autostrade per l'italia

# AUTOSTRADA (A14) : BOLOGNA-BARI-TARANTO

## TRATTO: BOLOGNA BORGO PANIGALE - BOLOGNA SAN LAZZARO

## POTENZIAMENTO IN SEDE DEL SISTEMA AUTOSTRADALE E TANGENZIALE DI BOLOGNA

## "PASSANTE DI BOLOGNA"

# PROGETTO DEFINITIVO

## VIABILITA' INTERFERITA

## LINEA FERROVIARIA FS Bologna-Padova pk11+901

## Cavalcaferrovia ex77T - F.S. - 11+901

-

## Relazione di calcolo fondazioni

| IL PROGETTISTA SPECIALISTICO | IL RESPONSABILE INTEGRAZIONE PRESTAZIONI SPECIALISTICHE | IL DIRETTORE TECNICO |
|---|---|---|
| Ing. Marco Pietro D'Angelantonio<br>Ord. Ingg. Milano n.A20155<br>RESPONSABILE GEOTECNICA ALL'APERTO | Ing. Raffaele Rinaldesi<br>Ord. Ingg. Macerata N. A1068 | Ing. Andrea Tanzi<br>Ord. Ingg. Parma N. 1154<br>PROGETTAZIONE NUOVE OPERE AUTOSTRADALI |

CODICE IDENTIFICATIVO

| RIFERIMENTO PROGETTO | | | RIFERIMENTO DIRETTORIO | | | | RIFERIMENTO ELABORATO | | | | ORDINATORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Codice Commessa | Lotto, Sub-Prog, Cod. Appalto | Fase | Capitolo | Paragrafo | W B S | Parte d'opera | Tip. | Disciplina | Progressivo | Rev. | -- |
| 111465 | 0000 | PD | IN | T02 | CV77F | FND00 | R | A P E | 2520 | - 2 | SCALA VARIE |

spea ENGINEERING gruppo Atlantia

| PROJECT MANAGER: | SUPPORTO SPECIALISTICO: |
|---|---|
| Ing. Raffaele Rinaldesi<br>Ord. Ingg. Macerata N. A1068 | Ing. Paolo Maestrelli<br>Ord. Ingg. Genova<br>N. 6972<br>SETECO ingegneria s.r.l. |
| REDATTO: | VERIFICATO: |

| REVISIONE | |
|---|---|
| n. | data |
| 0 | DICEMBRE 2017 |
| 1 | SETTEMBRE 2019 |
| 2 | SETTEMBRE 2020 |
| 3 | |
| 4 | |

| | VISTO DEL COMMITTENTE | VISTO DEL CONCEDENTE |
|---|---|---|
| | autostrade per l'italia<br>IL RESPONSABILE UNICO DEL PROCEDIMENTO<br>Ing. Fabio Visintin | Ministero delle Infrastrutture e dei Trasporti<br>DIPARTIMENTO PER LE INFRASTRUTTURE, GLI AFFARI GENERALI ED IL PERSONALE<br>STRUTTURA DI VIGILANZA SULLE CONCESSIONARIE AUTOSTRADALI |

# PONTE AD ARCO-TRAVE

## PROGETTO DEFINITIVO

## Relazione di calcolo fondazioni

## Cavalcavia CV02 km 11+901 (ex. CV77T)

**PROGETTAZIONE**

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| **2** | 15/10/2020 | REVISIONE | DeBenedetti | Vaccarezza | Maestrelli |
| **1** | 02/10/2020 | REVISIONE | DeBenedetti | Vaccarezza | Maestrelli |
| **0** | 30/05/2018 | EMISSIONE | DeBenedetti | Vaccarezza | Maestrelli |
| **REV.** | **DATA** | **DESCRIZIONE** | **REDATTO** | **CONTROLLATO** | **APPROVATO** |

# INDICE

# 1 GENERALITA'

## 1.1 Descrizione dell'opera

Nel presente documento si riporta il dimensionamento delle fondazioni del cavalcavia ferroviario sulla linea BO-VR (ex. 77T) con progr. Km 11+901, la cui realizzazione è prevista nell'ambito dei lavori di potenziamento del sistema tangenziale di Bologna tra Borgo Panigale e San Lazzaro.

Le spalle del cavalcavia sono costituite da scatolari in c.a. (dimensioni in pianta 13.0 m x 15.4 m circa) che verranno realizzati mantenendo in esercizio la linea ferroviaria esistente con montaggio provvisorio di un ponte "Bologna 25" e scavo sotto di esso, previa realizzazione di paratie di micropali, opportunamente puntonate.

In relazione ai carichi agenti ed ai terreni in sito, le fondazioni delle spalle saranno costituite da pali trivellati di grande diametro (D=1500 mm) disposti su due ali laterali dello scatolare.

Nella fase di varo impalcato, alcuni pali definitivi della spalla saranno utilizzati per la fase di varo impalcato con altri pali di fondazione appositamente eseguiti per la spalla provvisoria. Nella seguente Figura 3 è mostrata la configurazione dei pali di fondazione per la spalla di varo provvisoria. I dimensionamenti di questa fondazione provvisoria sono riportati in apposita relazione di calcolo a cui si rimanda.

La disposizione in pianta dei pali è mostrata nella seguente figura.

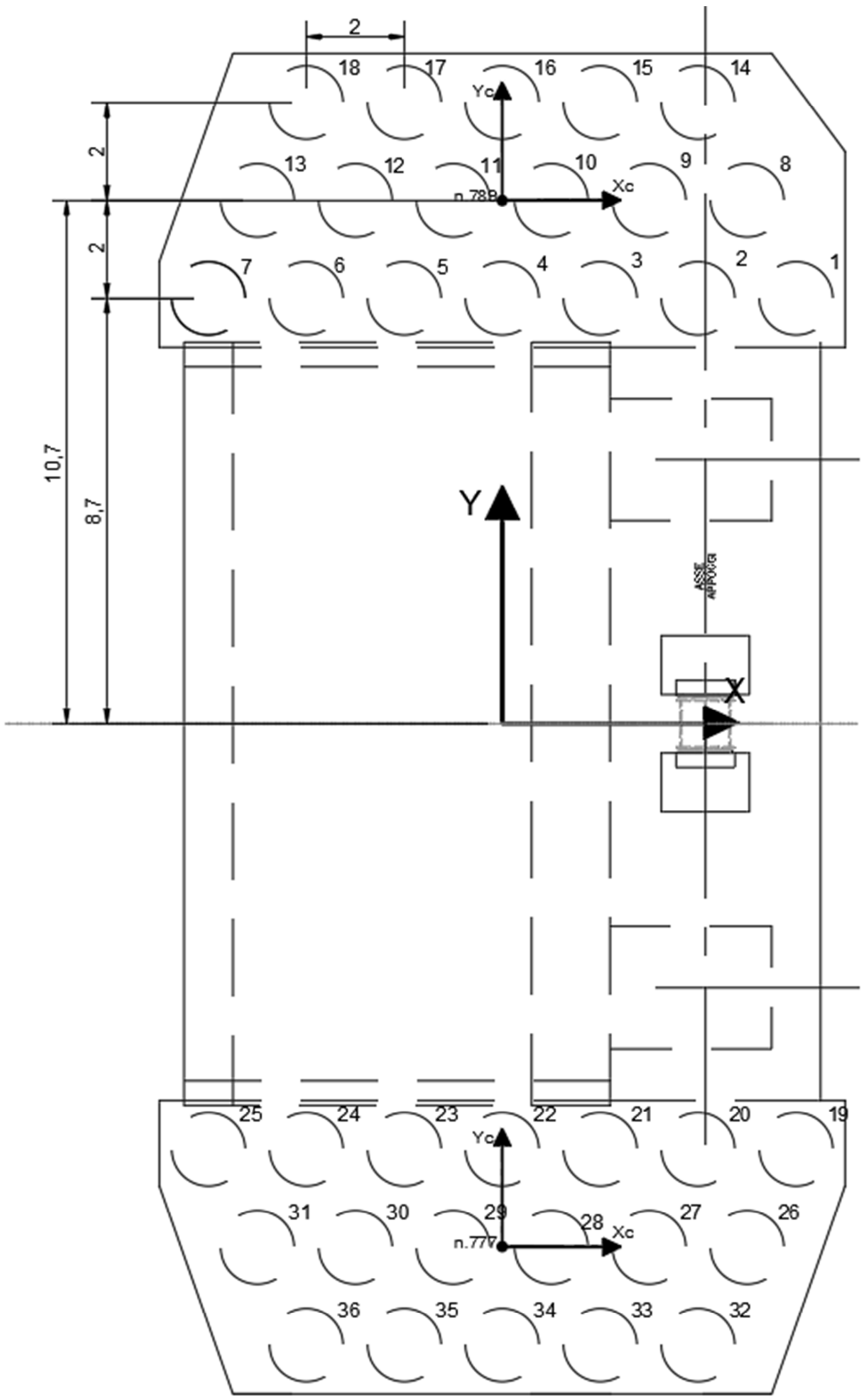



*Figura 1 – Pianta pali della fondazione spalla definitiva*

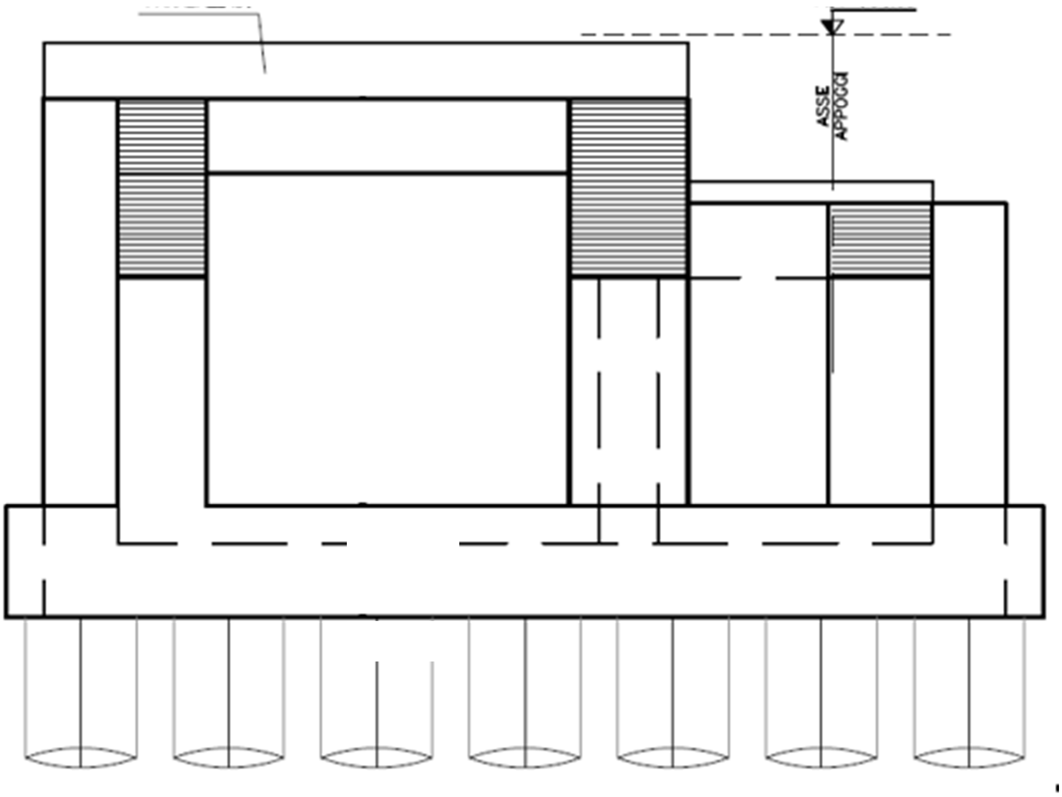



*Figura 2 – Sezione trasversale spalla*

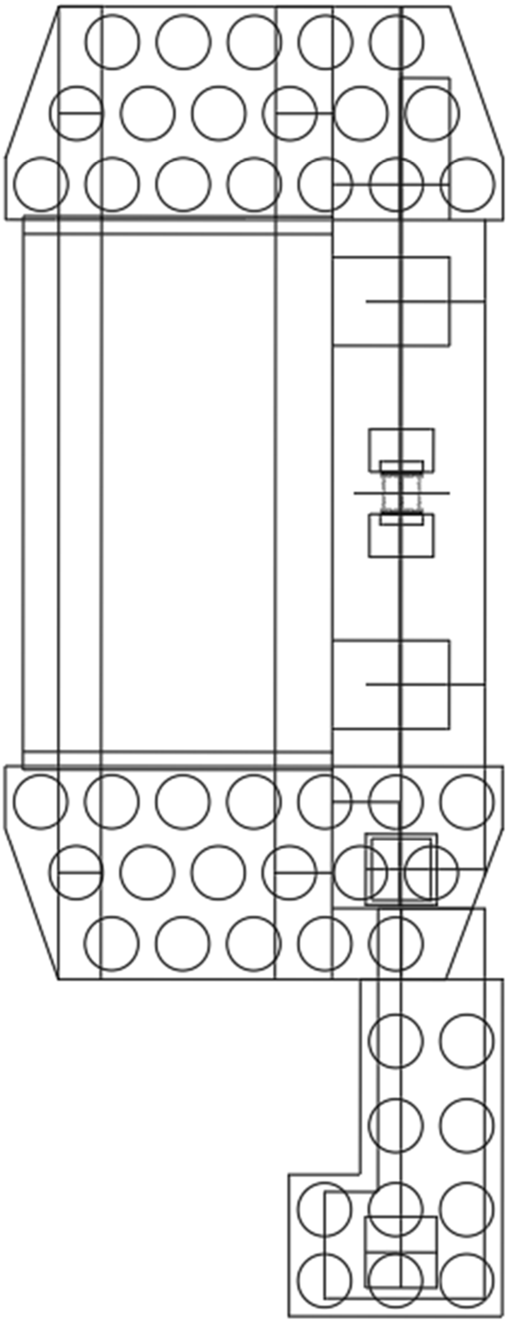


*Figura 3 – Pianta pali fase provvisionale di varo*

# 2 NORMATIVA E DOCUMENTI DI RIFERIMENTO

## 2.1 Normativa di riferimento

La redazione del presente documento è stata svolta secondo le prescrizioni della normativa vigente ed in particolare:

NT1. Norme Tecniche per le Costruzioni D.M del 17.01.2018.
NT2. Istruzioni per l'applicazione delle "Norme Tecniche per le Costruzioni approvate con D.M del 17.1.2018" - Circolare n.7 C.S.LL.PP. 21.01.2019.
NT3. RFI DTC SI PS MA IFS 001 D manuale di progettazione delle opere civili – parte II – sezione 2 – Ponti e Strutture.
NT4. RFI DTC SI CS MA IFS 001 D manuale di progettazione delle opere civili – parte II – sezione 3 – Corpo stradale.
NT5. EUROCODICI.

## 2.2 Documenti di riferimento

La redazione del presente elaborato è stata svolta con riferimento ai seguenti documenti di riferimento.

[DC1]. Autostrada A14. Potenziamento del sistema tangenziale di Bologna tra Borgo Panigale e San Lazzaro. Relazione geotecnica generale. Progetto Definitivo. Novembre, 2016.
[DC2]. Autostrada A14. Potenziamento del sistema tangenziale di Bologna tra Borgo Panigale e San Lazzaro. Planimetria e profilo geotecnico dal km 11+700 al km 13+200 (tavola 4 di 10). Progetto Definitivo. Novembre, 2016.
[DC3]. Relazione di calcolo impalcato CV02 – Progetto Definitivo.
[DC4]. Relazione di calcolo delle opere provvisionali dei cavalcavia CV1, CV2, CV3 nell'ambito sistema tangenziale di Bologna tra Borgo Panigale e San Lazzaro – Progetto Definitivo.
[DC5]. Elaborati grafici del cavalcavia CV02 – Progetto Definitivo.

## 2.3 Software

- MAP Matrix Analysis of Piles (G. Guiducci, 1999). Rimini (RN), Italia. Programma di calcolo per analisi delle sollecitazioni e deformazioni di tipo lineare e non lineare di palificate di fondazione collegate da plinto rigido.

  I risultati delle analisi ottenuti con la metodologia sopra descritta sono in linea con quelli ottenuti con il programma GROUP (Ensoft INC. engineering software Ausin Texas USA) utilizzato in vari ambiti progettuali ad esempio nella progettazione della linea ferroviaria Alta Velocità MI-NA (Roma-Napoli e Milano-Bologna) e quindi validato da Italferr. Ciò è stato possibile attraverso un procedimento di taratura e l'utilizzo dei medesimi criteri di valutazione delle rigidezze e degli effetti gruppo utilizzati nel programma GROUP.

- PAL (G. Guiducci, 1999-2006). Rimini (RN), Italia.
  Programma di valutazione capacità portante per pali singoli di fondazione soggetti a carichi assiali. Sono implementati diverse metodologie di calcolo di portata laterale e di base pubblicati in letteratura tecnica. L’elaborazione opera secondo somma di contributi unitari.
- APAL (G. Guiducci, 2006). Rimini (RN), Italia.
  Programma per l'analisi di pali caricati assialmente: curve carico-cedimento; trasferimento sforzo assiale.

Per il programma citato, con riferimento al paragrafo 10.2 del D.M. 17.01.2018 e relativa Circolare esplicativa n° 7/19 C.S.LL.PP., si dichiara che:

- i risultati dei calcoli eseguiti con l’utilizzo del calcolatore sono stati verificati dal progettista;
- i risultati presentati nelle forme allegate al progetto ne garantiscano la leggibilità, la corretta interpretazione e la riproducibilità;
- l’affidabilità dei codici utilizzati è stata verificata attraverso esame preliminare, di valutazione dell’affidabilità e soprattutto dell’idoneità del programma nel caso specifico di applicazione;
- la validazione dei codici di calcolo è stata verificata sia per confronto con soluzioni semplificate con metodi tradizionali, sia dall’esame della documentazione fornita dal produttore/distributore sulle modalità e procedure seguite per la validazione generale del codice.

# 3 MATERIALI

Calcestruzzo per pali di fondazione: Classe C 28/35

Resistenza caratteristica a compressione: $R_{ck} \geq 35$ N/mm$^2$
Resistenza cilindrica a compressione: $f_{ck} = 0{,}83\ R_{ck} = 29.05$ N/mm$^2$
$fd = 16.46$ N/mm$^2$

Acciaio in barre: B450C avente caratteristiche:
tensione caratteristica di snervamento $f_{yk} \geq 450$ N/mm$^2$
tensione caratteristica di rottura $f_{tk} \geq 540$ N/mm$^2$

# 4 CARATTERIZZAZIONE GEOTECNICA

Nel presente capitolo si riporta la caratterizzazione geotecnica per l'opera in esame in accordo alla relazione geotecnica generale della tratta A14 Bologna – Bari – Taranto nell'ambito del Potenziamento del Sistema Tangenziale di Bologna tra Borgo Panigale e San Lazzaro [DC1].

La stratigrafia è stata dedotta sulla base delle indagini geotecniche eseguite in corrispondenza dell'opera, rappresentate graficamente nell'elaborato [DC2] e sintetizzate nella seguente tabella.

*Tabella 1 - Indagini geognostiche di riferimento*

| Sigla sond./pozz./prova | Campagna di indagine | Progressiva (km) | Quota p.c. (m s.l.m.) | Lunghezza (m) | Strumentazione installata |
|---|---|---|---|---|---|
| SI 02 | 1986 | 11+810 | 32.0 | 30.0 | - |
| SI 03pz | 1986 | 11+935 | 32.6 | 30.0 | C (28 m |
| PB10-DH | 2016 | 11+940 | 32.0 | 35.0 | DH |
| C (….) = cella piezometrica Casagrande (profondità cella);<br>DH = tubo per misure Down-hole | | | | | |

In particolare per la caratterizzazione geotecnica si fa riferimento alle indicazioni della relazione geotecnica generale [DC1]. Il livello di falda è assunto cautelativamente a 5 m di profondità dal p.c. locale (piezometro installato nel sondaggio SI-03). Nella seguente tabella si riassume la stratigrafia per l'opera con riferimento ad una quota di p.c. di +32 m s.l.m..

*Tabella 2 - Stratigrafia e falda*

| Profondità (m da p.c.) | Descrizione | Unità geotecnica |
|---|---|---|
| 0.0 ÷ 7.0 | Limo argilloso | A |
| 7.0 ÷ 9.0 | Ghiaia e sabbia | B |
| 9.0 ÷ 19.0 | Limo argilloso | A |
| 19.0 ÷ 30.0 | Ghiaia e sabbia | B |
| 30.0 ÷ 35.0 | Limo argilloso | A |
| FALDA: 5.0 m da p.c. (+27 m s.l.m.) | | |

Nella seguente figura si riporta uno stralcio del profilo stratigrafico in corrispondenza dell'opera [DC2].

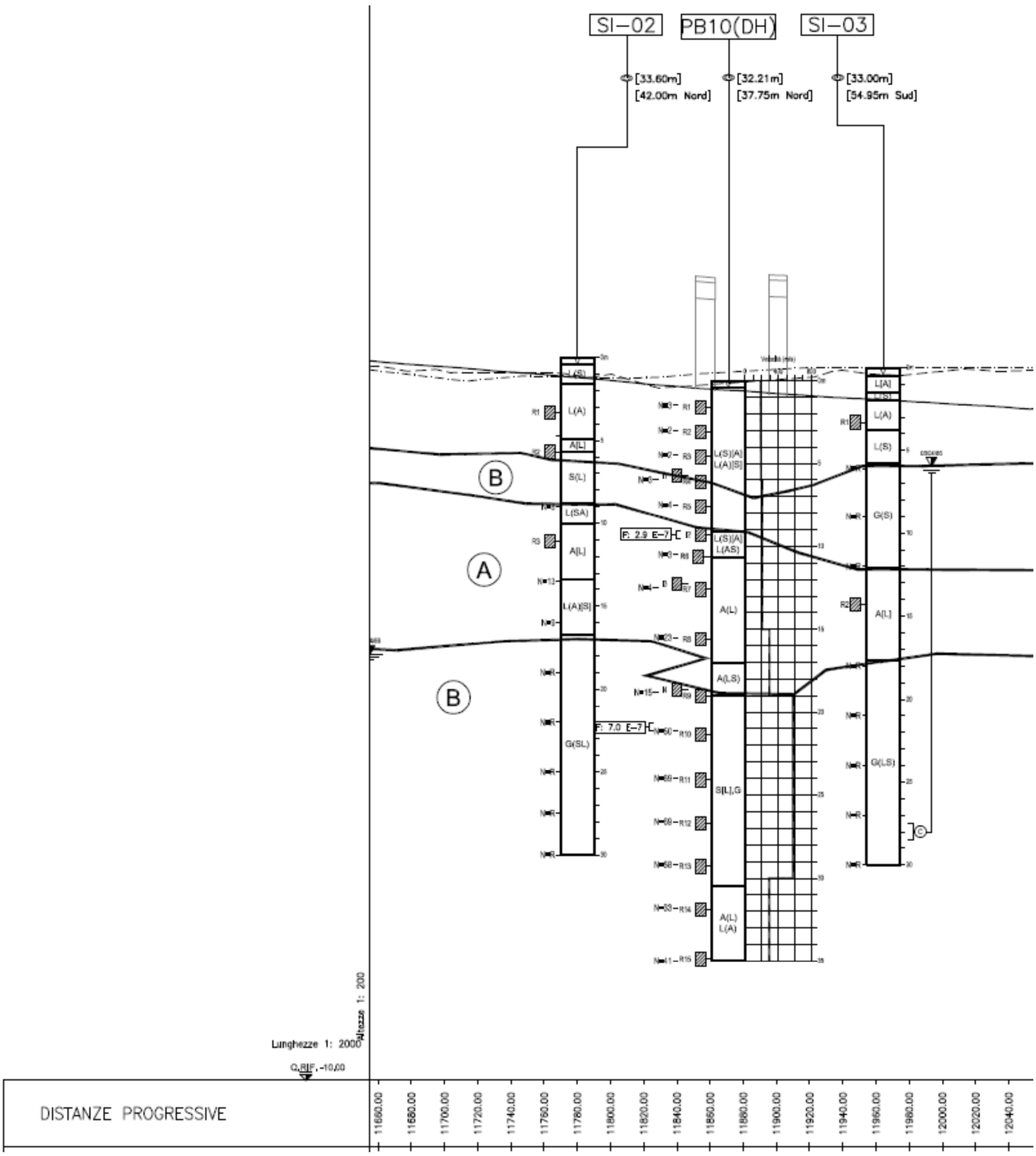



*Figura 4 – stralcio profilo stratigrafico in corrispondenza dell'opera*

Nelle seguenti tabelle si sintetizzano i parametri geotecnici delle unità geotecniche che interferiscono con l'opera, assunti in accordo a quanto esposto nella Relazione Geotecnica generale ([DC1], a cui si rimanda per approfondimenti) ed alle figure di seguito riportate.

*Tabella 3 - Parametri medi caratteristici dei materiali Limo argilloso (A)*

| Descrizione | γ (kN/m³) | c' (kPa) | ϕ' (°) | cu (kPa) | E' (kPa) |
|---|---|---|---|---|---|
| A - Limo argilloso | 19÷20 | 0÷15 | 24÷28 | cu = 30 + z (valori minimi)<br>cu = 90 + 2 · z (valori massimi) | 120 · cu |
| Valori assunti in progetto | 19 | 0 | 26 | cu = 60 + 1.5 · z | 10000 |

γ = peso di volume del terreno

c' = coesione efficace

φ' = angolo di resistenza al taglio

cu = resistenza al taglio in condizioni non drenate

E' = modulo di deformazione elastico operativo per calcolo paratie

*Tabella 4 - Parametri medi caratteristici dei materiali Ghiaia e Sabbia (B)*

| Descrizione | γ (kN/m³) | Nspt (colpi/30cm) | c' (kPa) | ϕ' (°) | E' (MPa) |
|---|---|---|---|---|---|
| B - Ghiaia e sabbia | 19 | 50÷65 | 0 | 35÷36 | 50 |

γ = peso di volume del terreno

c' = coesione efficace

φ' = angolo di resistenza al taglio

E' = modulo di deformazione elastico operativo per calcolo paratie (= Eo / 5)

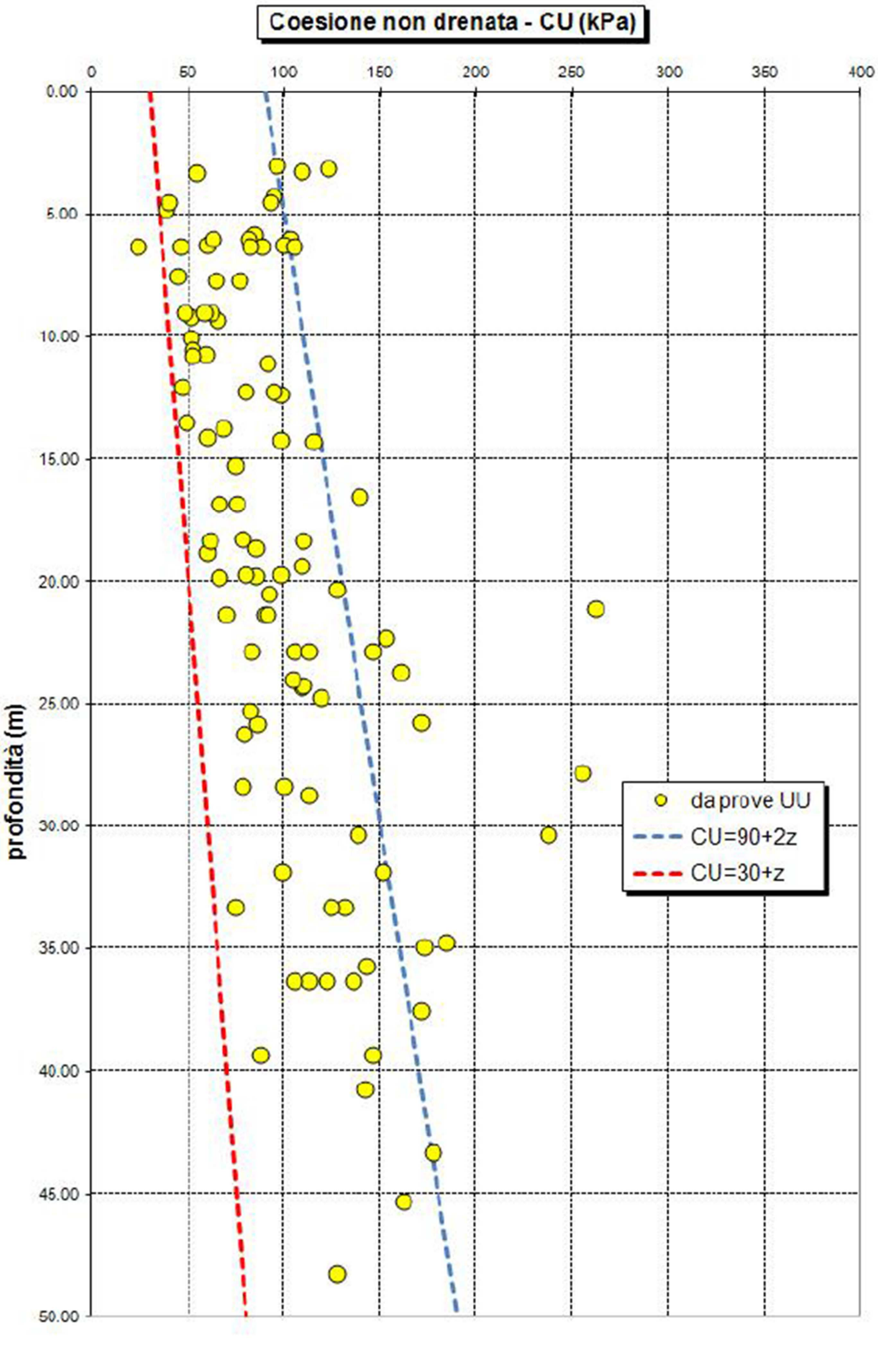



*Figura 5 – Resistenza al taglio in condizione non drenate*

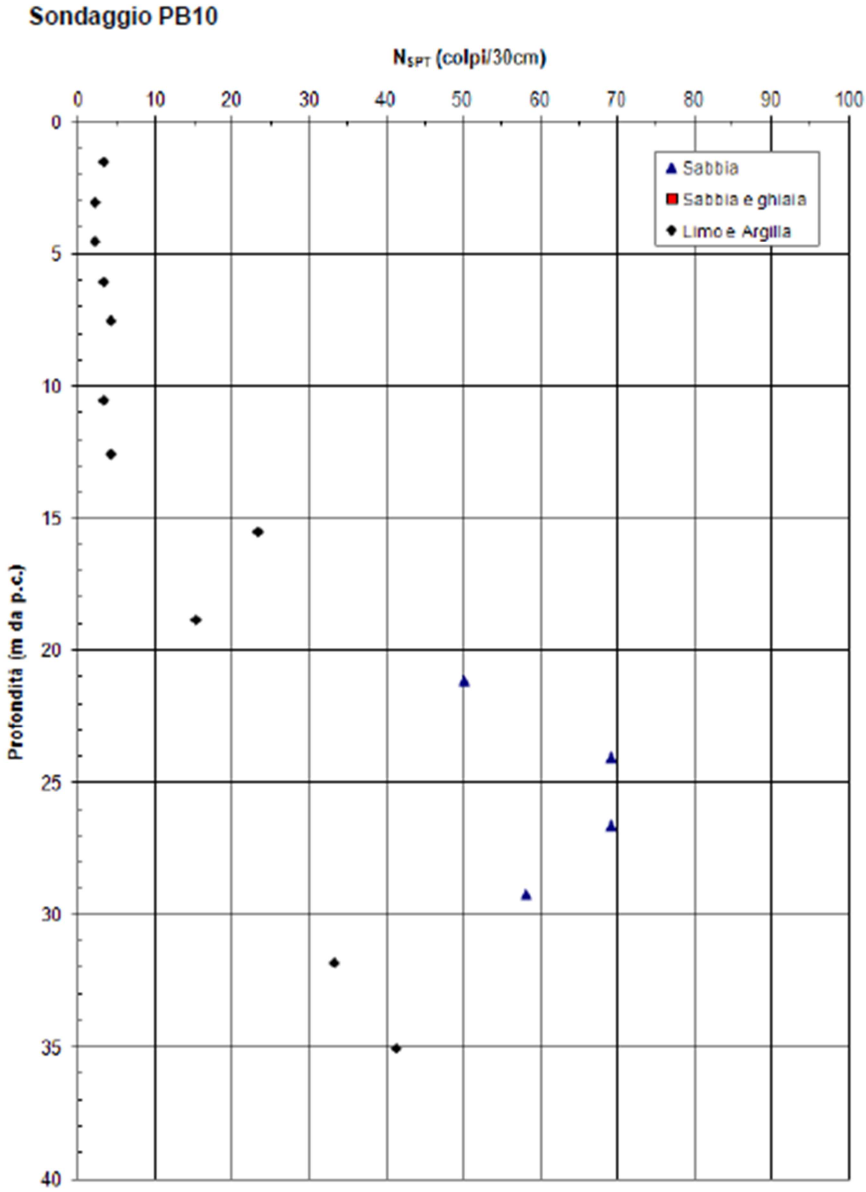



*Figura 6 – Nspt (sondaggio PB10)*

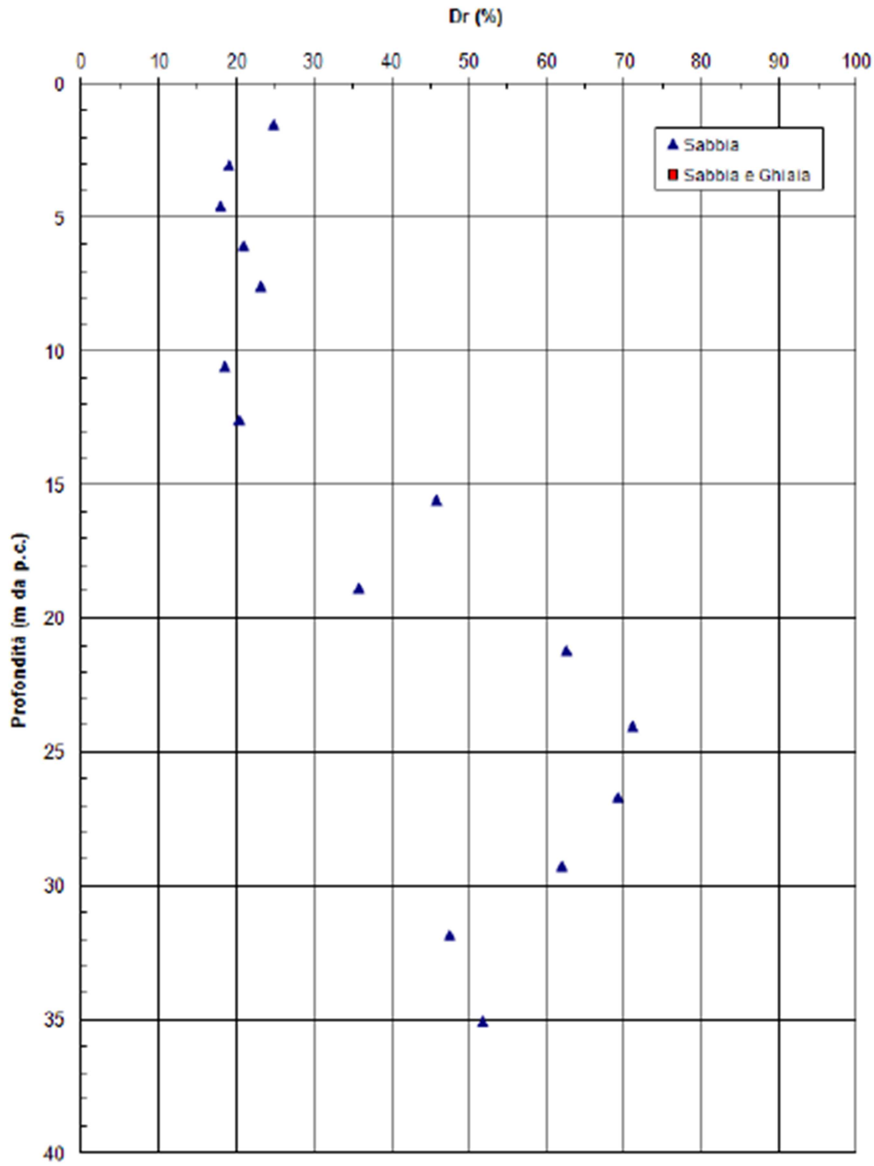



*Figura 7 – Densità relativa (sondaggio PB10)*

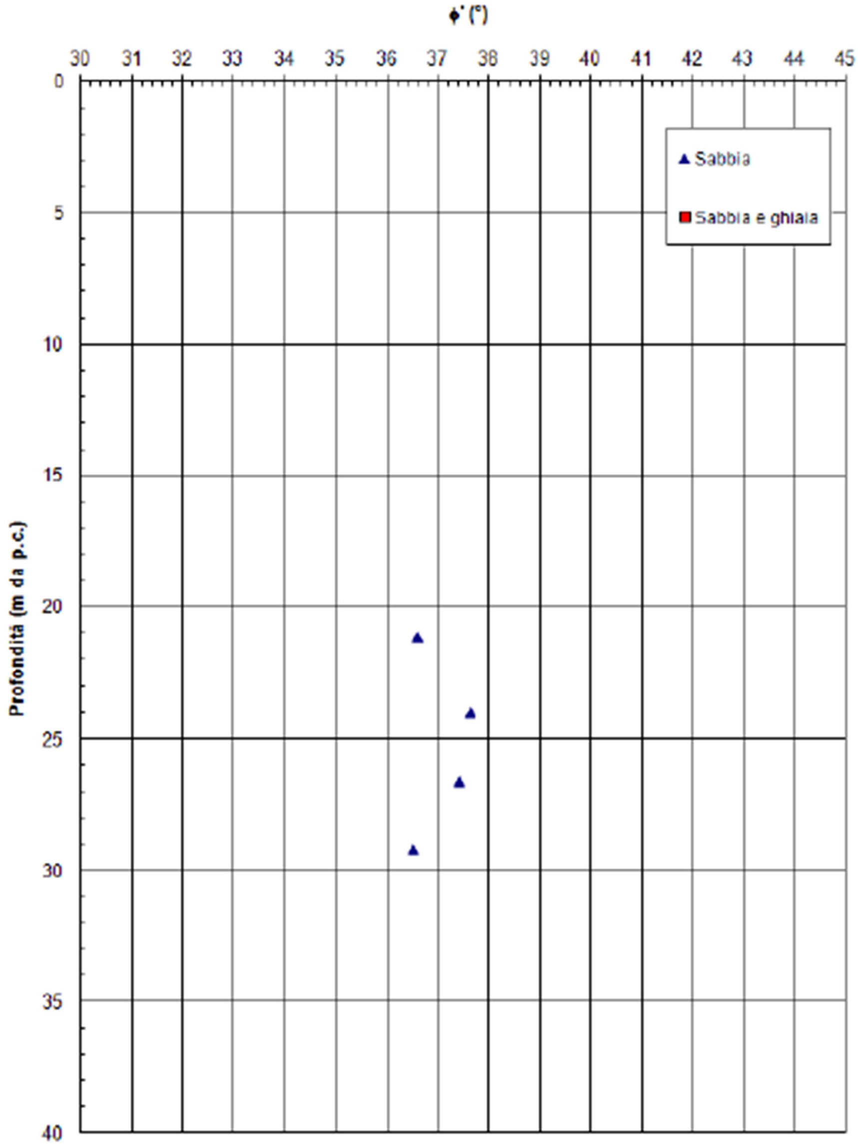



*Figura 8 – Angolo di resistenza al taglio (sondaggio PB10)*

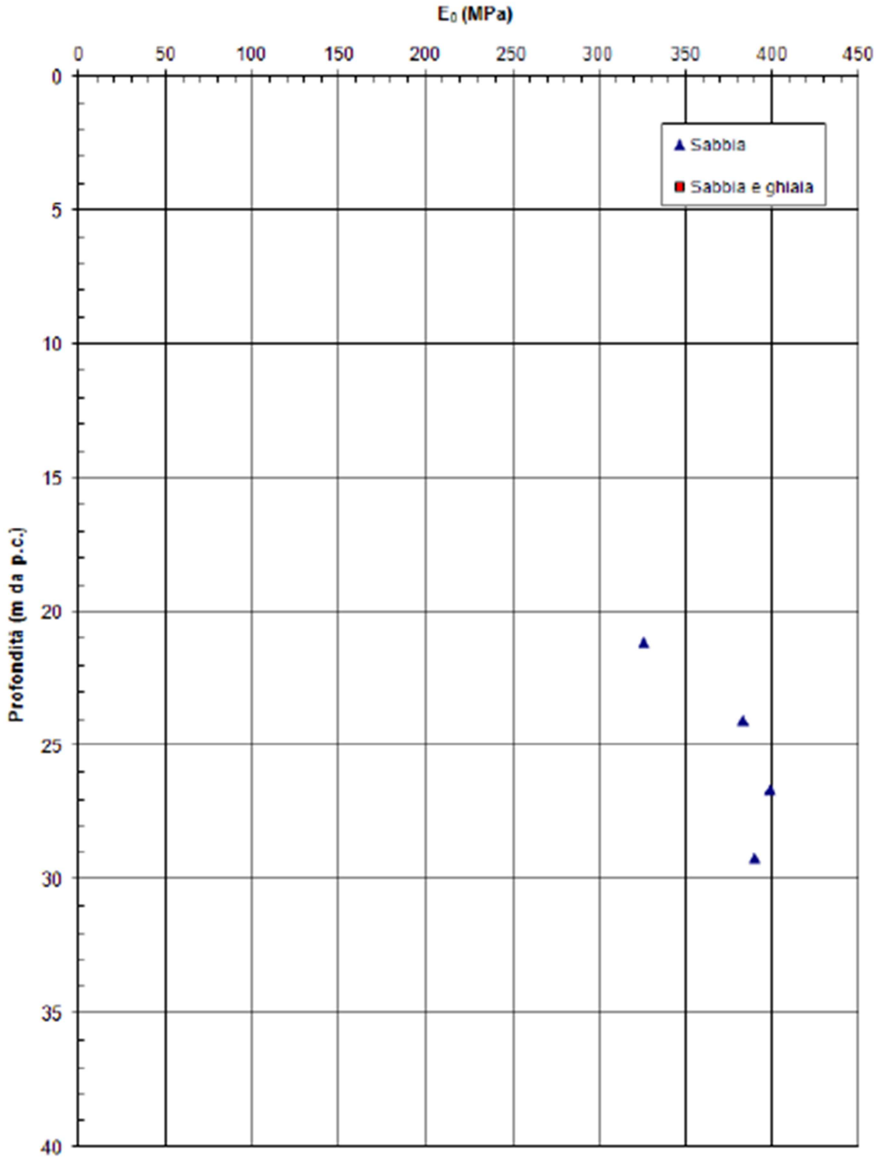



*Figura 9 – Modulo di deformazione elastico iniziale (a piccole deformazioni) (sondaggio PB10)*

# 5 CRITERI DI PROGETTAZIONE

## 5.1 Generale

In accordo con quanto definito nel paragrafo 6.2.4 delle NTC 2018, devono essere svolte le seguenti verifiche di sicurezza e delle prestazioni attese:

- Verifiche agli Stati Limite Ultimi (SLU);
- Verifiche agli Stati Limite d'Esercizio (SLE).

### 5.1.1 *Stati Limite Ultimi (SLU)*

Per ogni Stato Limite Ultimo (SLU) la verifica è considerata soddisfatta se vale la seguente disuguaglianza:

$Ed \leq Rd$

dove

Ed valore di progetto dell'azione o dell'effetto dell'azione;

Rd valore di progetto della resistenza.

L'azione e la corrispondente resistenza di progetto vanno determinate in accordo alle NTC 2018. Sono previsti coefficienti parziali da applicarsi rispettivamente alle azioni (A1 o A2), ai parametri del terreno (M1) ed alle resistenze caratteristiche di calcolo (R1 o R2 o R3). I diversi gruppi di coefficienti di sicurezza parziali sono scelti nell'ambito di due approcci progettuali distinti e alternativi.

Nel primo approccio progettuale, **Approccio 1**, sono previste due diverse combinazioni di gruppi di coefficienti:

- **Combinazione 1: A1+M1+R1**;
- **Combinazione 2: A2+M1+R2**.

Nel secondo approccio progettuale, **Approccio 2**, è prevista una sola combinazione di gruppi di coefficienti (**A1+M1+R3**) da adottarsi sia nelle verifiche strutturali, sia nelle verifiche geotecniche.

I valori assunti dai coefficienti di sicurezza parziali di ciascun gruppo, "Azioni – Parametri geotecnici del terreno – Resistenze", sono riportati all'interno delle NTC 2018, rispettivamente alle tabelle:

- A Tabella 6.2.I (coefficienti parziali per le azioni o per l'effetto delle azioni).
- M Tabella 6.2.II (coefficienti parziali per i parametri geotecnici del terreno).
- R Tabella 6.4.II (coefficienti parziali da applicare alle resistenze caratteristiche a carico verticale dei pali) e Tabella 6.4.VI (coefficiente parziale per le verifiche dei pali soggetti a carichi trasversali).

### 5.1.2 *Stati Limite di Esercizio (SLE)*

Per ogni Stato Limite d'Esercizio (SLE) la verifica è considerata soddisfatta se vale la seguente disuguaglianza:

$Ed \leq Cd$

dove

Ed valore di progetto dell'effetto dell'azione;

Cd valore limite prescritto dell'effetto delle azioni.

All'interno del progetto devono essere quindi definite le prescrizioni relative agli spostamenti compatibili per l'opera e le prestazioni attese.

## 5.2 Verifiche statiche

Come riportato al paragrafo 6.4.3 delle NTC 2018, le verifiche delle fondazioni su pali devono essere effettuate con riferimento almeno ai seguenti stati limite, quando pertinenti:

- Stato limite ultimo di tipo Geotecnico (SLU GEO)
- Stato limite ultimo di tipo Strutturale (SLU STR)
- Stato limite di esercizio (SLE)

La verifica di stabilità globale deve essere eseguita secondo la Combinazione 2 (A2+M2+R2) dell'Approccio 1. Le rimanenti verifiche devono essere condotte con Approccio 2 combinazione

(A1+M1+R3) tenendo conto dei coefficienti parziali riportati nelle tabelle 6.2.I, 6.2.II, 6.4.II, 6.4.VI: **Combinazione A1+M1+R3** (SLU statiche e sismiche).

Nelle verifiche SLU di tipo strutturale il coefficiente $\gamma_R$ non deve essere portato in conto.

### 5.2.1 *Verifiche agli stati limite ultimi di tipo Geotecnico (GEO)*

Le verifiche di sicurezza agli SLU di tipo geotecnico sono:

- collasso per carico limite della palificata nei riguardi dei carichi assiali di compressione e di trazione;
- collasso per carico limite della palificata nei riguardi dei carichi trasversali;
- stabilità globale.

### 5.2.2 *Verifiche agli stati limite ultimi di tipo Strutturale (STR)*

Le verifiche di sicurezza agli SLU di tipo strutturale sono:

- raggiungimento della resistenza strutturale dei pali;
- raggiungimento della resistenza strutturale della struttura di collegamento dei pali.

Quindi nel dettaglio le verifiche /analisi da eseguire saranno le seguenti.

**Raggiungimento della resistenza strutturale dei pali**

La verifica di tipo strutturale dei pali (azioni assiali, azioni di taglio e momento flettente) è condotta in accordo a quanto previsto da Normativa e verificando che le sollecitazioni calcolate sul singolo palo, a partire dai carichi forniti dal Progettista Strutturale per la combinazione di carico assunta (A1+M1+R1), siano interne al dominio di resistenza.

Di seguito si riporta nel dettaglio tale procedura di verifica:

1. Determinazione delle sollecitazioni (assiali di compressione e trazione, di taglio e momento flettente) sul singolo palo mediante l'analisi di gruppo col codice di calcolo MAP a partire dai carichi definiti dal Progettista Strutturale, come azioni agenti sull'intera palificata.

Tale calcolo viene eseguito inserendo nel codice di calcolo MAP:

- la curva carico-cedimento del palo singolo è stata abbattuta per effetto gruppo e calcolata come indicato nel paragrafo 7.1.1 e 7.1.1.1;
- il modulo di reazione orizzontale palo-terreno con effetto gruppo orizzontale per ogni palo, come indicato nel paragrafo 7.1.2.

2. Verifica del non raggiungimento della tensione massima nella sezione in c.a. e restituzione al Progettista Strutturale degli andamenti delle azioni interne (azioni di taglio e di momento flettente) lungo il fusto del palo per le verifiche strutturali.

**Raggiungimento della resistenza strutturale della struttura di collegamento dei pali**

Tale verifica viene condotta dal Progettista Strutturale e sarà pertanto contemplata negli elaborati strutturali.

**Collasso per carico limite della palificata nei riguardi dei carichi assiali di compressione e di trazione**

Di seguito si riporta nel dettaglio la procedura di verifica nei confronti dei carichi assiali. Considerando la particolare configurazione geometrica della palificata con pali (D=1500mm) disposti su 3 file ad interasse 2 m (quindi molto vicini fra loro), la verifica di capacità portante a singolo palo perde di significato in quanto la fondazione lavora a “blocco”. Quindi verrà eseguita la verifica di capacità portante assiale a compressione sul blocco di fondazione. Cautelativamente si verificherà sia la portanza dell’intero blocco, sia la portanza dei 6 pali esterni maggiormente caricati, sia la portanza dei tre pali esterni maggiormente caricati. Per la verifica di capacità portante a trazione, poiché la sollecitazione di trazione si ha generalmente sul palo di spigolo, verrà cautelativamente svolta la verifica a trazione sul singolo palo di spigolo.

1. Determinazione della capacità portante di progetto del palo/ del blocco fondale, con Approccio 2 (A1+M1+R3) come previsto da Normativa.
2. Determinazione dell’azione assiale massima (di compressione e di trazione) sul singolo palo/gruppo di pali, mediante l’analisi di gruppo col codice di calcolo MAP a partire dai carichi definiti dal Progettista Strutturale (secondo le metodologie già indicate).

3. Definizione della lunghezza di palo con le azioni assiali massime e le curve di capacità portante definite al punto 1.

**Collasso per carico limite della palificata nei riguardi dei carichi trasversali**

Considerando la particolare configurazione geometrica della palificata con pali (D=1500mm) disposti su 3 file ad interasse 2 m (quindi molto vicini fra loro), la verifica di capacità portante a singolo palo nei riguardi dei carichi trasversali perde di significato in quanto la fondazione lavora a "blocco". Per quanto concerne le verifiche geotecniche nei confronti dei carichi orizzontali nel caso in esame, le problematiche progettuali della palificata sottoposta ai carichi di progetto orizzontali afferiscano piuttosto nei seguenti aspetti:

- limitazione degli spostamenti orizzontali entro i limiti accettabili, ben lontani dall'ordine di grandezza di spostamenti attesi in prossimità della rottura,
- limitazione dei carichi orizzontali e dei relativi momenti di incastro per limiti strutturali.

**Stabilità globale**

La stabilità globale non viene qui considerata in quanto la geometria del problema non rende possibili fenomeni di instabilità globale della fondazione.

### 5.2.3 *Verifiche agli stati limite di esercizio (SLE)*

Le verifiche agli stati limite di esercizio sono:

- eccessivi cedimenti verticali;
- eccessivi spostamenti trasversali.

Nello specifico si devono calcolare i valori degli spostamenti e delle distorsioni per verificarne la compatibilità con i requisiti prestazionali della struttura in elevazione. La geometria della fondazione deve essere stabilita nel rispetto dei requisiti di cui sopra tenendo opportunamente conto degli effetti di interazione tra i pali.

Di seguito si riporta nel dettaglio la procedura di verifica:

- Determinazione degli spostamenti (verticali, orizzontali e rotazioni) della palificata, mediante l'analisi di gruppo col codice di calcolo MAP a partire dai carichi definiti dal Progettista Strutturale a intradosso plinto, a cui si aggiungono le spinte delle terre.

Tale calcolo viene eseguito inserendo nel codice di calcolo MAP:

  - la curva carico-cedimento del palo singolo abbattuta per effetto gruppo e calcolata come indicato nel paragrafo 7.1.1.1;
  - il modulo di reazione orizzontale palo-terreno con effetto gruppo orizzontale per ogni palo, come indicato nel paragrafo 7.1.2.

- Determinazione degli spostamenti calcolati al punto 1 e verifica dell'ammissibilità degli stessi secondo i limiti definiti dal Progettista Strutturale.

### 5.3 Verifiche sismiche delle opere e sistemi geotecnici

Come definito al paragrafo 7.11.1 delle NTC 2018 le verifiche agli stati limite ultimi di opere e sistemi geotecnici si riferiscono al solo stato limite di salvaguardia della vita (SLV) di cui al paragrafo 3.2.1 delle NTC 2018 e quelle agli stati limite di esercizio si riferiscono al solo stato limite di danno (SLD) di cui allo stesso paragrafo 3.2.1 delle NTC 2018.

Le verifiche degli stati limite ultimi in presenza di azioni sismiche devono essere eseguite ponendo pari ad 1, i coefficienti parziali sulle azioni e sui parametri geotecnici e impiegando le resistenze di progetto con i coefficienti parziali $\gamma_R$ delle tabelle 6.4.II e 6.4.VI rispettivamente per i carichi verticali e trasversali sui pali.

Di fatto si tratta di utilizzare, sia per le verifiche geotecniche che per quelle strutturali, la seguente combinazione di carico:

  - **SISMA+M1+R3**

# 6 CAPACITA' PORTANTE DI PROGETTO DEL PALO SINGOLO

## 6.1 Analisi agli stati limite

Le verifiche di capacità portante dei pali vengono svolte secondo la metodologia degli stati limite ultimi, in accordo alla normativa vigente DM 17/01/2018 "Norme tecniche per le costruzioni".

Le curve di resistenza di progetto a compressione (o trazione) del palo singolo Rc,d (o Rt,d), da confrontare con la massima azione di compressione (o trazione) agente in testa al palo Ed, sono date dalle seguenti espressioni:

$$R_{c,d} = \frac{R_{c,k}}{\gamma_R} = \min\left\{\frac{(R_{c;cal})_{media}}{\xi_3};\frac{(R_{c;cal})_{\min}}{\xi_4}\right\}/\gamma_R$$ Resistenza di progetto a compressione

$$R_{t,d} = \frac{R_{t,k}}{\gamma_R} = \min\left\{\frac{(R_{t;cal})_{media}}{\xi_3};\frac{(R_{t;cal})_{\min}}{\xi_4}\right\}/\gamma_R$$ Resistenza di progetto a trazione

dove:

$R_{c,cal}$ e $R_{t,cal}$ resistenza di calcolo del palo singolo, rispettivamente a compressione e a trazione, determinate ad una data profondità;

$\xi_3, \xi_4$ fattori di correlazione per la determinazione della resistenza caratteristica del palo in funzione del numero di verticali indagate;

$R_{c,k}$ e $R_{t,k}$ resistenza caratteristica del palo singolo rispettivamente a compressione e a trazione ad una data profondità;

$\gamma_R$ coefficienti parziali da applicarsi alle resistenze caratteristiche in funzione dell'approccio considerato.

In particolare le verifiche di capacità portante dei pali agli stati limite ultimi (SLU) vengono condotte con riferimento ad almeno uno dei due approcci, tenendo conto dei coefficienti parziali di riferimento normativo:

Approccio 1:
Combinazione 1: A1 + M1 + R1
Combinazione 2 : A2 + M1 + R2
Approccio 2:

Combinazione 1: A1 + M1 + R3

Nel caso in esame si è utilizzato l'Approccio 2.

## 6.2 Metodologie di calcolo

La portata di progetto a compressione di un palo trivellato (eseguito con completa asportazione del terreno) "Qd" può essere espressa dalla seguente relazione:

$Q_d = Q_{LL} / FS_L + Q_{BL} / FS_B - W'_P$

dove:

$Q_{LL}$ = portata laterale limite,

$Q_{BL}$ = portata di base limite,

$W'_P$ = peso efficace del palo (al netto del peso del terreno asportato),

$F_{SL}$ = fattore di sicurezza per la portata laterale (= $\gamma_s \cdot \xi_3$).

$F_{SB}$ = fattore di sicurezza per la portata di base (= $\gamma_b \cdot \xi_3$).

La portata a trazione di progetto di un palo trivellato (eseguito con completa asportazione del terreno) "Qd" può essere espressa dalla seguente relazione:

$Q_d = Q_{LL} / FS_L + W'_P$

dove:

$Q_{LL}$ = portata laterale limite,

$W'_P$ = peso efficace del palo (alleggerito se sotto falda),

$F_{SL}$ = fattore di sicurezza per la portata laterale (=$\gamma_{st} \cdot \xi_3$).

### 6.2.1 *Resistenza laterale di calcolo*

La resistenza laterale di calcolo è stata determinata, in base al tipo di terreno attraversato, come indicato nel seguito (AGI, 1984).

Per terreni coesivi, si utilizza l'equazione:

$\tau_{LIM} = \alpha \cdot c_U \leq 100 kPa$ (120 kPa per terreni coesivi a profondità > 30 m da p.c.)

dove:

α = coefficiente riduttivo:

= 0.9 per $c_U \leq 25$ kPa; 0.8 per $25 < c_U \leq 50$ kPa; 0.6 per $50 < c_U \leq 75$ kPa; 0.4 per $c_U > 75$ kPa; AGI [1984]);

$c_U$ = coesione non drenata (kPa).

I valori dell'attrito laterale limite in terreni granulari sono valutati mediante l'espressione:

$\tau_{LIM} = K \cdot \sigma'_v \cdot \tan(\phi)$,

dove:

K = rapporto tra pressione orizzontale e pressione verticale efficace in prossimità del palo.

$\sigma'_v$ = pressione geostatica verticale efficace;

$\phi$ = angolo d'attrito;

Per pali trivellati si adotta [Reese – Wright (1977)]:

K = 0.7 in compressione

K = 0.5 in trazione

Per pali battuti si adottano i coefficienti raccomandati da AGI [1984]. Per i pali trivellati deve essere comunque soddisfatta anche la seguente verifica:

$\tau \lim \leq \tau = f(N_{SPT})$

dove:

$N_{SPT}$ = numero di colpi/piede in prova SPT.

Nella seguente figura è illustrata la correlazione proposta da Wright e Reese tra il valore della $\tau_{lim}$ ed il valore di $N_{SPT}$.

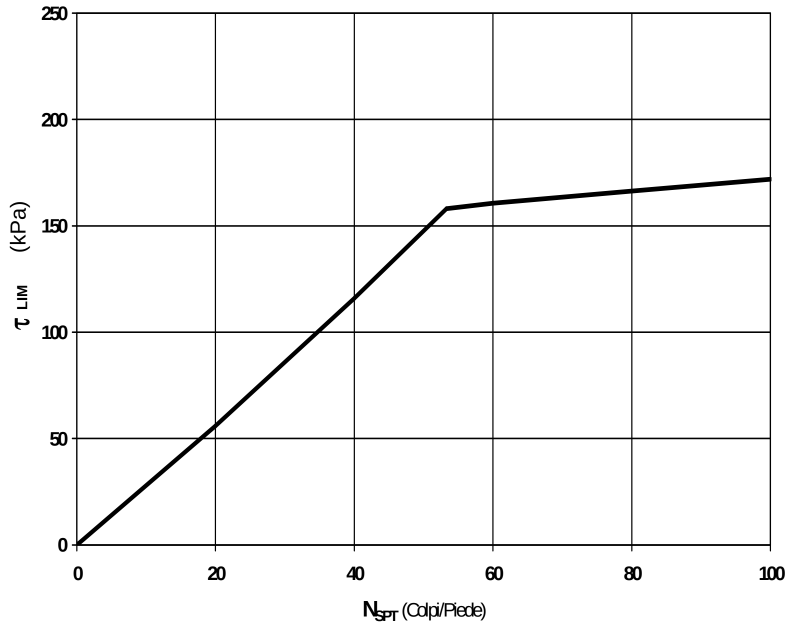



*Figura 10: Terreni granulari - $\tau_{LIM} = f\,(N_{SPT})$ (Wright-Reese [1977])*

### 6.2.2 *Resistenza di base di calcolo*

La resistenza di base di calcolo è stata determinata, in base al tipo di terreno alla base del palo, come indicato nel seguito (AGI, 1984).

Per terreni coesivi, la valutazione della capacità limite di base viene calcolata in base all'equazione:

$$q_b = 9 \cdot c_u + \sigma_V$$

dove:

$c_U$ = coesione non drenata (kPa).

$\sigma_v$ = tensione geostatica verticale (kPa).

I valori di $q_b$ sono interamente mobilizzati ad una profondità critica $z_c$ (Meyerhof, Sastry [1978]), secondo l'espressione $z_c = m * D$ con D pari al diametro del palo e m = 3.

In accordo con le più recenti metodologie di calcolo, la valutazione della capacità limite di base per terreni granulari è condotta facendo riferimento non più alle condizioni di rottura bensì riferendosi ad una "portata critica" corrispondente ad una "condizione di servizio limite" basata su considerazioni di cedimenti ammissibili, ed in genere riferita all'insorgere di deformazioni plastiche nei terreni di fondazione. Pertanto, si porrà $q_b = q_{cr}$, dove

$q_{cr}$ = portata critica unitaria di base;

Per pali trivellati la portata critica è valutata in accordo con le indicazioni di Reese-Wright et al. [1978]:

$$q_{cr} = 0.0667 \cdot N_{SPT} \leq 4MPa$$

I valori di $q_{cr}$ sono interamente mobilitati ad una "profondità critica" $z_c$ come descritto sopra, con m variabile fra 4 e 21 secondo la seguente figura.

La costruzione dell'andamento della portata di base con la profondità in condizioni stratigrafiche particolari (pali che attraversano uno strato di terreno sciolto fino a immorsarsi in uno strato compatto di base di notevole spessore, piuttosto che pali immorsati in uno strato compatto di base di modesto spessore sovrastante uno strato di terreno sciolto) è condotta in accordo alle indicazioni riportate nelle figure seguenti. Nel caso in esame si è assunto m=3.

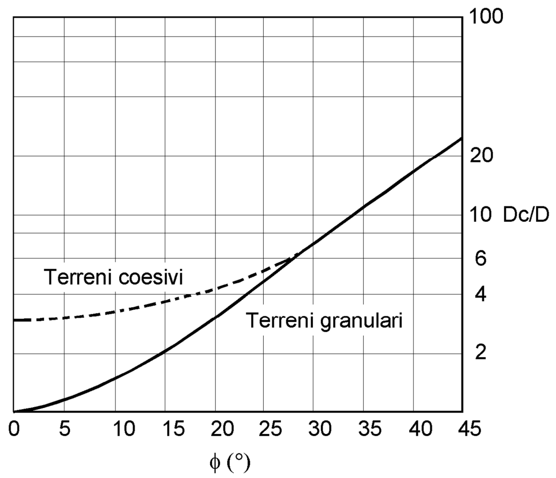
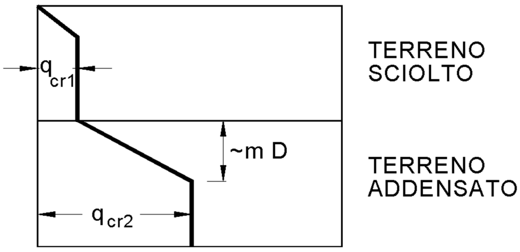



*Figura 11 - zc/D = f (Dr) (Meyerhof [1976])*



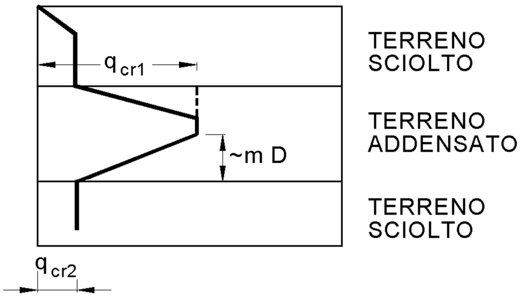




*Figura 12 - Portata di base - Terreni stratificati (Meyerhof [1976])*

### 6.2.3 *Resistenza di progetto*

Il valori della resistenza di progetto a compressione Rc,d e della resistenza di progetto a trazione Rt,d sono determinati applicando al valore caratteristico della resistenza i coefficienti parziali $\gamma_R$ secondo le seguenti espressioni:

$$R_{c,d} = \frac{R_{c,k}}{\gamma_R}$$

$$R_{t,d} = \frac{R_{t,k}}{\gamma_R}$$

essendo:

$R_{c,d}$ e $R_{t,d}$ resistenza di progetto del palo singolo rispettivamente a compressione e a trazione;

$R_{c,k}$ e $R_{t,k}$ resistenza caratteristica del palo singolo rispettivamente a compressione e a trazione;

$\gamma_R$ coefficienti parziali da applicarsi alle resistenze caratteristiche in funzione dell'approccio considerato e della tipologia esecutiva del palo (vedasi tabella seguente in cui sono riportati i fattori parziali relativi a pali trivellati).

*Tabella 5 - Coefficienti parziali alle resistenze caratteristiche*

| | | Pali trivellati |
|---|---|---|
| **Resistenza ( $\gamma_R$)** | **Simbolo** | **R3 [-]** |
| Base | $\gamma_b$ | 1.35 |
| Laterale - compressione | $\gamma_s$ | 1.15 |
| Laterale - trazione | $\gamma_{st}$ | 1.25 |

La capacità portante del palo è stata valutata con Approccio 2: A1+M1+R3. Il coefficiente $\xi_3$ è stato assunto pari a 1.60, con riferimento a 3 verticali di indagine.

Considerata la configurazione della palificata, con pali (D=1500 mm) disposti su tre file ad interasse 2 m, la verifica di capacità portante a singolo palo perde di significato in quanto la fondazione lavora a "blocco". La capacità portante della fondazione è stata valutata considerando un meccanismo di portanza a blocco, verificando cautelativamente le seguenti situazioni:

- Portanza del blocco di fondazione (18 pali):
  - area di base = area complessiva dei 18 pali (= 18 · 1.766 = 31.78 $m^2$);
  - perimetro = 33.7 m (superficie laterale esterna del perimetro del blocco di fondazione, vedasi linea rossa di Figura 13).
- Portanza del sistema di 6 pali maggiormente caricati (n. 1÷2, 8÷9, 14÷15, oppure n. 19÷20, 26÷27, 32÷33):
  - area di base = area di 6 pali (= 6 · 1.766 = 10.596 $m^2$);
  - perimetro = 12.8 m (superficie laterale minima esterna relativa ai pali di spigolo maggiormente caricati, vedasi linea rossa di Figura 14).
- Portanza del sistema di 3 pali maggiormente caricati (n. 1, 8, 14, oppure n. 19, 26, 32):
  - area di base = area di 3 pali (= 3 · 1.766 = 5.298 $m^2$);
  - perimetro = 9 m (superficie laterale minima esterna relativa ai pali di spigolo maggiormente caricati, vedasi linea rossa di Figura 15).

Inoltre dai calcoli eseguiti si evince che la trazione generalmente si ha sul palo di spigolo, quindi cautelativamente la verifica di capacità portante a trazione è eseguita considerando il singolo palo di spigolo con:

- area di base = area singolo palo (= 1.766 $m^2$);

- perimetro = 3.6 m (superficie laterale minima esterna relativa al singolo palo di spigolo).

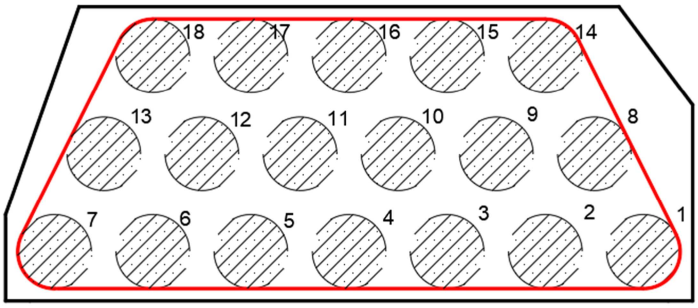



*Figura 13 – Blocco di fondazione (18 pali)*

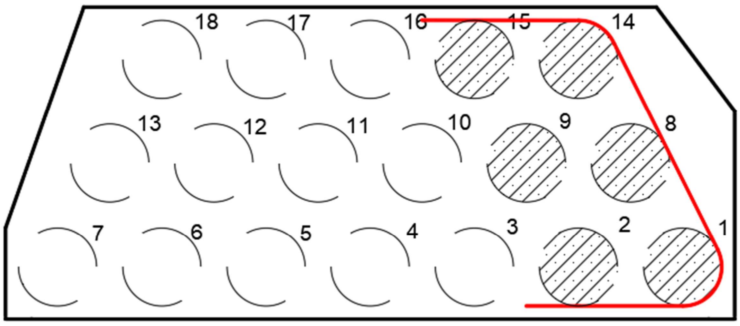



*Figura 14 – Gruppo di 6 pali di fondazione maggiormente caricati*

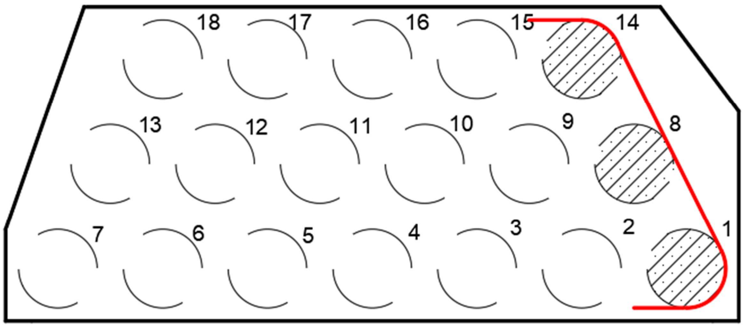



*Figura 15 – Gruppo di 3 pali di fondazione maggiormente caricati*

Nel seguito si riportano, i valori della portata di progetto a carico verticale (Qd).

I valori della resistenza di progetto per la lunghezza utile di palo, saranno poi confrontati con i corrispondenti valori delle sollecitazioni assiali risultanti dai calcoli.

Inoltre la portanza è stata valutata considerando:

- testa palo a 1.5 m p.c.
- falda a 5 m di profondità dal p.c..

*Tabella 6 – Stratigrafia e parametri geotecnici di calcolo portanza pali*

| Profondità da p.c. | Unità geotecnica | cu [kPa] | φ' [°] | qb [kPa] |
|---|---|---|---|---|
| 0.0÷7.0 | A | 60.0÷70.5 | - | $9 \cdot cu + \sigma v$ |
| 7.0÷9.0 | B | - | 35 | 1340 |
| 9.0÷19.0 | A | 73.5÷88.5 | - | $9 \cdot cu + \sigma v$ |
| 19.0÷30.0 | B | - | 36 | 4000 |
| 30.0÷60.0 | A | 105÷150 | - | $9 \cdot cu + \sigma v$ |

Nelle seguenti tabelle si riporta la capacità portante per le situazioni analizzate. In Appendice A si riportano i tabulati di calcolo completi.

