

ANCE | VENETO

ICEA

ISI
Società Servizi Edilizi

FEDERAZIONE
ORDINI
INGEGNERI
VENETO

POSEIDON
DISSIPATORI
OT SRI
CREATI 2012

con il contributo di

EDILMATIC

CICLO DI SEMINARI
LA SICUREZZA SISMICA E RIQUALIFICAZIONE
ENERGETICA DEGLI EDIFICI ESISTENTI
E NUOVI EDIFICI NZEB



3° appuntamento
IL RETROFITTING SISMICO DEGLI EDIFICI INDUSTRIALI

Mercoledì 5 aprile ore 14.15
Cittadella dell'Edilizia - Marghera

È POSSIBILE MIGLIORARE SISMICAMENTE
UN EDIFICIO INDUSTRIALE PREFABBRICATO ESISTENTE
SENZA INTERVENIRE SULLE PILASTRATE?



- **Messa in sicurezza**: si pone l'obiettivo di superare l'emergenza e di migliorare la sicurezza per la salvaguardia delle vite umane, garantendo l'eliminazione delle carenze strutturali più rilevanti (es. perdita d'appoggio delle travi), senza assicurare necessariamente l'aumento della capacità antisismica della struttura.
- **Miglioramento sismico**: gli interventi di miglioramento prevedono un aumento globale della sicurezza strutturale, senza cambiare lo schema statico, *raggiungendo almeno il 60% della capacità limite*.
- **Adeguamento sismico**: il livello di sicurezza nei confronti del sisma è lo stesso di un edificio nuovo, garantendo, perciò, il 100% della capacità limite, raggiungibile anche modificando l'ossatura portante.

SISTEMI DI RINFORZO PILASTRI

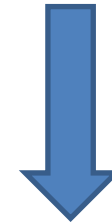


- DIFFICOLTÀ DI ESECUZIONE DEI LAVORI;
- RIMOZIONE TEMPORANEA DELL'IMPIANTISTICA;
- IMPATTO ESTETICO NEGATIVO;
- FERMO PARZIALE O TOTALE DELL'ATTIVITÀ PRODUTTIVA;
- TEMPI REALIZZATIVI LUNGHİ;
- RISCHIO DI DANNEGGIARE MATERIALI O MACCHINARI PRESENTI IN SITO;

MODALITÀ DI COLLASSO



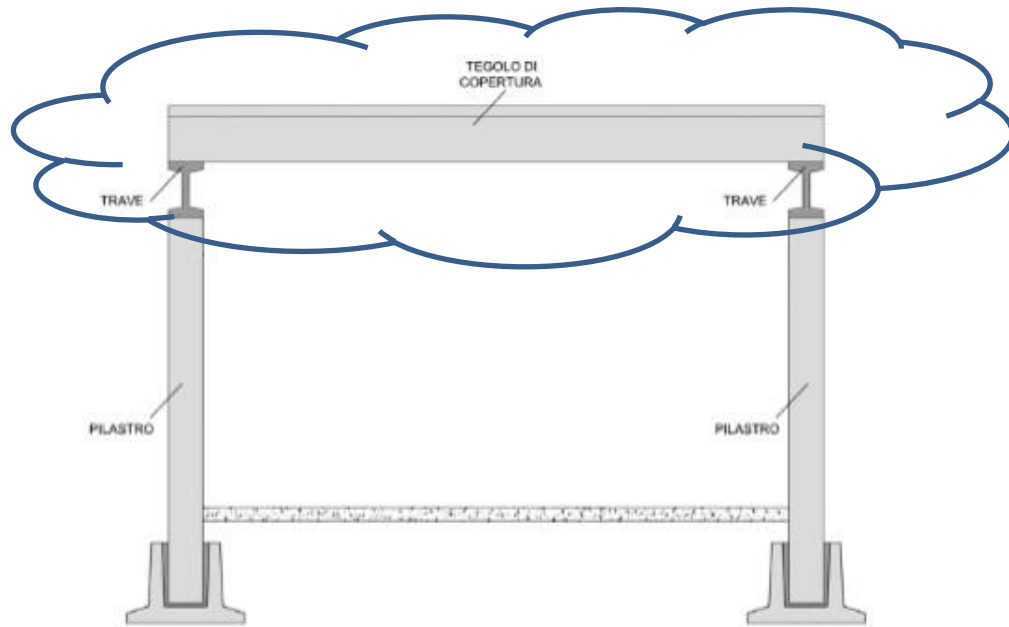
SPOSTAMENTO RELATIVO
TRA GLI ELEMENTI



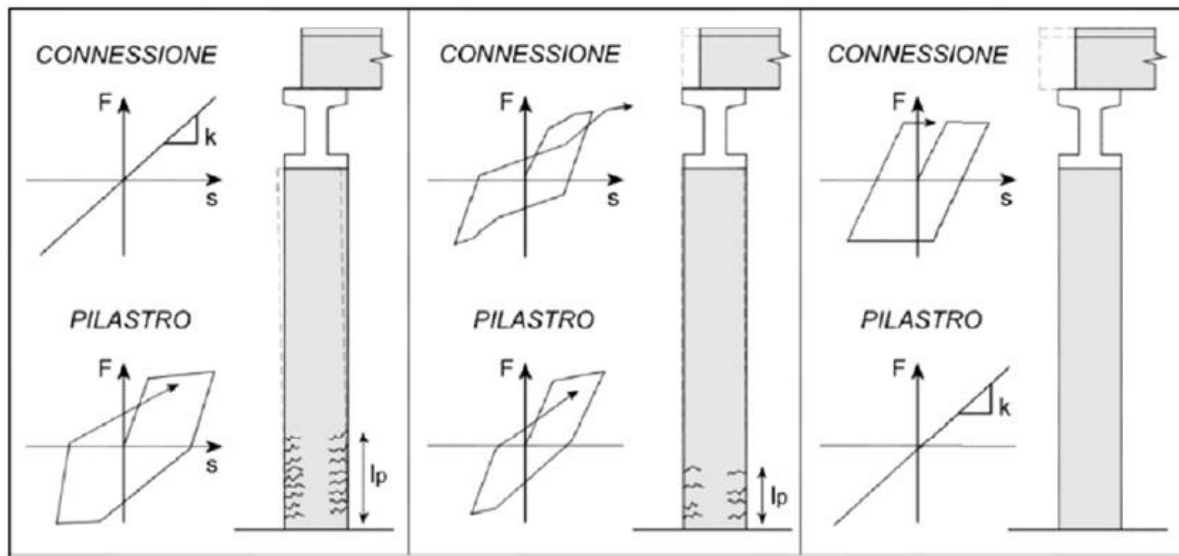
PERDITA D'APPOGGIO
(TEGOLO COPERTURA – ARCHITRAVE)

CEDIMENTO
COLLEGAMENTO
(PANNELLO DI TAMONAMENTO
– PILASTRO)



