of property → PILASTRI VANO SCALE 30 x 30 (assegno colore)

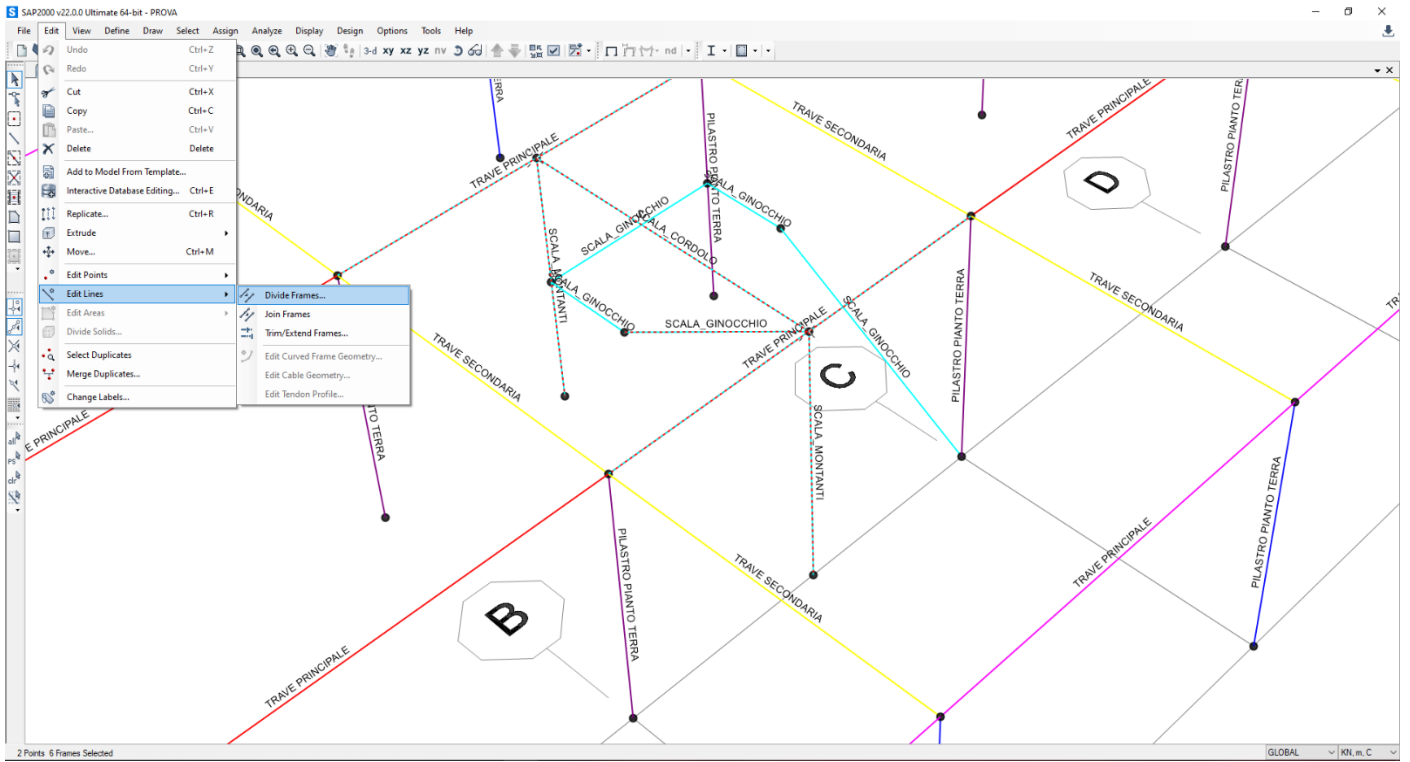
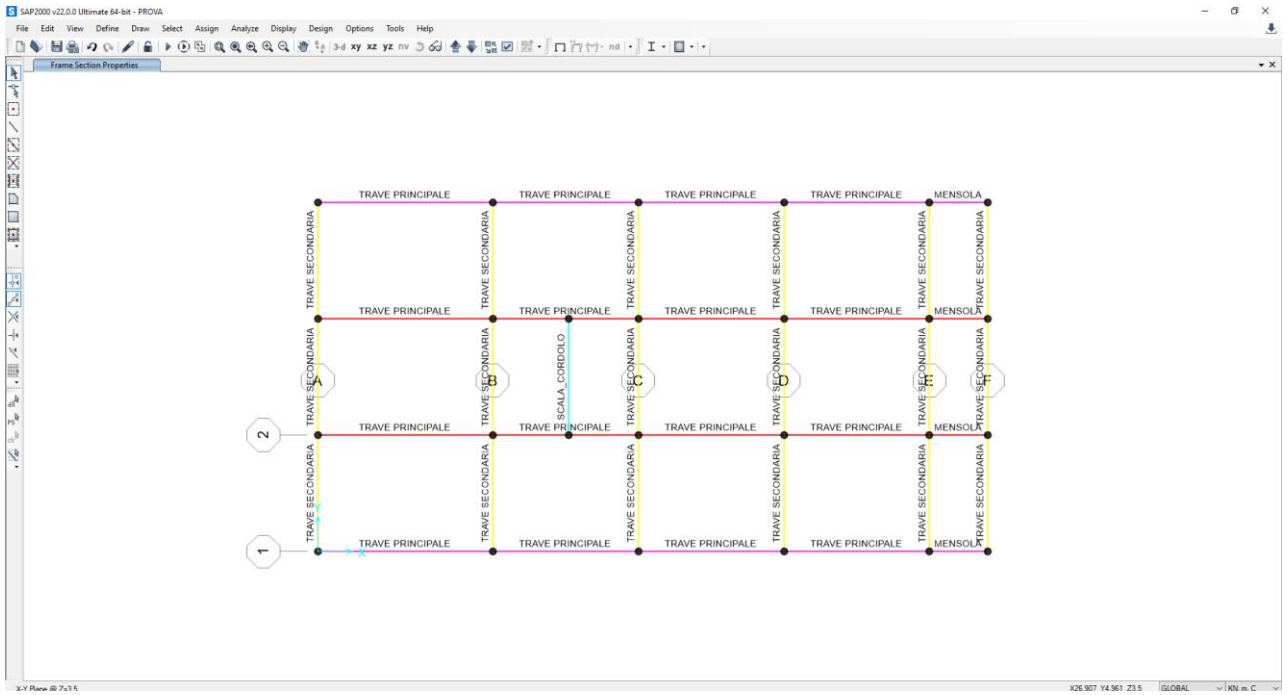
Define → Section properties → Frame sections → Add copy of property → CERCHIATURA 40 x 30 (assegno colore)

(Disegno pilastri verticali → si crea un buco nel solaio → ci andranno delle travi per creare un'asola)

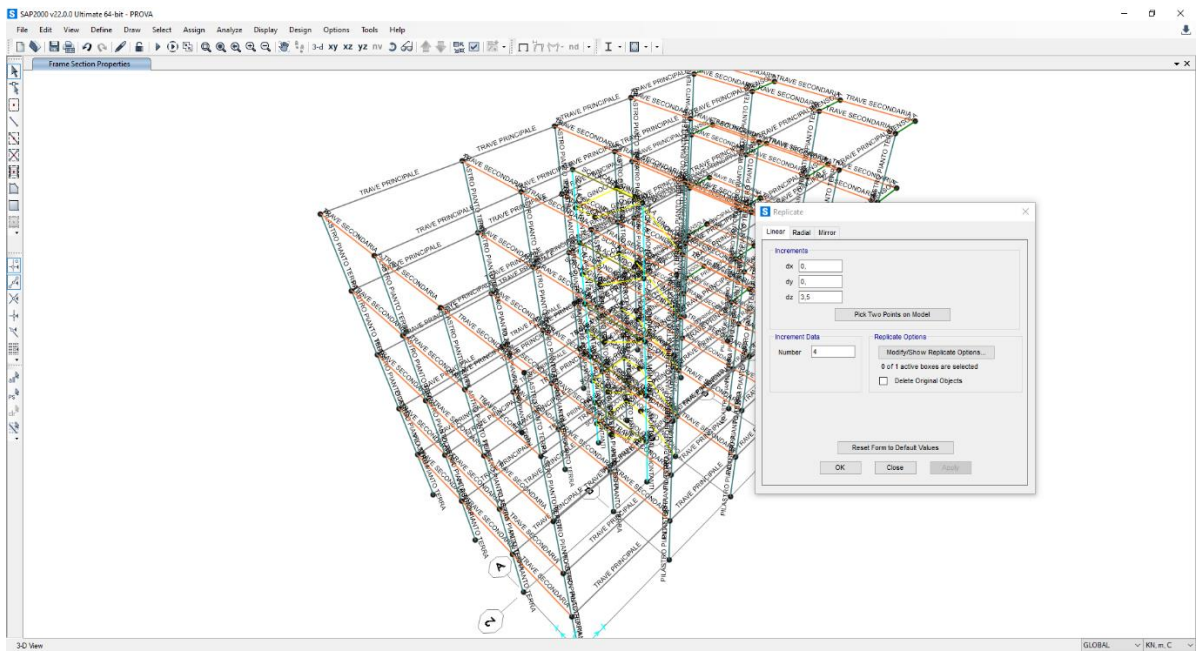
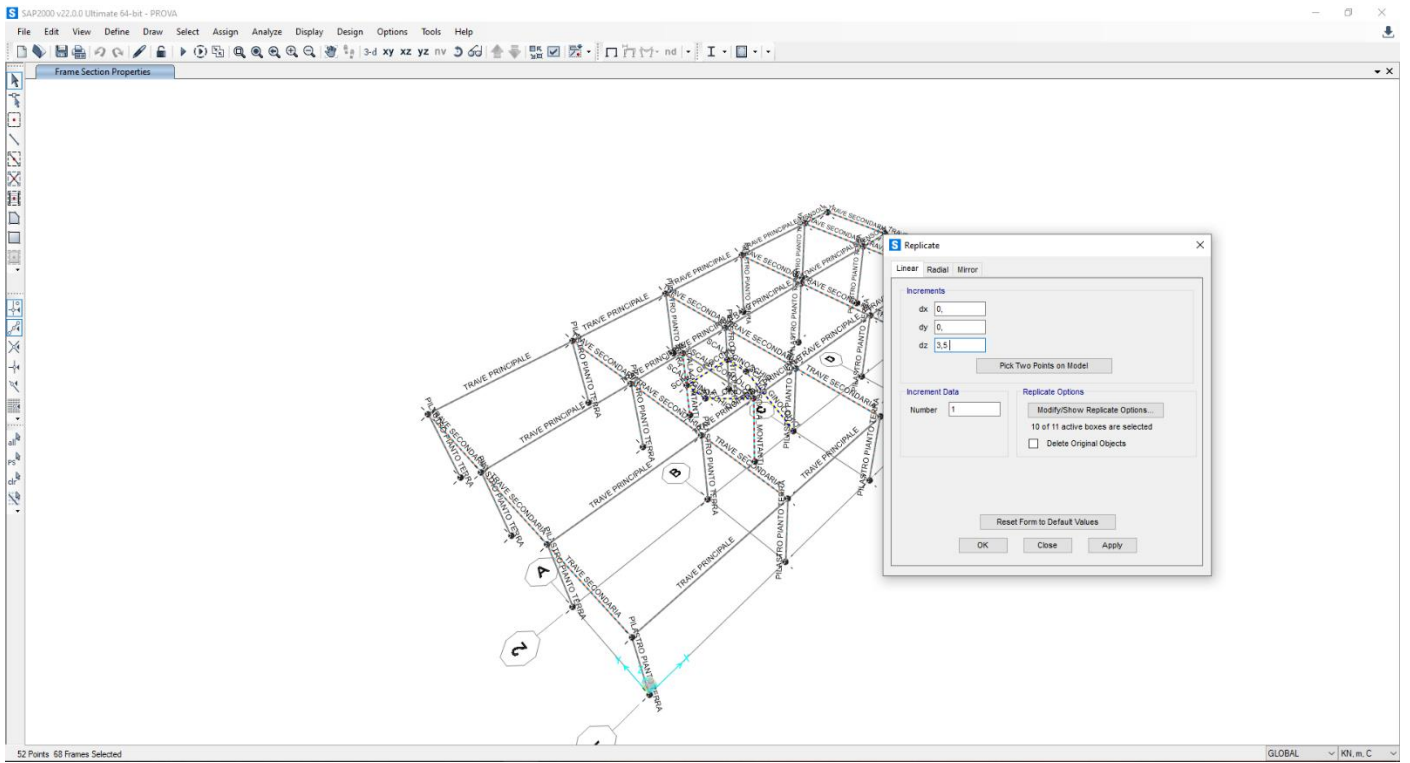
Define → Section properties → Frame sections → Add copy of property → TRAVE A GINOCCHIO 40 x 25 (assegno colore)