*Tabella 7 – Capacità portante di progetto A1+M1+R3 – Singolo blocco di fondazione (18 pali) - compressione*

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

-----------------------------------------------------------
   Lp          Qll         Qbl        Wp          Qu         Qd
    m           kN          kN        kN          kN         kN
-----------------------------------------------------------
   .00          0.      18715.        0.      18715.      8664.
   .50        308.      19232.      129.      19411.      8942.
  1.00        704.      19748.      257.      20195.      9268.
  1.50       1189.      20265.      386.      21067.      9642.
  2.00       1761.      20781.      515.      22027.     10063.
  2.50       2412.      21298.      644.      23066.     10527.
  3.00       3083.      21815.      772.      24125.     11002.
  3.50       3762.      22331.      901.      25191.     11482.
  4.00       4448.      22848.     1030.      26265.     11965.
  4.50       5142.      23364.     1159.      27347.     12452.
  5.00       5843.      23881.     1287.      28436.     12944.
  5.50       6579.      24397.     1416.      29561.     13455.
  6.00       7504.      24914.     1545.      30873.     14067.
  6.50       8493.      25430.     1674.      32250.     14715.
  7.00       9519.      25947.     1802.      33664.     15383.
  7.50      10540.      26464.     1931.      35072.     16049.
  8.00      11329.      26980.     2060.      36249.     16588.
  8.50      12084.      27497.     2189.      37392.     17108.
  9.00      12689.      28013.     2317.      38385.     17548.
  9.50      13258.      28530.     2446.      39341.     17967.
 10.00      13844.      29046.     2575.      40315.     18396.
 10.50      14447.      29563.     2704.      41307.     18835.
 11.00      15068.      30079.     2832.      42315.     19283.
 11.50      15707.      30596.     2961.      43342.     19740.
 12.00      16363.      31113.     3090.      44386.     20207.
 12.50      17036.      31629.     3219.      45447.     20683.
 13.00      17727.      32146.     3347.      46525.     21169.
 13.50      18435.      32662.     3476.      47621.     21664.
 14.00      19161.      33179.     3605.      48735.     22169.
 14.50      19904.      33695.     3734.      49866.     22684.
 15.00      20665.      34212.     3862.      51014.     23207.
 15.50      21443.      34728.     3991.      52180.     23741.
 16.00      22238.      35245.     4120.      53363.     24283.
 16.50      23051.      35762.     4248.      54564.     24835.
 17.00      23881.      36278.     4377.      55782.     25397.
 17.50      24859.      36795.     4506.      57147.     26039.
 18.00      26642.      39172.     4635.      61180.     27980.
 18.50      28594.      41550.     4763.      65381.     30013.
 19.00      30584.      43928.     4892.      69620.     32067.
 19.50      32613.      46306.     5021.      73898.     34141.
 20.00      34680.      48684.     5150.      78215.     36237.
```

| | | | | | |
|---|---|---|---|---|---|
| 20.50 | 36786. | 51062. | 5278. | 82570. | 38354. |
| 21.00 | 38931. | 53439. | 5407. | 86963. | 40491. |
| 21.50 | 41114. | 55817. | 5536. | 91395. | 42650. |
| 22.00 | 43336. | 58195. | 5665. | 95866. | 44830. |
| 22.50 | 45596. | 60573. | 5793. | 100375. | 47030. |
| 23.00 | 47895. | 62951. | 5922. | 104923. | 49251. |
| 23.50 | 50232. | 65329. | 6051. | 109510. | 51494. |
| 24.00 | 52608. | 67706. | 6180. | 114135. | 53757. |
| 24.50 | 55022. | 65534. | 6308. | 114249. | 53935. |
| 25.00 | 57476. | 63362. | 6437. | 114401. | 54134. |
| 25.50 | 59967. | 61191. | 6566. | 114592. | 54354. |
| 26.00 | 62490. | 59019. | 6695. | 114814. | 54591. |
| 26.50 | 65018. | 56847. | 6823. | 115041. | 54830. |
| 27.00 | 67545. | 54675. | 6952. | 115268. | 55070. |
| 27.50 | 70073. | 52503. | 7081. | 115495. | 55309. |
| 28.00 | 72600. | 50331. | 7210. | 115722. | 55549. |
| 28.50 | 74967. | 48159. | 7338. | 115788. | 55700. |
| 29.00 | 76377. | 48675. | 7467. | 117585. | 56577. |
| 29.50 | 77643. | 49192. | 7596. | 119239. | 57376. |
| 30.00 | 78927. | 49708. | 7724. | 120911. | 58184. |
| 30.50 | 80228. | 50225. | 7853. | 122600. | 59001. |
| 31.00 | 81547. | 50742. | 7982. | 124306. | 59828. |
| 31.50 | 82883. | 51258. | 8111. | 126030. | 60665. |
| 32.00 | 84236. | 51775. | 8239. | 127772. | 61511. |
| 32.50 | 85607. | 52291. | 8368. | 129530. | 62366. |
| 33.00 | 86996. | 52808. | 8497. | 131307. | 63231. |
| 33.50 | 88402. | 53324. | 8626. | 133100. | 64106. |
| 34.00 | 89825. | 53841. | 8754. | 134911. | 64990. |
| 34.50 | 91266. | 54357. | 8883. | 136740. | 65883. |
| 35.00 | 92724. | 54874. | 9012. | 138586. | 66786. |
| 35.50 | 94199. | 55391. | 9141. | 140449. | 67698. |
| 36.00 | 95692. | 55907. | 9269. | 142330. | 68620. |
| 36.50 | 97203. | 56424. | 9398. | 144228. | 69552. |
| 37.00 | 98731. | 56940. | 9527. | 146144. | 70492. |
| 37.50 | 100276. | 57457. | 9656. | 148077. | 71443. |
| 38.00 | 101839. | 57973. | 9784. | 150028. | 72402. |
| 38.50 | 103419. | 58490. | 9913. | 151996. | 73372. |
| 39.00 | 105017. | 59006. | 10042. | 153981. | 74350. |
| 39.50 | 106632. | 59523. | 10171. | 155984. | 75339. |
| 40.00 | 108264. | 60040. | 10299. | 158005. | 76336. |
| 40.50 | 109914. | 60556. | 10428. | 160043. | 77343. |
| 41.00 | 111582. | 61073. | 10557. | 162098. | 78360. |
| 41.50 | 113267. | 61589. | 10686. | 164170. | 79386. |
| 42.00 | 114969. | 62106. | 10814. | 166261. | 80422. |
| 42.50 | 116689. | 62622. | 10943. | 168368. | 81467. |
| 43.00 | 118426. | 63139. | 11072. | 170493. | 82521. |
| 43.50 | 120181. | 63655. | 11201. | 172636. | 83585. |
| 44.00 | 121953. | 64172. | 11329. | 174796. | 84659. |
| 44.50 | 123742. | 64689. | 11458. | 176973. | 85742. |
| 45.00 | 125549. | 65205. | 11587. | 179168. | 86834. |
| 45.50 | 127374. | 65722. | 11715. | 181380. | 87936. |
| 46.00 | 129215. | 66238. | 11844. | 183609. | 89047. |
| 46.50 | 131075. | 66755. | 11973. | 185857. | 90168. |
| 47.00 | 132951. | 67271. | 12102. | 188121. | 91299. |
| 47.50 | 134846. | 67788. | 12230. | 190403. | 92438. |
| 48.00 | 136757. | 68304. | 12359. | 192702. | 93588. |
| 48.50 | 138686. | 68821. | 12488. | 195019. | 94747. |
| 49.00 | 140633. | 69338. | 12617. | 197354. | 95915. |
| 49.50 | 142597. | 69854. | 12745. | 199705. | 97093. |
| 50.00 | 144578. | 70371. | 12874. | 202074. | 98280. |
| 50.50 | 146577. | 70887. | 13003. | 204461. | 99477. |
| 51.00 | 148592. | 71404. | 13132. | 206864. | 100682. |
| 51.50 | 150614. | 71920. | 13260. | 209274. | 101892. |
| 52.00 | 152636. | 72437. | 13389. | 211684. | 103101. |
| 52.50 | 154658. | 72953. | 13518. | 214094. | 104310. |
| 53.00 | 156680. | 73470. | 13647. | 216504. | 105520. |
| 53.50 | 158702. | 73987. | 13775. | 218913. | 106729. |
| 54.00 | 160724. | 74503. | 13904. | 221323. | 107938. |
| 54.50 | 162746. | 75020. | 14033. | 223733. | 109148. |
| 55.00 | 164768. | 75536. | 14162. | 226143. | 110357. |
| 55.50 | 166790. | 76053. | 14290. | 228553. | 111566. |
| 56.00 | 168812. | 76569. | 14419. | 230963. | 112775. |
| 56.50 | 170834. | 77086. | 14548. | 233372. | 113985. |
| 57.00 | 172856. | 77602. | 14677. | 235782. | 115194. |
| 57.50 | 174878. | 78119. | 14805. | 238192. | 116403. |
| 58.00 | 176900. | 78636. | 14934. | 240602. | 117613. |
| 58.50 | 178922. | 79152. | 15063. | 243012. | 118822. |

Lp  = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite

```
Wp  = Peso efficace del palo
Qu  = Portata totale limite
Qd  = Portata di progetto  =  Qll/FS,l + Qbl/FS,b - Wp
```

*Tabella 8 – Capacità portante di progetto A1+M1+R3 – Gruppo 6 pali - compressione*

```
NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi
```

| Lp m | Qll kN | Qbl kN | Wp kN | Qu kN | Qd kN |
|---|---|---|---|---|---|
| .00 | 0. | 6238. | 0. | 6238. | 2888. |
| .50 | 117. | 6411. | 43. | 6485. | 2989. |
| 1.00 | 268. | 6583. | 86. | 6764. | 3107. |
| 1.50 | 451. | 6755. | 129. | 7078. | 3244. |
| 2.00 | 669. | 6927. | 172. | 7424. | 3399. |
| 2.50 | 916. | 7099. | 215. | 7801. | 3570. |
| 3.00 | 1171. | 7272. | 257. | 8185. | 3745. |
| 3.50 | 1429. | 7444. | 300. | 8572. | 3922. |
| 4.00 | 1689. | 7616. | 343. | 8962. | 4101. |
| 4.50 | 1953. | 7788. | 386. | 9355. | 4281. |
| 5.00 | 2219. | 7960. | 429. | 9750. | 4462. |
| 5.50 | 2499. | 8132. | 472. | 10159. | 4651. |
| 6.00 | 2850. | 8408. | 515. | 10743. | 4927. |
| 6.50 | 3226. | 8684. | 558. | 11352. | 5216. |
| 7.00 | 3616. | 8960. | 601. | 11974. | 5512. |
| 7.50 | 4003. | 8821. | 644. | 12181. | 5616. |
| 8.00 | 4303. | 8993. | 687. | 12610. | 5816. |
| 8.50 | 4590. | 9166. | 730. | 13026. | 6008. |
| 9.00 | 4819. | 9338. | 772. | 13385. | 6170. |
| 9.50 | 5036. | 9510. | 815. | 13730. | 6324. |
| 10.00 | 5258. | 9682. | 858. | 14082. | 6482. |
| 10.50 | 5487. | 9854. | 901. | 14441. | 6643. |
| 11.00 | 5723. | 10026. | 944. | 14806. | 6808. |
| 11.50 | 5966. | 10199. | 987. | 15177. | 6977. |
| 12.00 | 6215. | 10371. | 1030. | 15556. | 7149. |
| 12.50 | 6471. | 10543. | 1073. | 15941. | 7325. |
| 13.00 | 6733. | 10715. | 1116. | 16333. | 7504. |
| 13.50 | 7002. | 10887. | 1159. | 16731. | 7687. |
| 14.00 | 7278. | 11060. | 1202. | 17136. | 7874. |
| 14.50 | 7560. | 11232. | 1245. | 17547. | 8064. |
| 15.00 | 7849. | 11404. | 1287. | 17965. | 8258. |
| 15.50 | 8144. | 11576. | 1330. | 18390. | 8455. |
| 16.00 | 8447. | 11748. | 1373. | 18822. | 8656. |
| 16.50 | 8755. | 11921. | 1416. | 19260. | 8861. |
| 17.00 | 9071. | 12093. | 1459. | 19704. | 9069. |
| 17.50 | 9442. | 12265. | 1502. | 20205. | 9308. |
| 18.00 | 10119. | 13634. | 1545. | 22208. | 10267. |
| 18.50 | 10861. | 15003. | 1588. | 24276. | 11261. |
| 19.00 | 11617. | 16372. | 1631. | 26358. | 12262. |
| 19.50 | 12387. | 17741. | 1674. | 28455. | 13272. |
| 20.00 | 13172. | 19110. | 1717. | 30566. | 14290. |
| 20.50 | 13972. | 20479. | 1759. | 32692. | 15315. |
| 21.00 | 14787. | 21848. | 1802. | 34833. | 16349. |
| 21.50 | 15616. | 23217. | 1845. | 36988. | 17390. |
| 22.00 | 16460. | 24586. | 1888. | 39158. | 18440. |
| 22.50 | 17318. | 25955. | 1931. | 41343. | 19497. |
| 23.00 | 18191. | 27324. | 1974. | 43542. | 20563. |
| 23.50 | 19079. | 27440. | 2017. | 44502. | 21056. |
| 24.00 | 19982. | 26301. | 2060. | 44223. | 20976. |
| 24.50 | 20899. | 25162. | 2103. | 43958. | 20904. |
| 25.00 | 21830. | 24024. | 2146. | 43708. | 20841. |
| 25.50 | 22777. | 22885. | 2189. | 43473. | 20785. |
| 26.00 | 23735. | 21746. | 2232. | 43250. | 20736. |
| 26.50 | 24695. | 20608. | 2274. | 43028. | 20687. |
| 27.00 | 25655. | 19469. | 2317. | 42807. | 20639. |
| 27.50 | 26615. | 18330. | 2360. | 42585. | 20591. |
| 28.00 | 27575. | 17192. | 2403. | 42364. | 20542. |
| 28.50 | 28474. | 16053. | 2446. | 42081. | 20461. |
| 29.00 | 29010. | 16225. | 2489. | 42746. | 20789. |
| 29.50 | 29491. | 16397. | 2532. | 43356. | 21087. |
| 30.00 | 29978. | 16569. | 2575. | 43973. | 21389. |
| 30.50 | 30472. | 16742. | 2618. | 44596. | 21694. |
| 31.00 | 30973. | 16914. | 2661. | 45226. | 22003. |

| | | | | | |
|---|---|---|---|---|---|
| 31.50 | 31481. | 17086. | 2704. | 45863. | 22316. |
| 32.00 | 31995. | 17258. | 2746. | 46507. | 22632. |
| 32.50 | 32516. | 17430. | 2789. | 47157. | 22952. |
| 33.00 | 33043. | 17603. | 2832. | 47813. | 23275. |
| 33.50 | 33577. | 17775. | 2875. | 48476. | 23602. |
| 34.00 | 34117. | 17947. | 2918. | 49146. | 23933. |
| 34.50 | 34665. | 18119. | 2961. | 49823. | 24267. |
| 35.00 | 35219. | 18291. | 3004. | 50506. | 24605. |
| 35.50 | 35779. | 18464. | 3047. | 51196. | 24946. |
| 36.00 | 36346. | 18636. | 3090. | 51892. | 25291. |
| 36.50 | 36920. | 18808. | 3133. | 52595. | 25640. |
| 37.00 | 37500. | 18980. | 3176. | 53305. | 25992. |
| 37.50 | 38087. | 19152. | 3219. | 54021. | 26348. |
| 38.00 | 38681. | 19324. | 3261. | 54744. | 26707. |
| 38.50 | 39281. | 19497. | 3304. | 55473. | 27070. |
| 39.00 | 39888. | 19669. | 3347. | 56209. | 27437. |
| 39.50 | 40501. | 19841. | 3390. | 56952. | 27807. |
| 40.00 | 41121. | 20013. | 3433. | 57701. | 28181. |
| 40.50 | 41748. | 20185. | 3476. | 58457. | 28558. |
| 41.00 | 42381. | 20358. | 3519. | 59220. | 28939. |
| 41.50 | 43021. | 20530. | 3562. | 59989. | 29324. |
| 42.00 | 43668. | 20702. | 3605. | 60765. | 29712. |
| 42.50 | 44321. | 20874. | 3648. | 61547. | 30104. |
| 43.00 | 44981. | 21046. | 3691. | 62337. | 30499. |
| 43.50 | 45647. | 21218. | 3734. | 63132. | 30898. |
| 44.00 | 46320. | 21391. | 3776. | 63935. | 31301. |
| 44.50 | 47000. | 21563. | 3819. | 64744. | 31707. |
| 45.00 | 47686. | 21735. | 3862. | 65559. | 32117. |
| 45.50 | 48379. | 21907. | 3905. | 66381. | 32530. |
| 46.00 | 49079. | 22079. | 3948. | 67210. | 32947. |
| 46.50 | 49785. | 22252. | 3991. | 68046. | 33368. |
| 47.00 | 50498. | 22424. | 4034. | 68888. | 33792. |
| 47.50 | 51217. | 22596. | 4077. | 69736. | 34220. |
| 48.00 | 51943. | 22768. | 4120. | 70592. | 34651. |
| 48.50 | 52676. | 22940. | 4163. | 71454. | 35086. |
| 49.00 | 53415. | 23113. | 4206. | 72322. | 35525. |
| 49.50 | 54161. | 23285. | 4248. | 73198. | 35967. |
| 50.00 | 54914. | 23457. | 4291. | 74079. | 36413. |
| 50.50 | 55673. | 23629. | 4334. | 74968. | 36862. |
| 51.00 | 56439. | 23801. | 4377. | 75863. | 37315. |
| 51.50 | 57207. | 23973. | 4420. | 76760. | 37769. |
| 52.00 | 57975. | 24146. | 4463. | 77657. | 38223. |
| 52.50 | 58743. | 24318. | 4506. | 78554. | 38678. |
| 53.00 | 59511. | 24490. | 4549. | 79452. | 39132. |
| 53.50 | 60279. | 24662. | 4592. | 80349. | 39586. |
| 54.00 | 61047. | 24834. | 4635. | 81246. | 40040. |
| 54.50 | 61815. | 25007. | 4678. | 82144. | 40494. |
| 55.00 | 62583. | 25179. | 4721. | 83041. | 40949. |
| 55.50 | 63351. | 25351. | 4763. | 83938. | 41403. |
| 56.00 | 64119. | 25523. | 4806. | 84835. | 41857. |
| 56.50 | 64887. | 25695. | 4849. | 85733. | 42311. |
| 57.00 | 65655. | 25867. | 4892. | 86630. | 42765. |
| 57.50 | 66423. | 26040. | 4935. | 87527. | 43220. |
| 58.00 | 67191. | 26212. | 4978. | 88424. | 43674. |
| 58.50 | 67959. | 26384. | 5021. | 89322. | 44128. |

Lp  = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp  = Peso efficace del palo
Qu  = Portata totale limite
Qd  = Portata di progetto  =  Qll/FS,l + Qbl/FS,b - Wp

*Tabella 9 – Capacità portante di progetto A1+M1+R3 – Gruppo 3 pali - compressione*

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi
```

| Lp m | Qll kN | Qbl kN | Wp kN | Qu kN | Qd kN |
|---|---|---|---|---|---|
| .00 | 0. | 3119. | 0. | 3119. | 1444. |
| .50 | 82. | 3205. | 21. | 3266. | 1507. |
| 1.00 | 188. | 3291. | 43. | 3437. | 1583. |
| 1.50 | 317. | 3377. | 64. | 3631. | 1672. |
| 2.00 | 470. | 3464. | 86. | 3848. | 1773. |
| 2.50 | 644. | 3550. | 107. | 4086. | 1886. |
| 3.00 | 823. | 3636. | 129. | 4330. | 2002. |
| 3.50 | 1005. | 3722. | 150. | 4576. | 2119. |
| 4.00 | 1188. | 3808. | 172. | 4824. | 2237. |
| 4.50 | 1373. | 3894. | 193. | 5074. | 2356. |
| 5.00 | 1560. | 3980. | 215. | 5326. | 2476. |
| 5.50 | 1757. | 4066. | 236. | 5587. | 2601. |
| 6.00 | 2004. | 4262. | 257. | 6008. | 2805. |
| 6.50 | 2268. | 4458. | 279. | 6447. | 3017. |
| 7.00 | 2542. | 4653. | 300. | 6895. | 3235. |
| 7.50 | 2815. | 4411. | 322. | 6904. | 3250. |
| 8.00 | 3026. | 4497. | 343. | 7179. | 3383. |
| 8.50 | 3227. | 4583. | 365. | 7445. | 3511. |
| 9.00 | 3389. | 4669. | 386. | 7671. | 3617. |
| 9.50 | 3541. | 4755. | 408. | 7888. | 3718. |
| 10.00 | 3697. | 4841. | 429. | 8109. | 3821. |
| 10.50 | 3858. | 4927. | 451. | 8335. | 3927. |
| 11.00 | 4024. | 5013. | 472. | 8565. | 4036. |
| 11.50 | 4195. | 5099. | 494. | 8801. | 4147. |
| 12.00 | 4370. | 5185. | 515. | 9040. | 4261. |
| 12.50 | 4550. | 5272. | 536. | 9285. | 4377. |
| 13.00 | 4734. | 5358. | 558. | 9534. | 4495. |
| 13.50 | 4923. | 5444. | 579. | 9788. | 4617. |
| 14.00 | 5117. | 5530. | 601. | 10046. | 4740. |
| 14.50 | 5316. | 5616. | 622. | 10309. | 4867. |
| 15.00 | 5519. | 5702. | 644. | 10577. | 4995. |
| 15.50 | 5727. | 5788. | 665. | 10849. | 5127. |
| 16.00 | 5939. | 5874. | 687. | 11126. | 5261. |
| 16.50 | 6156. | 5960. | 708. | 11408. | 5397. |
| 17.00 | 6378. | 6046. | 730. | 11695. | 5536. |
| 17.50 | 6639. | 6132. | 751. | 12020. | 5696. |
| 18.00 | 7115. | 7104. | 772. | 13447. | 6383. |
| 18.50 | 7636. | 8076. | 794. | 14918. | 7095. |
| 19.00 | 8168. | 9047. | 815. | 16400. | 7812. |
| 19.50 | 8710. | 10019. | 837. | 17892. | 8535. |
| 20.00 | 9262. | 10990. | 858. | 19394. | 9263. |
| 20.50 | 9824. | 11962. | 880. | 20906. | 9997. |
| 21.00 | 10397. | 12730. | 901. | 22226. | 10643. |
| 21.50 | 10980. | 13294. | 923. | 23351. | 11199. |
| 22.00 | 11573. | 13858. | 944. | 24487. | 11762. |
| 22.50 | 12177. | 14422. | 966. | 25634. | 12329. |
| 23.00 | 12791. | 14986. | 987. | 26790. | 12903. |
| 23.50 | 13415. | 15551. | 1008. | 27957. | 13482. |
| 24.00 | 14050. | 15422. | 1030. | 28441. | 13745. |
| 24.50 | 14694. | 14600. | 1051. | 28243. | 13694. |
| 25.00 | 15350. | 13778. | 1073. | 28055. | 13648. |
| 25.50 | 16015. | 12957. | 1094. | 27877. | 13608. |
| 26.00 | 16689. | 12135. | 1116. | 27708. | 13572. |
| 26.50 | 17364. | 11313. | 1137. | 27540. | 13537. |
| 27.00 | 18039. | 10492. | 1159. | 27372. | 13502. |
| 27.50 | 18714. | 9670. | 1180. | 27204. | 13467. |
| 28.00 | 19389. | 8848. | 1202. | 27035. | 13432. |
| 28.50 | 20021. | 8026. | 1223. | 26824. | 13374. |
| 29.00 | 20397. | 8113. | 1245. | 27265. | 13597. |
| 29.50 | 20736. | 8199. | 1266. | 27668. | 13799. |
| 30.00 | 21078. | 8285. | 1287. | 28076. | 14004. |
| 30.50 | 21426. | 8371. | 1309. | 28488. | 14211. |
| 31.00 | 21778. | 8457. | 1330. | 28905. | 14421. |
| 31.50 | 22135. | 8543. | 1352. | 29326. | 14633. |
| 32.00 | 22496. | 8629. | 1373. | 29752. | 14848. |
| 32.50 | 22862. | 8715. | 1395. | 30183. | 15065. |
| 33.00 | 23233. | 8801. | 1416. | 30618. | 15285. |
| 33.50 | 23609. | 8887. | 1438. | 31059. | 15508. |
| 34.00 | 23989. | 8973. | 1459. | 31503. | 15733. |
| 34.50 | 24374. | 9060. | 1481. | 31953. | 15960. |

| | | | | | |
|---|---|---|---|---|---|
| 35.00 | 24763. | 9146. | 1502. | 32407. | 16190. |
| 35.50 | 25157. | 9232. | 1523. | 32865. | 16423. |
| 36.00 | 25556. | 9318. | 1545. | 33329. | 16658. |
| 36.50 | 25959. | 9404. | 1566. | 33797. | 16896. |
| 37.00 | 26367. | 9490. | 1588. | 34269. | 17136. |
| 37.50 | 26780. | 9576. | 1609. | 34747. | 17378. |
| 38.00 | 27197. | 9662. | 1631. | 35229. | 17624. |
| 38.50 | 27619. | 9748. | 1652. | 35715. | 17871. |
| 39.00 | 28046. | 9834. | 1674. | 36207. | 18122. |
| 39.50 | 28477. | 9921. | 1695. | 36703. | 18375. |
| 40.00 | 28913. | 10007. | 1717. | 37203. | 18630. |
| 40.50 | 29354. | 10093. | 1738. | 37709. | 18888. |
| 41.00 | 29799. | 10179. | 1759. | 38219. | 19148. |
| 41.50 | 30249. | 10265. | 1781. | 38733. | 19411. |
| 42.00 | 30704. | 10351. | 1802. | 39252. | 19677. |
| 42.50 | 31163. | 10437. | 1824. | 39776. | 19945. |
| 43.00 | 31627. | 10523. | 1845. | 40305. | 20215. |
| 43.50 | 32096. | 10609. | 1867. | 40838. | 20488. |
| 44.00 | 32569. | 10695. | 1888. | 41376. | 20764. |
| 44.50 | 33047. | 10781. | 1910. | 41919. | 21042. |
| 45.00 | 33529. | 10868. | 1931. | 42466. | 21323. |
| 45.50 | 34017. | 10954. | 1953. | 43018. | 21606. |
| 46.00 | 34509. | 11040. | 1974. | 43574. | 21892. |
| 46.50 | 35005. | 11126. | 1995. | 44135. | 22180. |
| 47.00 | 35506. | 11212. | 2017. | 44701. | 22471. |
| 47.50 | 36012. | 11298. | 2038. | 45272. | 22764. |
| 48.00 | 36523. | 11384. | 2060. | 45847. | 23060. |
| 48.50 | 37038. | 11470. | 2081. | 46427. | 23358. |
| 49.00 | 37558. | 11556. | 2103. | 47011. | 23659. |
| 49.50 | 38082. | 11642. | 2124. | 47600. | 23963. |
| 50.00 | 38611. | 11728. | 2146. | 48194. | 24269. |
| 50.50 | 39145. | 11815. | 2167. | 48793. | 24577. |
| 51.00 | 39683. | 11901. | 2189. | 49395. | 24888. |
| 51.50 | 40223. | 11987. | 2210. | 50000. | 25200. |
| 52.00 | 40763. | 12073. | 2232. | 50605. | 25512. |
| 52.50 | 41303. | 12159. | 2253. | 51209. | 25824. |
| 53.00 | 41843. | 12245. | 2274. | 51814. | 26136. |
| 53.50 | 42383. | 12331. | 2296. | 52419. | 26447. |
| 54.00 | 42923. | 12417. | 2317. | 53023. | 26759. |
| 54.50 | 43463. | 12503. | 2339. | 53628. | 27071. |
| 55.00 | 44003. | 12589. | 2360. | 54232. | 27383. |
| 55.50 | 44543. | 12675. | 2382. | 54837. | 27695. |
| 56.00 | 45083. | 12762. | 2403. | 55442. | 28007. |
| 56.50 | 45623. | 12848. | 2425. | 56046. | 28319. |
| 57.00 | 46163. | 12934. | 2446. | 56651. | 28631. |
| 57.50 | 46703. | 13020. | 2468. | 57256. | 28942. |
| 58.00 | 47243. | 13106. | 2489. | 57860. | 29254. |
| 58.50 | 47783. | 13192. | 2510. | 58465. | 29566. |

Lp = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp = Peso efficace del palo
Qu = Portata totale limite
Qd = Portata di progetto = Qll/FS,l + Qbl/FS,b - Wp

*Tabella 10 – Capacità portante di progetto A1+M1+R3 – Palo di spigolo - trazione*

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3  trazione

STAMPA capacita' portante e relativi contributi
```

| Lp<br>m | Qll<br>kN | Qbl<br>kN | Wp<br>kN | Qu<br>kN | Qd<br>kN |
|---|---|---|---|---|---|
| .00 | 0. | 0. | 0. | 0. | 0. |
| .50 | 33. | 0. | -13. | 46. | 30. |
| 1.00 | 75. | 0. | -26. | 102. | 64. |
| 1.50 | 127. | 0. | -40. | 167. | 103. |
| 2.00 | 188. | 0. | -53. | 241. | 147. |
| 2.50 | 258. | 0. | -66. | 324. | 195. |
| 3.00 | 329. | 0. | -79. | 409. | 244. |
| 3.50 | 402. | 0. | -93. | 495. | 294. |
| 4.00 | 475. | 0. | -106. | 581. | 344. |
| 4.50 | 549. | 0. | -119. | 668. | 394. |
| 5.00 | 624. | 0. | -132. | 757. | 445. |
| 5.50 | 699. | 0. | -146. | 845. | 495. |
| 6.00 | 773. | 0. | -159. | 931. | 545. |
| 6.50 | 848. | 0. | -172. | 1020. | 596. |
| 7.00 | 926. | 0. | -185. | 1112. | 649. |
| 7.50 | 1007. | 0. | -199. | 1206. | 702. |
| 8.00 | 1087. | 0. | -212. | 1299. | 756. |
| 8.50 | 1168. | 0. | -225. | 1393. | 809. |
| 9.00 | 1232. | 0. | -238. | 1471. | 855. |
| 9.50 | 1293. | 0. | -252. | 1545. | 898. |
| 10.00 | 1356. | 0. | -265. | 1621. | 943. |
| 10.50 | 1420. | 0. | -278. | 1698. | 988. |
| 11.00 | 1487. | 0. | -291. | 1778. | 1035. |
| 11.50 | 1555. | 0. | -305. | 1860. | 1082. |
| 12.00 | 1625. | 0. | -318. | 1943. | 1130. |
| 12.50 | 1697. | 0. | -331. | 2028. | 1180. |
| 13.00 | 1771. | 0. | -344. | 2115. | 1230. |
| 13.50 | 1846. | 0. | -358. | 2204. | 1281. |
| 14.00 | 1924. | 0. | -371. | 2295. | 1333. |
| 14.50 | 2003. | 0. | -384. | 2387. | 1386. |
| 15.00 | 2084. | 0. | -397. | 2482. | 1440. |
| 15.50 | 2168. | 0. | -411. | 2578. | 1494. |
| 16.00 | 2253. | 0. | -424. | 2676. | 1550. |
| 16.50 | 2339. | 0. | -437. | 2776. | 1607. |
| 17.00 | 2428. | 0. | -450. | 2878. | 1664. |
| 17.50 | 2525. | 0. | -464. | 2989. | 1726. |
| 18.00 | 2665. | 0. | -477. | 3141. | 1809. |
| 18.50 | 2814. | 0. | -490. | 3304. | 1897. |
| 19.00 | 2965. | 0. | -503. | 3469. | 1986. |
| 19.50 | 3120. | 0. | -517. | 3637. | 2077. |
| 20.00 | 3278. | 0. | -530. | 3808. | 2169. |
| 20.50 | 3439. | 0. | -543. | 3982. | 2262. |
| 21.00 | 3602. | 0. | -556. | 4159. | 2357. |
| 21.50 | 3769. | 0. | -570. | 4338. | 2454. |
| 22.00 | 3938. | 0. | -583. | 4521. | 2552. |
| 22.50 | 4111. | 0. | -596. | 4707. | 2651. |
| 23.00 | 4286. | 0. | -609. | 4896. | 2752. |
| 23.50 | 4465. | 0. | -623. | 5087. | 2855. |
| 24.00 | 4646. | 0. | -636. | 5282. | 2959. |
| 24.50 | 4830. | 0. | -649. | 5479. | 3064. |
| 25.00 | 5017. | 0. | -662. | 5680. | 3171. |
| 25.50 | 5207. | 0. | -675. | 5883. | 3279. |
| 26.00 | 5401. | 0. | -689. | 6089. | 3389. |
| 26.50 | 5597. | 0. | -702. | 6299. | 3500. |
| 27.00 | 5795. | 0. | -715. | 6511. | 3613. |
| 27.50 | 5997. | 0. | -728. | 6726. | 3727. |
| 28.00 | 6202. | 0. | -742. | 6944. | 3843. |
| 28.50 | 6400. | 0. | -755. | 7155. | 3955. |
| 29.00 | 6543. | 0. | -768. | 7312. | 4040. |
| 29.50 | 6679. | 0. | -781. | 7460. | 4121. |
| 30.00 | 6816. | 0. | -795. | 7610. | 4203. |
| 30.50 | 6955. | 0. | -808. | 7763. | 4285. |
| 31.00 | 7096. | 0. | -821. | 7917. | 4369. |
| 31.50 | 7238. | 0. | -834. | 8073. | 4454. |
| 32.00 | 7383. | 0. | -848. | 8231. | 4539. |
| 32.50 | 7529. | 0. | -861. | 8390. | 4626. |
| 33.00 | 7678. | 0. | -874. | 8552. | 4713. |
| 33.50 | 7828. | 0. | -887. | 8715. | 4801. |
| 34.00 | 7980. | 0. | -901. | 8881. | 4891. |
| 34.50 | 8134. | 0. | -914. | 9048. | 4981. |

| | | | | | |
|---|---|---|---|---|---|
| 35.00 | 8290. | 0. | -927. | 9217. | 5072. |
| 35.50 | 8447. | 0. | -940. | 9388. | 5164. |
| 36.00 | 8607. | 0. | -954. | 9560. | 5257. |
| 36.50 | 8768. | 0. | -967. | 9735. | 5351. |
| 37.00 | 8931. | 0. | -980. | 9911. | 5446. |
| 37.50 | 9096. | 0. | -993. | 10090. | 5542. |
| 38.00 | 9263. | 0. | -1007. | 10270. | 5638. |
| 38.50 | 9432. | 0. | -1020. | 10452. | 5736. |
| 39.00 | 9603. | 0. | -1033. | 10636. | 5835. |
| 39.50 | 9775. | 0. | -1046. | 10822. | 5934. |
| 40.00 | 9950. | 0. | -1060. | 11009. | 6034. |
| 40.50 | 10126. | 0. | -1073. | 11199. | 6136. |
| 41.00 | 10304. | 0. | -1086. | 11390. | 6238. |
| 41.50 | 10484. | 0. | -1099. | 11583. | 6341. |
| 42.00 | 10666. | 0. | -1113. | 11779. | 6446. |
| 42.50 | 10850. | 0. | -1126. | 11976. | 6551. |
| 43.00 | 11035. | 0. | -1139. | 12174. | 6657. |
| 43.50 | 11223. | 0. | -1152. | 12375. | 6764. |
| 44.00 | 11412. | 0. | -1166. | 12578. | 6872. |
| 44.50 | 11603. | 0. | -1179. | 12782. | 6980. |
| 45.00 | 11796. | 0. | -1192. | 12988. | 7090. |
| 45.50 | 11991. | 0. | -1205. | 13196. | 7201. |
| 46.00 | 12188. | 0. | -1219. | 13406. | 7312. |
| 46.50 | 12386. | 0. | -1232. | 13618. | 7425. |
| 47.00 | 12587. | 0. | -1245. | 13832. | 7538. |
| 47.50 | 12789. | 0. | -1258. | 14048. | 7653. |
| 48.00 | 12993. | 0. | -1272. | 14265. | 7768. |
| 48.50 | 13200. | 0. | -1285. | 14484. | 7885. |
| 49.00 | 13407. | 0. | -1298. | 14705. | 8002. |
| 49.50 | 13617. | 0. | -1311. | 14929. | 8120. |
| 50.00 | 13829. | 0. | -1325. | 15153. | 8239. |
| 50.50 | 14042. | 0. | -1338. | 15380. | 8359. |
| 51.00 | 14258. | 0. | -1351. | 15609. | 8480. |
| 51.50 | 14474. | 0. | -1364. | 15838. | 8601. |
| 52.00 | 14690. | 0. | -1377. | 16067. | 8722. |
| 52.50 | 14906. | 0. | -1391. | 16296. | 8844. |
| 53.00 | 15122. | 0. | -1404. | 16526. | 8965. |
| 53.50 | 15338. | 0. | -1417. | 16755. | 9086. |
| 54.00 | 15554. | 0. | -1430. | 16984. | 9207. |
| 54.50 | 15770. | 0. | -1444. | 17213. | 9329. |
| 55.00 | 15986. | 0. | -1457. | 17443. | 9450. |
| 55.50 | 16202. | 0. | -1470. | 17672. | 9571. |
| 56.00 | 16418. | 0. | -1483. | 17901. | 9692. |
| 56.50 | 16634. | 0. | -1497. | 18130. | 9814. |
| 57.00 | 16850. | 0. | -1510. | 18360. | 9935. |
| 57.50 | 17066. | 0. | -1523. | 18589. | 10056. |
| 58.00 | 17282. | 0. | -1536. | 18818. | 10177. |
| 58.50 | 17498. | 0. | -1550. | 19047. | 10299. |

Lp = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp = Peso efficace del palo
Qu = Portata totale limite
Qd = Portata di progetto = Qll/FS,l + Qbl/FS,b - Wp

# 7 ANALISI PALIFICATE DI FONDAZIONE

## 7.1 Metodologie di calcolo

L'analisi statica nello spazio della palificata è stata condotta considerando fondazioni costituite da pali collegati (incastrati) in testa ad un plinto di fondazione assimilabile ad un corpo infinitamente rigido.

I valori massimi delle sollecitazioni agenti su ciascun palo e gli spostamenti della fondazione conseguenti ai carichi applicati sono stati determinati con l'ausilio del codice di calcolo MAP Matrix Analysis of Piles - (G. Guiducci - 1999).

Con tale metodo si tiene conto del fatto che il comportamento della palificata è influenzato sia dalla rigidezza orizzontale dei singoli pali che della loro rigidezza assiale, nonché dell'influenza reciproca fra i vari elementi (effetto gruppo per carichi orizzontali e verticali).

Il programma consente l'analisi di palificate del tutto generiche nella geometria, disposizione, inclinazione e lunghezza degli elementi di fondazione (pali, pali o setti comunque orientati).

Le condizioni di vincolo tra pali e plinto possono essere di incastro, cerniera e semplice appoggio anche variabili per i diversi elementi.

Il comportamento del palo isolato ai carichi assiali è definito da una caratteristica di rigidezza (del sistema palo-terreno), che può essere lineare o non lineare.

Il comportamento del palo isolato soggetto a carico trasversale è definito da una caratteristica di rigidezza che tiene conto di un profilo di modulo di reazione terreno-palo variabile con la profondità.

E' possibile tenere conto delle reciproche influenze fra i pali (effetto gruppo sia per carichi verticali che orizzontali) sia in ambito elastico, sulla base della teoria di Poulus e Davis (1980), che adottando curve d'interazione sperimentali quali ad esempio Prakash (1962), Cox et al. (1984), Wang (1986) e Lieng (1988).

Le azioni esterne, siano esse carichi o coazioni (effetti indotti dei cedimenti dei rilevati d'accesso in presenza di terreni compressibili) possono essere applicate al plinto in più centri di carico, per ognuno dei quali vengono definite le componenti di carico in sistemi di riferimento locali.

Le figure seguenti riportano i sistemi di riferimento globale, locale con le convenzioni sui segni delle variabili adottate, le possibili caratteristiche di rigidezza assiale ed orizzontale per i pali nonché le convezioni adottate per la definizione dei centri di carico.

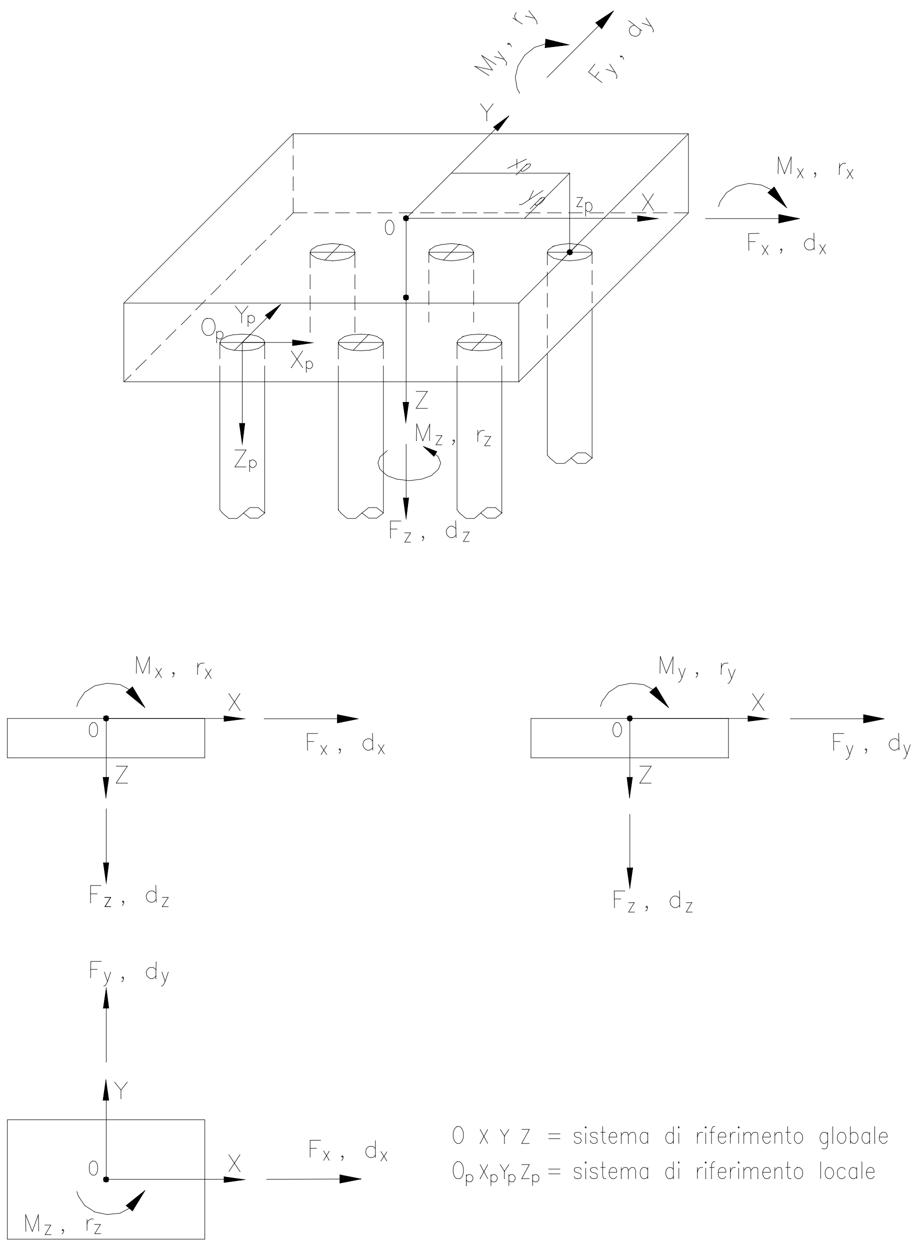



*Figura 16 - Sistema di riferimento globale - convenzioni sulle variabili*

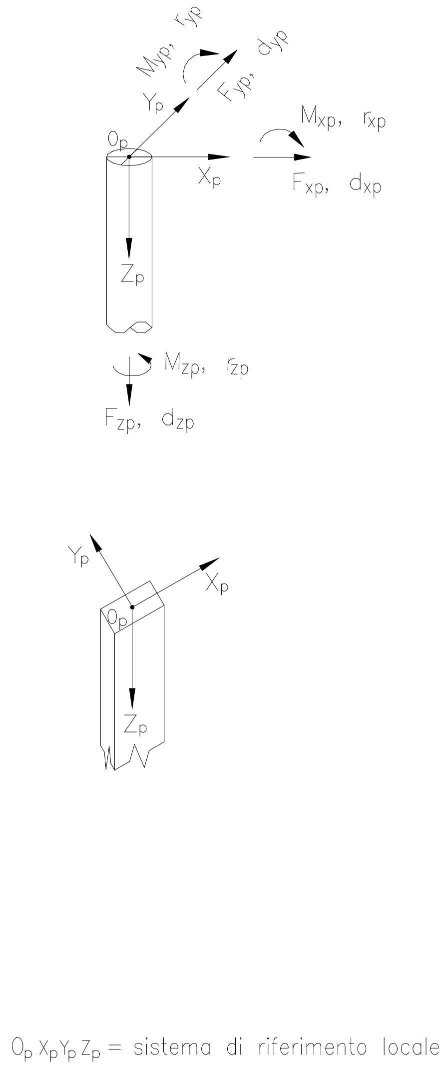



*Figura 17- Sistema di riferimento locale - convenzioni sulle variabili*

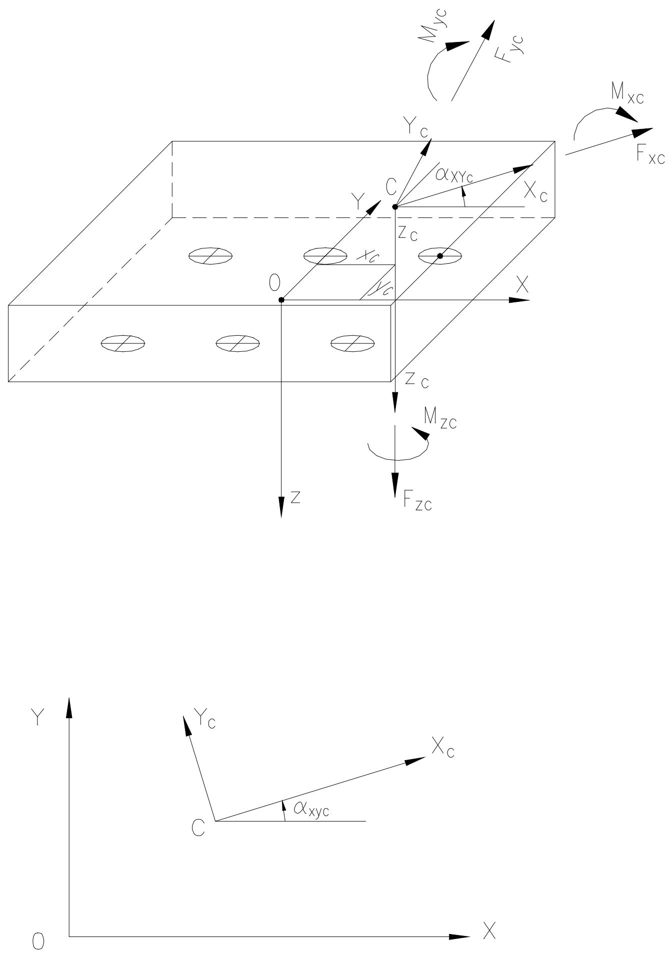



*Figura 18- Carichi applicati al plinto: convenzioni relative ai centri di carico*

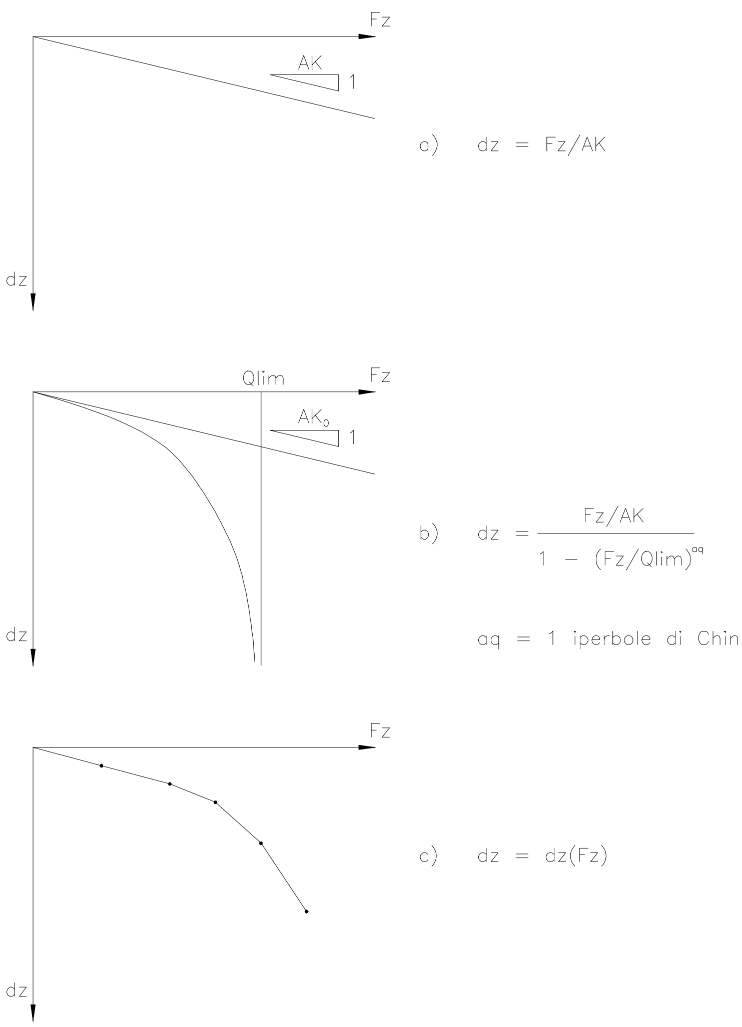



*Figura 19- Pali soggetti a carichi assiali: relazioni carico-cedimento*

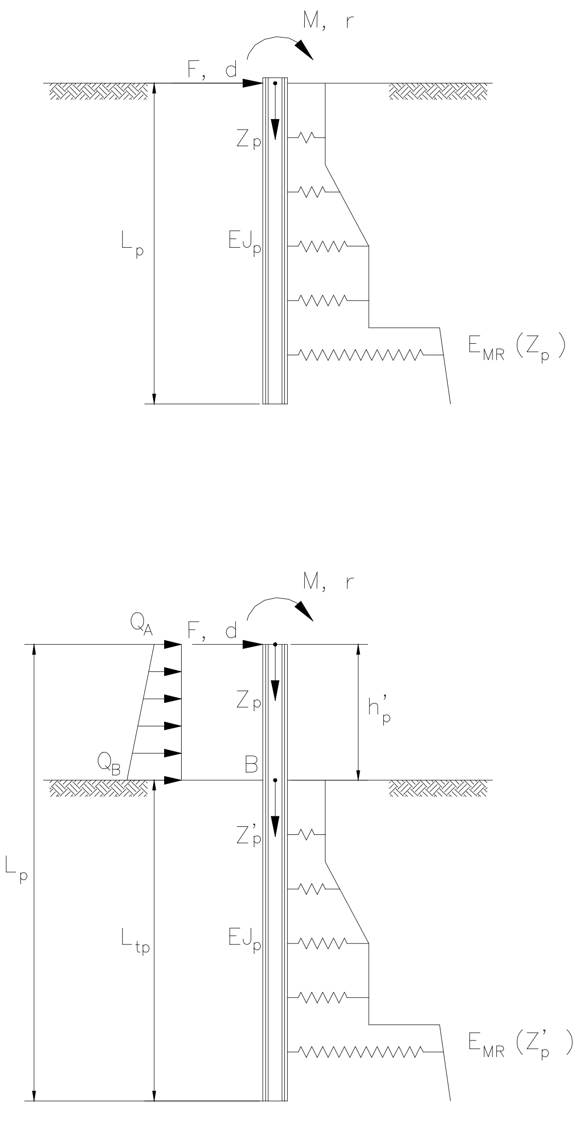



*Figura 20 - Pali soggetti a carichi trasversali: moduli di reazione del terreno*

Nel seguito si definiscono, per il caso in esame, gli elementi impiegati nello schema di calcolo prescelto ed i risultati delle elaborazioni.

### 7.1.1 *Valutazione della rigidezza assiale del palo isolato*

La curva carico-cedimento del palo isolato viene caratterizzata attraverso la seguente relazione lineare:

dz = [Fz / AK]

dove:

dz = spostamento verticale a testa palo;

Fz = carico assiale a testa palo.

La valutazione della curva carico-cedimento del palo isolato è stata effettuata con il programma APAL che utilizza il metodo delle curve di trasferimento riferite al fusto ed alla base dei pali sviluppate da Reese e O'Neill (curve t-s e q-s). In base a tale metodo:

- il palo è schematizzato con un elemento cilindrico, suddiviso in conci, caratterizzato da un modulo elastico Ep;
- il legame tra palo e terreno viene schematizzato come indicato in Figura 21; le curve di trasferimento per adesione laterale sono di tipo bilatere, definite dal valore limite della $\tau$ nel punto considerato e dallo spostamento relativo limite tra palo e terreno. Lo spostamento limite è stato assunto per i terreni in esame pari a 5 mm, in accordo con numerose risultanze sperimentali disponibili in bibliografia (vedasi *Figura 22*).
- La curva di trasferimento per la base è di tipo iperbolico (vedasi *Figura 22*). Si ipotizza che la portata di base limite venga raggiunta per una frazione k del diametro D del palo. L'interpolazione delle curve per le sabbie (Duncan e Champ) e per le argille (Burland – Whitaker) risulta soddisfacente adottando le seguenti relazioni:

Pb = [Qbl / 0.9 · Esi · s] / [(Qbl / 0.9) + (Esi · s)]

Dove:

Esi = (Qbl / 0.9) / C · k · D

Qbl / 0.9 = portata limite teorica asintotica

s = spostamento generico

C = coefficiente caratteristico della curva

D = diametro del palo.

La curva di base è dunque definita dalla portata limite, dal coefficiente k che determina lo spostamento limite e da C (assunto 0.09 per le sabbie e 0.13 per le argille) che influenza la forma della curva iperbolica.

I valori di tensione laterale limite e di base, adottati per la definizione delle curve carico-cedimento dei pali, sono quelli utilizzati per la capacità portante.

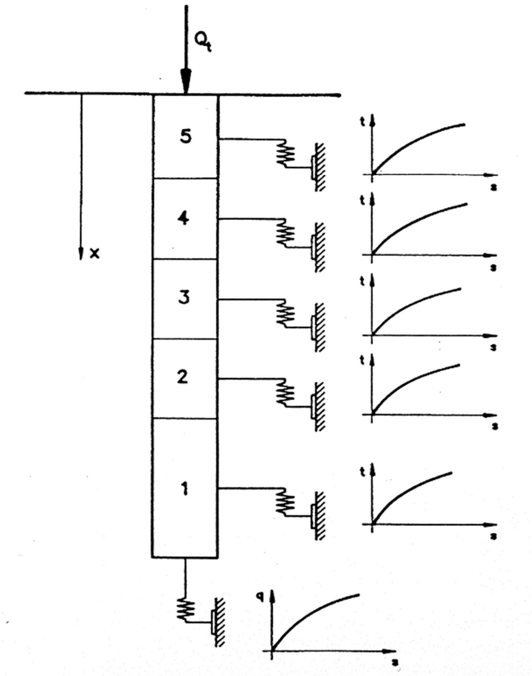



*Figura 21 –Legame ideale palo-terreno*

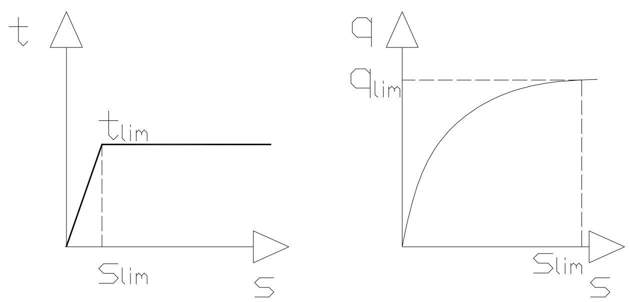



*Figura 22 –curve di trasferimento (laterale e base)*

La curva carico-cedimento del palo isolato è stata determinata assegnando diversi valori di carico in sommità e ottenendo i corrispondenti valori di cedimento.

Nella seguente figura è mostrata la curve carico-cedimento valutata sulla base della stratigrafia in esame e della geometria del palo (diametro e lunghezza).

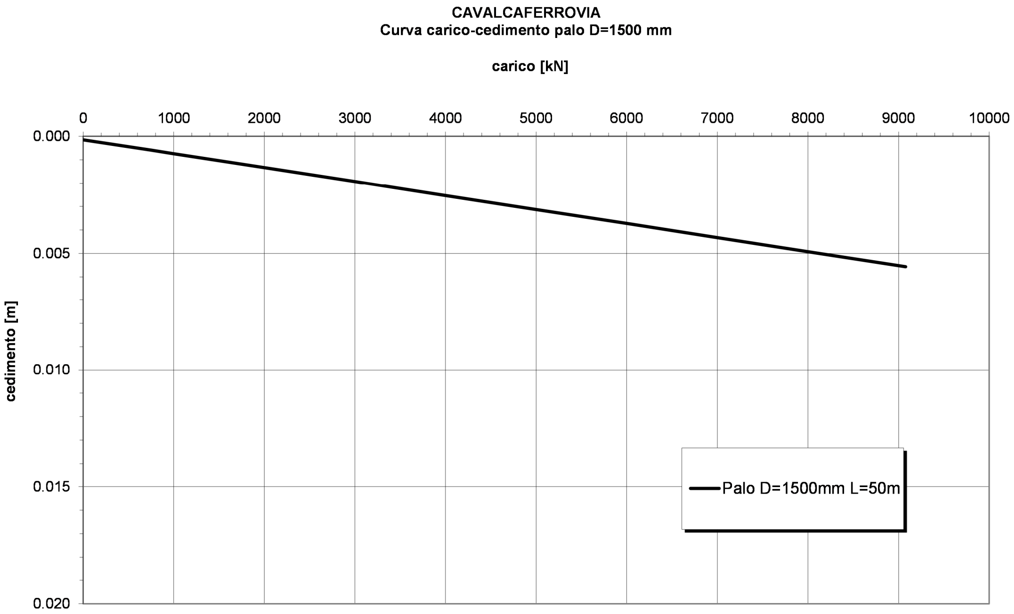



*Figura 23 –curva carico – cedimento – palo isolato D=1500 mm*

Nel caso in esame, si assume la seguente rigidezza assiale per palo singolo:

- Ak = 1600000 kN/m per palo diametro D=1500 mm ($L_{preliminare}$ = 50 m)

#### 7.1.1.1 *Valutazione della rigidezza assiale del palo in gruppo*

La rigidezza assiale del palo in gruppo è stata valutata in accordo alla correlazione riportata in Mandolini, Russo, Viggiani (vedasi figura seguente) basata sul confronto parametrico di evidenze sperimentali. Nel grafico viene rappresentato:

$$R_G = E_G / n.$$

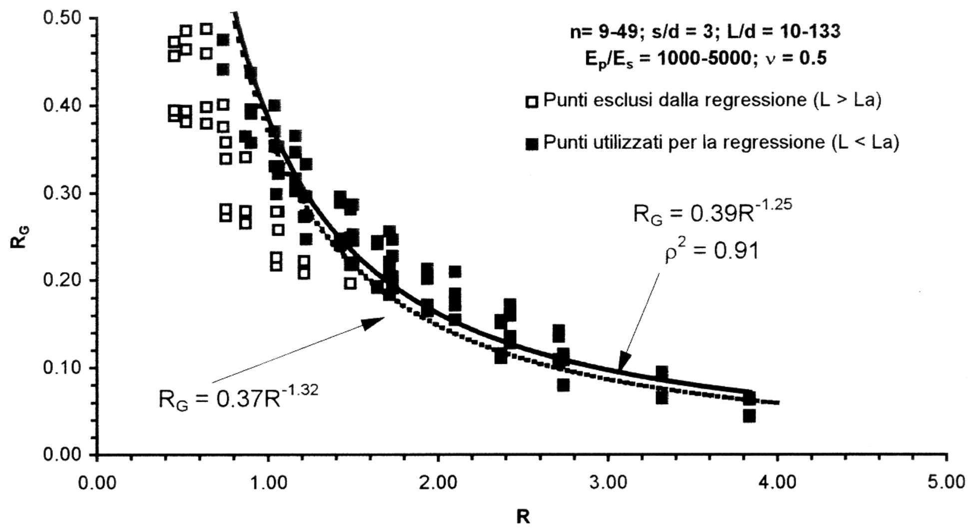



*Figura 24 – valutazione Eg (effetto gruppo verticale pali)*

In ascissa, il parametro geometrico R (modified aspect ratio) tiene conto della geometria della fondazione (n: numero di pali; s: interasse dei pali; L: lunghezza). Si ha:

$$R = (n \cdot s / L)^{0.5}$$

$$R_G = 0.39 \cdot R^{-1.25}$$

$$E_G = R_G \cdot n = (0.39 \cdot ((n \cdot s / L)^{0.5})^{-1.25}) \cdot n$$

Per la Spalla in esame l'effetto gruppo è stato valutato considerando una singola ala di fondazione, laterale allo scatolare, costituita da 18 pali ad interasse 2 m. Ne consegue:

$E_G \cong 8$; $A_{k,g} \cong 1600000 / Eg \cong 200000$ kN/m.

### 7.1.2 *Comportamento del palo soggetto ai carichi orizzontali*

#### 7.1.2.1 ***Modulo di reazione orizzontale del terreno***

Lo studio dell'interazione tra palo soggetto ai carichi orizzontali ed il terreno viene effettuato ricorrendo alla teoria di Matlock e Reese che si basa sul noto modello di suolo alla Winkler (elastico-lienare), caratterizzato da un modulo di reazione orizzontale del terreno ($E_S$) definito come il rapporto fra la reazione del terreno per unità di lunghezza del palo (p) ed il corrispondente spostamento orizzontale (y):

$E_S = p / y$ $[FL^{-2}]$

Si osservi che, definito $K_W$ $[FL^{-3}]$ il coefficiente di sottofondo di Winkler, per un palo di diametro D si ha:

$$E_S = K_W \cdot D \qquad [FL^{-2}]$$

L'andamento del modulo di reazione orizzontale con la profondità è funzione principalmente del tipo di terreno.

Per i terreni incoerenti si assume in genere una legge di variazione lineare caratterizzata dai seguenti parametri:

$$Es = E_{s,0} + kh \cdot z \qquad [FL^{-2}]$$

dove:

$E_{s,0}$ = valore del modulo di reazione a testa palo;

kh = gradiente del modulo di reazione del terreno funzione principalmente della densità relativa (Dr);

z = profondità a partire dal p.c. locale.

Per i terreni coesivi si assume in genere una legge del tipo:

$$Es = \xi \cdot cu$$

dove:  cu = resistenza al taglio in condizioni non drenate.

Per le fondazioni in esame è stato considerato: $\xi = 500$, $kh = 15000$ $kN/m^3$.

A tali valori corrispondono a valori secanti del modulo Es per pali isolati con basse deformazioni ($y \leq 0.005 \cdot D$, Figura 25).

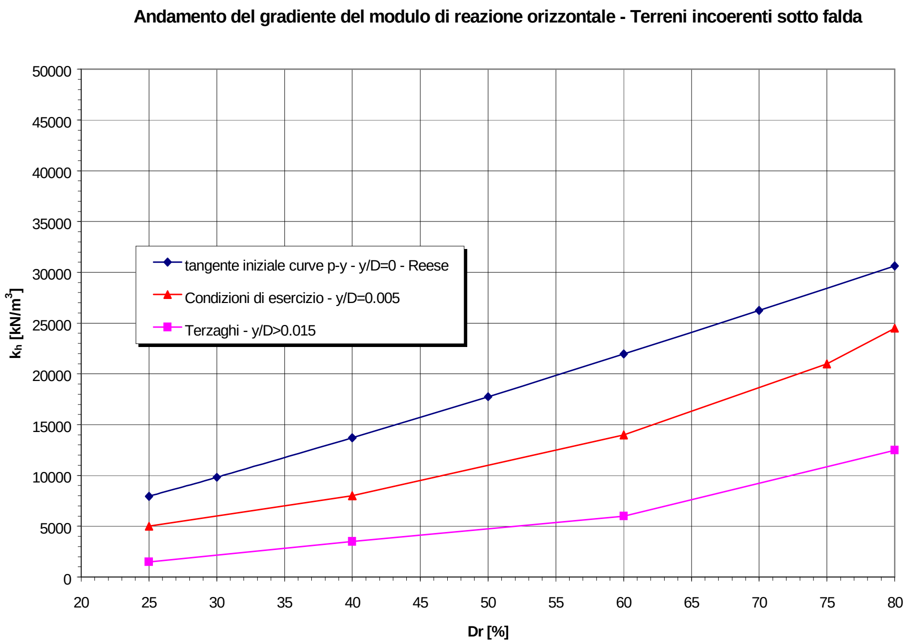



*Figura 25*

Per i pali della palificata si considera il seguente andamento del modulo di reazione orizzontale con la profondità, definito a partire da testa palo.

| Prof. m | E kN/m2 |
|---|---|
| .00 | 33750.0 |
| 3.00 | 35250.0 |
| 3.10 | 150000.0 |
| 8.00 | 150000.0 |
| 8.10 | 36750.0 |
| 13.00 | 44250.0 |
| 13.10 | 150000.0 |
| 26.00 | 150000.0 |
| 26.10 | 52500.0 |
| 60.00 | 75000.0 |

#### 7.1.2.1 *Fattori d'interazione orizzontali per pali in gruppo*

La valutazione dell'effetto gruppo orizzontale è stata svolta in accordo alle indicazioni di Reese et al.. Tali indicazioni tengono essenzialmente conto di risultati di natura sperimentale, condotti da Prakash (1962), Cox (1984), Wang (1986), Lieng (1988).

Le interazioni orizzontali fra i pali sono essenzialmente di due tipi:

- interazione tra pali in linea, caricati in direzione parallela alla fila (figura *Figura 26*);

- interazione tra pali affiancati, caricati in direzione ortogonale alla fila (figura *Figura 27*).

L'interazione del primo tipo si esplica in una diminuzione delle caratteristiche meccaniche del terreno retrostante il palo di testa della fila, con conseguente incremento degli spostamenti dei pali retrostanti.

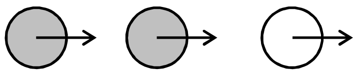


*Figura 26*

L'interazione del secondo tipo si esplica invece con un incremento degli spostamenti del palo centrale per effetto della presenza dei pali laterali.

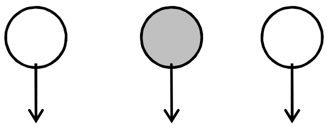


*Figura 27*

Si tiene inoltre in considerazione una interazione di tipo "obliquo" tra pali, combinando gli effetti precedentemente descritti tramite l'espressione matematica dell'ellisse in coordinate polari (figura *Figura 28*):

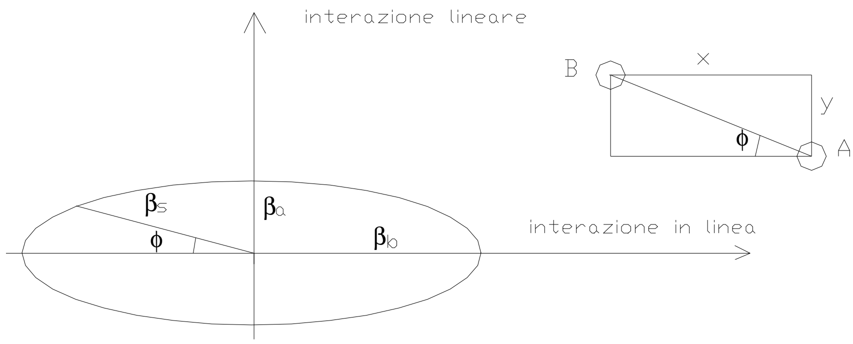



*Figura 28*

$\beta s = (\beta_b^2 \cos^2\Phi + \beta_a^2 \sin^2\Phi)^{1/2}$

per n pali si ha: $\beta_{si} = \prod_{j=1,n}^{j \neq i} \beta_{sij}$

<u>- interazione tra pali affiancati, caricati in direzione perpendicolare alla fila</u>

Il fattore di riduzione in funzione del rapporto s/D (s=interasse dei pali, D=diametro del palo) è rappresentata in figura *Figura 29*;

<u>- interazione tra pali in linea, caricati in direzione parallela alla fila</u>

Il fenomeno di interazione in direzione del carico è più complicato di quello nella direzione trasversale. Studi sperimentali condotti sull'argomento hanno mostrato che l'interazione dipende principalmente dalla posizione relativa dei pali. Numerosi autori indicano fattori di riduzione distinti per pali frontali e pali retrostanti. Tali fattori sono dati in funzione della spaziatura tra i pali nella direzione del carico. I fattori di riduzione per pali frontali e retrostanti sono indicati nelle figure *Figura 30÷Figura 31*.

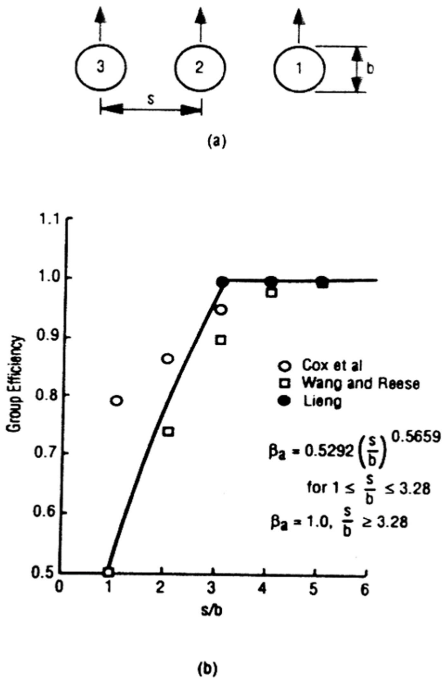



*Figura 29 - Fattori di riduzione per pali disposti su file perpendicolari alla direzione di carico*

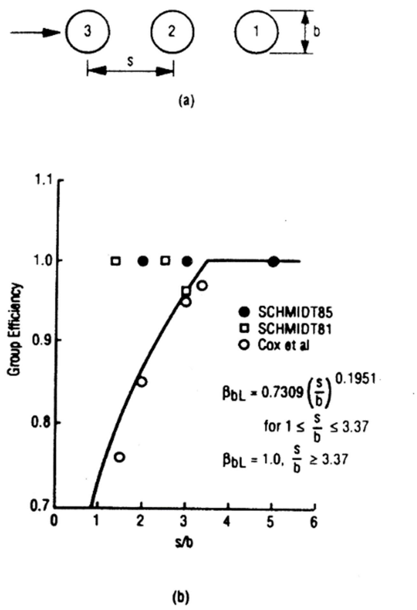



*Figura 30 – Fattori di riduzione per pali disposti parallelamente alla direzione di carico- (pali frontali)*

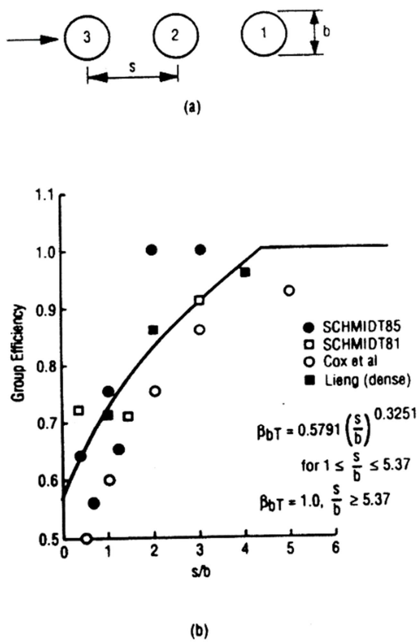
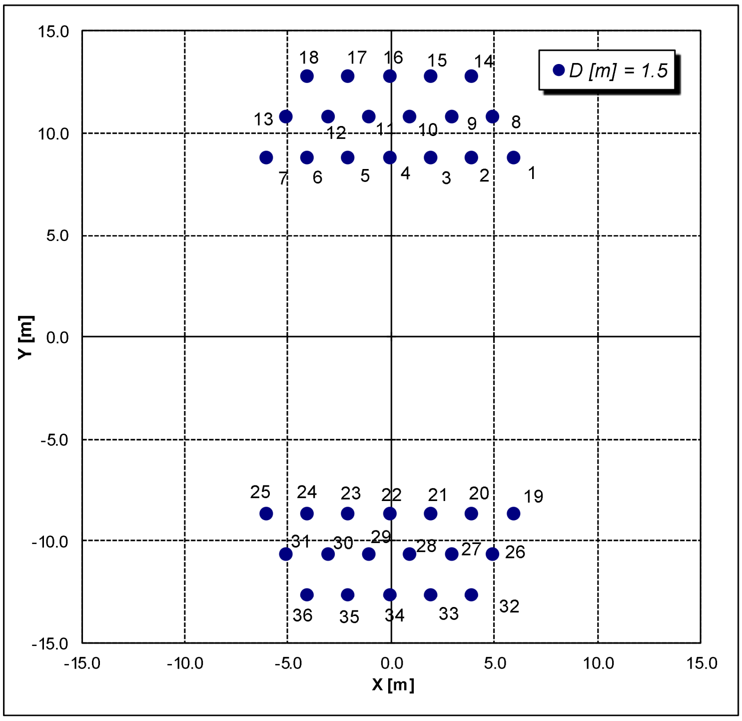



*Figura 31 - Fattori di riduzione per pali disposti parallelamente alla direzione di carico- (pali retrostanti)*

I fattori così determinati sono utilizzati per penalizzare i moduli di reazione orizzontali di ciascun palo della palificata.

Nelle figure seguenti si riportano i fattori d'interazione ottenuti per ciascun palo delle spalle ed inseriti nel programma di calcolo MAP per l’analisi delle palificate.

E [GPa] = 30.0 J [$m^4$] = 0.249 EJ [kPa] = 7455147 D [m] = 1.5




| ip [--] | X [m] | Y [m] | fattori di riduzione bX [--] | fattori di riduzione bY [--] |
|---|---|---|---|---|
| 1 | 6.00 | 8.70 | 0.30 | 0.25 |
| 2 | 4.00 | 8.70 | 0.08 | 0.05 |
| 3 | 2.00 | 8.70 | 0.06 | 0.05 |
| 4 | 0.00 | 8.70 | 0.06 | 0.05 |
| 5 | -2.00 | 8.70 | 0.06 | 0.05 |
| 6 | -4.00 | 8.70 | 0.06 | 0.05 |
| 7 | -6.00 | 8.70 | 0.20 | 0.25 |
| 8 | 5.00 | 10.70 | 0.20 | 0.20 |
| 9 | 3.00 | 10.70 | 0.05 | 0.05 |
| 10 | 1.00 | 10.70 | 0.05 | 0.05 |
| 11 | -1.00 | 10.70 | 0.05 | 0.05 |
| 12 | -3.00 | 10.70 | 0.05 | 0.05 |
| 13 | -5.00 | 10.70 | 0.20 | 0.20 |
| 14 | 4.00 | 12.70 | 0.25 | 0.25 |
| 15 | 2.00 | 12.70 | 0.06 | 0.05 |
| 16 | 0.00 | 12.70 | 0.06 | 0.05 |
| 17 | -2.00 | 12.70 | 0.06 | 0.05 |
| 18 | -4.00 | 12.70 | 0.20 | 0.25 |
| 19 | 6.00 | -8.70 | 0.30 | 0.25 |
| 20 | 4.00 | -8.70 | 0.08 | 0.05 |
| 21 | 2.00 | -8.70 | 0.06 | 0.05 |
| 22 | 0.00 | -8.70 | 0.06 | 0.05 |
| 23 | -2.00 | -8.70 | 0.06 | 0.05 |
| 24 | -4.00 | -8.70 | 0.06 | 0.05 |
| 25 | -6.00 | -8.70 | 0.20 | 0.25 |
| 26 | 5.00 | -10.70 | 0.20 | 0.20 |
| 27 | 3.00 | -10.70 | 0.05 | 0.05 |
| 28 | 1.00 | -10.70 | 0.05 | 0.05 |
| 29 | -1.00 | -10.70 | 0.05 | 0.05 |
| 30 | -3.00 | -10.70 | 0.05 | 0.05 |
| 31 | -5.00 | -10.70 | 0.20 | 0.20 |
| 32 | 4.00 | -12.70 | 0.25 | 0.25 |
| 33 | 2.00 | -12.70 | 0.06 | 0.05 |
| 34 | 0.00 | -12.70 | 0.06 | 0.05 |
| 35 | -2.00 | -12.70 | 0.06 | 0.05 |
| 36 | -4.00 | -12.70 | 0.20 | 0.25 |

*Figura 32 – Fattori di riduzione per l’analisi della palificata della Spalla*

### 7.2 Carichi agenti in fondazione

I carichi agenti in fondazione sono stati forniti dal progettista strutturale nel baricentro palificata delle singole ali laterali allo scatolare, a quota intradosso plinto (nodo n. 777 e nodo n. 789, Figura 1). In Figura 1 è mostrato il sistema di riferimento della palificata ed i sistemi di riferimento dei due punti di applicazione del carico. Per completezza in Appendice C si riportano i carichi forniti dal progettista strutturale.

### 7.3 Risultati delle analisi

Le analisi sono svolte per entrambe le spalle con appoggi fissi e con appoggi mobili, anche se le geometrie sono uguali.

### 7.3.1 *Spalla appoggi fissi*

Nelle seguenti tabelle si sintetizzano le massime sollecitazioni in testa ai pali, il numero del palo e la condizione di carico per cui si ottengono, per le analisi eseguite: SLE, SLU STR, SLU SISMA. Per l'analisi SLE si riportano anche gli spostamenti massimi del plinto. Nelle figure a seguire si riportano gli andamenti del taglio e del momento lungo il fusto del palo.

Nell'Appendice B si riportano i tabulati di calcolo completi.

Tabella 11 – Spalla appoggi fissi – Analisi SLU STR

```
NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

    36 pali      D = 1500 mm


Sollecitazioni massime in sommita' ai pali

------------------------------------------------
        Fz          M         T     palo   c.d.c.
        kN       kN*m        kN
------------------------------------------------
S.1   6111.0    1158.0    1248.0     1       7
S.2   -632.8     729.9     977.3    25       7
S.3   3855.5    1733.4    1001.3    19       1
S.4   6050.5    1643.8    1395.7    19       7
T.1   5919.9    1668.9    1364.2     1      12
T.2   1421.0    1446.5      84.6    12       2
------------------------------------------------
S.1: cond. di carico con Sforzo Normale Massimo
     spalla fissa - n777 _STR7- n789 _STR7
S.2: cond. di carico con Sforzo Normale Minimo
     spalla fissa - n777 _STR7- n789 _STR7
S.3: cond. di carico con Momento Massimo
     spalla fissa - n777 _STR1 - n789 _STR1
S.4: cond. di carico con Taglio Massimo
     spalla fissa - n777 _STR7- n789 _STR7
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
     spalla fissa - n777 _STR12- n789 _STR12
T.2: cond. di carico con Tensione Minima  (sez. interamente reagente)
     spalla fissa - n777 _STR2- n789 _STR2
```

## Tabella 12 – Spalla appoggi fissi – Analisi SLV SISMA

```
NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

    36 pali      D = 1500 mm


Sollecitazioni massime in sommita' ai pali

------------------------------------------------
        Fz         M          T     palo   c.d.c.
        kN       kN*m        kN
------------------------------------------------
S.1   6294.6    5476.7    2853.1     1      19
S.2  -3254.7    4841.6    2403.8    25      19
S.3   3855.3    7301.8    2713.7    19      29
S.4   6028.5    7064.2    3337.6    19      19
T.1   6028.5    7064.2    3337.6    19      19
T.2   2792.8    7251.0    2652.9    32      29
------------------------------------------------
S.1: cond. di carico con Sforzo Normale Massimo
     spalla fissa - n777 _Sis7- n789 _Sis7
S.2: cond. di carico con Sforzo Normale Minimo
     spalla fissa - n777 _Sis7- n789 _Sis7
S.3: cond. di carico con Momento Massimo
     spalla fissa - n777 _Sis17- n789 _Sis17
S.4: cond. di carico con Taglio Massimo
     spalla fissa - n777 _Sis7- n789 _Sis7
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
     spalla fissa - n777 _Sis7- n789 _Sis7
T.2: cond. di carico con Tensione Minima  (sez. interamente reagente)
     spalla fissa - n777 _Sis17- n789 _Sis17
```

Tabella 13 – Spalla appoggi fissi – Analisi SLE FESS

```
NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

    36 pali     D = 1500 mm


Sollecitazioni massime in sommita' ai pali

------------------------------------------------
        Fz         M         T     palo   c.d.c.
        kN       kN*m       kN
------------------------------------------------
S.1   4006.8     702.7     775.4     1       7
S.2   -232.9     450.3     611.8    25       7
S.3   3762.4    1055.5     831.7     1      12
S.4   3966.0    1026.1     874.2    19       7
T.1   3966.0    1026.1     874.2    19       7
T.2   1045.4     888.4      55.6    12       2
------------------------------------------------
S.1: cond. di carico con Sforzo Normale Massimo
     spalla fissa - n777 _FESS_7 - n789 _FESS_7
S.2: cond. di carico con Sforzo Normale Minimo
     spalla fissa - n777 _FESS_7 - n789 _FESS_7
S.3: cond. di carico con Momento Massimo
     spalla fissa - n777 _FESS_12- n789 _FESS_12
S.4: cond. di carico con Taglio Massimo
     spalla fissa - n777 _FESS_7 - n789 _FESS_7
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
     spalla fissa - n777 _FESS_7 - n789 _FESS_7
T.2: cond. di carico con Tensione Minima  (sez. interamente reagente)
     spalla fissa - n777 _FESS_2- n789 _FESS_2


Deformazioni massime del plinto

-------------------------------------------------------------
        dz        dx        rx        dy        ry      c.d.c.
        mm        mm       mRad       mm       mRad
-------------------------------------------------------------
D.1    9.649     9.059     1.511      .324      .010      2
D.2    9.435    11.602     1.750      .322      .012      7
D.3    9.435    11.602     1.750      .322      .012      7
D.4    9.291     9.059     1.453     -.570     -.030      6
D.5    9.291     9.059     1.453     -.570     -.030      6
-------------------------------------------------------------
D.1: cond. di carico con  dz  massimo
     spalla fissa - n777 _FESS_2- n789 _FESS_2
D.2: cond. di carico con  dx  massimo
     spalla fissa - n777 _FESS_7 - n789 _FESS_7
D.3: cond. di carico con  rx  massimo
     spalla fissa - n777 _FESS_7 - n789 _FESS_7
D.4: cond. di carico con  dy  massimo
     spalla fissa - n777 _FESS_6- n789 _FESS_6
D.5: cond. di carico con  ry  massimo
     spalla fissa - n777 _FESS_6- n789 _FESS_6
```

Tabella 14 – Spalla appoggi fissi – Analisi SLE RARA, FREQ, QP

```
NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

    36 pali      D = 1500 mm


Sollecitazioni massime in sommita' ai pali

------------------------------------------------
        Fz         M         T     palo   c.d.c.
        kN       kN*m       kN
------------------------------------------------
S.1   4878.3    1143.5    1003.7    19      23
S.2   -378.7     437.3     661.3    25      18
S.3   4816.3    1664.4    1161.9     1      23
S.4   4816.3    1664.4    1161.9     1      23
T.1   4816.3    1664.4    1161.9     1      23
T.2   -109.0     902.9     820.4     7      23
------------------------------------------------
S.1: cond. di carico con Sforzo Normale Massimo
     spalla fissa - n777 _RARA_12- n789 _RARA_12
S.2: cond. di carico con Sforzo Normale Minimo
     spalla fissa - n777 _RARA_7- n789 _RARA_7
S.3: cond. di carico con Momento Massimo
     spalla fissa - n777 _RARA_12- n789 _RARA_12
S.4: cond. di carico con Taglio Massimo
     spalla fissa - n777 _RARA_12- n789 _RARA_12
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
     spalla fissa - n777 _RARA_12- n789 _RARA_12
T.2: cond. di carico con Tensione Minima  (sez. interamente reagente)
     spalla fissa - n777 _RARA_12- n789 _RARA_12