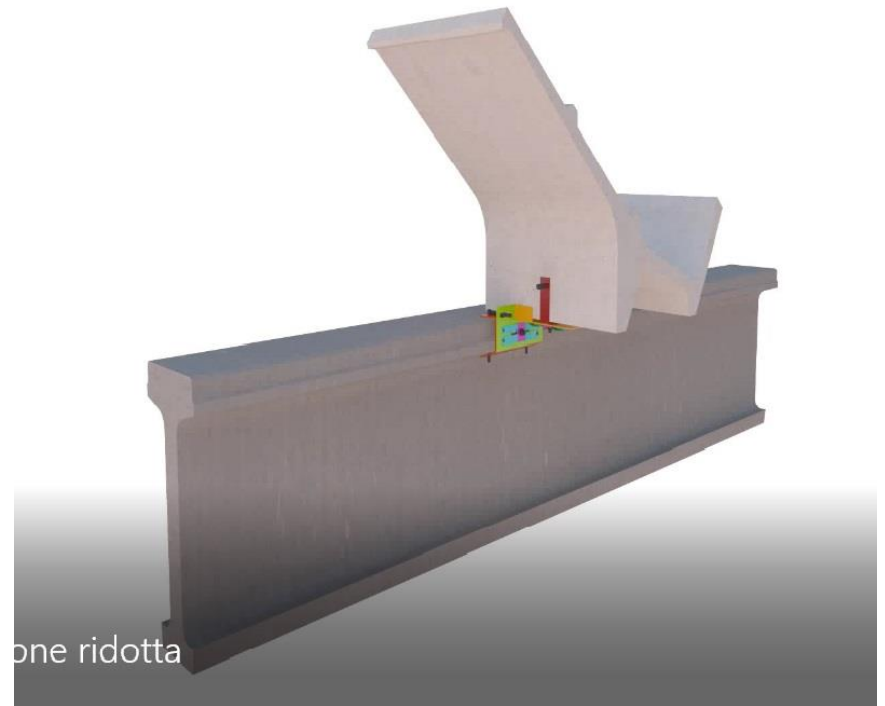


MASSA SISMICA

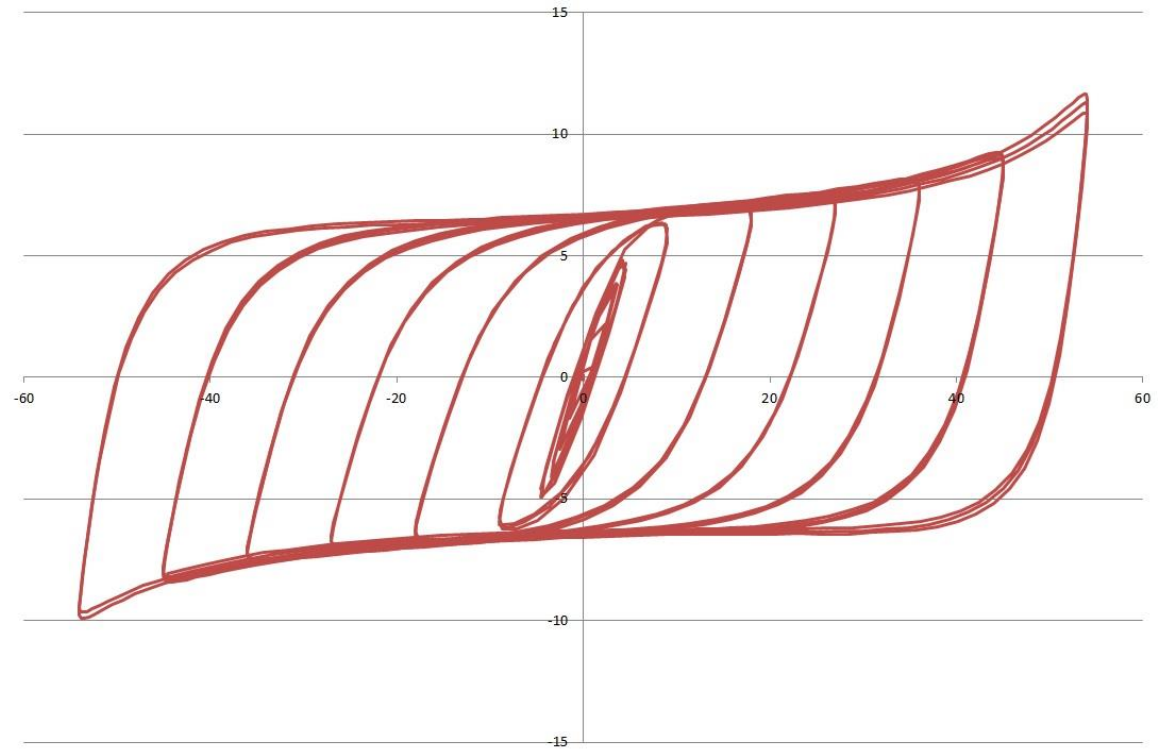


COLLEGAMENTO RIGIDO – DUTTILE – COLLEGAMENTO DISSIPATIVO

COLLEGAMENTO DISSIPATIVO RESILIO BIDIREZIONALE



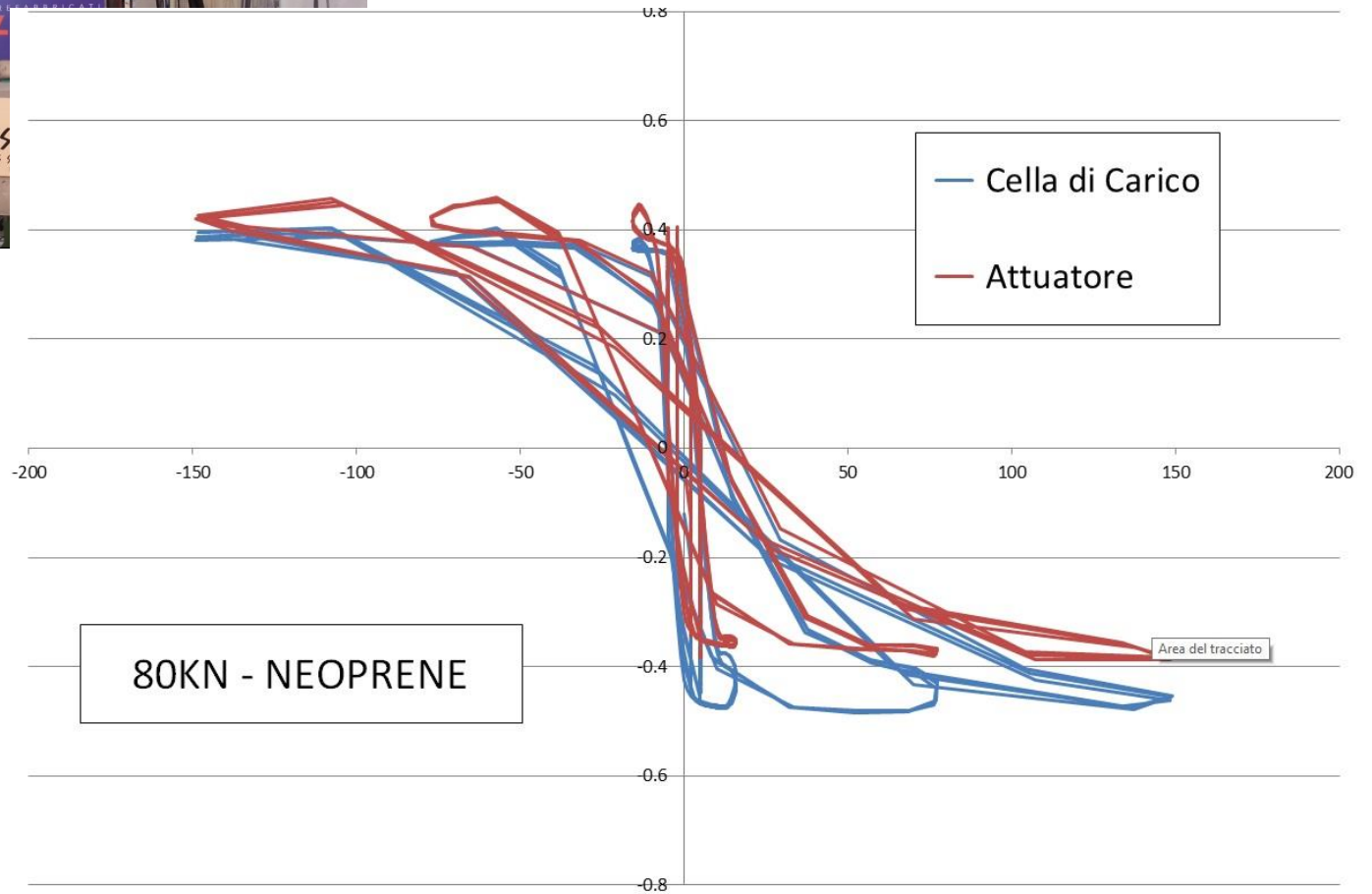
COLLEGAMENTO DISSIPATIVO RESILIO BIDIREZIONALE