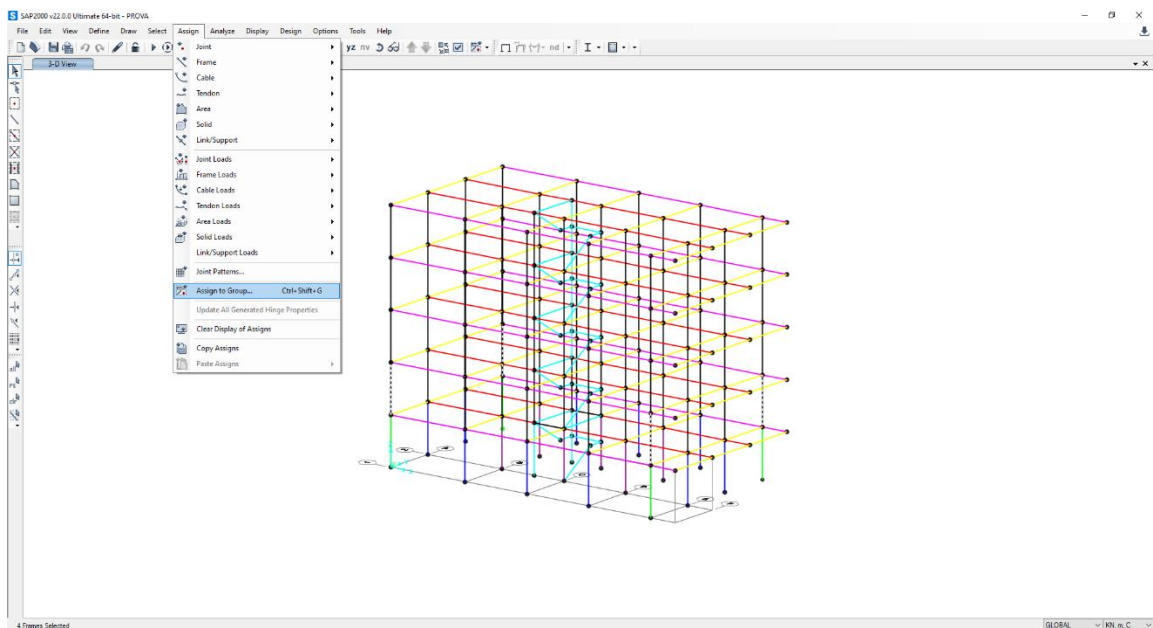
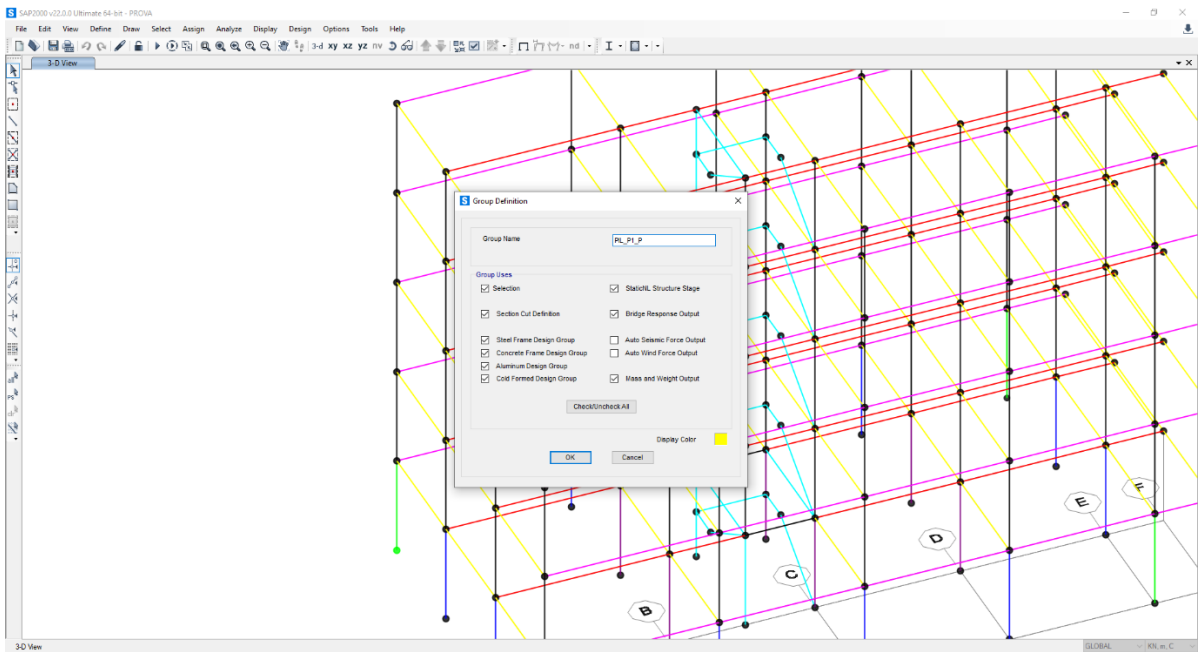
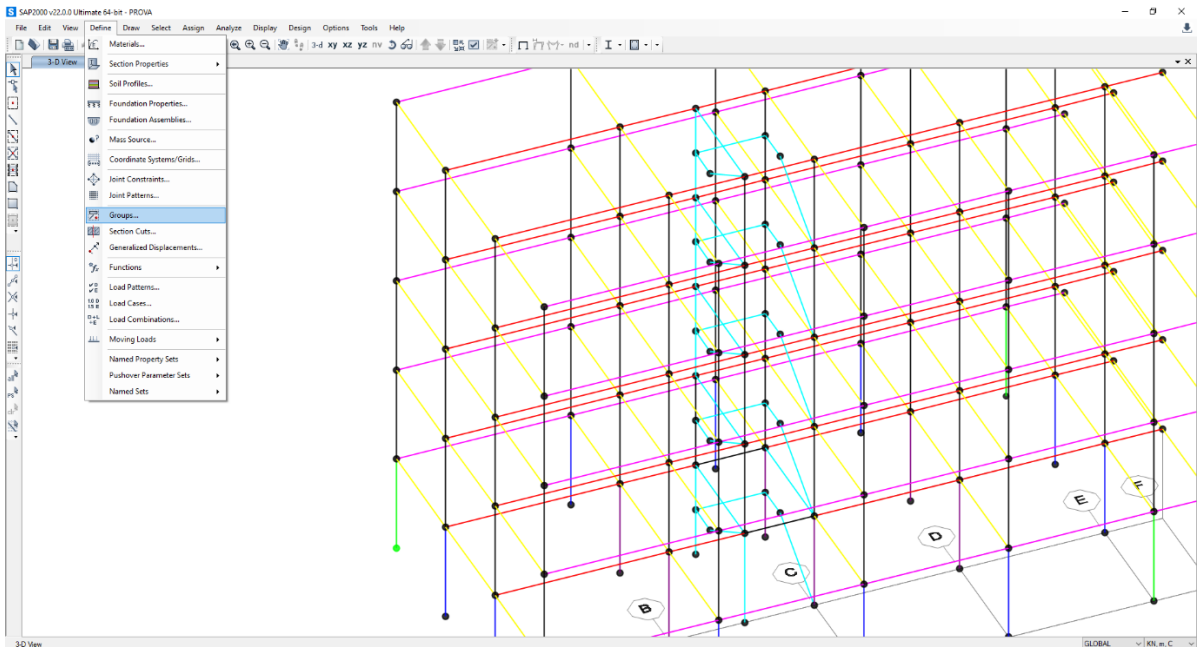
Per poter inserire la trave a ginocchio devo andare alla metà del pilastro → Ends and Medpoints

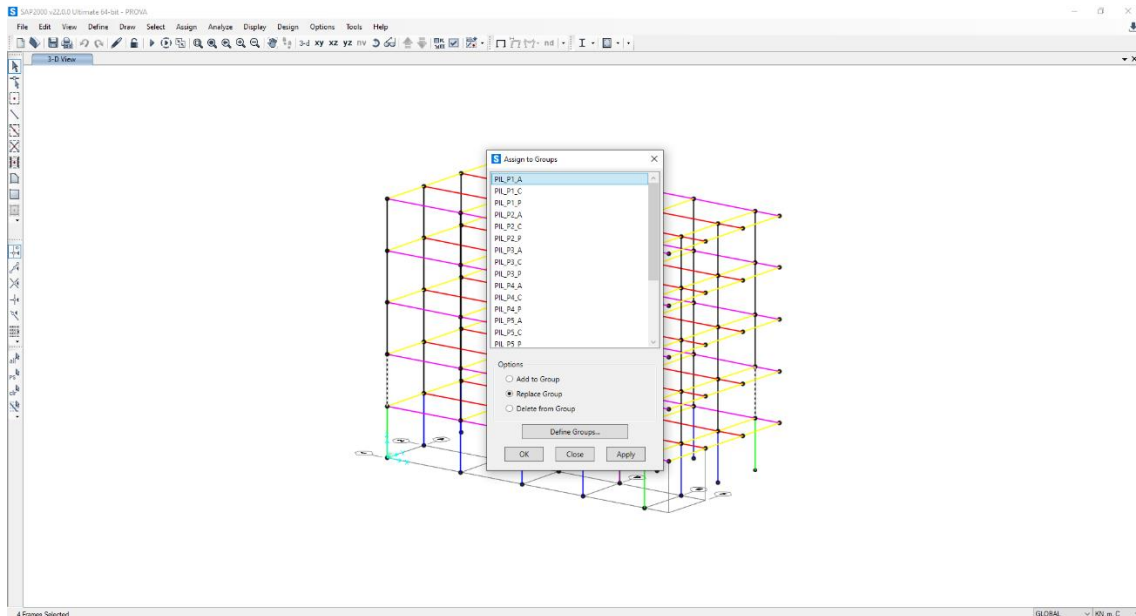
La trave a ginocchio una volta arrivata al pilastro, poi si "piegherà" per sostenere il pianerottolo → Draw special joint (es -1) → Draw frame per poter disegnare la trave a ginocchio e il pianerottolo → poi assegno la sezione e le proprietà



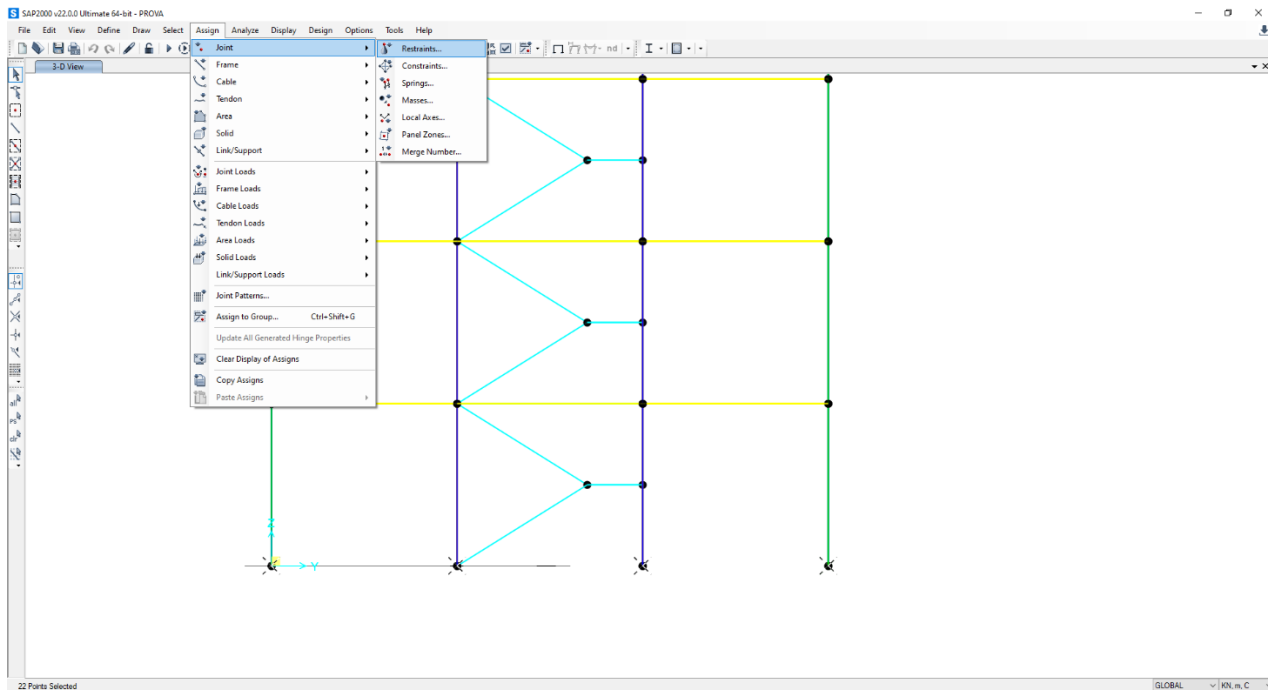
Seleziono tutto → Ctrl +R → dz 3 (altezza dove deve copiare il modello) → number (il numero delle volte che deve copiare) → controllare se ha copiato tutte le proprietà → riassegnare i gruppi perché SAP li perde sempre