Deformazioni massime del plinto

-------------------------------------------------------------
        dz        dx        rx        dy        ry     c.d.c.
        mm        mm       mRad       mm       mRad
-------------------------------------------------------------
D.1   11.923    14.399     2.052     -.457     -.018     23
D.2   11.923    14.399     2.052     -.457     -.018     23
D.3   11.923    14.399     2.052     -.457     -.018     23
D.4    9.411     9.492     1.518      .592      .033     17
D.5    9.411     9.492     1.518      .592      .033     17
-------------------------------------------------------------
D.1: cond. di carico con  dz  massimo
     spalla fissa - n777 _RARA_12- n789 _RARA_12
D.2: cond. di carico con  dx  massimo
     spalla fissa - n777 _RARA_12- n789 _RARA_12
D.3: cond. di carico con  rx  massimo
     spalla fissa - n777 _RARA_12- n789 _RARA_12
D.4: cond. di carico con  dy  massimo
     spalla fissa - n777 _RARA_5 - n789 _RARA_5
D.5: cond. di carico con  ry  massimo
     spalla fissa - n777 _RARA_5 - n789 _RARA_5
```

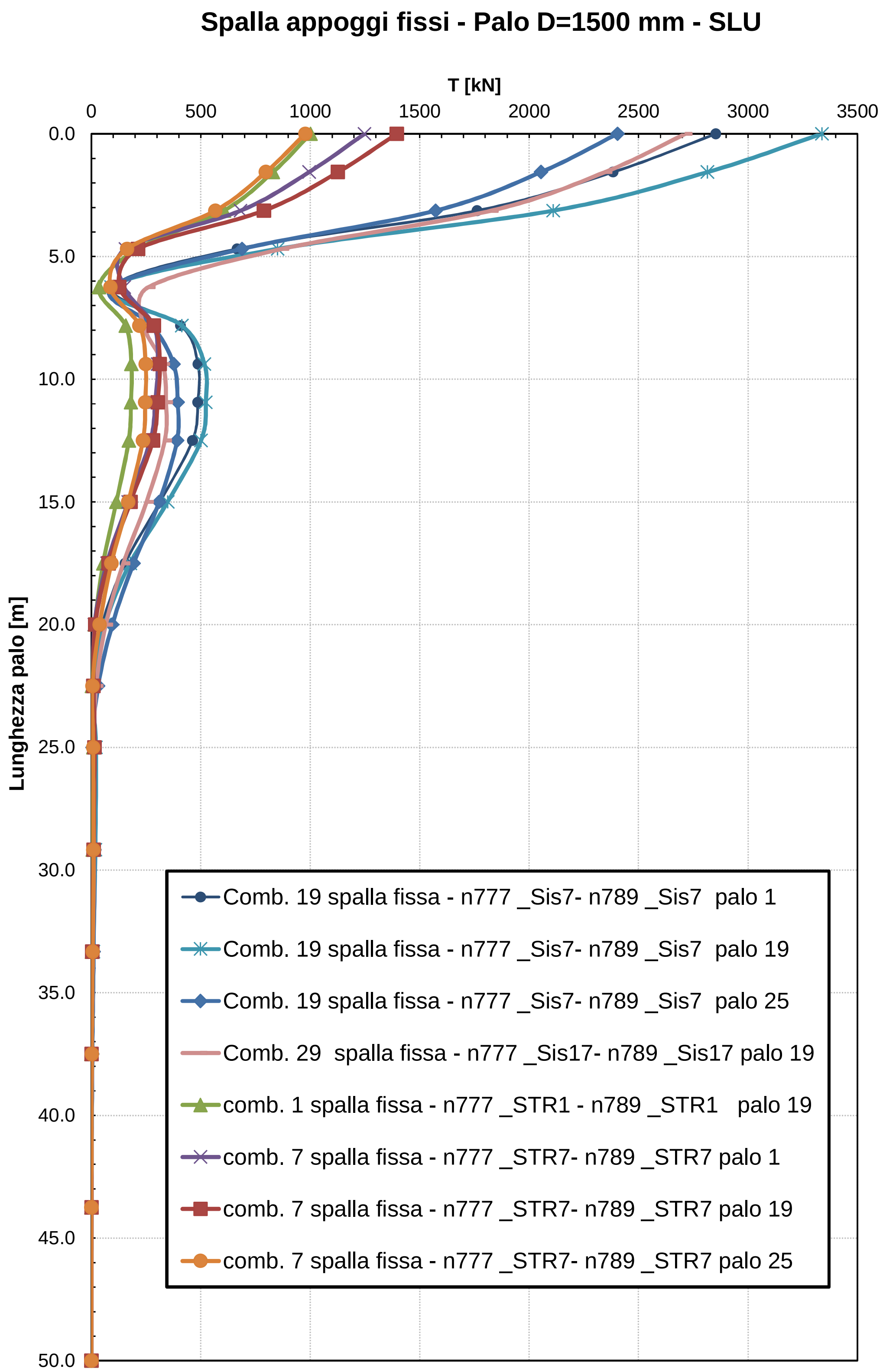



*Figura 33 – Andamento del taglio lungo il fusto del palo - SLU*

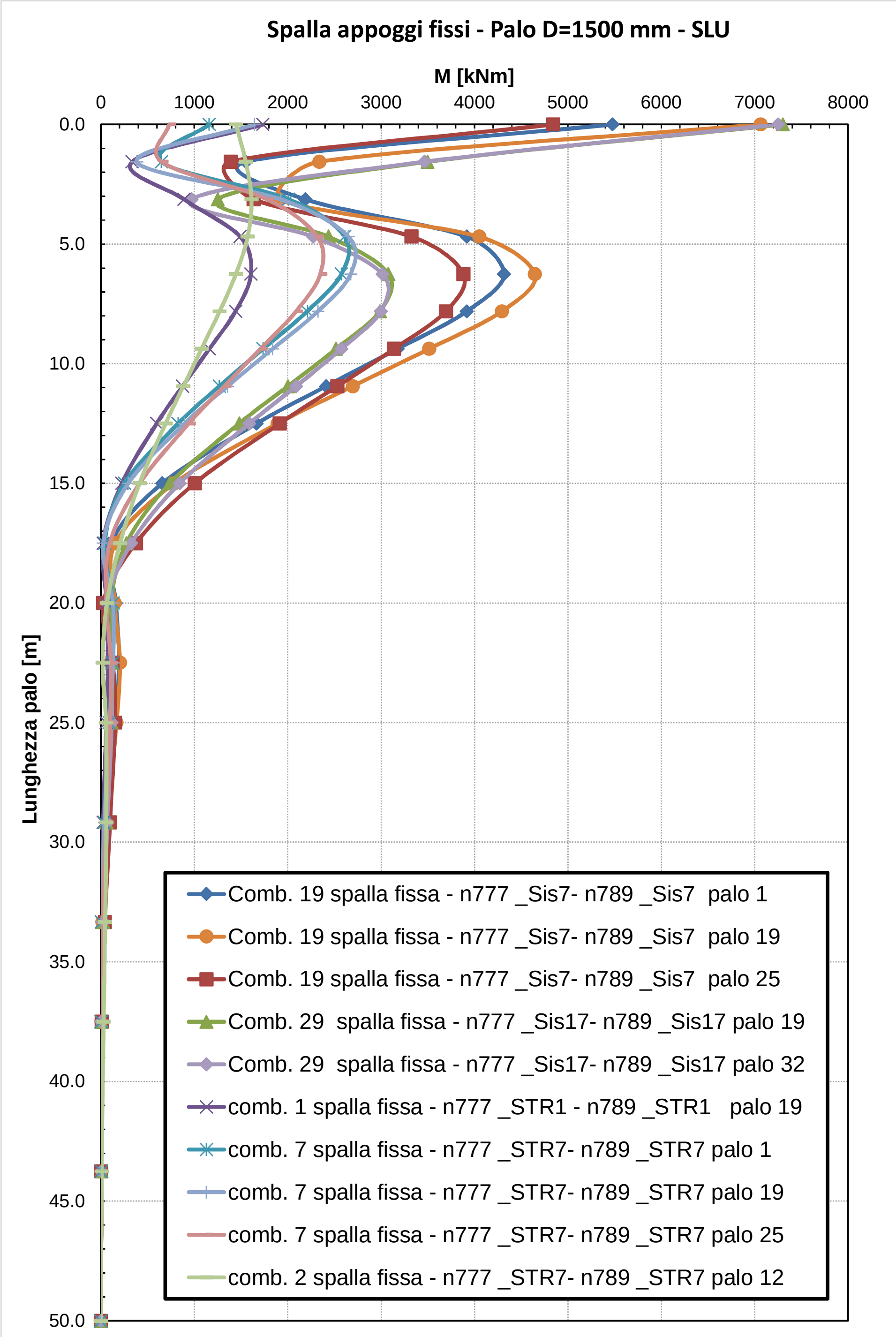



*Figura 34 – Andamento del momento lungo il fusto del palo - SLU*

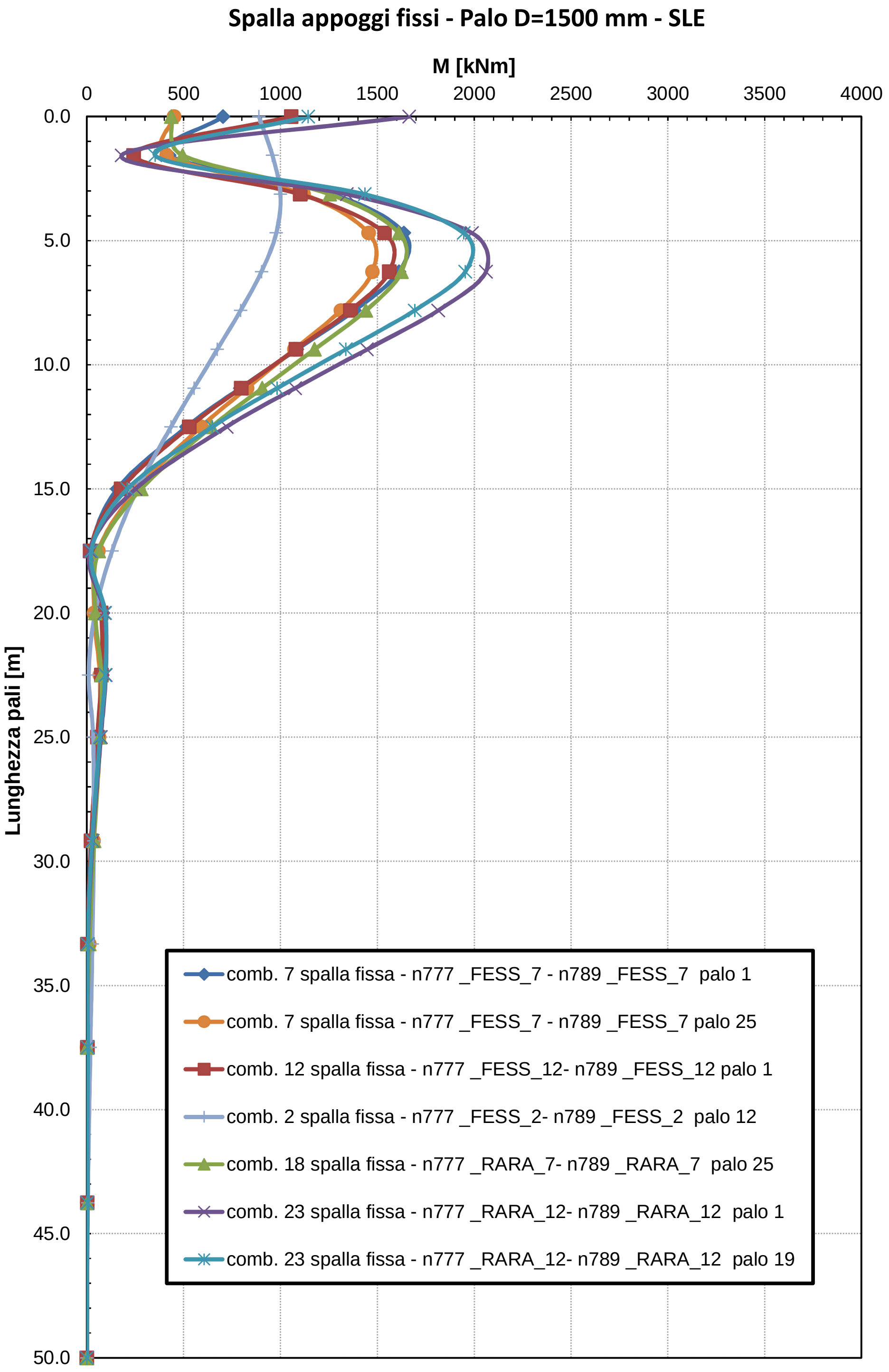



*Figura 35 – Andamento del momento lungo il fusto del palo – SLE*

### 7.3.2 *Spalla appoggi mobili*

Nelle seguenti tabelle si sintetizzano le massime sollecitazioni in testa ai pali, il numero del palo e la condizione di carico per cui si ottengono, per le analisi eseguite: SLE, SLU STR, SLU SISMA. Per l'analisi SLE si riportano anche gli spostamenti massimi del plinto. Nelle figure a seguire si riportano gli andamenti del taglio e del momento lungo il fusto del palo.

Nell'Appendice B si riportano i tabulati di calcolo completi.

Tabella 15 – Spalla appoggi mobili – Analisi SLU STR

```
NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

    36 pali   D = 1500 mm


Sollecitazioni massime in sommita' ai pali

------------------------------------------------
        Fz         M         T     palo   c.d.c.
        kN       kN*m       kN
------------------------------------------------
S.1   5984.5     664.3    1006.4     1       3
S.2   -299.2     123.5     714.3    25       3
S.3   3886.2    1562.8     927.9    19       1
S.4   4959.2    1350.1    1055.8    19      13
T.1   3886.2    1562.8     927.9    19       1
T.2   1011.8    1244.4     117.6     6       4
------------------------------------------------
S.1: cond. di carico con Sforzo Normale Massimo
     spalla mobile - n777 _STRM3 - n789 _STRM3
S.2: cond. di carico con Sforzo Normale Minimo
     spalla mobile - n777 _STRM3 - n789 _STRM3
S.3: cond. di carico con Momento Massimo
     spalla mobile - n777 _STRM1- n789 _STRM1
S.4: cond. di carico con Taglio Massimo
     spalla mobile - n777 _STRM13- n789 _STRM13
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
     spalla mobile - n777 _STRM1- n789 _STRM1
T.2: cond. di carico con Tensione Minima  (sez. interamente reagente)
     spalla mobile - n777 _STRM4- n789 _STRM4
```

Tabella 16 – Spalla appoggi mobili – Analisi SLV SISMA

```
NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

    36 pali   D = 1500 mm


Sollecitazioni massime in sommita' ai pali

------------------------------------------------
        Fz         M         T     palo   c.d.c.
        kN       kN*m       kN
------------------------------------------------
S.1   4862.2    2210.5    1419.4    19      19
S.2  -1267.6    1928.3    1151.6     7      23
S.3   3199.9    4097.7    1511.4    19      41
S.4   3930.4    3771.8    1699.2    19      21
T.1   3265.3    4089.0    1513.3    19      37
T.2   2370.9    3955.0    1429.8    32      41
------------------------------------------------
S.1: cond. di carico con Sforzo Normale Massimo
     spalla mobile - n777 _SisM3- n789 _SisM3
S.2: cond. di carico con Sforzo Normale Minimo
     spalla mobile - n777 _SisM7- n789 _SisM7
S.3: cond. di carico con Momento Massimo
     spalla mobile - n777 _SisM29 - n789 _SisM29
S.4: cond. di carico con Taglio Massimo
     spalla mobile - n777 _SisM5- n789 _SisM5
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
     spalla mobile - n777 _SisM25- n789 _SisM25
T.2: cond. di carico con Tensione Minima  (sez. interamente reagente)
     spalla mobile - n777 _SisM29 - n789 _SisM29
```

Tabella 17 – Spalla appoggi mobili – Analisi SLE FESS

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

36 pali   D = 1500 mm

Sollecitazioni massime in sommita' ai pali

| | Fz kN | M kN*m | T kN | palo | c.d.c. |
|---|---|---|---|---|---|
| S.1 | 3930.4 | 514.2 | 667.8 | 1 | 3 |
| S.2 | -119.5 | 258.6 | 510.8 | 25 | 13 |
| S.3 | 2823.6 | 799.2 | 60.7 | 9 | 4 |
| S.4 | 3861.7 | 730.0 | 731.9 | 19 | 13 |
| T.1 | 3861.7 | 730.0 | 731.9 | 19 | 13 |
| T.2 | 773.3 | 750.7 | 81.9 | 6 | 4 |

S.1: cond. di carico con Sforzo Normale Massimo
spalla mobile - n777 _FESSM_3- n789 _FESSM_3
S.2: cond. di carico con Sforzo Normale Minimo
spalla mobile - n777 _FESSM_13- n789 _FESSM_13
S.3: cond. di carico con Momento Massimo
spalla mobile - n777 _FESSM_4- n789 _FESSM_4
S.4: cond. di carico con Taglio Massimo
spalla mobile - n777 _FESSM_13- n789 _FESSM_13
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
spalla mobile - n777 _FESSM_13- n789 _FESSM_13
T.2: cond. di carico con Tensione Minima (sez. interamente reagente)
spalla mobile - n777 _FESSM_4- n789 _FESSM_4

Deformazioni massime del plinto

| | dz mm | dx mm | rx mRad | dy mm | ry mRad | c.d.c. |
|---|---|---|---|---|---|---|
| D.1 | 9.649 | 10.753 | 1.656 | .228 | .008 | 3 |
| D.2 | 9.435 | 11.119 | 1.659 | .226 | .009 | 13 |
| D.3 | 9.435 | 11.119 | 1.659 | .226 | .009 | 13 |
| D.4 | 9.291 | 10.324 | 1.553 | -.409 | -.025 | 11 |
| D.5 | 9.291 | 8.455 | 1.359 | -.409 | -.025 | 12 |

D.1: cond. di carico con dz massimo
spalla mobile - n777 _FESSM_3- n789 _FESSM_3
D.2: cond. di carico con dx massimo
spalla mobile - n777 _FESSM_13- n789 _FESSM_13
D.3: cond. di carico con rx massimo
spalla mobile - n777 _FESSM_13- n789 _FESSM_13
D.4: cond. di carico con dy massimo
spalla mobile - n777 _FESSM_11- n789 _FESSM_11
D.5: cond. di carico con ry massimo
spalla mobile - n777 _FESSM_12- n789 _FESSM_12

## Tabella 18 – Spalla appoggi mobili – Analisi SLE RARA, FREQ, QP

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

36 pali D = 1500 mm

Sollecitazioni massime in sommita' ai pali

| | Fz kN | M kN*m | T kN | palo | c.d.c. |
|---|---|---|---|---|---|
| S.1 | 4351.6 | 805.0 | 876.0 | 1 | 19 |
| S.2 | -591.6 | 295.4 | 624.4 | 25 | 19 |
| S.3 | 3580.1 | 1138.6 | 847.7 | 1 | 43 |
| S.4 | 4327.0 | 872.3 | 895.6 | 19 | 19 |
| T.1 | 3688.0 | 1132.9 | 868.2 | 19 | 17 |
| T.2 | 781.7 | 910.1 | 97.5 | 12 | 20 |

S.1: cond. di carico con Sforzo Normale Massimo
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3
S.2: cond. di carico con Sforzo Normale Minimo
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3
S.3: cond. di carico con Momento Massimo
spalla mobile - n777 _FREQM_13- n789 _FREQM_13
S.4: cond. di carico con Taglio Massimo
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3
T.1: cond. di carico con Tensione Massima (sez. interamente reagente)
spalla mobile - n777 _RARAM_1- n789 _RARAM_1
T.2: cond. di carico con Tensione Minima (sez. interamente reagente)
spalla mobile - n777 _RARAM_4- n789 _RARAM_4

Deformazioni massime del plinto

| | dz mm | dx mm | rx mRad | dy mm | ry mRad | c.d.c. |
|---|---|---|---|---|---|---|
| D.1 | 9.400 | 13.673 | 2.049 | .251 | .007 | 19 |
| D.2 | 9.400 | 13.673 | 2.049 | .251 | .007 | 19 |
| D.3 | 9.400 | 13.673 | 2.049 | .251 | .007 | 19 |
| D.4 | 8.605 | 12.720 | 1.820 | .425 | .027 | 24 |
| D.5 | 8.605 | 12.720 | 1.820 | -.425 | -.027 | 26 |

D.1: cond. di carico con dz massimo
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3
D.2: cond. di carico con dx massimo
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3
D.3: cond. di carico con rx massimo
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3
D.4: cond. di carico con dy massimo
spalla mobile - n777 _RARAM_9- n789 _RARAM_9
D.5: cond. di carico con ry massimo
spalla mobile - n777 _RARAM_11- n789 _RARAM_11

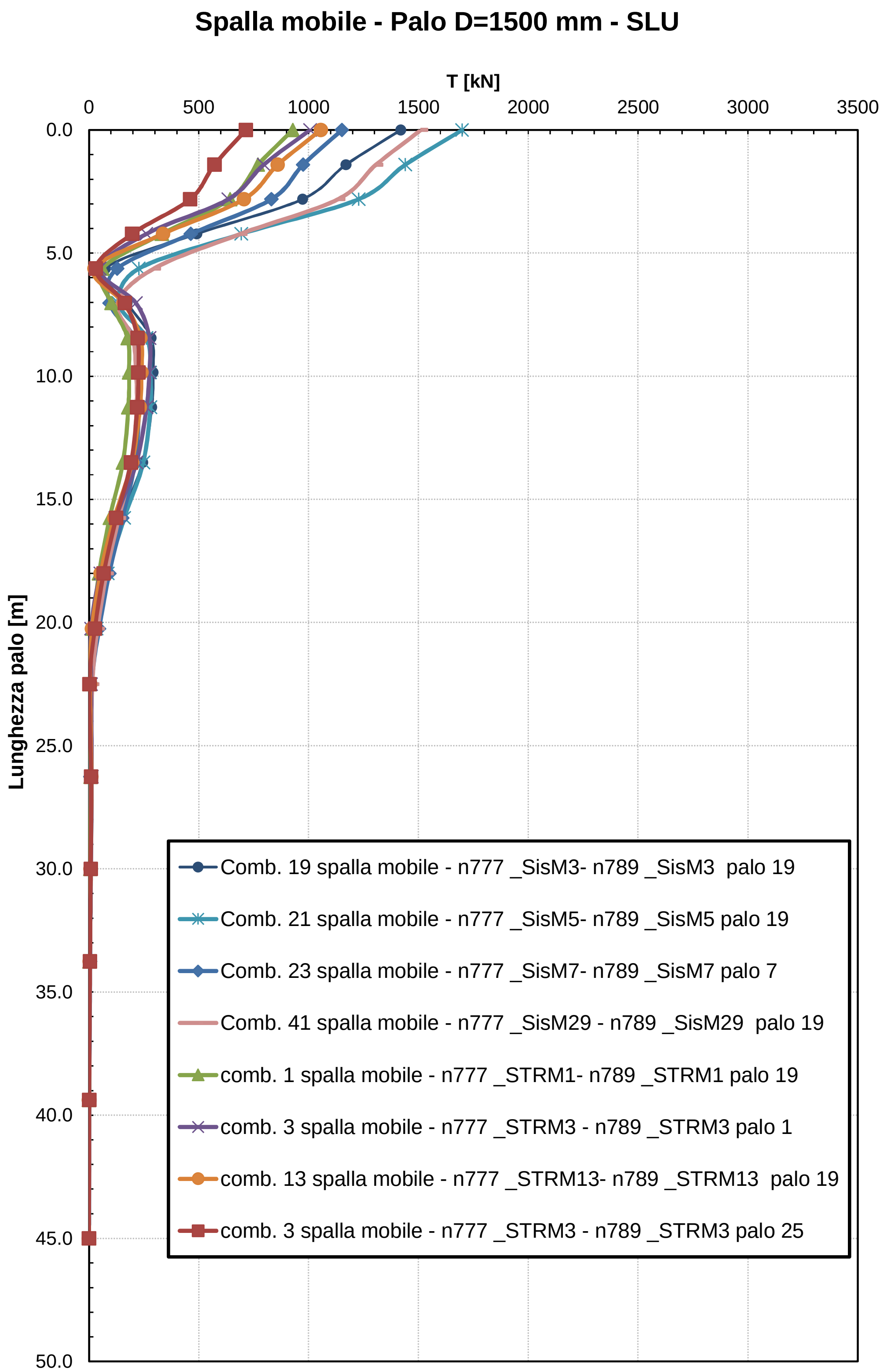



*Figura 36 – Andamento del taglio lungo il fusto del palo - SLU*

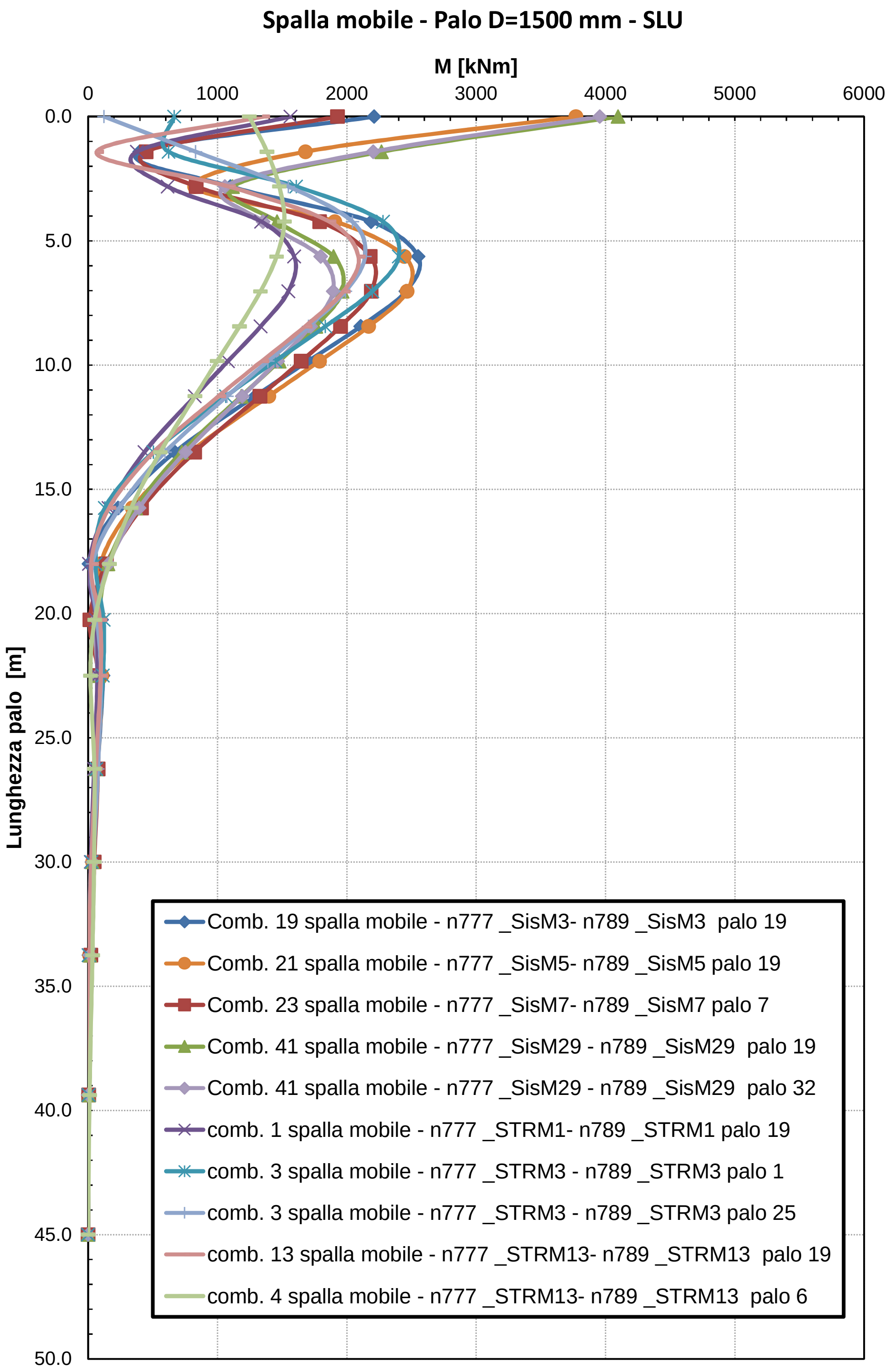



*Figura 37 – Andamento del momento lungo il fusto del palo - SLU*

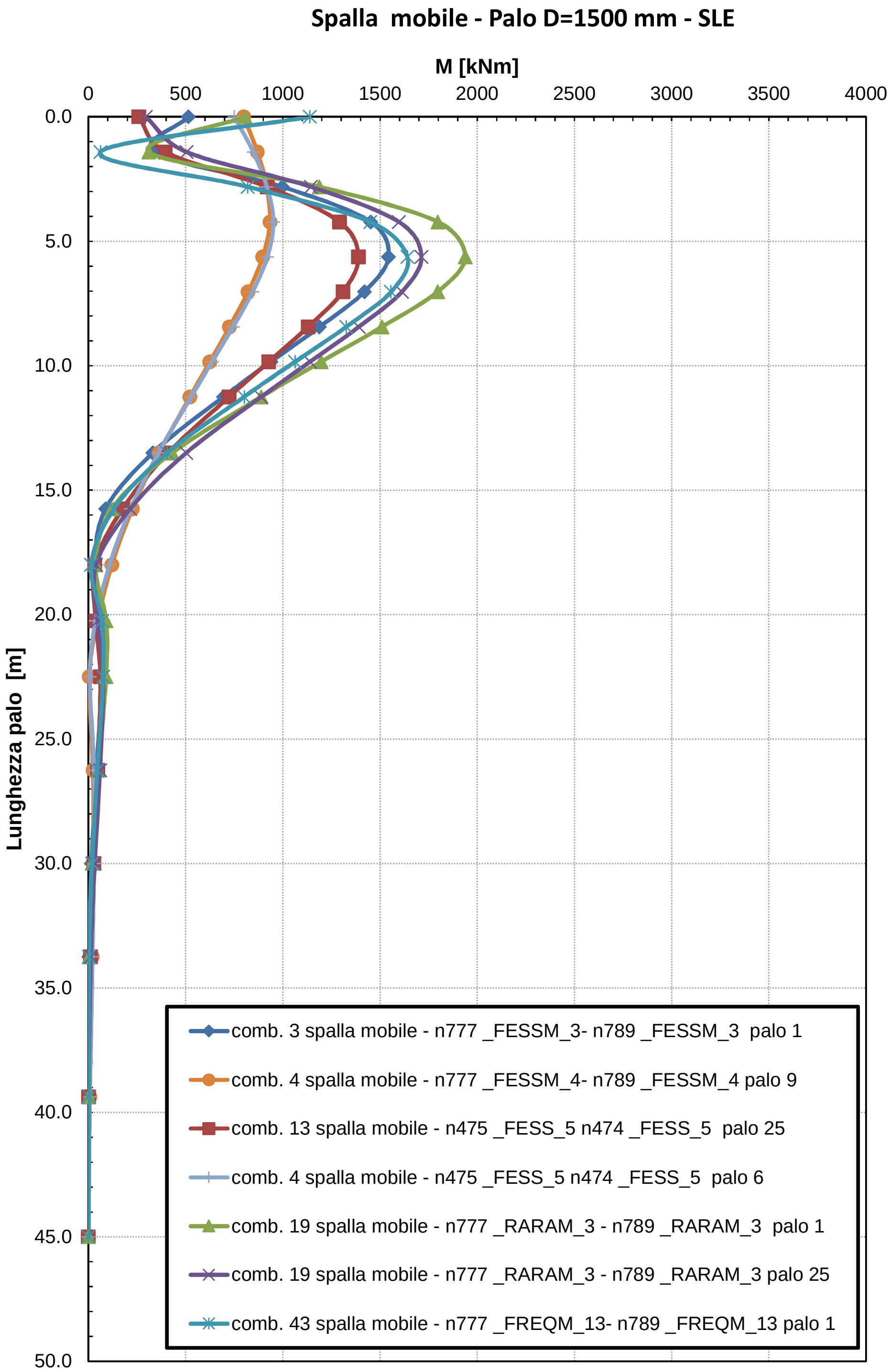



*Figura 38 – Andamento del momento lungo il fusto del palo – SLE*

### 7.4 Verifiche di capacità portante pali ai carichi verticali

Le verifiche di capacità portante dei pali sono condotte in accordo alla normativa vigente con Approccio 2 (A1+M1+R3). Nelle seguenti tabelle si sintetizzano le massime sollecitazioni derivanti dal calcolo per le analisi eseguite statiche e sismiche SLU, le lunghezze dei pali e le relative resistenze di progetto a compressione (Rd,c) ed a trazione (Rd,t) per i vari meccanismi di portanza in gruppo analizzati (come specificato al paragrafo 6.2.3). Le verifiche di portanza dei pali sono soddisfatte in quanto la resistenza di progetto (Rd) è sempre maggiore della massima sollecitazione assiale (Nmax) sia a compressione, che a trazione.

Tabella 19 – Verifiche di capacità portante pali spalla definitiva (A1+M1+R3) – appoggi fissi

| **Spalla appoggi fissi** | **Condizione di carico** | **Nmax,c [kN]** | **Rd,c [kN]** | **Nmax,t [kN]** | **Rd,t [kN]** | **Lpalo [m]** |
|---|---|---|---|---|---|---|
| Nmax blocco di fondazione | Cdc2-STR2 | 102336 | 182598 = (91299·2) | - | - | **47.0** |
| Nmax gruppo di 6 pali maggiormente caricati: ($N_1+N_2+N_8+N_9+N_{14}+N_{15}$) | Cdc7-STR7 | 30024 | 33792 | - | - | **47.0** |
| Nmax gruppo di 3 pali maggiormente caricati: ($N_1+N_8+N_{14}$) | Cdc7-STR7 | 16683 | 22471 | - | - | **47.0** |
| Nmax,t – singolo palo di spigolo | Cdc19-SIS7 | - | - | 3255 | 7538 | **47.0** |

Dove:
Nmax,c = sollecitazione assiale massima a compressione
Nmax,t = sollecitazione assiale massima a trazione
Rd,c = resistenza di progetto a compressione
Rd,t = resistenza di progetto a trazione

Tabella 20 – Verifiche di capacità portante pali spalla definitiva (A1+M1+R3) – appoggi mobili

| **Spalla appoggi mobili** | **Condizione di carico** | **Nmax,c [kN]** | **Rd,c [kN]** | **Nmax,t [kN]** | **Rd,t [kN]** | **Lpalo [m]** |
|---|---|---|---|---|---|---|
| Nmax blocco di fondazione | Cdc3-STR3 | 102335 | 165042= (82521·2) | - | - | **43.0** |
| Nmax gruppo di 6 pali maggiormente caricati:($N_1+N_2+N_8+N_9+N_{14}+N_{15}$) | Cdc3-STR3 | 29687 | 30499 | - | - | **43.0** |
| Nmax gruppo di 3 pali maggiormente caricati: ($N_1+N_8+N_{14}$) | Cdc3-STR3 | 16405 | 20215 | - | - | **43.0** |
| Nmax,t – singolo palo di spigolo | Cdc23-SIS7 | - | - | 1268 | 6657 | **43.0** |

Dove:
Nmax,c = sollecitazione assiale massima a compressione
Nmax,t = sollecitazione assiale massima a trazione
Rd,c = resistenza di progetto a compressione
Rd,t = resistenza di progetto a trazione

La lunghezza palo di progetto soddisfa anche le verifiche di capacità portante relativamente alla configurazione di palificata della spalla di varo impalcato (Figura 3) in quanto la resistenza di progetto (Rd) è sempre maggiore della massima sollecitazione assiale (Nmax) sia a compressione, che a trazione, come si evince dalla seguente tabella.

Tabella 21 – Verifiche di capacità portante pali spalla fase di varo (A1+M1+R3)

| **Spalla** | **Nmax,c (*) [kN]** | **Rd,c [kN]** | **Nmax,t (*) [kN]** | **Rd,t [kN]** | **Lpalo [m]** |
|---|---|---|---|---|---|
| Appoggi fissi | 5788 | 8777 | 359 | 7538 | **47.0** |
| Appoggi mobili | 5788 | 7884 | 359 | 6657 | **43.0** |

Dove:
Nmax,c = sollecitazione assiale massima a compressione
Nmax,t = sollecitazione assiale massima a trazione
Rd,c = resistenza di progetto a compressione
Rd,t = resistenza di progetto a trazione
(*) azioni derivanti dal calcolo della spalla provvisoria di varo riportate nel documento

### 7.5 Verifiche strutturali dei pali

Le verifiche strutturali dei pali sono riportate nella relazione di calcolo dell'opera. Si rammenta comunque che alcuni pali definitivi della spalla saranno utilizzati anche per la fondazione della spalla provvisoria di varo impalcato e quindi le armature dovranno soddisfare le verifiche strutturali anche per le sollecitazioni relative alla fase di varo. Nella Figura 3 è mostrata la configurazione dei pali di fondazione per la spalla di varo provvisoria. I dimensionamenti della fondazione provvisoria di varo sono riportati in apposita relazione di calcolo, a cui si rimanda.

### 7.6 Verifica dei requisiti prestazionali della fondazione

La verifica dei requisiti prestazionali della fondazione è stata condotta analizzando le fondazioni con effetto gruppo verticale (rigidezza assiale abbattuta secondo quanto indicato al paragrafo 7.1.1.1 ed orizzontale (valutato secondo quanto indicato al paragrafo 0) considerando le condizioni di carico allo SLE. Nella Tabella 13, Tabella 14 sono riportati i valori di spostamento del plinto a quota testa pali per le condizioni di carico SLE, per la spalla con appoggi fissi. Nella Tabella 17, Tabella 18 sono riportati i valori di spostamento del plinto a quota testa pali per le condizioni di carico SLE, per la spalla con appoggi fissi.

Si stima uno spostamento verticale massimo allo SLE di 11.9 mm (spalla appoggi fissi). Lo spostamento orizzontale massimo agli appoggi si stima pari a: $14.4 + (2.05 \cdot 6) = 26.7$ mm (dove 6 m è la distanza da quota appoggi a intradosso plinto) per la combinazione di carico RARA.

Si tratta di spostamenti compatibili con le prestazioni della struttura.

# 8 APPENDICE A. VALUTAZIONE CAPACITA' PORTANTE PALI. TABULATI DI CALCOLO PAL

## 8.1 Portata di porgetto (A1+M1+R3) - Singolo blocco di fondazione (18 pali) - compressione

```
                  ***   P A L   ***
              Programma per l'analisi della capacita' portante
                    assiale di un palo di fondazione

              (C)  G.Guiducci - Studio SINTESI (RN - Italy)
                             ottobre 2006


                                                     pag./  2


NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3



Quota testa palo da p.c.                =   1.50 m
Quota falda da p.c.                     =   5.00 m
Peso di volume del palo                 =   8.10 kN/m3
Fattore di sicurezza portata laterale   =   1.84   (FS,l)
Fattore di sicurezza portata di base    =   2.16   (FS,b)



Elemento con sezione avente:
                Area =31.78800 m2     Perimetro =33.70000 m



Criterio per la determinazione della portata di base in uno strato "i"
quando la  Qb,i  ad esso attribuibile e' superiore a quella degli
strati adiacenti:


La base del palo deve essere situata almeno:  3.0 * 6.362 = 19.09 m
   entro lo strato se quello sovrastante e' piu' debole


La base del palo deve essere situata almeno:  3.0 * 6.362 = 19.09 m
   sopra lo strato sottostante se esso e' piu' debole


La variazione di Qb viene assunta lineare dal passaggio di strato
```

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 1 "A    "  (Coesivo)  da    .00  a   7.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    60.0  a    70.5  kPa


Strato 2 "B    "  (Incoerente)  da   7.00  a   9.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 35.0 deg

    Qb   variabile lin. da   1340.  a   1340.  kPa


Strato 3 "A    "  (Coesivo)  da   9.00  a  19.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    73.5  a    88.5  kPa
```

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO

```
Strato 4 "B    "  (Incoerente)  da  19.00  a  30.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 36.0 deg

    Qb   variabile lin. da   4000.  a   4000.  kPa


Strato 5 "A    "  (Coesivo)  da  30.00  a  60.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 120.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da   105.0  a   150.0  kPa
```



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

MOLTIPLICATORI per i parametri di calcolo

| strato | Molt. Tau | Molt. Qb | Molt. Cu |
|---|---|---|---|
| 1 "A " | 1.00 | 1.00 | 1.00 |
| 2 "B " | 1.00 | 1.00 | - |
| 3 "A " | 1.00 | 1.00 | 1.00 |
| 4 "B " | 1.00 | 1.00 | - |
| 5 "A " | 1.00 | 1.00 | 1.00 |

NOTA: i moltiplicatori non influenzano le limitazioni
superiori o inferiori dei parametri

Per terreni coesivi:   Criterio   Tau = alfa * Cu

| Cu kPa | alfa - |
|---|---|
| .0 | .90 |
| 25.0 | .90 |
| 25.1 | .80 |
| 50.0 | .80 |
| 51.0 | .60 |
| 75.0 | .60 |
| 75.1 | .40 |
| 300.0 | .40 |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 1.50 | 28.5 | 28.5 | 62.3 | .55 | 15.7 | 589. |
| 2.00 | 38.0 | 38.0 | 63.0 | .55 | 20.9 | 605. |
| 2.50 | 47.5 | 47.5 | 63.8 | .55 | 26.1 | 621. |
| 3.00 | 57.0 | 57.0 | 64.5 | .55 | 31.4 | 638. |
| 3.50 | 66.5 | 66.5 | 65.3 | .55 | 36.6 | 654. |
| 4.00 | 76.0 | 76.0 | 66.0 | .52 | 39.6 | 670. |
| 4.50 | 85.5 | 85.5 | 66.8 | .47 | 40.1 | 686. |
| 5.00 | 95.0 | 95.0 | 67.5 | .43 | 40.5 | 703. |
| 5.50 | 99.5 | 104.5 | 68.3 | .41 | 41.0 | 719. |
| 6.00 | 104.0 | 114.0 | 69.0 | .40 | 41.4 | 735. |
| 6.50 | 108.5 | 123.5 | 69.8 | .39 | 41.9 | 751. |
| 7.00 | 113.0 | 133.0 | 70.5 | .43 | 48.8 | 768. |
| 7.50 | 117.5 | 142.5 | -- | .49 | 57.6 | 784. |
| 8.00 | 122.0 | 152.0 | -- | .49 | 59.8 | 800. |
| 8.50 | 126.5 | 161.5 | -- | .49 | 62.0 | 816. |
| 9.00 | 131.0 | 171.0 | -- | .41 | 54.2 | 833. |
| 9.50 | 135.5 | 180.5 | 74.3 | .33 | 44.6 | 849. |
| 10.00 | 140.0 | 190.0 | 75.0 | .32 | 45.0 | 865. |
| 10.50 | 144.5 | 199.5 | 75.8 | .23 | 33.2 | 881. |
| 11.00 | 149.0 | 209.0 | 76.5 | .23 | 34.3 | 898. |
| 11.50 | 153.5 | 218.5 | 77.3 | .23 | 35.3 | 914. |
| 12.00 | 158.0 | 228.0 | 78.0 | .23 | 36.3 | 930. |
| 12.50 | 162.5 | 237.5 | 78.8 | .23 | 37.4 | 946. |
| 13.00 | 167.0 | 247.0 | 79.5 | .23 | 38.4 | 963. |
| 13.50 | 171.5 | 256.5 | 80.3 | .23 | 39.4 | 979. |
| 14.00 | 176.0 | 266.0 | 81.0 | .23 | 40.5 | 995. |
| 14.50 | 180.5 | 275.5 | 81.8 | .23 | 41.5 | 1011. |
| 15.00 | 185.0 | 285.0 | 82.5 | .23 | 42.5 | 1028. |
| 15.50 | 189.5 | 294.5 | 83.3 | .23 | 43.6 | 1044. |
| 16.00 | 194.0 | 304.0 | 84.0 | .23 | 44.6 | 1060. |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 16.50 | 198.5 | 313.5 | 84.8 | .23 | 45.7 | 1076. |
| 17.00 | 203.0 | 323.0 | 85.5 | .23 | 46.7 | 1093. |
| 17.50 | 207.5 | 332.5 | 86.3 | .23 | 47.7 | 1109. |
| 18.00 | 212.0 | 342.0 | 87.0 | .23 | 48.8 | 1125. |
| 18.50 | 216.5 | 351.5 | 87.8 | .23 | 49.8 | 1141. |
| 19.00 | 221.0 | 361.0 | 88.5 | .37 | 81.6 | 1158. |
| 19.50 | 225.5 | 370.5 | -- | .51 | 114.7 | 1232. |
| 20.00 | 230.0 | 380.0 | -- | .51 | 117.0 | 1307. |
| 20.50 | 234.5 | 389.5 | -- | .51 | 119.3 | 1382. |
| 21.00 | 239.0 | 399.0 | -- | .51 | 121.6 | 1457. |
| 21.50 | 243.5 | 408.5 | -- | .51 | 123.8 | 1532. |
| 22.00 | 248.0 | 418.0 | -- | .51 | 126.1 | 1606. |
| 22.50 | 252.5 | 427.5 | -- | .51 | 128.4 | 1681. |
| 23.00 | 257.0 | 437.0 | -- | .51 | 130.7 | 1756. |
| 23.50 | 261.5 | 446.5 | -- | .51 | 133.0 | 1831. |
| 24.00 | 266.0 | 456.0 | -- | .51 | 135.3 | 1906. |
| 24.50 | 270.5 | 465.5 | -- | .51 | 137.6 | 1980. |
| 25.00 | 275.0 | 475.0 | -- | .51 | 139.9 | 2055. |
| 25.50 | 279.5 | 484.5 | -- | .51 | 142.1 | 2130. |
| 26.00 | 284.0 | 494.0 | -- | .51 | 144.4 | 2062. |
| 26.50 | 288.5 | 503.5 | -- | .51 | 146.7 | 1993. |
| 27.00 | 293.0 | 513.0 | -- | .51 | 149.0 | 1925. |
| 27.50 | 297.5 | 522.5 | -- | .50 | 150.0 | 1857. |
| 28.00 | 302.0 | 532.0 | -- | .50 | 150.0 | 1788. |
| 28.50 | 306.5 | 541.5 | -- | .49 | 150.0 | 1720. |
| 29.00 | 311.0 | 551.0 | -- | .48 | 150.0 | 1652. |
| 29.50 | 315.5 | 560.5 | -- | .48 | 150.0 | 1583. |
| 30.00 | 320.0 | 570.0 | -- | .35 | 111.8 | 1515. |
| 30.50 | 324.5 | 579.5 | 105.8 | .23 | 74.6 | 1531. |
| 31.00 | 329.0 | 589.0 | 106.5 | .23 | 75.7 | 1548. |



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 31.50 | 333.5 | 598.5 | 107.3 | .23 | 76.7 | 1564. |
| 32.00 | 338.0 | 608.0 | 108.0 | .23 | 77.7 | 1580. |
| 32.50 | 342.5 | 617.5 | 108.8 | .23 | 78.8 | 1596. |
| 33.00 | 347.0 | 627.0 | 109.5 | .23 | 79.8 | 1613. |
| 33.50 | 351.5 | 636.5 | 110.3 | .23 | 80.8 | 1629. |
| 34.00 | 356.0 | 646.0 | 111.0 | .23 | 81.9 | 1645. |
| 34.50 | 360.5 | 655.5 | 111.8 | .23 | 82.9 | 1661. |
| 35.00 | 365.0 | 665.0 | 112.5 | .23 | 84.0 | 1678. |
| 35.50 | 369.5 | 674.5 | 113.3 | .23 | 85.0 | 1694. |
| 36.00 | 374.0 | 684.0 | 114.0 | .23 | 86.0 | 1710. |
| 36.50 | 378.5 | 693.5 | 114.8 | .23 | 87.1 | 1726. |
| 37.00 | 383.0 | 703.0 | 115.5 | .23 | 88.1 | 1743. |
| 37.50 | 387.5 | 712.5 | 116.3 | .23 | 89.1 | 1759. |
| 38.00 | 392.0 | 722.0 | 117.0 | .23 | 90.2 | 1775. |
| 38.50 | 396.5 | 731.5 | 117.8 | .23 | 91.2 | 1791. |
| 39.00 | 401.0 | 741.0 | 118.5 | .23 | 92.2 | 1808. |
| 39.50 | 405.5 | 750.5 | 119.3 | .23 | 93.3 | 1824. |
| 40.00 | 410.0 | 760.0 | 120.0 | .23 | 94.3 | 1840. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 40.50 | 414.5 | 769.5 | 120.8 | .23 | 95.3 | 1856. |
| 41.00 | 419.0 | 779.0 | 121.5 | .23 | 96.4 | 1873. |
| 41.50 | 423.5 | 788.5 | 122.3 | .23 | 97.4 | 1889. |
| 42.00 | 428.0 | 798.0 | 123.0 | .23 | 98.4 | 1905. |
| 42.50 | 432.5 | 807.5 | 123.8 | .23 | 99.5 | 1921. |
| 43.00 | 437.0 | 817.0 | 124.5 | .23 | 100.5 | 1938. |
| 43.50 | 441.5 | 826.5 | 125.3 | .23 | 101.5 | 1954. |
| 44.00 | 446.0 | 836.0 | 126.0 | .23 | 102.6 | 1970. |
| 44.50 | 450.5 | 845.5 | 126.8 | .23 | 103.6 | 1986. |
| 45.00 | 455.0 | 855.0 | 127.5 | .23 | 104.7 | 2003. |
| 45.50 | 459.5 | 864.5 | 128.3 | .23 | 105.7 | 2019. |
| 46.00 | 464.0 | 874.0 | 129.0 | .23 | 106.7 | 2035. |

pag./ 9

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 46.50 | 468.5 | 883.5 | 129.8 | .23 | 107.8 | 2051. |
| 47.00 | 473.0 | 893.0 | 130.5 | .23 | 108.8 | 2068. |
| 47.50 | 477.5 | 902.5 | 131.3 | .23 | 109.8 | 2084. |
| 48.00 | 482.0 | 912.0 | 132.0 | .23 | 110.9 | 2100. |
| 48.50 | 486.5 | 921.5 | 132.8 | .23 | 111.9 | 2116. |
| 49.00 | 491.0 | 931.0 | 133.5 | .23 | 112.9 | 2133. |
| 49.50 | 495.5 | 940.5 | 134.3 | .23 | 114.0 | 2149. |
| 50.00 | 500.0 | 950.0 | 135.0 | .23 | 115.0 | 2165. |
| 50.50 | 504.5 | 959.5 | 135.8 | .23 | 116.0 | 2181. |
| 51.00 | 509.0 | 969.0 | 136.5 | .23 | 117.1 | 2198. |
| 51.50 | 513.5 | 978.5 | 137.3 | .23 | 118.1 | 2214. |
| 52.00 | 518.0 | 988.0 | 138.0 | .23 | 119.1 | 2230. |
| 52.50 | 522.5 | 997.5 | 138.8 | .23 | 120.0 | 2246. |
| 53.00 | 527.0 | 1007.0 | 139.5 | .23 | 120.0 | 2263. |
| 53.50 | 531.5 | 1016.5 | 140.3 | .23 | 120.0 | 2279. |
| 54.00 | 536.0 | 1026.0 | 141.0 | .22 | 120.0 | 2295. |
| 54.50 | 540.5 | 1035.5 | 141.8 | .22 | 120.0 | 2311. |
| 55.00 | 545.0 | 1045.0 | 142.5 | .22 | 120.0 | 2328. |
| 55.50 | 549.5 | 1054.5 | 143.3 | .22 | 120.0 | 2344. |
| 56.00 | 554.0 | 1064.0 | 144.0 | .22 | 120.0 | 2360. |
| 56.50 | 558.5 | 1073.5 | 144.8 | .21 | 120.0 | 2376. |
| 57.00 | 563.0 | 1083.0 | 145.5 | .21 | 120.0 | 2393. |
| 57.50 | 567.5 | 1092.5 | 146.3 | .21 | 120.0 | 2409. |
| 58.00 | 572.0 | 1102.0 | 147.0 | .21 | 120.0 | 2425. |
| 58.50 | 576.5 | 1111.5 | 147.8 | .21 | 120.0 | 2441. |
| 59.00 | 581.0 | 1121.0 | 148.5 | .21 | 120.0 | 2458. |
| 59.50 | 585.5 | 1130.5 | 149.3 | .20 | 120.0 | 2474. |
| 60.00 | 590.0 | 1140.0 | 150.0 | .20 | 120.0 | 2490. |

zz = Profondita' da piano campagna
S'v = Tensione verticale efficace
Sv = Tensione verticale totale
Cu = Coesione non drenata
Tau = Tensione di adesione laterale limite
qb = Portata di base limite unitaria

pag./ 10

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante blocco SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

| Lp<br>m | Qll<br>kN | Qbl<br>kN | Wp<br>kN | Qu<br>kN | Qd<br>kN |
|---|---|---|---|---|---|
| .00 | 0. | 18715. | 0. | 18715. | 8664. |
| .50 | 308. | 19232. | 129. | 19411. | 8942. |
| 1.00 | 704. | 19748. | 257. | 20195. | 9268. |
| 1.50 | 1189. | 20265. | 386. | 21067. | 9642. |
| 2.00 | 1761. | 20781. | 515. | 22027. | 10063. |
| 2.50 | 2412. | 21298. | 644. | 23066. | 10527. |
| 3.00 | 3083. | 21815. | 772. | 24125. | 11002. |
| 3.50 | 3762. | 22331. | 901. | 25191. | 11482. |
| 4.00 | 4448. | 22848. | 1030. | 26265. | 11965. |
| 4.50 | 5142. | 23364. | 1159. | 27347. | 12452. |
| 5.00 | 5843. | 23881. | 1287. | 28436. | 12944. |
| 5.50 | 6579. | 24397. | 1416. | 29561. | 13455. |
| 6.00 | 7504. | 24914. | 1545. | 30873. | 14067. |
| 6.50 | 8493. | 25430. | 1674. | 32250. | 14715. |
| 7.00 | 9519. | 25947. | 1802. | 33664. | 15383. |
| 7.50 | 10540. | 26464. | 1931. | 35072. | 16049. |
| 8.00 | 11329. | 26980. | 2060. | 36249. | 16588. |
| 8.50 | 12084. | 27497. | 2189. | 37392. | 17108. |
| 9.00 | 12689. | 28013. | 2317. | 38385. | 17548. |
| 9.50 | 13258. | 28530. | 2446. | 39341. | 17967. |
| 10.00 | 13844. | 29046. | 2575. | 40315. | 18396. |
| 10.50 | 14447. | 29563. | 2704. | 41307. | 18835. |
| 11.00 | 15068. | 30079. | 2832. | 42315. | 19283. |
| 11.50 | 15707. | 30596. | 2961. | 43342. | 19740. |
| 12.00 | 16363. | 31113. | 3090. | 44386. | 20207. |
| 12.50 | 17036. | 31629. | 3219. | 45447. | 20683. |
| 13.00 | 17727. | 32146. | 3347. | 46525. | 21169. |
| 13.50 | 18435. | 32662. | 3476. | 47621. | 21664. |
| 14.00 | 19161. | 33179. | 3605. | 48735. | 22169. |
| 14.50 | 19904. | 33695. | 3734. | 49866. | 22684. |
| 15.00 | 20665. | 34212. | 3862. | 51014. | 23207. |
| 15.50 | 21443. | 34728. | 3991. | 52180. | 23741. |
| 16.00 | 22238. | 35245. | 4120. | 53363. | 24283. |
| 16.50 | 23051. | 35762. | 4248. | 54564. | 24835. |
| 17.00 | 23881. | 36278. | 4377. | 55782. | 25397. |
| 17.50 | 24859. | 36795. | 4506. | 57147. | 26039. |
| 18.00 | 26642. | 39172. | 4635. | 61180. | 27980. |
| 18.50 | 28594. | 41550. | 4763. | 65381. | 30013. |
| 19.00 | 30584. | 43928. | 4892. | 69620. | 32067. |
| 19.50 | 32613. | 46306. | 5021. | 73898. | 34141. |
| 20.00 | 34680. | 48684. | 5150. | 78215. | 36237. |
| 20.50 | 36786. | 51062. | 5278. | 82570. | 38354. |
| 21.00 | 38931. | 53439. | 5407. | 86963. | 40491. |
| 21.50 | 41114. | 55817. | 5536. | 91395. | 42650. |
| 22.00 | 43336. | 58195. | 5665. | 95866. | 44830. |
| 22.50 | 45596. | 60573. | 5793. | 100375. | 47030. |
| 23.00 | 47895. | 62951. | 5922. | 104923. | 49251. |
| 23.50 | 50232. | 65329. | 6051. | 109510. | 51494. |
| 24.00 | 52608. | 67706. | 6180. | 114135. | 53757. |
| 24.50 | 55022. | 65534. | 6308. | 114249. | 53935. |
| 25.00 | 57476. | 63362. | 6437. | 114401. | 54134. |
| 25.50 | 59967. | 61191. | 6566. | 114592. | 54354. |
| 26.00 | 62490. | 59019. | 6695. | 114814. | 54591. |
| 26.50 | 65018. | 56847. | 6823. | 115041. | 54830. |
| 27.00 | 67545. | 54675. | 6952. | 115268. | 55070. |
| 27.50 | 70073. | 52503. | 7081. | 115495. | 55309. |
| 28.00 | 72600. | 50331. | 7210. | 115722. | 55549. |
| 28.50 | 74967. | 48159. | 7338. | 115788. | 55700. |
| 29.00 | 76377. | 48675. | 7467. | 117585. | 56577. |
| 29.50 | 77643. | 49192. | 7596. | 119239. | 57376. |
| 30.00 | 78927. | 49708. | 7724. | 120911. | 58184. |
| 30.50 | 80228. | 50225. | 7853. | 122600. | 59001. |
| 31.00 | 81547. | 50742. | 7982. | 124306. | 59828. |
| 31.50 | 82883. | 51258. | 8111. | 126030. | 60665. |
| 32.00 | 84236. | 51775. | 8239. | 127772. | 61511. |
| 32.50 | 85607. | 52291. | 8368. | 129530. | 62366. |

| | | | | | |
|---|---|---|---|---|---|
| 33.00 | 86996. | 52808. | 8497. | 131307. | 63231. |
| 33.50 | 88402. | 53324. | 8626. | 133100. | 64106. |
| 34.00 | 89825. | 53841. | 8754. | 134911. | 64990. |
| 34.50 | 91266. | 54357. | 8883. | 136740. | 65883. |
| 35.00 | 92724. | 54874. | 9012. | 138586. | 66786. |
| 35.50 | 94199. | 55391. | 9141. | 140449. | 67698. |
| 36.00 | 95692. | 55907. | 9269. | 142330. | 68620. |
| 36.50 | 97203. | 56424. | 9398. | 144228. | 69552. |
| 37.00 | 98731. | 56940. | 9527. | 146144. | 70492. |
| 37.50 | 100276. | 57457. | 9656. | 148077. | 71443. |
| 38.00 | 101839. | 57973. | 9784. | 150028. | 72402. |
| 38.50 | 103419. | 58490. | 9913. | 151996. | 73372. |
| 39.00 | 105017. | 59006. | 10042. | 153981. | 74350. |
| 39.50 | 106632. | 59523. | 10171. | 155984. | 75339. |
| 40.00 | 108264. | 60040. | 10299. | 158005. | 76336. |
| 40.50 | 109914. | 60556. | 10428. | 160043. | 77343. |
| 41.00 | 111582. | 61073. | 10557. | 162098. | 78360. |
| 41.50 | 113267. | 61589. | 10686. | 164170. | 79386. |
| 42.00 | 114969. | 62106. | 10814. | 166261. | 80422. |
| 42.50 | 116689. | 62622. | 10943. | 168368. | 81467. |
| 43.00 | 118426. | 63139. | 11072. | 170493. | 82521. |
| 43.50 | 120181. | 63655. | 11201. | 172636. | 83585. |
| 44.00 | 121953. | 64172. | 11329. | 174796. | 84659. |
| 44.50 | 123742. | 64689. | 11458. | 176973. | 85742. |
| 45.00 | 125549. | 65205. | 11587. | 179168. | 86834. |
| 45.50 | 127374. | 65722. | 11715. | 181380. | 87936. |
| 46.00 | 129215. | 66238. | 11844. | 183609. | 89047. |
| 46.50 | 131075. | 66755. | 11973. | 185857. | 90168. |
| 47.00 | 132951. | 67271. | 12102. | 188121. | 91299. |
| 47.50 | 134846. | 67788. | 12230. | 190403. | 92438. |
| 48.00 | 136757. | 68304. | 12359. | 192702. | 93588. |
| 48.50 | 138686. | 68821. | 12488. | 195019. | 94747. |
| 49.00 | 140633. | 69338. | 12617. | 197354. | 95915. |
| 49.50 | 142597. | 69854. | 12745. | 199705. | 97093. |
| 50.00 | 144578. | 70371. | 12874. | 202074. | 98280. |
| 50.50 | 146577. | 70887. | 13003. | 204461. | 99477. |
| 51.00 | 148592. | 71404. | 13132. | 206864. | 100682. |
| 51.50 | 150614. | 71920. | 13260. | 209274. | 101892. |
| 52.00 | 152636. | 72437. | 13389. | 211684. | 103101. |
| 52.50 | 154658. | 72953. | 13518. | 214094. | 104310. |
| 53.00 | 156680. | 73470. | 13647. | 216504. | 105520. |
| 53.50 | 158702. | 73987. | 13775. | 218913. | 106729. |
| 54.00 | 160724. | 74503. | 13904. | 221323. | 107938. |
| 54.50 | 162746. | 75020. | 14033. | 223733. | 109148. |
| 55.00 | 164768. | 75536. | 14162. | 226143. | 110357. |
| 55.50 | 166790. | 76053. | 14290. | 228553. | 111566. |
| 56.00 | 168812. | 76569. | 14419. | 230963. | 112775. |
| 56.50 | 170834. | 77086. | 14548. | 233372. | 113985. |
| 57.00 | 172856. | 77602. | 14677. | 235782. | 115194. |
| 57.50 | 174878. | 78119. | 14805. | 238192. | 116403. |
| 58.00 | 176900. | 78636. | 14934. | 240602. | 117613. |
| 58.50 | 178922. | 79152. | 15063. | 243012. | 118822. |

```
Lp  = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp  = Peso efficace del palo
Qu  = Portata totale limite
Qd  = Portata di progetto  =  Qll/FS,l + Qbl/FS,b - Wp
```

## 8.2 Portata di porgetto (A1+M1+R3) - Gruppo 6 pali - compressione

```
                  ***   P A L   ***
              Programma per l'analisi della capacita' portante
                    assiale di un palo di fondazione

              (C)  G.Guiducci - Studio SINTESI (RN - Italy)
                             ottobre 2006


                                                            pag./  2


 NODO BOLOGNA CAVALCAVIA CV01 eCV02
 Capacita portante blocco 6pali SLU A1+M1+R3



 Quota testa palo da p.c.                =   1.50 m
 Quota falda da p.c.                     =   5.00 m
 Peso di volume del palo                 =   8.10 kN/m3
 Fattore di sicurezza portata laterale   =   1.84   (FS,l)
 Fattore di sicurezza portata di base    =   2.16   (FS,b)



 Elemento con sezione avente:
                 Area =10.59600 m2     Perimetro =12.80000 m



 Criterio per la determinazione della portata di base in uno strato "i"
 quando la  Qb,i  ad esso attribuibile e' superiore a quella degli
 strati adiacenti:


 La base del palo deve essere situata almeno:  3.0 * 3.673 = 11.02 m
    entro lo strato se quello sovrastante e' piu' debole


 La base del palo deve essere situata almeno:  3.0 * 3.673 = 11.02 m
    sopra lo strato sottostante se esso e' piu' debole


 La variazione di Qb viene assunta lineare dal passaggio di strato
```

```
NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 1 "A    "  (Coesivo)  da    .00  a   7.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    60.0  a    70.5  kPa


Strato 2 "B    "  (Incoerente)  da   7.00  a   9.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 35.0 deg

    Qb   variabile lin. da   1340.  a   1340.  kPa


Strato 3 "A    "  (Coesivo)  da   9.00  a  19.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    73.5  a    88.5  kPa
```

NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO

```
Strato 4 "B    "  (Incoerente)  da  19.00  a  30.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 36.0 deg

    Qb   variabile lin. da   4000.  a   4000.  kPa


Strato 5 "A    "  (Coesivo)  da  30.00  a  60.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 120.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da   105.0  a   150.0  kPa
```



NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

MOLTIPLICATORI per i parametri di calcolo

| strato | Molt. Tau | Molt. Qb | Molt. Cu |
|---|---|---|---|
| 1 "A " | 1.00 | 1.00 | 1.00 |
| 2 "B " | 1.00 | 1.00 | - |
| 3 "A " | 1.00 | 1.00 | 1.00 |
| 4 "B " | 1.00 | 1.00 | - |
| 5 "A " | 1.00 | 1.00 | 1.00 |

NOTA: i moltiplicatori non influenzano le limitazioni
superiori o inferiori dei parametri

Per terreni coesivi: Criterio Tau = alfa * Cu

| Cu<br>kPa | alfa<br>- |
|---|---|
| .0 | .90 |
| 25.0 | .90 |
| 25.1 | .80 |
| 50.0 | .80 |
| 51.0 | .60 |
| 75.0 | .60 |
| 75.1 | .40 |
| 300.0 | .40 |

NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 1.50 | 28.5 | 28.5 | 62.3 | .55 | 15.7 | 589. |
| 2.00 | 38.0 | 38.0 | 63.0 | .55 | 20.9 | 605. |
| 2.50 | 47.5 | 47.5 | 63.8 | .55 | 26.1 | 621. |
| 3.00 | 57.0 | 57.0 | 64.5 | .55 | 31.4 | 638. |
| 3.50 | 66.5 | 66.5 | 65.3 | .55 | 36.6 | 654. |
| 4.00 | 76.0 | 76.0 | 66.0 | .52 | 39.6 | 670. |
| 4.50 | 85.5 | 85.5 | 66.8 | .47 | 40.1 | 686. |
| 5.00 | 95.0 | 95.0 | 67.5 | .43 | 40.5 | 703. |
| 5.50 | 99.5 | 104.5 | 68.3 | .41 | 41.0 | 719. |
| 6.00 | 104.0 | 114.0 | 69.0 | .40 | 41.4 | 735. |
| 6.50 | 108.5 | 123.5 | 69.8 | .39 | 41.9 | 751. |
| 7.00 | 113.0 | 133.0 | 70.5 | .43 | 48.8 | 768. |
| 7.50 | 117.5 | 142.5 | -- | .49 | 57.6 | 794. |
| 8.00 | 122.0 | 152.0 | -- | .49 | 59.8 | 820. |
| 8.50 | 126.5 | 161.5 | -- | .49 | 62.0 | 846. |
| 9.00 | 131.0 | 171.0 | -- | .41 | 54.2 | 833. |
| 9.50 | 135.5 | 180.5 | 74.3 | .33 | 44.6 | 849. |
| 10.00 | 140.0 | 190.0 | 75.0 | .32 | 45.0 | 865. |
| 10.50 | 144.5 | 199.5 | 75.8 | .23 | 33.2 | 881. |
| 11.00 | 149.0 | 209.0 | 76.5 | .23 | 34.3 | 898. |
| 11.50 | 153.5 | 218.5 | 77.3 | .23 | 35.3 | 914. |
| 12.00 | 158.0 | 228.0 | 78.0 | .23 | 36.3 | 930. |
| 12.50 | 162.5 | 237.5 | 78.8 | .23 | 37.4 | 946. |
| 13.00 | 167.0 | 247.0 | 79.5 | .23 | 38.4 | 963. |
| 13.50 | 171.5 | 256.5 | 80.3 | .23 | 39.4 | 979. |
| 14.00 | 176.0 | 266.0 | 81.0 | .23 | 40.5 | 995. |
| 14.50 | 180.5 | 275.5 | 81.8 | .23 | 41.5 | 1011. |
| 15.00 | 185.0 | 285.0 | 82.5 | .23 | 42.5 | 1028. |
| 15.50 | 189.5 | 294.5 | 83.3 | .23 | 43.6 | 1044. |
| 16.00 | 194.0 | 304.0 | 84.0 | .23 | 44.6 | 1060. |

NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 16.50 | 198.5 | 313.5 | 84.8 | .23 | 45.7 | 1076. |
| 17.00 | 203.0 | 323.0 | 85.5 | .23 | 46.7 | 1093. |
| 17.50 | 207.5 | 332.5 | 86.3 | .23 | 47.7 | 1109. |
| 18.00 | 212.0 | 342.0 | 87.0 | .23 | 48.8 | 1125. |
| 18.50 | 216.5 | 351.5 | 87.8 | .23 | 49.8 | 1141. |
| 19.00 | 221.0 | 361.0 | 88.5 | .37 | 81.6 | 1158. |
| 19.50 | 225.5 | 370.5 | -- | .51 | 114.7 | 1287. |
| 20.00 | 230.0 | 380.0 | -- | .51 | 117.0 | 1416. |
| 20.50 | 234.5 | 389.5 | -- | .51 | 119.3 | 1545. |
| 21.00 | 239.0 | 399.0 | -- | .51 | 121.6 | 1674. |
| 21.50 | 243.5 | 408.5 | -- | .51 | 123.8 | 1804. |
| 22.00 | 248.0 | 418.0 | -- | .51 | 126.1 | 1933. |
| 22.50 | 252.5 | 427.5 | -- | .51 | 128.4 | 2062. |
| 23.00 | 257.0 | 437.0 | -- | .51 | 130.7 | 2191. |
| 23.50 | 261.5 | 446.5 | -- | .51 | 133.0 | 2320. |
| 24.00 | 266.0 | 456.0 | -- | .51 | 135.3 | 2450. |
| 24.50 | 270.5 | 465.5 | -- | .51 | 137.6 | 2579. |
| 25.00 | 275.0 | 475.0 | -- | .51 | 139.9 | 2590. |
| 25.50 | 279.5 | 484.5 | -- | .51 | 142.1 | 2482. |
| 26.00 | 284.0 | 494.0 | -- | .51 | 144.4 | 2375. |
| 26.50 | 288.5 | 503.5 | -- | .51 | 146.7 | 2267. |
| 27.00 | 293.0 | 513.0 | -- | .51 | 149.0 | 2160. |
| 27.50 | 297.5 | 522.5 | -- | .50 | 150.0 | 2052. |
| 28.00 | 302.0 | 532.0 | -- | .50 | 150.0 | 1945. |
| 28.50 | 306.5 | 541.5 | -- | .49 | 150.0 | 1837. |
| 29.00 | 311.0 | 551.0 | -- | .48 | 150.0 | 1730. |
| 29.50 | 315.5 | 560.5 | -- | .48 | 150.0 | 1622. |
| 30.00 | 320.0 | 570.0 | -- | .35 | 111.8 | 1515. |
| 30.50 | 324.5 | 579.5 | 105.8 | .23 | 74.6 | 1531. |
| 31.00 | 329.0 | 589.0 | 106.5 | .23 | 75.7 | 1548. |



NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 31.50 | 333.5 | 598.5 | 107.3 | .23 | 76.7 | 1564. |
| 32.00 | 338.0 | 608.0 | 108.0 | .23 | 77.7 | 1580. |
| 32.50 | 342.5 | 617.5 | 108.8 | .23 | 78.8 | 1596. |
| 33.00 | 347.0 | 627.0 | 109.5 | .23 | 79.8 | 1613. |
| 33.50 | 351.5 | 636.5 | 110.3 | .23 | 80.8 | 1629. |
| 34.00 | 356.0 | 646.0 | 111.0 | .23 | 81.9 | 1645. |
| 34.50 | 360.5 | 655.5 | 111.8 | .23 | 82.9 | 1661. |
| 35.00 | 365.0 | 665.0 | 112.5 | .23 | 84.0 | 1678. |
| 35.50 | 369.5 | 674.5 | 113.3 | .23 | 85.0 | 1694. |
| 36.00 | 374.0 | 684.0 | 114.0 | .23 | 86.0 | 1710. |
| 36.50 | 378.5 | 693.5 | 114.8 | .23 | 87.1 | 1726. |
| 37.00 | 383.0 | 703.0 | 115.5 | .23 | 88.1 | 1743. |
| 37.50 | 387.5 | 712.5 | 116.3 | .23 | 89.1 | 1759. |
| 38.00 | 392.0 | 722.0 | 117.0 | .23 | 90.2 | 1775. |
| 38.50 | 396.5 | 731.5 | 117.8 | .23 | 91.2 | 1791. |
| 39.00 | 401.0 | 741.0 | 118.5 | .23 | 92.2 | 1808. |
| 39.50 | 405.5 | 750.5 | 119.3 | .23 | 93.3 | 1824. |
| 40.00 | 410.0 | 760.0 | 120.0 | .23 | 94.3 | 1840. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 40.50 | 414.5 | 769.5 | 120.8 | .23 | 95.3 | 1856. |
| 41.00 | 419.0 | 779.0 | 121.5 | .23 | 96.4 | 1873. |
| 41.50 | 423.5 | 788.5 | 122.3 | .23 | 97.4 | 1889. |
| 42.00 | 428.0 | 798.0 | 123.0 | .23 | 98.4 | 1905. |
| 42.50 | 432.5 | 807.5 | 123.8 | .23 | 99.5 | 1921. |
| 43.00 | 437.0 | 817.0 | 124.5 | .23 | 100.5 | 1938. |
| 43.50 | 441.5 | 826.5 | 125.3 | .23 | 101.5 | 1954. |
| 44.00 | 446.0 | 836.0 | 126.0 | .23 | 102.6 | 1970. |
| 44.50 | 450.5 | 845.5 | 126.8 | .23 | 103.6 | 1986. |
| 45.00 | 455.0 | 855.0 | 127.5 | .23 | 104.7 | 2003. |
| 45.50 | 459.5 | 864.5 | 128.3 | .23 | 105.7 | 2019. |
| 46.00 | 464.0 | 874.0 | 129.0 | .23 | 106.7 | 2035. |

pag./ 9

NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 46.50 | 468.5 | 883.5 | 129.8 | .23 | 107.8 | 2051. |
| 47.00 | 473.0 | 893.0 | 130.5 | .23 | 108.8 | 2068. |
| 47.50 | 477.5 | 902.5 | 131.3 | .23 | 109.8 | 2084. |
| 48.00 | 482.0 | 912.0 | 132.0 | .23 | 110.9 | 2100. |
| 48.50 | 486.5 | 921.5 | 132.8 | .23 | 111.9 | 2116. |
| 49.00 | 491.0 | 931.0 | 133.5 | .23 | 112.9 | 2133. |
| 49.50 | 495.5 | 940.5 | 134.3 | .23 | 114.0 | 2149. |
| 50.00 | 500.0 | 950.0 | 135.0 | .23 | 115.0 | 2165. |
| 50.50 | 504.5 | 959.5 | 135.8 | .23 | 116.0 | 2181. |
| 51.00 | 509.0 | 969.0 | 136.5 | .23 | 117.1 | 2198. |
| 51.50 | 513.5 | 978.5 | 137.3 | .23 | 118.1 | 2214. |
| 52.00 | 518.0 | 988.0 | 138.0 | .23 | 119.1 | 2230. |
| 52.50 | 522.5 | 997.5 | 138.8 | .23 | 120.0 | 2246. |
| 53.00 | 527.0 | 1007.0 | 139.5 | .23 | 120.0 | 2263. |
| 53.50 | 531.5 | 1016.5 | 140.3 | .23 | 120.0 | 2279. |
| 54.00 | 536.0 | 1026.0 | 141.0 | .22 | 120.0 | 2295. |
| 54.50 | 540.5 | 1035.5 | 141.8 | .22 | 120.0 | 2311. |
| 55.00 | 545.0 | 1045.0 | 142.5 | .22 | 120.0 | 2328. |
| 55.50 | 549.5 | 1054.5 | 143.3 | .22 | 120.0 | 2344. |
| 56.00 | 554.0 | 1064.0 | 144.0 | .22 | 120.0 | 2360. |
| 56.50 | 558.5 | 1073.5 | 144.8 | .21 | 120.0 | 2376. |
| 57.00 | 563.0 | 1083.0 | 145.5 | .21 | 120.0 | 2393. |
| 57.50 | 567.5 | 1092.5 | 146.3 | .21 | 120.0 | 2409. |
| 58.00 | 572.0 | 1102.0 | 147.0 | .21 | 120.0 | 2425. |
| 58.50 | 576.5 | 1111.5 | 147.8 | .21 | 120.0 | 2441. |
| 59.00 | 581.0 | 1121.0 | 148.5 | .21 | 120.0 | 2458. |
| 59.50 | 585.5 | 1130.5 | 149.3 | .20 | 120.0 | 2474. |
| 60.00 | 590.0 | 1140.0 | 150.0 | .20 | 120.0 | 2490. |

zz = Profondita' da piano campagna
S'v = Tensione verticale efficace
Sv = Tensione verticale totale
Cu = Coesione non drenata
Tau = Tensione di adesione laterale limite
qb = Portata di base limite unitaria

NODO BOLOGNA CAVALCAVIA CV01 eCV02
Capacita portante blocco 6pali SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

| Lp m | Qll kN | Qbl kN | Wp kN | Qu kN | Qd kN |
|---|---|---|---|---|---|
| .00 | 0. | 6238. | 0. | 6238. | 2888. |
| .50 | 117. | 6411. | 43. | 6485. | 2989. |
| 1.00 | 268. | 6583. | 86. | 6764. | 3107. |
| 1.50 | 451. | 6755. | 129. | 7078. | 3244. |
| 2.00 | 669. | 6927. | 172. | 7424. | 3399. |
| 2.50 | 916. | 7099. | 215. | 7801. | 3570. |
| 3.00 | 1171. | 7272. | 257. | 8185. | 3745. |
| 3.50 | 1429. | 7444. | 300. | 8572. | 3922. |
| 4.00 | 1689. | 7616. | 343. | 8962. | 4101. |
| 4.50 | 1953. | 7788. | 386. | 9355. | 4281. |
| 5.00 | 2219. | 7960. | 429. | 9750. | 4462. |
| 5.50 | 2499. | 8132. | 472. | 10159. | 4651. |
| 6.00 | 2850. | 8408. | 515. | 10743. | 4927. |
| 6.50 | 3226. | 8684. | 558. | 11352. | 5216. |
| 7.00 | 3616. | 8960. | 601. | 11974. | 5512. |
| 7.50 | 4003. | 8821. | 644. | 12181. | 5616. |
| 8.00 | 4303. | 8993. | 687. | 12610. | 5816. |
| 8.50 | 4590. | 9166. | 730. | 13026. | 6008. |
| 9.00 | 4819. | 9338. | 772. | 13385. | 6170. |
| 9.50 | 5036. | 9510. | 815. | 13730. | 6324. |
| 10.00 | 5258. | 9682. | 858. | 14082. | 6482. |
| 10.50 | 5487. | 9854. | 901. | 14441. | 6643. |
| 11.00 | 5723. | 10026. | 944. | 14806. | 6808. |
| 11.50 | 5966. | 10199. | 987. | 15177. | 6977. |
| 12.00 | 6215. | 10371. | 1030. | 15556. | 7149. |
| 12.50 | 6471. | 10543. | 1073. | 15941. | 7325. |
| 13.00 | 6733. | 10715. | 1116. | 16333. | 7504. |
| 13.50 | 7002. | 10887. | 1159. | 16731. | 7687. |
| 14.00 | 7278. | 11060. | 1202. | 17136. | 7874. |
| 14.50 | 7560. | 11232. | 1245. | 17547. | 8064. |
| 15.00 | 7849. | 11404. | 1287. | 17965. | 8258. |
| 15.50 | 8144. | 11576. | 1330. | 18390. | 8455. |
| 16.00 | 8447. | 11748. | 1373. | 18822. | 8656. |
| 16.50 | 8755. | 11921. | 1416. | 19260. | 8861. |
| 17.00 | 9071. | 12093. | 1459. | 19704. | 9069. |
| 17.50 | 9442. | 12265. | 1502. | 20205. | 9308. |
| 18.00 | 10119. | 13634. | 1545. | 22208. | 10267. |
| 18.50 | 10861. | 15003. | 1588. | 24276. | 11261. |
| 19.00 | 11617. | 16372. | 1631. | 26358. | 12262. |
| 19.50 | 12387. | 17741. | 1674. | 28455. | 13272. |
| 20.00 | 13172. | 19110. | 1717. | 30566. | 14290. |
| 20.50 | 13972. | 20479. | 1759. | 32692. | 15315. |
| 21.00 | 14787. | 21848. | 1802. | 34833. | 16349. |
| 21.50 | 15616. | 23217. | 1845. | 36988. | 17390. |
| 22.00 | 16460. | 24586. | 1888. | 39158. | 18440. |
| 22.50 | 17318. | 25955. | 1931. | 41343. | 19497. |
| 23.00 | 18191. | 27324. | 1974. | 43542. | 20563. |
| 23.50 | 19079. | 27440. | 2017. | 44502. | 21056. |
| 24.00 | 19982. | 26301. | 2060. | 44223. | 20976. |
| 24.50 | 20899. | 25162. | 2103. | 43958. | 20904. |
| 25.00 | 21830. | 24024. | 2146. | 43708. | 20841. |
| 25.50 | 22777. | 22885. | 2189. | 43473. | 20785. |
| 26.00 | 23735. | 21746. | 2232. | 43250. | 20736. |
| 26.50 | 24695. | 20608. | 2274. | 43028. | 20687. |
| 27.00 | 25655. | 19469. | 2317. | 42807. | 20639. |
| 27.50 | 26615. | 18330. | 2360. | 42585. | 20591. |
| 28.00 | 27575. | 17192. | 2403. | 42364. | 20542. |
| 28.50 | 28474. | 16053. | 2446. | 42081. | 20461. |
| 29.00 | 29010. | 16225. | 2489. | 42746. | 20789. |
| 29.50 | 29491. | 16397. | 2532. | 43356. | 21087. |
| 30.00 | 29978. | 16569. | 2575. | 43973. | 21389. |
| 30.50 | 30472. | 16742. | 2618. | 44596. | 21694. |
| 31.00 | 30973. | 16914. | 2661. | 45226. | 22003. |
| 31.50 | 31481. | 17086. | 2704. | 45863. | 22316. |
| 32.00 | 31995. | 17258. | 2746. | 46507. | 22632. |
| 32.50 | 32516. | 17430. | 2789. | 47157. | 22952. |

| | | | | | |
|---|---|---|---|---|---|
| 33.00 | 33043. | 17603. | 2832. | 47813. | 23275. |
| 33.50 | 33577. | 17775. | 2875. | 48476. | 23602. |
| 34.00 | 34117. | 17947. | 2918. | 49146. | 23933. |
| 34.50 | 34665. | 18119. | 2961. | 49823. | 24267. |
| 35.00 | 35219. | 18291. | 3004. | 50506. | 24605. |
| 35.50 | 35779. | 18464. | 3047. | 51196. | 24946. |
| 36.00 | 36346. | 18636. | 3090. | 51892. | 25291. |
| 36.50 | 36920. | 18808. | 3133. | 52595. | 25640. |
| 37.00 | 37500. | 18980. | 3176. | 53305. | 25992. |
| 37.50 | 38087. | 19152. | 3219. | 54021. | 26348. |
| 38.00 | 38681. | 19324. | 3261. | 54744. | 26707. |
| 38.50 | 39281. | 19497. | 3304. | 55473. | 27070. |
| 39.00 | 39888. | 19669. | 3347. | 56209. | 27437. |
| 39.50 | 40501. | 19841. | 3390. | 56952. | 27807. |
| 40.00 | 41121. | 20013. | 3433. | 57701. | 28181. |
| 40.50 | 41748. | 20185. | 3476. | 58457. | 28558. |
| 41.00 | 42381. | 20358. | 3519. | 59220. | 28939. |
| 41.50 | 43021. | 20530. | 3562. | 59989. | 29324. |
| 42.00 | 43668. | 20702. | 3605. | 60765. | 29712. |
| 42.50 | 44321. | 20874. | 3648. | 61547. | 30104. |
| 43.00 | 44981. | 21046. | 3691. | 62337. | 30499. |
| 43.50 | 45647. | 21218. | 3734. | 63132. | 30898. |
| 44.00 | 46320. | 21391. | 3776. | 63935. | 31301. |
| 44.50 | 47000. | 21563. | 3819. | 64744. | 31707. |
| 45.00 | 47686. | 21735. | 3862. | 65559. | 32117. |
| 45.50 | 48379. | 21907. | 3905. | 66381. | 32530. |
| 46.00 | 49079. | 22079. | 3948. | 67210. | 32947. |
| 46.50 | 49785. | 22252. | 3991. | 68046. | 33368. |
| 47.00 | 50498. | 22424. | 4034. | 68888. | 33792. |
| 47.50 | 51217. | 22596. | 4077. | 69736. | 34220. |
| 48.00 | 51943. | 22768. | 4120. | 70592. | 34651. |
| 48.50 | 52676. | 22940. | 4163. | 71454. | 35086. |
| 49.00 | 53415. | 23113. | 4206. | 72322. | 35525. |
| 49.50 | 54161. | 23285. | 4248. | 73198. | 35967. |
| 50.00 | 54914. | 23457. | 4291. | 74079. | 36413. |
| 50.50 | 55673. | 23629. | 4334. | 74968. | 36862. |
| 51.00 | 56439. | 23801. | 4377. | 75863. | 37315. |
| 51.50 | 57207. | 23973. | 4420. | 76760. | 37769. |
| 52.00 | 57975. | 24146. | 4463. | 77657. | 38223. |
| 52.50 | 58743. | 24318. | 4506. | 78554. | 38678. |
| 53.00 | 59511. | 24490. | 4549. | 79452. | 39132. |
| 53.50 | 60279. | 24662. | 4592. | 80349. | 39586. |
| 54.00 | 61047. | 24834. | 4635. | 81246. | 40040. |
| 54.50 | 61815. | 25007. | 4678. | 82144. | 40494. |
| 55.00 | 62583. | 25179. | 4721. | 83041. | 40949. |
| 55.50 | 63351. | 25351. | 4763. | 83938. | 41403. |
| 56.00 | 64119. | 25523. | 4806. | 84835. | 41857. |
| 56.50 | 64887. | 25695. | 4849. | 85733. | 42311. |
| 57.00 | 65655. | 25867. | 4892. | 86630. | 42765. |
| 57.50 | 66423. | 26040. | 4935. | 87527. | 43220. |
| 58.00 | 67191. | 26212. | 4978. | 88424. | 43674. |
| 58.50 | 67959. | 26384. | 5021. | 89322. | 44128. |

```
Lp  = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp  = Peso efficace del palo
Qu  = Portata totale limite
Qd  = Portata di progetto  =  Qll/FS,l + Qbl/FS,b - Wp
```