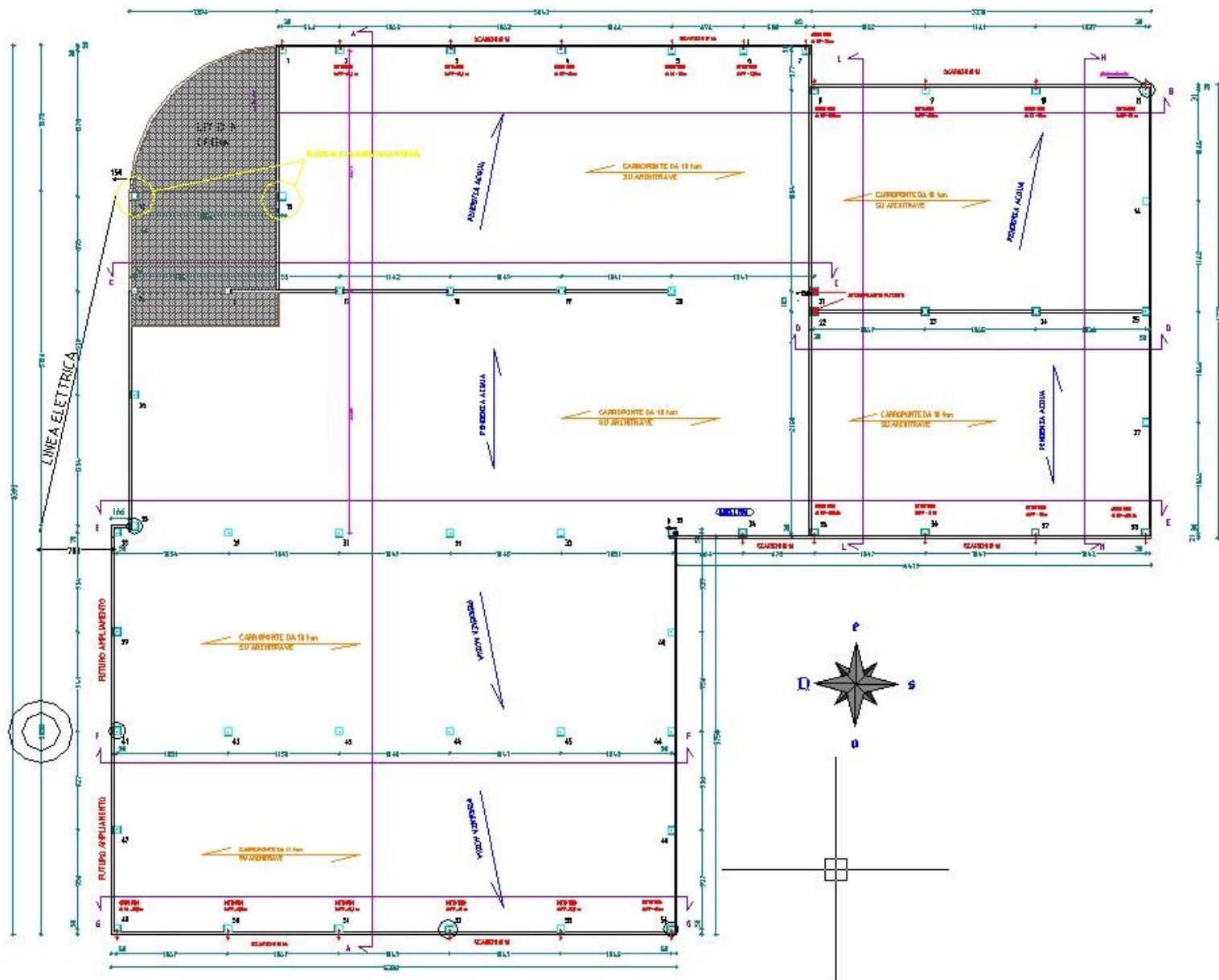
ATTRITO



ATTRITO

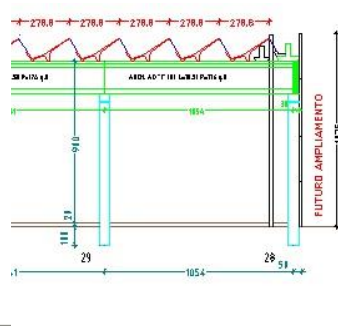
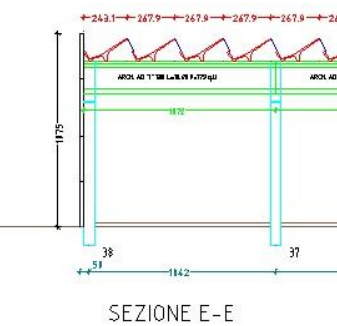
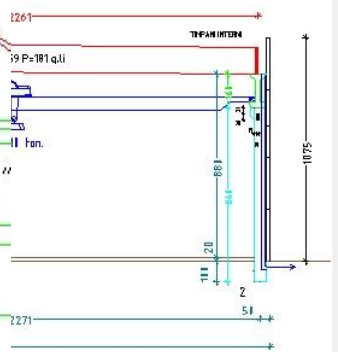
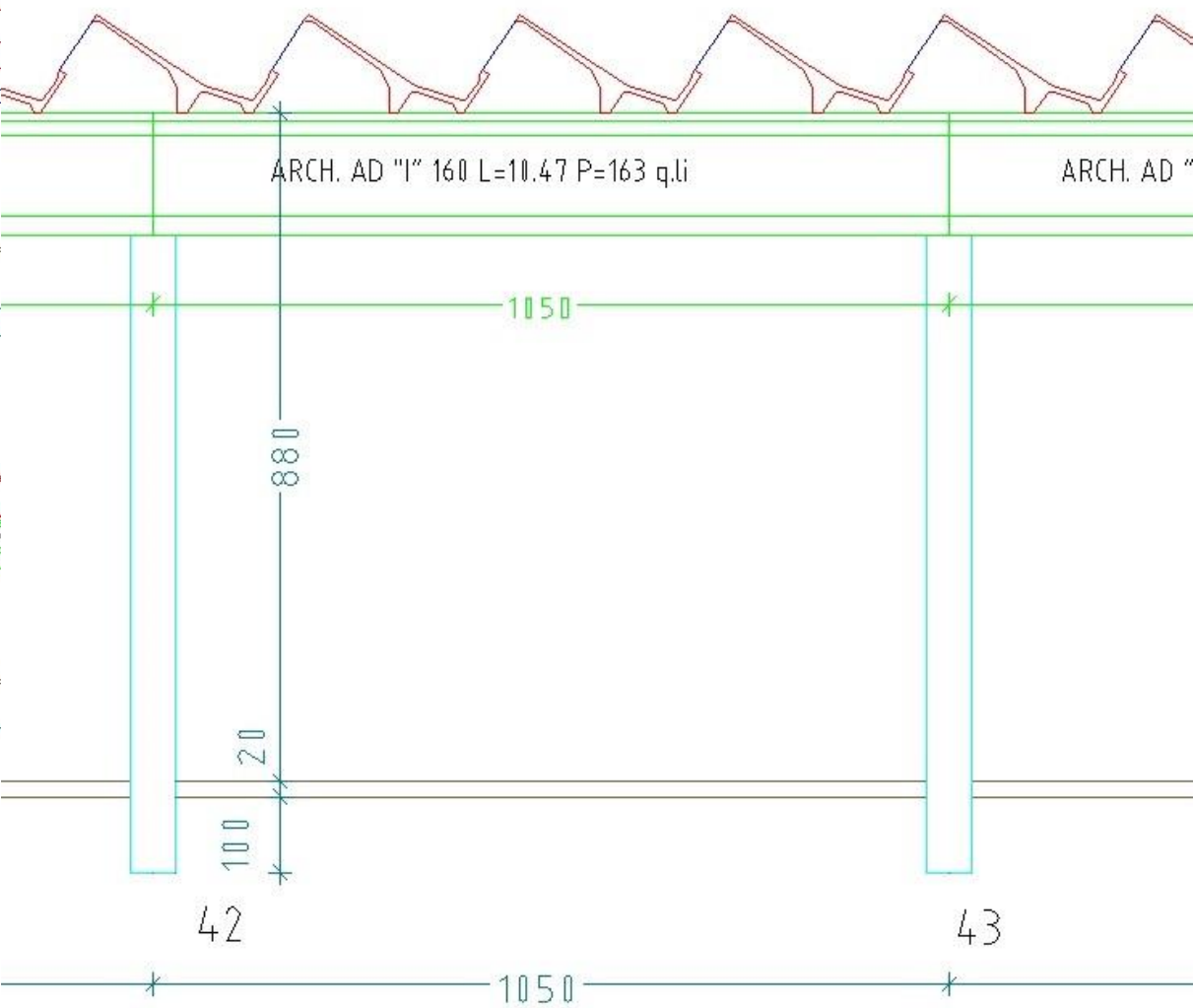
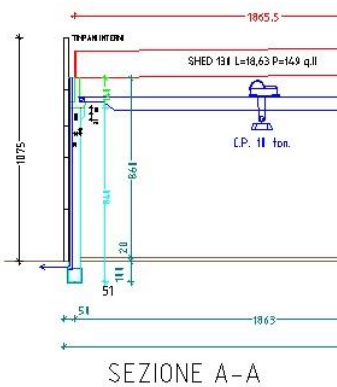