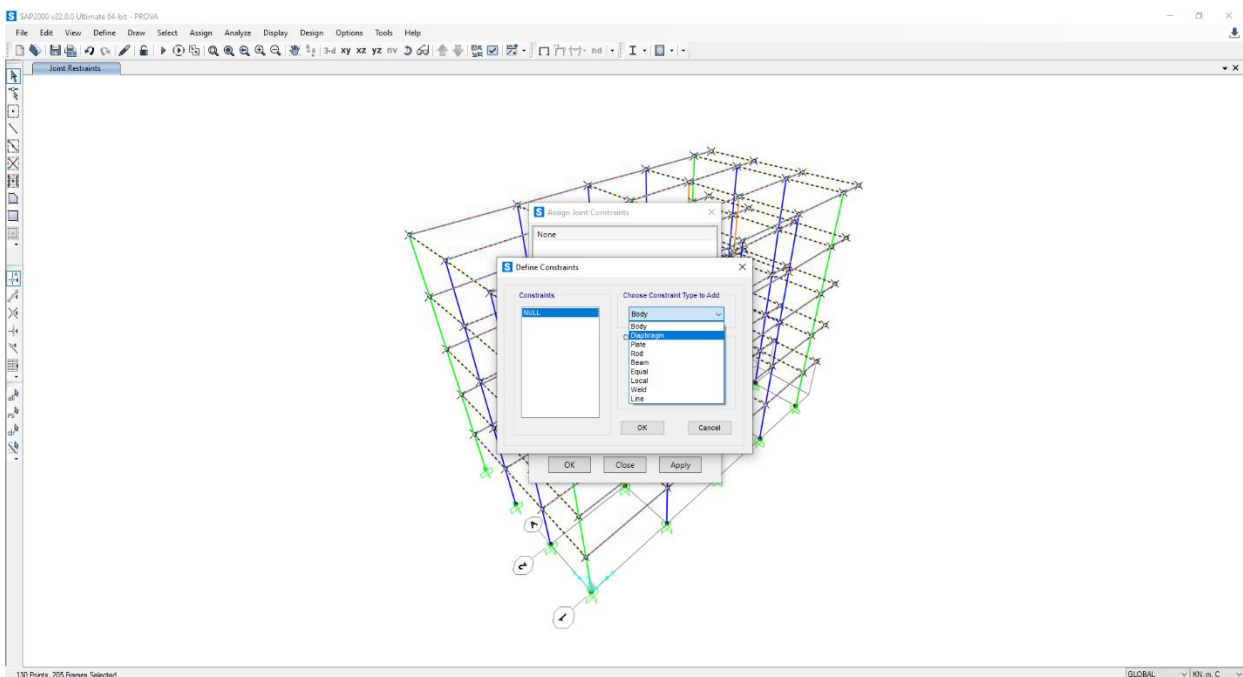
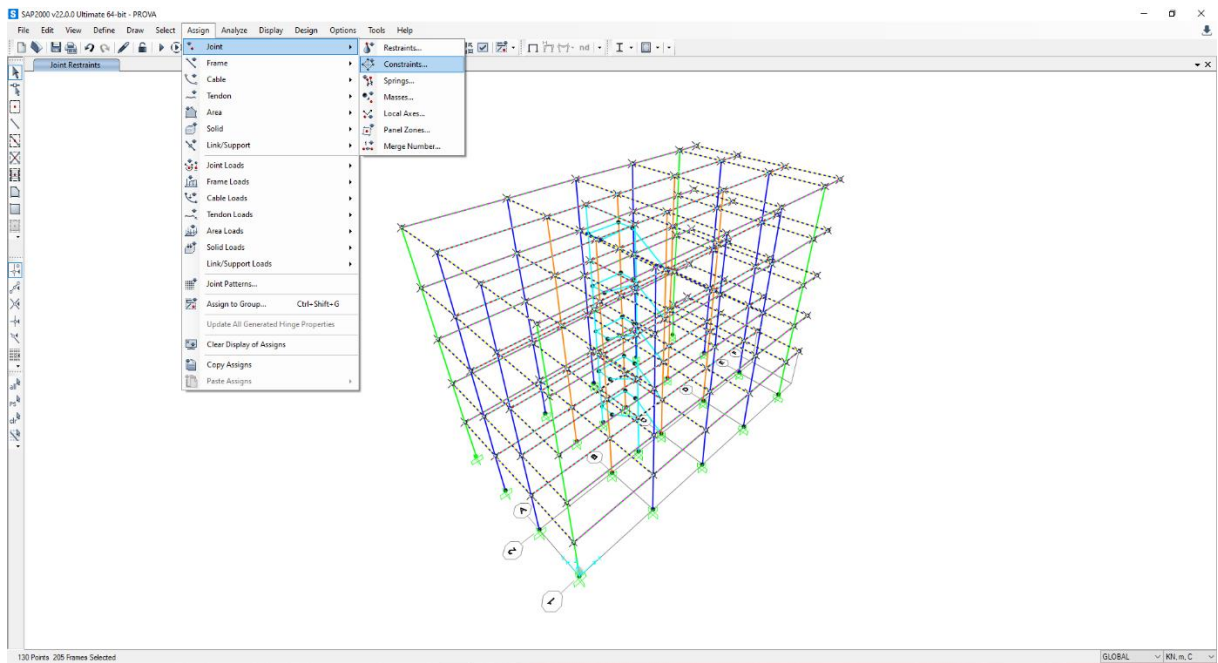
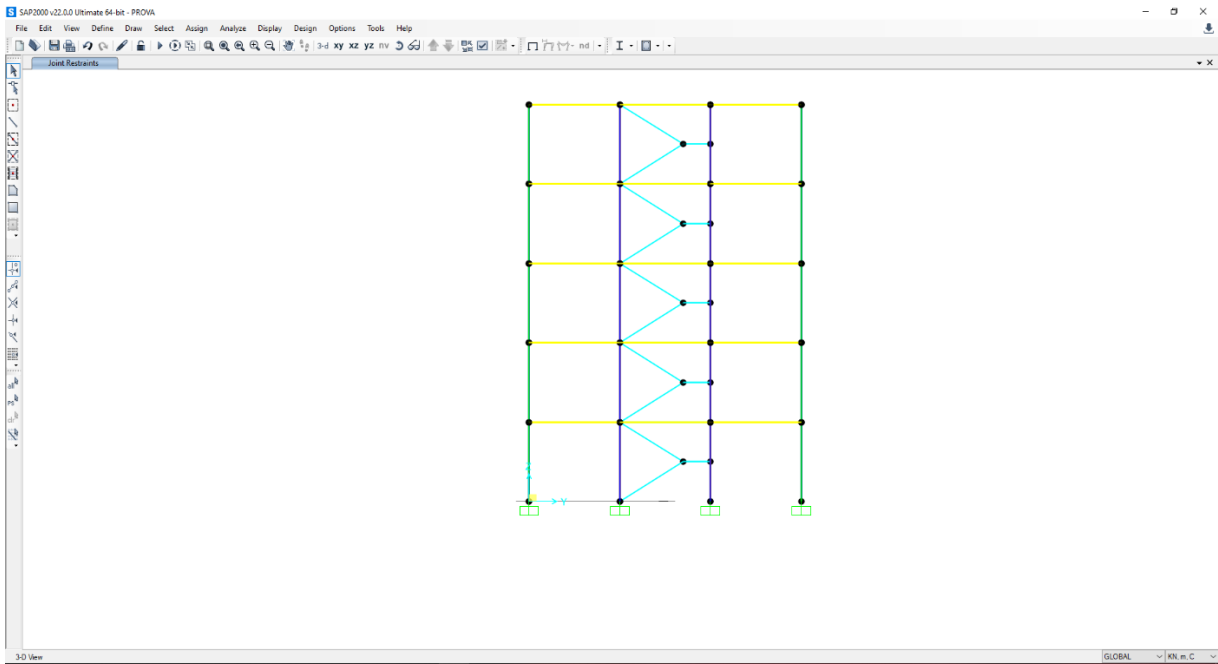


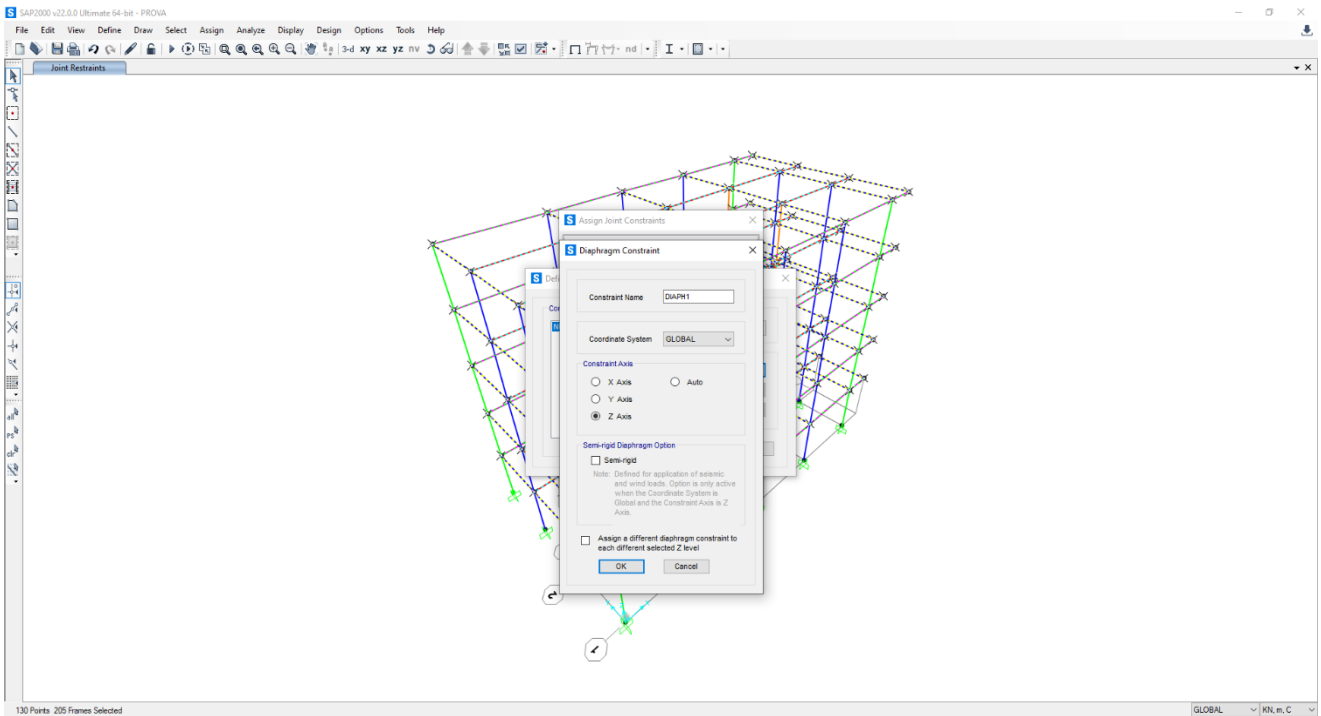




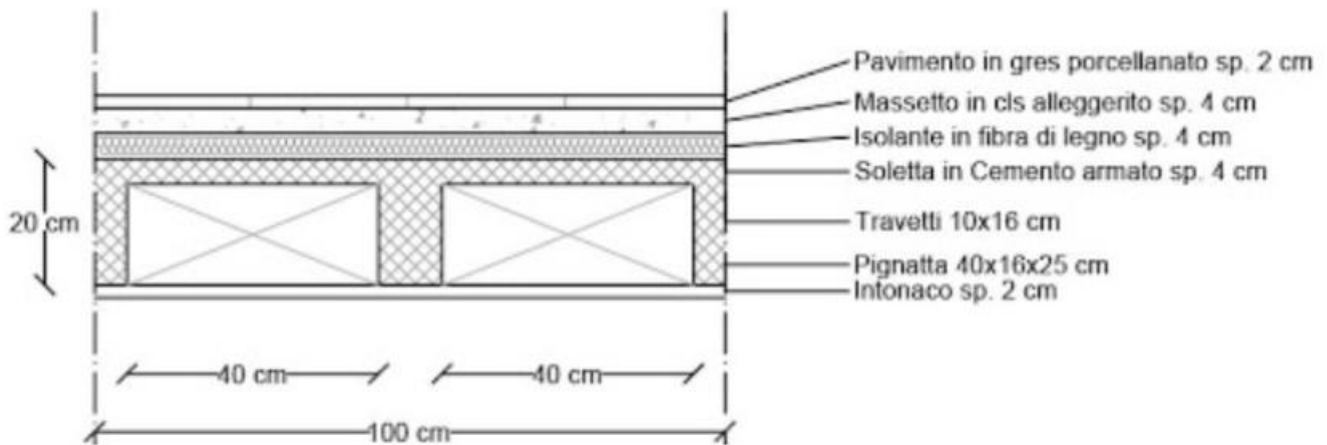
Seleziono i punti a terra → Assign → Joint → Restraint → Incastro







ANALISI DEI CARICHI



CARICO STRUTTURALE (Q_s)

Soletta in cemento

$$2500 \times (0,04 \times 1,00) = 100 \text{ Kg/m}^2 \rightarrow 1,00 \text{ KN/m}^2$$

Travetti

$$2500 \times (2 \times 0,10 \times 0,20) = 100 \text{ Kg/m}^2 \rightarrow 1,00 \text{ KN/m}^2$$

Pignatte

$$800 \times (2 \times 0,40 \times 0,16) = 102,40 \text{ Kg/m}^2 \rightarrow 1,02 \text{ KN/m}^2$$

$$Q_s = 1,00 + 1,00 + 1,02 = \mathbf{3,02 \text{ KN/m}^2}$$

SOVRACCARICO PERMANENTE (Qp)

Pavimento in gres porcellanato

$$20 \times (0,02 \times 1,00) = 4 \text{ Kg/m}^2 \rightarrow 0,04 \text{ KN/m}^2$$

Massetto in cls alleggerito

$$2400 \times (0,04 \times 1,00) = 96 \text{ Kg/m}^2 \rightarrow 0,96 \text{ KN/m}^2$$

Isolante in fibra di legno (Fiber Therm Flex 60)

$$60 \times (0,04 \times 1,00) = 2,40 \text{ Kg/m}^2 \rightarrow 0,02 \text{ KN/m}^2$$

Intonaco

$$1800 \times (0,02 \times 1,00) = 36 \text{ Kg/m}^2 \rightarrow 0,36 \text{ KN/m}^2$$

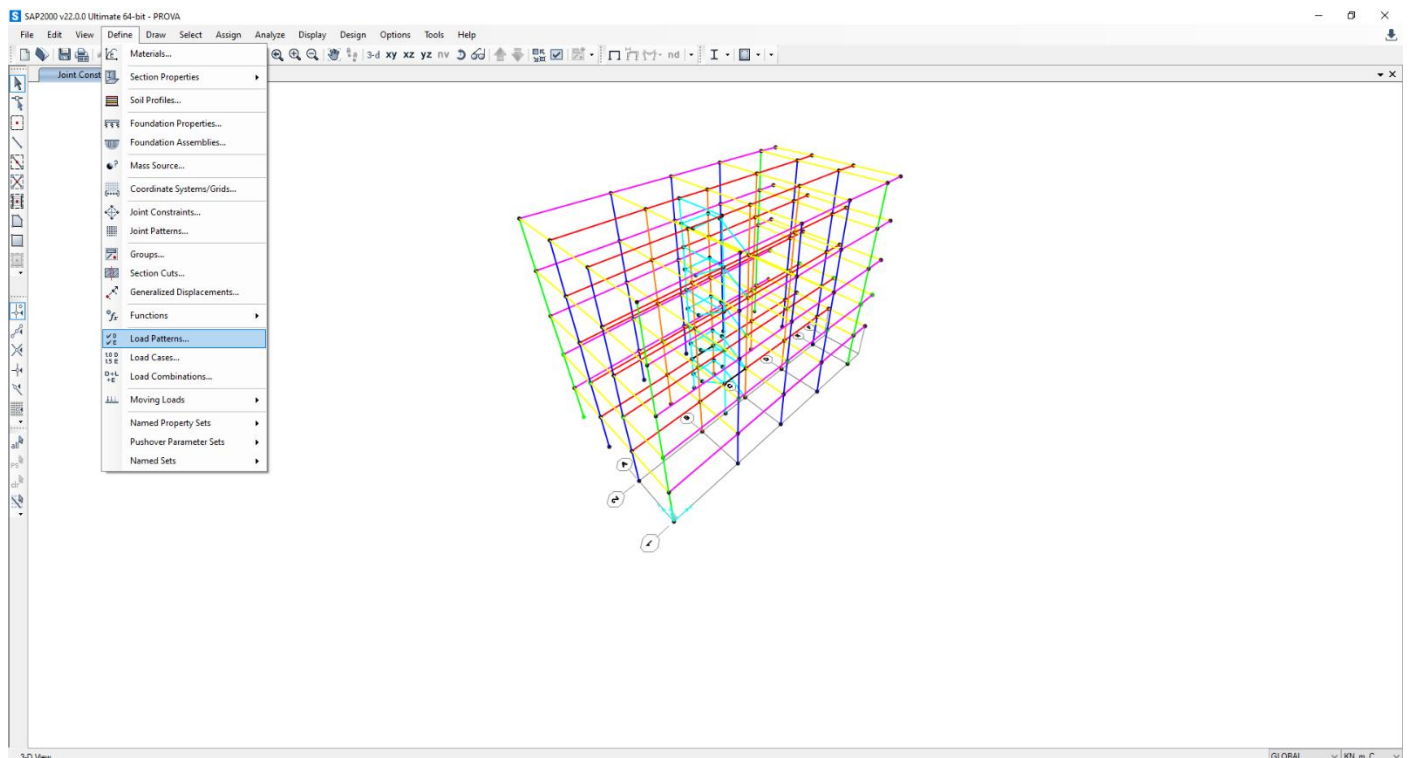
Incidenza tramezzi $\rightarrow 1,00 \text{ KN/m}^2$