## 8.3 Portata di porgetto (A1+M1+R3) – Gruppo 3 pali - compressione

```
                  ***   P A L   ***
          Programma per l'analisi della capacita' portante
                assiale di un palo di fondazione

          (C)  G.Guiducci - Studio SINTESI (RN - Italy)
                         ottobre 2006


                                                     pag./  2


 NODO BOLOGNA CAVALCAVIA CV01 e CV02
 Capacita portante 3pali SLU A1+M1+R3




 Quota testa palo da p.c.               =   1.50 m
 Quota falda da p.c.                    =   5.00 m
 Peso di volume del palo                =   8.10 kN/m3
 Fattore di sicurezza portata laterale  =   1.84   (FS,l)
 Fattore di sicurezza portata di base   =   2.16   (FS,b)




 Elemento con sezione avente:
                 Area = 5.29800 m2     Perimetro = 9.00000 m




 Criterio per la determinazione della portata di base in uno strato "i"
 quando la  Qb,i  ad esso attribuibile e' superiore a quella degli
 strati adiacenti:


 La base del palo deve essere situata almeno:  3.0 * 2.597 =  7.79 m
    entro lo strato se quello sovrastante e' piu' debole


 La base del palo deve essere situata almeno:  3.0 * 2.597 =  7.79 m
    sopra lo strato sottostante se esso e' piu' debole


 La variazione di Qb viene assunta lineare dal passaggio di strato
```

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 1 "A    "  (Coesivo)  da    .00  a   7.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    60.0  a    70.5  kPa


Strato 2 "B    "  (Incoerente)  da   7.00  a   9.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 35.0 deg

    Qb   variabile lin. da   1340.  a   1340.  kPa


Strato 3 "A    "  (Coesivo)  da   9.00  a  19.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    73.5  a    88.5  kPa
```

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 4 "B    "  (Incoerente)  da  19.00  a  30.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 36.0 deg

    Qb   variabile lin. da   4000.  a   4000.  kPa


Strato 5 "A    "  (Coesivo)  da  30.00  a  60.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 120.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da   105.0  a   150.0  kPa
```



```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3



MOLTIPLICATORI per i parametri di calcolo
```

| strato | Molt. Tau | Molt. Qb | Molt. Cu |
|---|---|---|---|
| 1 "A    " | 1.00 | 1.00 | 1.00 |
| 2 "B    " | 1.00 | 1.00 | - |
| 3 "A    " | 1.00 | 1.00 | 1.00 |
| 4 "B    " | 1.00 | 1.00 | - |
| 5 "A    " | 1.00 | 1.00 | 1.00 |

```
NOTA: i moltiplicatori non influenzano le limitazioni
      superiori o inferiori dei parametri


Per terreni coesivi:   Criterio   Tau = alfa * Cu
```

| Cu<br>kPa | alfa<br>- |
|---|---|
| .0 | .90 |
| 25.0 | .90 |
| 25.1 | .80 |
| 50.0 | .80 |
| 51.0 | .60 |
| 75.0 | .60 |
| 75.1 | .40 |
| 300.0 | .40 |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 1.50 | 28.5 | 28.5 | 62.3 | .55 | 15.7 | 589. |
| 2.00 | 38.0 | 38.0 | 63.0 | .55 | 20.9 | 605. |
| 2.50 | 47.5 | 47.5 | 63.8 | .55 | 26.1 | 621. |
| 3.00 | 57.0 | 57.0 | 64.5 | .55 | 31.4 | 638. |
| 3.50 | 66.5 | 66.5 | 65.3 | .55 | 36.6 | 654. |
| 4.00 | 76.0 | 76.0 | 66.0 | .52 | 39.6 | 670. |
| 4.50 | 85.5 | 85.5 | 66.8 | .47 | 40.1 | 686. |
| 5.00 | 95.0 | 95.0 | 67.5 | .43 | 40.5 | 703. |
| 5.50 | 99.5 | 104.5 | 68.3 | .41 | 41.0 | 719. |
| 6.00 | 104.0 | 114.0 | 69.0 | .40 | 41.4 | 735. |
| 6.50 | 108.5 | 123.5 | 69.8 | .39 | 41.9 | 751. |
| 7.00 | 113.0 | 133.0 | 70.5 | .43 | 48.8 | 768. |
| 7.50 | 117.5 | 142.5 | -- | .49 | 57.6 | 804. |
| 8.00 | 122.0 | 152.0 | -- | .49 | 59.8 | 841. |
| 8.50 | 126.5 | 161.5 | -- | .49 | 62.0 | 878. |
| 9.00 | 131.0 | 171.0 | -- | .41 | 54.2 | 833. |
| 9.50 | 135.5 | 180.5 | 74.3 | .33 | 44.6 | 849. |
| 10.00 | 140.0 | 190.0 | 75.0 | .32 | 45.0 | 865. |
| 10.50 | 144.5 | 199.5 | 75.8 | .23 | 33.2 | 881. |
| 11.00 | 149.0 | 209.0 | 76.5 | .23 | 34.3 | 898. |
| 11.50 | 153.5 | 218.5 | 77.3 | .23 | 35.3 | 914. |
| 12.00 | 158.0 | 228.0 | 78.0 | .23 | 36.3 | 930. |
| 12.50 | 162.5 | 237.5 | 78.8 | .23 | 37.4 | 946. |
| 13.00 | 167.0 | 247.0 | 79.5 | .23 | 38.4 | 963. |
| 13.50 | 171.5 | 256.5 | 80.3 | .23 | 39.4 | 979. |
| 14.00 | 176.0 | 266.0 | 81.0 | .23 | 40.5 | 995. |
| 14.50 | 180.5 | 275.5 | 81.8 | .23 | 41.5 | 1011. |
| 15.00 | 185.0 | 285.0 | 82.5 | .23 | 42.5 | 1028. |
| 15.50 | 189.5 | 294.5 | 83.3 | .23 | 43.6 | 1044. |
| 16.00 | 194.0 | 304.0 | 84.0 | .23 | 44.6 | 1060. |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz | S'v | Sv | Cu | Tau/S'v | Tau | qb |
|---|---|---|---|---|---|---|
| m | kPa | kPa | kPa | - | kPa | kPa |
| 16.50 | 198.5 | 313.5 | 84.8 | .23 | 45.7 | 1076. |
| 17.00 | 203.0 | 323.0 | 85.5 | .23 | 46.7 | 1093. |
| 17.50 | 207.5 | 332.5 | 86.3 | .23 | 47.7 | 1109. |
| 18.00 | 212.0 | 342.0 | 87.0 | .23 | 48.8 | 1125. |
| 18.50 | 216.5 | 351.5 | 87.8 | .23 | 49.8 | 1141. |
| 19.00 | 221.0 | 361.0 | 88.5 | .37 | 81.6 | 1158. |
| 19.50 | 225.5 | 370.5 | -- | .51 | 114.7 | 1341. |
| 20.00 | 230.0 | 380.0 | -- | .51 | 117.0 | 1524. |
| 20.50 | 234.5 | 389.5 | -- | .51 | 119.3 | 1708. |
| 21.00 | 239.0 | 399.0 | -- | .51 | 121.6 | 1891. |
| 21.50 | 243.5 | 408.5 | -- | .51 | 123.8 | 2074. |
| 22.00 | 248.0 | 418.0 | -- | .51 | 126.1 | 2258. |
| 22.50 | 252.5 | 427.5 | -- | .51 | 128.4 | 2403. |
| 23.00 | 257.0 | 437.0 | -- | .51 | 130.7 | 2509. |
| 23.50 | 261.5 | 446.5 | -- | .51 | 133.0 | 2616. |
| 24.00 | 266.0 | 456.0 | -- | .51 | 135.3 | 2722. |
| 24.50 | 270.5 | 465.5 | -- | .51 | 137.6 | 2829. |
| 25.00 | 275.0 | 475.0 | -- | .51 | 139.9 | 2935. |
| 25.50 | 279.5 | 484.5 | -- | .51 | 142.1 | 2911. |
| 26.00 | 284.0 | 494.0 | -- | .51 | 144.4 | 2756. |
| 26.50 | 288.5 | 503.5 | -- | .51 | 146.7 | 2601. |
| 27.00 | 293.0 | 513.0 | -- | .51 | 149.0 | 2446. |
| 27.50 | 297.5 | 522.5 | -- | .50 | 150.0 | 2290. |
| 28.00 | 302.0 | 532.0 | -- | .50 | 150.0 | 2135. |
| 28.50 | 306.5 | 541.5 | -- | .49 | 150.0 | 1980. |
| 29.00 | 311.0 | 551.0 | -- | .48 | 150.0 | 1825. |
| 29.50 | 315.5 | 560.5 | -- | .48 | 150.0 | 1670. |
| 30.00 | 320.0 | 570.0 | -- | .35 | 111.8 | 1515. |
| 30.50 | 324.5 | 579.5 | 105.8 | .23 | 74.6 | 1531. |
| 31.00 | 329.0 | 589.0 | 106.5 | .23 | 75.7 | 1548. |



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz | S'v | Sv | Cu | Tau/S'v | Tau | qb |
|---|---|---|---|---|---|---|
| m | kPa | kPa | kPa | - | kPa | kPa |
| 31.50 | 333.5 | 598.5 | 107.3 | .23 | 76.7 | 1564. |
| 32.00 | 338.0 | 608.0 | 108.0 | .23 | 77.7 | 1580. |
| 32.50 | 342.5 | 617.5 | 108.8 | .23 | 78.8 | 1596. |
| 33.00 | 347.0 | 627.0 | 109.5 | .23 | 79.8 | 1613. |
| 33.50 | 351.5 | 636.5 | 110.3 | .23 | 80.8 | 1629. |
| 34.00 | 356.0 | 646.0 | 111.0 | .23 | 81.9 | 1645. |
| 34.50 | 360.5 | 655.5 | 111.8 | .23 | 82.9 | 1661. |
| 35.00 | 365.0 | 665.0 | 112.5 | .23 | 84.0 | 1678. |
| 35.50 | 369.5 | 674.5 | 113.3 | .23 | 85.0 | 1694. |
| 36.00 | 374.0 | 684.0 | 114.0 | .23 | 86.0 | 1710. |
| 36.50 | 378.5 | 693.5 | 114.8 | .23 | 87.1 | 1726. |
| 37.00 | 383.0 | 703.0 | 115.5 | .23 | 88.1 | 1743. |
| 37.50 | 387.5 | 712.5 | 116.3 | .23 | 89.1 | 1759. |
| 38.00 | 392.0 | 722.0 | 117.0 | .23 | 90.2 | 1775. |
| 38.50 | 396.5 | 731.5 | 117.8 | .23 | 91.2 | 1791. |
| 39.00 | 401.0 | 741.0 | 118.5 | .23 | 92.2 | 1808. |
| 39.50 | 405.5 | 750.5 | 119.3 | .23 | 93.3 | 1824. |
| 40.00 | 410.0 | 760.0 | 120.0 | .23 | 94.3 | 1840. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 40.50 | 414.5 | 769.5 | 120.8 | .23 | 95.3 | 1856. |
| 41.00 | 419.0 | 779.0 | 121.5 | .23 | 96.4 | 1873. |
| 41.50 | 423.5 | 788.5 | 122.3 | .23 | 97.4 | 1889. |
| 42.00 | 428.0 | 798.0 | 123.0 | .23 | 98.4 | 1905. |
| 42.50 | 432.5 | 807.5 | 123.8 | .23 | 99.5 | 1921. |
| 43.00 | 437.0 | 817.0 | 124.5 | .23 | 100.5 | 1938. |
| 43.50 | 441.5 | 826.5 | 125.3 | .23 | 101.5 | 1954. |
| 44.00 | 446.0 | 836.0 | 126.0 | .23 | 102.6 | 1970. |
| 44.50 | 450.5 | 845.5 | 126.8 | .23 | 103.6 | 1986. |
| 45.00 | 455.0 | 855.0 | 127.5 | .23 | 104.7 | 2003. |
| 45.50 | 459.5 | 864.5 | 128.3 | .23 | 105.7 | 2019. |
| 46.00 | 464.0 | 874.0 | 129.0 | .23 | 106.7 | 2035. |

pag./ 9

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 46.50 | 468.5 | 883.5 | 129.8 | .23 | 107.8 | 2051. |
| 47.00 | 473.0 | 893.0 | 130.5 | .23 | 108.8 | 2068. |
| 47.50 | 477.5 | 902.5 | 131.3 | .23 | 109.8 | 2084. |
| 48.00 | 482.0 | 912.0 | 132.0 | .23 | 110.9 | 2100. |
| 48.50 | 486.5 | 921.5 | 132.8 | .23 | 111.9 | 2116. |
| 49.00 | 491.0 | 931.0 | 133.5 | .23 | 112.9 | 2133. |
| 49.50 | 495.5 | 940.5 | 134.3 | .23 | 114.0 | 2149. |
| 50.00 | 500.0 | 950.0 | 135.0 | .23 | 115.0 | 2165. |
| 50.50 | 504.5 | 959.5 | 135.8 | .23 | 116.0 | 2181. |
| 51.00 | 509.0 | 969.0 | 136.5 | .23 | 117.1 | 2198. |
| 51.50 | 513.5 | 978.5 | 137.3 | .23 | 118.1 | 2214. |
| 52.00 | 518.0 | 988.0 | 138.0 | .23 | 119.1 | 2230. |
| 52.50 | 522.5 | 997.5 | 138.8 | .23 | 120.0 | 2246. |
| 53.00 | 527.0 | 1007.0 | 139.5 | .23 | 120.0 | 2263. |
| 53.50 | 531.5 | 1016.5 | 140.3 | .23 | 120.0 | 2279. |
| 54.00 | 536.0 | 1026.0 | 141.0 | .22 | 120.0 | 2295. |
| 54.50 | 540.5 | 1035.5 | 141.8 | .22 | 120.0 | 2311. |
| 55.00 | 545.0 | 1045.0 | 142.5 | .22 | 120.0 | 2328. |
| 55.50 | 549.5 | 1054.5 | 143.3 | .22 | 120.0 | 2344. |
| 56.00 | 554.0 | 1064.0 | 144.0 | .22 | 120.0 | 2360. |
| 56.50 | 558.5 | 1073.5 | 144.8 | .21 | 120.0 | 2376. |
| 57.00 | 563.0 | 1083.0 | 145.5 | .21 | 120.0 | 2393. |
| 57.50 | 567.5 | 1092.5 | 146.3 | .21 | 120.0 | 2409. |
| 58.00 | 572.0 | 1102.0 | 147.0 | .21 | 120.0 | 2425. |
| 58.50 | 576.5 | 1111.5 | 147.8 | .21 | 120.0 | 2441. |
| 59.00 | 581.0 | 1121.0 | 148.5 | .21 | 120.0 | 2458. |
| 59.50 | 585.5 | 1130.5 | 149.3 | .20 | 120.0 | 2474. |
| 60.00 | 590.0 | 1140.0 | 150.0 | .20 | 120.0 | 2490. |

zz = Profondita' da piano campagna
S'v = Tensione verticale efficace
Sv = Tensione verticale totale
Cu = Coesione non drenata
Tau = Tensione di adesione laterale limite
qb = Portata di base limite unitaria

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante 3pali SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

| Lp<br>m | Qll<br>kN | Qbl<br>kN | Wp<br>kN | Qu<br>kN | Qd<br>kN |
|---|---|---|---|---|---|
| .00 | 0. | 3119. | 0. | 3119. | 1444. |
| .50 | 82. | 3205. | 21. | 3266. | 1507. |
| 1.00 | 188. | 3291. | 43. | 3437. | 1583. |
| 1.50 | 317. | 3377. | 64. | 3631. | 1672. |
| 2.00 | 470. | 3464. | 86. | 3848. | 1773. |
| 2.50 | 644. | 3550. | 107. | 4086. | 1886. |
| 3.00 | 823. | 3636. | 129. | 4330. | 2002. |
| 3.50 | 1005. | 3722. | 150. | 4576. | 2119. |
| 4.00 | 1188. | 3808. | 172. | 4824. | 2237. |
| 4.50 | 1373. | 3894. | 193. | 5074. | 2356. |
| 5.00 | 1560. | 3980. | 215. | 5326. | 2476. |
| 5.50 | 1757. | 4066. | 236. | 5587. | 2601. |
| 6.00 | 2004. | 4262. | 257. | 6008. | 2805. |
| 6.50 | 2268. | 4458. | 279. | 6447. | 3017. |
| 7.00 | 2542. | 4653. | 300. | 6895. | 3235. |
| 7.50 | 2815. | 4411. | 322. | 6904. | 3250. |
| 8.00 | 3026. | 4497. | 343. | 7179. | 3383. |
| 8.50 | 3227. | 4583. | 365. | 7445. | 3511. |
| 9.00 | 3389. | 4669. | 386. | 7671. | 3617. |
| 9.50 | 3541. | 4755. | 408. | 7888. | 3718. |
| 10.00 | 3697. | 4841. | 429. | 8109. | 3821. |
| 10.50 | 3858. | 4927. | 451. | 8335. | 3927. |
| 11.00 | 4024. | 5013. | 472. | 8565. | 4036. |
| 11.50 | 4195. | 5099. | 494. | 8801. | 4147. |
| 12.00 | 4370. | 5185. | 515. | 9040. | 4261. |
| 12.50 | 4550. | 5272. | 536. | 9285. | 4377. |
| 13.00 | 4734. | 5358. | 558. | 9534. | 4495. |
| 13.50 | 4923. | 5444. | 579. | 9788. | 4617. |
| 14.00 | 5117. | 5530. | 601. | 10046. | 4740. |
| 14.50 | 5316. | 5616. | 622. | 10309. | 4867. |
| 15.00 | 5519. | 5702. | 644. | 10577. | 4995. |
| 15.50 | 5727. | 5788. | 665. | 10849. | 5127. |
| 16.00 | 5939. | 5874. | 687. | 11126. | 5261. |
| 16.50 | 6156. | 5960. | 708. | 11408. | 5397. |
| 17.00 | 6378. | 6046. | 730. | 11695. | 5536. |
| 17.50 | 6639. | 6132. | 751. | 12020. | 5696. |
| 18.00 | 7115. | 7104. | 772. | 13447. | 6383. |
| 18.50 | 7636. | 8076. | 794. | 14918. | 7095. |
| 19.00 | 8168. | 9047. | 815. | 16400. | 7812. |
| 19.50 | 8710. | 10019. | 837. | 17892. | 8535. |
| 20.00 | 9262. | 10990. | 858. | 19394. | 9263. |
| 20.50 | 9824. | 11962. | 880. | 20906. | 9997. |
| 21.00 | 10397. | 12730. | 901. | 22226. | 10643. |
| 21.50 | 10980. | 13294. | 923. | 23351. | 11199. |
| 22.00 | 11573. | 13858. | 944. | 24487. | 11762. |
| 22.50 | 12177. | 14422. | 966. | 25634. | 12329. |
| 23.00 | 12791. | 14986. | 987. | 26790. | 12903. |
| 23.50 | 13415. | 15551. | 1008. | 27957. | 13482. |
| 24.00 | 14050. | 15422. | 1030. | 28441. | 13745. |
| 24.50 | 14694. | 14600. | 1051. | 28243. | 13694. |
| 25.00 | 15350. | 13778. | 1073. | 28055. | 13648. |
| 25.50 | 16015. | 12957. | 1094. | 27877. | 13608. |
| 26.00 | 16689. | 12135. | 1116. | 27708. | 13572. |
| 26.50 | 17364. | 11313. | 1137. | 27540. | 13537. |
| 27.00 | 18039. | 10492. | 1159. | 27372. | 13502. |
| 27.50 | 18714. | 9670. | 1180. | 27204. | 13467. |
| 28.00 | 19389. | 8848. | 1202. | 27035. | 13432. |
| 28.50 | 20021. | 8026. | 1223. | 26824. | 13374. |
| 29.00 | 20397. | 8113. | 1245. | 27265. | 13597. |
| 29.50 | 20736. | 8199. | 1266. | 27668. | 13799. |
| 30.00 | 21078. | 8285. | 1287. | 28076. | 14004. |
| 30.50 | 21426. | 8371. | 1309. | 28488. | 14211. |
| 31.00 | 21778. | 8457. | 1330. | 28905. | 14421. |
| 31.50 | 22135. | 8543. | 1352. | 29326. | 14633. |
| 32.00 | 22496. | 8629. | 1373. | 29752. | 14848. |
| 32.50 | 22862. | 8715. | 1395. | 30183. | 15065. |

| | | | | | |
|---|---|---|---|---|---|
| 33.00 | 23233. | 8801. | 1416. | 30618. | 15285. |
| 33.50 | 23609. | 8887. | 1438. | 31059. | 15508. |
| 34.00 | 23989. | 8973. | 1459. | 31503. | 15733. |
| 34.50 | 24374. | 9060. | 1481. | 31953. | 15960. |
| 35.00 | 24763. | 9146. | 1502. | 32407. | 16190. |
| 35.50 | 25157. | 9232. | 1523. | 32865. | 16423. |
| 36.00 | 25556. | 9318. | 1545. | 33329. | 16658. |
| 36.50 | 25959. | 9404. | 1566. | 33797. | 16896. |
| 37.00 | 26367. | 9490. | 1588. | 34269. | 17136. |
| 37.50 | 26780. | 9576. | 1609. | 34747. | 17378. |
| 38.00 | 27197. | 9662. | 1631. | 35229. | 17624. |
| 38.50 | 27619. | 9748. | 1652. | 35715. | 17871. |
| 39.00 | 28046. | 9834. | 1674. | 36207. | 18122. |
| 39.50 | 28477. | 9921. | 1695. | 36703. | 18375. |
| 40.00 | 28913. | 10007. | 1717. | 37203. | 18630. |
| 40.50 | 29354. | 10093. | 1738. | 37709. | 18888. |
| 41.00 | 29799. | 10179. | 1759. | 38219. | 19148. |
| 41.50 | 30249. | 10265. | 1781. | 38733. | 19411. |
| 42.00 | 30704. | 10351. | 1802. | 39252. | 19677. |
| 42.50 | 31163. | 10437. | 1824. | 39776. | 19945. |
| 43.00 | 31627. | 10523. | 1845. | 40305. | 20215. |
| 43.50 | 32096. | 10609. | 1867. | 40838. | 20488. |
| 44.00 | 32569. | 10695. | 1888. | 41376. | 20764. |
| 44.50 | 33047. | 10781. | 1910. | 41919. | 21042. |
| 45.00 | 33529. | 10868. | 1931. | 42466. | 21323. |
| 45.50 | 34017. | 10954. | 1953. | 43018. | 21606. |
| 46.00 | 34509. | 11040. | 1974. | 43574. | 21892. |
| 46.50 | 35005. | 11126. | 1995. | 44135. | 22180. |
| 47.00 | 35506. | 11212. | 2017. | 44701. | 22471. |
| 47.50 | 36012. | 11298. | 2038. | 45272. | 22764. |
| 48.00 | 36523. | 11384. | 2060. | 45847. | 23060. |
| 48.50 | 37038. | 11470. | 2081. | 46427. | 23358. |
| 49.00 | 37558. | 11556. | 2103. | 47011. | 23659. |
| 49.50 | 38082. | 11642. | 2124. | 47600. | 23963. |
| 50.00 | 38611. | 11728. | 2146. | 48194. | 24269. |
| 50.50 | 39145. | 11815. | 2167. | 48793. | 24577. |
| 51.00 | 39683. | 11901. | 2189. | 49395. | 24888. |
| 51.50 | 40223. | 11987. | 2210. | 50000. | 25200. |
| 52.00 | 40763. | 12073. | 2232. | 50605. | 25512. |
| 52.50 | 41303. | 12159. | 2253. | 51209. | 25824. |
| 53.00 | 41843. | 12245. | 2274. | 51814. | 26136. |
| 53.50 | 42383. | 12331. | 2296. | 52419. | 26447. |
| 54.00 | 42923. | 12417. | 2317. | 53023. | 26759. |
| 54.50 | 43463. | 12503. | 2339. | 53628. | 27071. |
| 55.00 | 44003. | 12589. | 2360. | 54232. | 27383. |
| 55.50 | 44543. | 12675. | 2382. | 54837. | 27695. |
| 56.00 | 45083. | 12762. | 2403. | 55442. | 28007. |
| 56.50 | 45623. | 12848. | 2425. | 56046. | 28319. |
| 57.00 | 46163. | 12934. | 2446. | 56651. | 28631. |
| 57.50 | 46703. | 13020. | 2468. | 57256. | 28942. |
| 58.00 | 47243. | 13106. | 2489. | 57860. | 29254. |
| 58.50 | 47783. | 13192. | 2510. | 58465. | 29566. |

```
Lp  = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp  = Peso efficace del palo
Qu  = Portata totale limite
Qd  = Portata di progetto  =  Qll/FS,l + Qbl/FS,b - Wp
```

## 8.4 Portata di porgetto (A1+M1+R3) - palo di spigolo - trazione

```
                   ***   P A L   ***
             Programma per l'analisi della capacita' portante
                   assiale di un palo di fondazione

             (C)  G.Guiducci - Studio SINTESI (RN - Italy)
                          ottobre 2006


                                                       pag./  2


  NODO BOLOGNA CAVALCAVIA CV01 e CV02
  Capacita portante palo spigolo SLU A1+M1+R3  trazione



  Quota testa palo da p.c.               =   1.50 m
  Quota falda da p.c.                    =   5.00 m
  Peso di volume del palo                = -15.00 kN/m3
  Fattore di sicurezza portata laterale  =   2.00   (FS,l)
  Fattore di sicurezza portata di base   =   1.00   (FS,b)



  Elemento con sezione avente:
                  Area = 1.76600 m2     Perimetro = 3.60000 m



  Criterio per la determinazione della portata di base in uno strato "i"
  quando la  Qb,i  ad esso attribuibile e' superiore a quella degli
  strati adiacenti:


  La base del palo deve essere situata almeno:  3.0 * 1.500 =  4.50 m
     entro lo strato se quello sovrastante e' piu' debole


  La base del palo deve essere situata almeno:  3.0 * 1.500 =  4.50 m
     sopra lo strato sottostante se esso e' piu' debole


  La variazione di Qb viene assunta lineare dal passaggio di strato
```

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3  trazione



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 1 "A    "  (Coesivo)  da    .00  a   7.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb   variabile lin. da      0.  a      0.  kPa

    Cu   variabile lin. da    60.0  a    70.5  kPa


Strato 2 "B    "  (Incoerente)  da   7.00  a   9.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .50             delta = 35.0 deg

    Qb   variabile lin. da      0.  a      0.  kPa


Strato 3 "A    "  (Coesivo)  da   9.00  a  19.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb   variabile lin. da      0.  a      0.  kPa

    Cu   variabile lin. da    73.5  a    88.5  kPa
```

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3  trazione



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 4 "B    "  (Incoerente)  da  19.00  a  30.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .50             delta = 36.0 deg

    Qb   variabile lin. da      0.  a      0.  kPa


Strato 5 "A    "  (Coesivo)  da  30.00  a  60.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 120.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb   variabile lin. da      0.  a      0.  kPa

    Cu   variabile lin. da   105.0  a   150.0  kPa
```



```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3  trazione



MOLTIPLICATORI per i parametri di calcolo

-------------------------------------------------
strato        Molt. Tau     Molt. Qb     Molt. Cu
-------------------------------------------------
1 "A    "        1.00          1.00         1.00
2 "B    "        1.00          1.00          -
3 "A    "        1.00          1.00         1.00
4 "B    "        1.00          1.00          -
5 "A    "        1.00          1.00         1.00
-------------------------------------------------

NOTA: i moltiplicatori non influenzano le limitazioni
      superiori o inferiori dei parametri


Per terreni coesivi:   Criterio   Tau = alfa * Cu

---------------
   Cu      alfa
  kPa        -
---------------
    .0      .90
  25.0      .90
  25.1      .80
  50.0      .80
  51.0      .60
  75.0      .60
  75.1      .40
 300.0      .40
---------------
```

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3 trazione

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 1.50 | 28.5 | 28.5 | 62.3 | .55 | 15.7 | 0. |
| 2.00 | 38.0 | 38.0 | 63.0 | .55 | 20.9 | 0. |
| 2.50 | 47.5 | 47.5 | 63.8 | .55 | 26.1 | 0. |
| 3.00 | 57.0 | 57.0 | 64.5 | .55 | 31.4 | 0. |
| 3.50 | 66.5 | 66.5 | 65.3 | .55 | 36.6 | 0. |
| 4.00 | 76.0 | 76.0 | 66.0 | .52 | 39.6 | 0. |
| 4.50 | 85.5 | 85.5 | 66.8 | .47 | 40.1 | 0. |
| 5.00 | 95.0 | 95.0 | 67.5 | .43 | 40.5 | 0. |
| 5.50 | 99.5 | 104.5 | 68.3 | .41 | 41.0 | 0. |
| 6.00 | 104.0 | 114.0 | 69.0 | .40 | 41.4 | 0. |
| 6.50 | 108.5 | 123.5 | 69.8 | .39 | 41.9 | 0. |
| 7.00 | 113.0 | 133.0 | 70.5 | .36 | 40.9 | 0. |
| 7.50 | 117.5 | 142.5 | -- | .35 | 41.1 | 0. |
| 8.00 | 122.0 | 152.0 | -- | .35 | 42.7 | 0. |
| 8.50 | 126.5 | 161.5 | -- | .35 | 44.3 | 0. |
| 9.00 | 131.0 | 171.0 | -- | .34 | 45.0 | 0. |
| 9.50 | 135.5 | 180.5 | 74.3 | .33 | 44.6 | 0. |
| 10.00 | 140.0 | 190.0 | 75.0 | .32 | 45.0 | 0. |
| 10.50 | 144.5 | 199.5 | 75.8 | .23 | 33.2 | 0. |
| 11.00 | 149.0 | 209.0 | 76.5 | .23 | 34.3 | 0. |
| 11.50 | 153.5 | 218.5 | 77.3 | .23 | 35.3 | 0. |
| 12.00 | 158.0 | 228.0 | 78.0 | .23 | 36.3 | 0. |
| 12.50 | 162.5 | 237.5 | 78.8 | .23 | 37.4 | 0. |
| 13.00 | 167.0 | 247.0 | 79.5 | .23 | 38.4 | 0. |
| 13.50 | 171.5 | 256.5 | 80.3 | .23 | 39.4 | 0. |
| 14.00 | 176.0 | 266.0 | 81.0 | .23 | 40.5 | 0. |
| 14.50 | 180.5 | 275.5 | 81.8 | .23 | 41.5 | 0. |
| 15.00 | 185.0 | 285.0 | 82.5 | .23 | 42.5 | 0. |
| 15.50 | 189.5 | 294.5 | 83.3 | .23 | 43.6 | 0. |
| 16.00 | 194.0 | 304.0 | 84.0 | .23 | 44.6 | 0. |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3 trazione

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 16.50 | 198.5 | 313.5 | 84.8 | .23 | 45.7 | 0. |
| 17.00 | 203.0 | 323.0 | 85.5 | .23 | 46.7 | 0. |
| 17.50 | 207.5 | 332.5 | 86.3 | .23 | 47.7 | 0. |
| 18.00 | 212.0 | 342.0 | 87.0 | .23 | 48.8 | 0. |
| 18.50 | 216.5 | 351.5 | 87.8 | .23 | 49.8 | 0. |
| 19.00 | 221.0 | 361.0 | 88.5 | .30 | 65.6 | 0. |
| 19.50 | 225.5 | 370.5 | -- | .36 | 81.9 | 0. |
| 20.00 | 230.0 | 380.0 | -- | .36 | 83.6 | 0. |
| 20.50 | 234.5 | 389.5 | -- | .36 | 85.2 | 0. |
| 21.00 | 239.0 | 399.0 | -- | .36 | 86.8 | 0. |
| 21.50 | 243.5 | 408.5 | -- | .36 | 88.5 | 0. |
| 22.00 | 248.0 | 418.0 | -- | .36 | 90.1 | 0. |
| 22.50 | 252.5 | 427.5 | -- | .36 | 91.7 | 0. |
| 23.00 | 257.0 | 437.0 | -- | .36 | 93.4 | 0. |
| 23.50 | 261.5 | 446.5 | -- | .36 | 95.0 | 0. |
| 24.00 | 266.0 | 456.0 | -- | .36 | 96.6 | 0. |
| 24.50 | 270.5 | 465.5 | -- | .36 | 98.3 | 0. |
| 25.00 | 275.0 | 475.0 | -- | .36 | 99.9 | 0. |
| 25.50 | 279.5 | 484.5 | -- | .36 | 101.5 | 0. |
| 26.00 | 284.0 | 494.0 | -- | .36 | 103.2 | 0. |
| 26.50 | 288.5 | 503.5 | -- | .36 | 104.8 | 0. |
| 27.00 | 293.0 | 513.0 | -- | .36 | 106.4 | 0. |
| 27.50 | 297.5 | 522.5 | -- | .36 | 108.1 | 0. |
| 28.00 | 302.0 | 532.0 | -- | .36 | 109.7 | 0. |
| 28.50 | 306.5 | 541.5 | -- | .36 | 111.3 | 0. |
| 29.00 | 311.0 | 551.0 | -- | .36 | 113.0 | 0. |
| 29.50 | 315.5 | 560.5 | -- | .36 | 114.6 | 0. |
| 30.00 | 320.0 | 570.0 | -- | .30 | 94.9 | 0. |
| 30.50 | 324.5 | 579.5 | 105.8 | .23 | 74.6 | 0. |
| 31.00 | 329.0 | 589.0 | 106.5 | .23 | 75.7 | 0. |



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3 trazione

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 31.50 | 333.5 | 598.5 | 107.3 | .23 | 76.7 | 0. |
| 32.00 | 338.0 | 608.0 | 108.0 | .23 | 77.7 | 0. |
| 32.50 | 342.5 | 617.5 | 108.8 | .23 | 78.8 | 0. |
| 33.00 | 347.0 | 627.0 | 109.5 | .23 | 79.8 | 0. |
| 33.50 | 351.5 | 636.5 | 110.3 | .23 | 80.8 | 0. |
| 34.00 | 356.0 | 646.0 | 111.0 | .23 | 81.9 | 0. |
| 34.50 | 360.5 | 655.5 | 111.8 | .23 | 82.9 | 0. |
| 35.00 | 365.0 | 665.0 | 112.5 | .23 | 84.0 | 0. |
| 35.50 | 369.5 | 674.5 | 113.3 | .23 | 85.0 | 0. |
| 36.00 | 374.0 | 684.0 | 114.0 | .23 | 86.0 | 0. |
| 36.50 | 378.5 | 693.5 | 114.8 | .23 | 87.1 | 0. |
| 37.00 | 383.0 | 703.0 | 115.5 | .23 | 88.1 | 0. |
| 37.50 | 387.5 | 712.5 | 116.3 | .23 | 89.1 | 0. |
| 38.00 | 392.0 | 722.0 | 117.0 | .23 | 90.2 | 0. |
| 38.50 | 396.5 | 731.5 | 117.8 | .23 | 91.2 | 0. |
| 39.00 | 401.0 | 741.0 | 118.5 | .23 | 92.2 | 0. |
| 39.50 | 405.5 | 750.5 | 119.3 | .23 | 93.3 | 0. |
| 40.00 | 410.0 | 760.0 | 120.0 | .23 | 94.3 | 0. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 40.50 | 414.5 | 769.5 | 120.8 | .23 | 95.3 | 0. |
| 41.00 | 419.0 | 779.0 | 121.5 | .23 | 96.4 | 0. |
| 41.50 | 423.5 | 788.5 | 122.3 | .23 | 97.4 | 0. |
| 42.00 | 428.0 | 798.0 | 123.0 | .23 | 98.4 | 0. |
| 42.50 | 432.5 | 807.5 | 123.8 | .23 | 99.5 | 0. |
| 43.00 | 437.0 | 817.0 | 124.5 | .23 | 100.5 | 0. |
| 43.50 | 441.5 | 826.5 | 125.3 | .23 | 101.5 | 0. |
| 44.00 | 446.0 | 836.0 | 126.0 | .23 | 102.6 | 0. |
| 44.50 | 450.5 | 845.5 | 126.8 | .23 | 103.6 | 0. |
| 45.00 | 455.0 | 855.0 | 127.5 | .23 | 104.7 | 0. |
| 45.50 | 459.5 | 864.5 | 128.3 | .23 | 105.7 | 0. |
| 46.00 | 464.0 | 874.0 | 129.0 | .23 | 106.7 | 0. |

pag./ 9

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3 trazione

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 46.50 | 468.5 | 883.5 | 129.8 | .23 | 107.8 | 0. |
| 47.00 | 473.0 | 893.0 | 130.5 | .23 | 108.8 | 0. |
| 47.50 | 477.5 | 902.5 | 131.3 | .23 | 109.8 | 0. |
| 48.00 | 482.0 | 912.0 | 132.0 | .23 | 110.9 | 0. |
| 48.50 | 486.5 | 921.5 | 132.8 | .23 | 111.9 | 0. |
| 49.00 | 491.0 | 931.0 | 133.5 | .23 | 112.9 | 0. |
| 49.50 | 495.5 | 940.5 | 134.3 | .23 | 114.0 | 0. |
| 50.00 | 500.0 | 950.0 | 135.0 | .23 | 115.0 | 0. |
| 50.50 | 504.5 | 959.5 | 135.8 | .23 | 116.0 | 0. |
| 51.00 | 509.0 | 969.0 | 136.5 | .23 | 117.1 | 0. |
| 51.50 | 513.5 | 978.5 | 137.3 | .23 | 118.1 | 0. |
| 52.00 | 518.0 | 988.0 | 138.0 | .23 | 119.1 | 0. |
| 52.50 | 522.5 | 997.5 | 138.8 | .23 | 120.0 | 0. |
| 53.00 | 527.0 | 1007.0 | 139.5 | .23 | 120.0 | 0. |
| 53.50 | 531.5 | 1016.5 | 140.3 | .23 | 120.0 | 0. |
| 54.00 | 536.0 | 1026.0 | 141.0 | .22 | 120.0 | 0. |
| 54.50 | 540.5 | 1035.5 | 141.8 | .22 | 120.0 | 0. |
| 55.00 | 545.0 | 1045.0 | 142.5 | .22 | 120.0 | 0. |
| 55.50 | 549.5 | 1054.5 | 143.3 | .22 | 120.0 | 0. |
| 56.00 | 554.0 | 1064.0 | 144.0 | .22 | 120.0 | 0. |
| 56.50 | 558.5 | 1073.5 | 144.8 | .21 | 120.0 | 0. |
| 57.00 | 563.0 | 1083.0 | 145.5 | .21 | 120.0 | 0. |
| 57.50 | 567.5 | 1092.5 | 146.3 | .21 | 120.0 | 0. |
| 58.00 | 572.0 | 1102.0 | 147.0 | .21 | 120.0 | 0. |
| 58.50 | 576.5 | 1111.5 | 147.8 | .21 | 120.0 | 0. |
| 59.00 | 581.0 | 1121.0 | 148.5 | .21 | 120.0 | 0. |
| 59.50 | 585.5 | 1130.5 | 149.3 | .20 | 120.0 | 0. |
| 60.00 | 590.0 | 1140.0 | 150.0 | .20 | 120.0 | 0. |

zz = Profondita' da piano campagna
S'v = Tensione verticale efficace
Sv = Tensione verticale totale
Cu = Coesione non drenata
Tau = Tensione di adesione laterale limite
qb = Portata di base limite unitaria

pag./ 10

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3 trazione

STAMPA capacita' portante e relativi contributi

| Lp<br>m | Qll<br>kN | Qbl<br>kN | Wp<br>kN | Qu<br>kN | Qd<br>kN |
|---|---|---|---|---|---|
| .00 | 0. | 0. | 0. | 0. | 0. |
| .50 | 33. | 0. | -13. | 46. | 30. |
| 1.00 | 75. | 0. | -26. | 102. | 64. |
| 1.50 | 127. | 0. | -40. | 167. | 103. |
| 2.00 | 188. | 0. | -53. | 241. | 147. |
| 2.50 | 258. | 0. | -66. | 324. | 195. |
| 3.00 | 329. | 0. | -79. | 409. | 244. |
| 3.50 | 402. | 0. | -93. | 495. | 294. |
| 4.00 | 475. | 0. | -106. | 581. | 344. |
| 4.50 | 549. | 0. | -119. | 668. | 394. |
| 5.00 | 624. | 0. | -132. | 757. | 445. |
| 5.50 | 699. | 0. | -146. | 845. | 495. |
| 6.00 | 773. | 0. | -159. | 931. | 545. |
| 6.50 | 848. | 0. | -172. | 1020. | 596. |
| 7.00 | 926. | 0. | -185. | 1112. | 649. |
| 7.50 | 1007. | 0. | -199. | 1206. | 702. |
| 8.00 | 1087. | 0. | -212. | 1299. | 756. |
| 8.50 | 1168. | 0. | -225. | 1393. | 809. |
| 9.00 | 1232. | 0. | -238. | 1471. | 855. |
| 9.50 | 1293. | 0. | -252. | 1545. | 898. |
| 10.00 | 1356. | 0. | -265. | 1621. | 943. |
| 10.50 | 1420. | 0. | -278. | 1698. | 988. |
| 11.00 | 1487. | 0. | -291. | 1778. | 1035. |
| 11.50 | 1555. | 0. | -305. | 1860. | 1082. |
| 12.00 | 1625. | 0. | -318. | 1943. | 1130. |
| 12.50 | 1697. | 0. | -331. | 2028. | 1180. |
| 13.00 | 1771. | 0. | -344. | 2115. | 1230. |
| 13.50 | 1846. | 0. | -358. | 2204. | 1281. |
| 14.00 | 1924. | 0. | -371. | 2295. | 1333. |
| 14.50 | 2003. | 0. | -384. | 2387. | 1386. |
| 15.00 | 2084. | 0. | -397. | 2482. | 1440. |
| 15.50 | 2168. | 0. | -411. | 2578. | 1494. |
| 16.00 | 2253. | 0. | -424. | 2676. | 1550. |
| 16.50 | 2339. | 0. | -437. | 2776. | 1607. |
| 17.00 | 2428. | 0. | -450. | 2878. | 1664. |
| 17.50 | 2525. | 0. | -464. | 2989. | 1726. |
| 18.00 | 2665. | 0. | -477. | 3141. | 1809. |
| 18.50 | 2814. | 0. | -490. | 3304. | 1897. |
| 19.00 | 2965. | 0. | -503. | 3469. | 1986. |
| 19.50 | 3120. | 0. | -517. | 3637. | 2077. |
| 20.00 | 3278. | 0. | -530. | 3808. | 2169. |
| 20.50 | 3439. | 0. | -543. | 3982. | 2262. |
| 21.00 | 3602. | 0. | -556. | 4159. | 2357. |
| 21.50 | 3769. | 0. | -570. | 4338. | 2454. |
| 22.00 | 3938. | 0. | -583. | 4521. | 2552. |
| 22.50 | 4111. | 0. | -596. | 4707. | 2651. |
| 23.00 | 4286. | 0. | -609. | 4896. | 2752. |
| 23.50 | 4465. | 0. | -623. | 5087. | 2855. |
| 24.00 | 4646. | 0. | -636. | 5282. | 2959. |
| 24.50 | 4830. | 0. | -649. | 5479. | 3064. |
| 25.00 | 5017. | 0. | -662. | 5680. | 3171. |
| 25.50 | 5207. | 0. | -675. | 5883. | 3279. |
| 26.00 | 5401. | 0. | -689. | 6089. | 3389. |
| 26.50 | 5597. | 0. | -702. | 6299. | 3500. |
| 27.00 | 5795. | 0. | -715. | 6511. | 3613. |
| 27.50 | 5997. | 0. | -728. | 6726. | 3727. |
| 28.00 | 6202. | 0. | -742. | 6944. | 3843. |
| 28.50 | 6400. | 0. | -755. | 7155. | 3955. |
| 29.00 | 6543. | 0. | -768. | 7312. | 4040. |
| 29.50 | 6679. | 0. | -781. | 7460. | 4121. |
| 30.00 | 6816. | 0. | -795. | 7610. | 4203. |
| 30.50 | 6955. | 0. | -808. | 7763. | 4285. |
| 31.00 | 7096. | 0. | -821. | 7917. | 4369. |
| 31.50 | 7238. | 0. | -834. | 8073. | 4454. |
| 32.00 | 7383. | 0. | -848. | 8231. | 4539. |
| 32.50 | 7529. | 0. | -861. | 8390. | 4626. |

| | | | | | |
|---|---|---|---|---|---|
| 33.00 | 7678. | 0. | -874. | 8552. | 4713. |
| 33.50 | 7828. | 0. | -887. | 8715. | 4801. |
| 34.00 | 7980. | 0. | -901. | 8881. | 4891. |
| 34.50 | 8134. | 0. | -914. | 9048. | 4981. |
| 35.00 | 8290. | 0. | -927. | 9217. | 5072. |
| 35.50 | 8447. | 0. | -940. | 9388. | 5164. |
| 36.00 | 8607. | 0. | -954. | 9560. | 5257. |
| 36.50 | 8768. | 0. | -967. | 9735. | 5351. |
| 37.00 | 8931. | 0. | -980. | 9911. | 5446. |
| 37.50 | 9096. | 0. | -993. | 10090. | 5542. |
| 38.00 | 9263. | 0. | -1007. | 10270. | 5638. |
| 38.50 | 9432. | 0. | -1020. | 10452. | 5736. |
| 39.00 | 9603. | 0. | -1033. | 10636. | 5835. |
| 39.50 | 9775. | 0. | -1046. | 10822. | 5934. |
| 40.00 | 9950. | 0. | -1060. | 11009. | 6034. |
| 40.50 | 10126. | 0. | -1073. | 11199. | 6136. |
| 41.00 | 10304. | 0. | -1086. | 11390. | 6238. |
| 41.50 | 10484. | 0. | -1099. | 11583. | 6341. |
| 42.00 | 10666. | 0. | -1113. | 11779. | 6446. |
| 42.50 | 10850. | 0. | -1126. | 11976. | 6551. |
| 43.00 | 11035. | 0. | -1139. | 12174. | 6657. |
| 43.50 | 11223. | 0. | -1152. | 12375. | 6764. |
| 44.00 | 11412. | 0. | -1166. | 12578. | 6872. |
| 44.50 | 11603. | 0. | -1179. | 12782. | 6980. |
| 45.00 | 11796. | 0. | -1192. | 12988. | 7090. |
| 45.50 | 11991. | 0. | -1205. | 13196. | 7201. |
| 46.00 | 12188. | 0. | -1219. | 13406. | 7312. |
| 46.50 | 12386. | 0. | -1232. | 13618. | 7425. |
| 47.00 | 12587. | 0. | -1245. | 13832. | 7538. |
| 47.50 | 12789. | 0. | -1258. | 14048. | 7653. |
| 48.00 | 12993. | 0. | -1272. | 14265. | 7768. |
| 48.50 | 13200. | 0. | -1285. | 14484. | 7885. |
| 49.00 | 13407. | 0. | -1298. | 14705. | 8002. |
| 49.50 | 13617. | 0. | -1311. | 14929. | 8120. |
| 50.00 | 13829. | 0. | -1325. | 15153. | 8239. |
| 50.50 | 14042. | 0. | -1338. | 15380. | 8359. |
| 51.00 | 14258. | 0. | -1351. | 15609. | 8480. |
| 51.50 | 14474. | 0. | -1364. | 15838. | 8601. |
| 52.00 | 14690. | 0. | -1377. | 16067. | 8722. |
| 52.50 | 14906. | 0. | -1391. | 16296. | 8844. |
| 53.00 | 15122. | 0. | -1404. | 16526. | 8965. |
| 53.50 | 15338. | 0. | -1417. | 16755. | 9086. |
| 54.00 | 15554. | 0. | -1430. | 16984. | 9207. |
| 54.50 | 15770. | 0. | -1444. | 17213. | 9329. |
| 55.00 | 15986. | 0. | -1457. | 17443. | 9450. |
| 55.50 | 16202. | 0. | -1470. | 17672. | 9571. |
| 56.00 | 16418. | 0. | -1483. | 17901. | 9692. |
| 56.50 | 16634. | 0. | -1497. | 18130. | 9814. |
| 57.00 | 16850. | 0. | -1510. | 18360. | 9935. |
| 57.50 | 17066. | 0. | -1523. | 18589. | 10056. |
| 58.00 | 17282. | 0. | -1536. | 18818. | 10177. |
| 58.50 | 17498. | 0. | -1550. | 19047. | 10299. |

```
Lp  = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp  = Peso efficace del palo
Qu  = Portata totale limite
Qd  = Portata di progetto  =  Qll/FS,l + Qbl/FS,b - Wp
```

## 8.5 Portata di porgetto (A1+M1+R3) - palo di spigolo - compressione

```
                  ***   P A L   ***
             Programma per l'analisi della capacita' portante
                   assiale di un palo di fondazione

             (C)  G.Guiducci - Studio SINTESI (RN - Italy)
                          ottobre 2006


                                                        pag./  2


NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3



Quota testa palo da p.c.               =   1.50 m
Quota falda da p.c.                    =   5.00 m
Peso di volume del palo                =   8.10 kN/m3
Fattore di sicurezza portata laterale  =   1.84   (FS,l)
Fattore di sicurezza portata di base   =   2.16   (FS,b)




Elemento con sezione avente:
                Area = 1.76600 m2     Perimetro = 3.60000 m




Criterio per la determinazione della portata di base in uno strato "i"
quando la  Qb,i  ad esso attribuibile e' superiore a quella degli
strati adiacenti:


La base del palo deve essere situata almeno:  3.0 * 1.500 =  4.50 m
   entro lo strato se quello sovrastante e' piu' debole


La base del palo deve essere situata almeno:  3.0 * 1.500 =  4.50 m
   sopra lo strato sottostante se esso e' piu' debole


La variazione di Qb viene assunta lineare dal passaggio di strato
```

```
NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3



DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO



Strato 1 "A    "  (Coesivo)  da    .00  a   7.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    60.0  a    70.5  kPa


Strato 2 "B    "  (Incoerente)  da   7.00  a   9.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 35.0 deg

    Qb   variabile lin. da   1340.  a   1340.  kPa


Strato 3 "A    "  (Coesivo)  da   9.00  a  19.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 100.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da    73.5  a    88.5  kPa
```

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

DEFINIZIONE PARAMETRI E CRITERI DI CALCOLO PER GLI STRATI DI TERRENO

```
Strato 4 "B    "  (Incoerente)  da  19.00  a  30.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = K * tan(delta) * S'v  < 150.0 kPa
          K =  .70             delta = 36.0 deg

    Qb   variabile lin. da   4000.  a   4000.  kPa


Strato 5 "A    "  (Coesivo)  da  30.00  a  60.00 m

    Gn  = 19.0 kN/m3           Ge  =  9.0 kN/m3

    Tau = alfa * Cu  < 120.0  kPa
                               Criterio  alfa(Cu)  nel seguito
          Tau >  .23 * S'v
          Tau <  .55 * S'v

    Qb  =  9.0 * Cu + Sv

    Cu   variabile lin. da   105.0  a   150.0  kPa
```



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

MOLTIPLICATORI per i parametri di calcolo

| strato | Molt. Tau | Molt. Qb | Molt. Cu |
|---|---|---|---|
| 1 "A " | 1.00 | 1.00 | 1.00 |
| 2 "B " | 1.00 | 1.00 | - |
| 3 "A " | 1.00 | 1.00 | 1.00 |
| 4 "B " | 1.00 | 1.00 | - |
| 5 "A " | 1.00 | 1.00 | 1.00 |

NOTA: i moltiplicatori non influenzano le limitazioni
superiori o inferiori dei parametri

Per terreni coesivi: Criterio Tau = alfa * Cu

| Cu kPa | alfa - |
|---|---|
| .0 | .90 |
| 25.0 | .90 |
| 25.1 | .80 |
| 50.0 | .80 |
| 51.0 | .60 |
| 75.0 | .60 |
| 75.1 | .40 |
| 300.0 | .40 |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 1.50 | 28.5 | 28.5 | 62.3 | .55 | 15.7 | 589. |
| 2.00 | 38.0 | 38.0 | 63.0 | .55 | 20.9 | 605. |
| 2.50 | 47.5 | 47.5 | 63.8 | .55 | 26.1 | 621. |
| 3.00 | 57.0 | 57.0 | 64.5 | .55 | 31.4 | 638. |
| 3.50 | 66.5 | 66.5 | 65.3 | .55 | 36.6 | 654. |
| 4.00 | 76.0 | 76.0 | 66.0 | .52 | 39.6 | 670. |
| 4.50 | 85.5 | 85.5 | 66.8 | .47 | 40.1 | 686. |
| 5.00 | 95.0 | 95.0 | 67.5 | .43 | 40.5 | 703. |
| 5.50 | 99.5 | 104.5 | 68.3 | .41 | 41.0 | 719. |
| 6.00 | 104.0 | 114.0 | 69.0 | .40 | 41.4 | 735. |
| 6.50 | 108.5 | 123.5 | 69.8 | .39 | 41.9 | 751. |
| 7.00 | 113.0 | 133.0 | 70.5 | .43 | 48.8 | 768. |
| 7.50 | 117.5 | 142.5 | -- | .49 | 57.6 | 831. |
| 8.00 | 122.0 | 152.0 | -- | .49 | 59.8 | 895. |
| 8.50 | 126.5 | 161.5 | -- | .49 | 62.0 | 895. |
| 9.00 | 131.0 | 171.0 | -- | .41 | 54.2 | 833. |
| 9.50 | 135.5 | 180.5 | 74.3 | .33 | 44.6 | 849. |
| 10.00 | 140.0 | 190.0 | 75.0 | .32 | 45.0 | 865. |
| 10.50 | 144.5 | 199.5 | 75.8 | .23 | 33.2 | 881. |
| 11.00 | 149.0 | 209.0 | 76.5 | .23 | 34.3 | 898. |
| 11.50 | 153.5 | 218.5 | 77.3 | .23 | 35.3 | 914. |
| 12.00 | 158.0 | 228.0 | 78.0 | .23 | 36.3 | 930. |
| 12.50 | 162.5 | 237.5 | 78.8 | .23 | 37.4 | 946. |
| 13.00 | 167.0 | 247.0 | 79.5 | .23 | 38.4 | 963. |
| 13.50 | 171.5 | 256.5 | 80.3 | .23 | 39.4 | 979. |
| 14.00 | 176.0 | 266.0 | 81.0 | .23 | 40.5 | 995. |
| 14.50 | 180.5 | 275.5 | 81.8 | .23 | 41.5 | 1011. |
| 15.00 | 185.0 | 285.0 | 82.5 | .23 | 42.5 | 1028. |
| 15.50 | 189.5 | 294.5 | 83.3 | .23 | 43.6 | 1044. |
| 16.00 | 194.0 | 304.0 | 84.0 | .23 | 44.6 | 1060. |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 16.50 | 198.5 | 313.5 | 84.8 | .23 | 45.7 | 1076. |
| 17.00 | 203.0 | 323.0 | 85.5 | .23 | 46.7 | 1093. |
| 17.50 | 207.5 | 332.5 | 86.3 | .23 | 47.7 | 1109. |
| 18.00 | 212.0 | 342.0 | 87.0 | .23 | 48.8 | 1125. |
| 18.50 | 216.5 | 351.5 | 87.8 | .23 | 49.8 | 1141. |
| 19.00 | 221.0 | 361.0 | 88.5 | .37 | 81.6 | 1158. |
| 19.50 | 225.5 | 370.5 | -- | .51 | 114.7 | 1473. |
| 20.00 | 230.0 | 380.0 | -- | .51 | 117.0 | 1789. |
| 20.50 | 234.5 | 389.5 | -- | .51 | 119.3 | 2105. |
| 21.00 | 239.0 | 399.0 | -- | .51 | 121.6 | 2421. |
| 21.50 | 243.5 | 408.5 | -- | .51 | 123.8 | 2737. |
| 22.00 | 248.0 | 418.0 | -- | .51 | 126.1 | 3053. |
| 22.50 | 252.5 | 427.5 | -- | .51 | 128.4 | 3368. |
| 23.00 | 257.0 | 437.0 | -- | .51 | 130.7 | 3684. |
| 23.50 | 261.5 | 446.5 | -- | .51 | 133.0 | 4000. |
| 24.00 | 266.0 | 456.0 | -- | .51 | 135.3 | 4000. |
| 24.50 | 270.5 | 465.5 | -- | .51 | 137.6 | 4000. |
| 25.00 | 275.0 | 475.0 | -- | .51 | 139.9 | 4000. |
| 25.50 | 279.5 | 484.5 | -- | .51 | 142.1 | 4000. |
| 26.00 | 284.0 | 494.0 | -- | .51 | 144.4 | 3724. |
| 26.50 | 288.5 | 503.5 | -- | .51 | 146.7 | 3448. |
| 27.00 | 293.0 | 513.0 | -- | .51 | 149.0 | 3172. |
| 27.50 | 297.5 | 522.5 | -- | .50 | 150.0 | 2896. |
| 28.00 | 302.0 | 532.0 | -- | .50 | 150.0 | 2619. |
| 28.50 | 306.5 | 541.5 | -- | .49 | 150.0 | 2343. |
| 29.00 | 311.0 | 551.0 | -- | .48 | 150.0 | 2067. |
| 29.50 | 315.5 | 560.5 | -- | .48 | 150.0 | 1791. |
| 30.00 | 320.0 | 570.0 | -- | .35 | 111.8 | 1515. |
| 30.50 | 324.5 | 579.5 | 105.8 | .23 | 74.6 | 1531. |
| 31.00 | 329.0 | 589.0 | 106.5 | .23 | 75.7 | 1548. |



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 31.50 | 333.5 | 598.5 | 107.3 | .23 | 76.7 | 1564. |
| 32.00 | 338.0 | 608.0 | 108.0 | .23 | 77.7 | 1580. |
| 32.50 | 342.5 | 617.5 | 108.8 | .23 | 78.8 | 1596. |
| 33.00 | 347.0 | 627.0 | 109.5 | .23 | 79.8 | 1613. |
| 33.50 | 351.5 | 636.5 | 110.3 | .23 | 80.8 | 1629. |
| 34.00 | 356.0 | 646.0 | 111.0 | .23 | 81.9 | 1645. |
| 34.50 | 360.5 | 655.5 | 111.8 | .23 | 82.9 | 1661. |
| 35.00 | 365.0 | 665.0 | 112.5 | .23 | 84.0 | 1678. |
| 35.50 | 369.5 | 674.5 | 113.3 | .23 | 85.0 | 1694. |
| 36.00 | 374.0 | 684.0 | 114.0 | .23 | 86.0 | 1710. |
| 36.50 | 378.5 | 693.5 | 114.8 | .23 | 87.1 | 1726. |
| 37.00 | 383.0 | 703.0 | 115.5 | .23 | 88.1 | 1743. |
| 37.50 | 387.5 | 712.5 | 116.3 | .23 | 89.1 | 1759. |
| 38.00 | 392.0 | 722.0 | 117.0 | .23 | 90.2 | 1775. |
| 38.50 | 396.5 | 731.5 | 117.8 | .23 | 91.2 | 1791. |
| 39.00 | 401.0 | 741.0 | 118.5 | .23 | 92.2 | 1808. |
| 39.50 | 405.5 | 750.5 | 119.3 | .23 | 93.3 | 1824. |
| 40.00 | 410.0 | 760.0 | 120.0 | .23 | 94.3 | 1840. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 40.50 | 414.5 | 769.5 | 120.8 | .23 | 95.3 | 1856. |
| 41.00 | 419.0 | 779.0 | 121.5 | .23 | 96.4 | 1873. |
| 41.50 | 423.5 | 788.5 | 122.3 | .23 | 97.4 | 1889. |
| 42.00 | 428.0 | 798.0 | 123.0 | .23 | 98.4 | 1905. |
| 42.50 | 432.5 | 807.5 | 123.8 | .23 | 99.5 | 1921. |
| 43.00 | 437.0 | 817.0 | 124.5 | .23 | 100.5 | 1938. |
| 43.50 | 441.5 | 826.5 | 125.3 | .23 | 101.5 | 1954. |
| 44.00 | 446.0 | 836.0 | 126.0 | .23 | 102.6 | 1970. |
| 44.50 | 450.5 | 845.5 | 126.8 | .23 | 103.6 | 1986. |
| 45.00 | 455.0 | 855.0 | 127.5 | .23 | 104.7 | 2003. |
| 45.50 | 459.5 | 864.5 | 128.3 | .23 | 105.7 | 2019. |
| 46.00 | 464.0 | 874.0 | 129.0 | .23 | 106.7 | 2035. |



NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA parametri per valutazione capacita' portante

| zz<br>m | S'v<br>kPa | Sv<br>kPa | Cu<br>kPa | Tau/S'v<br>- | Tau<br>kPa | qb<br>kPa |
|---|---|---|---|---|---|---|
| 46.50 | 468.5 | 883.5 | 129.8 | .23 | 107.8 | 2051. |
| 47.00 | 473.0 | 893.0 | 130.5 | .23 | 108.8 | 2068. |
| 47.50 | 477.5 | 902.5 | 131.3 | .23 | 109.8 | 2084. |
| 48.00 | 482.0 | 912.0 | 132.0 | .23 | 110.9 | 2100. |
| 48.50 | 486.5 | 921.5 | 132.8 | .23 | 111.9 | 2116. |
| 49.00 | 491.0 | 931.0 | 133.5 | .23 | 112.9 | 2133. |
| 49.50 | 495.5 | 940.5 | 134.3 | .23 | 114.0 | 2149. |
| 50.00 | 500.0 | 950.0 | 135.0 | .23 | 115.0 | 2165. |
| 50.50 | 504.5 | 959.5 | 135.8 | .23 | 116.0 | 2181. |
| 51.00 | 509.0 | 969.0 | 136.5 | .23 | 117.1 | 2198. |
| 51.50 | 513.5 | 978.5 | 137.3 | .23 | 118.1 | 2214. |
| 52.00 | 518.0 | 988.0 | 138.0 | .23 | 119.1 | 2230. |
| 52.50 | 522.5 | 997.5 | 138.8 | .23 | 120.0 | 2246. |
| 53.00 | 527.0 | 1007.0 | 139.5 | .23 | 120.0 | 2263. |
| 53.50 | 531.5 | 1016.5 | 140.3 | .23 | 120.0 | 2279. |
| 54.00 | 536.0 | 1026.0 | 141.0 | .22 | 120.0 | 2295. |
| 54.50 | 540.5 | 1035.5 | 141.8 | .22 | 120.0 | 2311. |
| 55.00 | 545.0 | 1045.0 | 142.5 | .22 | 120.0 | 2328. |
| 55.50 | 549.5 | 1054.5 | 143.3 | .22 | 120.0 | 2344. |
| 56.00 | 554.0 | 1064.0 | 144.0 | .22 | 120.0 | 2360. |
| 56.50 | 558.5 | 1073.5 | 144.8 | .21 | 120.0 | 2376. |
| 57.00 | 563.0 | 1083.0 | 145.5 | .21 | 120.0 | 2393. |
| 57.50 | 567.5 | 1092.5 | 146.3 | .21 | 120.0 | 2409. |
| 58.00 | 572.0 | 1102.0 | 147.0 | .21 | 120.0 | 2425. |
| 58.50 | 576.5 | 1111.5 | 147.8 | .21 | 120.0 | 2441. |
| 59.00 | 581.0 | 1121.0 | 148.5 | .21 | 120.0 | 2458. |
| 59.50 | 585.5 | 1130.5 | 149.3 | .20 | 120.0 | 2474. |
| 60.00 | 590.0 | 1140.0 | 150.0 | .20 | 120.0 | 2490. |

zz = Profondita' da piano campagna
S'v = Tensione verticale efficace
Sv = Tensione verticale totale
Cu = Coesione non drenata
Tau = Tensione di adesione laterale limite
qb = Portata di base limite unitaria

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

| Lp m | Qll kN | Qbl kN | Wp kN | Qu kN | Qd kN |
|---|---|---|---|---|---|
| .00 | 0. | 1040. | 0. | 1040. | 481. |
| .50 | 33. | 1068. | 7. | 1094. | 505. |
| 1.00 | 75. | 1097. | 14. | 1158. | 535. |
| 1.50 | 127. | 1126. | 21. | 1231. | 569. |
| 2.00 | 188. | 1155. | 29. | 1314. | 608. |
| 2.50 | 258. | 1183. | 36. | 1405. | 652. |
| 3.00 | 329. | 1212. | 43. | 1498. | 697. |
| 3.50 | 402. | 1241. | 50. | 1592. | 743. |
| 4.00 | 475. | 1269. | 57. | 1687. | 789. |
| 4.50 | 549. | 1298. | 64. | 1783. | 835. |
| 5.00 | 624. | 1327. | 72. | 1879. | 882. |
| 5.50 | 703. | 1355. | 79. | 1980. | 931. |
| 6.00 | 802. | 1468. | 86. | 2184. | 1029. |
| 6.50 | 907. | 1580. | 93. | 2394. | 1132. |
| 7.00 | 1017. | 1581. | 100. | 2498. | 1184. |
| 7.50 | 1126. | 1470. | 107. | 2489. | 1185. |
| 8.00 | 1210. | 1499. | 114. | 2595. | 1237. |
| 8.50 | 1291. | 1528. | 122. | 2697. | 1287. |
| 9.00 | 1355. | 1556. | 129. | 2783. | 1328. |
| 9.50 | 1416. | 1585. | 136. | 2865. | 1368. |
| 10.00 | 1479. | 1614. | 143. | 2949. | 1408. |
| 10.50 | 1543. | 1642. | 150. | 3036. | 1449. |
| 11.00 | 1610. | 1671. | 157. | 3123. | 1491. |
| 11.50 | 1678. | 1700. | 165. | 3213. | 1534. |
| 12.00 | 1748. | 1728. | 172. | 3305. | 1579. |
| 12.50 | 1820. | 1757. | 179. | 3398. | 1624. |
| 13.00 | 1894. | 1786. | 186. | 3494. | 1670. |
| 13.50 | 1969. | 1815. | 193. | 3591. | 1717. |
| 14.00 | 2047. | 1843. | 200. | 3690. | 1766. |
| 14.50 | 2126. | 1872. | 207. | 3791. | 1815. |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

| Lp m | Qll kN | Qbl kN | Wp kN | Qu kN | Qd kN |
|---|---|---|---|---|---|
| 15.00 | 2207. | 1901. | 215. | 3894. | 1865. |
| 15.50 | 2291. | 1929. | 222. | 3998. | 1916. |
| 16.00 | 2376. | 1958. | 229. | 4105. | 1969. |
| 16.50 | 2462. | 1987. | 236. | 4213. | 2022. |
| 17.00 | 2551. | 2015. | 243. | 4323. | 2076. |
| 17.50 | 2656. | 2044. | 250. | 4449. | 2139. |
| 18.00 | 2846. | 2602. | 257. | 5190. | 2494. |
| 18.50 | 3055. | 3160. | 265. | 5950. | 2858. |
| 19.00 | 3267. | 3717. | 272. | 6713. | 3225. |
| 19.50 | 3484. | 4275. | 279. | 7480. | 3594. |
| 20.00 | 3705. | 4833. | 286. | 8252. | 3965. |
| 20.50 | 3930. | 5391. | 293. | 9027. | 4338. |
| 21.00 | 4159. | 5948. | 300. | 9807. | 4714. |
| 21.50 | 4392. | 6506. | 308. | 10591. | 5092. |
| 22.00 | 4629. | 7064. | 315. | 11379. | 5472. |
| 22.50 | 4871. | 7064. | 322. | 11613. | 5596. |
| 23.00 | 5116. | 7064. | 329. | 11851. | 5722. |
| 23.50 | 5366. | 7064. | 336. | 12094. | 5851. |
| 24.00 | 5620. | 7064. | 343. | 12341. | 5981. |
| 24.50 | 5878. | 6576. | 350. | 12104. | 5889. |
| 25.00 | 6140. | 6089. | 358. | 11871. | 5798. |
| 25.50 | 6406. | 5601. | 365. | 11642. | 5710. |
| 26.00 | 6676. | 5114. | 372. | 11417. | 5623. |
| 26.50 | 6946. | 4626. | 379. | 11192. | 5537. |
| 27.00 | 7216. | 4138. | 386. | 10968. | 5451. |
| 27.50 | 7486. | 3651. | 393. | 10743. | 5365. |
| 28.00 | 7756. | 3163. | 401. | 10518. | 5279. |
| 28.50 | 8008. | 2675. | 408. | 10276. | 5183. |
| 29.00 | 8159. | 2704. | 415. | 10448. | 5271. |
| 29.50 | 8294. | 2733. | 422. | 10605. | 5351. |
| 30.00 | 8431. | 2762. | 429. | 10764. | 5432. |
| 30.50 | 8570. | 2790. | 436. | 10924. | 5513. |
| 31.00 | 8711. | 2819. | 443. | 11087. | 5596. |
| 31.50 | 8854. | 2848. | 451. | 11251. | 5680. |
| 32.00 | 8999. | 2876. | 458. | 11417. | 5764. |
| 32.50 | 9145. | 2905. | 465. | 11585. | 5850. |
| 33.00 | 9293. | 2934. | 472. | 11755. | 5937. |
| 33.50 | 9443. | 2962. | 479. | 11927. | 6025. |
| 34.00 | 9596. | 2991. | 486. | 12100. | 6113. |
| 34.50 | 9749. | 3020. | 494. | 12276. | 6203. |
| 35.00 | 9905. | 3049. | 501. | 12453. | 6294. |
| 35.50 | 10063. | 3077. | 508. | 12632. | 6386. |
| 36.00 | 10222. | 3106. | 515. | 12813. | 6479. |
| 36.50 | 10384. | 3135. | 522. | 12996. | 6572. |
| 37.00 | 10547. | 3163. | 529. | 13181. | 6667. |
| 37.50 | 10712. | 3192. | 536. | 13368. | 6763. |
| 38.00 | 10879. | 3221. | 544. | 13556. | 6860. |
| 38.50 | 11048. | 3249. | 551. | 13746. | 6958. |
| 39.00 | 11218. | 3278. | 558. | 13939. | 7057. |
| 39.50 | 11391. | 3307. | 565. | 14133. | 7157. |
| 40.00 | 11565. | 3336. | 572. | 14329. | 7258. |
| 40.50 | 11742. | 3364. | 579. | 14526. | 7359. |
| 41.00 | 11920. | 3393. | 586. | 14726. | 7462. |
| 41.50 | 12100. | 3422. | 594. | 14928. | 7566. |
| 42.00 | 12282. | 3450. | 601. | 15131. | 7671. |
| 42.50 | 12465. | 3479. | 608. | 15336. | 7777. |
| 43.00 | 12651. | 3508. | 615. | 15543. | 7884. |
| 43.50 | 12838. | 3536. | 622. | 15752. | 7992. |
| 44.00 | 13028. | 3565. | 629. | 15963. | 8101. |
| 44.50 | 13219. | 3594. | 637. | 16176. | 8211. |

NODO BOLOGNA CAVALCAVIA CV01 e CV02
Capacita portante palo spigolo SLU A1+M1+R3

STAMPA capacita' portante e relativi contributi

| Lp<br>m | Qll<br>kN | Qbl<br>kN | Wp<br>kN | Qu<br>kN | Qd<br>kN |
|---|---|---|---|---|---|
| 45.00 | 13412. | 3623. | 644. | 16391. | 8322. |
| 45.50 | 13607. | 3651. | 651. | 16607. | 8434. |
| 46.00 | 13803. | 3680. | 658. | 16825. | 8548. |
| 46.50 | 14002. | 3709. | 665. | 17045. | 8662. |
| 47.00 | 14203. | 3737. | 672. | 17268. | 8777. |
| 47.50 | 14405. | 3766. | 679. | 17491. | 8893. |
| 48.00 | 14609. | 3795. | 687. | 17717. | 9010. |
| 48.50 | 14815. | 3823. | 694. | 17945. | 9128. |
| 49.00 | 15023. | 3852. | 701. | 18174. | 9247. |
| 49.50 | 15233. | 3881. | 708. | 18406. | 9367. |
| 50.00 | 15445. | 3909. | 715. | 18639. | 9488. |
| 50.50 | 15658. | 3938. | 722. | 18874. | 9611. |
| 51.00 | 15873. | 3967. | 730. | 19111. | 9734. |
| 51.50 | 16089. | 3996. | 737. | 19348. | 9857. |
| 52.00 | 16305. | 4024. | 744. | 19586. | 9981. |
| 52.50 | 16521. | 4053. | 751. | 19823. | 10104. |
| 53.00 | 16737. | 4082. | 758. | 20061. | 10228. |
| 53.50 | 16953. | 4110. | 765. | 20298. | 10351. |
| 54.00 | 17169. | 4139. | 772. | 20536. | 10475. |
| 54.50 | 17385. | 4168. | 780. | 20774. | 10598. |
| 55.00 | 17601. | 4196. | 787. | 21011. | 10722. |
| 55.50 | 17817. | 4225. | 794. | 21249. | 10846. |
| 56.00 | 18033. | 4254. | 801. | 21486. | 10969. |
| 56.50 | 18249. | 4283. | 808. | 21724. | 11093. |
| 57.00 | 18465. | 4311. | 815. | 21961. | 11216. |
| 57.50 | 18681. | 4340. | 823. | 22199. | 11340. |
| 58.00 | 18897. | 4369. | 830. | 22436. | 11463. |
| 58.50 | 19113. | 4397. | 837. | 22674. | 11587. |

Lp = Lunghezza utile del palo
Qll = Portata laterale limite
Qbl = Portata di base limite
Wp = Peso efficace del palo
Qu = Portata totale limite
Qd = Portata di progetto = Qll/FS,l + Qbl/FS,b - Wp

# 9 APPENDICE B. ANALISI PALIFICATE DI FONDAZIONE. TABULATI DI CALCOLO MAP

## 9.1 Spalla appoggi fissi – Analisi SLU statica e sismica

```
                 M A P  -  Matrix Analysis of Piles
 Programma per l'analisi di palificate collegate da un plinto rigido

                 (C)  G.Guiducci, S.G.I. - luglio 1994

                                                        pag./  2

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica
```