CANTIERE PILOTA



PIANTA

8 * 278.8 * 278.8 * 279.8 * 279.8 * 279.8 *



42

43

1050

FUTURO AMPLIAMENTO

PESO CLS= 74 Q. LI

MC= 3. 07

FERRO = 579 KG

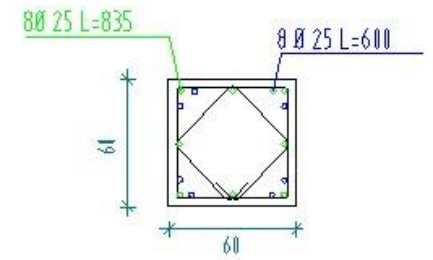
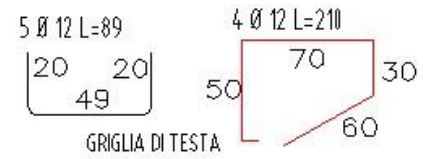
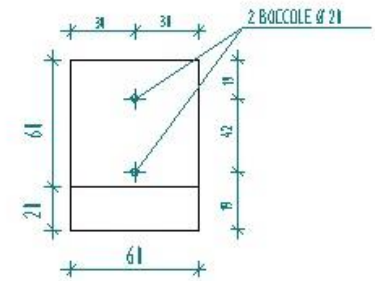
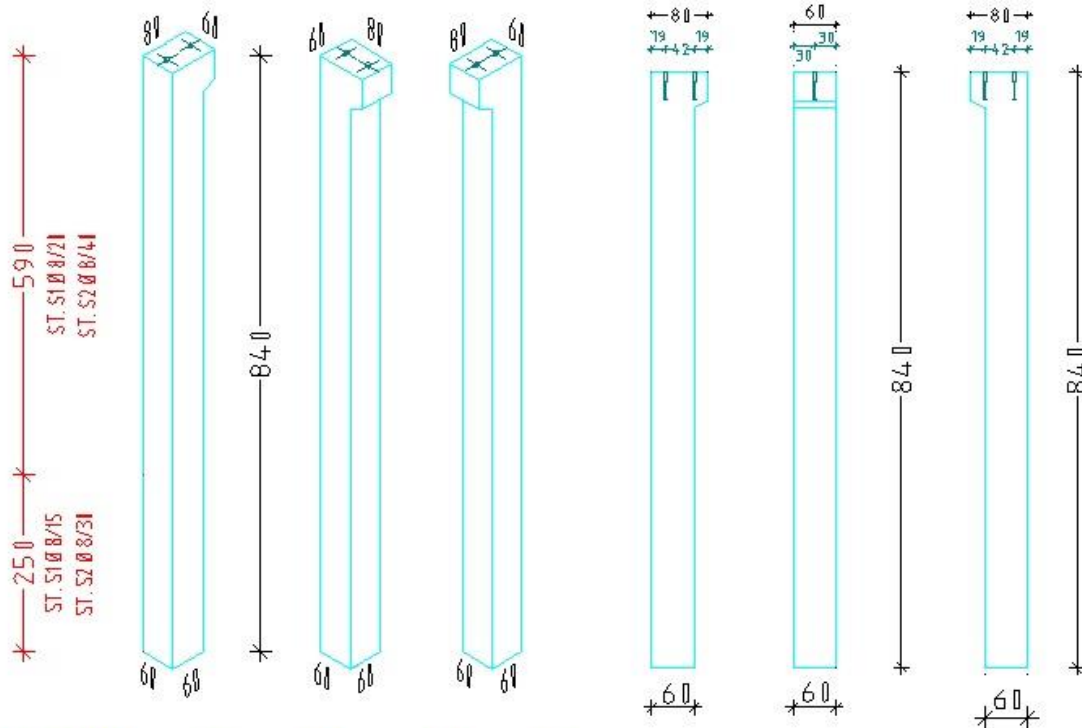
PESO TOT= 88 Q. LI

DITTA F.R.

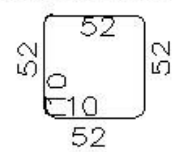
CODICE CFR30

PILASTRI Nr. 29-30-31-32

DISTANZIATORI 4 CM



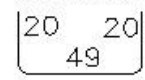
STAFFE S1 Ø 8 L=228



COLONNA 29 30 31 32

	FATTA IL	FATTA IL	FATTA IL	FATTA IL
FERRO	TEMPO	TEMPO	TEMPO	TEMPO
	FIRMA	FIRMA	FIRMA	FIRMA
GETTO	FATTA IL	FATTA IL	FATTA IL	FATTA IL
	TEMPO	TEMPO	TEMPO	TEMPO
	FIRMA	FIRMA	FIRMA	FIRMA

4+4 Ø 12 L=89



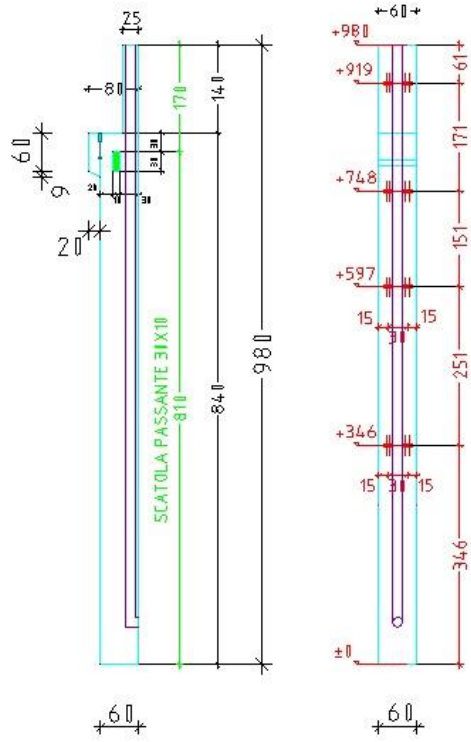
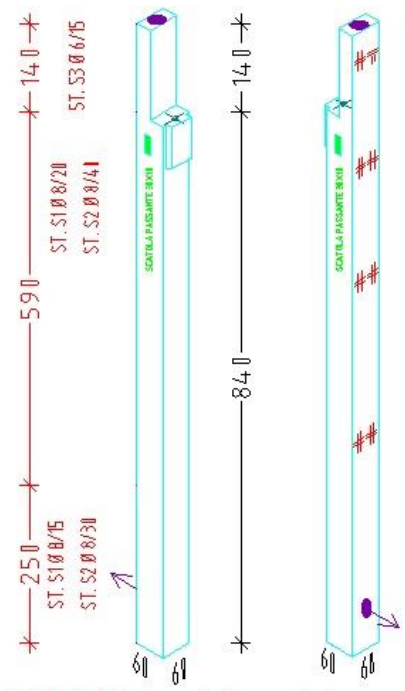
GRIGLIA DI BASE