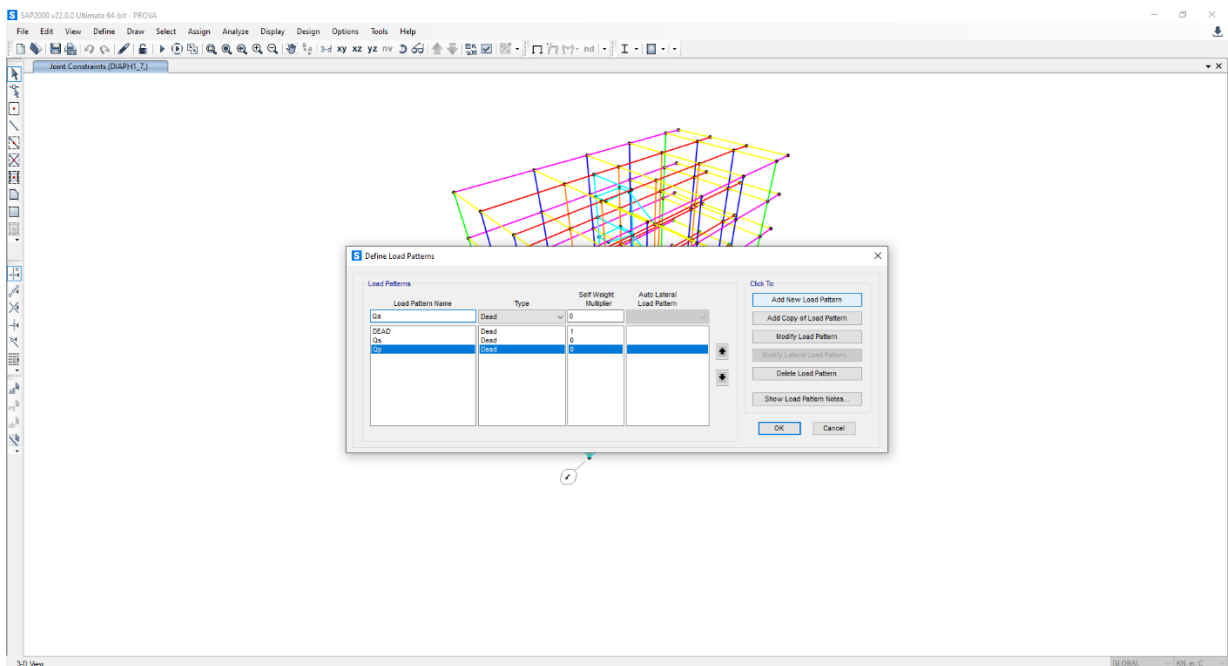
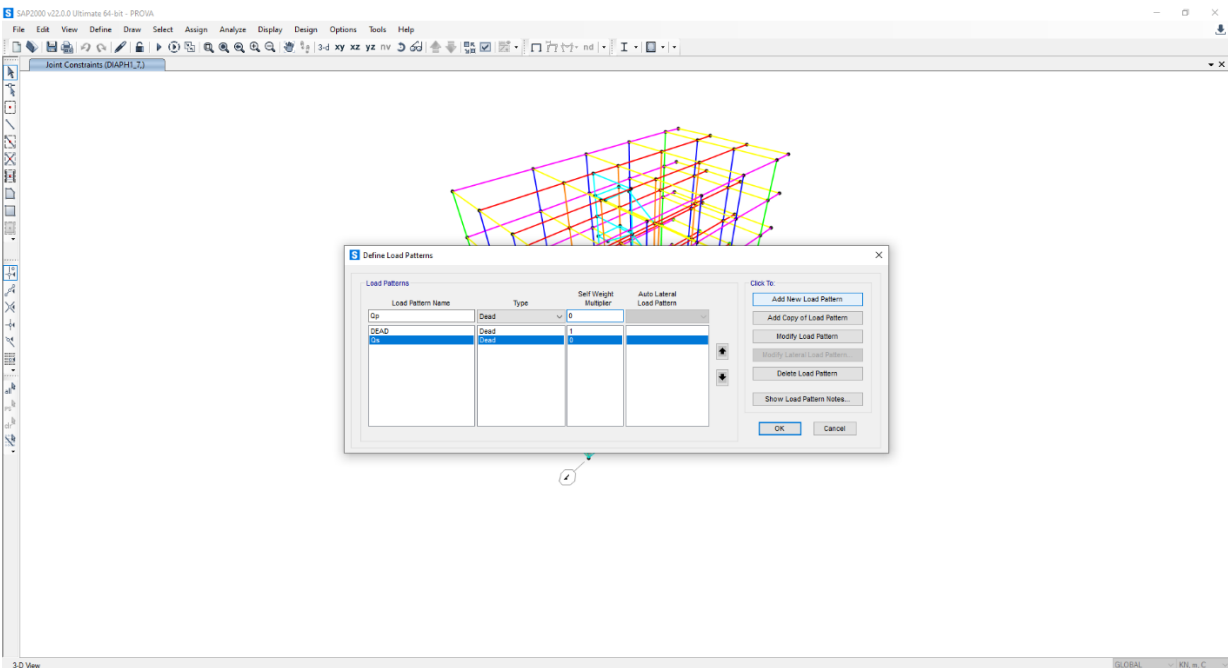
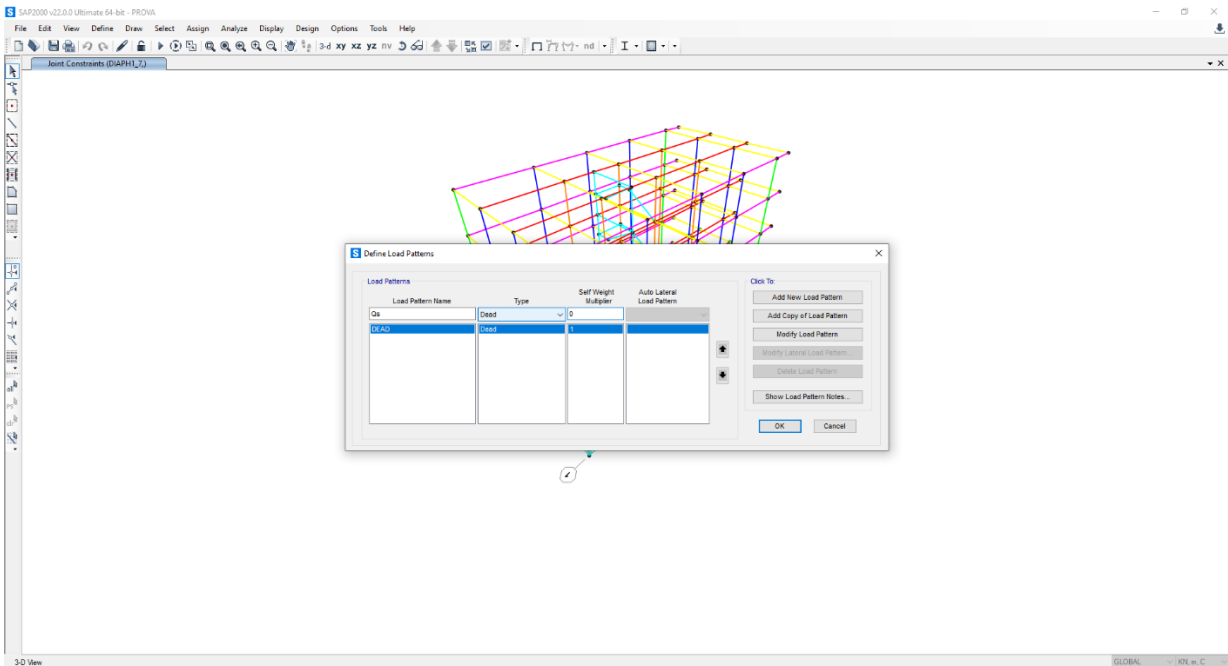
Incidenza degli impoanti $\rightarrow 0,50 \text{ KN/m}^2$

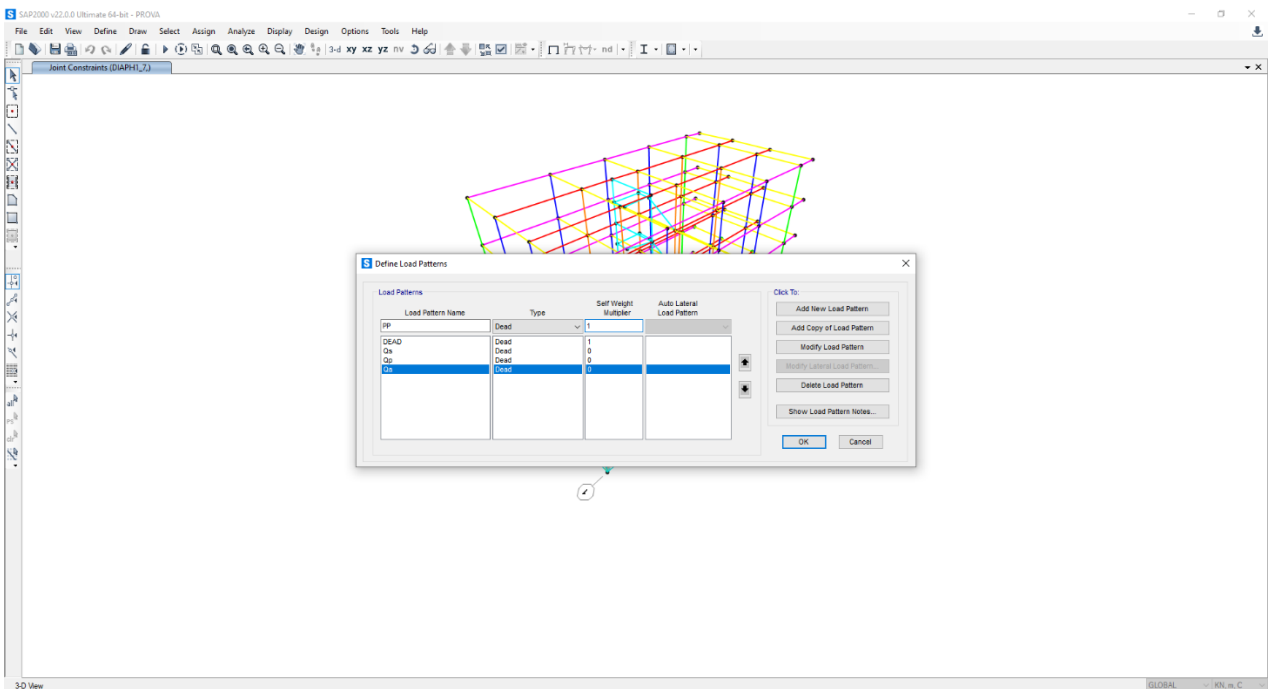
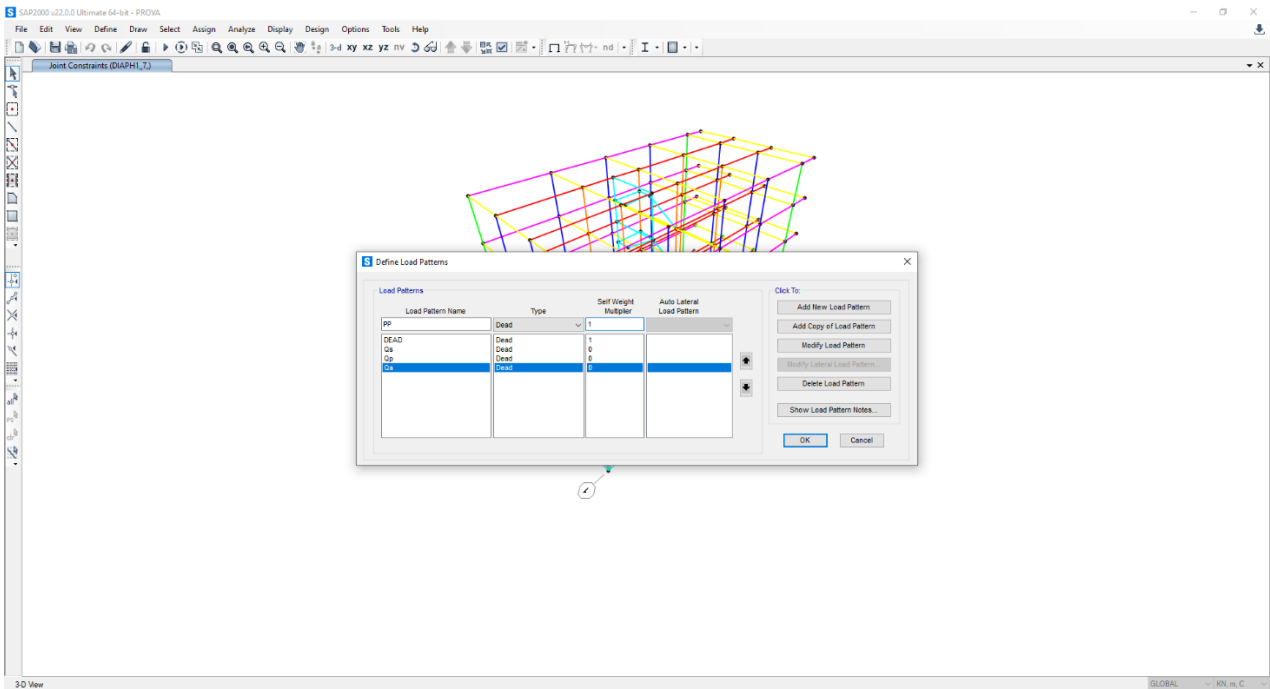
$$Q_p = 0,04 + 0,96 + 0,02 + 0,36 + 1,00 + 0,50 = \mathbf{2,88 \text{ KN/m}^2}$$

SOVRACCARICO ACCIDENTALE (Qa)