Geometria Palificata

| palo | vin | X m | Y m | Z m | axz deg | ayz deg | axy deg | Box m | Boy m |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 2 | 0 | 4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 3 | 0 | 2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 4 | 0 | .000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 5 | 0 | -2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 6 | 0 | -4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 7 | 0 | -6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 8 | 0 | 5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 9 | 0 | 3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 10 | 0 | 1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 11 | 0 | -1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 12 | 0 | -3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 13 | 0 | -5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 14 | 0 | 4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 15 | 0 | 2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 16 | 0 | .000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 17 | 0 | -2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 18 | 0 | -4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 19 | 0 | 6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 20 | 0 | 4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 21 | 0 | 2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 22 | 0 | .000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 23 | 0 | -2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 24 | 0 | -4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 25 | 0 | -6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 26 | 0 | 5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 27 | 0 | 3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 28 | 0 | 1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 29 | 0 | -1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 30 | 0 | -3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 31 | 0 | -5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 32 | 0 | 4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 33 | 0 | 2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 34 | 0 | .000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 35 | 0 | -2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 36 | 0 | -4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |

```
vin     = 0 - incastro;   1 - cerniera;   2 - appoggio
X, Y, Z = Coordinate testa pali
axz     = Inclinazione palo nel piano  Xp Z  rispetto alla verticale
             (positiva se verso  Xp positivo)
ayz     = Inclinazione palo nel piano  Yp Z  rispetto alla verticale
             (positiva se verso  Yp  positivo)
axy     = Rotazione assi  Xp Yp     (positiva se antioraria)
Box     = Lato dell'elemento parallelo all'asse  Xp
Boy     = Lato dell'elemento parallelo all'asse  Yp
          se  Boy = 0   D = Box:  diametro
          altrimenti    D = sqr (Box * Boy * 1.273): diametro equivalente
```

Caratterizzazione dei pali soggetti a carichi assiali e torsionali
(uguali per tutti i pali)

| palo | AK kN/m | TK kN*m/rad |
|---|---|---|
| 1 | 200000. | .0 |

AK = Rigidezza assiale palo-terreno
TK = Rigidezza torsionale palo-terreno

Baricentro palificata: Xg = .000 m Yg = .000 m
Rotazione direzioni princip. di inerzia: .00 deg

Caratterizzazione del terreno per pali soggetti a carichi trasversali

Terreno tipo 1

| Prof. m | E kN/m2 |
|---|---|
| .00 | 33750.0 |
| 3.00 | 35250.0 |
| 3.10 | 150000.0 |
| 8.00 | 150000.0 |
| 8.10 | 36750.0 |
| 13.00 | 44250.0 |
| 13.10 | 150000.0 |
| 26.00 | 150000.0 |
| 26.10 | 52500.0 |
| 60.00 | 75000.0 |

Caratterizzazione dei pali soggetti a carichi trasversali

| palo | Lp m | EJx kN*m2 | Itx | Ridx | EJy kN*m2 | Ity | Ridy |
|---|---|---|---|---|---|---|---|
| 1 | 50.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 2 | 50.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 3 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 4 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 5 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 6 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 7 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 8 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 9 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 10 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 11 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 12 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 13 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 14 | 50.00 | 7455147. | 1 | .250 | 7455147. | 1 | .250 |
| 15 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 16 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 17 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 18 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 19 | 50.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 20 | 50.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 21 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 22 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 23 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 24 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 25 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 26 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 27 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 28 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 29 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 30 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 31 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |

```
 32    50.00     7455147.    1     .250     7455147.     1     .250
 33    50.00     7455147.    1     .060     7455147.     1     .050
 34    50.00     7455147.    1     .060     7455147.     1     .050
 35    50.00     7455147.    1     .060     7455147.     1     .050
 36    50.00     7455147.    1     .200     7455147.     1     .250
-------------------------------------------------------------------

Lp  = Lunghezza palo (compreso eventuale tratto fuori terra)
EJ  = Rigidezza flessionale del palo
It  = Tipo di terreno
Rid = Moltiplicatore del modulo di reazione orizzontale
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 1
spalla fissa - n777 _STR1 - n789 _STR1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 37143.9 | 7603.2 | 62305.4 | -15916.7 | -59479.7 | -40366.0 |
| 2 | 38065.6 | 6043.7 | 63501.5 | 16816.7 | 59892.0 | 42601.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 75209.5 | 13646.9 | 125806.9 | 900.0 | 10274.5 | 18922.5 |

Punto di applic. carico verticale: Xv = 1.673 m Yv = .137 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 10.446 | 11.458 | 1.496 | .435 | .017 | .058 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3913.1 | 852.5 | -1218.6 | 92.3 | -304.7 | .0 | 1256.1 |
| 2 | 3314.7 | 255.0 | 144.7 | 24.0 | -103.4 | .0 | 177.8 |
| 3 | 2716.3 | 188.5 | 312.9 | 19.3 | -80.6 | .0 | 323.2 |
| 4 | 2118.0 | 188.5 | 312.9 | 14.6 | -57.7 | .0 | 318.2 |
| 5 | 1519.6 | 188.5 | 312.9 | 9.9 | -34.9 | .0 | 314.9 |
| 6 | 921.2 | 188.5 | 312.9 | 5.1 | -12.1 | .0 | 313.2 |
| 7 | 322.8 | 604.6 | -681.8 | 4.1 | 3.5 | .0 | 681.8 |
| 8 | 3620.5 | 591.9 | -635.8 | 72.7 | -248.1 | .0 | 682.5 |
| 9 | 3022.2 | 148.7 | 425.6 | 21.7 | -92.0 | .0 | 435.5 |
| 10 | 2423.8 | 148.7 | 425.6 | 16.9 | -69.2 | .0 | 431.2 |
| 11 | 1825.4 | 148.7 | 425.6 | 12.2 | -46.3 | .0 | 428.2 |
| 12 | 1227.0 | 148.7 | 425.6 | 7.5 | -23.5 | .0 | 426.3 |
| 13 | 628.6 | 591.9 | -635.8 | 9.5 | -17.9 | .0 | 636.0 |
| 14 | 3328.0 | 702.8 | -860.4 | 77.6 | -253.3 | .0 | 897.0 |
| 15 | 2729.6 | 177.7 | 363.1 | 19.3 | -80.6 | .0 | 371.9 |
| 16 | 2131.2 | 177.7 | 363.1 | 14.6 | -57.7 | .0 | 367.6 |
| 17 | 1532.8 | 177.7 | 363.1 | 9.9 | -34.9 | .0 | 364.7 |
| 18 | 934.4 | 579.3 | -589.7 | 18.8 | -47.9 | .0 | 591.7 |
| 19 | 3855.5 | 997.0 | -1706.4 | 92.3 | -304.7 | .0 | 1733.4 |
| 20 | 3257.1 | 312.8 | -107.7 | 24.0 | -103.4 | .0 | 149.3 |
| 21 | 2658.7 | 235.6 | 94.9 | 19.3 | -80.6 | .0 | 124.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2060.3 | 235.6 | 94.9 | 14.6 | -57.7 | .0 | 111.1 |
| 23 | 1462.0 | 235.6 | 94.9 | 9.9 | -34.9 | .0 | 101.1 |
| 24 | 863.6 | 235.6 | 94.9 | 5.1 | -12.1 | .0 | 95.7 |
| 25 | 265.2 | 714.5 | -1082.3 | 4.1 | 3.5 | .0 | 1082.3 |
| 26 | 3549.7 | 727.2 | -1128.4 | 72.7 | -248.1 | .0 | 1155.3 |
| 27 | 2951.3 | 199.3 | 181.4 | 21.7 | -92.0 | .0 | 203.4 |
| 28 | 2352.9 | 199.3 | 181.4 | 16.9 | -69.2 | .0 | 194.1 |
| 29 | 1754.5 | 199.3 | 181.4 | 12.2 | -46.3 | .0 | 187.2 |
| 30 | 1156.1 | 199.3 | 181.4 | 7.5 | -23.5 | .0 | 182.9 |
| 31 | 557.8 | 727.2 | -1128.4 | 9.5 | -17.9 | .0 | 1128.5 |
| 32 | 3243.9 | 889.6 | -1512.8 | 77.6 | -253.3 | .0 | 1533.8 |
| 33 | 2645.5 | 246.4 | 44.8 | 19.3 | -80.6 | .0 | 92.2 |
| 34 | 2047.1 | 246.4 | 44.8 | 14.6 | -57.7 | .0 | 73.1 |
| 35 | 1448.7 | 246.4 | 44.8 | 9.9 | -34.9 | .0 | 56.8 |
| 36 | 850.3 | 739.8 | -1174.4 | 18.8 | -47.9 | .0 | 1175.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 1
spalla fissa - n777 _STR1 - n789 _STR1

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 997.0 | -1706.4 | 92.3 | -304.7 | 1001.3 | 1733.4 |
| 1.56 | 825.6 | -289.7 | 82.3 | -168.4 | 829.7 | 335.1 |
| 3.13 | 601.9 | 888.9 | 66.8 | -47.1 | 605.6 | 890.2 |
| 4.69 | 210.0 | 1490.7 | 36.4 | 31.9 | 213.1 | 1491.0 |
| 6.25 | -31.1 | 1604.4 | 14.1 | 69.9 | 34.1 | 1605.9 |
| 7.81 | -156.7 | 1438.7 | -1.1 | 78.8 | 156.7 | 1440.9 |
| 9.38 | -182.9 | 1158.7 | -5.7 | 71.4 | 183.0 | 1160.9 |
| 10.94 | -181.3 | 872.3 | -7.1 | 61.2 | 181.4 | 874.4 |
| 12.50 | -171.0 | 595.3 | -7.8 | 49.5 | 171.2 | 597.3 |
| 15.00 | -114.1 | 222.2 | -7.3 | 30.1 | 114.3 | 224.2 |
| 17.50 | -54.2 | 17.8 | -5.2 | 14.2 | 54.5 | 22.7 |
| 20.00 | -15.8 | -62.9 | -3.0 | 4.0 | 16.1 | 63.0 |
| 22.50 | 2.9 | -73.8 | -1.2 | -1.0 | 3.1 | 73.8 |
| 25.00 | 8.2 | -56.8 | -.1 | -2.6 | 8.2 | 56.9 |
| 29.17 | 6.4 | -24.3 | .2 | -1.9 | 6.4 | 24.4 |
| 33.33 | 3.1 | -4.6 | .2 | -.9 | 3.1 | 4.7 |
| 37.50 | .7 | 2.9 | .1 | -.3 | .7 | 2.9 |
| 43.75 | -.4 | 2.2 | .0 | .0 | .4 | 2.2 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 2
spalla fissa - n777 _STR2- n789 _STR2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 50794.0 | 6605.2 | 122920.5 | -22759.2 | -85136.4 | -59790.7 |
| 2 | 51541.5 | 4974.6 | 123227.5 | 23877.2 | 84927.2 | 62280.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 102335.5 | 11579.8 | 246148.0 | 1118.0 | 7789.1 | 19936.9 |

Punto di applic. carico verticale: Xv = 2.405 m Yv = .076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 14.213 | 14.381 | 2.422 | .516 | .015 | .061 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5774.1 | 819.7 | -82.2 | 105.9 | -354.3 | .0 | 363.7 |
| 2 | 4805.4 | 188.9 | 1212.3 | 28.3 | -125.3 | .0 | 1218.8 |
| 3 | 3836.8 | 123.0 | 1351.6 | 23.3 | -101.2 | .0 | 1355.4 |
| 4 | 2868.1 | 123.0 | 1351.6 | 18.3 | -77.2 | .0 | 1353.8 |
| 5 | 1899.5 | 123.0 | 1351.6 | 13.3 | -53.1 | .0 | 1352.7 |
| 6 | 930.9 | 123.0 | 1351.6 | 8.3 | -29.0 | .0 | 1352.0 |
| 7 | -37.8 | 552.4 | 448.7 | 12.9 | -29.5 | .0 | 449.7 |
| 8 | 5295.6 | 539.1 | 497.2 | 84.1 | -291.5 | .0 | 576.4 |
| 9 | 4327.0 | 83.9 | 1445.9 | 25.8 | -113.2 | .0 | 1450.3 |
| 10 | 3358.3 | 83.9 | 1445.9 | 20.8 | -89.2 | .0 | 1448.7 |
| 11 | 2389.7 | 83.9 | 1445.9 | 15.8 | -65.1 | .0 | 1447.4 |
| 12 | 1421.0 | 83.9 | 1445.9 | 10.8 | -41.1 | .0 | 1446.5 |
| 13 | 452.4 | 539.1 | 497.2 | 17.5 | -49.0 | .0 | 499.6 |
| 14 | 4817.1 | 658.3 | 281.1 | 90.4 | -300.1 | .0 | 411.2 |
| 15 | 3848.5 | 111.6 | 1404.5 | 23.3 | -101.2 | .0 | 1408.1 |
| 16 | 2879.9 | 111.6 | 1404.5 | 18.3 | -77.2 | .0 | 1406.6 |
| 17 | 1911.2 | 111.6 | 1404.5 | 13.3 | -53.1 | .0 | 1405.5 |
| 18 | 942.6 | 525.8 | 545.7 | 28.4 | -83.7 | .0 | 552.1 |
| 19 | 5723.1 | 972.0 | -596.1 | 105.9 | -354.3 | .0 | 693.4 |
| 20 | 4754.4 | 249.8 | 946.4 | 28.3 | -125.3 | .0 | 954.7 |
| 21 | 3785.8 | 172.5 | 1121.9 | 23.3 | -101.2 | .0 | 1126.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2817.2 | 172.5 | 1121.9 | 18.3 | -77.2 | .0 | 1124.6 |
| 23 | 1848.5 | 172.5 | 1121.9 | 13.3 | -53.1 | .0 | 1123.2 |
| 24 | 879.9 | 172.5 | 1121.9 | 8.3 | -29.0 | .0 | 1122.3 |
| 25 | -88.8 | 668.3 | 26.7 | 12.9 | -29.5 | .0 | 39.8 |
| 26 | 5232.9 | 681.6 | -21.8 | 84.1 | -291.5 | .0 | 292.3 |
| 27 | 4264.3 | 137.2 | 1188.5 | 25.8 | -113.2 | .0 | 1193.9 |
| 28 | 3295.6 | 137.2 | 1188.5 | 20.8 | -89.2 | .0 | 1191.9 |
| 29 | 2327.0 | 137.2 | 1188.5 | 15.8 | -65.1 | .0 | 1190.3 |
| 30 | 1358.3 | 137.2 | 1188.5 | 10.8 | -41.1 | .0 | 1189.3 |
| 31 | 389.7 | 681.6 | -21.8 | 17.5 | -49.0 | .0 | 53.6 |
| 32 | 4742.7 | 855.2 | -406.2 | 90.4 | -300.1 | .0 | 505.0 |
| 33 | 3774.1 | 183.9 | 1069.1 | 23.3 | -101.2 | .0 | 1073.9 |
| 34 | 2805.4 | 183.9 | 1069.1 | 18.3 | -77.2 | .0 | 1071.9 |
| 35 | 1836.8 | 183.9 | 1069.1 | 13.3 | -53.1 | .0 | 1070.4 |
| 36 | 868.2 | 694.9 | -70.3 | 28.4 | -83.7 | .0 | 109.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 3
spalla fissa - n777 _STR3- n789 _STR3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48498.8 | 7285.7 | 113881.0 | -21532.8 | -81112.8 | -56695.0 |
| 2 | 50108.7 | 4638.1 | 116033.9 | 23206.8 | 81700.8 | 60715.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.5 | 11923.8 | 229914.9 | 1674.0 | 17813.9 | 32349.4 |

Punto di applic. carico verticale: Xv = 2.332 m Yv = .181 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 14.021 | 2.299 | .803 | .029 | .098 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5548.7 | 780.1 | -84.6 | 164.9 | -544.8 | .0 | 551.3 |
| 2 | 4629.1 | 180.1 | 1147.5 | 43.3 | -186.9 | .0 | 1162.6 |
| 3 | 3709.6 | 117.4 | 1280.2 | 35.3 | -147.8 | .0 | 1288.7 |
| 4 | 2790.0 | 117.4 | 1280.2 | 27.2 | -108.8 | .0 | 1284.8 |
| 5 | 1870.4 | 117.4 | 1280.2 | 19.1 | -69.8 | .0 | 1282.1 |
| 6 | 950.9 | 117.4 | 1280.2 | 11.0 | -30.8 | .0 | 1280.6 |
| 7 | 31.3 | 525.9 | 420.6 | 14.1 | -18.0 | .0 | 420.9 |
| 8 | 5100.6 | 504.3 | 499.3 | 130.5 | -445.4 | .0 | 669.1 |
| 9 | 4181.0 | 76.8 | 1386.2 | 39.3 | -167.4 | .0 | 1396.2 |
| 10 | 3261.5 | 76.8 | 1386.2 | 31.2 | -128.3 | .0 | 1392.1 |
| 11 | 2341.9 | 76.8 | 1386.2 | 23.1 | -89.3 | .0 | 1389.0 |
| 12 | 1422.3 | 76.8 | 1386.2 | 15.0 | -50.3 | .0 | 1387.1 |
| 13 | 502.8 | 504.3 | 499.3 | 22.4 | -51.9 | .0 | 502.0 |
| 14 | 4652.5 | 605.8 | 333.7 | 139.8 | -457.0 | .0 | 565.9 |
| 15 | 3733.0 | 98.9 | 1365.9 | 35.3 | -147.8 | .0 | 1373.9 |
| 16 | 2813.4 | 98.9 | 1365.9 | 27.2 | -108.8 | .0 | 1370.2 |
| 17 | 1893.8 | 98.9 | 1365.9 | 19.1 | -69.8 | .0 | 1367.7 |
| 18 | 974.3 | 482.7 | 578.0 | 39.2 | -105.8 | .0 | 587.6 |
| 19 | 5446.9 | 1027.2 | -918.5 | 164.9 | -544.8 | .0 | 1067.9 |
| 20 | 4527.3 | 278.9 | 716.1 | 43.3 | -186.9 | .0 | 740.0 |
| 21 | 3607.8 | 197.8 | 907.5 | 35.3 | -147.8 | .0 | 919.4 |

```
  22   2688.2    197.8    907.5     27.2   -108.8       .0     914.0
  23   1768.6    197.8    907.5     19.1    -69.8       .0     910.2
  24    849.1    197.8    907.5     11.0    -30.8       .0     908.0
  25    -70.5    713.9   -264.2     14.1    -18.0       .0     264.8
  26   4975.4    735.5   -342.9    130.5   -445.4       .0     562.1
  27   4055.9    163.4    968.6     39.3   -167.4       .0     982.9
  28   3136.3    163.4    968.6     31.2   -128.3       .0     977.0
  29   2216.7    163.4    968.6     23.1    -89.3       .0     972.7
  30   1297.2    163.4    968.6     15.0    -50.3       .0     969.9
  31    377.6    735.5   -342.9     22.4    -51.9       .0     346.8
  32   4503.9    925.2   -781.5    139.8   -457.0       .0     905.3
  33   3584.4    216.2    821.8     35.3   -147.8       .0     835.0
  34   2664.8    216.2    821.8     27.2   -108.8       .0     829.0
  35   1745.2    216.2    821.8     19.1    -69.8       .0     824.8
  36    825.7    757.1   -421.6     39.2   -105.8       .0     434.6
-------------------------------------------------------------------

Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 4
spalla fissa - n777 _STR4- n789 _STR4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 50108.7 | 4633.7 | 116022.3 | -23161.0 | -82537.7 | -59426.7 |
| 2 | 48498.8 | 7290.2 | 113892.6 | 21487.0 | 81948.8 | 55447.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.5 | 11923.9 | 229914.9 | -1674.0 | -17814.8 | -32404.3 |

Punto di applic. carico verticale: Xv = 2.332 m Yv = -.181 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 14.021 | 2.299 | -.803 | -.029 | -.099 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5446.9 | 1027.5 | -919.2 | -165.1 | 545.3 | .0 | 1068.7 |
| 2 | 4527.3 | 279.0 | 715.7 | -43.4 | 187.0 | .0 | 739.7 |
| 3 | 3607.8 | 197.8 | 907.2 | -35.3 | 147.9 | .0 | 919.1 |
| 4 | 2688.2 | 197.8 | 907.2 | -27.2 | 108.8 | .0 | 913.7 |
| 5 | 1768.6 | 197.8 | 907.2 | -19.1 | 69.7 | .0 | 909.8 |
| 6 | 849.1 | 197.8 | 907.2 | -11.0 | 30.6 | .0 | 907.7 |
| 7 | -70.5 | 714.1 | -264.8 | -13.9 | 17.5 | .0 | 265.3 |
| 8 | 4975.4 | 735.7 | -343.6 | -130.5 | 445.8 | .0 | 562.8 |
| 9 | 4055.9 | 163.4 | 968.2 | -39.3 | 167.5 | .0 | 982.6 |
| 10 | 3136.3 | 163.4 | 968.2 | -31.2 | 128.4 | .0 | 976.7 |
| 11 | 2216.7 | 163.4 | 968.2 | -23.1 | 89.3 | .0 | 972.3 |
| 12 | 1297.1 | 163.4 | 968.2 | -15.0 | 50.2 | .0 | 969.5 |
| 13 | 377.6 | 735.7 | -343.6 | -22.3 | 51.6 | .0 | 347.5 |
| 14 | 4503.9 | 925.5 | -782.5 | -139.9 | 457.3 | .0 | 906.3 |
| 15 | 3584.4 | 216.3 | 821.3 | -35.3 | 147.9 | .0 | 834.5 |
| 16 | 2664.8 | 216.3 | 821.3 | -27.2 | 108.8 | .0 | 828.5 |
| 17 | 1745.2 | 216.3 | 821.3 | -19.1 | 69.7 | .0 | 824.3 |
| 18 | 825.7 | 757.4 | -422.4 | -39.1 | 105.5 | .0 | 435.4 |
| 19 | 5548.7 | 779.9 | -83.9 | -165.1 | 545.3 | .0 | 551.7 |
| 20 | 4629.1 | 180.0 | 1147.8 | -43.4 | 187.0 | .0 | 1163.0 |
| 21 | 3709.6 | 117.3 | 1280.5 | -35.3 | 147.9 | .0 | 1289.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2790.0 | 117.3 | 1280.5 | -27.2 | 108.8 | .0 | 1285.2 |
| 23 | 1870.4 | 117.3 | 1280.5 | -19.1 | 69.7 | .0 | 1282.4 |
| 24 | 950.9 | 117.3 | 1280.5 | -11.0 | 30.6 | .0 | 1280.9 |
| 25 | 31.3 | 525.8 | 421.1 | -13.9 | 17.5 | .0 | 421.5 |
| 26 | 5100.6 | 504.1 | 500.0 | -130.5 | 445.8 | .0 | 669.8 |
| 27 | 4181.0 | 76.8 | 1386.5 | -39.3 | 167.5 | .0 | 1396.6 |
| 28 | 3261.5 | 76.8 | 1386.5 | -31.2 | 128.4 | .0 | 1392.4 |
| 29 | 2341.9 | 76.8 | 1386.5 | -23.1 | 89.3 | .0 | 1389.4 |
| 30 | 1422.3 | 76.8 | 1386.5 | -15.0 | 50.2 | .0 | 1387.4 |
| 31 | 502.8 | 504.1 | 500.0 | -22.3 | 51.6 | .0 | 502.6 |
| 32 | 4652.5 | 605.6 | 334.6 | -139.9 | 457.3 | .0 | 566.7 |
| 33 | 3733.0 | 98.8 | 1366.4 | -35.3 | 147.9 | .0 | 1374.4 |
| 34 | 2813.4 | 98.8 | 1366.4 | -27.2 | 108.8 | .0 | 1370.7 |
| 35 | 1893.8 | 98.8 | 1366.4 | -19.1 | 69.7 | .0 | 1368.1 |
| 36 | 974.3 | 482.5 | 578.8 | -39.1 | 105.5 | .0 | 588.3 |

```
Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 5
spalla fissa - n777 _STR5 - n789 _STR5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 37143.9 | 7603.2 | 62305.4 | -15916.7 | -59479.7 | -40366.0 |
| 2 | 38065.6 | 6043.7 | 63501.5 | 16816.7 | 59892.0 | 42601.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 75209.5 | 13646.9 | 125806.9 | 900.0 | 10274.5 | 18922.5 |

Punto di applic. carico verticale: Xv = 1.673 m Yv = .137 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 10.446 | 11.458 | 1.496 | .435 | .017 | .058 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3913.1 | 852.5 | -1218.6 | 92.3 | -304.7 | .0 | 1256.1 |
| 2 | 3314.7 | 255.0 | 144.7 | 24.0 | -103.4 | .0 | 177.8 |
| 3 | 2716.3 | 188.5 | 312.9 | 19.3 | -80.6 | .0 | 323.2 |
| 4 | 2118.0 | 188.5 | 312.9 | 14.6 | -57.7 | .0 | 318.2 |
| 5 | 1519.6 | 188.5 | 312.9 | 9.9 | -34.9 | .0 | 314.9 |
| 6 | 921.2 | 188.5 | 312.9 | 5.1 | -12.1 | .0 | 313.2 |
| 7 | 322.8 | 604.6 | -681.8 | 4.1 | 3.5 | .0 | 681.8 |
| 8 | 3620.5 | 591.9 | -635.8 | 72.7 | -248.1 | .0 | 682.5 |
| 9 | 3022.2 | 148.7 | 425.6 | 21.7 | -92.0 | .0 | 435.5 |
| 10 | 2423.8 | 148.7 | 425.6 | 16.9 | -69.2 | .0 | 431.2 |
| 11 | 1825.4 | 148.7 | 425.6 | 12.2 | -46.3 | .0 | 428.2 |
| 12 | 1227.0 | 148.7 | 425.6 | 7.5 | -23.5 | .0 | 426.3 |
| 13 | 628.6 | 591.9 | -635.8 | 9.5 | -17.9 | .0 | 636.0 |
| 14 | 3328.0 | 702.8 | -860.4 | 77.6 | -253.3 | .0 | 897.0 |
| 15 | 2729.6 | 177.7 | 363.1 | 19.3 | -80.6 | .0 | 371.9 |
| 16 | 2131.2 | 177.7 | 363.1 | 14.6 | -57.7 | .0 | 367.6 |
| 17 | 1532.8 | 177.7 | 363.1 | 9.9 | -34.9 | .0 | 364.7 |
| 18 | 934.4 | 579.3 | -589.7 | 18.8 | -47.9 | .0 | 591.7 |
| 19 | 3855.5 | 997.0 | -1706.4 | 92.3 | -304.7 | .0 | 1733.4 |
| 20 | 3257.1 | 312.8 | -107.7 | 24.0 | -103.4 | .0 | 149.3 |
| 21 | 2658.7 | 235.6 | 94.9 | 19.3 | -80.6 | .0 | 124.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2060.3 | 235.6 | 94.9 | 14.6 | -57.7 | .0 | 111.1 |
| 23 | 1462.0 | 235.6 | 94.9 | 9.9 | -34.9 | .0 | 101.1 |
| 24 | 863.6 | 235.6 | 94.9 | 5.1 | -12.1 | .0 | 95.7 |
| 25 | 265.2 | 714.5 | -1082.3 | 4.1 | 3.5 | .0 | 1082.3 |
| 26 | 3549.7 | 727.2 | -1128.4 | 72.7 | -248.1 | .0 | 1155.3 |
| 27 | 2951.3 | 199.3 | 181.4 | 21.7 | -92.0 | .0 | 203.4 |
| 28 | 2352.9 | 199.3 | 181.4 | 16.9 | -69.2 | .0 | 194.1 |
| 29 | 1754.5 | 199.3 | 181.4 | 12.2 | -46.3 | .0 | 187.2 |
| 30 | 1156.1 | 199.3 | 181.4 | 7.5 | -23.5 | .0 | 182.9 |
| 31 | 557.8 | 727.2 | -1128.4 | 9.5 | -17.9 | .0 | 1128.5 |
| 32 | 3243.9 | 889.6 | -1512.8 | 77.6 | -253.3 | .0 | 1533.8 |
| 33 | 2645.5 | 246.4 | 44.8 | 19.3 | -80.6 | .0 | 92.2 |
| 34 | 2047.1 | 246.4 | 44.8 | 14.6 | -57.7 | .0 | 73.1 |
| 35 | 1448.7 | 246.4 | 44.8 | 9.9 | -34.9 | .0 | 56.8 |
| 36 | 850.3 | 739.8 | -1174.4 | 18.8 | -47.9 | .0 | 1175.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 6
spalla fissa - n777 _STR6- n789 _STR6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48484.5 | 5020.1 | 109526.1 | -21985.0 | -79520.2 | -57304.0 |
| 2 | 45556.0 | 7611.7 | 101963.8 | 20311.0 | 76470.1 | 52629.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 94040.5 | 12631.8 | 211489.9 | -1674.0 | -34385.1 | -32404.4 |

Punto di applic. carico verticale: Xv = 2.249 m Yv = -.366 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.061 | 13.782 | 2.170 | -.883 | -.049 | -.099 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5131.4 | 1055.5 | -1156.5 | -166.5 | 529.2 | .0 | 1271.8 |
| 2 | 4263.3 | 297.6 | 526.3 | -42.8 | 168.9 | .0 | 552.7 |
| 3 | 3395.2 | 214.6 | 727.3 | -34.7 | 129.9 | .0 | 738.8 |
| 4 | 2527.1 | 214.6 | 727.3 | -26.6 | 90.8 | .0 | 733.0 |
| 5 | 1659.0 | 214.6 | 727.3 | -18.5 | 51.7 | .0 | 729.2 |
| 6 | 790.8 | 214.6 | 727.3 | -10.4 | 12.6 | .0 | 727.4 |
| 7 | -77.3 | 739.2 | -487.0 | -15.4 | 1.5 | .0 | 487.0 |
| 8 | 4677.8 | 760.9 | -565.9 | -131.4 | 429.0 | .0 | 710.1 |
| 9 | 3809.7 | 179.1 | 794.3 | -38.7 | 149.4 | .0 | 808.2 |
| 10 | 2941.5 | 179.1 | 794.3 | -30.6 | 110.3 | .0 | 801.9 |
| 11 | 2073.4 | 179.1 | 794.3 | -22.5 | 71.2 | .0 | 797.5 |
| 12 | 1205.3 | 179.1 | 794.3 | -14.4 | 32.1 | .0 | 794.9 |
| 13 | 337.2 | 760.9 | -565.9 | -23.2 | 34.8 | .0 | 567.0 |
| 14 | 4224.1 | 952.3 | -1013.0 | -141.3 | 441.3 | .0 | 1105.0 |
| 15 | 3356.0 | 233.1 | 641.5 | -34.7 | 129.9 | .0 | 654.5 |
| 16 | 2487.9 | 233.1 | 641.5 | -26.6 | 90.8 | .0 | 647.9 |
| 17 | 1619.8 | 233.1 | 641.5 | -18.5 | 51.7 | .0 | 643.6 |
| 18 | 751.7 | 782.5 | -644.7 | -40.5 | 89.4 | .0 | 650.9 |
| 19 | 5301.7 | 808.0 | -321.2 | -166.5 | 529.2 | .0 | 619.1 |
| 20 | 4433.6 | 198.6 | 958.4 | -42.8 | 168.9 | .0 | 973.2 |
| 21 | 3565.5 | 134.1 | 1100.7 | -34.7 | 129.9 | .0 | 1108.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2697.4 | 134.1 | 1100.7 | -26.6 | 90.8 | .0 | 1104.4 |
| 23 | 1829.3 | 134.1 | 1100.7 | -18.5 | 51.7 | .0 | 1101.9 |
| 24 | 961.2 | 134.1 | 1100.7 | -10.4 | 12.6 | .0 | 1100.8 |
| 25 | 93.1 | 550.9 | 198.9 | -15.4 | 1.5 | .0 | 198.9 |
| 26 | 4887.3 | 529.3 | 277.7 | -131.4 | 429.0 | .0 | 511.0 |
| 27 | 4019.2 | 92.4 | 1212.6 | -38.7 | 149.4 | .0 | 1221.8 |
| 28 | 3151.0 | 92.4 | 1212.6 | -30.6 | 110.3 | .0 | 1217.6 |
| 29 | 2282.9 | 92.4 | 1212.6 | -22.5 | 71.2 | .0 | 1214.7 |
| 30 | 1414.8 | 92.4 | 1212.6 | -14.4 | 32.1 | .0 | 1213.0 |
| 31 | 546.7 | 529.3 | 277.7 | -23.2 | 34.8 | .0 | 279.9 |
| 32 | 4472.8 | 632.4 | 104.0 | -141.3 | 441.3 | .0 | 453.4 |
| 33 | 3604.7 | 115.6 | 1186.5 | -34.7 | 129.9 | .0 | 1193.6 |
| 34 | 2736.6 | 115.6 | 1186.5 | -26.6 | 90.8 | .0 | 1190.0 |
| 35 | 1868.5 | 115.6 | 1186.5 | -18.5 | 51.7 | .0 | 1187.7 |
| 36 | 1000.3 | 507.6 | 356.5 | -40.5 | 89.4 | .0 | 367.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 7
spalla fissa - n777 _STR7- n789 _STR7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48824.5 | 9969.3 | 130711.0 | -21756.3 | -81903.8 | -71663.9 |
| 2 | 49783.1 | 8382.6 | 131986.7 | 22743.3 | 82266.8 | 74077.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.6 | 18351.9 | 262697.7 | 987.0 | 10620.0 | 19390.9 |

Punto di applic. carico verticale: Xv = 2.664 m Yv = .108 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 18.533 | 2.785 | .474 | .017 | .059 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 6111.0 | 1244.1 | -1111.8 | 98.0 | -323.7 | .0 | 1158.0 |
| 2 | 4997.1 | 337.8 | 867.8 | 25.7 | -110.8 | .0 | 874.8 |
| 3 | 3883.2 | 239.5 | 1099.6 | 20.9 | -87.4 | .0 | 1103.1 |
| 4 | 2769.3 | 239.5 | 1099.6 | 16.0 | -64.0 | .0 | 1101.4 |
| 5 | 1655.5 | 239.5 | 1099.6 | 11.2 | -40.6 | .0 | 1100.3 |
| 6 | 541.6 | 239.5 | 1099.6 | 6.3 | -17.2 | .0 | 1099.7 |
| 7 | -572.3 | 864.6 | -319.4 | 7.6 | -7.9 | .0 | 319.5 |
| 8 | 5561.0 | 851.7 | -272.2 | 77.5 | -264.4 | .0 | 379.5 |
| 9 | 4447.1 | 183.2 | 1244.2 | 23.3 | -99.1 | .0 | 1248.2 |
| 10 | 3333.2 | 183.2 | 1244.2 | 18.4 | -75.7 | .0 | 1246.5 |
| 11 | 2219.4 | 183.2 | 1244.2 | 13.6 | -52.3 | .0 | 1245.3 |
| 12 | 1105.5 | 183.2 | 1244.2 | 8.7 | -28.9 | .0 | 1244.5 |
| 13 | -8.4 | 851.7 | -272.2 | 12.7 | -28.5 | .0 | 273.7 |
| 14 | 5011.0 | 1029.5 | -627.9 | 82.9 | -271.1 | .0 | 684.0 |
| 15 | 3897.1 | 228.4 | 1150.9 | 20.9 | -87.4 | .0 | 1154.3 |
| 16 | 2783.3 | 228.4 | 1150.9 | 16.0 | -64.0 | .0 | 1152.7 |
| 17 | 1669.4 | 228.4 | 1150.9 | 11.2 | -40.6 | .0 | 1151.7 |
| 18 | 555.5 | 838.7 | -225.0 | 22.6 | -60.5 | .0 | 233.0 |
| 19 | 6050.5 | 1392.2 | -1611.6 | 98.0 | -323.7 | .0 | 1643.8 |
| 20 | 4936.6 | 397.0 | 609.2 | 25.7 | -110.8 | .0 | 619.2 |
| 21 | 3822.7 | 287.7 | 876.2 | 20.9 | -87.4 | .0 | 880.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2708.9 | 287.7 | 876.2 | 16.0 | -64.0 | .0 | 878.5 |
| 23 | 1595.0 | 287.7 | 876.2 | 11.2 | -40.6 | .0 | 877.1 |
| 24 | 481.1 | 287.7 | 876.2 | 6.3 | -17.2 | .0 | 876.3 |
| 25 | -632.8 | 977.3 | -729.8 | 7.6 | -7.9 | .0 | 729.9 |
| 26 | 5486.6 | 990.3 | -777.0 | 77.5 | -264.4 | .0 | 820.8 |
| 27 | 4372.7 | 235.0 | 993.9 | 23.3 | -99.1 | .0 | 998.8 |
| 28 | 3258.8 | 235.0 | 993.9 | 18.4 | -75.7 | .0 | 996.8 |
| 29 | 2145.0 | 235.0 | 993.9 | 13.6 | -52.3 | .0 | 995.3 |
| 30 | 1031.1 | 235.0 | 993.9 | 8.7 | -28.9 | .0 | 994.3 |
| 31 | -82.8 | 990.3 | -777.0 | 12.7 | -28.5 | .0 | 777.5 |
| 32 | 4922.7 | 1220.9 | -1296.4 | 82.9 | -271.1 | .0 | 1324.4 |
| 33 | 3808.8 | 298.7 | 824.8 | 20.9 | -87.4 | .0 | 829.4 |
| 34 | 2694.9 | 298.7 | 824.8 | 16.0 | -64.0 | .0 | 827.3 |
| 35 | 1581.1 | 298.7 | 824.8 | 11.2 | -40.6 | .0 | 825.8 |
| 36 | 467.2 | 1003.2 | -824.2 | 22.6 | -60.5 | .0 | 826.4 |

```
Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 7
spalla fissa - n777 _STR7- n789 _STR7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1244.1 | -1111.8 | 98.0 | -323.7 | 1248.0 | 1158.0 |
| 1.56 | 991.1 | 621.7 | 87.4 | -179.0 | 995.0 | 646.9 |
| 3.13 | 678.4 | 2011.2 | 70.9 | -50.2 | 682.1 | 2011.9 |
| 4.69 | 151.7 | 2610.1 | 38.7 | 33.7 | 156.5 | 2610.3 |
| 6.25 | -149.4 | 2573.7 | 15.0 | 74.0 | 150.1 | 2574.8 |
| 7.81 | -284.4 | 2208.0 | -1.1 | 83.5 | 284.4 | 2209.6 |
| 9.38 | -303.4 | 1734.3 | -6.1 | 75.8 | 303.5 | 1736.0 |
| 10.94 | -292.1 | 1266.6 | -7.5 | 65.0 | 292.2 | 1268.2 |
| 12.50 | -269.5 | 825.2 | -8.2 | 52.5 | 269.7 | 826.9 |
| 15.00 | -168.4 | 250.9 | -7.7 | 31.9 | 168.6 | 253.0 |
| 17.50 | -71.3 | -36.4 | -5.5 | 15.0 | 71.5 | 39.4 |
| 20.00 | -14.0 | -131.2 | -3.1 | 4.3 | 14.3 | 131.3 |
| 22.50 | 10.9 | -126.8 | -1.3 | -1.1 | 11.0 | 126.8 |
| 25.00 | 15.1 | -89.4 | -.1 | -2.8 | 15.1 | 89.4 |
| 29.17 | 10.3 | -35.0 | .2 | -2.0 | 10.3 | 35.1 |
| 33.33 | 4.6 | -4.4 | .2 | -1.0 | 4.7 | 4.6 |
| 37.50 | .8 | 6.0 | .1 | -.3 | .8 | 6.0 |
| 43.75 | -.8 | 3.7 | .0 | .0 | .8 | 3.7 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 7
spalla fissa - n777 _STR7- n789 _STR7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1392.2 | -1611.6 | 98.0 | -323.7 | 1395.7 | 1643.8 |
| 1.56 | 1123.2 | 340.6 | 87.4 | -179.0 | 1126.6 | 384.8 |
| 3.13 | 785.4 | 1924.9 | 70.9 | -50.2 | 788.6 | 1925.6 |
| 4.69 | 209.6 | 2650.0 | 38.7 | 33.7 | 213.1 | 2650.2 |
| 6.25 | -127.2 | 2673.7 | 15.0 | 74.0 | 128.1 | 2674.7 |
| 7.81 | -286.2 | 2321.9 | -1.1 | 83.5 | 286.2 | 2323.4 |
| 9.38 | -312.4 | 1836.6 | -6.1 | 75.8 | 312.4 | 1838.2 |
| 10.94 | -303.1 | 1353.0 | -7.5 | 65.0 | 303.2 | 1354.6 |
| 12.50 | -281.4 | 893.7 | -8.2 | 52.5 | 281.5 | 895.3 |
| 15.00 | -179.1 | 290.3 | -7.7 | 31.9 | 179.2 | 292.1 |
| 17.50 | -78.5 | -19.6 | -5.5 | 15.0 | 78.7 | 24.7 |
| 20.00 | -17.7 | -127.8 | -3.1 | 4.3 | 18.0 | 127.8 |
| 22.50 | 9.6 | -129.3 | -1.3 | -1.1 | 9.7 | 129.3 |
| 25.00 | 15.1 | -93.3 | -.1 | -2.8 | 15.1 | 93.4 |
| 29.17 | 10.7 | -37.5 | .2 | -2.0 | 10.7 | 37.6 |
| 33.33 | 4.9 | -5.4 | .2 | -1.0 | 4.9 | 5.5 |
| 37.50 | .9 | 5.8 | .1 | -.3 | .9 | 5.8 |
| 43.75 | -.8 | 3.8 | .0 | .0 | .8 | 3.8 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 7
spalla fissa - n777 _STR7- n789 _STR7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 977.3 | -729.8 | 7.6 | -7.9 | 977.3 | 729.9 |
| 1.56 | 797.3 | 648.3 | 6.1 | 2.8 | 797.4 | 648.3 |
| 3.13 | 566.5 | 1778.9 | 4.4 | 11.5 | 566.5 | 1778.9 |
| 4.69 | 163.3 | 2315.8 | 1.2 | 15.6 | 163.3 | 2315.8 |
| 6.25 | -87.0 | 2348.9 | -.6 | 15.8 | 87.0 | 2349.0 |
| 7.81 | -219.9 | 2089.7 | -1.6 | 13.9 | 219.9 | 2089.8 |
| 9.38 | -248.2 | 1708.3 | -1.8 | 11.2 | 248.2 | 1708.3 |
| 10.94 | -246.8 | 1319.4 | -1.7 | 8.5 | 246.8 | 1319.4 |
| 12.50 | -235.6 | 940.5 | -1.6 | 5.8 | 235.6 | 940.5 |
| 15.00 | -168.4 | 414.8 | -1.1 | 2.2 | 168.4 | 414.8 |
| 17.50 | -92.1 | 94.5 | -.5 | .2 | 92.1 | 94.5 |
| 20.00 | -37.4 | -60.0 | -.2 | -.6 | 37.4 | 60.0 |
| 22.50 | -5.7 | -107.3 | .0 | -.8 | 5.7 | 107.3 |
| 25.00 | 8.7 | -99.8 | .1 | -.6 | 8.7 | 99.8 |
| 29.17 | 10.1 | -54.5 | .1 | -.3 | 10.1 | 54.5 |
| 33.33 | 6.3 | -19.7 | .0 | -.1 | 6.3 | 19.7 |
| 37.50 | 2.4 | -1.6 | .0 | .0 | 2.4 | 1.6 |
| 43.75 | -.3 | 3.1 | .0 | .0 | .3 | 3.1 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 8
spalla fissa - n777 _STR8 - n789 _STR8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48824.5 | 3372.1 | 97076.1 | -21983.3 | -80864.4 | -42088.8 |
| 2 | 49783.0 | 1789.7 | 98352.6 | 22970.3 | 81225.9 | 44450.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.5 | 5161.8 | 195428.7 | 987.0 | 10617.4 | 19293.3 |

Punto di applic. carico verticale: Xv = 1.982 m Yv = .108 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 9.275 | 1.788 | .474 | .017 | .059 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4914.8 | 394.0 | 651.9 | 97.8 | -322.9 | .0 | 727.5 |
| 2 | 4199.6 | 55.1 | 1263.8 | 25.7 | -110.6 | .0 | 1268.6 |
| 3 | 3484.5 | 22.1 | 1316.5 | 20.8 | -87.3 | .0 | 1319.4 |
| 4 | 2769.3 | 22.1 | 1316.5 | 16.0 | -64.0 | .0 | 1318.0 |
| 5 | 2054.2 | 22.1 | 1316.5 | 11.2 | -40.8 | .0 | 1317.1 |
| 6 | 1339.0 | 22.1 | 1316.5 | 6.4 | -17.5 | .0 | 1316.6 |
| 7 | 623.9 | 247.2 | 916.5 | 7.8 | -8.7 | .0 | 916.5 |
| 8 | 4564.2 | 234.3 | 963.4 | 77.3 | -263.8 | .0 | 998.9 |
| 9 | 3849.0 | .7 | 1363.2 | 23.3 | -99.0 | .0 | 1366.8 |
| 10 | 3133.9 | .7 | 1363.2 | 18.4 | -75.7 | .0 | 1365.3 |
| 11 | 2418.7 | .7 | 1363.2 | 13.6 | -52.4 | .0 | 1364.2 |
| 12 | 1703.6 | .7 | 1363.2 | 8.8 | -29.1 | .0 | 1363.5 |
| 13 | 988.4 | 234.3 | 963.4 | 12.9 | -29.1 | .0 | 963.9 |
| 14 | 4213.6 | 292.0 | 885.3 | 82.8 | -270.5 | .0 | 925.7 |
| 15 | 3498.4 | 11.1 | 1367.6 | 20.8 | -87.3 | .0 | 1370.4 |
| 16 | 2783.2 | 11.1 | 1367.6 | 16.0 | -64.0 | .0 | 1369.1 |
| 17 | 2068.1 | 11.1 | 1367.6 | 11.2 | -40.8 | .0 | 1368.2 |
| 18 | 1352.9 | 221.4 | 1010.4 | 22.8 | -61.1 | .0 | 1012.2 |
| 19 | 4854.3 | 541.4 | 154.6 | 97.8 | -322.9 | .0 | 358.0 |
| 20 | 4139.2 | 114.0 | 1006.5 | 25.7 | -110.6 | .0 | 1012.5 |
| 21 | 3424.0 | 70.1 | 1094.2 | 20.8 | -87.3 | .0 | 1097.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2708.9 | 70.1 | 1094.2 | 16.0 | -64.0 | .0 | 1096.1 |
| 23 | 1993.7 | 70.1 | 1094.2 | 11.2 | -40.8 | .0 | 1094.9 |
| 24 | 1278.5 | 70.1 | 1094.2 | 6.4 | -17.5 | .0 | 1094.3 |
| 25 | 563.4 | 359.3 | 508.1 | 7.8 | -8.7 | .0 | 508.2 |
| 26 | 4489.8 | 372.2 | 461.2 | 77.3 | -263.8 | .0 | 531.3 |
| 27 | 3774.6 | 52.3 | 1114.2 | 23.3 | -99.0 | .0 | 1118.6 |
| 28 | 3059.5 | 52.3 | 1114.2 | 18.4 | -75.7 | .0 | 1116.7 |
| 29 | 2344.3 | 52.3 | 1114.2 | 13.6 | -52.4 | .0 | 1115.4 |
| 30 | 1629.2 | 52.3 | 1114.2 | 8.8 | -29.1 | .0 | 1114.6 |
| 31 | 914.0 | 372.2 | 461.2 | 12.9 | -29.1 | .0 | 462.1 |
| 32 | 4125.3 | 482.4 | 220.2 | 82.8 | -270.5 | .0 | 348.8 |
| 33 | 3410.1 | 81.1 | 1043.1 | 20.8 | -87.3 | .0 | 1046.7 |
| 34 | 2694.9 | 81.1 | 1043.1 | 16.0 | -64.0 | .0 | 1045.0 |
| 35 | 1979.8 | 81.1 | 1043.1 | 11.2 | -40.8 | .0 | 1043.9 |
| 36 | 1264.6 | 385.1 | 414.2 | 22.8 | -61.1 | .0 | 418.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 9
spalla fissa - n777 _STR9- n789 _STR9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48824.5 | 9969.3 | 130711.0 | -21756.3 | -81903.8 | -71663.9 |
| 2 | 49783.1 | 8382.6 | 131986.7 | 22743.3 | 82266.8 | 74077.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.6 | 18351.9 | 262697.7 | 987.0 | 10620.0 | 19390.9 |

Punto di applic. carico verticale: Xv = 2.664 m Yv = .108 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 18.533 | 2.785 | .474 | .017 | .059 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 6111.0 | 1244.1 | -1111.8 | 98.0 | -323.7 | .0 | 1158.0 |
| 2 | 4997.1 | 337.8 | 867.8 | 25.7 | -110.8 | .0 | 874.8 |
| 3 | 3883.2 | 239.5 | 1099.6 | 20.9 | -87.4 | .0 | 1103.1 |
| 4 | 2769.3 | 239.5 | 1099.6 | 16.0 | -64.0 | .0 | 1101.4 |
| 5 | 1655.5 | 239.5 | 1099.6 | 11.2 | -40.6 | .0 | 1100.3 |
| 6 | 541.6 | 239.5 | 1099.6 | 6.3 | -17.2 | .0 | 1099.7 |
| 7 | -572.3 | 864.6 | -319.4 | 7.6 | -7.9 | .0 | 319.5 |
| 8 | 5561.0 | 851.7 | -272.2 | 77.5 | -264.4 | .0 | 379.5 |
| 9 | 4447.1 | 183.2 | 1244.2 | 23.3 | -99.1 | .0 | 1248.2 |
| 10 | 3333.2 | 183.2 | 1244.2 | 18.4 | -75.7 | .0 | 1246.5 |
| 11 | 2219.4 | 183.2 | 1244.2 | 13.6 | -52.3 | .0 | 1245.3 |
| 12 | 1105.5 | 183.2 | 1244.2 | 8.7 | -28.9 | .0 | 1244.5 |
| 13 | -8.4 | 851.7 | -272.2 | 12.7 | -28.5 | .0 | 273.7 |
| 14 | 5011.0 | 1029.5 | -627.9 | 82.9 | -271.1 | .0 | 684.0 |
| 15 | 3897.1 | 228.4 | 1150.9 | 20.9 | -87.4 | .0 | 1154.3 |
| 16 | 2783.3 | 228.4 | 1150.9 | 16.0 | -64.0 | .0 | 1152.7 |
| 17 | 1669.4 | 228.4 | 1150.9 | 11.2 | -40.6 | .0 | 1151.7 |
| 18 | 555.5 | 838.7 | -225.0 | 22.6 | -60.5 | .0 | 233.0 |
| 19 | 6050.5 | 1392.2 | -1611.6 | 98.0 | -323.7 | .0 | 1643.8 |
| 20 | 4936.6 | 397.0 | 609.2 | 25.7 | -110.8 | .0 | 619.2 |
| 21 | 3822.7 | 287.7 | 876.2 | 20.9 | -87.4 | .0 | 880.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2708.9 | 287.7 | 876.2 | 16.0 | -64.0 | .0 | 878.5 |
| 23 | 1595.0 | 287.7 | 876.2 | 11.2 | -40.6 | .0 | 877.1 |
| 24 | 481.1 | 287.7 | 876.2 | 6.3 | -17.2 | .0 | 876.3 |
| 25 | -632.8 | 977.3 | -729.8 | 7.6 | -7.9 | .0 | 729.9 |
| 26 | 5486.6 | 990.3 | -777.0 | 77.5 | -264.4 | .0 | 820.8 |
| 27 | 4372.7 | 235.0 | 993.9 | 23.3 | -99.1 | .0 | 998.8 |
| 28 | 3258.8 | 235.0 | 993.9 | 18.4 | -75.7 | .0 | 996.8 |
| 29 | 2145.0 | 235.0 | 993.9 | 13.6 | -52.3 | .0 | 995.3 |
| 30 | 1031.1 | 235.0 | 993.9 | 8.7 | -28.9 | .0 | 994.3 |
| 31 | -82.8 | 990.3 | -777.0 | 12.7 | -28.5 | .0 | 777.5 |
| 32 | 4922.7 | 1220.9 | -1296.4 | 82.9 | -271.1 | .0 | 1324.4 |
| 33 | 3808.8 | 298.7 | 824.8 | 20.9 | -87.4 | .0 | 829.4 |
| 34 | 2694.9 | 298.7 | 824.8 | 16.0 | -64.0 | .0 | 827.3 |
| 35 | 1581.1 | 298.7 | 824.8 | 11.2 | -40.6 | .0 | 825.8 |
| 36 | 467.2 | 1003.2 | -824.2 | 22.6 | -60.5 | .0 | 826.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 10
spalla fissa - n777 _STR10- n789 _STR10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48824.5 | 3372.1 | 97076.1 | -21983.3 | -80864.4 | -42088.8 |
| 2 | 49783.0 | 1789.7 | 98352.6 | 22970.3 | 81225.9 | 44450.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.5 | 5161.8 | 195428.7 | 987.0 | 10617.4 | 19293.3 |

Punto di applic. carico verticale: Xv = 1.982 m Yv = .108 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 9.275 | 1.788 | .474 | .017 | .059 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4914.8 | 394.0 | 651.9 | 97.8 | -322.9 | .0 | 727.5 |
| 2 | 4199.6 | 55.1 | 1263.8 | 25.7 | -110.6 | .0 | 1268.6 |
| 3 | 3484.5 | 22.1 | 1316.5 | 20.8 | -87.3 | .0 | 1319.4 |
| 4 | 2769.3 | 22.1 | 1316.5 | 16.0 | -64.0 | .0 | 1318.0 |
| 5 | 2054.2 | 22.1 | 1316.5 | 11.2 | -40.8 | .0 | 1317.1 |
| 6 | 1339.0 | 22.1 | 1316.5 | 6.4 | -17.5 | .0 | 1316.6 |
| 7 | 623.9 | 247.2 | 916.5 | 7.8 | -8.7 | .0 | 916.5 |
| 8 | 4564.2 | 234.3 | 963.4 | 77.3 | -263.8 | .0 | 998.9 |
| 9 | 3849.0 | .7 | 1363.2 | 23.3 | -99.0 | .0 | 1366.8 |
| 10 | 3133.9 | .7 | 1363.2 | 18.4 | -75.7 | .0 | 1365.3 |
| 11 | 2418.7 | .7 | 1363.2 | 13.6 | -52.4 | .0 | 1364.2 |
| 12 | 1703.6 | .7 | 1363.2 | 8.8 | -29.1 | .0 | 1363.5 |
| 13 | 988.4 | 234.3 | 963.4 | 12.9 | -29.1 | .0 | 963.9 |
| 14 | 4213.6 | 292.0 | 885.3 | 82.8 | -270.5 | .0 | 925.7 |
| 15 | 3498.4 | 11.1 | 1367.6 | 20.8 | -87.3 | .0 | 1370.4 |
| 16 | 2783.2 | 11.1 | 1367.6 | 16.0 | -64.0 | .0 | 1369.1 |
| 17 | 2068.1 | 11.1 | 1367.6 | 11.2 | -40.8 | .0 | 1368.2 |
| 18 | 1352.9 | 221.4 | 1010.4 | 22.8 | -61.1 | .0 | 1012.2 |
| 19 | 4854.3 | 541.4 | 154.6 | 97.8 | -322.9 | .0 | 358.0 |
| 20 | 4139.2 | 114.0 | 1006.5 | 25.7 | -110.6 | .0 | 1012.5 |
| 21 | 3424.0 | 70.1 | 1094.2 | 20.8 | -87.3 | .0 | 1097.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2708.9 | 70.1 | 1094.2 | 16.0 | -64.0 | .0 | 1096.1 |
| 23 | 1993.7 | 70.1 | 1094.2 | 11.2 | -40.8 | .0 | 1094.9 |
| 24 | 1278.5 | 70.1 | 1094.2 | 6.4 | -17.5 | .0 | 1094.3 |
| 25 | 563.4 | 359.3 | 508.1 | 7.8 | -8.7 | .0 | 508.2 |
| 26 | 4489.8 | 372.2 | 461.2 | 77.3 | -263.8 | .0 | 531.3 |
| 27 | 3774.6 | 52.3 | 1114.2 | 23.3 | -99.0 | .0 | 1118.6 |
| 28 | 3059.5 | 52.3 | 1114.2 | 18.4 | -75.7 | .0 | 1116.7 |
| 29 | 2344.3 | 52.3 | 1114.2 | 13.6 | -52.4 | .0 | 1115.4 |
| 30 | 1629.2 | 52.3 | 1114.2 | 8.8 | -29.1 | .0 | 1114.6 |
| 31 | 914.0 | 372.2 | 461.2 | 12.9 | -29.1 | .0 | 462.1 |
| 32 | 4125.3 | 482.4 | 220.2 | 82.8 | -270.5 | .0 | 348.8 |
| 33 | 3410.1 | 81.1 | 1043.1 | 20.8 | -87.3 | .0 | 1046.7 |
| 34 | 2694.9 | 81.1 | 1043.1 | 16.0 | -64.0 | .0 | 1045.0 |
| 35 | 1979.8 | 81.1 | 1043.1 | 11.2 | -40.8 | .0 | 1043.9 |
| 36 | 1264.6 | 385.1 | 414.2 | 22.8 | -61.1 | .0 | 418.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 11
spalla fissa - n777 _STR11- n789 _STR11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48517.3 | 6418.5 | 109539.9 | -21604.7 | -80974.6 | -52881.4 |
| 2 | 50090.2 | 3783.3 | 111592.8 | 23191.7 | 81610.8 | 56734.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.5 | 10201.8 | 221132.7 | 1587.0 | 17466.2 | 32049.3 |

Punto di applic. carico verticale: Xv = 2.243 m Yv = .177 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 12.812 | 2.169 | .764 | .028 | .098 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5391.1 | 670.2 | 141.9 | 159.6 | -527.2 | .0 | 546.0 |
| 2 | 4523.6 | 143.7 | 1197.3 | 41.8 | -179.9 | .0 | 1210.7 |
| 3 | 3656.1 | 89.4 | 1306.9 | 33.8 | -141.2 | .0 | 1314.5 |
| 4 | 2788.5 | 89.4 | 1306.9 | 25.7 | -102.5 | .0 | 1310.9 |
| 5 | 1921.0 | 89.4 | 1306.9 | 17.7 | -63.9 | .0 | 1308.4 |
| 6 | 1053.5 | 89.4 | 1306.9 | 9.7 | -25.2 | .0 | 1307.1 |
| 7 | 186.0 | 446.1 | 578.9 | 10.2 | -5.2 | .0 | 578.9 |
| 8 | 4968.7 | 424.7 | 656.8 | 126.0 | -430.1 | .0 | 785.1 |
| 9 | 4101.2 | 53.4 | 1399.9 | 37.8 | -160.5 | .0 | 1409.0 |
| 10 | 3233.7 | 53.4 | 1399.9 | 29.7 | -121.9 | .0 | 1405.1 |
| 11 | 2366.2 | 53.4 | 1399.9 | 21.7 | -83.2 | .0 | 1402.3 |
| 12 | 1498.6 | 53.4 | 1399.9 | 13.7 | -44.5 | .0 | 1400.6 |
| 13 | 631.1 | 424.7 | 656.8 | 19.0 | -40.2 | .0 | 658.1 |
| 14 | 4546.3 | 511.0 | 526.3 | 134.7 | -440.2 | .0 | 686.1 |
| 15 | 3678.8 | 71.1 | 1391.8 | 33.8 | -141.2 | .0 | 1398.9 |
| 16 | 2811.3 | 71.1 | 1391.8 | 25.7 | -102.5 | .0 | 1395.6 |
| 17 | 1943.8 | 71.1 | 1391.8 | 17.7 | -63.9 | .0 | 1393.2 |
| 18 | 1076.3 | 403.3 | 734.8 | 35.1 | -92.2 | .0 | 740.6 |
| 19 | 5292.2 | 915.1 | -684.2 | 159.6 | -527.2 | .0 | 863.7 |
| 20 | 4424.7 | 241.5 | 769.8 | 41.8 | -179.9 | .0 | 790.6 |
| 21 | 3557.2 | 169.0 | 937.6 | 33.8 | -141.2 | .0 | 948.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2689.7 | 169.0 | 937.6 | 25.7 | -102.5 | .0 | 943.2 |
| 23 | 1822.1 | 169.0 | 937.6 | 17.7 | -63.9 | .0 | 939.8 |
| 24 | 954.6 | 169.0 | 937.6 | 9.7 | -25.2 | .0 | 937.9 |
| 25 | 87.1 | 632.4 | -99.5 | 10.2 | -5.2 | .0 | 99.7 |
| 26 | 4847.1 | 653.8 | -177.5 | 126.0 | -430.1 | .0 | 465.3 |
| 27 | 3979.6 | 139.1 | 986.1 | 37.8 | -160.5 | .0 | 999.1 |
| 28 | 3112.0 | 139.1 | 986.1 | 29.7 | -121.9 | .0 | 993.6 |
| 29 | 2244.5 | 139.1 | 986.1 | 21.7 | -83.2 | .0 | 989.6 |
| 30 | 1377.0 | 139.1 | 986.1 | 13.7 | -44.5 | .0 | 987.1 |
| 31 | 509.5 | 653.8 | -177.5 | 19.0 | -40.2 | .0 | 182.0 |
| 32 | 4401.9 | 827.4 | -578.6 | 134.7 | -440.2 | .0 | 727.0 |
| 33 | 3534.4 | 187.3 | 852.7 | 33.8 | -141.2 | .0 | 864.3 |
| 34 | 2666.9 | 187.3 | 852.7 | 25.7 | -102.5 | .0 | 858.8 |
| 35 | 1799.4 | 187.3 | 852.7 | 17.7 | -63.9 | .0 | 855.1 |
| 36 | 931.9 | 675.2 | -255.5 | 35.1 | -92.2 | .0 | 271.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa SLU statica

CONDIZIONE DI CARICO 12
spalla fissa - n777 _STR12- n789 _STR12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 50053.4 | 7249.8 | 129070.1 | -22945.2 | -82953.3 | -70869.7 |
| 2 | 48554.2 | 9842.0 | 127201.6 | 21532.2 | 82217.9 | 67396.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.6 | 17091.8 | 256271.7 | -1413.0 | -16776.9 | -31209.4 |

Punto di applic. carico verticale: Xv = 2.599 m Yv = -.170 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 17.649 | 2.689 | -.686 | -.027 | -.095 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5919.9 | 1356.1 | -1595.3 | -148.5 | 490.0 | .0 | 1668.9 |
| 2 | 4844.1 | 388.0 | 568.3 | -38.5 | 165.3 | .0 | 591.8 |
| 3 | 3768.3 | 281.6 | 828.8 | -30.7 | 127.6 | .0 | 838.6 |
| 4 | 2692.5 | 281.6 | 828.8 | -22.9 | 90.0 | .0 | 833.7 |
| 5 | 1616.7 | 281.6 | 828.8 | -15.1 | 52.3 | .0 | 830.5 |
| 6 | 541.0 | 281.6 | 828.8 | -7.3 | 14.6 | .0 | 829.0 |
| 7 | -534.8 | 952.6 | -736.7 | -2.9 | -18.3 | .0 | 737.0 |
| 8 | 5371.3 | 973.5 | -812.7 | -116.7 | 398.0 | .0 | 904.9 |
| 9 | 4295.5 | 233.4 | 929.0 | -34.6 | 146.4 | .0 | 940.5 |
| 10 | 3219.7 | 233.4 | 929.0 | -26.8 | 108.8 | .0 | 935.4 |
| 11 | 2143.9 | 233.4 | 929.0 | -19.0 | 71.1 | .0 | 931.8 |
| 12 | 1068.1 | 233.4 | 929.0 | -11.2 | 33.5 | .0 | 929.6 |
| 13 | -7.7 | 973.5 | -812.7 | -12.5 | 18.3 | .0 | 812.9 |
| 14 | 4822.7 | 1208.7 | -1355.4 | -124.2 | 405.3 | .0 | 1414.7 |
| 15 | 3746.9 | 299.4 | 746.2 | -30.7 | 127.6 | .0 | 757.0 |
| 16 | 2671.1 | 299.4 | 746.2 | -22.9 | 90.0 | .0 | 751.6 |
| 17 | 1595.3 | 299.4 | 746.2 | -15.1 | 52.3 | .0 | 748.0 |
| 18 | 519.5 | 994.3 | -888.6 | -27.2 | 66.4 | .0 | 891.1 |
| 19 | 6013.0 | 1117.7 | -790.9 | -148.5 | 490.0 | .0 | 930.3 |
| 20 | 4937.2 | 292.7 | 984.5 | -38.5 | 165.3 | .0 | 998.3 |
| 21 | 3861.5 | 204.0 | 1188.5 | -30.7 | 127.6 | .0 | 1195.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2785.7 | 204.0 | 1188.5 | -22.9 | 90.0 | .0 | 1191.9 |
| 23 | 1709.9 | 204.0 | 1188.5 | -15.1 | 52.3 | .0 | 1189.6 |
| 24 | 634.1 | 204.0 | 1188.5 | -7.3 | 14.6 | .0 | 1188.5 |
| 25 | -441.7 | 771.3 | -76.1 | -2.9 | -18.3 | .0 | 78.3 |
| 26 | 5485.8 | 750.4 | -.2 | -116.7 | 398.0 | .0 | 398.0 |
| 27 | 4410.1 | 149.9 | 1331.9 | -34.6 | 146.4 | .0 | 1340.0 |
| 28 | 3334.3 | 149.9 | 1331.9 | -26.8 | 108.8 | .0 | 1336.4 |
| 29 | 2258.5 | 149.9 | 1331.9 | -19.0 | 71.1 | .0 | 1333.8 |
| 30 | 1182.7 | 149.9 | 1331.9 | -11.2 | 33.5 | .0 | 1332.4 |
| 31 | 106.9 | 750.4 | -.2 | -12.5 | 18.3 | .0 | 18.3 |
| 32 | 4958.7 | 900.6 | -279.5 | -124.2 | 405.3 | .0 | 492.3 |
| 33 | 3882.9 | 186.2 | 1271.1 | -30.7 | 127.6 | .0 | 1277.5 |
| 34 | 2807.1 | 186.2 | 1271.1 | -22.9 | 90.0 | .0 | 1274.3 |
| 35 | 1731.3 | 186.2 | 1271.1 | -15.1 | 52.3 | .0 | 1272.2 |
| 36 | 655.5 | 729.6 | 75.7 | -27.2 | 66.4 | .0 | 100.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 13
spalla fissa - n777 _Sis1- n789 _Sis1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24906.7 | 25526.2 | 132712.0 | -7203.7 | -44541.3 | -102732.3 |
| 2 | 28416.6 | 20401.6 | 135382.2 | 14711.6 | 42045.3 | 112339.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 53323.3 | 45927.8 | 268094.2 | 7507.9 | 35059.9 | 64440.5 |

Punto di applic. carico verticale: Xv = 5.028 m Yv = .657 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.406 | 33.370 | 3.751 | 3.385 | .078 | .196 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 6117.8 | 2742.2 | -5096.1 | 547.9 | -1830.1 | .0 | 5414.8 |
| 2 | 4617.4 | 881.2 | -693.0 | 155.8 | -692.4 | .0 | 979.7 |
| 3 | 3117.1 | 669.4 | -127.5 | 139.7 | -614.7 | .0 | 627.8 |
| 4 | 1616.7 | 669.4 | -127.5 | 123.6 | -536.9 | .0 | 551.9 |
| 5 | 116.4 | 669.4 | -127.5 | 107.5 | -459.2 | .0 | 476.6 |
| 6 | -1384.0 | 669.4 | -127.5 | 91.4 | -381.4 | .0 | 402.2 |
| 7 | -2884.3 | 1975.9 | -3385.3 | 247.3 | -780.6 | .0 | 3474.1 |
| 8 | 5398.8 | 1932.9 | -3228.5 | 448.0 | -1552.5 | .0 | 3582.4 |
| 9 | 3898.4 | 540.7 | 256.8 | 147.7 | -653.6 | .0 | 702.2 |
| 10 | 2398.1 | 540.7 | 256.8 | 131.6 | -575.8 | .0 | 630.5 |
| 11 | 897.7 | 540.7 | 256.8 | 115.5 | -498.1 | .0 | 560.3 |
| 12 | -602.7 | 540.7 | 256.8 | 99.4 | -420.3 | .0 | 492.5 |
| 13 | -2103.0 | 1932.9 | -3228.5 | 232.8 | -768.6 | .0 | 3318.7 |
| 14 | 4679.7 | 2271.2 | -3934.7 | 497.8 | -1655.2 | .0 | 4268.7 |
| 15 | 3179.4 | 632.6 | 43.1 | 139.7 | -614.7 | .0 | 616.2 |
| 16 | 1679.0 | 632.6 | 43.1 | 123.6 | -536.9 | .0 | 538.7 |
| 17 | 178.7 | 632.6 | 43.1 | 107.5 | -459.2 | .0 | 461.2 |
| 18 | -1321.7 | 1889.9 | -3071.7 | 297.4 | -955.5 | .0 | 3216.9 |
| 19 | 5846.7 | 3234.5 | -6757.2 | 547.9 | -1830.1 | .0 | 7000.6 |
| 20 | 4346.4 | 1078.0 | -1552.4 | 155.8 | -692.4 | .0 | 1699.9 |
| 21 | 2846.0 | 829.5 | -870.1 | 139.7 | -614.7 | .0 | 1065.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1345.7 | 829.5 | -870.1 | 123.6 | -536.9 | .0 | 1022.4 |
| 23 | -154.7 | 829.5 | -870.1 | 107.5 | -459.2 | .0 | 983.8 |
| 24 | -1655.0 | 829.5 | -870.1 | 91.4 | -381.4 | .0 | 950.0 |
| 25 | -3155.4 | 2350.5 | -4749.3 | 247.3 | -780.6 | .0 | 4813.0 |
| 26 | 5065.4 | 2393.5 | -4906.0 | 448.0 | -1552.5 | .0 | 5145.8 |
| 27 | 3565.1 | 713.1 | -575.1 | 147.7 | -653.6 | .0 | 870.6 |
| 28 | 2064.7 | 713.1 | -575.1 | 131.6 | -575.8 | .0 | 813.8 |
| 29 | 564.4 | 713.1 | -575.1 | 115.5 | -498.1 | .0 | 760.8 |
| 30 | -936.0 | 713.1 | -575.1 | 99.4 | -420.3 | .0 | 712.3 |
| 31 | -2436.4 | 2393.5 | -4906.0 | 232.8 | -768.6 | .0 | 4965.9 |
| 32 | 4284.1 | 2907.4 | -6156.2 | 497.8 | -1655.2 | .0 | 6374.8 |
| 33 | 2783.7 | 866.3 | -1040.7 | 139.7 | -614.7 | .0 | 1208.7 |
| 34 | 1283.4 | 866.3 | -1040.7 | 123.6 | -536.9 | .0 | 1171.1 |
| 35 | -217.0 | 866.3 | -1040.7 | 107.5 | -459.2 | .0 | 1137.5 |
| 36 | -1717.3 | 2436.5 | -5062.8 | 297.4 | -955.5 | .0 | 5152.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 14
spalla fissa - n777 _Sis2- n789 _Sis2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34764.6 | -3991.8 | 45142.3 | -15487.6 | -55587.6 | -11799.9 |
| 2 | 32744.7 | 1204.5 | 42952.9 | 15118.5 | 53989.0 | 3875.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67509.3 | -2787.3 | 88095.2 | -369.1 | -23211.5 | -63525.3 |

Punto di applic. carico verticale: Xv = 1.305 m Yv = -.344 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.376 | 1.463 | .635 | -.270 | -.029 | -.193 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 2586.2 | 144.5 | 216.1 | -169.5 | 560.7 | .0 | 600.9 |
| 2 | 2332.2 | 21.4 | 440.9 | -37.0 | 156.3 | .0 | 467.8 |
| 3 | 2078.2 | 9.3 | 460.7 | -21.1 | 79.6 | .0 | 467.5 |
| 4 | 1824.1 | 9.3 | 460.7 | -5.3 | 3.0 | .0 | 460.7 |
| 5 | 1570.1 | 9.3 | 460.7 | 10.6 | -73.7 | .0 | 466.6 |
| 6 | 1316.1 | 9.3 | 460.7 | 26.5 | -150.3 | .0 | 484.6 |
| 7 | 1062.1 | 91.3 | 312.9 | 126.8 | -473.9 | .0 | 567.9 |
| 8 | 2447.4 | 133.7 | 158.3 | -124.0 | 421.7 | .0 | 450.5 |
| 9 | 2193.4 | 19.1 | 393.0 | -29.1 | 117.9 | .0 | 410.3 |
| 10 | 1939.4 | 19.1 | 393.0 | -13.2 | 41.3 | .0 | 395.2 |
| 11 | 1685.4 | 19.1 | 393.0 | 2.7 | -35.3 | .0 | 394.6 |
| 12 | 1431.4 | 19.1 | 393.0 | 18.5 | -112.0 | .0 | 408.7 |
| 13 | 1177.4 | 133.7 | 158.3 | 88.2 | -351.1 | .0 | 385.1 |
| 14 | 2308.7 | 217.2 | -81.8 | -120.2 | 388.3 | .0 | 396.8 |
| 15 | 2054.7 | 45.6 | 292.4 | -21.1 | 79.6 | .0 | 303.1 |
| 16 | 1800.7 | 45.6 | 292.4 | -5.3 | 3.0 | .0 | 292.5 |
| 17 | 1546.6 | 45.6 | 292.4 | 10.6 | -73.7 | .0 | 301.6 |
| 18 | 1292.6 | 176.1 | 3.8 | 77.4 | -301.5 | .0 | 301.5 |
| 19 | 2688.4 | -340.8 | 1853.6 | -169.5 | 560.7 | .0 | 1936.5 |
| 20 | 2434.4 | -172.6 | 1288.1 | -37.0 | 156.3 | .0 | 1297.5 |
| 21 | 2180.4 | -148.5 | 1192.7 | -21.1 | 79.6 | .0 | 1195.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1926.4 | -148.5 | 1192.7 | -5.3 | 3.0 | .0 | 1192.7 |
| 23 | 1672.4 | -148.5 | 1192.7 | 10.6 | -73.7 | .0 | 1194.9 |
| 24 | 1418.3 | -148.5 | 1192.7 | 26.5 | -150.3 | .0 | 1202.1 |
| 25 | 1164.3 | -277.9 | 1657.5 | 126.8 | -473.9 | .0 | 1723.9 |
| 26 | 2573.1 | -320.4 | 1812.0 | -124.0 | 421.7 | .0 | 1860.5 |
| 27 | 2319.1 | -150.8 | 1213.1 | -29.1 | 117.9 | .0 | 1218.8 |
| 28 | 2065.1 | -150.8 | 1213.1 | -13.2 | 41.3 | .0 | 1213.8 |
| 29 | 1811.1 | -150.8 | 1213.1 | 2.7 | -35.3 | .0 | 1213.6 |
| 30 | 1557.1 | -150.8 | 1213.1 | 18.5 | -112.0 | .0 | 1218.2 |
| 31 | 1303.1 | -320.4 | 1812.0 | 88.2 | -351.1 | .0 | 1845.7 |
| 32 | 2457.9 | -410.0 | 2108.2 | -120.2 | 388.3 | .0 | 2143.6 |
| 33 | 2203.9 | -184.8 | 1360.9 | -21.1 | 79.6 | .0 | 1363.3 |
| 34 | 1949.9 | -184.8 | 1360.9 | -5.3 | 3.0 | .0 | 1360.9 |
| 35 | 1695.9 | -184.8 | 1360.9 | 10.6 | -73.7 | .0 | 1362.9 |
| 36 | 1441.8 | -362.8 | 1966.6 | 77.4 | -301.5 | .0 | 1989.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 15
spalla fissa - n777 _Sis3- n789 _Sis3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25195.3 | 22931.0 | 101920.3 | -6223.9 | -46513.6 | -64654.4 |
| 2 | 33768.0 | 5890.8 | 106146.4 | 19306.8 | 45219.4 | 87895.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58963.3 | 28821.8 | 208066.7 | 13082.9 | 90433.7 | 205571.6 |

Punto di applic. carico verticale: Xv = 3.529 m Yv = 1.534 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.189 | 22.272 | 2.683 | 6.040 | .171 | .626 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5154.4 | 1121.9 | -812.2 | 1174.8 | -3920.3 | .0 | 4003.6 |
| 2 | 4081.1 | 294.7 | 970.1 | 317.0 | -1399.7 | .0 | 1703.0 |
| 3 | 3007.9 | 205.8 | 1175.2 | 265.6 | -1151.7 | .0 | 1645.4 |
| 4 | 1934.7 | 205.8 | 1175.2 | 214.2 | -903.7 | .0 | 1482.5 |
| 5 | 861.5 | 205.8 | 1175.2 | 162.8 | -655.6 | .0 | 1345.7 |
| 6 | -211.7 | 205.8 | 1175.2 | 111.5 | -407.6 | .0 | 1243.9 |
| 7 | -1284.9 | 774.6 | -95.0 | 215.9 | -572.3 | .0 | 580.1 |
| 8 | 4686.0 | 637.3 | 405.1 | 938.0 | -3243.1 | .0 | 3268.3 |
| 9 | 3612.8 | 107.9 | 1529.7 | 291.3 | -1275.7 | .0 | 1991.8 |
| 10 | 2539.6 | 107.9 | 1529.7 | 239.9 | -1027.7 | .0 | 1842.9 |
| 11 | 1466.3 | 107.9 | 1529.7 | 188.5 | -779.6 | .0 | 1717.0 |
| 12 | 393.1 | 107.9 | 1529.7 | 137.1 | -531.6 | .0 | 1619.5 |
| 13 | -680.1 | 637.3 | 405.1 | 251.4 | -742.3 | .0 | 845.7 |
| 14 | 4217.6 | 633.3 | 646.9 | 1014.9 | -3362.3 | .0 | 3424.0 |
| 15 | 3144.4 | 88.4 | 1719.8 | 265.6 | -1151.7 | .0 | 2069.8 |
| 16 | 2071.2 | 88.4 | 1719.8 | 214.2 | -903.7 | .0 | 1942.7 |
| 17 | 998.0 | 88.4 | 1719.8 | 162.8 | -655.6 | .0 | 1840.5 |
| 18 | -75.2 | 500.0 | 905.3 | 375.7 | -1130.3 | .0 | 1448.1 |
| 19 | 4560.7 | 2692.3 | -6111.0 | 1174.8 | -3920.3 | .0 | 7260.4 |
| 20 | 3487.5 | 922.4 | -1771.5 | 317.0 | -1399.7 | .0 | 2257.7 |
| 21 | 2414.2 | 716.5 | -1193.5 | 265.6 | -1151.7 | .0 | 1658.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1341.0 | 716.5 | -1193.5 | 214.2 | -903.7 | .0 | 1497.0 |
| 23 | 267.8 | 716.5 | -1193.5 | 162.8 | -655.6 | .0 | 1361.7 |
| 24 | -805.4 | 716.5 | -1193.5 | 111.5 | -407.6 | .0 | 1261.1 |
| 25 | -1878.6 | 1969.3 | -4446.3 | 215.9 | -572.3 | .0 | 4483.0 |
| 26 | 3955.8 | 2106.7 | -4946.4 | 938.0 | -3243.1 | .0 | 5914.8 |
| 27 | 2882.6 | 657.7 | -1124.0 | 291.3 | -1275.7 | .0 | 1700.2 |
| 28 | 1809.4 | 657.7 | -1124.0 | 239.9 | -1027.7 | .0 | 1523.0 |
| 29 | 736.2 | 657.7 | -1124.0 | 188.5 | -779.6 | .0 | 1368.0 |
| 30 | -337.0 | 657.7 | -1124.0 | 137.1 | -531.6 | .0 | 1243.4 |
| 31 | -1410.2 | 2106.7 | -4946.4 | 251.4 | -742.3 | .0 | 5001.8 |
| 32 | 3351.0 | 2662.8 | -6439.8 | 1014.9 | -3362.3 | .0 | 7264.8 |
| 33 | 2277.8 | 833.9 | -1738.0 | 265.6 | -1151.7 | .0 | 2084.9 |
| 34 | 1204.6 | 833.9 | -1738.0 | 214.2 | -903.7 | .0 | 1958.9 |
| 35 | 131.3 | 833.9 | -1738.0 | 162.8 | -655.6 | .0 | 1857.5 |
| 36 | -941.9 | 2244.0 | -5446.6 | 375.7 | -1130.3 | .0 | 5562.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 16
spalla fissa - n777 _Sis4- n789 _Sis4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35140.9 | -1446.0 | 78869.5 | -16809.8 | -54841.4 | -50831.8 |
| 2 | 27980.5 | 15675.8 | 74840.3 | 10820.7 | 51957.0 | 29156.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63121.4 | 14229.8 | 153709.8 | -5989.1 | -79500.7 | -204878.2 |