TABELLA DI RIEPILOGO PRODUZIONE

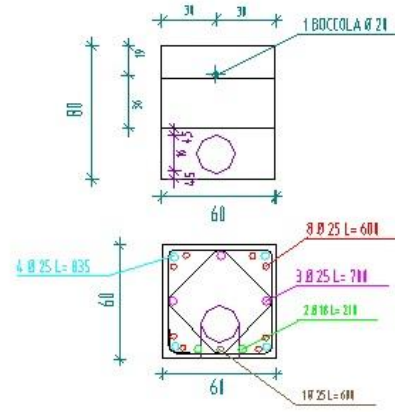
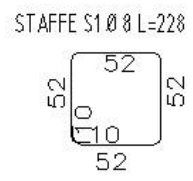
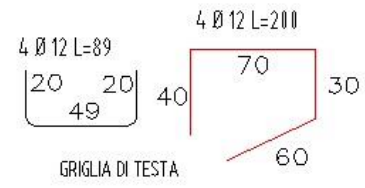
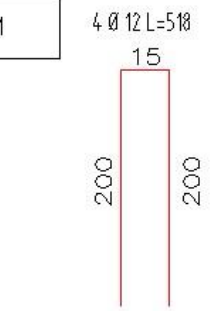
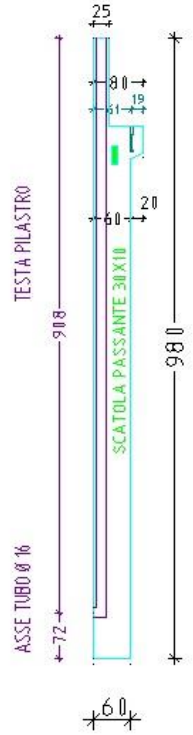
CODICE PROCEDURA		REV.		PILASTRI	
PRI		I		PILASTRI	
CODICE DOCUMENTO		REV.		PILASTRI	
S11-7		I		PILASTRI	
CONTROLLO MISURE				SI	NO
CONTROLLO VISIVO COPRIFERRO				SI	NO
DATA GETTO					
FIRMA RESPONSABILE DI REPARTO					

PESO CLS= 79 Q. LI
MC= 3.29
FERRO = 554 K G
PESO TOT= 85 Q. LI

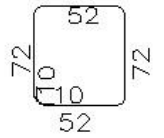
DITTA F.R.
 CODICE CFR30
 PILASTRO Nr. 50-53



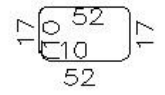
DISTANZIATORI 4 CM



5 STAFFE nella mensola Ø8 orizzontali L=268



STAFFE S3 Ø 6 L=117



STAFFE S2 Ø 8 L=168

TABELLA DI RIEPILOGO PRODUZIONE

CODICE PROCEDURA	PR 10	REV.	I	PROG. 1/1	PILASTRO	
CODICE DOCUMENTO	S11-7				SI	NO
CONTROLLO MISURE					SI	NO
CONTROLLO VISIVO COPRIFERRO					SI	NO
DATA GETTO						
FIRMA RESPONSABILE DI REPARTO						

COLONNA 50 53

FERRO	FATTA IL	FATTA IL
	TENPD	TENPD
GETTO	FIRMA	FIRMA
	FATTA IL	FATTA IL
	TENPD	TENPD
	FIRMA	FIRMA



ANALISI NUMERICA

INDICE DI VULNERABILITÀ SISMICA

- STATO DI FATTO

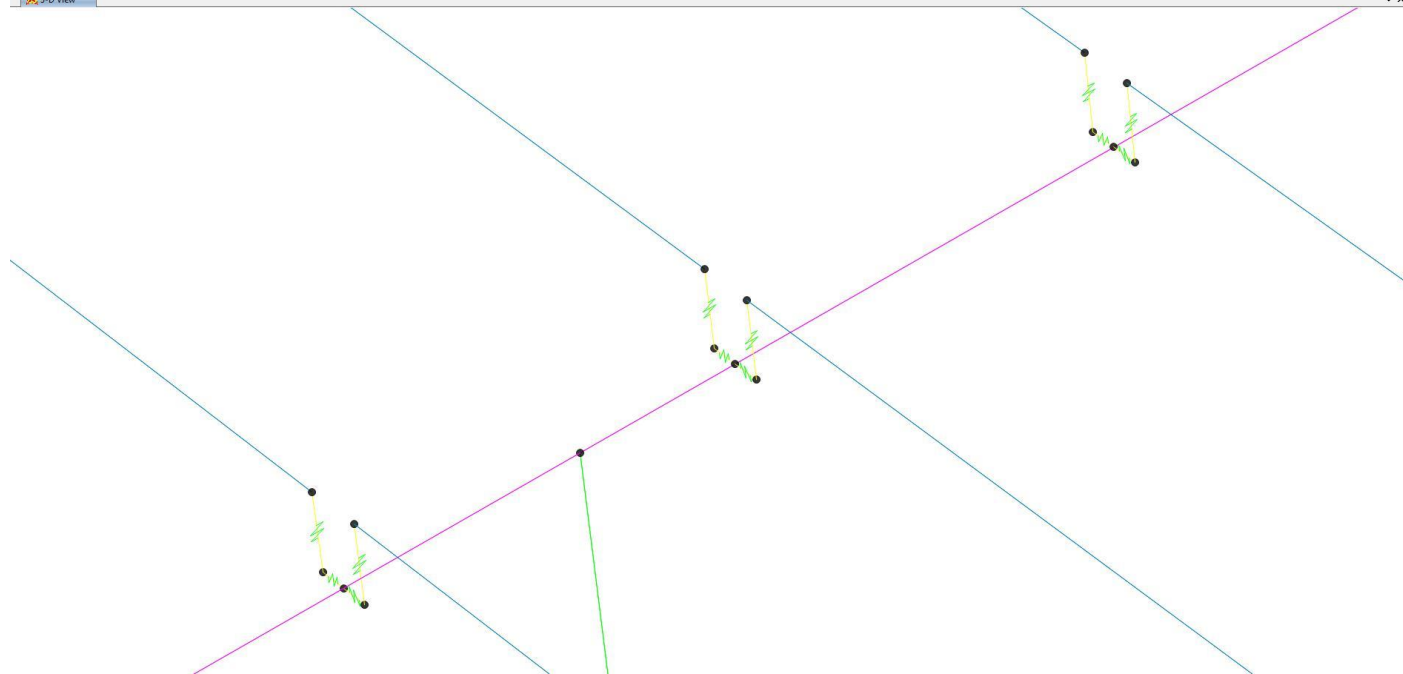
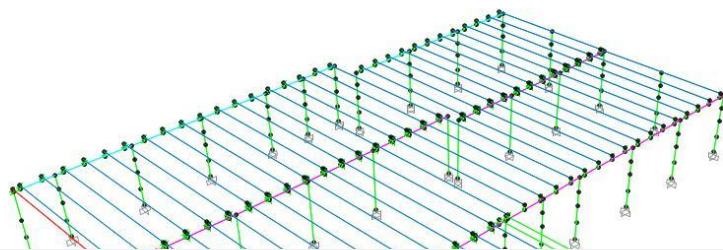
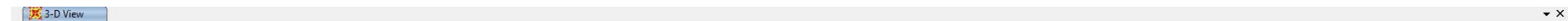
- ANALISI DINAMICA LINEARE (MODALE)

- ANALISI DINAMICA NON LINEARE (ATTRITO)

- PROGETTO

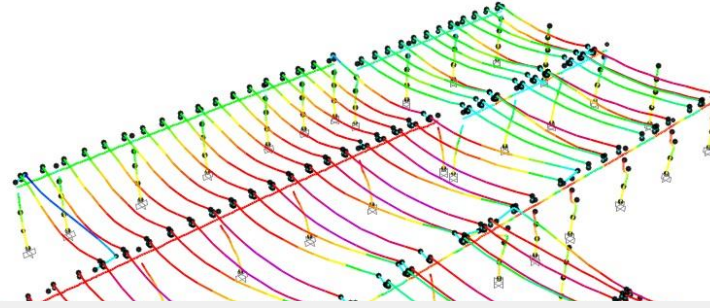
- ANALISI DINAMICA NON LINEARE (ATTRITO E DISSIPAZIONE)