Residenze $\rightarrow 2 \text{ KN/m}^2$







ASSEGNAZIONE CARICHI

TRAVI PRINCIPALI CENTRALE (TP_C)

$$Q_s \times \text{interasse} = 3,02 \times 4 = 12,08 \text{ KN/m}$$

$$Q_p \times \text{interasse} = 2,88 \times 4 = 11,52 \text{ KN/m}$$

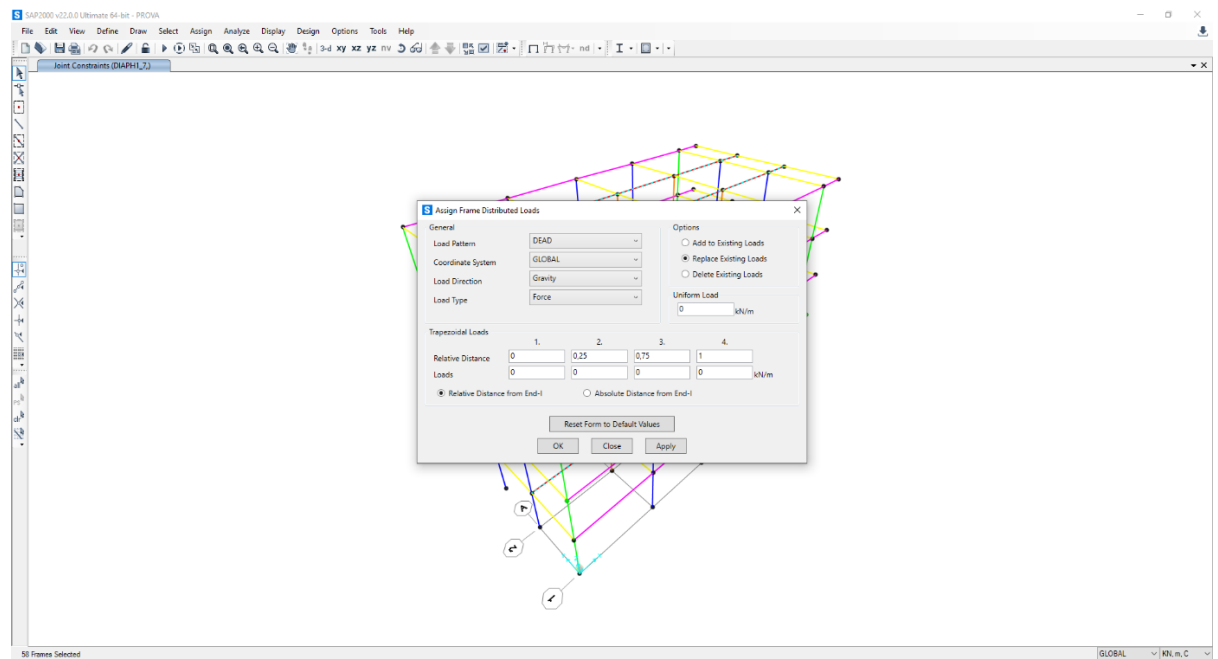
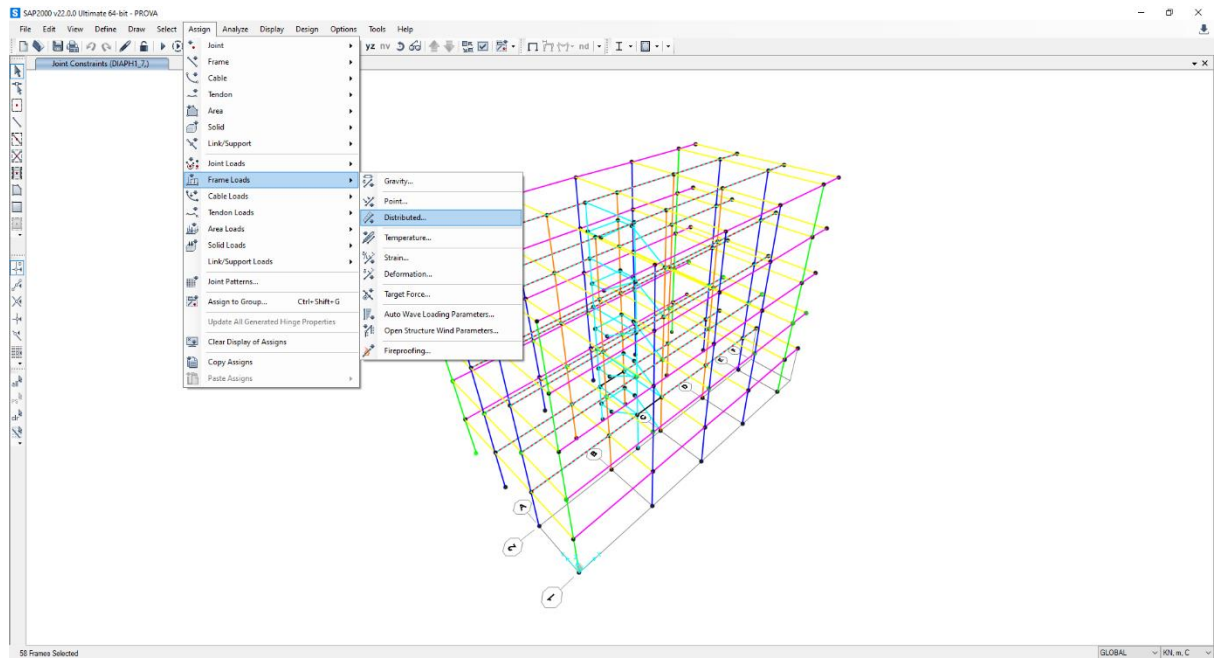
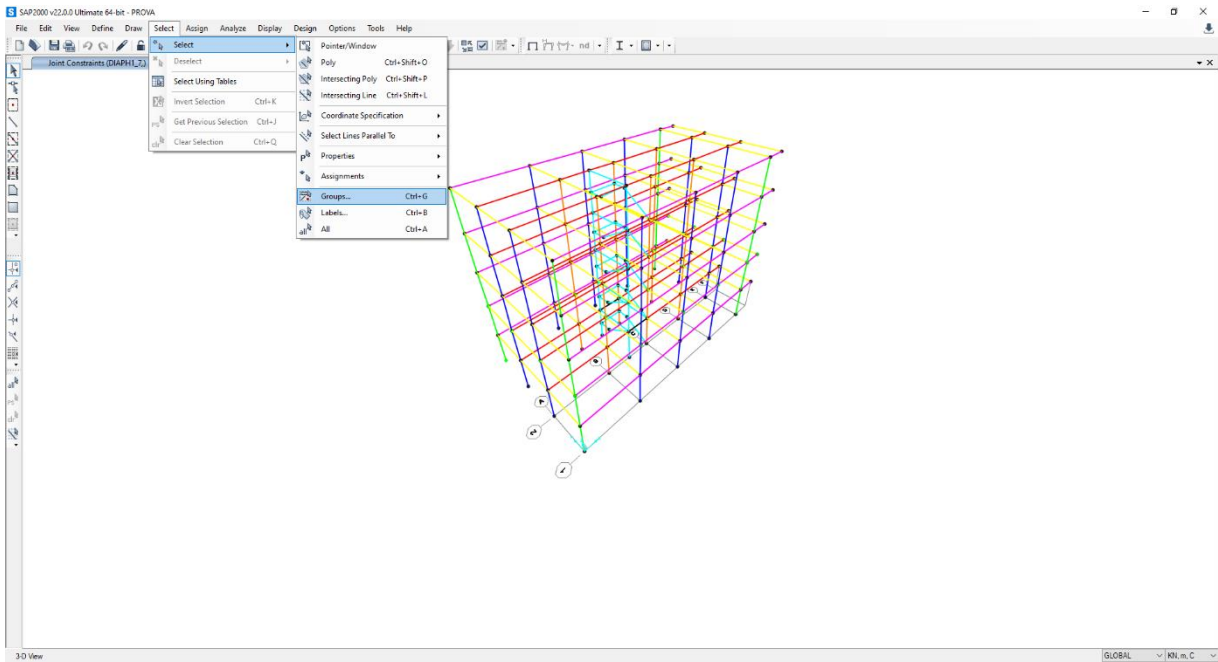
$$Q_a \times \text{interasse} = 2 \times 4 = 8 \text{ KN/m}$$

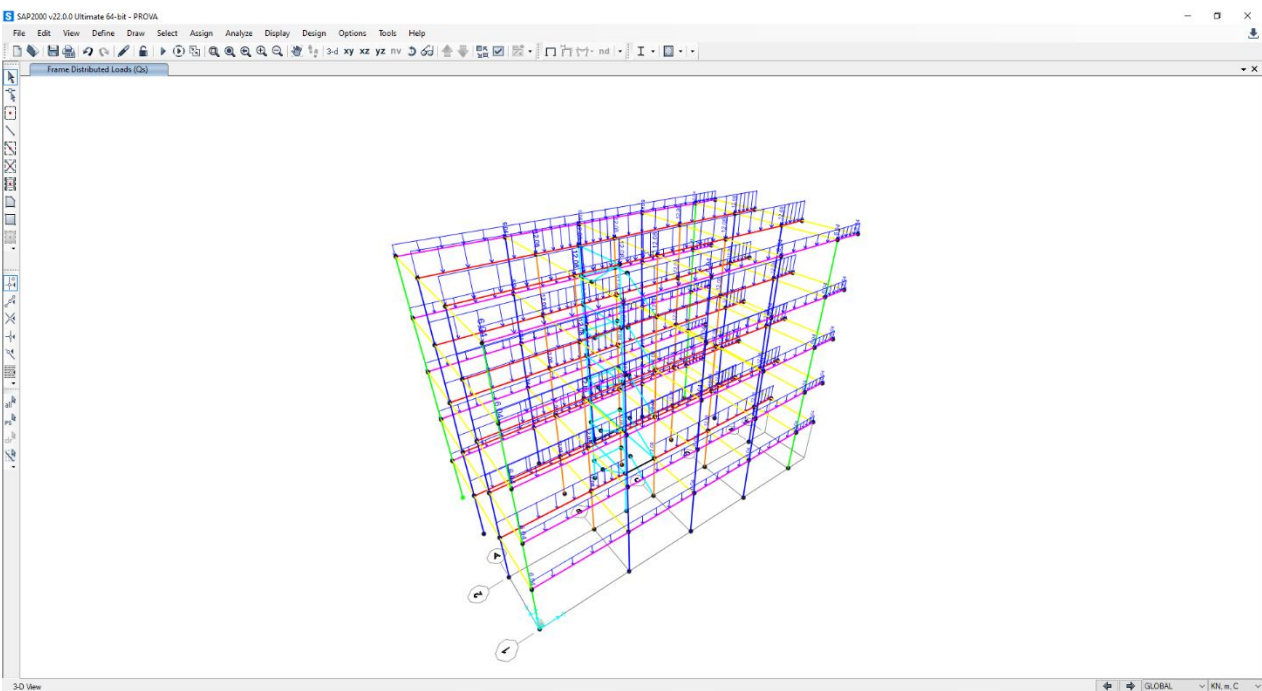
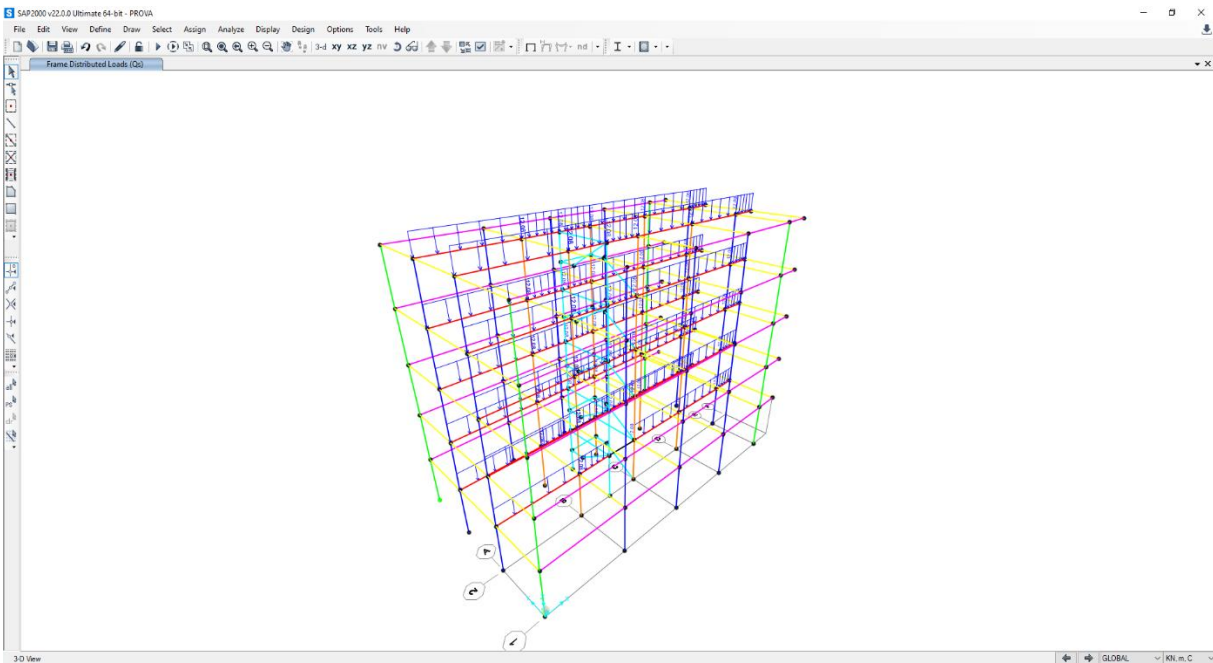
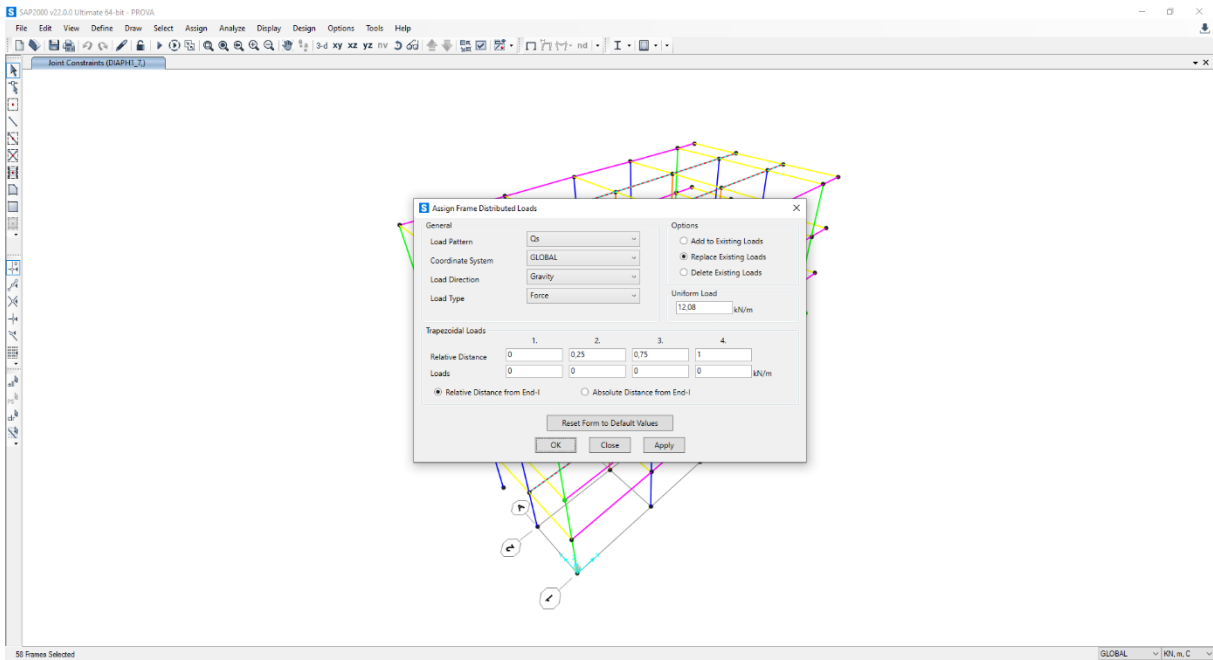
TRAVI PRINCIPALI PERIMETRALI (TP_P)

$$Q_s \times \text{interasse} = 3,02 \times 2 = 6,04 \text{ KN/m}$$

$$Q_p \times \text{interasse} = 2,88 \times 2 = 5,76 \text{ KN/m}$$

$$Q_a \times \text{interasse} = 2 \times 2 = 4 \text{ KN/m}$$





VENTO → 0,5 KN/m²

Per inserire il contributo dato dal vento , andiamo a calcolare l'area di influenza dei pilastri perimetrali