Punto di applic. carico verticale: Xv = 2.435 m Yv = -1.259 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.767 | 12.700 | 1.746 | -2.949 | -.123 | -.623 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3634.0 | 1764.8 | -4019.7 | -799.4 | 2659.9 | .0 | 4820.0 |
| 2 | 2935.5 | 605.4 | -1175.0 | -199.0 | 866.5 | .0 | 1459.9 |
| 3 | 2237.1 | 470.4 | -795.8 | -147.8 | 619.3 | .0 | 1008.4 |
| 4 | 1538.7 | 470.4 | -795.8 | -96.6 | 372.1 | .0 | 878.5 |
| 5 | 840.2 | 470.4 | -795.8 | -45.4 | 125.0 | .0 | 805.5 |
| 6 | 141.8 | 470.4 | -795.8 | 5.8 | -122.2 | .0 | 805.1 |
| 7 | -556.6 | 1291.3 | -2928.7 | 156.2 | -676.9 | .0 | 3005.9 |
| 8 | 3235.4 | 1428.1 | -3427.1 | -616.5 | 2119.8 | .0 | 4029.8 |
| 9 | 2537.0 | 449.4 | -834.7 | -173.4 | 742.9 | .0 | 1117.4 |
| 10 | 1838.5 | 449.4 | -834.7 | -122.2 | 495.7 | .0 | 970.8 |
| 11 | 1140.1 | 449.4 | -834.7 | -71.0 | 248.5 | .0 | 870.9 |
| 12 | 441.7 | 449.4 | -834.7 | -19.8 | 1.4 | .0 | 834.7 |
| 13 | -256.8 | 1428.1 | -3427.1 | 67.8 | -372.5 | .0 | 3447.3 |
| 14 | 2836.8 | 1854.7 | -4616.1 | -640.1 | 2103.7 | .0 | 5072.8 |
| 15 | 2138.4 | 587.4 | -1338.5 | -147.8 | 619.3 | .0 | 1474.8 |
| 16 | 1440.0 | 587.4 | -1338.5 | -96.6 | 372.1 | .0 | 1389.2 |
| 17 | 741.5 | 587.4 | -1338.5 | -45.4 | 125.0 | .0 | 1344.3 |
| 18 | 43.1 | 1565.0 | -3925.6 | -3.1 | -120.8 | .0 | 3927.5 |
| 19 | 4063.4 | 199.7 | 1261.3 | -799.4 | 2659.9 | .0 | 2943.7 |
| 20 | 3364.9 | -20.2 | 1557.4 | -199.0 | 866.5 | .0 | 1782.2 |
| 21 | 2666.5 | -38.6 | 1564.9 | -147.8 | 619.3 | .0 | 1683.0 |

```
 22   1968.1    -38.6   1564.9    -96.6    372.1       .0    1608.5
 23   1269.6    -38.6   1564.9    -45.4    125.0       .0    1569.9
 24    571.2    -38.6   1564.9      5.8   -122.2       .0    1569.7
 25   -127.2    100.6   1407.9    156.2   -676.9       .0    1562.2
 26   3763.5    -36.3   1906.4   -616.5   2119.8       .0    2851.0
 27   3065.1    -98.5   1810.1   -173.4    742.9       .0    1956.7
 28   2366.6    -98.5   1810.1   -122.2    495.7       .0    1876.8
 29   1668.2    -98.5   1810.1    -71.0    248.5       .0    1827.1
 30    969.8    -98.5   1810.1    -19.8      1.4       .0    1810.1
 31    271.3    -36.3   1906.4     67.8   -372.5       .0    1942.4
 32   3463.7   -168.0   2446.8   -640.1   2103.7       .0    3226.8
 33   2765.2   -155.6   2107.6   -147.8    619.3       .0    2196.7
 34   2066.8   -155.6   2107.6    -96.6    372.1       .0    2140.2
 35   1368.4   -155.6   2107.6    -45.4    125.0       .0    2111.3
 36    669.9   -173.1   2404.9     -3.1   -120.8       .0    2407.9
-------------------------------------------------------------------

Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 17
spalla fissa - n777 _Sis5- n789 _Sis5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24687.6 | 22986.8 | 99862.4 | -6020.9 | -45568.4 | -64167.3 |
| 2 | 33487.7 | 5957.0 | 105024.3 | 19103.9 | 44698.6 | 87529.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58175.3 | 28943.8 | 204886.7 | 13083.0 | 93291.3 | 205581.4 |

Punto di applic. carico verticale: Xv = 3.522 m Yv = 1.604 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.080 | 22.231 | 2.661 | 6.054 | .174 | .626 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5111.7 | 1126.7 | -853.0 | 1175.0 | -3917.7 | .0 | 4009.4 |
| 2 | 4047.4 | 297.9 | 937.5 | 316.9 | -1396.6 | .0 | 1682.1 |
| 3 | 2983.1 | 208.7 | 1144.3 | 265.5 | -1148.6 | .0 | 1621.3 |
| 4 | 1918.7 | 208.7 | 1144.3 | 214.1 | -900.5 | .0 | 1456.1 |
| 5 | 854.4 | 208.7 | 1144.3 | 162.7 | -652.5 | .0 | 1317.2 |
| 6 | -209.9 | 208.7 | 1144.3 | 111.3 | -404.5 | .0 | 1213.6 |
| 7 | -1274.3 | 778.9 | -133.2 | 216.2 | -569.4 | .0 | 584.8 |
| 8 | 4649.2 | 641.6 | 366.9 | 938.2 | -3240.2 | .0 | 3261.0 |
| 9 | 3584.8 | 110.6 | 1499.8 | 291.2 | -1272.6 | .0 | 1966.9 |
| 10 | 2520.5 | 110.6 | 1499.8 | 239.8 | -1024.6 | .0 | 1816.3 |
| 11 | 1456.2 | 110.6 | 1499.8 | 188.4 | -776.5 | .0 | 1688.9 |
| 12 | 391.8 | 110.6 | 1499.8 | 137.0 | -528.5 | .0 | 1590.2 |
| 13 | -672.5 | 641.6 | 366.9 | 251.6 | -739.4 | .0 | 825.4 |
| 14 | 4186.6 | 637.9 | 607.3 | 1015.2 | -3359.6 | .0 | 3414.1 |
| 15 | 3122.3 | 91.2 | 1688.8 | 265.5 | -1148.6 | .0 | 2042.4 |
| 16 | 2057.9 | 91.2 | 1688.8 | 214.1 | -900.5 | .0 | 1913.9 |
| 17 | 993.6 | 91.2 | 1688.8 | 162.7 | -652.5 | .0 | 1810.5 |
| 18 | -70.7 | 504.3 | 867.1 | 376.0 | -1127.5 | .0 | 1422.4 |
| 19 | 4506.2 | 2697.1 | -6152.1 | 1175.0 | -3917.7 | .0 | 7293.6 |
| 20 | 3441.9 | 925.7 | -1804.2 | 316.9 | -1396.6 | .0 | 2281.6 |
| 21 | 2377.6 | 719.4 | -1224.5 | 265.5 | -1148.6 | .0 | 1678.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1313.2 | 719.4 | -1224.5 | 214.1 | -900.5 | .0 | 1520.0 |
| 23 | 248.9 | 719.4 | -1224.5 | 162.7 | -652.5 | .0 | 1387.5 |
| 24 | -815.4 | 719.4 | -1224.5 | 111.3 | -404.5 | .0 | 1289.6 |
| 25 | -1879.8 | 1973.7 | -4484.7 | 216.2 | -569.4 | .0 | 4520.7 |
| 26 | 3904.5 | 2111.0 | -4984.9 | 938.2 | -3240.2 | .0 | 5945.5 |
| 27 | 2840.1 | 660.4 | -1154.1 | 291.2 | -1272.6 | .0 | 1718.0 |
| 28 | 1775.8 | 660.4 | -1154.1 | 239.8 | -1024.6 | .0 | 1543.3 |
| 29 | 711.5 | 660.4 | -1154.1 | 188.4 | -776.5 | .0 | 1391.0 |
| 30 | -352.9 | 660.4 | -1154.1 | 137.0 | -528.5 | .0 | 1269.4 |
| 31 | -1417.2 | 2111.0 | -4984.9 | 251.6 | -739.4 | .0 | 5039.4 |
| 32 | 3302.7 | 2667.5 | -6479.8 | 1015.2 | -3359.6 | .0 | 7298.9 |
| 33 | 2238.4 | 836.8 | -1769.1 | 265.5 | -1148.6 | .0 | 2109.2 |
| 34 | 1174.0 | 836.8 | -1769.1 | 214.1 | -900.5 | .0 | 1985.1 |
| 35 | 109.7 | 836.8 | -1769.1 | 162.7 | -652.5 | .0 | 1885.6 |
| 36 | -954.6 | 2248.4 | -5485.1 | 376.0 | -1127.5 | .0 | 5599.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 18
spalla fissa - n777 _Sis6- n789 _Sis6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34861.6 | -1379.4 | 77752.9 | -16607.4 | -54322.5 | -50466.9 |
| 2 | 27473.8 | 15731.2 | 72786.7 | 10618.3 | 51013.7 | 28672.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 62335.4 | 14351.8 | 150539.6 | -5989.1 | -82358.3 | -204878.1 |

Punto di applic. carico verticale: Xv = 2.415 m Yv = -1.321 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.658 | 12.659 | 1.724 | -2.962 | -.127 | -.623 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3579.7 | 1769.6 | -4060.6 | -799.6 | 2657.1 | .0 | 4852.6 |
| 2 | 2890.1 | 608.6 | -1207.6 | -198.9 | 863.4 | .0 | 1484.5 |
| 3 | 2200.5 | 473.3 | -826.7 | -147.7 | 616.2 | .0 | 1031.1 |
| 4 | 1510.9 | 473.3 | -826.7 | -96.5 | 369.0 | .0 | 905.4 |
| 5 | 821.3 | 473.3 | -826.7 | -45.3 | 121.8 | .0 | 835.7 |
| 6 | 131.8 | 473.3 | -826.7 | 5.9 | -125.3 | .0 | 836.2 |
| 7 | -557.8 | 1295.6 | -2966.9 | 156.0 | -679.7 | .0 | 3043.8 |
| 8 | 3184.2 | 1432.4 | -3465.4 | -616.6 | 2117.0 | .0 | 4060.9 |
| 9 | 2494.6 | 452.1 | -864.6 | -173.3 | 739.8 | .0 | 1137.9 |
| 10 | 1805.0 | 452.1 | -864.6 | -122.1 | 492.6 | .0 | 995.1 |
| 11 | 1115.4 | 452.1 | -864.6 | -70.9 | 245.4 | .0 | 898.8 |
| 12 | 425.8 | 452.1 | -864.6 | -19.7 | -1.7 | .0 | 864.6 |
| 13 | -263.7 | 1432.4 | -3465.4 | 67.7 | -375.3 | .0 | 3485.7 |
| 14 | 2788.7 | 1859.3 | -4655.8 | -640.4 | 2101.0 | .0 | 5107.9 |
| 15 | 2099.1 | 590.3 | -1369.4 | -147.7 | 616.2 | .0 | 1501.7 |
| 16 | 1409.5 | 590.3 | -1369.4 | -96.5 | 369.0 | .0 | 1418.3 |
| 17 | 719.9 | 590.3 | -1369.4 | -45.3 | 121.8 | .0 | 1374.8 |
| 18 | 30.3 | 1569.3 | -3963.9 | -3.3 | -123.5 | .0 | 3965.8 |
| 19 | 4020.9 | 204.5 | 1220.4 | -799.6 | 2657.1 | .0 | 2924.0 |
| 20 | 3331.3 | -17.0 | 1524.8 | -198.9 | 863.4 | .0 | 1752.2 |
| 21 | 2641.7 | -35.7 | 1534.0 | -147.7 | 616.2 | .0 | 1653.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1952.1 | -35.7 | 1534.0 | -96.5 | 369.0 | .0 | 1577.7 |
| 23 | 1262.6 | -35.7 | 1534.0 | -45.3 | 121.8 | .0 | 1538.8 |
| 24 | 573.0 | -35.7 | 1534.0 | 5.9 | -125.3 | .0 | 1539.1 |
| 25 | -116.6 | 104.9 | 1369.7 | 156.0 | -679.7 | .0 | 1529.0 |
| 26 | 3726.8 | -31.9 | 1868.1 | -616.6 | 2117.0 | .0 | 2823.4 |
| 27 | 3037.2 | -95.8 | 1780.2 | -173.3 | 739.8 | .0 | 1927.8 |
| 28 | 2347.7 | -95.8 | 1780.2 | -122.1 | 492.6 | .0 | 1847.1 |
| 29 | 1658.1 | -95.8 | 1780.2 | -70.9 | 245.4 | .0 | 1797.0 |
| 30 | 968.5 | -95.8 | 1780.2 | -19.7 | -1.7 | .0 | 1780.2 |
| 31 | 278.9 | -31.9 | 1868.1 | 67.7 | -375.3 | .0 | 1905.5 |
| 32 | 3432.7 | -163.3 | 2407.1 | -640.4 | 2101.0 | .0 | 3195.0 |
| 33 | 2743.2 | -152.7 | 2076.6 | -147.7 | 616.2 | .0 | 2166.1 |
| 34 | 2053.6 | -152.7 | 2076.6 | -96.5 | 369.0 | .0 | 2109.2 |
| 35 | 1364.0 | -152.7 | 2076.6 | -45.3 | 121.8 | .0 | 2080.2 |
| 36 | 674.4 | -168.8 | 2366.6 | -3.3 | -123.5 | .0 | 2369.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 19
spalla fissa - n777 _Sis7- n789 _Sis7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25651.4 | 25935.9 | 138347.6 | -7544.9 | -46008.2 | -105821.8 |
| 2 | 29066.0 | 20805.9 | 140624.1 | 15052.8 | 43334.2 | 115381.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54717.4 | 46741.8 | 278971.7 | 7507.9 | 33862.2 | 64450.8 |

Punto di applic. carico verticale: Xv = 5.098 m Yv = .619 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.600 | 34.166 | 3.868 | 3.379 | .076 | .196 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 6294.6 | 2800.0 | -5161.4 | 547.8 | -1831.4 | .0 | 5476.7 |
| 2 | 4747.4 | 897.6 | -666.1 | 155.8 | -693.8 | .0 | 961.8 |
| 3 | 3200.2 | 681.3 | -89.6 | 139.7 | -616.0 | .0 | 622.5 |
| 4 | 1653.0 | 681.3 | -89.6 | 123.6 | -538.2 | .0 | 545.6 |
| 5 | 105.8 | 681.3 | -89.6 | 107.5 | -460.5 | .0 | 469.1 |
| 6 | -1441.4 | 681.3 | -89.6 | 91.4 | -382.7 | .0 | 393.1 |
| 7 | -2988.6 | 2016.5 | -3413.9 | 247.2 | -781.7 | .0 | 3502.3 |
| 8 | 5551.6 | 1973.4 | -3257.1 | 447.9 | -1553.8 | .0 | 3608.7 |
| 9 | 4004.4 | 550.2 | 300.6 | 147.8 | -654.9 | .0 | 720.6 |
| 10 | 2457.2 | 550.2 | 300.6 | 131.7 | -577.1 | .0 | 650.7 |
| 11 | 910.0 | 550.2 | 300.6 | 115.6 | -499.4 | .0 | 582.8 |
| 12 | -637.2 | 550.2 | 300.6 | 99.4 | -421.6 | .0 | 517.8 |
| 13 | -2184.4 | 1973.4 | -3257.1 | 232.7 | -769.8 | .0 | 3346.8 |
| 14 | 4808.5 | 2320.6 | -3982.5 | 497.7 | -1656.4 | .0 | 4313.2 |
| 15 | 3261.3 | 644.5 | 81.1 | 139.7 | -616.0 | .0 | 621.3 |
| 16 | 1714.1 | 644.5 | 81.1 | 123.6 | -538.2 | .0 | 544.3 |
| 17 | 166.9 | 644.5 | 81.1 | 107.5 | -460.5 | .0 | 467.6 |
| 18 | -1380.3 | 1930.4 | -3100.3 | 297.3 | -956.6 | .0 | 3244.5 |
| 19 | 6028.5 | 3292.4 | -6822.7 | 547.8 | -1831.4 | .0 | 7064.2 |
| 20 | 4481.3 | 1094.4 | -1525.7 | 155.8 | -693.8 | .0 | 1676.0 |
| 21 | 2934.1 | 841.4 | -832.2 | 139.7 | -616.0 | .0 | 1035.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1386.9 | 841.4 | -832.2 | 123.6 | -538.2 | .0 | 991.1 |
| 23 | -160.3 | 841.4 | -832.2 | 107.5 | -460.5 | .0 | 951.1 |
| 24 | -1707.5 | 841.4 | -832.2 | 91.4 | -382.7 | .0 | 916.0 |
| 25 | -3254.7 | 2391.1 | -4778.1 | 247.2 | -781.7 | .0 | 4841.6 |
| 26 | 5224.3 | 2434.1 | -4934.9 | 447.9 | -1553.8 | .0 | 5173.8 |
| 27 | 3677.1 | 722.6 | -531.4 | 147.8 | -654.9 | .0 | 843.4 |
| 28 | 2129.9 | 722.6 | -531.4 | 131.7 | -577.1 | .0 | 784.5 |
| 29 | 582.7 | 722.6 | -531.4 | 115.6 | -499.4 | .0 | 729.2 |
| 30 | -964.5 | 722.6 | -531.4 | 99.4 | -421.6 | .0 | 678.4 |
| 31 | -2511.7 | 2434.1 | -4934.9 | 232.7 | -769.8 | .0 | 4994.6 |
| 32 | 4420.1 | 2956.9 | -6204.3 | 497.7 | -1656.4 | .0 | 6421.6 |
| 33 | 2872.9 | 878.2 | -1002.9 | 139.7 | -616.0 | .0 | 1177.0 |
| 34 | 1325.7 | 878.2 | -1002.9 | 123.6 | -538.2 | .0 | 1138.2 |
| 35 | -221.5 | 878.2 | -1002.9 | 107.5 | -460.5 | .0 | 1103.6 |
| 36 | -1768.7 | 2477.2 | -5091.7 | 297.3 | -956.6 | .0 | 5180.8 |

Mris  = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 19
spalla fissa - n777 _Sis7- n789 _Sis7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 2800.0 | -5161.4 | 547.8 | -1831.4 | 2853.1 | 5476.7 |
| 1.56 | 2332.8 | -1170.3 | 489.0 | -1022.1 | 2383.5 | 1553.8 |
| 3.13 | 1716.9 | 2169.0 | 397.8 | -300.4 | 1762.4 | 2189.7 |
| 4.69 | 629.8 | 3914.1 | 218.4 | 171.7 | 666.6 | 3917.9 |
| 6.25 | -47.0 | 4298.3 | 86.1 | 400.8 | 98.1 | 4316.9 |
| 7.81 | -407.9 | 3890.6 | -4.5 | 457.2 | 407.9 | 3917.4 |
| 9.38 | -486.2 | 3149.4 | -32.3 | 416.6 | 487.3 | 3176.8 |
| 10.94 | -485.2 | 2385.0 | -40.7 | 358.6 | 486.9 | 2411.8 |
| 12.50 | -459.9 | 1641.8 | -44.7 | 291.3 | 462.1 | 1667.5 |
| 15.00 | -310.9 | 633.5 | -42.6 | 178.7 | 313.8 | 658.3 |
| 17.50 | -151.0 | 71.3 | -30.8 | 85.3 | 154.1 | 111.1 |
| 20.00 | -46.5 | -157.4 | -17.7 | 25.1 | 49.7 | 159.4 |
| 22.50 | 5.4 | -194.5 | -7.5 | -5.1 | 9.3 | 194.6 |
| 25.00 | 21.2 | -152.9 | -.9 | -15.0 | 21.2 | 153.6 |
| 29.17 | 17.2 | -66.6 | 1.3 | -11.3 | 17.2 | 67.5 |
| 33.33 | 8.5 | -13.3 | 1.2 | -5.6 | 8.6 | 14.4 |
| 37.50 | 2.0 | 7.2 | .6 | -1.7 | 2.1 | 7.4 |
| 43.75 | -1.1 | 6.0 | .1 | .2 | 1.1 | 6.0 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 19
spalla fissa - n777 _Sis7- n789 _Sis7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 3292.4 | -6822.7 | 547.8 | -1831.4 | 3337.6 | 7064.2 |
| 1.56 | 2771.9 | -2104.4 | 489.0 | -1022.1 | 2814.7 | 2339.5 |
| 3.13 | 2072.7 | 1882.1 | 397.8 | -300.4 | 2110.5 | 1905.9 |
| 4.69 | 822.2 | 4046.7 | 218.4 | 171.7 | 850.8 | 4050.4 |
| 6.25 | 26.7 | 4630.5 | 86.1 | 400.8 | 90.1 | 4647.8 |
| 7.81 | -413.8 | 4268.9 | -4.5 | 457.2 | 413.8 | 4293.4 |
| 9.38 | -516.0 | 3489.4 | -32.3 | 416.6 | 517.0 | 3514.2 |
| 10.94 | -521.6 | 2672.4 | -40.7 | 358.6 | 523.2 | 2696.3 |
| 12.50 | -499.2 | 1869.4 | -44.7 | 291.3 | 501.2 | 1892.0 |
| 15.00 | -346.3 | 764.4 | -42.6 | 178.7 | 348.9 | 785.1 |
| 17.50 | -174.8 | 127.2 | -30.8 | 85.3 | 177.5 | 153.1 |
| 20.00 | -58.9 | -145.9 | -17.7 | 25.1 | 61.5 | 148.1 |
| 22.50 | 1.0 | -203.0 | -7.5 | -5.1 | 7.6 | 203.1 |
| 25.00 | 21.3 | -166.0 | -.9 | -15.0 | 21.3 | 166.7 |
| 29.17 | 18.5 | -74.8 | 1.3 | -11.3 | 18.6 | 75.7 |
| 33.33 | 9.5 | -16.6 | 1.2 | -5.6 | 9.5 | 17.5 |
| 37.50 | 2.4 | 6.8 | .6 | -1.7 | 2.4 | 7.0 |
| 43.75 | -1.1 | 6.4 | .1 | .2 | 1.1 | 6.4 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 19
spalla fissa - n777 _Sis7- n789 _Sis7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 2391.1 | -4778.1 | 247.2 | -781.7 | 2403.8 | 4841.6 |
| 1.56 | 2042.5 | -1326.5 | 219.1 | -417.9 | 2054.2 | 1390.8 |
| 3.13 | 1563.1 | 1631.9 | 176.6 | -95.4 | 1573.0 | 1634.7 |
| 4.69 | 682.1 | 3325.5 | 94.0 | 111.4 | 688.6 | 3327.4 |
| 6.25 | 87.0 | 3875.5 | 34.2 | 207.3 | 93.5 | 3881.1 |
| 7.81 | -277.5 | 3687.4 | -5.9 | 225.9 | 277.6 | 3694.3 |
| 9.38 | -375.6 | 3131.2 | -18.0 | 202.0 | 376.0 | 3137.7 |
| 10.94 | -394.0 | 2525.1 | -21.4 | 170.8 | 394.6 | 2530.9 |
| 12.50 | -390.9 | 1908.1 | -22.8 | 136.0 | 391.5 | 1912.9 |
| 15.00 | -309.4 | 1000.5 | -20.6 | 80.1 | 310.1 | 1003.7 |
| 17.50 | -192.8 | 374.2 | -14.2 | 36.0 | 193.3 | 375.9 |
| 20.00 | -95.7 | 23.0 | -7.8 | 8.9 | 96.1 | 24.7 |
| 22.50 | -31.4 | -125.5 | -3.1 | -4.1 | 31.5 | 125.6 |
| 25.00 | 5.0 | -152.7 | -.2 | -7.8 | 5.0 | 152.9 |
| 29.17 | 14.2 | -96.8 | .7 | -5.4 | 14.3 | 97.0 |
| 33.33 | 10.6 | -42.8 | .6 | -2.5 | 10.6 | 42.9 |
| 37.50 | 4.9 | -10.1 | .3 | -.6 | 4.9 | 10.1 |
| 43.75 | .2 | 3.2 | .0 | .2 | .2 | 3.2 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 20
spalla fissa - n777 _Sis8- n789 _Sis8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34678.5 | -5199.1 | 38589.1 | -15500.1 | -55229.3 | -6270.7 |
| 2 | 32688.9 | 2.8 | 36535.0 | 15116.0 | 53707.2 | -1672.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67367.4 | -5196.3 | 75124.1 | -384.1 | -22810.8 | -63603.0 |

Punto di applic. carico verticale: Xv = 1.115 m Yv = -.339 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.357 | -.251 | .447 | -.275 | -.029 | -.194 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 2357.7 | -11.1 | 533.1 | -170.5 | 564.4 | .0 | 776.3 |
| 2 | 2178.8 | -30.0 | 507.6 | -37.3 | 158.0 | .0 | 531.6 |
| 3 | 1999.8 | -30.1 | 494.7 | -21.4 | 81.3 | .0 | 501.4 |
| 4 | 1820.9 | -30.1 | 494.7 | -5.5 | 4.6 | .0 | 494.8 |
| 5 | 1642.0 | -30.1 | 494.7 | 10.4 | -72.2 | .0 | 500.0 |
| 6 | 1463.1 | -30.1 | 494.7 | 26.3 | -148.9 | .0 | 516.7 |
| 7 | 1284.1 | -21.6 | 533.1 | 126.2 | -471.5 | .0 | 711.7 |
| 8 | 2256.6 | 20.9 | 378.3 | -124.8 | 425.0 | .0 | 569.0 |
| 9 | 2077.7 | -13.9 | 409.2 | -29.4 | 119.7 | .0 | 426.3 |
| 10 | 1898.8 | -13.9 | 409.2 | -13.5 | 42.9 | .0 | 411.4 |
| 11 | 1719.9 | -13.9 | 409.2 | 2.4 | -33.8 | .0 | 410.6 |
| 12 | 1540.9 | -13.9 | 409.2 | 18.3 | -110.5 | .0 | 423.8 |
| 13 | 1362.0 | 20.9 | 378.3 | 87.7 | -348.7 | .0 | 514.6 |
| 14 | 2155.6 | 82.4 | 188.9 | -121.0 | 391.8 | .0 | 434.9 |
| 15 | 1976.7 | 6.2 | 326.3 | -21.4 | 81.3 | .0 | 336.2 |
| 16 | 1797.7 | 6.2 | 326.3 | -5.5 | 4.6 | .0 | 326.3 |
| 17 | 1618.8 | 6.2 | 326.3 | 10.4 | -72.2 | .0 | 334.2 |
| 18 | 1439.9 | 63.4 | 223.6 | 76.7 | -298.8 | .0 | 373.2 |
| 19 | 2458.5 | -496.9 | 2172.5 | -170.5 | 564.4 | .0 | 2244.6 |
| 20 | 2279.6 | -224.3 | 1355.8 | -37.3 | 158.0 | .0 | 1365.0 |
| 21 | 2100.6 | -188.1 | 1227.6 | -21.4 | 81.3 | .0 | 1230.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1921.7 | -188.1 | 1227.6 | -5.5 | 4.6 | .0 | 1227.6 |
| 23 | 1742.8 | -188.1 | 1227.6 | 10.4 | -72.2 | .0 | 1229.7 |
| 24 | 1563.9 | -188.1 | 1227.6 | 26.3 | -148.9 | .0 | 1236.6 |
| 25 | 1385.0 | -391.2 | 1879.4 | 126.2 | -471.5 | .0 | 1937.6 |
| 26 | 2380.6 | -433.7 | 2034.1 | -124.8 | 425.0 | .0 | 2078.0 |
| 27 | 2201.7 | -184.0 | 1230.2 | -29.4 | 119.7 | .0 | 1236.0 |
| 28 | 2022.8 | -184.0 | 1230.2 | -13.5 | 42.9 | .0 | 1231.0 |
| 29 | 1843.8 | -184.0 | 1230.2 | 2.4 | -33.8 | .0 | 1230.7 |
| 30 | 1664.9 | -184.0 | 1230.2 | 18.3 | -110.5 | .0 | 1235.2 |
| 31 | 1486.0 | -433.7 | 2034.1 | 87.7 | -348.7 | .0 | 2063.8 |
| 32 | 2302.7 | -545.5 | 2381.5 | -121.0 | 391.8 | .0 | 2413.5 |
| 33 | 2123.8 | -224.5 | 1396.1 | -21.4 | 81.3 | .0 | 1398.4 |
| 34 | 1944.9 | -224.5 | 1396.1 | -5.5 | 4.6 | .0 | 1396.1 |
| 35 | 1766.0 | -224.5 | 1396.1 | 10.4 | -72.2 | .0 | 1397.9 |
| 36 | 1587.1 | -476.2 | 2188.9 | 76.7 | -298.8 | .0 | 2209.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 21
spalla fissa - n777 _Sis9- n789 _Sis9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25651.4 | 25935.9 | 138347.6 | -7544.9 | -46008.2 | -105821.8 |
| 2 | 29066.0 | 20805.9 | 140624.1 | 15052.8 | 43334.2 | 115381.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54717.4 | 46741.8 | 278971.7 | 7507.9 | 33862.2 | 64450.8 |

Punto di applic. carico verticale: Xv = 5.098 m Yv = .619 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.600 | 34.166 | 3.868 | 3.379 | .076 | .196 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 6294.6 | 2800.0 | -5161.4 | 547.8 | -1831.4 | .0 | 5476.7 |
| 2 | 4747.4 | 897.6 | -666.1 | 155.8 | -693.8 | .0 | 961.8 |
| 3 | 3200.2 | 681.3 | -89.6 | 139.7 | -616.0 | .0 | 622.5 |
| 4 | 1653.0 | 681.3 | -89.6 | 123.6 | -538.2 | .0 | 545.6 |
| 5 | 105.8 | 681.3 | -89.6 | 107.5 | -460.5 | .0 | 469.1 |
| 6 | -1441.4 | 681.3 | -89.6 | 91.4 | -382.7 | .0 | 393.1 |
| 7 | -2988.6 | 2016.5 | -3413.9 | 247.2 | -781.7 | .0 | 3502.3 |
| 8 | 5551.6 | 1973.4 | -3257.1 | 447.9 | -1553.8 | .0 | 3608.7 |
| 9 | 4004.4 | 550.2 | 300.6 | 147.8 | -654.9 | .0 | 720.6 |
| 10 | 2457.2 | 550.2 | 300.6 | 131.7 | -577.1 | .0 | 650.7 |
| 11 | 910.0 | 550.2 | 300.6 | 115.6 | -499.4 | .0 | 582.8 |
| 12 | -637.2 | 550.2 | 300.6 | 99.4 | -421.6 | .0 | 517.8 |
| 13 | -2184.4 | 1973.4 | -3257.1 | 232.7 | -769.8 | .0 | 3346.8 |
| 14 | 4808.5 | 2320.6 | -3982.5 | 497.7 | -1656.4 | .0 | 4313.2 |
| 15 | 3261.3 | 644.5 | 81.1 | 139.7 | -616.0 | .0 | 621.3 |
| 16 | 1714.1 | 644.5 | 81.1 | 123.6 | -538.2 | .0 | 544.3 |
| 17 | 166.9 | 644.5 | 81.1 | 107.5 | -460.5 | .0 | 467.6 |
| 18 | -1380.3 | 1930.4 | -3100.3 | 297.3 | -956.6 | .0 | 3244.5 |
| 19 | 6028.5 | 3292.4 | -6822.7 | 547.8 | -1831.4 | .0 | 7064.2 |
| 20 | 4481.3 | 1094.4 | -1525.7 | 155.8 | -693.8 | .0 | 1676.0 |
| 21 | 2934.1 | 841.4 | -832.2 | 139.7 | -616.0 | .0 | 1035.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1386.9 | 841.4 | -832.2 | 123.6 | -538.2 | .0 | 991.1 |
| 23 | -160.3 | 841.4 | -832.2 | 107.5 | -460.5 | .0 | 951.1 |
| 24 | -1707.5 | 841.4 | -832.2 | 91.4 | -382.7 | .0 | 916.0 |
| 25 | -3254.7 | 2391.1 | -4778.1 | 247.2 | -781.7 | .0 | 4841.6 |
| 26 | 5224.3 | 2434.1 | -4934.9 | 447.9 | -1553.8 | .0 | 5173.8 |
| 27 | 3677.1 | 722.6 | -531.4 | 147.8 | -654.9 | .0 | 843.4 |
| 28 | 2129.9 | 722.6 | -531.4 | 131.7 | -577.1 | .0 | 784.5 |
| 29 | 582.7 | 722.6 | -531.4 | 115.6 | -499.4 | .0 | 729.2 |
| 30 | -964.5 | 722.6 | -531.4 | 99.4 | -421.6 | .0 | 678.4 |
| 31 | -2511.7 | 2434.1 | -4934.9 | 232.7 | -769.8 | .0 | 4994.6 |
| 32 | 4420.1 | 2956.9 | -6204.3 | 497.7 | -1656.4 | .0 | 6421.6 |
| 33 | 2872.9 | 878.2 | -1002.9 | 139.7 | -616.0 | .0 | 1177.0 |
| 34 | 1325.7 | 878.2 | -1002.9 | 123.6 | -538.2 | .0 | 1138.2 |
| 35 | -221.5 | 878.2 | -1002.9 | 107.5 | -460.5 | .0 | 1103.6 |
| 36 | -1768.7 | 2477.2 | -5091.7 | 297.3 | -956.6 | .0 | 5180.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 22
spalla fissa - n777 _Sis10- n789 _Sis10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34678.5 | -5199.1 | 38589.1 | -15500.1 | -55229.3 | -6270.7 |
| 2 | 32688.9 | 2.8 | 36535.0 | 15116.0 | 53707.2 | -1672.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67367.4 | -5196.3 | 75124.1 | -384.1 | -22810.8 | -63603.0 |

Punto di applic. carico verticale: Xv = 1.115 m Yv = -.339 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.357 | -.251 | .447 | -.275 | -.029 | -.194 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 2357.7 | -11.1 | 533.1 | -170.5 | 564.4 | .0 | 776.3 |
| 2 | 2178.8 | -30.0 | 507.6 | -37.3 | 158.0 | .0 | 531.6 |
| 3 | 1999.8 | -30.1 | 494.7 | -21.4 | 81.3 | .0 | 501.4 |
| 4 | 1820.9 | -30.1 | 494.7 | -5.5 | 4.6 | .0 | 494.8 |
| 5 | 1642.0 | -30.1 | 494.7 | 10.4 | -72.2 | .0 | 500.0 |
| 6 | 1463.1 | -30.1 | 494.7 | 26.3 | -148.9 | .0 | 516.7 |
| 7 | 1284.1 | -21.6 | 533.1 | 126.2 | -471.5 | .0 | 711.7 |
| 8 | 2256.6 | 20.9 | 378.3 | -124.8 | 425.0 | .0 | 569.0 |
| 9 | 2077.7 | -13.9 | 409.2 | -29.4 | 119.7 | .0 | 426.3 |
| 10 | 1898.8 | -13.9 | 409.2 | -13.5 | 42.9 | .0 | 411.4 |
| 11 | 1719.9 | -13.9 | 409.2 | 2.4 | -33.8 | .0 | 410.6 |
| 12 | 1540.9 | -13.9 | 409.2 | 18.3 | -110.5 | .0 | 423.8 |
| 13 | 1362.0 | 20.9 | 378.3 | 87.7 | -348.7 | .0 | 514.6 |
| 14 | 2155.6 | 82.4 | 188.9 | -121.0 | 391.8 | .0 | 434.9 |
| 15 | 1976.7 | 6.2 | 326.3 | -21.4 | 81.3 | .0 | 336.2 |
| 16 | 1797.7 | 6.2 | 326.3 | -5.5 | 4.6 | .0 | 326.3 |
| 17 | 1618.8 | 6.2 | 326.3 | 10.4 | -72.2 | .0 | 334.2 |
| 18 | 1439.9 | 63.4 | 223.6 | 76.7 | -298.8 | .0 | 373.2 |
| 19 | 2458.5 | -496.9 | 2172.5 | -170.5 | 564.4 | .0 | 2244.6 |
| 20 | 2279.6 | -224.3 | 1355.8 | -37.3 | 158.0 | .0 | 1365.0 |
| 21 | 2100.6 | -188.1 | 1227.6 | -21.4 | 81.3 | .0 | 1230.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1921.7 | -188.1 | 1227.6 | -5.5 | 4.6 | .0 | 1227.6 |
| 23 | 1742.8 | -188.1 | 1227.6 | 10.4 | -72.2 | .0 | 1229.7 |
| 24 | 1563.9 | -188.1 | 1227.6 | 26.3 | -148.9 | .0 | 1236.6 |
| 25 | 1385.0 | -391.2 | 1879.4 | 126.2 | -471.5 | .0 | 1937.6 |
| 26 | 2380.6 | -433.7 | 2034.1 | -124.8 | 425.0 | .0 | 2078.0 |
| 27 | 2201.7 | -184.0 | 1230.2 | -29.4 | 119.7 | .0 | 1236.0 |
| 28 | 2022.8 | -184.0 | 1230.2 | -13.5 | 42.9 | .0 | 1231.0 |
| 29 | 1843.8 | -184.0 | 1230.2 | 2.4 | -33.8 | .0 | 1230.7 |
| 30 | 1664.9 | -184.0 | 1230.2 | 18.3 | -110.5 | .0 | 1235.2 |
| 31 | 1486.0 | -433.7 | 2034.1 | 87.7 | -348.7 | .0 | 2063.8 |
| 32 | 2302.7 | -545.5 | 2381.5 | -121.0 | 391.8 | .0 | 2413.5 |
| 33 | 2123.8 | -224.5 | 1396.1 | -21.4 | 81.3 | .0 | 1398.4 |
| 34 | 1944.9 | -224.5 | 1396.1 | -5.5 | 4.6 | .0 | 1396.1 |
| 35 | 1766.0 | -224.5 | 1396.1 | 10.4 | -72.2 | .0 | 1397.9 |
| 36 | 1587.1 | -476.2 | 2188.9 | 76.7 | -298.8 | .0 | 2209.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 23
spalla fissa - n777 _Sis11- n789 _Sis11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25198.5 | 22781.7 | 101172.0 | -6236.3 | -46489.8 | -63996.6 |
| 2 | 33764.9 | 5743.1 | 105380.0 | 19304.2 | 45203.8 | 87209.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58963.4 | 28524.8 | 206552.0 | 13067.9 | 90374.5 | 205525.6 |

Punto di applic. carico verticale: Xv = 3.503 m Yv = 1.533 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.189 | 22.064 | 2.661 | 6.033 | .170 | .625 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5127.2 | 1102.9 | -773.0 | 1173.9 | -3917.3 | .0 | 3992.9 |
| 2 | 4062.9 | 288.4 | 978.7 | 316.7 | -1398.5 | .0 | 1707.0 |
| 3 | 2998.7 | 200.9 | 1179.9 | 265.3 | -1150.5 | .0 | 1648.0 |
| 4 | 1934.5 | 200.9 | 1179.9 | 214.0 | -902.6 | .0 | 1485.5 |
| 5 | 870.2 | 200.9 | 1179.9 | 162.6 | -654.6 | .0 | 1349.3 |
| 6 | -194.0 | 200.9 | 1179.9 | 111.2 | -406.6 | .0 | 1248.0 |
| 7 | -1258.3 | 760.9 | -67.6 | 215.3 | -570.0 | .0 | 574.0 |
| 8 | 4663.2 | 623.6 | 432.4 | 937.3 | -3240.4 | .0 | 3269.2 |
| 9 | 3599.0 | 103.9 | 1532.1 | 291.0 | -1274.5 | .0 | 1992.9 |
| 10 | 2534.8 | 103.9 | 1532.1 | 239.7 | -1026.5 | .0 | 1844.2 |
| 11 | 1470.5 | 103.9 | 1532.1 | 188.3 | -778.6 | .0 | 1718.6 |
| 12 | 406.3 | 103.9 | 1532.1 | 136.9 | -530.6 | .0 | 1621.4 |
| 13 | -658.0 | 623.6 | 432.4 | 250.8 | -740.3 | .0 | 857.3 |
| 14 | 4199.3 | 617.0 | 680.2 | 1014.1 | -3359.5 | .0 | 3427.6 |
| 15 | 3135.1 | 83.6 | 1724.3 | 265.3 | -1150.5 | .0 | 2072.9 |
| 16 | 2070.8 | 83.6 | 1724.3 | 214.0 | -902.6 | .0 | 1946.2 |
| 17 | 1006.6 | 83.6 | 1724.3 | 162.6 | -654.6 | .0 | 1844.3 |
| 18 | -57.6 | 486.3 | 932.4 | 375.0 | -1127.9 | .0 | 1463.4 |
| 19 | 4534.0 | 2672.9 | -6070.7 | 1173.9 | -3917.3 | .0 | 7224.9 |
| 20 | 3469.8 | 916.0 | -1762.2 | 316.7 | -1398.5 | .0 | 2249.7 |
| 21 | 2405.5 | 711.5 | -1188.3 | 265.3 | -1150.5 | .0 | 1654.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1341.3 | 711.5 | -1188.3 | 214.0 | -902.6 | .0 | 1492.2 |
| 23 | 277.0 | 711.5 | -1188.3 | 162.6 | -654.6 | .0 | 1356.7 |
| 24 | -787.2 | 711.5 | -1188.3 | 111.2 | -406.6 | .0 | 1255.9 |
| 25 | -1851.4 | 1955.3 | -4418.0 | 215.3 | -570.0 | .0 | 4454.6 |
| 26 | 3933.7 | 2092.6 | -4918.0 | 937.3 | -3240.4 | .0 | 5889.6 |
| 27 | 2869.5 | 653.5 | -1121.0 | 291.0 | -1274.5 | .0 | 1697.4 |
| 28 | 1805.2 | 653.5 | -1121.0 | 239.7 | -1026.5 | .0 | 1520.0 |
| 29 | 741.0 | 653.5 | -1121.0 | 188.3 | -778.6 | .0 | 1364.9 |
| 30 | -323.3 | 653.5 | -1121.0 | 136.9 | -530.6 | .0 | 1240.3 |
| 31 | -1387.5 | 2092.6 | -4918.0 | 250.8 | -740.3 | .0 | 4973.4 |
| 32 | 3333.4 | 2646.0 | -6404.9 | 1014.1 | -3359.5 | .0 | 7232.5 |
| 33 | 2269.2 | 828.9 | -1732.7 | 265.3 | -1150.5 | .0 | 2079.9 |
| 34 | 1204.9 | 828.9 | -1732.7 | 214.0 | -902.6 | .0 | 1953.7 |
| 35 | 140.7 | 828.9 | -1732.7 | 162.6 | -654.6 | .0 | 1852.2 |
| 36 | -923.6 | 2229.9 | -5418.0 | 375.0 | -1127.9 | .0 | 5534.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 24
spalla fissa - n777 _Sis12 - n789 _Sis12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35131.3 | -995.2 | 81118.7 | -16772.6 | -54913.1 | -52804.6 |
| 2 | 27990.0 | 16116.0 | 77135.2 | 10828.5 | 52003.4 | 31217.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63121.3 | 15120.8 | 158253.9 | -5944.1 | -79321.6 | -204677.3 |

Punto di applic. carico verticale: Xv = 2.507 m Yv = -1.257 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.767 | 13.325 | 1.813 | -2.929 | -.123 | -.623 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3715.5 | 1821.4 | -4136.3 | -796.5 | 2650.4 | .0 | 4912.6 |
| 2 | 2990.2 | 624.2 | -1200.4 | -198.2 | 862.8 | .0 | 1478.3 |
| 3 | 2264.8 | 484.8 | -809.3 | -147.0 | 615.8 | .0 | 1017.0 |
| 4 | 1539.4 | 484.8 | -809.3 | -95.9 | 368.9 | .0 | 889.4 |
| 5 | 814.0 | 484.8 | -809.3 | -44.7 | 121.9 | .0 | 818.5 |
| 6 | 88.7 | 484.8 | -809.3 | 6.4 | -125.0 | .0 | 818.9 |
| 7 | -636.7 | 1332.4 | -3010.1 | 158.1 | -683.1 | .0 | 3086.6 |
| 8 | 3303.7 | 1469.1 | -3508.1 | -614.1 | 2111.6 | .0 | 4094.6 |
| 9 | 2578.3 | 461.5 | -841.5 | -172.6 | 739.3 | .0 | 1120.1 |
| 10 | 1852.9 | 461.5 | -841.5 | -121.5 | 492.4 | .0 | 974.9 |
| 11 | 1127.5 | 461.5 | -841.5 | -70.3 | 245.4 | .0 | 876.5 |
| 12 | 402.2 | 461.5 | -841.5 | -19.2 | -1.5 | .0 | 841.5 |
| 13 | -323.2 | 1469.1 | -3508.1 | 69.5 | -378.2 | .0 | 3528.4 |
| 14 | 2891.8 | 1903.5 | -4714.9 | -637.4 | 2094.8 | .0 | 5159.3 |
| 15 | 2166.4 | 601.7 | -1351.5 | -147.0 | 615.8 | .0 | 1485.2 |
| 16 | 1441.0 | 601.7 | -1351.5 | -95.9 | 368.9 | .0 | 1400.9 |
| 17 | 715.7 | 601.7 | -1351.5 | -44.7 | 121.9 | .0 | 1357.0 |
| 18 | -9.7 | 1605.9 | -4006.1 | -1.0 | -127.6 | .0 | 4008.1 |
| 19 | 4143.4 | 257.9 | 1139.5 | -796.5 | 2650.4 | .0 | 2884.9 |
| 20 | 3418.1 | -.8 | 1529.2 | -198.2 | 862.8 | .0 | 1755.8 |
| 21 | 2692.7 | -23.6 | 1549.1 | -147.0 | 615.8 | .0 | 1667.0 |

```
  22   1967.3    -23.6   1549.1    -95.9    368.9       .0    1592.4
  23   1242.0    -23.6   1549.1    -44.7    121.9       .0    1553.9
  24    516.6    -23.6   1549.1      6.4   -125.0       .0    1554.1
  25   -208.8    142.9   1322.3    158.1   -683.1       .0    1488.3
  26   3829.9      6.2   1820.2   -614.1   2111.6       .0    2787.9
  27   3104.6    -85.9   1800.8   -172.6    739.3       .0    1946.6
  28   2379.2    -85.9   1800.8   -121.5    492.4       .0    1866.9
  29   1653.8    -85.9   1800.8    -70.3    245.4       .0    1817.4
  30    928.5    -85.9   1800.8    -19.2     -1.5       .0    1800.8
  31    203.1      6.2   1820.2     69.5   -378.2       .0    1859.1
  32   3516.4   -117.1   2341.0   -637.4   2094.8       .0    3141.4
  33   2791.1   -140.5   2091.2   -147.0    615.8       .0    2180.0
  34   2065.7   -140.5   2091.2    -95.9    368.9       .0    2123.5
  35   1340.3   -140.5   2091.2    -44.7    121.9       .0    2094.8
  36    615.0   -130.6   2318.2     -1.0   -127.6       .0    2321.7
 --------------------------------------------------------------------

 Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 25
spalla fissa - n777 _Sis13- n789 _Sis13

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24083.2 | 21349.8 | 121370.9 | -3126.2 | -46856.2 | -88191.2 |
| 2 | 29240.2 | 16301.9 | 124218.0 | 18910.2 | 39478.8 | 99438.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 53323.4 | 37651.7 | 245588.9 | 15784.0 | 47802.5 | 65260.2 |

Punto di applic. carico verticale: Xv = 4.606 m Yv = .896 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.406 | 28.219 | 3.288 | 6.991 | .133 | .199 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5658.5 | 2221.2 | -3850.7 | 985.8 | -3300.8 | .0 | 5071.8 |
| 2 | 4343.2 | 699.5 | -288.3 | 293.4 | -1314.5 | .0 | 1345.8 |
| 3 | 3027.8 | 527.4 | 164.0 | 277.1 | -1235.8 | .0 | 1246.6 |
| 4 | 1712.5 | 527.4 | 164.0 | 260.8 | -1157.0 | .0 | 1168.6 |
| 5 | 397.2 | 527.4 | 164.0 | 244.4 | -1078.3 | .0 | 1090.7 |
| 6 | -918.1 | 527.4 | 164.0 | 228.1 | -999.6 | .0 | 1012.9 |
| 7 | -2233.4 | 1593.1 | -2461.1 | 681.5 | -2237.9 | .0 | 3326.5 |
| 8 | 5054.0 | 1549.6 | -2302.3 | 823.2 | -2863.0 | .0 | 3673.9 |
| 9 | 3738.7 | 419.8 | 486.9 | 285.2 | -1275.1 | .0 | 1364.9 |
| 10 | 2423.4 | 419.8 | 486.9 | 268.9 | -1196.4 | .0 | 1291.7 |
| 11 | 1108.1 | 419.8 | 486.9 | 252.6 | -1117.7 | .0 | 1219.1 |
| 12 | -207.3 | 419.8 | 486.9 | 236.3 | -1038.9 | .0 | 1147.4 |
| 13 | -1522.6 | 1549.6 | -2302.3 | 605.2 | -2069.1 | .0 | 3095.5 |
| 14 | 4449.5 | 1815.6 | -2836.6 | 935.1 | -3123.6 | .0 | 4219.4 |
| 15 | 3134.2 | 490.1 | 336.8 | 277.1 | -1235.8 | .0 | 1280.9 |
| 16 | 1818.9 | 490.1 | 336.8 | 260.8 | -1157.0 | .0 | 1205.1 |
| 17 | 503.6 | 490.1 | 336.8 | 244.4 | -1078.3 | .0 | 1129.7 |
| 18 | -811.7 | 1506.0 | -2143.6 | 732.2 | -2415.1 | .0 | 3229.2 |
| 19 | 5195.8 | 2719.7 | -5532.8 | 985.8 | -3300.8 | .0 | 6442.6 |
| 20 | 3880.5 | 898.7 | -1158.7 | 293.4 | -1314.5 | .0 | 1752.3 |
| 21 | 2565.2 | 689.5 | -588.0 | 277.1 | -1235.8 | .0 | 1368.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1249.9 | 689.5 | -588.0 | 260.8 | -1157.0 | .0 | 1297.9 |
| 23 | -65.4 | 689.5 | -588.0 | 244.4 | -1078.3 | .0 | 1228.2 |
| 24 | -1380.7 | 689.5 | -588.0 | 228.1 | -999.6 | .0 | 1159.7 |
| 25 | -2696.1 | 1972.4 | -3842.5 | 681.5 | -2237.9 | .0 | 4446.7 |
| 26 | 4485.0 | 2016.0 | -4001.2 | 823.2 | -2863.0 | .0 | 4920.0 |
| 27 | 3169.7 | 594.3 | -355.6 | 285.2 | -1275.1 | .0 | 1323.8 |
| 28 | 1854.4 | 594.3 | -355.6 | 268.9 | -1196.4 | .0 | 1248.1 |
| 29 | 539.0 | 594.3 | -355.6 | 252.6 | -1117.7 | .0 | 1172.9 |
| 30 | -776.3 | 594.3 | -355.6 | 236.3 | -1038.9 | .0 | 1098.1 |
| 31 | -2091.6 | 2016.0 | -4001.2 | 605.2 | -2069.1 | .0 | 4504.6 |
| 32 | 3774.2 | 2459.9 | -5086.3 | 935.1 | -3123.6 | .0 | 5968.9 |
| 33 | 2458.8 | 726.8 | -760.8 | 277.1 | -1235.8 | .0 | 1451.2 |
| 34 | 1143.5 | 726.8 | -760.8 | 260.8 | -1157.0 | .0 | 1384.8 |
| 35 | -171.8 | 726.8 | -760.8 | 244.4 | -1078.3 | .0 | 1319.7 |
| 36 | -1487.1 | 2059.6 | -4160.0 | 732.2 | -2415.1 | .0 | 4810.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 26
spalla fissa - n777 _Sis14- n789 _Sis14

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33941.1 | -8168.1 | 33801.3 | -11410.1 | -57902.5 | 2741.3 |
| 2 | 33568.3 | -2895.2 | 31788.6 | 19317.1 | 51422.5 | -9025.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67509.4 | -11063.3 | 65589.9 | 7907.0 | -10469.0 | -62704.5 |

Punto di applic. carico verticale: Xv = .972 m Yv = -.155 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.376 | -3.688 | .172 | 3.336 | .026 | -.191 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 2126.9 | -376.5 | 1461.6 | 268.4 | -910.0 | .0 | 1721.7 |
| 2 | 2057.9 | -160.4 | 845.6 | 100.6 | -465.8 | .0 | 965.4 |
| 3 | 1988.9 | -132.7 | 752.2 | 116.2 | -541.5 | .0 | 926.9 |
| 4 | 1920.0 | -132.7 | 752.2 | 131.9 | -617.1 | .0 | 973.0 |
| 5 | 1851.0 | -132.7 | 752.2 | 147.6 | -692.8 | .0 | 1022.6 |
| 6 | 1782.0 | -132.7 | 752.2 | 163.3 | -768.4 | .0 | 1075.3 |
| 7 | 1713.0 | -291.5 | 1237.0 | 560.9 | -1931.2 | .0 | 2293.4 |
| 8 | 2102.7 | -249.6 | 1084.4 | 251.2 | -888.8 | .0 | 1402.1 |
| 9 | 2033.7 | -101.8 | 623.2 | 108.4 | -503.7 | .0 | 801.3 |
| 10 | 1964.7 | -101.8 | 623.2 | 124.1 | -579.3 | .0 | 850.8 |
| 11 | 1895.7 | -101.8 | 623.2 | 139.8 | -655.0 | .0 | 904.0 |
| 12 | 1826.8 | -101.8 | 623.2 | 155.4 | -730.6 | .0 | 960.3 |
| 13 | 1757.8 | -249.6 | 1084.4 | 460.6 | -1651.6 | .0 | 1975.8 |
| 14 | 2078.4 | -238.5 | 1016.4 | 317.2 | -1080.2 | .0 | 1483.2 |
| 15 | 2009.5 | -96.9 | 586.1 | 116.2 | -541.5 | .0 | 798.0 |
| 16 | 1940.5 | -96.9 | 586.1 | 131.9 | -617.1 | .0 | 851.1 |
| 17 | 1871.5 | -96.9 | 586.1 | 147.6 | -692.8 | .0 | 907.5 |
| 18 | 1802.6 | -207.8 | 931.9 | 512.2 | -1761.0 | .0 | 1992.4 |
| 19 | 2037.5 | -855.5 | 3077.9 | 268.4 | -910.0 | .0 | 3209.6 |
| 20 | 1968.5 | -351.8 | 1681.8 | 100.6 | -465.8 | .0 | 1745.2 |
| 21 | 1899.5 | -288.5 | 1474.7 | 116.2 | -541.5 | .0 | 1571.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1830.6 | -288.5 | 1474.7 | 131.9 | -617.1 | .0 | 1598.7 |
| 23 | 1761.6 | -288.5 | 1474.7 | 147.6 | -692.8 | .0 | 1629.4 |
| 24 | 1692.6 | -288.5 | 1474.7 | 163.3 | -768.4 | .0 | 1662.9 |
| 25 | 1623.7 | -655.9 | 2564.3 | 560.9 | -1931.2 | .0 | 3210.1 |
| 26 | 1992.7 | -697.8 | 2716.8 | 251.2 | -888.8 | .0 | 2858.5 |
| 27 | 1923.7 | -269.5 | 1432.6 | 108.4 | -503.7 | .0 | 1518.6 |
| 28 | 1854.8 | -269.5 | 1432.6 | 124.1 | -579.3 | .0 | 1545.3 |
| 29 | 1785.8 | -269.5 | 1432.6 | 139.8 | -655.0 | .0 | 1575.2 |
| 30 | 1716.8 | -269.5 | 1432.6 | 155.4 | -730.6 | .0 | 1608.2 |
| 31 | 1647.9 | -697.8 | 2716.8 | 460.6 | -1651.6 | .0 | 3179.4 |
| 32 | 1948.0 | -857.5 | 3178.0 | 317.2 | -1080.2 | .0 | 3356.6 |
| 33 | 1879.0 | -324.3 | 1640.8 | 116.2 | -541.5 | .0 | 1727.9 |
| 34 | 1810.0 | -324.3 | 1640.8 | 131.9 | -617.1 | .0 | 1753.1 |
| 35 | 1741.0 | -324.3 | 1640.8 | 147.6 | -692.8 | .0 | 1781.1 |
| 36 | 1672.1 | -739.7 | 2869.4 | 512.2 | -1761.0 | .0 | 3366.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 27
spalla fissa - n777 _Sis15- n789 _Sis15

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24371.8 | 18754.6 | 90579.2 | -2146.4 | -48828.5 | -50113.3 |
| 2 | 34591.6 | 1791.1 | 94982.1 | 23505.4 | 42652.9 | 74995.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58963.4 | 20545.7 | 185561.3 | 21359.0 | 103176.3 | 206391.2 |

Punto di applic. carico verticale: Xv = 3.147 m Yv = 1.750 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.189 | 17.121 | 2.220 | 9.646 | .226 | .628 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4695.0 | 600.9 | 433.3 | 1612.7 | -5391.0 | .0 | 5408.4 |
| 2 | 3806.9 | 113.0 | 1374.8 | 454.6 | -2021.8 | .0 | 2444.9 |
| 3 | 2918.7 | 63.8 | 1466.8 | 403.0 | -1772.8 | .0 | 2300.9 |
| 4 | 2030.5 | 63.8 | 1466.8 | 351.4 | -1523.8 | .0 | 2115.0 |
| 5 | 1142.3 | 63.8 | 1466.8 | 299.8 | -1274.8 | .0 | 1943.3 |
| 6 | 254.2 | 63.8 | 1466.8 | 248.2 | -1025.7 | .0 | 1789.8 |
| 7 | -634.0 | 391.8 | 829.1 | 650.1 | -2029.6 | .0 | 2192.4 |
| 8 | 4341.2 | 254.0 | 1331.3 | 1313.2 | -4553.5 | .0 | 4744.2 |
| 9 | 3453.0 | -13.0 | 1759.9 | 428.8 | -1897.3 | .0 | 2587.8 |
| 10 | 2564.9 | -13.0 | 1759.9 | 377.2 | -1648.3 | .0 | 2411.2 |
| 11 | 1676.7 | -13.0 | 1759.9 | 325.6 | -1399.3 | .0 | 2248.4 |
| 12 | 788.5 | -13.0 | 1759.9 | 274.0 | -1150.3 | .0 | 2102.4 |
| 13 | -99.7 | 254.0 | 1331.3 | 623.8 | -2042.8 | .0 | 2438.3 |
| 14 | 3987.4 | 177.7 | 1745.0 | 1452.3 | -4830.8 | .0 | 5136.3 |
| 15 | 3099.2 | -54.1 | 2013.4 | 403.0 | -1772.8 | .0 | 2682.7 |
| 16 | 2211.0 | -54.1 | 2013.4 | 351.4 | -1523.8 | .0 | 2525.0 |
| 17 | 1322.9 | -54.1 | 2013.4 | 299.8 | -1274.8 | .0 | 2383.1 |
| 18 | 434.7 | 116.1 | 1833.4 | 810.5 | -2589.8 | .0 | 3173.1 |
| 19 | 3909.8 | 2177.5 | -4886.7 | 1612.7 | -5391.0 | .0 | 7276.1 |
| 20 | 3021.6 | 743.2 | -1377.7 | 454.6 | -2021.8 | .0 | 2446.6 |
| 21 | 2133.4 | 576.5 | -911.4 | 403.0 | -1772.8 | .0 | 1993.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1245.2 | 576.5 | -911.4 | 351.4 | -1523.8 | .0 | 1775.5 |
| 23 | 357.1 | 576.5 | -911.4 | 299.8 | -1274.8 | .0 | 1567.0 |
| 24 | -531.1 | 576.5 | -911.4 | 248.2 | -1025.7 | .0 | 1372.1 |
| 25 | -1419.3 | 1591.3 | -3539.5 | 650.1 | -2029.6 | .0 | 4080.1 |
| 26 | 3375.4 | 1729.2 | -4041.6 | 1313.2 | -4553.5 | .0 | 6088.5 |
| 27 | 2487.2 | 539.0 | -904.5 | 428.8 | -1897.3 | .0 | 2101.8 |
| 28 | 1599.1 | 539.0 | -904.5 | 377.2 | -1648.3 | .0 | 1880.1 |
| 29 | 710.9 | 539.0 | -904.5 | 325.6 | -1399.3 | .0 | 1666.1 |
| 30 | -177.3 | 539.0 | -904.5 | 274.0 | -1150.3 | .0 | 1463.3 |
| 31 | -1065.5 | 1729.2 | -4041.6 | 623.8 | -2042.8 | .0 | 4528.6 |
| 32 | 2841.1 | 2215.3 | -5370.0 | 1452.3 | -4830.8 | .0 | 7223.1 |
| 33 | 1952.9 | 694.4 | -1458.1 | 403.0 | -1772.8 | .0 | 2295.4 |
| 34 | 1064.7 | 694.4 | -1458.1 | 351.4 | -1523.8 | .0 | 2109.0 |
| 35 | 176.5 | 694.4 | -1458.1 | 299.8 | -1274.8 | .0 | 1936.7 |
| 36 | -711.6 | 1867.0 | -4543.8 | 810.5 | -2589.8 | .0 | 5230.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 28
spalla fissa - n777 _Sis16- n789 _Sis16

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34317.3 | -5622.4 | 67528.5 | -12732.4 | -57156.3 | -36290.6 |
| 2 | 28804.0 | 11576.1 | 63676.0 | 15019.4 | 49390.5 | 16256.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63121.3 | 5953.7 | 131204.5 | 2287.0 | -66758.1 | -204058.5 |

Punto di applic. carico verticale: Xv = 2.079 m Yv = -1.058 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.767 | 7.549 | 1.283 | .658 | -.068 | -.621 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3174.6 | 1243.7 | -2774.2 | -361.4 | 1189.2 | .0 | 3018.4 |
| 2 | 2661.3 | 423.6 | -770.3 | -61.5 | 244.4 | .0 | 808.1 |
| 3 | 2147.9 | 328.4 | -504.3 | -10.5 | -1.8 | .0 | 504.3 |
| 4 | 1634.5 | 328.4 | -504.3 | 40.6 | -248.0 | .0 | 561.9 |
| 5 | 1121.1 | 328.4 | -504.3 | 91.6 | -494.2 | .0 | 706.0 |
| 6 | 607.7 | 328.4 | -504.3 | 142.6 | -740.4 | .0 | 895.8 |
| 7 | 94.3 | 908.5 | -2004.5 | 590.3 | -2134.2 | .0 | 2928.0 |
| 8 | 2890.6 | 1044.8 | -2501.0 | -241.3 | 809.4 | .0 | 2628.7 |
| 9 | 2377.2 | 328.5 | -604.5 | -36.0 | 121.3 | .0 | 616.6 |
| 10 | 1863.8 | 328.5 | -604.5 | 15.1 | -124.9 | .0 | 617.3 |
| 11 | 1350.4 | 328.5 | -604.5 | 66.1 | -371.1 | .0 | 709.3 |
| 12 | 837.1 | 328.5 | -604.5 | 117.1 | -617.3 | .0 | 864.0 |
| 13 | 323.7 | 1044.8 | -2501.0 | 440.3 | -1673.0 | .0 | 3009.0 |
| 14 | 2606.6 | 1399.1 | -3517.9 | -202.8 | 635.3 | .0 | 3574.9 |
| 15 | 2093.2 | 444.9 | -1044.8 | -10.5 | -1.8 | .0 | 1044.8 |
| 16 | 1579.8 | 444.9 | -1044.8 | 40.6 | -248.0 | .0 | 1073.8 |
| 17 | 1066.4 | 444.9 | -1044.8 | 91.6 | -494.2 | .0 | 1155.7 |
| 18 | 553.0 | 1181.1 | -2997.5 | 431.7 | -1580.3 | .0 | 3388.5 |
| 19 | 3412.4 | -315.1 | 2485.6 | -361.4 | 1189.2 | .0 | 2755.5 |
| 20 | 2899.0 | -199.5 | 1951.1 | -61.5 | 244.4 | .0 | 1966.4 |
| 21 | 2385.7 | -178.6 | 1847.0 | -10.5 | -1.8 | .0 | 1847.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1872.3 | -178.6 | 1847.0 | 40.6 | -248.0 | .0 | 1863.6 |
| 23 | 1358.9 | -178.6 | 1847.0 | 91.6 | -494.2 | .0 | 1912.0 |
| 24 | 845.5 | -178.6 | 1847.0 | 142.6 | -740.4 | .0 | 1989.8 |
| 25 | 332.1 | -277.5 | 2314.7 | 590.3 | -2134.2 | .0 | 3148.5 |
| 26 | 3183.1 | -413.8 | 2811.2 | -241.3 | 809.4 | .0 | 2925.4 |
| 27 | 2669.7 | -217.3 | 2029.7 | -36.0 | 121.3 | .0 | 2033.3 |
| 28 | 2156.3 | -217.3 | 2029.7 | 15.1 | -124.9 | .0 | 2033.5 |
| 29 | 1642.9 | -217.3 | 2029.7 | 66.1 | -371.1 | .0 | 2063.3 |
| 30 | 1129.5 | -217.3 | 2029.7 | 117.1 | -617.3 | .0 | 2121.5 |
| 31 | 616.1 | -413.8 | 2811.2 | 440.3 | -1673.0 | .0 | 3271.3 |
| 32 | 2953.7 | -615.5 | 3516.6 | -202.8 | 635.3 | .0 | 3573.5 |
| 33 | 2440.3 | -295.1 | 2387.5 | -10.5 | -1.8 | .0 | 2387.5 |
| 34 | 1926.9 | -295.1 | 2387.5 | 40.6 | -248.0 | .0 | 2400.3 |
| 35 | 1413.5 | -295.1 | 2387.5 | 91.6 | -494.2 | .0 | 2438.1 |
| 36 | 900.1 | -550.1 | 3307.7 | 431.7 | -1580.3 | .0 | 3665.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 29
spalla fissa - n777 _Sis17- n789 _Sis17

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 23864.1 | 18810.4 | 88521.4 | -1943.5 | -47883.3 | -49626.1 |
| 2 | 34311.3 | 1857.2 | 93860.0 | 23302.5 | 42132.1 | 74629.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58175.4 | 20667.6 | 182381.4 | 21359.0 | 106033.9 | 206402.3 |

Punto di applic. carico verticale: Xv = 3.135 m Yv = 1.823 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.080 | 17.080 | 2.198 | 9.660 | .229 | .628 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4652.4 | 605.6 | 392.5 | 1613.0 | -5388.3 | .0 | 5402.6 |
| 2 | 3773.1 | 116.2 | 1342.2 | 454.5 | -2018.7 | .0 | 2424.2 |
| 3 | 2893.8 | 66.6 | 1435.8 | 402.9 | -1769.7 | .0 | 2278.9 |
| 4 | 2014.5 | 66.6 | 1435.8 | 351.3 | -1520.6 | .0 | 2091.4 |
| 5 | 1135.2 | 66.6 | 1435.8 | 299.7 | -1271.6 | .0 | 1918.0 |
| 6 | 256.0 | 66.6 | 1435.8 | 248.1 | -1022.6 | .0 | 1762.7 |
| 7 | -623.3 | 396.1 | 790.9 | 650.3 | -2026.7 | .0 | 2175.6 |
| 8 | 4304.4 | 258.3 | 1293.1 | 1313.4 | -4550.7 | .0 | 4730.9 |
| 9 | 3425.1 | -10.3 | 1730.0 | 428.7 | -1894.2 | .0 | 2565.3 |
| 10 | 2545.8 | -10.3 | 1730.0 | 377.1 | -1645.2 | .0 | 2387.3 |
| 11 | 1666.5 | -10.3 | 1730.0 | 325.5 | -1396.1 | .0 | 2223.0 |
| 12 | 787.2 | -10.3 | 1730.0 | 273.9 | -1147.1 | .0 | 2075.7 |
| 13 | -92.1 | 258.3 | 1293.1 | 624.0 | -2039.9 | .0 | 2415.2 |
| 14 | 3956.4 | 182.3 | 1705.5 | 1452.5 | -4828.1 | .0 | 5120.4 |
| 15 | 3077.1 | -51.3 | 1982.5 | 402.9 | -1769.7 | .0 | 2657.5 |
| 16 | 2197.8 | -51.3 | 1982.5 | 351.3 | -1520.6 | .0 | 2498.6 |
| 17 | 1318.5 | -51.3 | 1982.5 | 299.7 | -1271.6 | .0 | 2355.3 |
| 18 | 439.2 | 120.4 | 1795.3 | 810.7 | -2587.0 | .0 | 3148.9 |
| 19 | 3855.3 | 2182.4 | -4927.7 | 1613.0 | -5388.3 | .0 | 7301.8 |
| 20 | 2976.0 | 746.4 | -1410.5 | 454.5 | -2018.7 | .0 | 2462.6 |
| 21 | 2096.7 | 579.4 | -942.5 | 402.9 | -1769.7 | .0 | 2005.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1217.4 | 579.4 | -942.5 | 351.3 | -1520.6 | .0 | 1789.0 |
| 23 | 338.1 | 579.4 | -942.5 | 299.7 | -1271.6 | .0 | 1582.8 |
| 24 | -541.2 | 579.4 | -942.5 | 248.1 | -1022.6 | .0 | 1390.7 |
| 25 | -1420.4 | 1595.7 | -3577.9 | 650.3 | -2026.7 | .0 | 4112.1 |
| 26 | 3324.0 | 1733.5 | -4080.1 | 1313.4 | -4550.7 | .0 | 6112.0 |
| 27 | 2444.7 | 541.7 | -934.5 | 428.7 | -1894.2 | .0 | 2112.2 |
| 28 | 1565.5 | 541.7 | -934.5 | 377.1 | -1645.2 | .0 | 1892.1 |
| 29 | 686.2 | 541.7 | -934.5 | 325.5 | -1396.1 | .0 | 1680.1 |
| 30 | -193.1 | 541.7 | -934.5 | 273.9 | -1147.1 | .0 | 1479.6 |
| 31 | -1072.4 | 1733.5 | -4080.1 | 624.0 | -2039.9 | .0 | 4561.6 |
| 32 | 2792.8 | 2220.0 | -5409.9 | 1452.5 | -4828.1 | .0 | 7251.0 |
| 33 | 1913.5 | 697.3 | -1489.2 | 402.9 | -1769.7 | .0 | 2312.9 |
| 34 | 1034.2 | 697.3 | -1489.2 | 351.3 | -1520.6 | .0 | 2128.4 |
| 35 | 154.9 | 697.3 | -1489.2 | 299.7 | -1271.6 | .0 | 1958.2 |
| 36 | -724.4 | 1871.4 | -4582.3 | 810.7 | -2587.0 | .0 | 5262.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 29
spalla fissa - n777 _Sis17- n789 _Sis17

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 2182.4 | -4927.7 | 1613.0 | -5388.3 | 2713.7 | 7301.8 |
| 1.56 | 1852.9 | -1786.5 | 1439.8 | -3005.4 | 2346.5 | 3496.3 |
| 3.13 | 1402.8 | 888.2 | 1171.2 | -880.7 | 1827.5 | 1250.8 |
| 4.69 | 589.0 | 2383.6 | 642.8 | 508.9 | 871.8 | 2437.3 |
| 6.25 | 61.7 | 2841.6 | 253.1 | 1182.8 | 260.6 | 3077.9 |
| 7.81 | -238.9 | 2665.2 | -13.5 | 1348.1 | 239.2 | 2986.8 |
| 9.38 | -312.1 | 2198.0 | -95.4 | 1228.0 | 326.3 | 2517.8 |
| 10.94 | -319.5 | 1700.4 | -120.0 | 1056.8 | 341.3 | 2002.0 |
| 12.50 | -308.6 | 1206.3 | -131.7 | 858.2 | 335.5 | 1480.4 |
| 15.00 | -219.2 | 517.2 | -125.7 | 526.3 | 252.6 | 737.9 |
| 17.50 | -114.4 | 107.7 | -90.9 | 250.8 | 146.1 | 272.9 |
| 20.00 | -41.4 | -75.7 | -52.0 | 73.8 | 66.4 | 105.7 |
| 22.50 | -2.3 | -120.7 | -22.1 | -15.2 | 22.2 | 121.7 |
| 25.00 | 12.2 | -102.7 | -2.7 | -44.2 | 12.5 | 111.8 |
| 29.17 | 11.3 | -47.7 | 3.9 | -33.3 | 12.0 | 58.2 |
| 33.33 | 6.0 | -11.5 | 3.5 | -16.5 | 6.9 | 20.2 |
| 37.50 | 1.6 | 3.5 | 1.9 | -4.9 | 2.4 | 6.1 |
| 43.75 | -.7 | 3.9 | .2 | .7 | .7 | 3.9 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 30
spalla fissa - n777 _Sis18 - n789 _Sis18

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34038.0 | -5555.8 | 66411.8 | -12530.0 | -56637.5 | -35925.7 |
| 2 | 28297.3 | 11631.5 | 61622.4 | 14817.0 | 48447.2 | 15771.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 62335.3 | 6075.7 | 128034.2 | 2287.0 | -69615.8 | -204058.3 |