MODELLO 3D

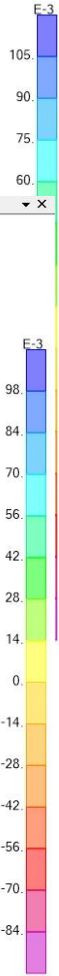
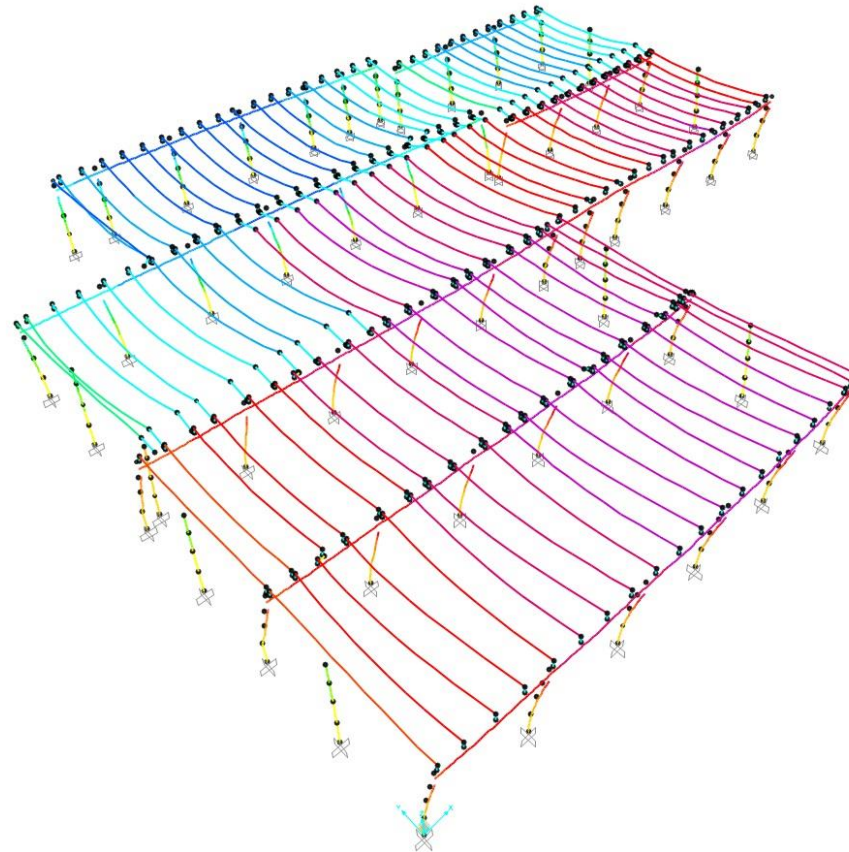


SPOSTAMENTO SDF – NL – ATT.45%

Deformed Shape (SLV_X_FNA)

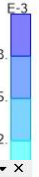
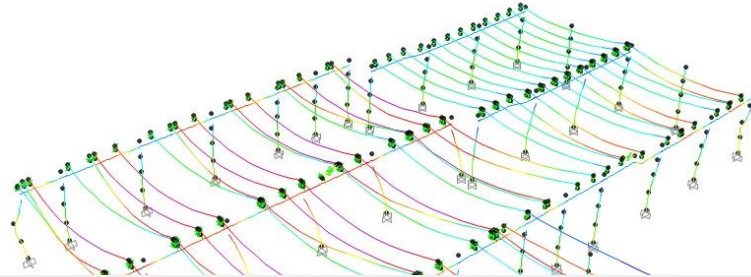


Deformed Shape (SLV_Y_FNA)

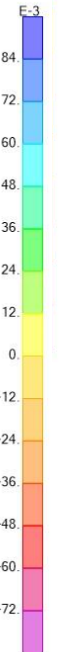
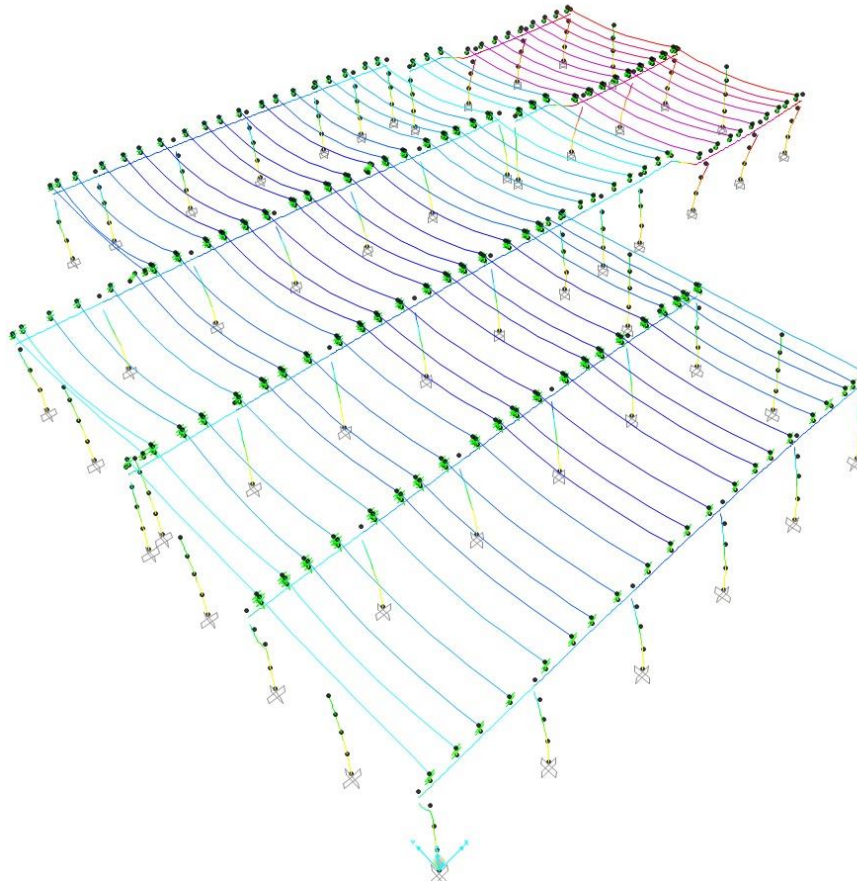