Y-Z

$$0,5 \times 2 = 1 \text{ KN/m}$$

$$0,5 \times 4 = 2 \text{ KN/m}$$

X-Z

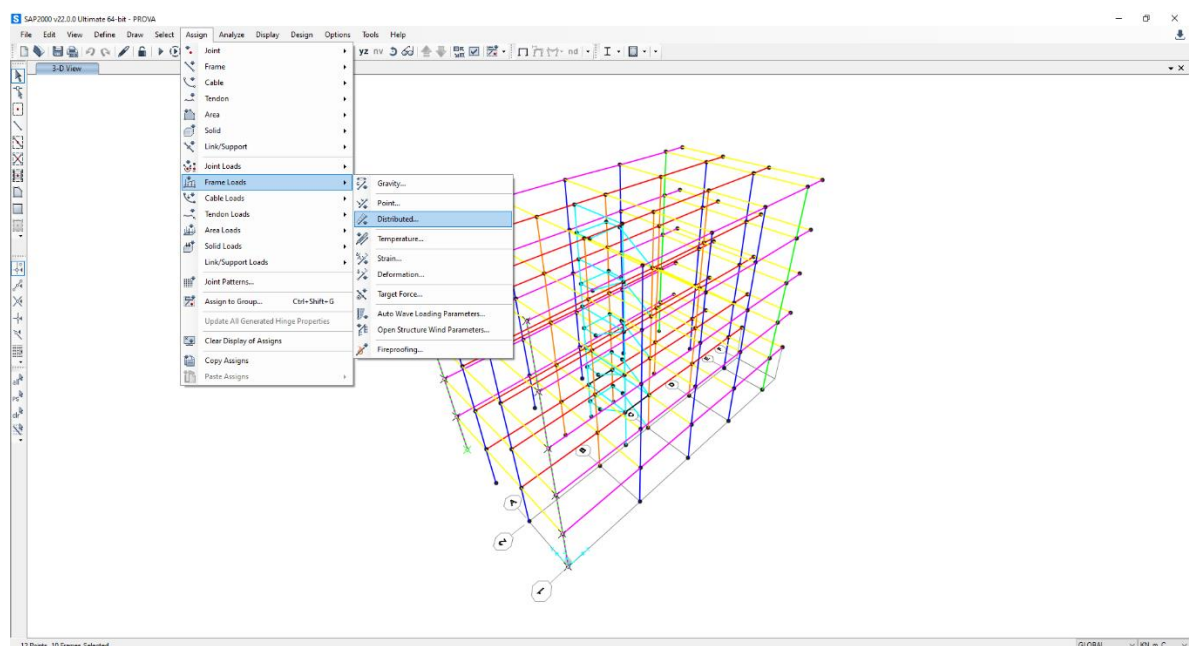
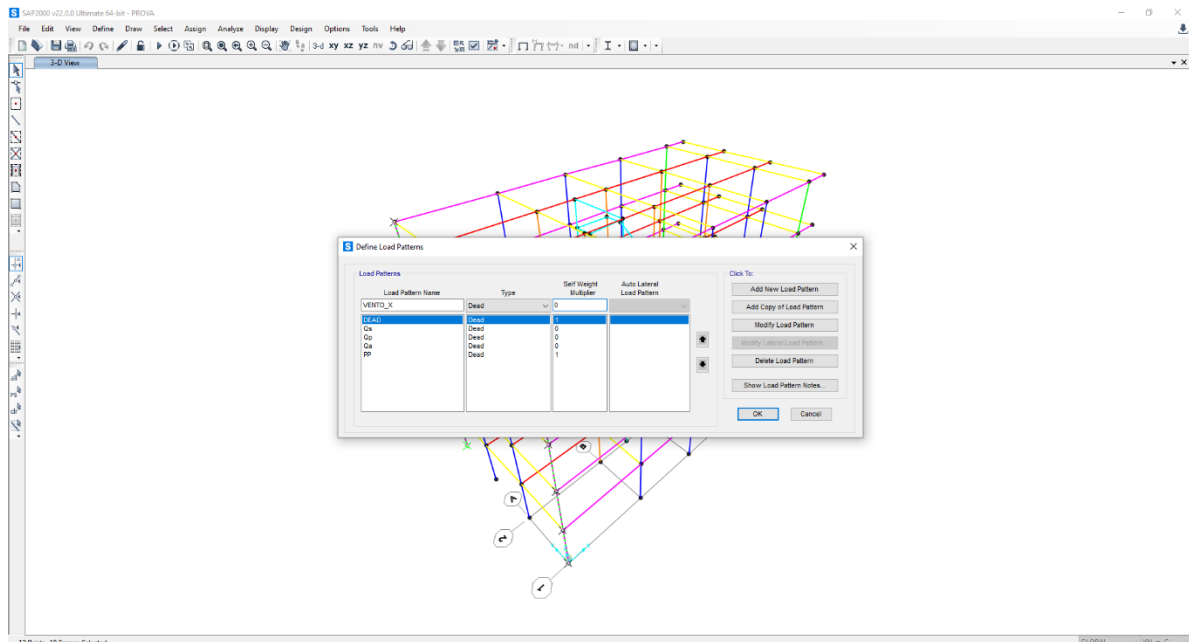
$$0,5 \times 3 = 1,5 \text{ KN/m}$$

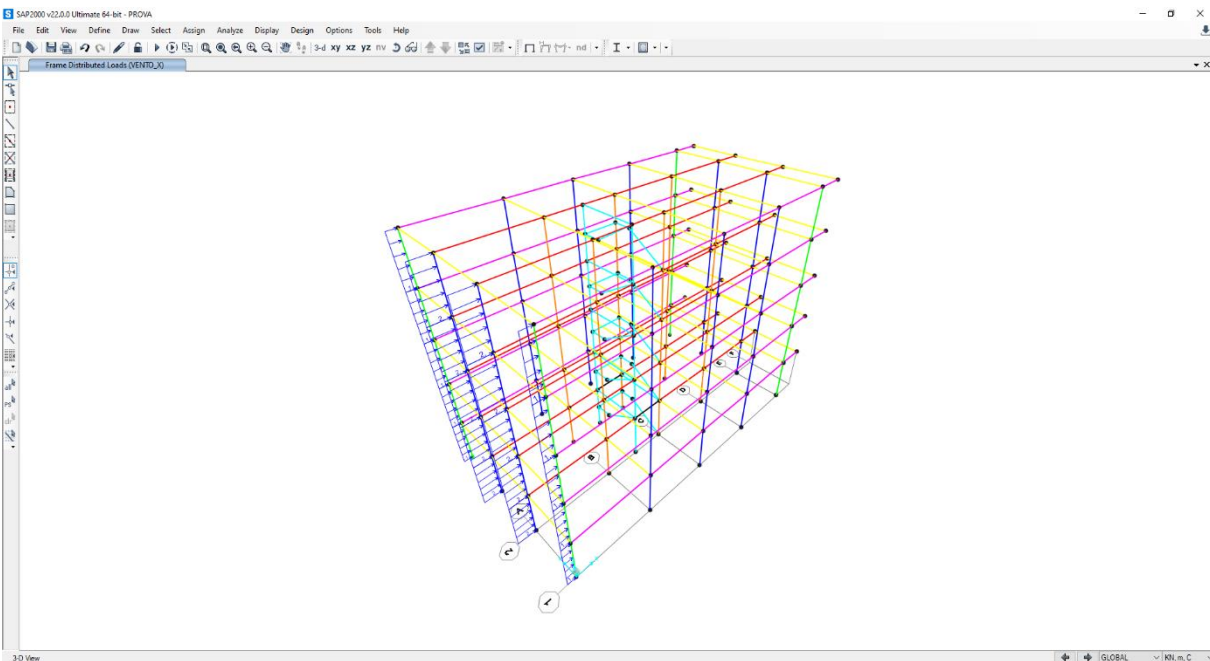
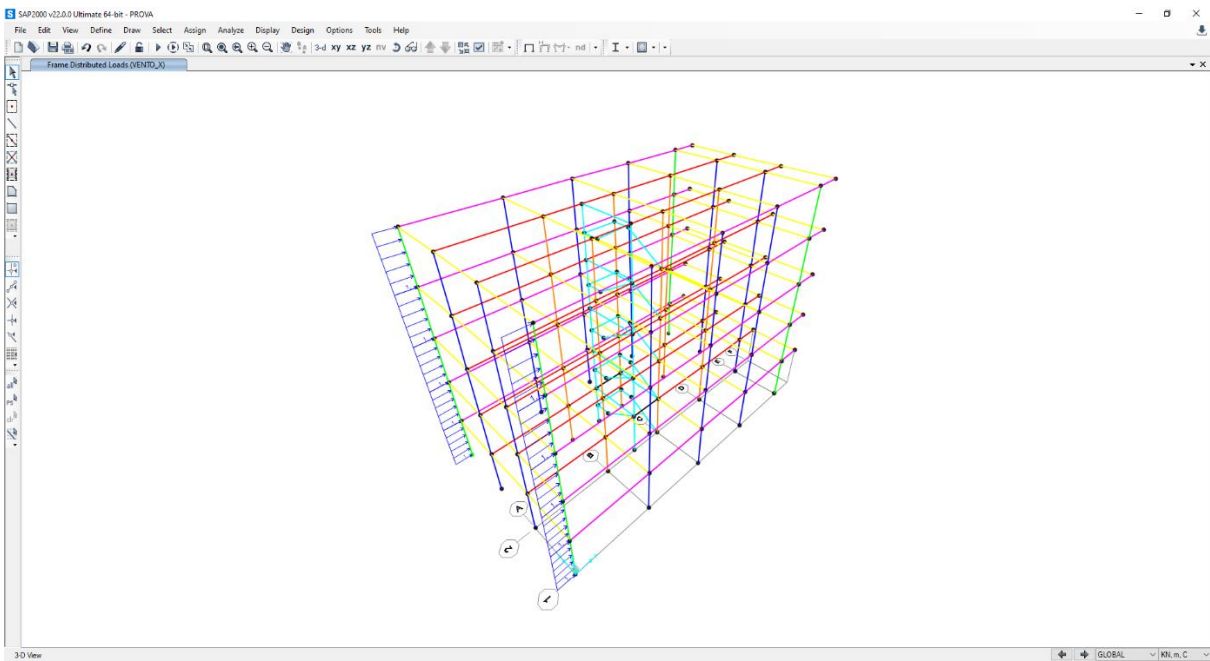
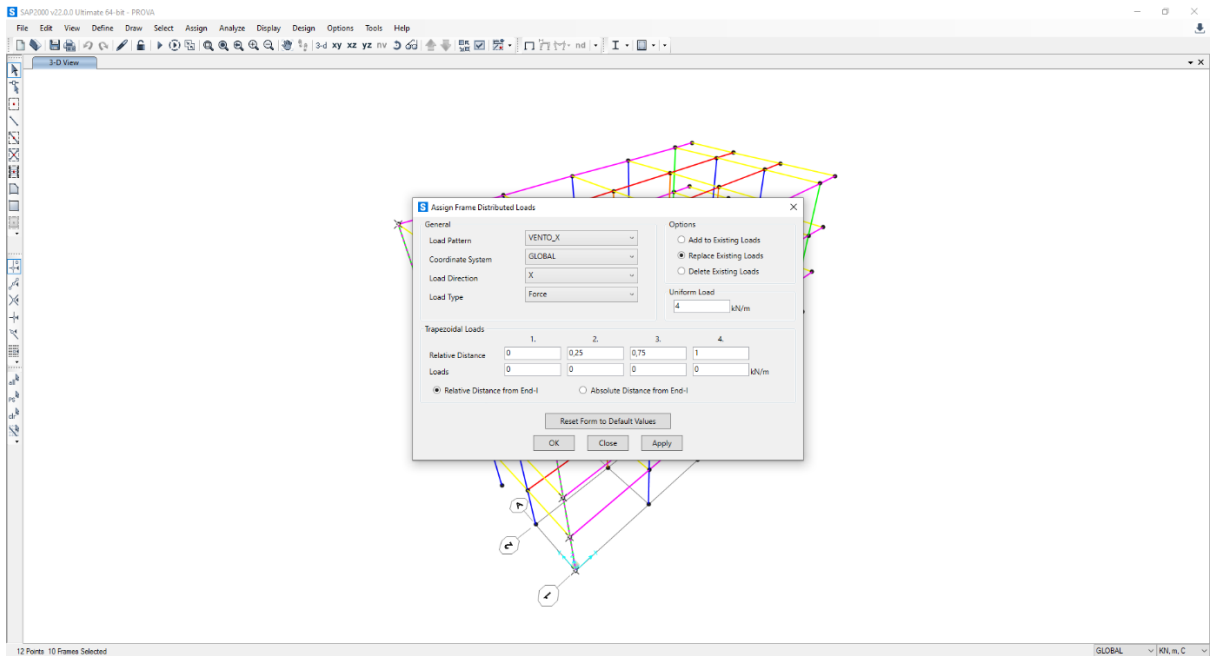
$$0,5 \times 5,5 = 2,75 \text{ KN/m}$$