Punto di applic. carico verticale: Xv = 2.054 m Yv = -1.117 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.658 | 7.508 | 1.261 | .644 | -.072 | -.621 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3120.4 | 1248.6 | -2815.1 | -361.7 | 1186.4 | .0 | 3054.9 |
| 2 | 2615.8 | 426.8 | -802.9 | -61.3 | 241.3 | .0 | 838.4 |
| 3 | 2111.3 | 331.3 | -535.2 | -10.3 | -4.9 | .0 | 535.2 |
| 4 | 1606.7 | 331.3 | -535.2 | 40.7 | -251.1 | .0 | 591.2 |
| 5 | 1102.2 | 331.3 | -535.2 | 91.7 | -497.3 | .0 | 730.6 |
| 6 | 597.6 | 331.3 | -535.2 | 142.7 | -743.5 | .0 | 916.1 |
| 7 | 93.1 | 912.8 | -2042.8 | 590.1 | -2137.0 | .0 | 2956.3 |
| 8 | 2839.4 | 1049.1 | -2539.3 | -241.4 | 806.5 | .0 | 2664.3 |
| 9 | 2334.8 | 331.2 | -634.5 | -35.8 | 118.2 | .0 | 645.4 |
| 10 | 1830.3 | 331.2 | -634.5 | 15.2 | -128.0 | .0 | 647.3 |
| 11 | 1325.8 | 331.2 | -634.5 | 66.2 | -374.2 | .0 | 736.6 |
| 12 | 821.2 | 331.2 | -634.5 | 117.2 | -620.4 | .0 | 887.4 |
| 13 | 316.7 | 1049.1 | -2539.3 | 440.1 | -1675.9 | .0 | 3042.4 |
| 14 | 2558.4 | 1403.7 | -3557.6 | -203.0 | 632.5 | .0 | 3613.4 |
| 15 | 2053.9 | 447.8 | -1075.7 | -10.3 | -4.9 | .0 | 1075.7 |
| 16 | 1549.3 | 447.8 | -1075.7 | 40.7 | -251.1 | .0 | 1104.6 |
| 17 | 1044.8 | 447.8 | -1075.7 | 91.7 | -497.3 | .0 | 1185.1 |
| 18 | 540.3 | 1185.4 | -3035.7 | 431.5 | -1583.1 | .0 | 3423.7 |
| 19 | 3370.0 | -310.3 | 2444.8 | -361.7 | 1186.4 | .0 | 2717.4 |
| 20 | 2865.4 | -196.3 | 1918.5 | -61.3 | 241.3 | .0 | 1933.6 |
| 21 | 2360.9 | -175.7 | 1816.0 | -10.3 | -4.9 | .0 | 1816.0 |

```
 22   1856.3   -175.7   1816.0     40.7   -251.1       .0    1833.3
 23   1351.8   -175.7   1816.0     91.7   -497.3       .0    1882.9
 24    847.3   -175.7   1816.0    142.7   -743.5       .0    1962.3
 25    342.7   -273.1   2276.5    590.1  -2137.0       .0    3122.3
 26   3146.4   -409.4   2772.9   -241.4    806.5       .0    2887.8
 27   2641.8   -214.6   1999.8    -35.8    118.2       .0    2003.3
 28   2137.3   -214.6   1999.8     15.2   -128.0       .0    2003.9
 29   1632.8   -214.6   1999.8     66.2   -374.2       .0    2034.5
 30   1128.2   -214.6   1999.8    117.2   -620.4       .0    2093.8
 31    623.7   -409.4   2772.9    440.1  -1675.9       .0    3240.0
 32   2922.8   -610.9   3476.9   -203.0    632.5       .0    3534.0
 33   2418.3   -292.2   2356.6    -10.3     -4.9       .0    2356.6
 34   1913.7   -292.2   2356.6     40.7   -251.1       .0    2369.9
 35   1409.2   -292.2   2356.6     91.7   -497.3       .0    2408.4
 36    904.6   -545.7   3269.4    431.5  -1583.1       .0    3632.5
-------------------------------------------------------------------

Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 31
spalla fissa - n777 _Sis19 - n789 _Sis19

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24827.8 | 21759.5 | 127006.5 | -3467.4 | -48323.1 | -91280.6 |
| 2 | 29889.5 | 16706.2 | 129459.8 | 19251.5 | 40767.7 | 102480.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54717.3 | 38465.7 | 256466.3 | 15784.1 | 46604.8 | 65270.5 |

Punto di applic. carico verticale: Xv = 4.687 m Yv = .852 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.600 | 29.016 | 3.405 | 6.985 | .132 | .199 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5835.2 | 2279.0 | -3915.9 | 985.8 | -3302.0 | .0 | 5122.3 |
| 2 | 4473.1 | 715.9 | -261.4 | 293.4 | -1315.8 | .0 | 1341.6 |
| 3 | 3110.9 | 539.3 | 201.9 | 277.1 | -1237.1 | .0 | 1253.5 |
| 4 | 1748.8 | 539.3 | 201.9 | 260.8 | -1158.4 | .0 | 1175.8 |
| 5 | 386.6 | 539.3 | 201.9 | 244.5 | -1079.6 | .0 | 1098.3 |
| 6 | -975.5 | 539.3 | 201.9 | 228.2 | -1000.9 | .0 | 1021.0 |
| 7 | -2337.7 | 1633.7 | -2489.8 | 681.3 | -2239.0 | .0 | 3348.4 |
| 8 | 5206.8 | 1590.1 | -2331.0 | 823.1 | -2864.3 | .0 | 3692.9 |
| 9 | 3844.6 | 429.3 | 530.7 | 285.3 | -1276.5 | .0 | 1382.4 |
| 10 | 2482.5 | 429.3 | 530.7 | 269.0 | -1197.7 | .0 | 1310.0 |
| 11 | 1120.3 | 429.3 | 530.7 | 252.6 | -1119.0 | .0 | 1238.5 |
| 12 | -241.9 | 429.3 | 530.7 | 236.3 | -1040.2 | .0 | 1167.8 |
| 13 | -1604.0 | 1590.1 | -2331.0 | 605.1 | -2070.3 | .0 | 3117.6 |
| 14 | 4578.3 | 1865.0 | -2884.3 | 935.0 | -3124.9 | .0 | 4252.6 |
| 15 | 3216.1 | 502.0 | 374.8 | 277.1 | -1237.1 | .0 | 1292.6 |
| 16 | 1854.0 | 502.0 | 374.8 | 260.8 | -1158.4 | .0 | 1217.5 |
| 17 | 491.8 | 502.0 | 374.8 | 244.5 | -1079.6 | .0 | 1142.8 |
| 18 | -870.3 | 1546.5 | -2172.2 | 732.1 | -2416.2 | .0 | 3249.0 |
| 19 | 5377.6 | 2777.6 | -5598.3 | 985.8 | -3302.0 | .0 | 6499.6 |
| 20 | 4015.4 | 915.2 | -1131.9 | 293.4 | -1315.8 | .0 | 1735.7 |
| 21 | 2653.2 | 701.4 | -550.1 | 277.1 | -1237.1 | .0 | 1353.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1291.1 | 701.4 | -550.1 | 260.8 | -1158.4 | .0 | 1282.4 |
| 23 | -71.1 | 701.4 | -550.1 | 244.5 | -1079.6 | .0 | 1211.7 |
| 24 | -1433.2 | 701.4 | -550.1 | 228.2 | -1000.9 | .0 | 1142.1 |
| 25 | -2795.4 | 2013.0 | -3871.3 | 681.3 | -2239.0 | .0 | 4472.2 |
| 26 | 4643.9 | 2056.6 | -4030.1 | 823.1 | -2864.3 | .0 | 4944.3 |
| 27 | 3281.7 | 603.8 | -311.9 | 285.3 | -1276.5 | .0 | 1314.0 |
| 28 | 1919.5 | 603.8 | -311.9 | 269.0 | -1197.7 | .0 | 1237.7 |
| 29 | 557.4 | 603.8 | -311.9 | 252.6 | -1119.0 | .0 | 1161.6 |
| 30 | -804.8 | 603.8 | -311.9 | 236.3 | -1040.2 | .0 | 1086.0 |
| 31 | -2166.9 | 2056.6 | -4030.1 | 605.1 | -2070.3 | .0 | 4530.8 |
| 32 | 3910.2 | 2509.4 | -5134.4 | 935.0 | -3124.9 | .0 | 6010.6 |
| 33 | 2548.0 | 738.7 | -723.0 | 277.1 | -1237.1 | .0 | 1432.9 |
| 34 | 1185.9 | 738.7 | -723.0 | 260.8 | -1158.4 | .0 | 1365.5 |
| 35 | -176.3 | 738.7 | -723.0 | 244.5 | -1079.6 | .0 | 1299.4 |
| 36 | -1538.5 | 2100.2 | -4188.9 | 732.1 | -2416.2 | .0 | 4835.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 32
spalla fissa - n777 _Sis20- n789 _Sis20

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33854.9 | -9375.4 | 27248.1 | -11422.6 | -57544.2 | 8270.5 |
| 2 | 33512.4 | -4096.9 | 25370.8 | 19314.7 | 51140.7 | -14572.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67367.3 | -13472.3 | 52618.9 | 7892.1 | -10068.2 | -62782.3 |

Punto di applic. carico verticale: Xv = .781 m Yv = -.149 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.357 | -5.402 | -.015 | 3.332 | .026 | -.191 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 1898.4 | -532.1 | 1778.5 | 267.5 | -906.3 | .0 | 1996.1 |
| 2 | 1904.5 | -211.8 | 912.3 | 100.3 | -464.1 | .0 | 1023.5 |
| 3 | 1910.6 | -172.1 | 786.3 | 116.0 | -539.8 | .0 | 953.7 |
| 4 | 1916.7 | -172.1 | 786.3 | 131.7 | -615.6 | .0 | 998.6 |
| 5 | 1922.8 | -172.1 | 786.3 | 147.3 | -691.3 | .0 | 1047.0 |
| 6 | 1928.9 | -172.1 | 786.3 | 163.0 | -767.0 | .0 | 1098.4 |
| 7 | 1935.1 | -404.4 | 1457.2 | 560.3 | -1928.8 | .0 | 2417.4 |
| 8 | 1911.9 | -362.4 | 1304.5 | 250.4 | -885.5 | .0 | 1576.7 |
| 9 | 1918.0 | -134.9 | 639.3 | 108.1 | -501.9 | .0 | 812.8 |
| 10 | 1924.1 | -134.9 | 639.3 | 123.8 | -577.7 | .0 | 861.6 |
| 11 | 1930.2 | -134.9 | 639.3 | 139.5 | -653.4 | .0 | 914.2 |
| 12 | 1936.3 | -134.9 | 639.3 | 155.2 | -729.2 | .0 | 969.7 |
| 13 | 1942.4 | -362.4 | 1304.5 | 460.1 | -1649.3 | .0 | 2102.8 |
| 14 | 1925.3 | -373.3 | 1287.1 | 316.3 | -1076.7 | .0 | 1678.0 |
| 15 | 1931.5 | -136.3 | 620.0 | 116.0 | -539.8 | .0 | 822.0 |
| 16 | 1937.6 | -136.3 | 620.0 | 131.7 | -615.6 | .0 | 873.7 |
| 17 | 1943.7 | -136.3 | 620.0 | 147.3 | -691.3 | .0 | 928.6 |
| 18 | 1949.8 | -320.5 | 1151.7 | 511.5 | -1758.4 | .0 | 2102.0 |
| 19 | 1807.6 | -1011.7 | 3396.8 | 267.5 | -906.3 | .0 | 3515.6 |
| 20 | 1813.7 | -403.5 | 1749.6 | 100.3 | -464.1 | .0 | 1810.1 |
| 21 | 1819.8 | -328.1 | 1509.7 | 116.0 | -539.8 | .0 | 1603.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1825.9 | -328.1 | 1509.7 | 131.7 | -615.6 | .0 | 1630.3 |
| 23 | 1832.0 | -328.1 | 1509.7 | 147.3 | -691.3 | .0 | 1660.4 |
| 24 | 1838.2 | -328.1 | 1509.7 | 163.0 | -767.0 | .0 | 1693.4 |
| 25 | 1844.3 | -769.2 | 2786.1 | 560.3 | -1928.8 | .0 | 3388.6 |
| 26 | 1800.2 | -811.2 | 2938.9 | 250.4 | -885.5 | .0 | 3069.4 |
| 27 | 1806.3 | -302.8 | 1449.8 | 108.1 | -501.9 | .0 | 1534.2 |
| 28 | 1812.4 | -302.8 | 1449.8 | 123.8 | -577.7 | .0 | 1560.6 |
| 29 | 1818.5 | -302.8 | 1449.8 | 139.5 | -653.4 | .0 | 1590.2 |
| 30 | 1824.7 | -302.8 | 1449.8 | 155.2 | -729.2 | .0 | 1622.8 |
| 31 | 1830.8 | -811.2 | 2938.9 | 460.1 | -1649.3 | .0 | 3370.0 |
| 32 | 1792.8 | -993.1 | 3451.4 | 316.3 | -1076.7 | .0 | 3615.4 |
| 33 | 1798.9 | -364.0 | 1676.0 | 116.0 | -539.8 | .0 | 1760.8 |
| 34 | 1805.0 | -364.0 | 1676.0 | 131.7 | -615.6 | .0 | 1785.4 |
| 35 | 1811.2 | -364.0 | 1676.0 | 147.3 | -691.3 | .0 | 1813.0 |
| 36 | 1817.3 | -853.1 | 3091.6 | 511.5 | -1758.4 | .0 | 3556.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 33
spalla fissa - n777 _Sis21- n789 _Sis21

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24827.8 | 21759.5 | 127006.5 | -3467.4 | -48323.1 | -91280.6 |
| 2 | 29889.5 | 16706.2 | 129459.8 | 19251.5 | 40767.7 | 102480.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54717.3 | 38465.7 | 256466.3 | 15784.1 | 46604.8 | 65270.5 |

Punto di applic. carico verticale: Xv = 4.687 m Yv = .852 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.600 | 29.016 | 3.405 | 6.985 | .132 | .199 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5835.2 | 2279.0 | -3915.9 | 985.8 | -3302.0 | .0 | 5122.3 |
| 2 | 4473.1 | 715.9 | -261.4 | 293.4 | -1315.8 | .0 | 1341.6 |
| 3 | 3110.9 | 539.3 | 201.9 | 277.1 | -1237.1 | .0 | 1253.5 |
| 4 | 1748.8 | 539.3 | 201.9 | 260.8 | -1158.4 | .0 | 1175.8 |
| 5 | 386.6 | 539.3 | 201.9 | 244.5 | -1079.6 | .0 | 1098.3 |
| 6 | -975.5 | 539.3 | 201.9 | 228.2 | -1000.9 | .0 | 1021.0 |
| 7 | -2337.7 | 1633.7 | -2489.8 | 681.3 | -2239.0 | .0 | 3348.4 |
| 8 | 5206.8 | 1590.1 | -2331.0 | 823.1 | -2864.3 | .0 | 3692.9 |
| 9 | 3844.6 | 429.3 | 530.7 | 285.3 | -1276.5 | .0 | 1382.4 |
| 10 | 2482.5 | 429.3 | 530.7 | 269.0 | -1197.7 | .0 | 1310.0 |
| 11 | 1120.3 | 429.3 | 530.7 | 252.6 | -1119.0 | .0 | 1238.5 |
| 12 | -241.9 | 429.3 | 530.7 | 236.3 | -1040.2 | .0 | 1167.8 |
| 13 | -1604.0 | 1590.1 | -2331.0 | 605.1 | -2070.3 | .0 | 3117.6 |
| 14 | 4578.3 | 1865.0 | -2884.3 | 935.0 | -3124.9 | .0 | 4252.6 |
| 15 | 3216.1 | 502.0 | 374.8 | 277.1 | -1237.1 | .0 | 1292.6 |
| 16 | 1854.0 | 502.0 | 374.8 | 260.8 | -1158.4 | .0 | 1217.5 |
| 17 | 491.8 | 502.0 | 374.8 | 244.5 | -1079.6 | .0 | 1142.8 |
| 18 | -870.3 | 1546.5 | -2172.2 | 732.1 | -2416.2 | .0 | 3249.0 |
| 19 | 5377.6 | 2777.6 | -5598.3 | 985.8 | -3302.0 | .0 | 6499.6 |
| 20 | 4015.4 | 915.2 | -1131.9 | 293.4 | -1315.8 | .0 | 1735.7 |
| 21 | 2653.2 | 701.4 | -550.1 | 277.1 | -1237.1 | .0 | 1353.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1291.1 | 701.4 | -550.1 | 260.8 | -1158.4 | .0 | 1282.4 |
| 23 | -71.1 | 701.4 | -550.1 | 244.5 | -1079.6 | .0 | 1211.7 |
| 24 | -1433.2 | 701.4 | -550.1 | 228.2 | -1000.9 | .0 | 1142.1 |
| 25 | -2795.4 | 2013.0 | -3871.3 | 681.3 | -2239.0 | .0 | 4472.2 |
| 26 | 4643.9 | 2056.6 | -4030.1 | 823.1 | -2864.3 | .0 | 4944.3 |
| 27 | 3281.7 | 603.8 | -311.9 | 285.3 | -1276.5 | .0 | 1314.0 |
| 28 | 1919.5 | 603.8 | -311.9 | 269.0 | -1197.7 | .0 | 1237.7 |
| 29 | 557.4 | 603.8 | -311.9 | 252.6 | -1119.0 | .0 | 1161.6 |
| 30 | -804.8 | 603.8 | -311.9 | 236.3 | -1040.2 | .0 | 1086.0 |
| 31 | -2166.9 | 2056.6 | -4030.1 | 605.1 | -2070.3 | .0 | 4530.8 |
| 32 | 3910.2 | 2509.4 | -5134.4 | 935.0 | -3124.9 | .0 | 6010.6 |
| 33 | 2548.0 | 738.7 | -723.0 | 277.1 | -1237.1 | .0 | 1432.9 |
| 34 | 1185.9 | 738.7 | -723.0 | 260.8 | -1158.4 | .0 | 1365.5 |
| 35 | -176.3 | 738.7 | -723.0 | 244.5 | -1079.6 | .0 | 1299.4 |
| 36 | -1538.5 | 2100.2 | -4188.9 | 732.1 | -2416.2 | .0 | 4835.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 34
spalla fissa - n777 _Sis22- n789 _Sis22

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33854.9 | -9375.4 | 27248.1 | -11422.6 | -57544.2 | 8270.5 |
| 2 | 33512.4 | -4096.9 | 25370.8 | 19314.7 | 51140.7 | -14572.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67367.3 | -13472.3 | 52618.9 | 7892.1 | -10068.2 | -62782.3 |

Punto di applic. carico verticale: Xv = .781 m Yv = -.149 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.357 | -5.402 | -.015 | 3.332 | .026 | -.191 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 1898.4 | -532.1 | 1778.5 | 267.5 | -906.3 | .0 | 1996.1 |
| 2 | 1904.5 | -211.8 | 912.3 | 100.3 | -464.1 | .0 | 1023.5 |
| 3 | 1910.6 | -172.1 | 786.3 | 116.0 | -539.8 | .0 | 953.7 |
| 4 | 1916.7 | -172.1 | 786.3 | 131.7 | -615.6 | .0 | 998.6 |
| 5 | 1922.8 | -172.1 | 786.3 | 147.3 | -691.3 | .0 | 1047.0 |
| 6 | 1928.9 | -172.1 | 786.3 | 163.0 | -767.0 | .0 | 1098.4 |
| 7 | 1935.1 | -404.4 | 1457.2 | 560.3 | -1928.8 | .0 | 2417.4 |
| 8 | 1911.9 | -362.4 | 1304.5 | 250.4 | -885.5 | .0 | 1576.7 |
| 9 | 1918.0 | -134.9 | 639.3 | 108.1 | -501.9 | .0 | 812.8 |
| 10 | 1924.1 | -134.9 | 639.3 | 123.8 | -577.7 | .0 | 861.6 |
| 11 | 1930.2 | -134.9 | 639.3 | 139.5 | -653.4 | .0 | 914.2 |
| 12 | 1936.3 | -134.9 | 639.3 | 155.2 | -729.2 | .0 | 969.7 |
| 13 | 1942.4 | -362.4 | 1304.5 | 460.1 | -1649.3 | .0 | 2102.8 |
| 14 | 1925.3 | -373.3 | 1287.1 | 316.3 | -1076.7 | .0 | 1678.0 |
| 15 | 1931.5 | -136.3 | 620.0 | 116.0 | -539.8 | .0 | 822.0 |
| 16 | 1937.6 | -136.3 | 620.0 | 131.7 | -615.6 | .0 | 873.7 |
| 17 | 1943.7 | -136.3 | 620.0 | 147.3 | -691.3 | .0 | 928.6 |
| 18 | 1949.8 | -320.5 | 1151.7 | 511.5 | -1758.4 | .0 | 2102.0 |
| 19 | 1807.6 | -1011.7 | 3396.8 | 267.5 | -906.3 | .0 | 3515.6 |
| 20 | 1813.7 | -403.5 | 1749.6 | 100.3 | -464.1 | .0 | 1810.1 |
| 21 | 1819.8 | -328.1 | 1509.7 | 116.0 | -539.8 | .0 | 1603.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1825.9 | -328.1 | 1509.7 | 131.7 | -615.6 | .0 | 1630.3 |
| 23 | 1832.0 | -328.1 | 1509.7 | 147.3 | -691.3 | .0 | 1660.4 |
| 24 | 1838.2 | -328.1 | 1509.7 | 163.0 | -767.0 | .0 | 1693.4 |
| 25 | 1844.3 | -769.2 | 2786.1 | 560.3 | -1928.8 | .0 | 3388.6 |
| 26 | 1800.2 | -811.2 | 2938.9 | 250.4 | -885.5 | .0 | 3069.4 |
| 27 | 1806.3 | -302.8 | 1449.8 | 108.1 | -501.9 | .0 | 1534.2 |
| 28 | 1812.4 | -302.8 | 1449.8 | 123.8 | -577.7 | .0 | 1560.6 |
| 29 | 1818.5 | -302.8 | 1449.8 | 139.5 | -653.4 | .0 | 1590.2 |
| 30 | 1824.7 | -302.8 | 1449.8 | 155.2 | -729.2 | .0 | 1622.8 |
| 31 | 1830.8 | -811.2 | 2938.9 | 460.1 | -1649.3 | .0 | 3370.0 |
| 32 | 1792.8 | -993.1 | 3451.4 | 316.3 | -1076.7 | .0 | 3615.4 |
| 33 | 1798.9 | -364.0 | 1676.0 | 116.0 | -539.8 | .0 | 1760.8 |
| 34 | 1805.0 | -364.0 | 1676.0 | 131.7 | -615.6 | .0 | 1785.4 |
| 35 | 1811.2 | -364.0 | 1676.0 | 147.3 | -691.3 | .0 | 1813.0 |
| 36 | 1817.3 | -853.1 | 3091.6 | 511.5 | -1758.4 | .0 | 3556.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 35
spalla fissa - n777 _Sis23- n789 _Sis23

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24375.0 | 18605.3 | 89830.9 | -2158.8 | -48804.7 | -49455.5 |
| 2 | 34588.4 | 1643.4 | 94215.7 | 23502.8 | 42637.3 | 74308.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58963.4 | 20248.7 | 184046.6 | 21344.0 | 103116.0 | 206345.3 |

Punto di applic. carico verticale: Xv = 3.121 m Yv = 1.749 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.189 | 16.913 | 2.198 | 9.639 | .226 | .628 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4667.9 | 581.9 | 472.5 | 1611.8 | -5388.0 | .0 | 5408.7 |
| 2 | 3788.7 | 106.7 | 1383.4 | 454.3 | -2020.6 | .0 | 2448.8 |
| 3 | 2909.5 | 58.9 | 1471.4 | 402.7 | -1771.6 | .0 | 2303.0 |
| 4 | 2030.3 | 58.9 | 1471.4 | 351.2 | -1522.7 | .0 | 2117.4 |
| 5 | 1151.1 | 58.9 | 1471.4 | 299.6 | -1273.7 | .0 | 1946.1 |
| 6 | 271.9 | 58.9 | 1471.4 | 248.0 | -1024.8 | .0 | 1793.1 |
| 7 | -607.3 | 378.1 | 856.5 | 649.4 | -2027.3 | .0 | 2200.8 |
| 8 | 4318.5 | 240.2 | 1358.5 | 1312.4 | -4550.9 | .0 | 4749.4 |
| 9 | 3439.3 | -17.1 | 1762.3 | 428.5 | -1896.1 | .0 | 2588.6 |
| 10 | 2560.1 | -17.1 | 1762.3 | 376.9 | -1647.2 | .0 | 2412.2 |
| 11 | 1680.9 | -17.1 | 1762.3 | 325.4 | -1398.2 | .0 | 2249.6 |
| 12 | 801.7 | -17.1 | 1762.3 | 273.8 | -1149.3 | .0 | 2103.9 |
| 13 | -77.5 | 240.2 | 1358.5 | 623.2 | -2040.8 | .0 | 2451.6 |
| 14 | 3969.1 | 161.3 | 1778.3 | 1451.4 | -4827.9 | .0 | 5145.0 |
| 15 | 3089.9 | -58.9 | 2018.0 | 402.7 | -1771.6 | .0 | 2685.3 |
| 16 | 2210.7 | -58.9 | 2018.0 | 351.2 | -1522.7 | .0 | 2528.0 |
| 17 | 1331.5 | -58.9 | 2018.0 | 299.6 | -1273.7 | .0 | 2386.3 |
| 18 | 452.3 | 102.4 | 1860.6 | 809.8 | -2587.5 | .0 | 3186.9 |
| 19 | 3883.1 | 2158.2 | -4846.3 | 1611.8 | -5388.0 | .0 | 7246.9 |
| 20 | 3003.9 | 736.7 | -1368.5 | 454.3 | -2020.6 | .0 | 2440.4 |
| 21 | 2124.7 | 571.5 | -906.2 | 402.7 | -1771.6 | .0 | 1989.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1245.5 | 571.5 | -906.2 | 351.2 | -1522.7 | .0 | 1771.9 |
| 23 | 366.3 | 571.5 | -906.2 | 299.6 | -1273.7 | .0 | 1563.2 |
| 24 | -512.9 | 571.5 | -906.2 | 248.0 | -1024.8 | .0 | 1368.0 |
| 25 | -1392.1 | 1577.3 | -3511.2 | 649.4 | -2027.3 | .0 | 4054.4 |
| 26 | 3353.3 | 1715.1 | -4013.2 | 1312.4 | -4550.9 | .0 | 6067.7 |
| 27 | 2474.1 | 534.8 | -901.5 | 428.5 | -1896.1 | .0 | 2099.5 |
| 28 | 1594.9 | 534.8 | -901.5 | 376.9 | -1647.2 | .0 | 1877.7 |
| 29 | 715.7 | 534.8 | -901.5 | 325.4 | -1398.2 | .0 | 1663.6 |
| 30 | -163.5 | 534.8 | -901.5 | 273.8 | -1149.3 | .0 | 1460.6 |
| 31 | -1042.7 | 1715.1 | -4013.2 | 623.2 | -2040.8 | .0 | 4502.3 |
| 32 | 2823.5 | 2198.5 | -5335.1 | 1451.4 | -4827.9 | .0 | 7195.2 |
| 33 | 1944.3 | 689.4 | -1452.8 | 402.7 | -1771.6 | .0 | 2291.1 |
| 34 | 1065.1 | 689.4 | -1452.8 | 351.2 | -1522.7 | .0 | 2104.6 |
| 35 | 185.9 | 689.4 | -1452.8 | 299.6 | -1273.7 | .0 | 1932.1 |
| 36 | -693.3 | 1852.9 | -4515.2 | 809.8 | -2587.5 | .0 | 5204.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLV

CONDIZIONE DI CARICO 36
spalla fissa - n777 _Sis24- n789 _Sis24

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34307.8 | -5171.6 | 69777.7 | -12695.2 | -57228.0 | -38263.5 |
| 2 | 28813.6 | 12016.3 | 65970.9 | 15027.2 | 49436.9 | 18316.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63121.4 | 6844.7 | 135748.6 | 2332.0 | -66579.1 | -203857.7 |

Punto di applic. carico verticale: Xv = 2.151 m Yv = -1.055 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.767 | 8.175 | 1.351 | .678 | -.068 | -.620 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3256.2 | 1300.4 | -2890.9 | -358.6 | 1179.7 | .0 | 3122.3 |
| 2 | 2715.9 | 442.4 | -795.7 | -60.6 | 240.7 | .0 | 831.3 |
| 3 | 2175.6 | 342.8 | -517.8 | -9.7 | -5.3 | .0 | 517.8 |
| 4 | 1635.2 | 342.8 | -517.8 | 41.3 | -251.2 | .0 | 575.5 |
| 5 | 1094.9 | 342.8 | -517.8 | 92.2 | -497.2 | .0 | 717.8 |
| 6 | 554.6 | 342.8 | -517.8 | 143.2 | -743.1 | .0 | 905.7 |
| 7 | 14.2 | 949.6 | -2086.0 | 592.3 | -2140.4 | .0 | 2988.8 |
| 8 | 2958.9 | 1085.8 | -2581.9 | -238.9 | 801.2 | .0 | 2703.4 |
| 9 | 2418.6 | 340.5 | -611.3 | -35.1 | 117.7 | .0 | 622.6 |
| 10 | 1878.2 | 340.5 | -611.3 | 15.8 | -128.2 | .0 | 624.6 |
| 11 | 1337.9 | 340.5 | -611.3 | 66.8 | -374.2 | .0 | 716.8 |
| 12 | 797.6 | 340.5 | -611.3 | 117.7 | -620.1 | .0 | 870.8 |
| 13 | 257.2 | 1085.8 | -2581.9 | 442.0 | -1678.7 | .0 | 3079.7 |
| 14 | 2661.6 | 1447.9 | -3616.8 | -200.1 | 626.3 | .0 | 3670.7 |
| 15 | 2121.2 | 459.2 | -1057.8 | -9.7 | -5.3 | .0 | 1057.8 |
| 16 | 1580.9 | 459.2 | -1057.8 | 41.3 | -251.2 | .0 | 1087.2 |
| 17 | 1040.6 | 459.2 | -1057.8 | 92.2 | -497.2 | .0 | 1168.8 |
| 18 | 500.2 | 1222.0 | -3077.9 | 433.8 | -1587.1 | .0 | 3463.0 |
| 19 | 3492.5 | -256.9 | 2363.8 | -358.6 | 1179.7 | .0 | 2641.8 |
| 20 | 2952.2 | -180.1 | 1923.0 | -60.6 | 240.7 | .0 | 1938.0 |
| 21 | 2411.8 | -163.6 | 1831.1 | -9.7 | -5.3 | .0 | 1831.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1871.5 | -163.6 | 1831.1 | 41.3 | -251.2 | .0 | 1848.3 |
| 23 | 1331.2 | -163.6 | 1831.1 | 92.2 | -497.2 | .0 | 1897.4 |
| 24 | 790.9 | -163.6 | 1831.1 | 143.2 | -743.1 | .0 | 1976.2 |
| 25 | 250.5 | -235.1 | 2229.1 | 592.3 | -2140.4 | .0 | 3090.3 |
| 26 | 3249.5 | -371.3 | 2725.0 | -238.9 | 801.2 | .0 | 2840.4 |
| 27 | 2709.2 | -204.7 | 2020.3 | -35.1 | 117.7 | .0 | 2023.8 |
| 28 | 2168.8 | -204.7 | 2020.3 | 15.8 | -128.2 | .0 | 2024.4 |
| 29 | 1628.5 | -204.7 | 2020.3 | 66.8 | -374.2 | .0 | 2054.7 |
| 30 | 1088.2 | -204.7 | 2020.3 | 117.7 | -620.1 | .0 | 2113.4 |
| 31 | 547.9 | -371.3 | 2725.0 | 442.0 | -1678.7 | .0 | 3200.6 |
| 32 | 3006.5 | -564.7 | 3410.8 | -200.1 | 626.3 | .0 | 3467.9 |
| 33 | 2466.2 | -280.1 | 2371.1 | -9.7 | -5.3 | .0 | 2371.1 |
| 34 | 1925.8 | -280.1 | 2371.1 | 41.3 | -251.2 | .0 | 2384.4 |
| 35 | 1385.5 | -280.1 | 2371.1 | 92.2 | -497.2 | .0 | 2422.7 |
| 36 | 845.2 | -507.5 | 3221.0 | 433.8 | -1587.1 | .0 | 3590.8 |

Mris  = (Mxp^2 + Myp^2)^0.5

## 9.2 Spalla appoggi fissi – Analisi SLE

```
                 M A P  -  Matrix Analysis of Piles
 Programma per l'analisi di palificate collegate da un plinto rigido

                 (C)  G.Guiducci, S.G.I. - luglio 1994

                                                    pag./  2

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS
```

Geometria Palificata

| palo | vin | X m | Y m | Z m | axz deg | ayz deg | axy deg | Box m | Boy m |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 2 | 0 | 4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 3 | 0 | 2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 4 | 0 | .000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 5 | 0 | -2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 6 | 0 | -4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 7 | 0 | -6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 8 | 0 | 5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 9 | 0 | 3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 10 | 0 | 1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 11 | 0 | -1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 12 | 0 | -3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 13 | 0 | -5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 14 | 0 | 4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 15 | 0 | 2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 16 | 0 | .000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 17 | 0 | -2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 18 | 0 | -4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 19 | 0 | 6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 20 | 0 | 4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 21 | 0 | 2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 22 | 0 | .000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 23 | 0 | -2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 24 | 0 | -4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 25 | 0 | -6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 26 | 0 | 5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 27 | 0 | 3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 28 | 0 | 1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 29 | 0 | -1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 30 | 0 | -3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 31 | 0 | -5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 32 | 0 | 4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 33 | 0 | 2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 34 | 0 | .000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 35 | 0 | -2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 36 | 0 | -4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |

```
vin     = 0 - incastro;   1 - cerniera;   2 - appoggio
X, Y, Z = Coordinate testa pali
axz     = Inclinazione palo nel piano  Xp Z  rispetto alla verticale
             (positiva se verso  Xp positivo)
ayz     = Inclinazione palo nel piano  Yp Z  rispetto alla verticale
             (positiva se verso  Yp  positivo)
axy     = Rotazione assi  Xp Yp     (positiva se antioraria)
Box     = Lato dell'elemento parallelo all'asse  Xp
Boy     = Lato dell'elemento parallelo all'asse  Yp
          se  Boy = 0   D = Box:  diametro
          altrimenti    D = sqr (Box * Boy * 1.273): diametro equivalente
```

Caratterizzazione dei pali soggetti a carichi assiali e torsionali
(uguali per tutti i pali)

| palo | AK kN/m | TK kN*m/rad |
|---|---|---|
| 1 | 200000. | .0 |

AK = Rigidezza assiale palo-terreno
TK = Rigidezza torsionale palo-terreno

Baricentro palificata: Xg = .000 m Yg = .000 m
Rotazione direzioni princip. di inerzia: .00 deg

Caratterizzazione del terreno per pali soggetti a carichi trasversali

Terreno tipo 1

| Prof. m | E kN/m2 |
|---|---|
| .00 | 33750.0 |
| 3.00 | 35250.0 |
| 3.10 | 150000.0 |
| 8.00 | 150000.0 |
| 8.10 | 36750.0 |
| 13.00 | 44250.0 |
| 13.10 | 150000.0 |
| 26.00 | 150000.0 |
| 26.10 | 52500.0 |
| 60.00 | 75000.0 |

Caratterizzazione dei pali soggetti a carichi trasversali

| palo | Lp m | EJx kN*m2 | Itx | Ridx | EJy kN*m2 | Ity | Ridy |
|---|---|---|---|---|---|---|---|
| 1 | 50.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 2 | 50.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 3 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 4 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 5 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 6 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 7 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 8 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 9 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 10 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 11 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 12 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 13 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 14 | 50.00 | 7455147. | 1 | .250 | 7455147. | 1 | .250 |
| 15 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 16 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 17 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 18 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 19 | 50.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 20 | 50.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 21 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 22 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 23 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 24 | 50.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 25 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 26 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 27 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 28 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 29 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 30 | 50.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 31 | 50.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |

```
 32    50.00     7455147.    1     .250     7455147.     1     .250
 33    50.00     7455147.    1     .060     7455147.     1     .050
 34    50.00     7455147.    1     .060     7455147.     1     .050
 35    50.00     7455147.    1     .060     7455147.     1     .050
 36    50.00     7455147.    1     .200     7455147.     1     .250
-------------------------------------------------------------------

Lp  = Lunghezza palo (compreso eventuale tratto fuori terra)
EJ  = Rigidezza flessionale del palo
It  = Tipo di terreno
Rid = Moltiplicatore del modulo di reazione orizzontale
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 1
spalla fissa - n777 _FESS_1- n789 _FESS_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32384.3 | 5092.6 | 69612.9 | -14298.7 | -53438.2 | -36567.4 |
| 2 | 34058.5 | 3361.7 | 73538.7 | 15394.7 | 54979.1 | 39534.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.8 | 8454.3 | 143151.6 | 1096.0 | 19454.9 | 21488.1 |

Punto di applic. carico verticale: Xv = 2.155 m Yv = .293 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 9.277 | 1.466 | .563 | .028 | .065 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3654.0 | 542.8 | -207.2 | 109.4 | -351.7 | .0 | 408.2 |
| 2 | 3067.7 | 133.0 | 652.4 | 28.2 | -114.6 | .0 | 662.4 |
| 3 | 2481.4 | 89.6 | 747.8 | 22.9 | -88.7 | .0 | 753.0 |
| 4 | 1895.1 | 89.6 | 747.8 | 17.5 | -62.8 | .0 | 750.4 |
| 5 | 1308.8 | 89.6 | 747.8 | 12.1 | -36.8 | .0 | 748.7 |
| 6 | 722.4 | 89.6 | 747.8 | 6.8 | -10.9 | .0 | 747.9 |
| 7 | 136.1 | 369.9 | 142.3 | 9.2 | -1.7 | .0 | 142.3 |
| 8 | 3372.2 | 355.5 | 194.6 | 86.3 | -285.6 | .0 | 345.6 |
| 9 | 2785.9 | 61.7 | 822.5 | 25.6 | -101.6 | .0 | 828.7 |
| 10 | 2199.6 | 61.7 | 822.5 | 20.2 | -75.7 | .0 | 826.0 |
| 11 | 1613.3 | 61.7 | 822.5 | 14.8 | -49.8 | .0 | 824.0 |
| 12 | 1027.0 | 61.7 | 822.5 | 9.4 | -23.9 | .0 | 822.8 |
| 13 | 440.6 | 355.5 | 194.6 | 14.6 | -24.2 | .0 | 196.1 |
| 14 | 3090.4 | 425.2 | 77.1 | 92.7 | -293.3 | .0 | 303.3 |
| 15 | 2504.1 | 77.4 | 804.7 | 22.9 | -88.7 | .0 | 809.6 |
| 16 | 1917.8 | 77.4 | 804.7 | 17.5 | -62.8 | .0 | 807.1 |
| 17 | 1331.5 | 77.4 | 804.7 | 12.1 | -36.8 | .0 | 805.5 |
| 18 | 745.2 | 341.2 | 246.9 | 25.9 | -60.0 | .0 | 254.1 |
| 19 | 3555.2 | 707.0 | -761.1 | 109.4 | -351.7 | .0 | 838.4 |
| 20 | 2968.8 | 198.6 | 365.8 | 28.2 | -114.6 | .0 | 383.3 |
| 21 | 2382.5 | 143.0 | 500.2 | 22.9 | -88.7 | .0 | 508.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1796.2 | 143.0 | 500.2 | 17.5 | -62.8 | .0 | 504.1 |
| 23 | 1209.9 | 143.0 | 500.2 | 12.1 | -36.8 | .0 | 501.5 |
| 24 | 623.6 | 143.0 | 500.2 | 6.8 | -10.9 | .0 | 500.3 |
| 25 | 37.2 | 494.8 | -312.5 | 9.2 | -1.7 | .0 | 312.5 |
| 26 | 3250.6 | 509.1 | -364.8 | 86.3 | -285.6 | .0 | 463.3 |
| 27 | 2664.3 | 119.2 | 545.1 | 25.6 | -101.6 | .0 | 554.5 |
| 28 | 2078.0 | 119.2 | 545.1 | 20.2 | -75.7 | .0 | 550.3 |
| 29 | 1491.7 | 119.2 | 545.1 | 14.8 | -49.8 | .0 | 547.3 |
| 30 | 905.3 | 119.2 | 545.1 | 9.4 | -23.9 | .0 | 545.6 |
| 31 | 319.0 | 509.1 | -364.8 | 14.6 | -24.2 | .0 | 365.6 |
| 32 | 2946.1 | 637.3 | -663.7 | 92.7 | -293.3 | .0 | 725.6 |
| 33 | 2359.8 | 155.3 | 443.3 | 22.9 | -88.7 | .0 | 452.1 |
| 34 | 1773.5 | 155.3 | 443.3 | 17.5 | -62.8 | .0 | 447.7 |
| 35 | 1187.1 | 155.3 | 443.3 | 12.1 | -36.8 | .0 | 444.8 |
| 36 | 600.8 | 523.5 | -417.1 | 25.9 | -60.0 | .0 | 421.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 2
spalla fissa - n777 _FESS_2- n789 _FESS_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34465.4 | 4257.9 | 76103.6 | -15285.6 | -57077.7 | -37535.1 |
| 2 | 35007.3 | 3189.5 | 76532.0 | 15975.6 | 57094.6 | 39125.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69472.7 | 7447.4 | 152635.6 | 690.0 | 5815.3 | 13022.3 |

Punto di applic. carico verticale: Xv = 2.197 m Yv = .084 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.649 | 9.059 | 1.511 | .324 | .010 | .040 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3760.3 | 521.9 | -87.0 | 67.1 | -223.5 | .0 | 239.8 |
| 2 | 3156.1 | 122.1 | 737.7 | 17.8 | -77.9 | .0 | 741.9 |
| 3 | 2551.8 | 80.2 | 827.2 | 14.5 | -62.2 | .0 | 829.5 |
| 4 | 1947.6 | 80.2 | 827.2 | 11.3 | -46.5 | .0 | 828.5 |
| 5 | 1343.4 | 80.2 | 827.2 | 8.0 | -30.8 | .0 | 827.7 |
| 6 | 739.2 | 80.2 | 827.2 | 4.7 | -15.1 | .0 | 827.3 |
| 7 | 135.0 | 352.6 | 250.6 | 6.4 | -11.4 | .0 | 250.8 |
| 8 | 3462.3 | 343.9 | 282.3 | 53.2 | -183.2 | .0 | 336.5 |
| 9 | 2858.0 | 55.2 | 888.1 | 16.1 | -70.1 | .0 | 890.9 |
| 10 | 2253.8 | 55.2 | 888.1 | 12.9 | -54.4 | .0 | 889.8 |
| 11 | 1649.6 | 55.2 | 888.1 | 9.6 | -38.7 | .0 | 888.9 |
| 12 | 1045.4 | 55.2 | 888.1 | 6.4 | -23.0 | .0 | 888.4 |
| 13 | 441.2 | 343.9 | 282.3 | 9.7 | -24.8 | .0 | 283.3 |
| 14 | 3164.2 | 419.1 | 145.8 | 57.0 | -188.2 | .0 | 238.0 |
| 15 | 2560.0 | 72.7 | 861.7 | 14.5 | -62.2 | .0 | 863.9 |
| 16 | 1955.8 | 72.7 | 861.7 | 11.3 | -46.5 | .0 | 862.9 |
| 17 | 1351.6 | 72.7 | 861.7 | 8.0 | -30.8 | .0 | 862.2 |
| 18 | 747.4 | 335.2 | 313.9 | 16.5 | -46.8 | .0 | 317.4 |
| 19 | 3724.6 | 621.4 | -422.6 | 67.1 | -223.5 | .0 | 478.1 |
| 20 | 3120.4 | 161.8 | 564.1 | 17.8 | -77.9 | .0 | 569.4 |
| 21 | 2516.2 | 112.5 | 677.1 | 14.5 | -62.2 | .0 | 680.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1912.0 | 112.5 | 677.1 | 11.3 | -46.5 | .0 | 678.7 |
| 23 | 1307.8 | 112.5 | 677.1 | 8.0 | -30.8 | .0 | 677.8 |
| 24 | 703.5 | 112.5 | 677.1 | 4.7 | -15.1 | .0 | 677.3 |
| 25 | 99.3 | 428.3 | -25.1 | 6.4 | -11.4 | .0 | 27.5 |
| 26 | 3418.4 | 437.0 | -56.7 | 53.2 | -183.2 | .0 | 191.8 |
| 27 | 2814.2 | 90.0 | 720.0 | 16.1 | -70.1 | .0 | 723.4 |
| 28 | 2210.0 | 90.0 | 720.0 | 12.9 | -54.4 | .0 | 722.0 |
| 29 | 1605.8 | 90.0 | 720.0 | 9.6 | -38.7 | .0 | 721.0 |
| 30 | 1001.6 | 90.0 | 720.0 | 6.4 | -23.0 | .0 | 720.4 |
| 31 | 397.3 | 437.0 | -56.7 | 9.7 | -24.8 | .0 | 61.9 |
| 32 | 3112.2 | 547.7 | -303.1 | 57.0 | -188.2 | .0 | 356.8 |
| 33 | 2508.0 | 120.0 | 642.6 | 14.5 | -62.2 | .0 | 645.6 |
| 34 | 1903.8 | 120.0 | 642.6 | 11.3 | -46.5 | .0 | 644.3 |
| 35 | 1299.6 | 120.0 | 642.6 | 8.0 | -30.8 | .0 | 643.4 |
| 36 | 695.4 | 445.7 | -88.4 | 16.5 | -46.8 | .0 | 100.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 3
spalla fissa - n777 _FESS_3- n789 _FESS_3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32384.3 | 5092.6 | 69612.9 | -14298.7 | -53438.2 | -36567.4 |
| 2 | 34058.5 | 3361.7 | 73538.7 | 15394.7 | 54979.1 | 39534.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.8 | 8454.3 | 143151.6 | 1096.0 | 19454.9 | 21488.1 |

Punto di applic. carico verticale: Xv = 2.155 m Yv = .293 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 9.277 | 1.466 | .563 | .028 | .065 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3654.0 | 542.8 | -207.2 | 109.4 | -351.7 | .0 | 408.2 |
| 2 | 3067.7 | 133.0 | 652.4 | 28.2 | -114.6 | .0 | 662.4 |
| 3 | 2481.4 | 89.6 | 747.8 | 22.9 | -88.7 | .0 | 753.0 |
| 4 | 1895.1 | 89.6 | 747.8 | 17.5 | -62.8 | .0 | 750.4 |
| 5 | 1308.8 | 89.6 | 747.8 | 12.1 | -36.8 | .0 | 748.7 |
| 6 | 722.4 | 89.6 | 747.8 | 6.8 | -10.9 | .0 | 747.9 |
| 7 | 136.1 | 369.9 | 142.3 | 9.2 | -1.7 | .0 | 142.3 |
| 8 | 3372.2 | 355.5 | 194.6 | 86.3 | -285.6 | .0 | 345.6 |
| 9 | 2785.9 | 61.7 | 822.5 | 25.6 | -101.6 | .0 | 828.7 |
| 10 | 2199.6 | 61.7 | 822.5 | 20.2 | -75.7 | .0 | 826.0 |
| 11 | 1613.3 | 61.7 | 822.5 | 14.8 | -49.8 | .0 | 824.0 |
| 12 | 1027.0 | 61.7 | 822.5 | 9.4 | -23.9 | .0 | 822.8 |
| 13 | 440.6 | 355.5 | 194.6 | 14.6 | -24.2 | .0 | 196.1 |
| 14 | 3090.4 | 425.2 | 77.1 | 92.7 | -293.3 | .0 | 303.3 |
| 15 | 2504.1 | 77.4 | 804.7 | 22.9 | -88.7 | .0 | 809.6 |
| 16 | 1917.8 | 77.4 | 804.7 | 17.5 | -62.8 | .0 | 807.1 |
| 17 | 1331.5 | 77.4 | 804.7 | 12.1 | -36.8 | .0 | 805.5 |
| 18 | 745.2 | 341.2 | 246.9 | 25.9 | -60.0 | .0 | 254.1 |
| 19 | 3555.2 | 707.0 | -761.1 | 109.4 | -351.7 | .0 | 838.4 |
| 20 | 2968.8 | 198.6 | 365.8 | 28.2 | -114.6 | .0 | 383.3 |
| 21 | 2382.5 | 143.0 | 500.2 | 22.9 | -88.7 | .0 | 508.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1796.2 | 143.0 | 500.2 | 17.5 | -62.8 | .0 | 504.1 |
| 23 | 1209.9 | 143.0 | 500.2 | 12.1 | -36.8 | .0 | 501.5 |
| 24 | 623.6 | 143.0 | 500.2 | 6.8 | -10.9 | .0 | 500.3 |
| 25 | 37.2 | 494.8 | -312.5 | 9.2 | -1.7 | .0 | 312.5 |
| 26 | 3250.6 | 509.1 | -364.8 | 86.3 | -285.6 | .0 | 463.3 |
| 27 | 2664.3 | 119.2 | 545.1 | 25.6 | -101.6 | .0 | 554.5 |
| 28 | 2078.0 | 119.2 | 545.1 | 20.2 | -75.7 | .0 | 550.3 |
| 29 | 1491.7 | 119.2 | 545.1 | 14.8 | -49.8 | .0 | 547.3 |
| 30 | 905.3 | 119.2 | 545.1 | 9.4 | -23.9 | .0 | 545.6 |
| 31 | 319.0 | 509.1 | -364.8 | 14.6 | -24.2 | .0 | 365.6 |
| 32 | 2946.1 | 637.3 | -663.7 | 92.7 | -293.3 | .0 | 725.6 |
| 33 | 2359.8 | 155.3 | 443.3 | 22.9 | -88.7 | .0 | 452.1 |
| 34 | 1773.5 | 155.3 | 443.3 | 17.5 | -62.8 | .0 | 447.7 |
| 35 | 1187.1 | 155.3 | 443.3 | 12.1 | -36.8 | .0 | 444.8 |
| 36 | 600.8 | 523.5 | -417.1 | 25.9 | -60.0 | .0 | 421.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 4
spalla fissa - n777 _FESS_4- n789 _FESS_4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33449.1 | 3330.1 | 71021.4 | -15364.7 | -54389.4 | -38366.3 |
| 2 | 32993.7 | 5124.2 | 72130.2 | 14268.7 | 55123.1 | 36075.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.8 | 8454.3 | 143151.6 | -1096.0 | -4139.1 | -21487.8 |

Punto di applic. carico verticale: Xv = 2.155 m Yv = -.062 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 9.277 | 1.466 | -.489 | -.010 | -.065 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3586.8 | 707.0 | -761.1 | -108.1 | 366.5 | .0 | 844.7 |
| 2 | 3000.5 | 198.6 | 365.8 | -28.8 | 131.3 | .0 | 388.6 |
| 3 | 2414.2 | 143.0 | 500.2 | -23.4 | 105.4 | .0 | 511.2 |
| 4 | 1827.9 | 143.0 | 500.2 | -18.1 | 79.4 | .0 | 506.5 |
| 5 | 1241.6 | 143.0 | 500.2 | -12.7 | 53.5 | .0 | 503.0 |
| 6 | 655.2 | 143.0 | 500.2 | -7.3 | 27.6 | .0 | 501.0 |
| 7 | 68.9 | 494.8 | -312.5 | -7.8 | 16.5 | .0 | 312.9 |
| 8 | 3289.6 | 509.1 | -364.8 | -85.5 | 301.1 | .0 | 473.0 |
| 9 | 2703.3 | 119.2 | 545.1 | -26.1 | 118.3 | .0 | 557.8 |
| 10 | 2117.0 | 119.2 | 545.1 | -20.8 | 92.4 | .0 | 552.9 |
| 11 | 1530.6 | 119.2 | 545.1 | -15.4 | 66.5 | .0 | 549.1 |
| 12 | 944.3 | 119.2 | 545.1 | -10.0 | 40.6 | .0 | 546.6 |
| 13 | 358.0 | 509.1 | -364.8 | -13.8 | 39.7 | .0 | 366.9 |
| 14 | 2992.4 | 637.3 | -663.7 | -91.4 | 308.2 | .0 | 731.7 |
| 15 | 2406.0 | 155.3 | 443.3 | -23.4 | 105.4 | .0 | 455.6 |
| 16 | 1819.7 | 155.3 | 443.3 | -18.1 | 79.4 | .0 | 450.3 |
| 17 | 1233.4 | 155.3 | 443.3 | -12.7 | 53.5 | .0 | 446.5 |
| 18 | 647.1 | 523.5 | -417.1 | -24.5 | 74.8 | .0 | 423.7 |
| 19 | 3622.4 | 542.8 | -207.2 | -108.1 | 366.5 | .0 | 421.0 |
| 20 | 3036.0 | 133.0 | 652.4 | -28.8 | 131.3 | .0 | 665.4 |
| 21 | 2449.7 | 89.6 | 747.8 | -23.4 | 105.4 | .0 | 755.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1863.4 | 89.6 | 747.8 | -18.1 | 79.4 | .0 | 752.0 |
| 23 | 1277.1 | 89.6 | 747.8 | -12.7 | 53.5 | .0 | 749.7 |
| 24 | 690.8 | 89.6 | 747.8 | -7.3 | 27.6 | .0 | 748.3 |
| 25 | 104.4 | 369.9 | 142.3 | -7.8 | 16.5 | .0 | 143.3 |
| 26 | 3333.3 | 355.5 | 194.6 | -85.5 | 301.1 | .0 | 358.5 |
| 27 | 2747.0 | 61.7 | 822.5 | -26.1 | 118.3 | .0 | 830.9 |
| 28 | 2160.6 | 61.7 | 822.5 | -20.8 | 92.4 | .0 | 827.6 |
| 29 | 1574.3 | 61.7 | 822.5 | -15.4 | 66.5 | .0 | 825.2 |
| 30 | 988.0 | 61.7 | 822.5 | -10.0 | 40.6 | .0 | 823.5 |
| 31 | 401.7 | 355.5 | 194.6 | -13.8 | 39.7 | .0 | 198.6 |
| 32 | 3044.2 | 425.2 | 77.1 | -91.4 | 308.2 | .0 | 317.6 |
| 33 | 2457.9 | 77.4 | 804.7 | -23.4 | 105.4 | .0 | 811.6 |
| 34 | 1871.6 | 77.4 | 804.7 | -18.1 | 79.4 | .0 | 808.6 |
| 35 | 1285.2 | 77.4 | 804.7 | -12.7 | 53.5 | .0 | 806.5 |
| 36 | 698.9 | 341.2 | 246.9 | -24.5 | 74.8 | .0 | 258.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 5
spalla fissa - n777 _FESS_5- n789 _FESS_5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32552.8 | 4883.0 | 69406.8 | -14421.8 | -53724.1 | -36005.3 |
| 2 | 34345.0 | 3154.3 | 73813.4 | 15517.8 | 55484.9 | 39034.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66897.8 | 8037.3 | 143220.2 | 1096.0 | 20937.3 | 21526.0 |

Punto di applic. carico verticale: Xv = 2.141 m Yv = .313 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.291 | 9.058 | 1.452 | .570 | .030 | .066 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3653.7 | 517.5 | -136.7 | 109.6 | -350.6 | .0 | 376.3 |
| 2 | 3072.7 | 123.7 | 681.9 | 28.2 | -113.1 | .0 | 691.2 |
| 3 | 2491.7 | 82.2 | 771.6 | 22.8 | -87.1 | .0 | 776.5 |
| 4 | 1910.8 | 82.2 | 771.6 | 17.4 | -61.1 | .0 | 774.0 |
| 5 | 1329.8 | 82.2 | 771.6 | 12.1 | -35.2 | .0 | 772.4 |
| 6 | 748.8 | 82.2 | 771.6 | 6.7 | -9.2 | .0 | 771.7 |
| 7 | 167.9 | 351.0 | 197.4 | 9.2 | .0 | .0 | 197.4 |
| 8 | 3375.3 | 336.7 | 249.7 | 86.5 | -284.4 | .0 | 378.5 |
| 9 | 2794.3 | 55.3 | 843.2 | 25.5 | -100.1 | .0 | 849.1 |
| 10 | 2213.3 | 55.3 | 843.2 | 20.1 | -74.1 | .0 | 846.4 |
| 11 | 1632.4 | 55.3 | 843.2 | 14.8 | -48.2 | .0 | 844.6 |
| 12 | 1051.4 | 55.3 | 843.2 | 9.4 | -22.2 | .0 | 843.5 |
| 13 | 470.4 | 336.7 | 249.7 | 14.6 | -22.5 | .0 | 250.7 |
| 14 | 3096.9 | 402.9 | 140.5 | 92.9 | -292.1 | .0 | 324.1 |
| 15 | 2515.9 | 69.9 | 828.6 | 22.8 | -87.1 | .0 | 833.2 |
| 16 | 1934.9 | 69.9 | 828.6 | 17.4 | -61.1 | .0 | 830.9 |
| 17 | 1353.9 | 69.9 | 828.6 | 12.1 | -35.2 | .0 | 829.4 |
| 18 | 773.0 | 322.3 | 302.1 | 25.9 | -58.4 | .0 | 307.7 |
| 19 | 3548.7 | 682.0 | -691.5 | 109.6 | -350.6 | .0 | 775.3 |
| 20 | 2967.7 | 189.4 | 394.8 | 28.2 | -113.1 | .0 | 410.7 |
| 21 | 2386.7 | 135.7 | 523.6 | 22.8 | -87.1 | .0 | 530.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1805.8 | 135.7 | 523.6 | 17.4 | -61.1 | .0 | 527.2 |
| 23 | 1224.8 | 135.7 | 523.6 | 12.1 | -35.2 | .0 | 524.8 |
| 24 | 643.8 | 135.7 | 523.6 | 6.7 | -9.2 | .0 | 523.7 |
| 25 | 62.9 | 476.1 | -258.3 | 9.2 | .0 | .0 | 258.3 |
| 26 | 3246.1 | 490.5 | -310.6 | 86.5 | -284.4 | .0 | 421.1 |
| 27 | 2665.2 | 112.9 | 565.3 | 25.5 | -100.1 | .0 | 574.1 |
| 28 | 2084.2 | 112.9 | 565.3 | 20.1 | -74.1 | .0 | 570.1 |
| 29 | 1503.2 | 112.9 | 565.3 | 14.8 | -48.2 | .0 | 567.4 |
| 30 | 922.2 | 112.9 | 565.3 | 9.4 | -22.2 | .0 | 565.7 |
| 31 | 341.3 | 490.5 | -310.6 | 14.6 | -22.5 | .0 | 311.5 |
| 32 | 2943.6 | 615.4 | -601.6 | 92.9 | -292.1 | .0 | 668.8 |
| 33 | 2362.6 | 148.0 | 466.6 | 22.8 | -87.1 | .0 | 474.6 |
| 34 | 1781.6 | 148.0 | 466.6 | 17.4 | -61.1 | .0 | 470.6 |
| 35 | 1200.7 | 148.0 | 466.6 | 12.1 | -35.2 | .0 | 467.9 |
| 36 | 619.7 | 504.9 | -363.0 | 25.9 | -58.4 | .0 | 367.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 6
spalla fissa - n777 _FESS_6- n789 _FESS_6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34345.0 | 3153.8 | 73810.8 | -15487.8 | -56033.1 | -38192.1 |
| 2 | 32552.7 | 4884.6 | 69414.5 | 14391.8 | 54271.4 | 35191.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66897.7 | 8038.4 | 143225.3 | -1096.0 | -20939.3 | -21520.6 |

Punto di applic. carico verticale: Xv = 2.141 m Yv = -.313 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.291 | 9.059 | 1.453 | -.570 | -.030 | -.065 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3548.8 | 682.0 | -691.6 | -109.6 | 350.5 | .0 | 775.4 |
| 2 | 2967.8 | 189.4 | 394.8 | -28.2 | 113.1 | .0 | 410.7 |
| 3 | 2386.8 | 135.7 | 523.6 | -22.8 | 87.1 | .0 | 530.8 |
| 4 | 1805.8 | 135.7 | 523.6 | -17.4 | 61.1 | .0 | 527.2 |
| 5 | 1224.8 | 135.7 | 523.6 | -12.1 | 35.2 | .0 | 524.8 |
| 6 | 643.8 | 135.7 | 523.6 | -6.7 | 9.2 | .0 | 523.7 |
| 7 | 62.7 | 476.2 | -258.3 | -9.2 | .0 | .0 | 258.3 |
| 8 | 3246.2 | 490.5 | -310.7 | -86.5 | 284.3 | .0 | 421.1 |
| 9 | 2665.2 | 112.9 | 565.3 | -25.5 | 100.1 | .0 | 574.1 |
| 10 | 2084.2 | 112.9 | 565.3 | -20.1 | 74.1 | .0 | 570.2 |
| 11 | 1503.2 | 112.9 | 565.3 | -14.8 | 48.2 | .0 | 567.4 |
| 12 | 922.2 | 112.9 | 565.3 | -9.4 | 22.2 | .0 | 565.8 |
| 13 | 341.2 | 490.5 | -310.7 | -14.6 | 22.5 | .0 | 311.5 |
| 14 | 2943.6 | 615.5 | -601.6 | -92.9 | 292.1 | .0 | 668.8 |
| 15 | 2362.6 | 148.0 | 466.6 | -22.8 | 87.1 | .0 | 474.7 |
| 16 | 1781.6 | 148.0 | 466.6 | -17.4 | 61.1 | .0 | 470.6 |
| 17 | 1200.6 | 148.0 | 466.6 | -12.1 | 35.2 | .0 | 467.9 |
| 18 | 619.6 | 504.9 | -363.0 | -25.9 | 58.4 | .0 | 367.7 |
| 19 | 3653.8 | 517.6 | -136.9 | -109.6 | 350.5 | .0 | 376.3 |
| 20 | 3072.8 | 123.7 | 681.8 | -28.2 | 113.1 | .0 | 691.1 |
| 21 | 2491.8 | 82.2 | 771.6 | -22.8 | 87.1 | .0 | 776.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1910.8 | 82.2 | 771.6 | -17.4 | 61.1 | .0 | 774.0 |
| 23 | 1329.8 | 82.2 | 771.6 | -12.1 | 35.2 | .0 | 772.4 |
| 24 | 748.8 | 82.2 | 771.6 | -6.7 | 9.2 | .0 | 771.6 |
| 25 | 167.8 | 351.1 | 197.2 | -9.2 | .0 | .0 | 197.2 |
| 26 | 3375.4 | 336.7 | 249.6 | -86.5 | 284.3 | .0 | 378.3 |
| 27 | 2794.4 | 55.3 | 843.1 | -25.5 | 100.1 | .0 | 849.1 |
| 28 | 2213.4 | 55.3 | 843.1 | -20.1 | 74.1 | .0 | 846.4 |
| 29 | 1632.3 | 55.3 | 843.1 | -14.8 | 48.2 | .0 | 844.5 |
| 30 | 1051.3 | 55.3 | 843.1 | -9.4 | 22.2 | .0 | 843.4 |
| 31 | 470.3 | 336.7 | 249.6 | -14.6 | 22.5 | .0 | 250.6 |
| 32 | 3096.9 | 403.0 | 140.3 | -92.9 | 292.1 | .0 | 324.0 |
| 33 | 2515.9 | 69.9 | 828.6 | -22.8 | 87.1 | .0 | 833.1 |
| 34 | 1934.9 | 69.9 | 828.6 | -17.4 | 61.1 | .0 | 830.8 |
| 35 | 1353.9 | 69.9 | 828.6 | -12.1 | 35.2 | .0 | 829.3 |
| 36 | 772.9 | 322.3 | 301.9 | -25.9 | 58.4 | .0 | 307.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 7
spalla fissa - n777 _FESS_7 - n789 _FESS_7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33642.4 | 6242.7 | 82304.4 | -14832.7 | -55833.1 | -45061.6 |
| 2 | 34287.4 | 5181.7 | 83168.9 | 15504.7 | 56067.1 | 46693.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67929.8 | 11424.4 | 165473.3 | 672.0 | 7135.5 | 12984.1 |

Punto di applic. carico verticale: Xv = 2.436 m Yv = .105 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.435 | 11.602 | 1.750 | .322 | .012 | .040 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4006.8 | 772.5 | -667.8 | 66.2 | -218.7 | .0 | 702.7 |
| 2 | 3307.0 | 208.6 | 561.1 | 17.4 | -75.0 | .0 | 566.1 |
| 3 | 2607.2 | 147.5 | 704.6 | 14.2 | -59.4 | .0 | 707.1 |
| 4 | 1907.3 | 147.5 | 704.6 | 10.9 | -43.7 | .0 | 705.9 |
| 5 | 1207.5 | 147.5 | 704.6 | 7.7 | -28.0 | .0 | 705.1 |
| 6 | 507.7 | 147.5 | 704.6 | 4.4 | -12.4 | .0 | 704.7 |
| 7 | -192.1 | 536.3 | -175.4 | 5.6 | -7.2 | .0 | 175.6 |
| 8 | 3661.6 | 527.6 | -143.8 | 52.4 | -178.8 | .0 | 229.5 |
| 9 | 2961.8 | 112.3 | 795.2 | 15.8 | -67.2 | .0 | 798.0 |
| 10 | 2261.9 | 112.3 | 795.2 | 12.5 | -51.5 | .0 | 796.8 |
| 11 | 1562.1 | 112.3 | 795.2 | 9.3 | -35.9 | .0 | 796.0 |
| 12 | 862.3 | 112.3 | 795.2 | 6.0 | -20.2 | .0 | 795.4 |
| 13 | 162.5 | 527.6 | -143.8 | 9.0 | -20.9 | .0 | 145.4 |
| 14 | 3316.4 | 637.5 | -362.0 | 56.1 | -183.5 | .0 | 405.9 |
| 15 | 2616.5 | 140.1 | 739.0 | 14.2 | -59.4 | .0 | 741.3 |
| 16 | 1916.7 | 140.1 | 739.0 | 10.9 | -43.7 | .0 | 740.3 |
| 17 | 1216.9 | 140.1 | 739.0 | 7.7 | -28.0 | .0 | 739.5 |
| 18 | 517.1 | 518.9 | -112.3 | 15.7 | -42.5 | .0 | 120.0 |
| 19 | 3966.0 | 871.7 | -1002.5 | 66.2 | -218.7 | .0 | 1026.1 |
| 20 | 3266.2 | 248.2 | 387.9 | 17.4 | -75.0 | .0 | 395.1 |
| 21 | 2566.4 | 179.8 | 555.0 | 14.2 | -59.4 | .0 | 558.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1866.5 | 179.8 | 555.0 | 10.9 | -43.7 | .0 | 556.7 |
| 23 | 1166.7 | 179.8 | 555.0 | 7.7 | -28.0 | .0 | 555.7 |
| 24 | 466.9 | 179.8 | 555.0 | 4.4 | -12.4 | .0 | 555.1 |
| 25 | -232.9 | 611.7 | -450.3 | 5.6 | -7.2 | .0 | 450.3 |
| 26 | 3611.4 | 620.4 | -481.9 | 52.4 | -178.8 | .0 | 514.0 |
| 27 | 2911.6 | 147.0 | 627.6 | 15.8 | -67.2 | .0 | 631.2 |
| 28 | 2211.8 | 147.0 | 627.6 | 12.5 | -51.5 | .0 | 629.7 |
| 29 | 1511.9 | 147.0 | 627.6 | 9.3 | -35.9 | .0 | 628.6 |
| 30 | 812.1 | 147.0 | 627.6 | 6.0 | -20.2 | .0 | 627.9 |
| 31 | 112.3 | 620.4 | -481.9 | 9.0 | -20.9 | .0 | 482.3 |
| 32 | 3256.8 | 765.7 | -809.6 | 56.1 | -183.5 | .0 | 830.2 |
| 33 | 2557.0 | 187.2 | 520.6 | 14.2 | -59.4 | .0 | 523.9 |
| 34 | 1857.2 | 187.2 | 520.6 | 10.9 | -43.7 | .0 | 522.4 |
| 35 | 1157.3 | 187.2 | 520.6 | 7.7 | -28.0 | .0 | 521.3 |
| 36 | 457.5 | 629.1 | -513.4 | 15.7 | -42.5 | .0 | 515.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 7
spalla fissa - n777 _FESS_7 - n789 _FESS_7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 772.5 | -667.8 | 66.2 | -218.7 | 775.4 | 702.7 |
| 1.56 | 614.6 | 407.8 | 59.0 | -121.0 | 617.4 | 425.4 |
| 3.13 | 419.6 | 1268.9 | 47.9 | -33.9 | 422.3 | 1269.4 |
| 4.69 | 91.7 | 1637.4 | 26.1 | 22.8 | 95.4 | 1637.6 |
| 6.25 | -95.2 | 1610.9 | 10.1 | 50.0 | 95.8 | 1611.6 |
| 7.81 | -178.6 | 1380.3 | -.8 | 56.4 | 178.6 | 1381.4 |
| 9.38 | -190.1 | 1083.4 | -4.1 | 51.2 | 190.1 | 1084.6 |
| 10.94 | -182.8 | 790.4 | -5.1 | 43.9 | 182.9 | 791.7 |
| 12.50 | -168.6 | 514.3 | -5.6 | 35.5 | 168.7 | 515.5 |
| 15.00 | -105.2 | 155.2 | -5.2 | 21.6 | 105.3 | 156.7 |
| 17.50 | -44.4 | -23.9 | -3.7 | 10.2 | 44.5 | 26.0 |
| 20.00 | -8.6 | -82.6 | -2.1 | 2.9 | 8.8 | 82.7 |
| 22.50 | 6.9 | -79.5 | -.9 | -.7 | 7.0 | 79.5 |
| 25.00 | 9.5 | -55.9 | -.1 | -1.9 | 9.5 | 55.9 |
| 29.17 | 6.5 | -21.9 | .2 | -1.4 | 6.5 | 21.9 |
| 33.33 | 2.9 | -2.7 | .1 | -.7 | 2.9 | 2.8 |
| 37.50 | .5 | 3.8 | .1 | -.2 | .5 | 3.8 |
| 43.75 | -.5 | 2.3 | .0 | .0 | .5 | 2.3 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 7
spalla fissa - n777 _FESS_7 - n789 _FESS_7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 611.7 | -450.3 | 5.6 | -7.2 | 611.8 | 450.3 |
| 1.56 | 498.9 | 412.2 | 4.6 | .8 | 498.9 | 412.2 |
| 3.13 | 354.2 | 1119.5 | 3.3 | 7.4 | 354.2 | 1119.5 |
| 4.69 | 101.6 | 1454.7 | 1.1 | 10.6 | 101.6 | 1454.7 |
| 6.25 | -55.1 | 1474.4 | -.3 | 11.0 | 55.1 | 1474.5 |
| 7.81 | -138.2 | 1311.2 | -1.1 | 9.8 | 138.2 | 1311.3 |
| 9.38 | -155.9 | 1071.6 | -1.2 | 8.0 | 155.9 | 1071.6 |
| 10.94 | -155.0 | 827.4 | -1.2 | 6.0 | 155.0 | 827.4 |
| 12.50 | -147.9 | 589.5 | -1.1 | 4.2 | 147.9 | 589.6 |
| 15.00 | -105.6 | 259.6 | -.8 | 1.7 | 105.6 | 259.7 |
| 17.50 | -57.7 | 58.8 | -.4 | .2 | 57.7 | 58.8 |
| 20.00 | -23.4 | -37.9 | -.1 | -.4 | 23.4 | 37.9 |
| 22.50 | -3.5 | -67.5 | .0 | -.5 | 3.5 | 67.5 |
| 25.00 | 5.5 | -62.7 | .1 | -.4 | 5.5 | 62.7 |
| 29.17 | 6.3 | -34.2 | .0 | -.2 | 6.3 | 34.2 |
| 33.33 | 4.0 | -12.3 | .0 | -.1 | 4.0 | 12.3 |
| 37.50 | 1.5 | -1.0 | .0 | .0 | 1.5 | 1.0 |
| 43.75 | -.2 | 1.9 | .0 | .0 | .2 | 1.9 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 7
spalla fissa - n777 _FESS_7 - n789 _FESS_7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 871.7 | -1002.5 | 66.2 | -218.7 | 874.2 | 1026.1 |
| 1.56 | 703.0 | 219.7 | 59.0 | -121.0 | 705.5 | 250.8 |
| 3.13 | 491.3 | 1211.1 | 47.9 | -33.9 | 493.6 | 1211.6 |
| 4.69 | 130.5 | 1664.1 | 26.1 | 22.8 | 133.1 | 1664.3 |
| 6.25 | -80.4 | 1677.8 | 10.1 | 50.0 | 81.0 | 1678.5 |
| 7.81 | -179.8 | 1456.5 | -.8 | 56.4 | 179.8 | 1457.6 |
| 9.38 | -196.1 | 1151.9 | -4.1 | 51.2 | 196.1 | 1153.0 |
| 10.94 | -190.2 | 848.3 | -5.1 | 43.9 | 190.3 | 849.5 |
| 12.50 | -176.5 | 560.1 | -5.6 | 35.5 | 176.6 | 561.2 |
| 15.00 | -112.3 | 181.6 | -5.2 | 21.6 | 112.4 | 182.9 |
| 17.50 | -49.2 | -12.6 | -3.7 | 10.2 | 49.3 | 16.2 |
| 20.00 | -11.1 | -80.3 | -2.1 | 2.9 | 11.3 | 80.4 |
| 22.50 | 6.0 | -81.2 | -.9 | -.7 | 6.1 | 81.2 |
| 25.00 | 9.5 | -58.6 | -.1 | -1.9 | 9.5 | 58.6 |
| 29.17 | 6.7 | -23.5 | .2 | -1.4 | 6.7 | 23.6 |
| 33.33 | 3.1 | -3.4 | .1 | -.7 | 3.1 | 3.5 |
| 37.50 | .6 | 3.7 | .1 | -.2 | .6 | 3.7 |
| 43.75 | -.5 | 2.4 | .0 | .0 | .5 | 2.4 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 8
spalla fissa - n777 _FESS_8- n789 _FESS_8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33642.4 | 2715.9 | 64322.2 | -14954.1 | -55277.4 | -29249.3 |
| 2 | 34287.3 | 1656.4 | 65186.0 | 15626.1 | 55510.6 | 30853.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67929.7 | 4372.3 | 129508.2 | 672.0 | 7133.7 | 12940.6 |