SPOSTAMENTO SDF – ELASTIC

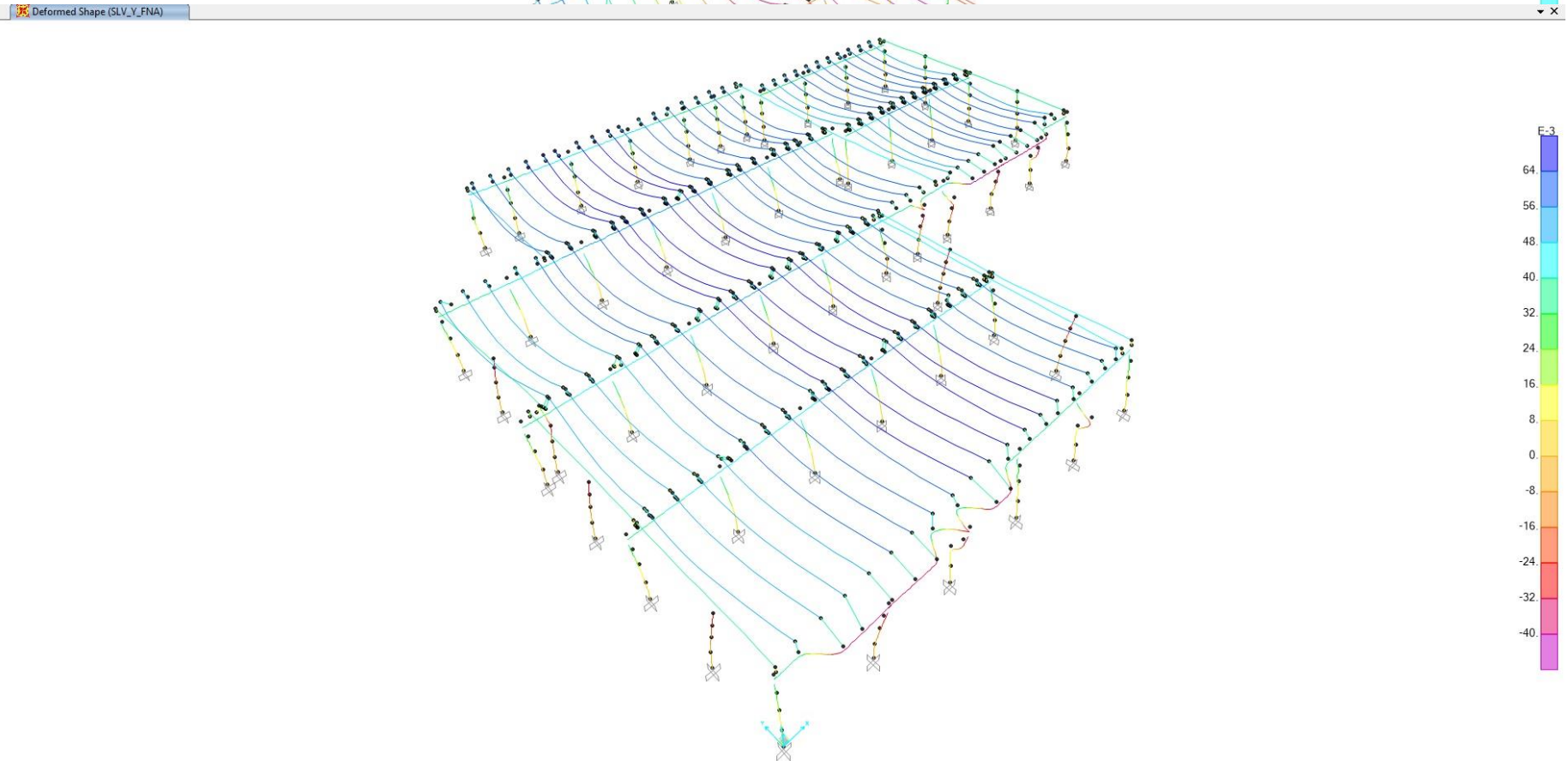
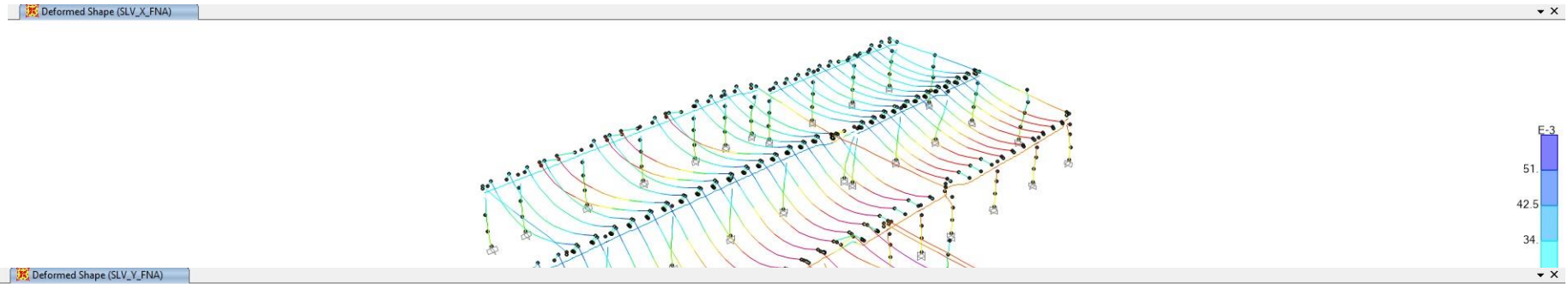
Deformed Shape (SLV_X_ELASTIC)



Deformed Shape (SLV_Y_ELASTIC)



SPOSTAMENTO SDF – NL – F50 - ATT.4%



TAGLIANTI DI BASE

TABLE: Base Reactions - SDF_Att45%

OutputCase	CaseType	StepType	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY	GlobalMZ
Text	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
SLV_X_FNA	Combination	Max	4476.482	1289.995	35692.252	1583555.322	-1273100.41	155838.2213
SLV_X_FNA	Combination	Min	-4363.316	-1725.897	29676.305	1314034.07	-1563955.49	-163743.978
SLV_Y_FNA	Combination	Max	1407.919	4665.021	35698.495	1596946.548	-1283302.64	184437.362
SLV_Y_FNA	Combination	Min	-1294.596	-5163.396	29675.247	1300892.565	-1555304.35	-196905.509

TABLE: Base Reactions - SDF_Elastic

OutputCase	CaseType	StepType	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY	GlobalMZ
Text	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
SLV_X_ELASTIC	Combination	Max	4331.957	1278.011	32779.248	1458819.724	-1302328.3	248188.8869
SLV_X_ELASTIC	Combination	Min	-4331.957	-1278.011	31188.281	1367066.622	-1447091.35	-248188.887
SLV_Y_ELASTIC	Combination	Max	1307.759	4243.07	32756.868	1484832.763	-1329358.04	246681.8561
SLV_Y_ELASTIC	Combination	Min	-1307.759	-4243.07	31210.661	1341053.583	-1420061.61	-246681.856