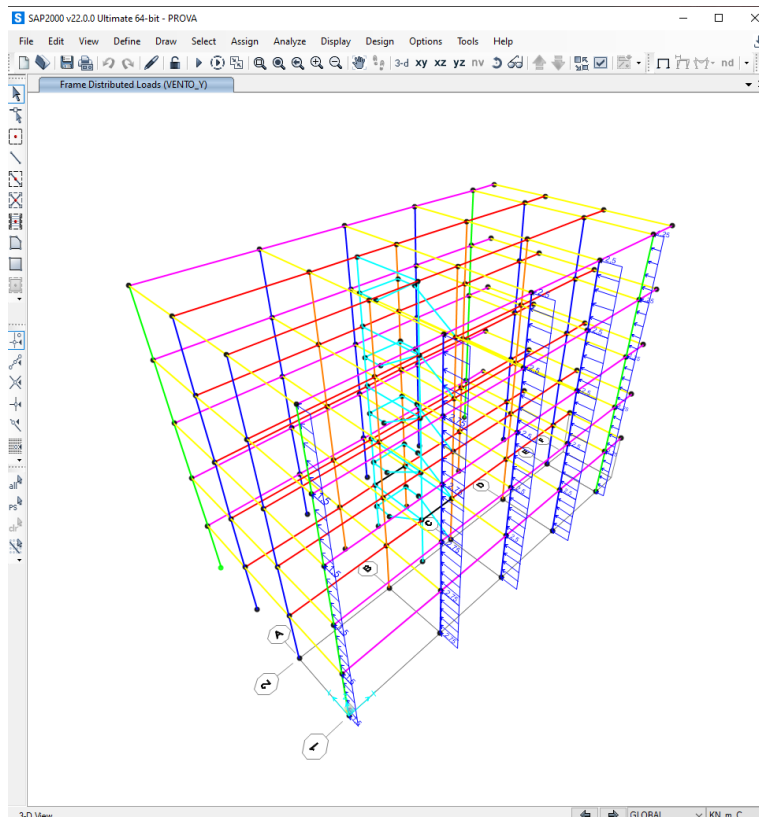
$$0,5 \times 5 = 2,5 \text{ KN/m}$$

$$0,5 \times 2,5 = 1,25 \text{ KN/m}$$

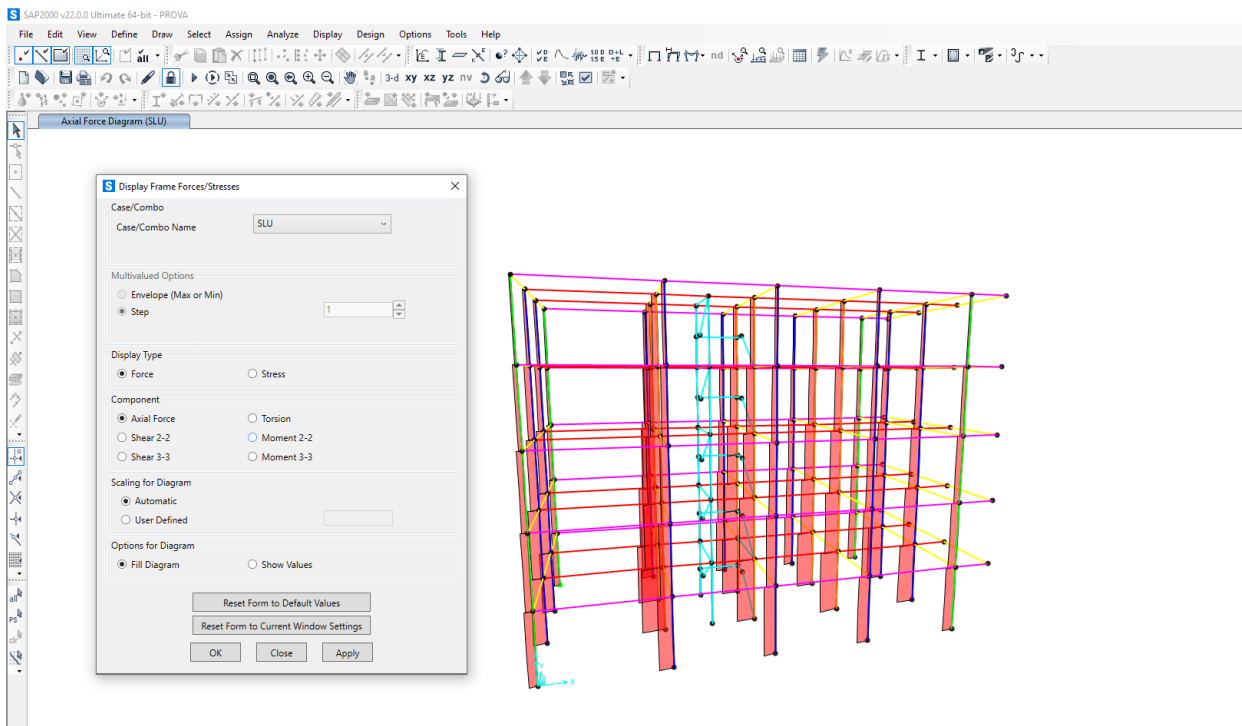
Nel momento in cui assegno il carico del vento, devo fare attenzione a modificare la direzione (quindi prima verso X e poi verso Y)







Analisi combinazioni



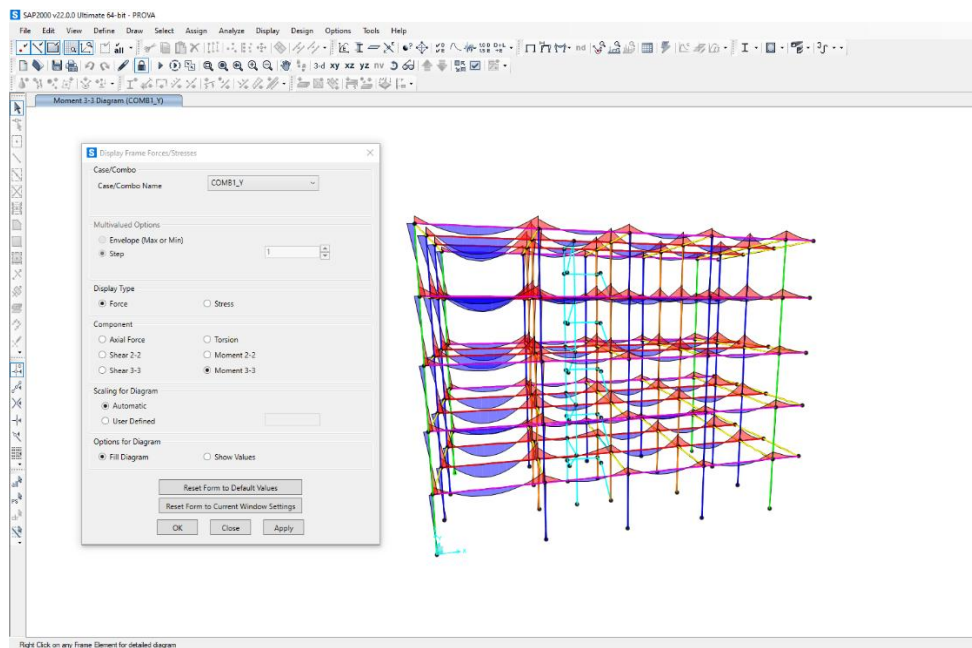
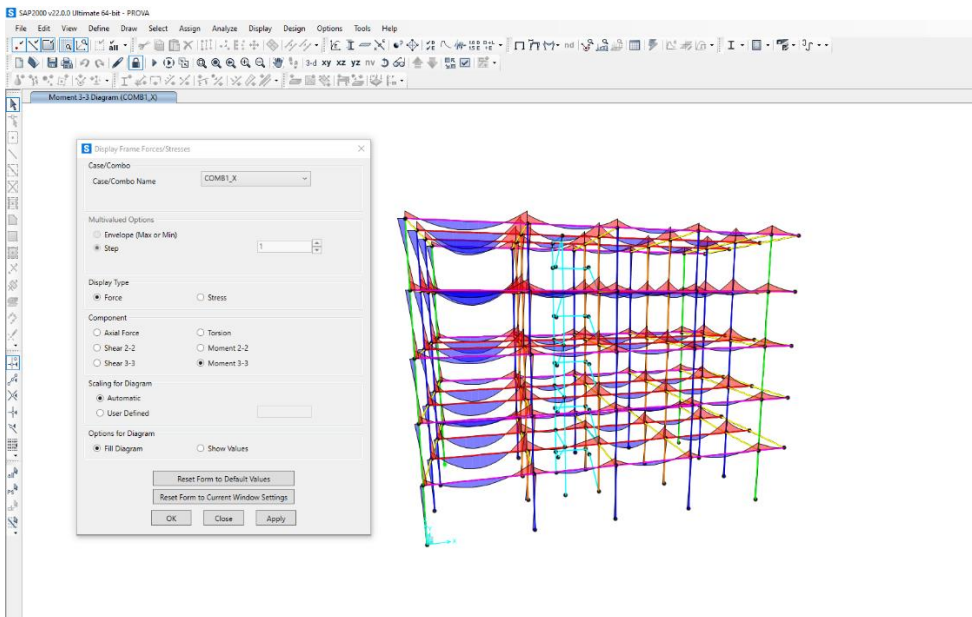
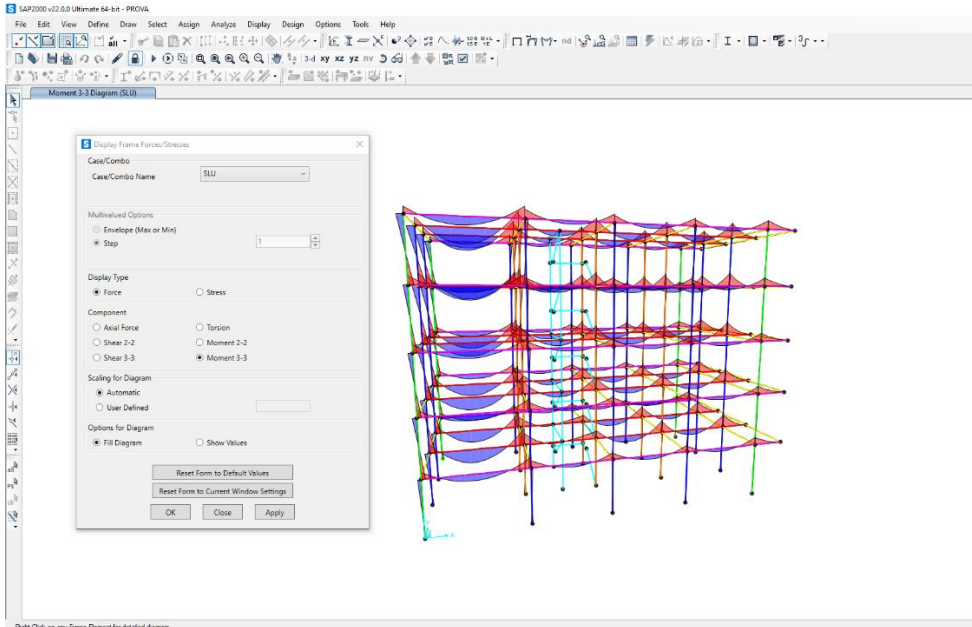


Tabella travi

esercitazione_travi.xls [modalità compatibilità] - Excel

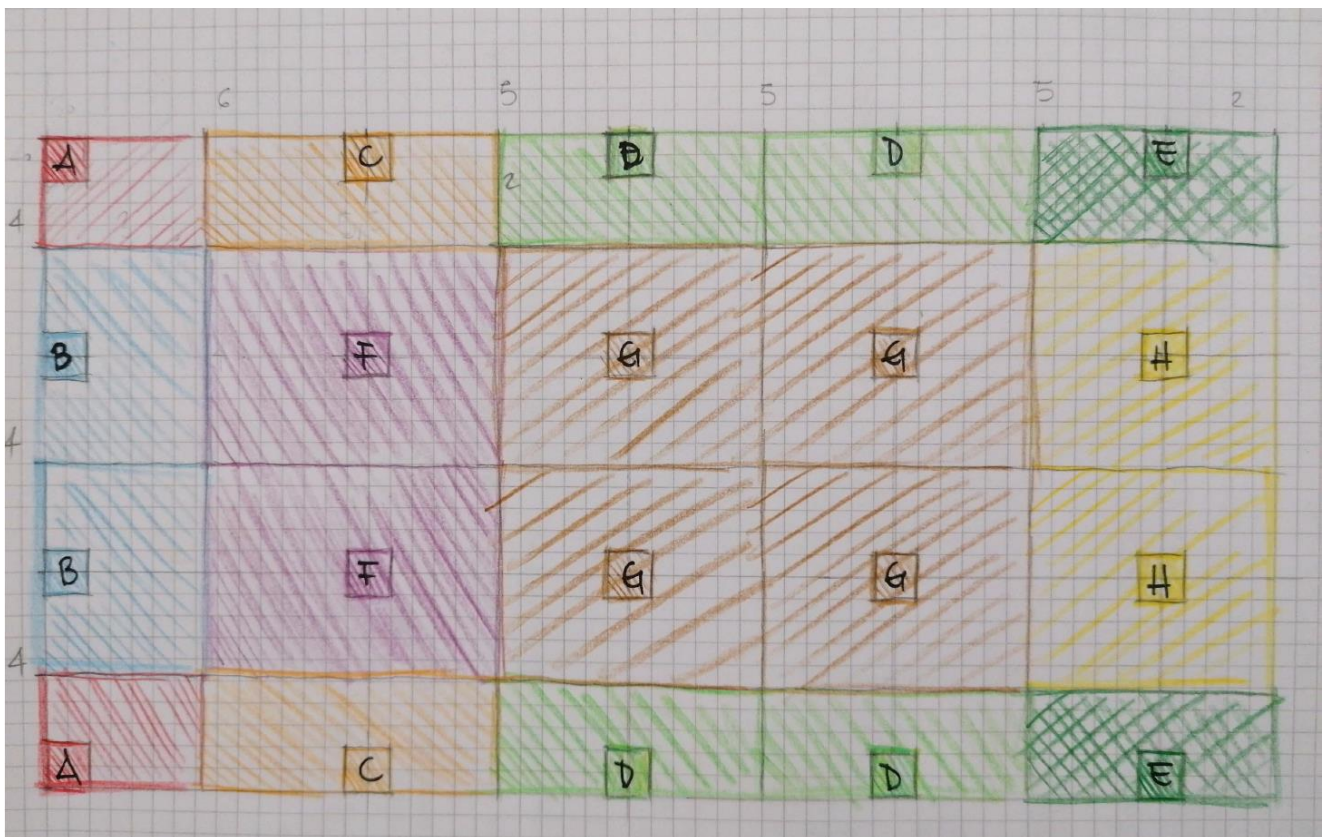
Q14	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
1	interasse (m)	q_d (KN/m ²)	q_s (KN/m ²)	q_{d+s} (KN/m ²)	q_d (KN/m)	luce (m)	M_{max} (KN/m ²)	f_{yk} (N/mm ²)	f_{td} (N/mm ²)	f_{td} (N/mm ²)	f_{td} (N/mm ²)	β	r	b (cm)	h_u (cm)	δ (cm)	H_{tot} (cm)	H	H/I	area (m ²)	peso unitario (KN/m)				
2																									
3	4.00	3.02	2.88	2.00	44.98	6.00	202.43	355.00	308.70	28.00	15.87	0.44	2.32	30.00	47.81	5.00	52.81	50.00	0.09	0.18	4.50			TRAVI PRINCIPALI CENTRALI (luce 6 m)	
4					50.83	6.00	228.75	355.00	308.70	28.00	15.87	0.44	2.32	30.00	50.82	5.00	55.82	50.00							
5	2.00	3.02	2.88	2.00	22.49	6.00	101.21	355.00	308.70	28.00	15.87	0.44	2.32	30.00	33.80	5.00	38.80	45.00	0.08	0.14	3.38			TRAVI PRINCIPALI PERIMETRALI (luce 6 m)	
6					26.88	6.00	120.96	355.00	308.70	28.00	15.87	0.44	2.32	30.00	36.95	5.00	41.95	50.00							
7	4.00	3.02	2.88	2.00	44.98	5.00	140.58	355.00	308.70	28.00	15.87	0.44	2.32	30.00	39.84	5.00	44.84	50.00	0.12	0.18	4.50			TRAVI PRINCIPALI CENTRALI (luce 5 m)	
8					50.83	5.00	158.86	355.00	308.70	28.00	15.87	0.44	2.32	30.00	42.35	5.00	47.35	50.00							
9	2.00	3.02	2.88	2.00	22.49	5.00	70.29	355.00	308.70	28.00	15.87	0.44	2.32	30.00	28.17	5.00	33.17	45.00	0.09	0.14	3.38			TRAVI PRINCIPALI PERIMETRALI (luce 5 m)	
10					26.88	5.00	84.00	355.00	308.70	28.00	15.87	0.44	2.32	30.00	30.79	5.00	35.79	50.00							
11																									
12	0.50	3.02	2.88	2.00	5.62	4.00	11.25	355.00	308.70	28.00	15.87	0.44	2.32	25.00	12.34	5.00	17.34	25.00	0.09	0.09	2.19			TRAVI SECONDARIE	
13					8.47	4.00	16.93	355.00	308.70	28.00	15.87	0.44	2.32	25.00	15.15	5.00	20.15	50.00							
14																									
15																									