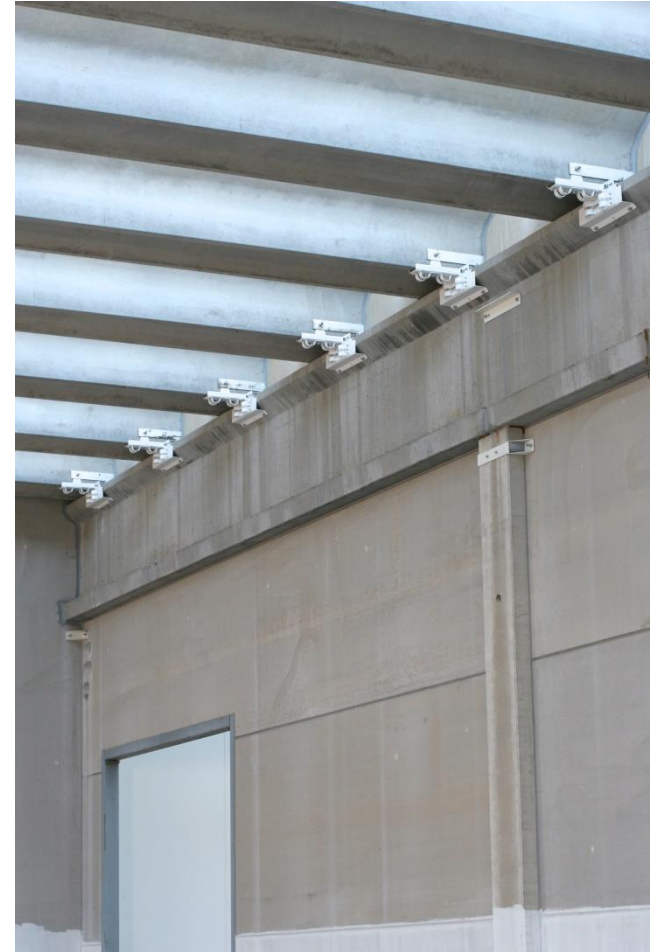
TABLE: Base Reactions - NL_F50_Att4%

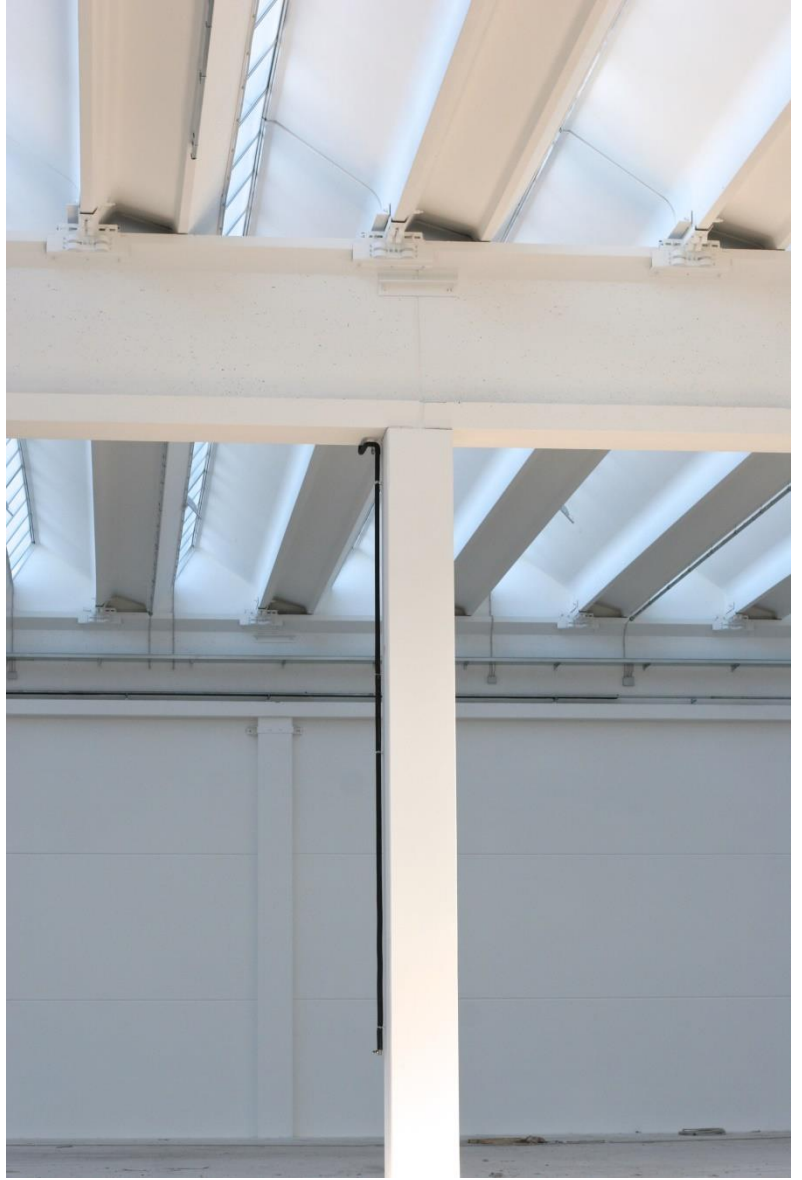
OutputCase	CaseType	StepType	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY	GlobalMZ
Text	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
SLV_X_FNA	Combination	Max	3208.574	1229.52	35883.378	1577179.743	-1300943.48	110952.8706
SLV_X_FNA	Combination	Min	-3168.122	-1104.737	30008.32	1316090.066	-1571923.78	-104439.214
SLV_Y_FNA	Combination	Max	1116.279	3200.772	35864.368	1579650.455	-1307982.98	108136.9593
SLV_Y_FNA	Combination	Min	-994.434	-3094.449	30009.045	1309968.202	-1567880.14	-108351.192

Pilastro	Segmento	Sezione	Combinazione	N [N]	M2 [Nm]	M3 [Nm]	As [cm ²]	β maj	β min	D/C	C/D
270		4 60x60_4D25_St20	SLV_Y_FNA	-2.05E+05	-6.12E+05	-1.15E+05	19.63	0.707	0.7071	2.803	0.357
266		4 60x60_4D25_St20	SLV_Y_FNA	-4.78E+05	6.59E+05	1.22E+05	19.63	0.707	0.7071	2.701	0.370
220		4 60x60_4D25_St20	SLV_Y_FNA	-4.02E+05	-6.10E+05	-1.18E+05	19.63	0.707	0.7071	2.558	0.391
218		4 60x60_4D25_St20	SLV_Y_FNA	-4.05E+05	-6.06E+05	-1.18E+05	19.63	0.707	0.7071	2.534	0.395
264		4 60x60_4D25_St20	SLV_Y_FNA	-4.76E+05	5.83E+05	1.22E+05	19.63	0.707	0.7071	2.332	0.429
222		4 60x60_4D25_St20	SLV_Y_FNA	-4.01E+05	-5.63E+05	-1.18E+05	19.63	0.707	0.7071	2.324	0.430
268		4 60x60_4D25_St20	SLV_Y_FNA	-3.87E+05	5.42E+05	1.21E+05	19.63	0.707	0.7071	2.24	0.446
216		4 60x60_4D25_St20	SLV_Y_FNA	-3.35E+05	-5.30E+05	-1.09E+05	19.63	0.7071	0.7071	2.237	0.447
254		4 60x60_4D25_St20	SLV_Y_FNA	-4.58E+05	-5.35E+05	-1.20E+05	19.63	0.707	0.7071	2.114	0.473

Pilastro	Segmento	Sezione	Combinazione	N [N]	M2 [Nm]	M3 [Nm]	As [cm ²]	β maj	β min	D/C	C/D
270		4 60x60_4D25_St20	SLV_Y_FNA	-2.13E+05	3.11E+05	9.78E+04	19.63	0.707	0.7071	1.302	0.768
228		4 60x60_4D25_St20	SLV_Y_FNA	-1.53E+05	2.97E+05	6.18E+04	19.63	0.7069	0.7071	1.3	0.769
258		4 60x60_4D25_St20	SLV_Y_FNA	-1.52E+05	-2.84E+05	-6.39E+04	19.63	0.707	0.7071	1.238	0.808
230		4 60x60_4D25_St20	SLV_Y_FNA	-3.80E+05	3.42E+05	4.56E+04	19.63	0.707	0.7071	1.234	0.810
268		4 60x60_4D25_St20	SLV_Y_FNA	-3.78E+05	3.28E+05	8.24E+04	19.63	0.707	0.7071	1.176	0.850
250		4 60x60_4D25_St20	SLV_Y_FNA	-2.91E+05	-2.93E+05	9.17E+04	19.63	0.7071	0.7071	1.113	0.898
234		4 60x60_4D25_St20	SLV_Y_FNA	-4.93E+05	-3.41E+05	9.66E+04	19.63	0.707	0.7071	1.113	0.898
266		4 60x60_4D25_St20	SLV_Y_FNA	-4.72E+05	3.35E+05	8.34E+04	19.63	0.707	0.7071	1.109	0.902
236		4 60x60_4D25_St20	SLV_Y_FNA	-4.06E+05	3.19E+05	9.86E+04	19.63	0.7071	0.7071	1.106	0.904
216		4 60x60_4D25_St20	SLV_Y_FNA	-3.36E+05	-3.01E+05	9.56E+04	19.63	0.7071	0.7071	1.1	0.909
260		4 60x60_4D25_St20	SLV_Y_FNA	-2.88E+05	2.82E+05	8.38E+04	19.63	0.7069	0.7071	1.06	0.943
232		4 60x60_4D25_St20	SLV_Y_FNA	-4.97E+05	-3.30E+05	9.97E+04	19.63	0.707	0.7071	1.055	0.948
252		4 60x60_4D25_St20	SLV_Y_FNA	-4.48E+05	3.17E+05	8.97E+04	19.63	0.707	0.7071	1.051	0.951
264		4 60x60_4D25_St20	SLV_Y_FNA	-4.80E+05	3.24E+05	8.33E+04	19.63	0.707	0.7071	1.043	0.959
218		4 60x60_4D25_St20	SLV_Y_FNA	-4.12E+05	-3.07E+05	-8.38E+04	19.63	0.707	0.7071	1.039	0.962
254		4 60x60_4D25_St20	SLV_Y_FNA	-4.55E+05	3.05E+05	8.97E+04	19.63	0.707	0.7071	0.982	1.018
230		3 60x60_4+4D25_St20	SLV_Y_FNA	-4.25E+05	4.72E+05	9.87E+04	39.27	0.707	0.7071	0.981	1.019
262		4 60x60_4D25_St20	SLV_Y_FNA	-4.11E+05	2.89E+05	8.21E+04	19.63	0.707	0.7071	0.954	1.048
230		1 60x60_4+8+4D25_St15	SLV_Y_FNA	-4.75E+05	-7.76E+05	-2.04E+05	78.54	0.707	0.7071	0.95	1.053
220		4 60x60_4D25_St20	SLV_Y_FNA	-4.07E+05	-2.81E+05	-8.25E+04	19.63	0.707	0.7071	0.92	1.087
226		4 60x60_4D25_St20	SLV_Y_FNA	-3.28E+05	-2.59E+05	-8.74E+04	19.63	0.7071	0.7071	0.908	1.101
222		4 60x60_4D25_St20	SLV_Y_FNA	-4.08E+05	-2.77E+05	-8.23E+04	19.63	0.707	0.7071	0.897	1.115
256		4 60x60_4D25_St20	SLV_X_FNA	-2.57E+05	1.22E+05	2.32E+05	19.63	0.7071	0.7071	0.869	1.151
91		1 60x60_4+8+4D25_St15	SLV_Y_FNA	-8.89E+05	7.60E+05	2.28E+05	78.54	0.707	0.7071	0.86	1.163

ESECUZIONE DEI LAVORI







GRAZIE PER L'ATTENZIONE