Tabella mensole

esercitazione_mensole.xls [modalità compatibilità] - Excel

M14	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	AA	
1	interasse (m)	q_d (KN/m ²)	q_s (KN/m ²)	q_{d+s} (KN/m ²)	q_d (KN/m)	luce (m)	M_{max} (KN/m ²)	f_{yk} (N/mm ²)	f_{td} (N/mm ²)	f_{td} (N/mm ²)	f_{td} (N/mm ²)	β	r	b (cm)	h_u (cm)	δ (cm)	H_{tot} (cm)	H	area (m ²)	peso unitario (KN/m)	E (N/mm ²)	I_x (cm ⁴)	V_{max} (cm)	$I_{V_{max}}$			
2																											
3	4.00	3.02	2.88	2.00	44.98	2.00	89.97	355.00	308.70	28.00	15.87	0.44	2.32	30.00	31.87	5.00	36.87	40.00	0.12	3.00	30.60	32308	180000	0.12	1689.31	SI	MENSOLA CENTRALE
4					48.88	2.00	97.77	355.00	308.70	28.00	15.87	0.44	2.32	30.00	33.22	5.00	38.22	50.00									
5	2.00	3.02	2.88	2.00	22.49	2.00	44.98	355.00	308.70	28.00	15.87	0.44	2.32	30.00	22.54	5.00	27.54	35.00	0.11	2.53	16.43	32308	107188	0.09	2108.38	SI	MENSOLA PERIMETRALE
6					25.90	2.00	51.81	355.00	308.70	28.00	15.87	0.44	2.32	30.00	24.18	5.00	29.18	50.00									
7																											
8																											
9																											

Tabella pilastri



File Home Inserisci Layout di pagina Formule Dati Revisione Visualizza Guida Cosa vuoi fare?

Incolla Copia Copia Formattato

Carattere

Allineamento Numeri

Formattazione Formattazione condizionale

Stili

Normal Neutrale Valore non v... Valore valido Calcolo Cella collegata

Inserisci Elimina Formattato

Celle

Somma automatica Riempimento Ordina e filtra Trova e seleziona

Modifica Riservatezza

ABS2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	
1	L _o	L _s	Area	trave _v	trave _a	Q _{trave}	Q _a	Q _b	Q _a	Q _{solcio}	ρ _{pani}	N	f _{ck}	f _{cd}	t _{cd}	A _{ann}	b _{min}	E	β	l	λ*	P _{min}	b _{min}	b	h _{min}	h	A _{assign}			
2	m	m	m ²	kN/m	kN/m	kN/mq	kN/mq	kN/mq	kN/mq	kN		Mpa	Mpa	Mpa	Mpa	cm ²	cm	Mpa		m		cm	cm	cm	cm	cm	cm	cm ²		
3																														
4	3.00	2.00	6.00	3.37	2.19	18.84	3.02	2.88	2.00	67.48	5	432	28.0	15.9	7.9	544.0	23.3	32308	0.50	3.50	141.76	1.23	4.28	30.00	18.13	35.00	1050		PT_ANGOLO_A	
5	3.00	4.00	12.00	3.37	2.19	24.53	3.02	2.88	2.00	134.95	5	797	28.0	15.9	7.9	1005.1	31.7	32308	0.50	3.50	141.76	1.23	4.28	30.00	33.50	35.00	1050		PT_PERIMETRALE_B	
6	5.50	2.00	11.00	3.37	2.19	29.79	3.02	2.88	2.00	123.71	5	767	28.0	15.9	7.9	967.4	31.1	32308	0.50	3.50	141.76	1.23	4.28	30.00	32.25	35.00	1050		PT_PERIMETRALE_C	
7	5.00	2.00	10.00	3.37	2.19	27.60	3.02	2.88	2.00	112.46	5	700	28.0	15.9	7.9	882.7	29.7	32308	0.50	3.50	141.76	1.23	4.28	30.00	29.42	35.00	1050		PT_PERIMETRALE_D	
8	4.50	2.00	9.00	3.37	2.19	25.41	3.02	2.88	2.00	101.21	5	633	28.0	15.9	7.9	798.0	28.2	32308	0.50	3.50	141.76	1.23	4.28	30.00	26.60	35.00	1050		PT_PERIMETRALE_E	
9	5.50	4.00	22.00	4.50	2.19	43.56	3.02	2.88	2.00	247.41	5	1455	28.0	15.9	7.9	1833.9	42.8	32308	0.50	3.50	141.76	1.23	4.28	40.00	45.85	45.00	1800		PT_CENTRALE_F	
10	5.00	4.00	20.00	4.50	2.19	40.64	3.02	2.88	2.00	224.92	5	1328	28.0	15.9	7.9	1673.7	40.9	32308	0.50	3.50	141.76	1.23	4.28	40.00	41.84	45.00	1800		PT_CENTRALE_G	
11	4.50	4.00	18.00	4.50	2.19	37.71	3.02	2.88	2.00	202.43	5	1201	28.0	15.9	7.9	1513.5	38.9	32308	0.50	3.50	141.76	1.23	4.28	40.00	37.84	45.00	1800		PT_PERIMETRALE_H	
12																														
13																														
14	3.00	2.00	6.00	3.37	2.19	18.84	3.02	2.88	2.00	67.48	4	345	28.0	15.9	7.9	435.2	20.9	32308	0.50	3.50	141.76	1.23	4.28	30.00	14.51	35.00	1050		P1_ANGOLO_A	
15	3.00	4.00	12.00	3.37	2.19	24.53	3.02	2.88	2.00	134.95	4	638	28.0	15.9	7.9	804.1	28.4	32308	0.50	3.50	141.76	1.23	4.28	30.00	26.80	35.00	1050		P1_PERIMETRALE_B	
16	5.50	2.00	11.00	3.37	2.19	29.79	3.02	2.88	2.00	123.71	4	614	28.0	15.9	7.9	773.9	27.8	32308	0.50	3.50	141.76	1.23	4.28	30.00	25.80	35.00	1050		P1_PERIMETRALE_C	
17	5.00	2.00	10.00	3.37	2.19	27.60	3.02	2.88	2.00	112.46	4	560	28.0	15.9	7.9	706.2	26.6	32308	0.50	3.50	141.76	1.23	4.28	30.00	23.54	35.00	1050		P1_PERIMETRALE_D	
18	4.50	2.00	9.00	3.37	2.19	25.41	3.02	2.88	2.00	101.21	4	506	28.0	15.9	7.9	638.4	25.3	32308	0.50	3.50	141.76	1.23	4.28	30.00	21.28	35.00	1050		P1_PERIMETRALE_E	
19	5.50	4.00	22.00	4.50	2.19	43.56	3.02	2.88	2.00	247.41	4	1164	28.0	15.9	7.9	1467.1	38.3	32308	0.50	3.50	141.76	1.23	4.28	40.00	36.68	45.00	1800		P1_PERIMETRALE_F	
20	5.00	4.00	20.00	4.50	2.19	40.64	3.02	2.88	2.00	224.92	4	1062	28.0	15.9	7.9	1338.9	36.6	32308	0.50	3.50	141.76	1.23	4.28	40.00	33.47	45.00	1800		P1_CENTRALE_G	
21	4.50	4.00	18.00	4.50	2.19	37.71	3.02	2.88	2.00	202.43	4	961	28.0	15.9	7.9	1210.8	34.8	32308	0.50	3.50	141.76	1.23	4.28	40.00	30.27	45.00	1800		P1_PERIMETRALE_H	
22																														
23																														
24	3.00	2.00	6.00	3.37	2.19	18.84	3.02	2.88	2.00	67.48	3	259	28.0	15.9	7.9	326.4	18.1	32308	0.50	3.50	141.76	1.23	4.28	30.00	10.88	35.00	1050		P2_ANGOLO_A	
25	3.00	4.00	12.00	3.37	2.19	24.53	3.02	2.88	2.00	134.95	3	478	28.0	15.9	7.9	603.1	24.6	32308	0.50	3.50	141.76	1.23	4.28	30.00	20.10	35.00	1050		P2_PERIMETRALE_B	
26	5.50	2.00	11.00	3.37	2.19	29.79	3.02	2.88	2.00	123.71	3	460	28.0	15.9	7.9	580.4	24.1	32308	0.50	3.50	141.76	1.23	4.28	30.00	19.35	35.00	1050		P2_PERIMETRALE_C	
27	5.00	2.00	10.00	3.37	2.19	27.60	3.02	2.88	2.00	112.46	3	420	28.0	15.9	7.9	529.6	23.0	32308	0.50	3.50	141.76	1.23	4.28	30.00	17.65	35.00	1050		P2_PERIMETRALE_D	
28	4.50	2.00	9.00	3.37	2.19	25.41	3.02	2.88	2.00	101.21	3	380	28.0	15.9	7.9	478.8	21.9	32308	0.50	3.50	141.76	1.23	4.28	30.00	15.96	35.00	1050		P2_PERIMETRALE_E	
29	5.50	4.00	22.00	4.50	2.19	43.56	3.02	2.88	2.00	247.41	3	873	28.0	15.9	7.9	1100.3	33.2	32308	0.50	3.50	141.76	1.23	4.28	40.00	27.51	45.00	1800		P2_CENTRALE_F	
30	5.00	4.00	20.00	4.50	2.19	40.64	3.02	2.88	2.00	224.92	3	797	28.0	15.9	7.9	1004.2	31.7	32308	0.50	3.50	141.76	1.23	4.28	40.00	25.11	45.00	1800		P2_CENTRALE_G	
31	4.50	4.00	18.00	4.50	2.19	37.71	3.02	2.88	2.00	202.43	3	720	28.0	15.9	7.9	908.1	30.1	32308	0.50	3.50	141.76	1.23	4.28	40.00	22.70	45.00	1800		P2_PERIMETRALE_H	
32																														
33																														
34	3.00	2.00	6.00	3.37	2.19	18.84	3.02	2.88	2.00	67.48	2	173	28.0	15.9	7.9	217.6	14.8	32308	0.50	3.50	141.76	1.23	4.28	30.00	7.25	35.00	1050		P3_ANGOLO_A	
35	3.00	4.00	12.00	3.37	2.19	24.53	3.02	2.88	2.00	134.95	2	319	28.0	15.9	7.9	402.1	20.1	32308	0.50	3.50	141.76	1.23	4.28	30.00	13.40	35.00	1050		P3_PERIMETRALE_B	
36	5.50	2.00	11.00	3.37	2.19	29.79	3.02	2.88	2.00	123.71	2	307	28.0	15.9	7.9	387.0	19.7	32308	0.50	3.50	141.76	1.23	4.28	30.00	12.90	35.00	1050		P3_PERIMETRALE_C	
37	5.00	2.00	10.00	3.37	2.19	27.60	3.02	2.88	2.00	112.46	2	280	28.0	15.9	7.9	353.1	18.8	32308	0.50	3.50	141.76	1.23	4.28	30.00	11.77	35.00	1050		P3_PERIMETRALE_D	
38	4.50	2.00	9.00	3.37	2.19	25.41	3.02	2.88	2.00	101.21	2	253	28.0	15.9	7.9	319.2	17.9	32308	0.50	3.50	141.76	1.23	4.28	30.00	10.64	35.00	1050		P3_PERIMETRALE_E	
39	5.50	4.00	22.00	4.50	2.19	43.56	3.02	2.88	2.00	247.41	2	582	28.0	15.9	7.9	733.6	27.1	32308	0.50	3.50	141.76	1.23	4.28	40.00	18.34	45.00	1800		P3_CENTRALE_F	
40	5.00	4.00	20.00	4.50	2.19	40.64	3.02	2.88	2.00	224.92	2	531	28.0	15.9	7.9	669.5	25.9	32308	0.50	3.50	141.76	1.23	4.28	40.00	16.74	45.00	1800		P3_CENTRALE_G	
41	4.50	4.00	18.00	4.50	2.19	37.71	3.02	2.88	2.00	202.43	2	480	28.0	15.9	7.9	605.4	24.6	32308	0.50	3.50	141.76	1.23	4.28	40.00	15.13	45.00	1800		P3_PERIMETRALE_H	
42																														
43																														
44	3.00	2.00	6.00	3.37	2.19	18.84	3.02	2.88	2.00	67.48	1	86	28.0	15.9	7.9	108.8	10.4	32308	0.50	3.50	141.76	1.23	4.28	30.00	3.63	35.00	1050		P4_ANGOLO_A	
45	3.00	4.00	12.00	3.37	2.19	24.53	3.02	2.88	2.00	134.95	1	159	28.0	15.9	7.9	201.0	14.2	32308	0.50	3.50	141.76	1.23	4.28	30.00	6.70	35.00	1050		P4_PERIMETRALE_B	
46	5.50	2.00	11.00	3.37	2.19	29.79	3.02	2.88	2.00	123.71	1	153	28.0	15.9	7.9	193.5	13.9	32308	0.50	3.50	141.76	1.23	4.28	30.00	6.45	35.00	1050		P4_PERIMETRALE_C	
47	5.00	2.00	10.00	3.37	2.19	27.60	3.02	2.88	2.00	112.46	1	140	28.0	15.9	7.9	176.5	13.3	32308	0.50	3.50	141.76	1.23	4.28	30.00	5.88	35.00	1050		P4_PERIMETRALE_D	
48	4.50	2.00	9.00	3.37	2.19	25.41	3.02	2.88	2.00	101.21	1	127	28.0	15.9	7.9	159.6	12.6	32308	0.50	3.50	141.76	1.23	4.2							