Punto di applic. carico verticale: Xv = 1.907 m Yv = .105 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.435 | 6.652 | 1.217 | .322 | .012 | .039 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3367.3 | 318.0 | 275.3 | 66.1 | -218.4 | .0 | 351.4 |
| 2 | 2880.6 | 57.4 | 772.9 | 17.4 | -74.9 | .0 | 776.5 |
| 3 | 2394.0 | 31.3 | 820.6 | 14.1 | -59.3 | .0 | 822.7 |
| 4 | 1907.3 | 31.3 | 820.6 | 10.9 | -43.7 | .0 | 821.8 |
| 5 | 1420.7 | 31.3 | 820.6 | 7.7 | -28.1 | .0 | 821.1 |
| 6 | 934.0 | 31.3 | 820.6 | 4.4 | -12.5 | .0 | 820.7 |
| 7 | 447.4 | 206.2 | 485.4 | 5.8 | -7.6 | .0 | 485.5 |
| 8 | 3128.6 | 197.5 | 516.9 | 52.3 | -178.5 | .0 | 546.9 |
| 9 | 2642.0 | 14.7 | 858.9 | 15.8 | -67.1 | .0 | 861.5 |
| 10 | 2155.3 | 14.7 | 858.9 | 12.5 | -51.5 | .0 | 860.4 |
| 11 | 1668.7 | 14.7 | 858.9 | 9.3 | -35.9 | .0 | 859.6 |
| 12 | 1182.1 | 14.7 | 858.9 | 6.1 | -20.3 | .0 | 859.1 |
| 13 | 695.4 | 197.5 | 516.9 | 9.1 | -21.1 | .0 | 517.3 |
| 14 | 2890.0 | 243.1 | 447.2 | 56.0 | -183.2 | .0 | 483.2 |
| 15 | 2403.4 | 23.9 | 854.9 | 14.1 | -59.3 | .0 | 856.9 |
| 16 | 1916.7 | 23.9 | 854.9 | 10.9 | -43.7 | .0 | 856.0 |
| 17 | 1430.1 | 23.9 | 854.9 | 7.7 | -28.1 | .0 | 855.3 |
| 18 | 943.4 | 188.9 | 548.4 | 15.8 | -42.7 | .0 | 550.0 |
| 19 | 3326.5 | 416.8 | -58.3 | 66.1 | -218.4 | .0 | 226.0 |
| 20 | 2839.8 | 96.9 | 600.3 | 17.4 | -74.9 | .0 | 604.9 |
| 21 | 2353.2 | 63.4 | 671.5 | 14.1 | -59.3 | .0 | 674.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1866.5 | 63.4 | 671.5 | 10.9 | -43.7 | .0 | 672.9 |
| 23 | 1379.9 | 63.4 | 671.5 | 7.7 | -28.1 | .0 | 672.1 |
| 24 | 893.3 | 63.4 | 671.5 | 4.4 | -12.5 | .0 | 671.6 |
| 25 | 406.6 | 281.4 | 211.5 | 5.8 | -7.6 | .0 | 211.6 |
| 26 | 3078.5 | 290.0 | 180.0 | 52.3 | -178.5 | .0 | 253.5 |
| 27 | 2591.8 | 49.3 | 691.8 | 15.8 | -67.1 | .0 | 695.1 |
| 28 | 2105.2 | 49.3 | 691.8 | 12.5 | -51.5 | .0 | 693.7 |
| 29 | 1618.5 | 49.3 | 691.8 | 9.3 | -35.9 | .0 | 692.7 |
| 30 | 1131.9 | 49.3 | 691.8 | 6.1 | -20.3 | .0 | 692.1 |
| 31 | 645.2 | 290.0 | 180.0 | 9.1 | -21.1 | .0 | 181.2 |
| 32 | 2830.5 | 370.9 | 1.1 | 56.0 | -183.2 | .0 | 183.2 |
| 33 | 2343.8 | 70.8 | 637.2 | 14.1 | -59.3 | .0 | 640.0 |
| 34 | 1857.2 | 70.8 | 637.2 | 10.9 | -43.7 | .0 | 638.7 |
| 35 | 1370.5 | 70.8 | 637.2 | 7.7 | -28.1 | .0 | 637.8 |
| 36 | 883.9 | 298.6 | 148.5 | 15.8 | -42.7 | .0 | 154.6 |

```
Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 9
spalla fissa - n777 _FESS_9- n789 _FESS_9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33642.4 | 6242.7 | 82304.4 | -14832.7 | -55833.1 | -45061.6 |
| 2 | 34287.4 | 5181.7 | 83168.9 | 15504.7 | 56067.1 | 46693.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67929.8 | 11424.4 | 165473.3 | 672.0 | 7135.5 | 12984.1 |

Punto di applic. carico verticale: Xv = 2.436 m Yv = .105 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.435 | 11.602 | 1.750 | .322 | .012 | .040 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4006.8 | 772.5 | -667.8 | 66.2 | -218.7 | .0 | 702.7 |
| 2 | 3307.0 | 208.6 | 561.1 | 17.4 | -75.0 | .0 | 566.1 |
| 3 | 2607.2 | 147.5 | 704.6 | 14.2 | -59.4 | .0 | 707.1 |
| 4 | 1907.3 | 147.5 | 704.6 | 10.9 | -43.7 | .0 | 705.9 |
| 5 | 1207.5 | 147.5 | 704.6 | 7.7 | -28.0 | .0 | 705.1 |
| 6 | 507.7 | 147.5 | 704.6 | 4.4 | -12.4 | .0 | 704.7 |
| 7 | -192.1 | 536.3 | -175.4 | 5.6 | -7.2 | .0 | 175.6 |
| 8 | 3661.6 | 527.6 | -143.8 | 52.4 | -178.8 | .0 | 229.5 |
| 9 | 2961.8 | 112.3 | 795.2 | 15.8 | -67.2 | .0 | 798.0 |
| 10 | 2261.9 | 112.3 | 795.2 | 12.5 | -51.5 | .0 | 796.8 |
| 11 | 1562.1 | 112.3 | 795.2 | 9.3 | -35.9 | .0 | 796.0 |
| 12 | 862.3 | 112.3 | 795.2 | 6.0 | -20.2 | .0 | 795.4 |
| 13 | 162.5 | 527.6 | -143.8 | 9.0 | -20.9 | .0 | 145.4 |
| 14 | 3316.4 | 637.5 | -362.0 | 56.1 | -183.5 | .0 | 405.9 |
| 15 | 2616.5 | 140.1 | 739.0 | 14.2 | -59.4 | .0 | 741.3 |
| 16 | 1916.7 | 140.1 | 739.0 | 10.9 | -43.7 | .0 | 740.3 |
| 17 | 1216.9 | 140.1 | 739.0 | 7.7 | -28.0 | .0 | 739.5 |
| 18 | 517.1 | 518.9 | -112.3 | 15.7 | -42.5 | .0 | 120.0 |
| 19 | 3966.0 | 871.7 | -1002.5 | 66.2 | -218.7 | .0 | 1026.1 |
| 20 | 3266.2 | 248.2 | 387.9 | 17.4 | -75.0 | .0 | 395.1 |
| 21 | 2566.4 | 179.8 | 555.0 | 14.2 | -59.4 | .0 | 558.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1866.5 | 179.8 | 555.0 | 10.9 | -43.7 | .0 | 556.7 |
| 23 | 1166.7 | 179.8 | 555.0 | 7.7 | -28.0 | .0 | 555.7 |
| 24 | 466.9 | 179.8 | 555.0 | 4.4 | -12.4 | .0 | 555.1 |
| 25 | -232.9 | 611.7 | -450.3 | 5.6 | -7.2 | .0 | 450.3 |
| 26 | 3611.4 | 620.4 | -481.9 | 52.4 | -178.8 | .0 | 514.0 |
| 27 | 2911.6 | 147.0 | 627.6 | 15.8 | -67.2 | .0 | 631.2 |
| 28 | 2211.8 | 147.0 | 627.6 | 12.5 | -51.5 | .0 | 629.7 |
| 29 | 1511.9 | 147.0 | 627.6 | 9.3 | -35.9 | .0 | 628.6 |
| 30 | 812.1 | 147.0 | 627.6 | 6.0 | -20.2 | .0 | 627.9 |
| 31 | 112.3 | 620.4 | -481.9 | 9.0 | -20.9 | .0 | 482.3 |
| 32 | 3256.8 | 765.7 | -809.6 | 56.1 | -183.5 | .0 | 830.2 |
| 33 | 2557.0 | 187.2 | 520.6 | 14.2 | -59.4 | .0 | 523.9 |
| 34 | 1857.2 | 187.2 | 520.6 | 10.9 | -43.7 | .0 | 522.4 |
| 35 | 1157.3 | 187.2 | 520.6 | 7.7 | -28.0 | .0 | 521.3 |
| 36 | 457.5 | 629.1 | -513.4 | 15.7 | -42.5 | .0 | 515.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 9
spalla fissa - n777 _FESS_9- n789 _FESS_9

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 871.7 | -1002.5 | 66.2 | -218.7 | 874.2 | 1026.1 |
| 1.56 | 703.0 | 219.7 | 59.0 | -121.0 | 705.5 | 250.8 |
| 3.13 | 491.3 | 1211.1 | 47.9 | -33.9 | 493.6 | 1211.6 |
| 4.69 | 130.5 | 1664.1 | 26.1 | 22.8 | 133.1 | 1664.3 |
| 6.25 | -80.4 | 1677.8 | 10.1 | 50.0 | 81.0 | 1678.5 |
| 7.81 | -179.8 | 1456.5 | -.8 | 56.4 | 179.8 | 1457.6 |
| 9.38 | -196.1 | 1151.9 | -4.1 | 51.2 | 196.1 | 1153.0 |
| 10.94 | -190.2 | 848.3 | -5.1 | 43.9 | 190.3 | 849.5 |
| 12.50 | -176.5 | 560.1 | -5.6 | 35.5 | 176.6 | 561.2 |
| 15.00 | -112.3 | 181.6 | -5.2 | 21.6 | 112.4 | 182.9 |
| 17.50 | -49.2 | -12.6 | -3.7 | 10.2 | 49.3 | 16.2 |
| 20.00 | -11.1 | -80.3 | -2.1 | 2.9 | 11.3 | 80.4 |
| 22.50 | 6.0 | -81.2 | -.9 | -.7 | 6.1 | 81.2 |
| 25.00 | 9.5 | -58.6 | -.1 | -1.9 | 9.5 | 58.6 |
| 29.17 | 6.7 | -23.5 | .2 | -1.4 | 6.7 | 23.6 |
| 33.33 | 3.1 | -3.4 | .1 | -.7 | 3.1 | 3.5 |
| 37.50 | .6 | 3.7 | .1 | -.2 | .6 | 3.7 |
| 43.75 | -.5 | 2.4 | .0 | .0 | .5 | 2.4 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 9
spalla fissa - n777 _FESS_9- n789 _FESS_9

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 611.7 | -450.3 | 5.6 | -7.2 | 611.8 | 450.3 |
| 1.56 | 498.9 | 412.2 | 4.6 | .8 | 498.9 | 412.2 |
| 3.13 | 354.2 | 1119.5 | 3.3 | 7.4 | 354.2 | 1119.5 |
| 4.69 | 101.6 | 1454.7 | 1.1 | 10.6 | 101.6 | 1454.7 |
| 6.25 | -55.1 | 1474.4 | -.3 | 11.0 | 55.1 | 1474.5 |
| 7.81 | -138.2 | 1311.2 | -1.1 | 9.8 | 138.2 | 1311.3 |
| 9.38 | -155.9 | 1071.6 | -1.2 | 8.0 | 155.9 | 1071.6 |
| 10.94 | -155.0 | 827.4 | -1.2 | 6.0 | 155.0 | 827.4 |
| 12.50 | -147.9 | 589.5 | -1.1 | 4.2 | 147.9 | 589.6 |
| 15.00 | -105.6 | 259.6 | -.8 | 1.7 | 105.6 | 259.7 |
| 17.50 | -57.7 | 58.8 | -.4 | .2 | 57.7 | 58.8 |
| 20.00 | -23.4 | -37.9 | -.1 | -.4 | 23.4 | 37.9 |
| 22.50 | -3.5 | -67.5 | .0 | -.5 | 3.5 | 67.5 |
| 25.00 | 5.5 | -62.7 | .1 | -.4 | 5.5 | 62.7 |
| 29.17 | 6.3 | -34.2 | .0 | -.2 | 6.3 | 34.2 |
| 33.33 | 4.0 | -12.3 | .0 | -.1 | 4.0 | 12.3 |
| 37.50 | 1.5 | -1.0 | .0 | .0 | 1.5 | 1.0 |
| 43.75 | -.2 | 1.9 | .0 | .0 | .2 | 1.9 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 10
spalla fissa - n777 _FESS_10- n789 _FESS_10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33642.4 | 2715.9 | 64322.2 | -14954.1 | -55277.4 | -29249.3 |
| 2 | 34287.3 | 1656.4 | 65186.0 | 15626.1 | 55510.6 | 30853.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67929.7 | 4372.3 | 129508.2 | 672.0 | 7133.7 | 12940.6 |

Punto di applic. carico verticale: Xv = 1.907 m Yv = .105 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.435 | 6.652 | 1.217 | .322 | .012 | .039 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3367.3 | 318.0 | 275.3 | 66.1 | -218.4 | .0 | 351.4 |
| 2 | 2880.6 | 57.4 | 772.9 | 17.4 | -74.9 | .0 | 776.5 |
| 3 | 2394.0 | 31.3 | 820.6 | 14.1 | -59.3 | .0 | 822.7 |
| 4 | 1907.3 | 31.3 | 820.6 | 10.9 | -43.7 | .0 | 821.8 |
| 5 | 1420.7 | 31.3 | 820.6 | 7.7 | -28.1 | .0 | 821.1 |
| 6 | 934.0 | 31.3 | 820.6 | 4.4 | -12.5 | .0 | 820.7 |
| 7 | 447.4 | 206.2 | 485.4 | 5.8 | -7.6 | .0 | 485.5 |
| 8 | 3128.6 | 197.5 | 516.9 | 52.3 | -178.5 | .0 | 546.9 |
| 9 | 2642.0 | 14.7 | 858.9 | 15.8 | -67.1 | .0 | 861.5 |
| 10 | 2155.3 | 14.7 | 858.9 | 12.5 | -51.5 | .0 | 860.4 |
| 11 | 1668.7 | 14.7 | 858.9 | 9.3 | -35.9 | .0 | 859.6 |
| 12 | 1182.1 | 14.7 | 858.9 | 6.1 | -20.3 | .0 | 859.1 |
| 13 | 695.4 | 197.5 | 516.9 | 9.1 | -21.1 | .0 | 517.3 |
| 14 | 2890.0 | 243.1 | 447.2 | 56.0 | -183.2 | .0 | 483.2 |
| 15 | 2403.4 | 23.9 | 854.9 | 14.1 | -59.3 | .0 | 856.9 |
| 16 | 1916.7 | 23.9 | 854.9 | 10.9 | -43.7 | .0 | 856.0 |
| 17 | 1430.1 | 23.9 | 854.9 | 7.7 | -28.1 | .0 | 855.3 |
| 18 | 943.4 | 188.9 | 548.4 | 15.8 | -42.7 | .0 | 550.0 |
| 19 | 3326.5 | 416.8 | -58.3 | 66.1 | -218.4 | .0 | 226.0 |
| 20 | 2839.8 | 96.9 | 600.3 | 17.4 | -74.9 | .0 | 604.9 |
| 21 | 2353.2 | 63.4 | 671.5 | 14.1 | -59.3 | .0 | 674.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1866.5 | 63.4 | 671.5 | 10.9 | -43.7 | .0 | 672.9 |
| 23 | 1379.9 | 63.4 | 671.5 | 7.7 | -28.1 | .0 | 672.1 |
| 24 | 893.3 | 63.4 | 671.5 | 4.4 | -12.5 | .0 | 671.6 |
| 25 | 406.6 | 281.4 | 211.5 | 5.8 | -7.6 | .0 | 211.6 |
| 26 | 3078.5 | 290.0 | 180.0 | 52.3 | -178.5 | .0 | 253.5 |
| 27 | 2591.8 | 49.3 | 691.8 | 15.8 | -67.1 | .0 | 695.1 |
| 28 | 2105.2 | 49.3 | 691.8 | 12.5 | -51.5 | .0 | 693.7 |
| 29 | 1618.5 | 49.3 | 691.8 | 9.3 | -35.9 | .0 | 692.7 |
| 30 | 1131.9 | 49.3 | 691.8 | 6.1 | -20.3 | .0 | 692.1 |
| 31 | 645.2 | 290.0 | 180.0 | 9.1 | -21.1 | .0 | 181.2 |
| 32 | 2830.5 | 370.9 | 1.1 | 56.0 | -183.2 | .0 | 183.2 |
| 33 | 2343.8 | 70.8 | 637.2 | 14.1 | -59.3 | .0 | 640.0 |
| 34 | 1857.2 | 70.8 | 637.2 | 10.9 | -43.7 | .0 | 638.7 |
| 35 | 1370.5 | 70.8 | 637.2 | 7.7 | -28.1 | .0 | 637.8 |
| 36 | 883.9 | 298.6 | 148.5 | 15.8 | -42.7 | .0 | 154.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 11
spalla fissa - n777 _FESS_11- n789 _FESS_11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32384.3 | 4847.9 | 68358.5 | -14307.2 | -53399.4 | -35461.7 |
| 2 | 34058.5 | 3113.4 | 72278.8 | 15403.2 | 54940.0 | 38427.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.8 | 7961.3 | 140637.3 | 1096.0 | 19454.5 | 21525.3 |

Punto di applic. carico verticale: Xv = 2.117 m Yv = .293 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 8.931 | 1.429 | .563 | .028 | .066 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3609.3 | 510.9 | -140.7 | 109.5 | -352.0 | .0 | 379.1 |
| 2 | 3037.9 | 122.4 | 667.4 | 28.3 | -114.7 | .0 | 677.2 |
| 3 | 2466.5 | 81.5 | 756.1 | 22.9 | -88.7 | .0 | 761.3 |
| 4 | 1895.1 | 81.5 | 756.1 | 17.5 | -62.8 | .0 | 758.7 |
| 5 | 1323.7 | 81.5 | 756.1 | 12.1 | -36.8 | .0 | 757.0 |
| 6 | 752.2 | 81.5 | 756.1 | 6.7 | -10.8 | .0 | 756.2 |
| 7 | 180.8 | 346.7 | 189.0 | 9.1 | -1.4 | .0 | 189.0 |
| 8 | 3335.0 | 332.3 | 241.3 | 86.4 | -285.9 | .0 | 374.1 |
| 9 | 2763.6 | 54.8 | 827.2 | 25.6 | -101.7 | .0 | 833.4 |
| 10 | 2192.1 | 54.8 | 827.2 | 20.2 | -75.7 | .0 | 830.6 |
| 11 | 1620.7 | 54.8 | 827.2 | 14.8 | -49.8 | .0 | 828.7 |
| 12 | 1049.3 | 54.8 | 827.2 | 9.4 | -23.8 | .0 | 827.5 |
| 13 | 477.9 | 332.3 | 241.3 | 14.5 | -24.0 | .0 | 242.5 |
| 14 | 3060.6 | 397.4 | 134.3 | 92.7 | -293.6 | .0 | 322.8 |
| 15 | 2489.2 | 69.2 | 813.1 | 22.9 | -88.7 | .0 | 818.0 |
| 16 | 1917.8 | 69.2 | 813.1 | 17.5 | -62.8 | .0 | 815.6 |
| 17 | 1346.4 | 69.2 | 813.1 | 12.1 | -36.8 | .0 | 814.0 |
| 18 | 775.0 | 317.9 | 293.7 | 25.8 | -59.8 | .0 | 299.7 |
| 19 | 3510.4 | 675.3 | -695.6 | 109.5 | -352.0 | .0 | 779.6 |
| 20 | 2939.0 | 188.1 | 380.4 | 28.3 | -114.7 | .0 | 397.3 |
| 21 | 2367.6 | 134.9 | 508.1 | 22.9 | -88.7 | .0 | 515.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1796.2 | 134.9 | 508.1 | 17.5 | -62.8 | .0 | 512.0 |
| 23 | 1224.8 | 134.9 | 508.1 | 12.1 | -36.8 | .0 | 509.4 |
| 24 | 653.4 | 134.9 | 508.1 | 6.7 | -10.8 | .0 | 508.2 |
| 25 | 81.9 | 471.8 | -266.7 | 9.1 | -1.4 | .0 | 266.7 |
| 26 | 3213.4 | 486.2 | -319.0 | 86.4 | -285.9 | .0 | 428.4 |
| 27 | 2642.0 | 112.4 | 549.3 | 25.6 | -101.7 | .0 | 558.6 |
| 28 | 2070.5 | 112.4 | 549.3 | 20.2 | -75.7 | .0 | 554.5 |
| 29 | 1499.1 | 112.4 | 549.3 | 14.8 | -49.8 | .0 | 551.6 |
| 30 | 927.7 | 112.4 | 549.3 | 9.4 | -23.8 | .0 | 549.8 |
| 31 | 356.3 | 486.2 | -319.0 | 14.5 | -24.0 | .0 | 319.9 |
| 32 | 2916.3 | 609.9 | -607.7 | 92.7 | -293.6 | .0 | 674.9 |
| 33 | 2344.9 | 147.2 | 451.1 | 22.9 | -88.7 | .0 | 459.7 |
| 34 | 1773.5 | 147.2 | 451.1 | 17.5 | -62.8 | .0 | 455.4 |
| 35 | 1202.0 | 147.2 | 451.1 | 12.1 | -36.8 | .0 | 452.6 |
| 36 | 630.6 | 500.5 | -371.4 | 25.8 | -59.8 | .0 | 376.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 12
spalla fissa - n777 _FESS_12- n789 _FESS_12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33408.4 | 4305.0 | 75774.4 | -15238.6 | -54545.5 | -42522.0 |
| 2 | 33034.4 | 6050.3 | 77072.3 | 14334.6 | 55171.0 | 40596.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.8 | 10355.3 | 152846.7 | -904.0 | -3376.3 | -20599.9 |

Punto di applic. carico verticale: Xv = 2.300 m Yv = -.051 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 10.612 | 1.609 | -.403 | -.008 | -.063 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3762.4 | 826.2 | -1004.0 | -95.8 | 325.7 | .0 | 1055.5 |
| 2 | 3118.6 | 238.0 | 314.6 | -25.2 | 115.3 | .0 | 335.0 |
| 3 | 2474.9 | 173.3 | 474.0 | -20.1 | 90.4 | .0 | 482.5 |
| 4 | 1831.1 | 173.3 | 474.0 | -14.9 | 65.6 | .0 | 478.5 |
| 5 | 1187.3 | 173.3 | 474.0 | -9.8 | 40.7 | .0 | 475.7 |
| 6 | 543.5 | 173.3 | 474.0 | -4.6 | 15.9 | .0 | 474.2 |
| 7 | -100.3 | 581.2 | -481.4 | .2 | -9.8 | .0 | 481.5 |
| 8 | 3437.2 | 595.0 | -531.5 | -75.3 | 265.9 | .0 | 594.3 |
| 9 | 2793.4 | 144.3 | 533.6 | -22.6 | 102.9 | .0 | 543.4 |
| 10 | 2149.6 | 144.3 | 533.6 | -17.5 | 78.0 | .0 | 539.2 |
| 11 | 1505.8 | 144.3 | 533.6 | -12.3 | 53.1 | .0 | 536.2 |
| 12 | 862.0 | 144.3 | 533.6 | -7.2 | 28.3 | .0 | 534.3 |
| 13 | 218.2 | 595.0 | -531.5 | -6.5 | 15.3 | .0 | 531.7 |
| 14 | 3111.9 | 739.3 | -866.7 | -79.8 | 269.8 | .0 | 907.8 |
| 15 | 2468.2 | 185.0 | 419.4 | -20.1 | 90.4 | .0 | 429.0 |
| 16 | 1824.4 | 185.0 | 419.4 | -14.9 | 65.6 | .0 | 424.5 |
| 17 | 1180.6 | 185.0 | 419.4 | -9.8 | 40.7 | .0 | 421.4 |
| 18 | 536.8 | 608.7 | -581.6 | -15.8 | 46.2 | .0 | 583.4 |
| 19 | 3791.6 | 668.8 | -473.0 | -95.8 | 325.7 | .0 | 574.3 |
| 20 | 3147.8 | 175.1 | 589.3 | -25.2 | 115.3 | .0 | 600.4 |
| 21 | 2504.0 | 122.1 | 711.3 | -20.1 | 90.4 | .0 | 717.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1860.2 | 122.1 | 711.3 | -14.9 | 65.6 | .0 | 714.3 |
| 23 | 1216.4 | 122.1 | 711.3 | -9.8 | 40.7 | .0 | 712.5 |
| 24 | 572.6 | 122.1 | 711.3 | -4.6 | 15.9 | .0 | 711.5 |
| 25 | -71.2 | 461.5 | -45.3 | .2 | -9.8 | .0 | 46.4 |
| 26 | 3473.0 | 447.7 | 4.8 | -75.3 | 265.9 | .0 | 265.9 |
| 27 | 2829.2 | 89.2 | 799.5 | -22.6 | 102.9 | .0 | 806.1 |
| 28 | 2185.4 | 89.2 | 799.5 | -17.5 | 78.0 | .0 | 803.3 |
| 29 | 1541.7 | 89.2 | 799.5 | -12.3 | 53.1 | .0 | 801.3 |
| 30 | 897.9 | 89.2 | 799.5 | -7.2 | 28.3 | .0 | 800.0 |
| 31 | 254.1 | 447.7 | 4.8 | -6.5 | 15.3 | .0 | 16.0 |
| 32 | 3154.5 | 535.9 | -156.6 | -79.8 | 269.8 | .0 | 312.0 |
| 33 | 2510.7 | 110.3 | 765.9 | -20.1 | 90.4 | .0 | 771.2 |
| 34 | 1866.9 | 110.3 | 765.9 | -14.9 | 65.6 | .0 | 768.7 |
| 35 | 1223.1 | 110.3 | 765.9 | -9.8 | 40.7 | .0 | 767.0 |
| 36 | 579.3 | 434.0 | 54.9 | -15.8 | 46.2 | .0 | 71.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA fissa - SLE FESS

CONDIZIONE DI CARICO 12
spalla fissa - n777 _FESS_12- n789 _FESS_12

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 826.2 | -1004.0 | -95.8 | 325.7 | 831.7 | 1055.5 |
| 1.56 | 668.4 | 156.1 | -85.7 | 184.0 | 673.8 | 241.3 |
| 3.13 | 469.5 | 1100.0 | -70.0 | 57.3 | 474.7 | 1101.5 |
| 4.69 | 129.5 | 1537.4 | -38.8 | -26.0 | 135.2 | 1537.6 |
| 6.25 | -70.3 | 1559.8 | -15.6 | -67.0 | 72.0 | 1561.2 |
| 7.81 | -165.7 | 1358.5 | .3 | -77.7 | 165.7 | 1360.7 |
| 9.38 | -181.8 | 1076.4 | 5.2 | -71.2 | 181.9 | 1078.7 |
| 10.94 | -176.8 | 794.5 | 6.8 | -61.7 | 176.9 | 796.9 |
| 12.50 | -164.3 | 526.5 | 7.5 | -50.4 | 164.5 | 528.9 |
| 15.00 | -105.0 | 173.5 | 7.3 | -31.3 | 105.3 | 176.3 |
| 17.50 | -46.4 | -8.9 | 5.4 | -15.2 | 46.7 | 17.6 |
| 20.00 | -10.8 | -73.3 | 3.1 | -4.7 | 11.2 | 73.5 |
| 22.50 | 5.3 | -75.1 | 1.4 | .7 | 5.5 | 75.1 |
| 25.00 | 8.7 | -54.5 | .2 | 2.5 | 8.7 | 54.6 |
| 29.17 | 6.3 | -22.0 | -.2 | 1.9 | 6.3 | 22.1 |
| 33.33 | 2.9 | -3.3 | -.2 | 1.0 | 2.9 | 3.4 |
| 37.50 | .5 | 3.3 | -.1 | .3 | .6 | 3.4 |
| 43.75 | -.5 | 2.2 | .0 | .0 | .5 | 2.2 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 13
spalla fissa - n777 _RARA_1- n789 _RARA_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31948.2 | 5005.3 | 66959.9 | -14034.8 | -52584.7 | -35261.5 |
| 2 | 33378.6 | 3273.0 | 69909.4 | 15094.8 | 53719.3 | 38040.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 65326.8 | 8278.3 | 136869.3 | 1060.0 | 16439.9 | 21314.2 |

Punto di applic. carico verticale: Xv = 2.095 m Yv = .252 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.073 | 8.974 | 1.408 | .533 | .025 | .065 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3547.1 | 527.8 | -220.7 | 106.8 | -346.8 | .0 | 411.0 |
| 2 | 2983.9 | 130.3 | 615.4 | 27.7 | -114.7 | .0 | 626.0 |
| 3 | 2420.7 | 88.2 | 708.6 | 22.3 | -89.0 | .0 | 714.2 |
| 4 | 1857.5 | 88.2 | 708.6 | 17.0 | -63.3 | .0 | 711.4 |
| 5 | 1294.3 | 88.2 | 708.6 | 11.7 | -37.6 | .0 | 709.6 |
| 6 | 731.1 | 88.2 | 708.6 | 6.4 | -11.9 | .0 | 708.7 |
| 7 | 167.9 | 360.2 | 118.9 | 7.4 | .4 | .0 | 118.9 |
| 8 | 3275.4 | 345.9 | 170.8 | 84.3 | -281.9 | .0 | 329.6 |
| 9 | 2712.2 | 60.9 | 782.0 | 25.0 | -101.9 | .0 | 788.6 |
| 10 | 2149.0 | 60.9 | 782.0 | 19.7 | -76.1 | .0 | 785.7 |
| 11 | 1585.8 | 60.9 | 782.0 | 14.4 | -50.4 | .0 | 783.6 |
| 12 | 1022.6 | 60.9 | 782.0 | 9.0 | -24.7 | .0 | 782.4 |
| 13 | 459.4 | 345.9 | 170.8 | 13.1 | -22.6 | .0 | 172.2 |
| 14 | 3003.6 | 413.0 | 57.8 | 90.3 | -288.9 | .0 | 294.6 |
| 15 | 2440.5 | 76.0 | 765.0 | 22.3 | -89.0 | .0 | 770.2 |
| 16 | 1877.3 | 76.0 | 765.0 | 17.0 | -63.3 | .0 | 767.7 |
| 17 | 1314.1 | 76.0 | 765.0 | 11.7 | -37.6 | .0 | 766.0 |
| 18 | 750.9 | 331.7 | 222.6 | 24.0 | -57.5 | .0 | 229.9 |
| 19 | 3461.3 | 690.7 | -770.1 | 106.8 | -346.8 | .0 | 844.6 |
| 20 | 2898.1 | 195.4 | 331.2 | 27.7 | -114.7 | .0 | 350.5 |
| 21 | 2334.9 | 141.1 | 463.0 | 22.3 | -89.0 | .0 | 471.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1771.7 | 141.1 | 463.0 | 17.0 | -63.3 | .0 | 467.3 |
| 23 | 1208.5 | 141.1 | 463.0 | 11.7 | -37.6 | .0 | 464.5 |
| 24 | 645.3 | 141.1 | 463.0 | 6.4 | -11.9 | .0 | 463.2 |
| 25 | 82.1 | 484.0 | -332.3 | 7.4 | .4 | .0 | 332.3 |
| 26 | 3169.9 | 498.3 | -384.1 | 84.3 | -281.9 | .0 | 476.4 |
| 27 | 2606.7 | 117.9 | 506.9 | 25.0 | -101.9 | .0 | 517.0 |
| 28 | 2043.5 | 117.9 | 506.9 | 19.7 | -76.1 | .0 | 512.5 |
| 29 | 1480.3 | 117.9 | 506.9 | 14.4 | -50.4 | .0 | 509.4 |
| 30 | 917.1 | 117.9 | 506.9 | 9.0 | -24.7 | .0 | 507.5 |
| 31 | 353.9 | 498.3 | -384.1 | 13.1 | -22.6 | .0 | 384.8 |
| 32 | 2878.4 | 623.5 | -677.0 | 90.3 | -288.9 | .0 | 736.0 |
| 33 | 2315.2 | 153.3 | 406.5 | 22.3 | -89.0 | .0 | 416.2 |
| 34 | 1752.0 | 153.3 | 406.5 | 17.0 | -63.3 | .0 | 411.4 |
| 35 | 1188.8 | 153.3 | 406.5 | 11.7 | -37.6 | .0 | 408.3 |
| 36 | 625.6 | 512.5 | -436.0 | 24.0 | -57.5 | .0 | 439.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 14
spalla fissa - n777 _RARA_2- n789 _RARA_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 36491.4 | 4410.7 | 86613.0 | -16272.0 | -60944.0 | -41718.9 |
| 2 | 36985.4 | 3321.6 | 86795.5 | 17022.0 | 60789.9 | 43383.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 73476.8 | 7732.3 | 173408.5 | 750.0 | 5131.7 | 13317.7 |

Punto di applic. carico verticale: Xv = 2.360 m Yv = .070 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 10.205 | 9.905 | 1.692 | .346 | .010 | .041 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4088.1 | 554.5 | 3.7 | 70.9 | -237.3 | .0 | 237.3 |
| 2 | 3411.3 | 124.7 | 878.6 | 18.9 | -84.0 | .0 | 882.6 |
| 3 | 2734.6 | 80.0 | 971.6 | 15.6 | -67.9 | .0 | 974.0 |
| 4 | 2057.9 | 80.0 | 971.6 | 12.3 | -51.9 | .0 | 973.0 |
| 5 | 1381.2 | 80.0 | 971.6 | 9.0 | -35.8 | .0 | 972.3 |
| 6 | 704.5 | 80.0 | 971.6 | 5.6 | -19.7 | .0 | 971.8 |
| 7 | 27.8 | 372.1 | 363.7 | 8.8 | -20.4 | .0 | 364.2 |
| 8 | 3753.6 | 363.3 | 396.1 | 56.3 | -195.3 | .0 | 441.6 |
| 9 | 3076.9 | 53.6 | 1034.3 | 17.3 | -76.0 | .0 | 1037.1 |
| 10 | 2400.2 | 53.6 | 1034.3 | 13.9 | -59.9 | .0 | 1036.0 |
| 11 | 1723.5 | 53.6 | 1034.3 | 10.6 | -43.8 | .0 | 1035.2 |
| 12 | 1046.8 | 53.6 | 1034.3 | 7.3 | -27.8 | .0 | 1034.7 |
| 13 | 370.0 | 363.3 | 396.1 | 11.8 | -33.3 | .0 | 397.5 |
| 14 | 3419.1 | 444.8 | 249.1 | 60.6 | -201.1 | .0 | 320.1 |
| 15 | 2742.4 | 72.4 | 1006.9 | 15.6 | -67.9 | .0 | 1009.2 |
| 16 | 2065.7 | 72.4 | 1006.9 | 12.3 | -51.9 | .0 | 1008.2 |
| 17 | 1389.0 | 72.4 | 1006.9 | 9.0 | -35.8 | .0 | 1007.5 |
| 18 | 712.3 | 354.4 | 428.5 | 19.2 | -56.5 | .0 | 432.2 |
| 19 | 4054.2 | 656.3 | -339.6 | 70.9 | -237.3 | .0 | 414.3 |
| 20 | 3377.5 | 165.4 | 701.0 | 18.9 | -84.0 | .0 | 706.0 |
| 21 | 2700.8 | 113.1 | 818.2 | 15.6 | -67.9 | .0 | 821.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2024.1 | 113.1 | 818.2 | 12.3 | -51.9 | .0 | 819.8 |
| 23 | 1347.4 | 113.1 | 818.2 | 9.0 | -35.8 | .0 | 818.9 |
| 24 | 670.7 | 113.1 | 818.2 | 5.6 | -19.7 | .0 | 818.4 |
| 25 | -6.0 | 449.5 | 81.8 | 8.8 | -20.4 | .0 | 84.3 |
| 26 | 3712.0 | 458.4 | 49.4 | 56.3 | -195.3 | .0 | 201.4 |
| 27 | 3035.3 | 89.2 | 862.4 | 17.3 | -76.0 | .0 | 865.7 |
| 28 | 2358.6 | 89.2 | 862.4 | 13.9 | -59.9 | .0 | 864.4 |
| 29 | 1681.9 | 89.2 | 862.4 | 10.6 | -43.8 | .0 | 863.5 |
| 30 | 1005.2 | 89.2 | 862.4 | 7.3 | -27.8 | .0 | 862.8 |
| 31 | 328.5 | 458.4 | 49.4 | 11.8 | -33.3 | .0 | 59.5 |
| 32 | 3369.8 | 576.3 | -210.0 | 60.6 | -201.1 | .0 | 290.8 |
| 33 | 2693.0 | 120.7 | 782.9 | 15.6 | -67.9 | .0 | 785.8 |
| 34 | 2016.3 | 120.7 | 782.9 | 12.3 | -51.9 | .0 | 784.6 |
| 35 | 1339.6 | 120.7 | 782.9 | 9.0 | -35.8 | .0 | 783.7 |
| 36 | 662.9 | 467.3 | 17.0 | 19.2 | -56.5 | .0 | 59.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 15
spalla fissa - n777 _RARA_3- n789 _RARA_3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34915.4 | 4868.1 | 80388.8 | -15432.7 | -58175.5 | -39597.1 |
| 2 | 35990.3 | 3102.2 | 81828.3 | 16552.7 | 58565.2 | 42283.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.7 | 7970.3 | 162217.1 | 1120.0 | 11891.2 | 21581.8 |

Punto di applic. carico verticale: Xv = 2.288 m Yv = .168 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 9.657 | 1.607 | .537 | .020 | .066 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3932.3 | 528.4 | -1.9 | 110.2 | -364.0 | .0 | 364.0 |
| 2 | 3289.4 | 119.1 | 831.9 | 29.0 | -124.9 | .0 | 841.2 |
| 3 | 2646.5 | 76.6 | 920.6 | 23.6 | -98.9 | .0 | 925.9 |
| 4 | 2003.6 | 76.6 | 920.6 | 18.2 | -72.8 | .0 | 923.5 |
| 5 | 1360.7 | 76.6 | 920.6 | 12.8 | -46.8 | .0 | 921.8 |
| 6 | 717.8 | 76.6 | 920.6 | 7.4 | -20.8 | .0 | 920.9 |
| 7 | 74.9 | 354.8 | 341.0 | 9.6 | -12.5 | .0 | 341.3 |
| 8 | 3618.6 | 340.4 | 393.6 | 87.2 | -297.7 | .0 | 493.4 |
| 9 | 2975.7 | 49.1 | 991.2 | 26.3 | -111.9 | .0 | 997.5 |
| 10 | 2332.9 | 49.1 | 991.2 | 20.9 | -85.9 | .0 | 994.9 |
| 11 | 1690.0 | 49.1 | 991.2 | 15.5 | -59.8 | .0 | 993.0 |
| 12 | 1047.1 | 49.1 | 991.2 | 10.1 | -33.8 | .0 | 991.7 |
| 13 | 404.2 | 340.4 | 393.6 | 15.1 | -35.1 | .0 | 395.1 |
| 14 | 3305.0 | 410.1 | 280.1 | 93.4 | -305.5 | .0 | 414.5 |
| 15 | 2662.1 | 64.2 | 977.8 | 23.6 | -98.9 | .0 | 982.8 |
| 16 | 2019.2 | 64.2 | 977.8 | 18.2 | -72.8 | .0 | 980.5 |
| 17 | 1376.3 | 64.2 | 977.8 | 12.8 | -46.8 | .0 | 978.9 |
| 18 | 733.5 | 325.9 | 446.1 | 26.3 | -71.1 | .0 | 451.7 |
| 19 | 3864.3 | 693.3 | -558.2 | 110.2 | -364.0 | .0 | 666.4 |
| 20 | 3221.4 | 185.0 | 544.0 | 29.0 | -124.9 | .0 | 558.2 |
| 21 | 2578.5 | 130.2 | 672.0 | 23.6 | -98.9 | .0 | 679.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1935.6 | 130.2 | 672.0 | 18.2 | -72.8 | .0 | 675.9 |
| 23 | 1292.7 | 130.2 | 672.0 | 12.8 | -46.8 | .0 | 673.6 |
| 24 | 649.8 | 130.2 | 672.0 | 7.4 | -20.8 | .0 | 672.3 |
| 25 | 6.9 | 480.2 | -115.8 | 9.6 | -12.5 | .0 | 116.4 |
| 26 | 3535.0 | 494.6 | -168.3 | 87.2 | -297.7 | .0 | 341.9 |
| 27 | 2892.1 | 106.9 | 712.6 | 26.3 | -111.9 | .0 | 721.3 |
| 28 | 2249.2 | 106.9 | 712.6 | 20.9 | -85.9 | .0 | 717.7 |
| 29 | 1606.4 | 106.9 | 712.6 | 15.5 | -59.8 | .0 | 715.1 |
| 30 | 963.5 | 106.9 | 712.6 | 10.1 | -33.8 | .0 | 713.4 |
| 31 | 320.6 | 494.6 | -168.3 | 15.1 | -35.1 | .0 | 171.9 |
| 32 | 3205.8 | 623.2 | -463.9 | 93.4 | -305.5 | .0 | 555.4 |
| 33 | 2562.9 | 142.5 | 614.8 | 23.6 | -98.9 | .0 | 622.7 |
| 34 | 1920.0 | 142.5 | 614.8 | 18.2 | -72.8 | .0 | 619.1 |
| 35 | 1277.1 | 142.5 | 614.8 | 12.8 | -46.8 | .0 | 616.6 |
| 36 | 634.2 | 509.0 | -220.8 | 26.3 | -71.1 | .0 | 232.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 16
spalla fissa - n777 _RARA_4- n789 _RARA_4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35990.4 | 3099.0 | 81820.2 | -16522.1 | -59125.2 | -41422.7 |
| 2 | 34915.4 | 4871.3 | 80397.0 | 15402.1 | 58734.8 | 38761.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.8 | 7970.3 | 162217.2 | -1120.0 | -11892.9 | -21625.0 |

Punto di applic. carico verticale: Xv = 2.288 m Yv = -.168 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 9.657 | 1.607 | -.537 | -.020 | -.066 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3864.3 | 693.5 | -558.7 | -110.3 | 364.4 | .0 | 667.1 |
| 2 | 3221.4 | 185.1 | 543.8 | -29.0 | 125.0 | .0 | 557.9 |
| 3 | 2578.5 | 130.2 | 671.7 | -23.6 | 98.9 | .0 | 679.0 |
| 4 | 1935.6 | 130.2 | 671.7 | -18.2 | 72.8 | .0 | 675.6 |
| 5 | 1292.7 | 130.2 | 671.7 | -12.8 | 46.7 | .0 | 673.3 |
| 6 | 649.8 | 130.2 | 671.7 | -7.4 | 20.7 | .0 | 672.0 |
| 7 | 6.9 | 480.3 | -116.2 | -9.5 | 12.2 | .0 | 116.9 |
| 8 | 3535.0 | 494.8 | -168.8 | -87.3 | 297.9 | .0 | 342.4 |
| 9 | 2892.1 | 106.9 | 712.3 | -26.3 | 112.0 | .0 | 721.0 |
| 10 | 2249.2 | 106.9 | 712.3 | -20.9 | 85.9 | .0 | 717.4 |
| 11 | 1606.3 | 106.9 | 712.3 | -15.5 | 59.8 | .0 | 714.8 |
| 12 | 963.5 | 106.9 | 712.3 | -10.1 | 33.7 | .0 | 713.1 |
| 13 | 320.6 | 494.8 | -168.8 | -15.0 | 34.9 | .0 | 172.4 |
| 14 | 3205.8 | 623.4 | -464.6 | -93.5 | 305.7 | .0 | 556.1 |
| 15 | 2562.9 | 142.6 | 614.4 | -23.6 | 98.9 | .0 | 622.3 |
| 16 | 1920.0 | 142.6 | 614.4 | -18.2 | 72.8 | .0 | 618.7 |
| 17 | 1277.1 | 142.6 | 614.4 | -12.8 | 46.7 | .0 | 616.2 |
| 18 | 634.2 | 509.2 | -221.5 | -26.3 | 70.9 | .0 | 232.5 |
| 19 | 3932.3 | 528.3 | -1.3 | -110.3 | 364.4 | .0 | 364.4 |
| 20 | 3289.4 | 119.1 | 832.1 | -29.0 | 125.0 | .0 | 841.5 |
| 21 | 2646.5 | 76.5 | 920.9 | -23.6 | 98.9 | .0 | 926.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2003.6 | 76.5 | 920.9 | -18.2 | 72.8 | .0 | 923.8 |
| 23 | 1360.7 | 76.5 | 920.9 | -12.8 | 46.7 | .0 | 922.1 |
| 24 | 717.8 | 76.5 | 920.9 | -7.4 | 20.7 | .0 | 921.1 |
| 25 | 74.9 | 354.6 | 341.5 | -9.5 | 12.2 | .0 | 341.7 |
| 26 | 3618.6 | 340.2 | 394.1 | -87.3 | 297.9 | .0 | 494.1 |
| 27 | 2975.8 | 49.1 | 991.4 | -26.3 | 112.0 | .0 | 997.8 |
| 28 | 2332.9 | 49.1 | 991.4 | -20.9 | 85.9 | .0 | 995.2 |
| 29 | 1690.0 | 49.1 | 991.4 | -15.5 | 59.8 | .0 | 993.2 |
| 30 | 1047.1 | 49.1 | 991.4 | -10.1 | 33.7 | .0 | 992.0 |
| 31 | 404.2 | 340.2 | 394.1 | -15.0 | 34.9 | .0 | 395.7 |
| 32 | 3305.0 | 409.9 | 280.9 | -93.5 | 305.7 | .0 | 415.1 |
| 33 | 2662.1 | 64.2 | 978.2 | -23.6 | 98.9 | .0 | 983.1 |
| 34 | 2019.2 | 64.2 | 978.2 | -18.2 | 72.8 | .0 | 980.9 |
| 35 | 1376.3 | 64.2 | 978.2 | -12.8 | 46.7 | .0 | 979.3 |
| 36 | 733.5 | 325.8 | 446.7 | -26.3 | 70.9 | .0 | 452.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 17
spalla fissa - n777 _RARA_5 - n789 _RARA_5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32885.6 | 5091.5 | 72162.3 | -14621.6 | -54396.6 | -37650.4 |
| 2 | 34870.2 | 3366.8 | 77344.9 | 15741.6 | 56484.0 | 40821.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67755.8 | 8458.3 | 149507.2 | 1120.0 | 23322.6 | 21625.7 |

Punto di applic. carico verticale: Xv = 2.207 m Yv = .344 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.411 | 9.492 | 1.518 | .592 | .033 | .066 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3761.9 | 547.6 | -165.0 | 111.3 | -353.3 | .0 | 389.9 |
| 2 | 3154.5 | 131.9 | 701.5 | 28.6 | -112.6 | .0 | 710.5 |
| 3 | 2547.1 | 88.1 | 796.9 | 23.2 | -86.5 | .0 | 801.5 |
| 4 | 1939.7 | 88.1 | 796.9 | 17.8 | -60.4 | .0 | 799.1 |
| 5 | 1332.4 | 88.1 | 796.9 | 12.3 | -34.3 | .0 | 797.6 |
| 6 | 725.0 | 88.1 | 796.9 | 6.9 | -8.2 | .0 | 796.9 |
| 7 | 117.6 | 372.0 | 188.2 | 10.4 | -1.1 | .0 | 188.2 |
| 8 | 3471.5 | 357.5 | 240.8 | 87.9 | -286.4 | .0 | 374.2 |
| 9 | 2864.1 | 59.9 | 871.5 | 25.9 | -99.5 | .0 | 877.1 |
| 10 | 2256.7 | 59.9 | 871.5 | 20.5 | -73.4 | .0 | 874.6 |
| 11 | 1649.3 | 59.9 | 871.5 | 15.1 | -47.3 | .0 | 872.8 |
| 12 | 1041.9 | 59.9 | 871.5 | 9.6 | -21.2 | .0 | 871.7 |
| 13 | 434.5 | 357.5 | 240.8 | 15.6 | -23.3 | .0 | 242.0 |
| 14 | 3181.0 | 428.4 | 121.9 | 94.5 | -294.6 | .0 | 318.9 |
| 15 | 2573.6 | 75.7 | 854.1 | 23.2 | -86.5 | .0 | 858.5 |
| 16 | 1966.2 | 75.7 | 854.1 | 17.8 | -60.4 | .0 | 856.3 |
| 17 | 1358.9 | 75.7 | 854.1 | 12.3 | -34.3 | .0 | 854.8 |
| 18 | 751.5 | 343.1 | 293.5 | 27.2 | -59.8 | .0 | 299.5 |
| 19 | 3646.6 | 712.8 | -722.4 | 111.3 | -353.3 | .0 | 804.2 |
| 20 | 3039.2 | 197.9 | 413.1 | 28.6 | -112.6 | .0 | 428.2 |
| 21 | 2431.9 | 141.8 | 547.7 | 23.2 | -86.5 | .0 | 554.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1824.5 | 141.8 | 547.7 | 17.8 | -60.4 | .0 | 551.0 |
| 23 | 1217.1 | 141.8 | 547.7 | 12.3 | -34.3 | .0 | 548.7 |
| 24 | 609.7 | 141.8 | 547.7 | 6.9 | -8.2 | .0 | 547.7 |
| 25 | 2.3 | 497.6 | -269.5 | 10.4 | -1.1 | .0 | 269.5 |
| 26 | 3329.7 | 512.1 | -322.1 | 87.9 | -286.4 | .0 | 431.0 |
| 27 | 2722.3 | 117.7 | 592.3 | 25.9 | -99.5 | .0 | 600.6 |
| 28 | 2114.9 | 117.7 | 592.3 | 20.5 | -73.4 | .0 | 596.8 |
| 29 | 1507.5 | 117.7 | 592.3 | 15.1 | -47.3 | .0 | 594.2 |
| 30 | 900.1 | 117.7 | 592.3 | 9.6 | -21.2 | .0 | 592.7 |
| 31 | 292.7 | 512.1 | -322.1 | 15.6 | -23.3 | .0 | 323.0 |
| 32 | 3012.7 | 641.9 | -623.6 | 94.5 | -294.6 | .0 | 689.7 |
| 33 | 2405.4 | 154.1 | 490.4 | 23.2 | -86.5 | .0 | 498.0 |
| 34 | 1798.0 | 154.1 | 490.4 | 17.8 | -60.4 | .0 | 494.1 |
| 35 | 1190.6 | 154.1 | 490.4 | 12.3 | -34.3 | .0 | 491.6 |
| 36 | 583.2 | 526.5 | -374.7 | 27.2 | -59.8 | .0 | 379.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 18
spalla fissa - n777 _RARA_7- n789 _RARA_7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35132.9 | 6716.4 | 91912.5 | -15580.7 | -58712.2 | -49843.6 |
| 2 | 35772.8 | 5658.0 | 92765.0 | 16240.7 | 58953.0 | 51455.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.7 | 12374.4 | 184677.5 | 660.0 | 7087.8 | 12937.1 |

Punto di applic. carico verticale: Xv = 2.605 m Yv = .100 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 12.749 | 1.940 | .317 | .012 | .039 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4317.9 | 845.4 | -702.6 | 65.5 | -216.2 | .0 | 735.2 |
| 2 | 3541.8 | 226.8 | 641.8 | 17.2 | -74.1 | .0 | 646.0 |
| 3 | 2765.8 | 159.9 | 798.2 | 13.9 | -58.4 | .0 | 800.3 |
| 4 | 1989.8 | 159.9 | 798.2 | 10.7 | -42.8 | .0 | 799.4 |
| 5 | 1213.8 | 159.9 | 798.2 | 7.5 | -27.2 | .0 | 798.7 |
| 6 | 437.8 | 159.9 | 798.2 | 4.2 | -11.6 | .0 | 798.3 |
| 7 | -338.3 | 586.1 | -163.4 | 5.1 | -5.5 | .0 | 163.5 |
| 8 | 3934.5 | 577.5 | -132.0 | 51.7 | -176.7 | .0 | 220.5 |
| 9 | 3158.5 | 121.7 | 895.4 | 15.6 | -66.2 | .0 | 897.9 |
| 10 | 2382.5 | 121.7 | 895.4 | 12.3 | -50.6 | .0 | 896.8 |
| 11 | 1606.4 | 121.7 | 895.4 | 9.1 | -35.0 | .0 | 896.1 |
| 12 | 830.4 | 121.7 | 895.4 | 5.9 | -19.4 | .0 | 895.6 |
| 13 | 54.4 | 577.5 | -132.0 | 8.5 | -19.3 | .0 | 133.4 |
| 14 | 3551.1 | 699.2 | -374.7 | 55.4 | -181.1 | .0 | 416.2 |
| 15 | 2775.1 | 152.5 | 832.5 | 13.9 | -58.4 | .0 | 834.5 |
| 16 | 1999.1 | 152.5 | 832.5 | 10.7 | -42.8 | .0 | 833.6 |
| 17 | 1223.1 | 152.5 | 832.5 | 7.5 | -27.2 | .0 | 832.9 |
| 18 | 447.0 | 568.9 | -100.5 | 15.2 | -40.6 | .0 | 108.4 |
| 19 | 4277.5 | 944.2 | -1036.1 | 65.5 | -216.2 | .0 | 1058.4 |
| 20 | 3501.4 | 266.3 | 469.2 | 17.2 | -74.1 | .0 | 475.0 |
| 21 | 2725.4 | 192.1 | 649.1 | 13.9 | -58.4 | .0 | 651.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1949.4 | 192.1 | 649.1 | 10.7 | -42.8 | .0 | 650.6 |
| 23 | 1173.4 | 192.1 | 649.1 | 7.5 | -27.2 | .0 | 649.7 |
| 24 | 397.4 | 192.1 | 649.1 | 4.2 | -11.6 | .0 | 649.2 |
| 25 | -378.7 | 661.3 | -437.3 | 5.1 | -5.5 | .0 | 437.3 |
| 26 | 3884.8 | 670.0 | -468.7 | 51.7 | -176.7 | .0 | 500.9 |
| 27 | 3108.8 | 156.3 | 728.4 | 15.6 | -66.2 | .0 | 731.4 |
| 28 | 2332.8 | 156.3 | 728.4 | 12.3 | -50.6 | .0 | 730.2 |
| 29 | 1556.8 | 156.3 | 728.4 | 9.1 | -35.0 | .0 | 729.3 |
| 30 | 780.7 | 156.3 | 728.4 | 5.9 | -19.4 | .0 | 728.7 |
| 31 | 4.7 | 670.0 | -468.7 | 8.5 | -19.3 | .0 | 469.1 |
| 32 | 3492.2 | 826.9 | -820.7 | 55.4 | -181.1 | .0 | 840.4 |
| 33 | 2716.1 | 199.4 | 614.9 | 13.9 | -58.4 | .0 | 617.6 |
| 34 | 1940.1 | 199.4 | 614.9 | 10.7 | -42.8 | .0 | 616.4 |
| 35 | 1164.1 | 199.4 | 614.9 | 7.5 | -27.2 | .0 | 615.5 |
| 36 | 388.1 | 678.6 | -500.2 | 15.2 | -40.6 | .0 | 501.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 18
spalla fissa - n777 _RARA_7- n789 _RARA_7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 661.3 | -437.3 | 5.1 | -5.5 | 661.3 | 437.3 |
| 1.56 | 537.8 | 493.8 | 4.2 | 1.7 | 537.8 | 493.8 |
| 3.13 | 380.0 | 1255.2 | 3.0 | 7.6 | 380.0 | 1255.2 |
| 4.69 | 105.1 | 1611.3 | .9 | 10.4 | 105.1 | 1611.3 |
| 6.25 | -64.5 | 1624.9 | -.4 | 10.6 | 64.5 | 1624.9 |
| 7.81 | -153.7 | 1441.0 | -1.1 | 9.4 | 153.7 | 1441.1 |
| 9.38 | -172.4 | 1175.8 | -1.2 | 7.5 | 172.4 | 1175.8 |
| 10.94 | -171.0 | 906.1 | -1.2 | 5.7 | 171.0 | 906.1 |
| 12.50 | -162.9 | 643.8 | -1.1 | 3.9 | 162.9 | 643.8 |
| 15.00 | -115.9 | 280.9 | -.7 | 1.5 | 115.9 | 280.9 |
| 17.50 | -63.0 | 61.2 | -.4 | .2 | 63.0 | 61.2 |
| 20.00 | -25.3 | -43.8 | -.1 | -.4 | 25.3 | 43.8 |
| 22.50 | -3.5 | -75.2 | .0 | -.5 | 3.5 | 75.2 |
| 25.00 | 6.2 | -69.3 | .1 | -.4 | 6.2 | 69.3 |
| 29.17 | 7.0 | -37.6 | .0 | -.2 | 7.0 | 37.6 |
| 33.33 | 4.4 | -13.4 | .0 | .0 | 4.4 | 13.4 |
| 37.50 | 1.7 | -1.0 | .0 | .0 | 1.7 | 1.0 |
| 43.75 | -.2 | 2.2 | .0 | .0 | .2 | 2.2 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 19
spalla fissa - n777 _RARA_8- n789 _RARA_8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35133.0 | 2239.0 | 69084.8 | -15734.7 | -58006.8 | -29771.1 |
| 2 | 35772.8 | 1183.4 | 69937.6 | 16394.7 | 58246.5 | 31348.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.8 | 3422.4 | 139022.4 | 660.0 | 7085.6 | 12872.1 |

Punto di applic. carico verticale: Xv = 1.961 m Yv = .100 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 6.465 | 1.264 | .317 | .012 | .039 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3506.0 | 268.5 | 494.4 | 65.3 | -215.7 | .0 | 539.4 |
| 2 | 3000.6 | 34.9 | 910.5 | 17.1 | -73.9 | .0 | 913.5 |
| 3 | 2495.2 | 12.4 | 945.4 | 13.9 | -58.4 | .0 | 947.2 |
| 4 | 1989.8 | 12.4 | 945.4 | 10.7 | -42.8 | .0 | 946.4 |
| 5 | 1484.4 | 12.4 | 945.4 | 7.5 | -27.3 | .0 | 945.8 |
| 6 | 979.0 | 12.4 | 945.4 | 4.3 | -11.8 | .0 | 945.5 |
| 7 | 473.6 | 167.1 | 675.3 | 5.3 | -6.1 | .0 | 675.4 |
| 8 | 3257.9 | 158.5 | 706.7 | 51.6 | -176.3 | .0 | 728.3 |
| 9 | 2752.5 | -2.2 | 976.2 | 15.5 | -66.1 | .0 | 978.4 |
| 10 | 2247.1 | -2.2 | 976.2 | 12.3 | -50.6 | .0 | 977.5 |
| 11 | 1741.7 | -2.2 | 976.2 | 9.1 | -35.1 | .0 | 976.8 |
| 12 | 1236.3 | -2.2 | 976.2 | 5.9 | -19.5 | .0 | 976.4 |
| 13 | 730.9 | 158.5 | 706.7 | 8.6 | -19.7 | .0 | 706.9 |
| 14 | 3009.9 | 198.7 | 652.3 | 55.3 | -180.8 | .0 | 676.9 |
| 15 | 2504.5 | 5.0 | 979.5 | 13.9 | -58.4 | .0 | 981.3 |
| 16 | 1999.1 | 5.0 | 979.5 | 10.7 | -42.8 | .0 | 980.5 |
| 17 | 1493.7 | 5.0 | 979.5 | 7.5 | -27.3 | .0 | 979.9 |
| 18 | 988.3 | 149.9 | 738.0 | 15.3 | -41.0 | .0 | 739.1 |
| 19 | 3465.6 | 366.8 | 162.6 | 65.3 | -215.7 | .0 | 270.1 |
| 20 | 2960.2 | 74.2 | 738.9 | 17.1 | -73.9 | .0 | 742.6 |
| 21 | 2454.8 | 44.4 | 797.1 | 13.9 | -58.4 | .0 | 799.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1949.4 | 44.4 | 797.1 | 10.7 | -42.8 | .0 | 798.3 |
| 23 | 1444.0 | 44.4 | 797.1 | 7.5 | -27.3 | .0 | 797.6 |
| 24 | 938.6 | 44.4 | 797.1 | 4.3 | -11.8 | .0 | 797.2 |
| 25 | 433.2 | 241.9 | 402.9 | 5.3 | -6.1 | .0 | 402.9 |
| 26 | 3208.3 | 250.5 | 371.6 | 51.6 | -176.3 | .0 | 411.3 |
| 27 | 2702.9 | 32.2 | 810.0 | 15.5 | -66.1 | .0 | 812.7 |
| 28 | 2197.5 | 32.2 | 810.0 | 12.3 | -50.6 | .0 | 811.6 |
| 29 | 1692.1 | 32.2 | 810.0 | 9.1 | -35.1 | .0 | 810.8 |
| 30 | 1186.7 | 32.2 | 810.0 | 5.9 | -19.5 | .0 | 810.3 |
| 31 | 681.3 | 250.5 | 371.6 | 8.6 | -19.7 | .0 | 372.1 |
| 32 | 2950.9 | 325.8 | 208.6 | 55.3 | -180.8 | .0 | 276.0 |
| 33 | 2445.5 | 51.7 | 763.0 | 13.9 | -58.4 | .0 | 765.2 |
| 34 | 1940.1 | 51.7 | 763.0 | 10.7 | -42.8 | .0 | 764.2 |
| 35 | 1434.7 | 51.7 | 763.0 | 7.5 | -27.3 | .0 | 763.5 |
| 36 | 929.3 | 259.1 | 340.2 | 15.3 | -41.0 | .0 | 342.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 20
spalla fissa - n777 _RARA_9 - n789 _RARA_9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35132.9 | 6716.4 | 91912.5 | -15580.7 | -58712.2 | -49843.6 |
| 2 | 35772.8 | 5658.0 | 92765.0 | 16240.7 | 58953.0 | 51455.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.7 | 12374.4 | 184677.5 | 660.0 | 7087.8 | 12937.1 |

Punto di applic. carico verticale: Xv = 2.605 m Yv = .100 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 12.749 | 1.940 | .317 | .012 | .039 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4317.9 | 845.4 | -702.6 | 65.5 | -216.2 | .0 | 735.2 |
| 2 | 3541.8 | 226.8 | 641.8 | 17.2 | -74.1 | .0 | 646.0 |
| 3 | 2765.8 | 159.9 | 798.2 | 13.9 | -58.4 | .0 | 800.3 |
| 4 | 1989.8 | 159.9 | 798.2 | 10.7 | -42.8 | .0 | 799.4 |
| 5 | 1213.8 | 159.9 | 798.2 | 7.5 | -27.2 | .0 | 798.7 |
| 6 | 437.8 | 159.9 | 798.2 | 4.2 | -11.6 | .0 | 798.3 |
| 7 | -338.3 | 586.1 | -163.4 | 5.1 | -5.5 | .0 | 163.5 |
| 8 | 3934.5 | 577.5 | -132.0 | 51.7 | -176.7 | .0 | 220.5 |
| 9 | 3158.5 | 121.7 | 895.4 | 15.6 | -66.2 | .0 | 897.9 |
| 10 | 2382.5 | 121.7 | 895.4 | 12.3 | -50.6 | .0 | 896.8 |
| 11 | 1606.4 | 121.7 | 895.4 | 9.1 | -35.0 | .0 | 896.1 |
| 12 | 830.4 | 121.7 | 895.4 | 5.9 | -19.4 | .0 | 895.6 |
| 13 | 54.4 | 577.5 | -132.0 | 8.5 | -19.3 | .0 | 133.4 |
| 14 | 3551.1 | 699.2 | -374.7 | 55.4 | -181.1 | .0 | 416.2 |
| 15 | 2775.1 | 152.5 | 832.5 | 13.9 | -58.4 | .0 | 834.5 |
| 16 | 1999.1 | 152.5 | 832.5 | 10.7 | -42.8 | .0 | 833.6 |
| 17 | 1223.1 | 152.5 | 832.5 | 7.5 | -27.2 | .0 | 832.9 |
| 18 | 447.0 | 568.9 | -100.5 | 15.2 | -40.6 | .0 | 108.4 |
| 19 | 4277.5 | 944.2 | -1036.1 | 65.5 | -216.2 | .0 | 1058.4 |
| 20 | 3501.4 | 266.3 | 469.2 | 17.2 | -74.1 | .0 | 475.0 |
| 21 | 2725.4 | 192.1 | 649.1 | 13.9 | -58.4 | .0 | 651.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1949.4 | 192.1 | 649.1 | 10.7 | -42.8 | .0 | 650.6 |
| 23 | 1173.4 | 192.1 | 649.1 | 7.5 | -27.2 | .0 | 649.7 |
| 24 | 397.4 | 192.1 | 649.1 | 4.2 | -11.6 | .0 | 649.2 |
| 25 | -378.7 | 661.3 | -437.3 | 5.1 | -5.5 | .0 | 437.3 |
| 26 | 3884.8 | 670.0 | -468.7 | 51.7 | -176.7 | .0 | 500.9 |
| 27 | 3108.8 | 156.3 | 728.4 | 15.6 | -66.2 | .0 | 731.4 |
| 28 | 2332.8 | 156.3 | 728.4 | 12.3 | -50.6 | .0 | 730.2 |
| 29 | 1556.8 | 156.3 | 728.4 | 9.1 | -35.0 | .0 | 729.3 |
| 30 | 780.7 | 156.3 | 728.4 | 5.9 | -19.4 | .0 | 728.7 |
| 31 | 4.7 | 670.0 | -468.7 | 8.5 | -19.3 | .0 | 469.1 |
| 32 | 3492.2 | 826.9 | -820.7 | 55.4 | -181.1 | .0 | 840.4 |
| 33 | 2716.1 | 199.4 | 614.9 | 13.9 | -58.4 | .0 | 617.6 |
| 34 | 1940.1 | 199.4 | 614.9 | 10.7 | -42.8 | .0 | 616.4 |
| 35 | 1164.1 | 199.4 | 614.9 | 7.5 | -27.2 | .0 | 615.5 |
| 36 | 388.1 | 678.6 | -500.2 | 15.2 | -40.6 | .0 | 501.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 21
spalla fissa - n777 _RARA_10- n789 _RARA_10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35133.0 | 2239.0 | 69084.8 | -15734.7 | -58006.8 | -29771.1 |
| 2 | 35772.8 | 1183.4 | 69937.6 | 16394.7 | 58246.5 | 31348.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.8 | 3422.4 | 139022.4 | 660.0 | 7085.6 | 12872.1 |

Punto di applic. carico verticale: Xv = 1.961 m Yv = .100 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 6.465 | 1.264 | .317 | .012 | .039 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3506.0 | 268.5 | 494.4 | 65.3 | -215.7 | .0 | 539.4 |
| 2 | 3000.6 | 34.9 | 910.5 | 17.1 | -73.9 | .0 | 913.5 |
| 3 | 2495.2 | 12.4 | 945.4 | 13.9 | -58.4 | .0 | 947.2 |
| 4 | 1989.8 | 12.4 | 945.4 | 10.7 | -42.8 | .0 | 946.4 |
| 5 | 1484.4 | 12.4 | 945.4 | 7.5 | -27.3 | .0 | 945.8 |
| 6 | 979.0 | 12.4 | 945.4 | 4.3 | -11.8 | .0 | 945.5 |
| 7 | 473.6 | 167.1 | 675.3 | 5.3 | -6.1 | .0 | 675.4 |
| 8 | 3257.9 | 158.5 | 706.7 | 51.6 | -176.3 | .0 | 728.3 |
| 9 | 2752.5 | -2.2 | 976.2 | 15.5 | -66.1 | .0 | 978.4 |
| 10 | 2247.1 | -2.2 | 976.2 | 12.3 | -50.6 | .0 | 977.5 |
| 11 | 1741.7 | -2.2 | 976.2 | 9.1 | -35.1 | .0 | 976.8 |
| 12 | 1236.3 | -2.2 | 976.2 | 5.9 | -19.5 | .0 | 976.4 |
| 13 | 730.9 | 158.5 | 706.7 | 8.6 | -19.7 | .0 | 706.9 |
| 14 | 3009.9 | 198.7 | 652.3 | 55.3 | -180.8 | .0 | 676.9 |
| 15 | 2504.5 | 5.0 | 979.5 | 13.9 | -58.4 | .0 | 981.3 |
| 16 | 1999.1 | 5.0 | 979.5 | 10.7 | -42.8 | .0 | 980.5 |
| 17 | 1493.7 | 5.0 | 979.5 | 7.5 | -27.3 | .0 | 979.9 |
| 18 | 988.3 | 149.9 | 738.0 | 15.3 | -41.0 | .0 | 739.1 |
| 19 | 3465.6 | 366.8 | 162.6 | 65.3 | -215.7 | .0 | 270.1 |
| 20 | 2960.2 | 74.2 | 738.9 | 17.1 | -73.9 | .0 | 742.6 |
| 21 | 2454.8 | 44.4 | 797.1 | 13.9 | -58.4 | .0 | 799.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1949.4 | 44.4 | 797.1 | 10.7 | -42.8 | .0 | 798.3 |
| 23 | 1444.0 | 44.4 | 797.1 | 7.5 | -27.3 | .0 | 797.6 |
| 24 | 938.6 | 44.4 | 797.1 | 4.3 | -11.8 | .0 | 797.2 |
| 25 | 433.2 | 241.9 | 402.9 | 5.3 | -6.1 | .0 | 402.9 |
| 26 | 3208.3 | 250.5 | 371.6 | 51.6 | -176.3 | .0 | 411.3 |
| 27 | 2702.9 | 32.2 | 810.0 | 15.5 | -66.1 | .0 | 812.7 |
| 28 | 2197.5 | 32.2 | 810.0 | 12.3 | -50.6 | .0 | 811.6 |
| 29 | 1692.1 | 32.2 | 810.0 | 9.1 | -35.1 | .0 | 810.8 |
| 30 | 1186.7 | 32.2 | 810.0 | 5.9 | -19.5 | .0 | 810.3 |
| 31 | 681.3 | 250.5 | 371.6 | 8.6 | -19.7 | .0 | 372.1 |
| 32 | 2950.9 | 325.8 | 208.6 | 55.3 | -180.8 | .0 | 276.0 |
| 33 | 2445.5 | 51.7 | 763.0 | 13.9 | -58.4 | .0 | 765.2 |
| 34 | 1940.1 | 51.7 | 763.0 | 10.7 | -42.8 | .0 | 764.2 |
| 35 | 1434.7 | 51.7 | 763.0 | 7.5 | -27.3 | .0 | 763.5 |
| 36 | 929.3 | 259.1 | 340.2 | 15.3 | -41.0 | .0 | 342.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 22
spalla fissa - n777 _RARA_11- n789 _RARA_11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34928.2 | 4270.0 | 77394.2 | -15482.3 | -58080.3 | -36966.1 |
| 2 | 35977.6 | 2512.3 | 78764.2 | 16542.3 | 58503.1 | 39537.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 70905.8 | 6782.3 | 156158.4 | 1060.0 | 11651.4 | 21378.7 |

Punto di applic. carico verticale: Xv = 2.202 m Yv = .164 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.848 | 8.823 | 1.517 | .510 | .019 | .065 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3823.5 | 452.6 | 154.5 | 106.6 | -351.9 | .0 | 384.3 |
| 2 | 3216.5 | 94.0 | 866.2 | 27.9 | -120.1 | .0 | 874.5 |
| 3 | 2609.6 | 57.2 | 939.0 | 22.5 | -94.3 | .0 | 943.8 |
| 4 | 2002.6 | 57.2 | 939.0 | 17.2 | -68.5 | .0 | 941.5 |
| 5 | 1395.6 | 57.2 | 939.0 | 11.9 | -42.7 | .0 | 940.0 |
| 6 | 788.7 | 57.2 | 939.0 | 6.5 | -16.9 | .0 | 939.2 |
| 7 | 181.7 | 299.7 | 450.3 | 6.9 | -3.7 | .0 | 450.3 |
| 8 | 3527.6 | 285.4 | 502.3 | 84.1 | -287.1 | .0 | 578.6 |
| 9 | 2920.6 | 33.0 | 1000.6 | 25.2 | -107.2 | .0 | 1006.4 |
| 10 | 2313.7 | 33.0 | 1000.6 | 19.9 | -81.4 | .0 | 1003.9 |
| 11 | 1706.7 | 33.0 | 1000.6 | 14.5 | -55.6 | .0 | 1002.2 |
| 12 | 1099.7 | 33.0 | 1000.6 | 9.2 | -29.8 | .0 | 1001.1 |
| 13 | 492.8 | 285.4 | 502.3 | 12.7 | -27.0 | .0 | 503.0 |
| 14 | 3231.7 | 344.7 | 413.1 | 89.9 | -293.9 | .0 | 507.0 |
| 15 | 2624.7 | 45.0 | 995.7 | 22.5 | -94.3 | .0 | 1000.1 |
| 16 | 2017.8 | 45.0 | 995.7 | 17.2 | -68.5 | .0 | 998.0 |
| 17 | 1410.8 | 45.0 | 995.7 | 11.9 | -42.7 | .0 | 996.6 |
| 18 | 803.8 | 271.2 | 554.3 | 23.5 | -61.8 | .0 | 557.8 |
| 19 | 3757.5 | 615.9 | -396.6 | 106.6 | -351.9 | .0 | 530.2 |
| 20 | 3150.6 | 159.3 | 581.1 | 27.9 | -120.1 | .0 | 593.4 |
| 21 | 2543.6 | 110.3 | 692.7 | 22.5 | -94.3 | .0 | 699.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1936.6 | 110.3 | 692.7 | 17.2 | -68.5 | .0 | 696.1 |
| 23 | 1329.6 | 110.3 | 692.7 | 11.9 | -42.7 | .0 | 694.0 |
| 24 | 722.7 | 110.3 | 692.7 | 6.5 | -16.9 | .0 | 692.9 |
| 25 | 115.7 | 424.0 | -2.2 | 6.9 | -3.7 | .0 | 4.3 |
| 26 | 3446.5 | 438.2 | -54.2 | 84.1 | -287.1 | .0 | 292.2 |
| 27 | 2839.5 | 90.1 | 724.7 | 25.2 | -107.2 | .0 | 732.5 |
| 28 | 2232.5 | 90.1 | 724.7 | 19.9 | -81.4 | .0 | 729.2 |
| 29 | 1625.5 | 90.1 | 724.7 | 14.5 | -55.6 | .0 | 726.8 |
| 30 | 1018.6 | 90.1 | 724.7 | 9.2 | -29.8 | .0 | 725.3 |
| 31 | 411.6 | 438.2 | -54.2 | 12.7 | -27.0 | .0 | 60.6 |
| 32 | 3135.4 | 555.7 | -323.9 | 89.9 | -293.9 | .0 | 437.4 |
| 33 | 2528.4 | 122.5 | 636.1 | 22.5 | -94.3 | .0 | 643.0 |
| 34 | 1921.4 | 122.5 | 636.1 | 17.2 | -68.5 | .0 | 639.8 |
| 35 | 1314.5 | 122.5 | 636.1 | 11.9 | -42.7 | .0 | 637.5 |
| 36 | 707.5 | 452.5 | -106.2 | 23.5 | -61.8 | .0 | 122.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 23
spalla fissa - n777 _RARA_12- n789 _RARA_12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 43423.1 | 6832.0 | 93640.0 | -19492.6 | -70554.1 | -55310.5 |
| 2 | 42424.4 | 8560.8 | 92399.8 | 18552.6 | 70062.7 | 53008.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 85847.5 | 15392.8 | 186039.8 | -940.0 | -11177.6 | -20800.6 |

Punto di applic. carico verticale: Xv = 2.167 m Yv = -.130 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 11.923 | 14.399 | 2.052 | -.457 | -.018 | -.063 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4816.3 | 1157.7 | -1632.1 | -98.9 | 326.3 | .0 | 1664.4 |
| 2 | 3995.4 | 345.2 | 219.0 | -25.6 | 110.0 | .0 | 245.1 |
| 3 | 3174.5 | 254.8 | 447.0 | -20.4 | 84.9 | .0 | 455.0 |
| 4 | 2353.6 | 254.8 | 447.0 | -15.2 | 59.8 | .0 | 451.0 |
| 5 | 1532.8 | 254.8 | 447.0 | -10.0 | 34.7 | .0 | 448.3 |
| 6 | 711.9 | 254.8 | 447.0 | -4.8 | 9.6 | .0 | 447.1 |
| 7 | -109.0 | 820.4 | -902.8 | -1.9 | -12.5 | .0 | 902.9 |
| 8 | 4398.7 | 834.3 | -953.4 | -77.7 | 265.0 | .0 | 989.5 |
| 9 | 3577.8 | 212.3 | 543.6 | -23.0 | 97.5 | .0 | 552.3 |
| 10 | 2757.0 | 212.3 | 543.6 | -17.8 | 72.4 | .0 | 548.4 |
| 11 | 1936.1 | 212.3 | 543.6 | -12.6 | 47.3 | .0 | 545.7 |
| 12 | 1115.2 | 212.3 | 543.6 | -7.4 | 22.2 | .0 | 544.1 |
| 13 | 294.3 | 834.3 | -953.4 | -8.2 | 11.9 | .0 | 953.5 |
| 14 | 3981.1 | 1026.5 | -1397.9 | -82.7 | 269.8 | .0 | 1423.7 |
| 15 | 3160.3 | 266.7 | 391.9 | -20.4 | 84.9 | .0 | 401.0 |
| 16 | 2339.4 | 266.7 | 391.9 | -15.2 | 59.8 | .0 | 396.4 |
| 17 | 1518.5 | 266.7 | 391.9 | -10.0 | 34.7 | .0 | 393.4 |
| 18 | 697.6 | 848.2 | -1004.0 | -18.0 | 43.9 | .0 | 1005.0 |
| 19 | 4878.3 | 998.8 | -1096.0 | -98.9 | 326.3 | .0 | 1143.5 |
| 20 | 4057.4 | 281.7 | 496.4 | -25.6 | 110.0 | .0 | 508.4 |
| 21 | 3236.5 | 203.2 | 686.7 | -20.4 | 84.9 | .0 | 691.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2415.7 | 203.2 | 686.7 | -15.2 | 59.8 | .0 | 689.3 |
| 23 | 1594.8 | 203.2 | 686.7 | -10.0 | 34.7 | .0 | 687.6 |
| 24 | 773.9 | 203.2 | 686.7 | -4.8 | 9.6 | .0 | 686.7 |
| 25 | -47.0 | 699.5 | -462.5 | -1.9 | -12.5 | .0 | 462.7 |
| 26 | 4475.0 | 685.6 | -411.9 | -77.7 | 265.0 | .0 | 489.8 |
| 27 | 3654.1 | 156.7 | 812.1 | -23.0 | 97.5 | .0 | 818.0 |
| 28 | 2833.2 | 156.7 | 812.1 | -17.8 | 72.4 | .0 | 815.3 |
| 29 | 2012.4 | 156.7 | 812.1 | -12.6 | 47.3 | .0 | 813.5 |
| 30 | 1191.5 | 156.7 | 812.1 | -7.4 | 22.2 | .0 | 812.4 |
| 31 | 370.6 | 685.6 | -411.9 | -8.2 | 11.9 | .0 | 412.1 |
| 32 | 4071.7 | 821.1 | -680.9 | -82.7 | 269.8 | .0 | 732.4 |
| 33 | 3250.8 | 191.3 | 741.8 | -20.4 | 84.9 | .0 | 746.6 |
| 34 | 2429.9 | 191.3 | 741.8 | -15.2 | 59.8 | .0 | 744.2 |
| 35 | 1609.0 | 191.3 | 741.8 | -10.0 | 34.7 | .0 | 742.6 |
| 36 | 788.2 | 671.8 | -361.3 | -18.0 | 43.9 | .0 | 364.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 23
spalla fissa - n777 _RARA_12- n789 _RARA_12

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1157.7 | -1632.1 | -98.9 | 326.3 | 1161.9 | 1664.4 |
| 1.56 | 945.2 | 1.1 | -88.1 | 180.3 | 949.3 | 180.3 |
| 3.13 | 674.0 | 1341.8 | -71.5 | 50.4 | 677.8 | 1342.7 |
| 4.69 | 205.9 | 1988.4 | -39.0 | -34.2 | 209.6 | 1988.7 |
| 6.25 | -74.0 | 2059.2 | -15.1 | -74.9 | 75.6 | 2060.6 |
| 7.81 | -212.5 | 1812.3 | 1.2 | -84.4 | 212.5 | 1814.3 |
| 9.38 | -238.2 | 1444.5 | 6.2 | -76.5 | 238.2 | 1446.5 |
| 10.94 | -233.1 | 1074.0 | 7.6 | -65.6 | 233.2 | 1076.0 |
| 12.50 | -217.9 | 719.5 | 8.3 | -53.0 | 218.0 | 721.5 |
| 15.00 | -141.4 | 249.0 | 7.8 | -32.2 | 141.6 | 251.0 |
| 17.50 | -64.2 | .5 | 5.6 | -15.2 | 64.5 | 15.2 |
| 20.00 | -16.4 | -91.1 | 3.2 | -4.3 | 16.7 | 91.2 |
| 22.50 | 5.9 | -97.6 | 1.3 | 1.1 | 6.0 | 97.6 |
| 25.00 | 11.2 | -72.3 | .1 | 2.8 | 11.2 | 72.4 |
| 29.17 | 8.2 | -29.8 | -.2 | 2.1 | 8.3 | 29.9 |
| 33.33 | 3.9 | -4.9 | -.2 | 1.0 | 3.9 | 5.0 |
| 37.50 | .8 | 4.2 | -.1 | .3 | .8 | 4.2 |
| 43.75 | -.6 | 2.9 | .0 | .0 | .6 | 2.9 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 23
spalla fissa - n777 _RARA_12- n789 _RARA_12

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 998.8 | -1096.0 | -98.9 | 326.3 | 1003.7 | 1143.5 |
| 1.56 | 803.5 | 302.6 | -88.1 | 180.3 | 808.3 | 352.2 |
| 3.13 | 559.2 | 1434.4 | -71.5 | 50.4 | 563.7 | 1435.3 |
| 4.69 | 143.8 | 1945.6 | -39.0 | -34.2 | 149.0 | 1945.9 |
| 6.25 | -97.8 | 1952.0 | -15.1 | -74.9 | 99.0 | 1953.5 |
| 7.81 | -210.6 | 1690.2 | 1.2 | -84.4 | 210.6 | 1692.3 |
| 9.38 | -228.6 | 1334.7 | 6.2 | -76.5 | 228.6 | 1336.9 |
| 10.94 | -221.3 | 981.2 | 7.6 | -65.6 | 221.5 | 983.4 |
| 12.50 | -205.2 | 646.1 | 8.3 | -53.0 | 205.4 | 648.2 |
| 15.00 | -130.0 | 206.7 | 7.8 | -32.2 | 130.2 | 209.2 |
| 17.50 | -56.5 | -17.5 | 5.6 | -15.2 | 56.8 | 23.2 |
| 20.00 | -12.4 | -94.8 | 3.2 | -4.3 | 12.8 | 94.9 |
| 22.50 | 7.3 | -94.8 | 1.3 | 1.1 | 7.4 | 94.8 |
| 25.00 | 11.1 | -68.1 | .1 | 2.8 | 11.1 | 68.1 |
| 29.17 | 7.8 | -27.2 | -.2 | 2.1 | 7.8 | 27.3 |
| 33.33 | 3.6 | -3.8 | -.2 | 1.0 | 3.6 | 4.0 |
| 37.50 | .7 | 4.3 | -.1 | .3 | .7 | 4.3 |
| 43.75 | -.6 | 2.8 | .0 | .0 | .6 | 2.8 |
| 50.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 24
spalla fissa - n777 _FREQ_1 - n789 _FREQ_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31477.9 | 4907.3 | 65325.7 | -13821.9 | -51478.5 | -35668.7 |
| 2 | 31989.9 | 4041.0 | 65990.9 | 14321.9 | 51707.2 | 36911.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63467.8 | 8948.3 | 131316.6 | 500.0 | 5707.1 | 10512.2 |

Punto di applic. carico verticale: Xv = 2.069 m Yv = .090 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.815 | 9.145 | 1.384 | .242 | .009 | .032 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3440.4 | 605.2 | -507.6 | 51.3 | -169.3 | .0 | 535.1 |
| 2 | 2886.6 | 162.6 | 454.8 | 13.4 | -57.4 | .0 | 458.4 |
| 3 | 2332.8 | 114.7 | 566.9 | 10.7 | -44.8 | .0 | 568.6 |
| 4 | 1779.0 | 114.7 | 566.9 | 8.1 | -32.1 | .0 | 567.8 |
| 5 | 1225.2 | 114.7 | 566.9 | 5.5 | -19.4 | .0 | 567.2 |
| 6 | 671.4 | 114.7 | 566.9 | 2.8 | -6.7 | .0 | 566.9 |
| 7 | 117.6 | 419.7 | -121.7 | 2.3 | 1.9 | .0 | 121.7 |
| 8 | 3167.2 | 412.7 | -96.1 | 40.4 | -137.8 | .0 | 168.0 |
| 9 | 2613.4 | 87.0 | 638.0 | 12.0 | -51.1 | .0 | 640.1 |
| 10 | 2059.6 | 87.0 | 638.0 | 9.4 | -38.4 | .0 | 639.2 |
| 11 | 1505.8 | 87.0 | 638.0 | 6.8 | -25.7 | .0 | 638.5 |
| 12 | 952.0 | 87.0 | 638.0 | 4.2 | -13.1 | .0 | 638.2 |
| 13 | 398.2 | 412.7 | -96.1 | 5.3 | -9.9 | .0 | 96.6 |
| 14 | 2893.9 | 498.6 | -266.1 | 43.1 | -140.7 | .0 | 301.0 |
| 15 | 2340.1 | 108.7 | 594.7 | 10.7 | -44.8 | .0 | 596.4 |
| 16 | 1786.4 | 108.7 | 594.7 | 8.1 | -32.1 | .0 | 595.6 |
| 17 | 1232.6 | 108.7 | 594.7 | 5.5 | -19.4 | .0 | 595.0 |
| 18 | 678.8 | 405.6 | -70.6 | 10.4 | -26.6 | .0 | 75.4 |
| 19 | 3408.4 | 685.5 | -778.6 | 51.3 | -169.3 | .0 | 796.8 |
| 20 | 2854.6 | 194.7 | 314.6 | 13.4 | -57.4 | .0 | 319.8 |
| 21 | 2300.8 | 140.8 | 445.7 | 10.7 | -44.8 | .0 | 448.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1747.0 | 140.8 | 445.7 | 8.1 | -32.1 | .0 | 446.9 |
| 23 | 1193.2 | 140.8 | 445.7 | 5.5 | -19.4 | .0 | 446.2 |
| 24 | 639.4 | 140.8 | 445.7 | 2.8 | -6.7 | .0 | 445.8 |
| 25 | 85.6 | 480.8 | -344.2 | 2.3 | 1.9 | .0 | 344.2 |
| 26 | 3127.8 | 487.8 | -369.8 | 40.4 | -137.8 | .0 | 394.6 |
| 27 | 2574.0 | 115.2 | 502.3 | 12.0 | -51.1 | .0 | 504.9 |
| 28 | 2020.2 | 115.2 | 502.3 | 9.4 | -38.4 | .0 | 503.8 |
| 29 | 1466.4 | 115.2 | 502.3 | 6.8 | -25.7 | .0 | 503.0 |
| 30 | 912.6 | 115.2 | 502.3 | 4.2 | -13.1 | .0 | 502.5 |
| 31 | 358.8 | 487.8 | -369.8 | 5.3 | -9.9 | .0 | 369.9 |
| 32 | 2847.2 | 602.4 | -628.5 | 43.1 | -140.7 | .0 | 644.1 |
| 33 | 2293.4 | 146.8 | 417.9 | 10.7 | -44.8 | .0 | 420.3 |
| 34 | 1739.6 | 146.8 | 417.9 | 8.1 | -32.1 | .0 | 419.1 |
| 35 | 1185.8 | 146.8 | 417.9 | 5.5 | -19.4 | .0 | 418.3 |
| 36 | 632.1 | 494.8 | -395.4 | 10.4 | -26.6 | .0 | 396.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 25
spalla fissa - n777 _FREQ_2- n789 _FREQ_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34772.7 | 4060.4 | 78146.6 | -15566.3 | -57415.9 | -39491.1 |
| 2 | 34700.1 | 4032.9 | 77783.7 | 15656.3 | 57158.0 | 39614.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69472.8 | 8093.3 | 155930.3 | 90.0 | -1034.7 | 417.4 |

Punto di applic. carico verticale: Xv = 2.244 m Yv = -.015 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.649 | 9.513 | 1.559 | .034 | -.001 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3799.6 | 611.7 | -335.9 | 5.6 | -20.5 | .0 | 336.5 |
| 2 | 3175.9 | 155.2 | 634.3 | 1.7 | -9.0 | .0 | 634.3 |
| 3 | 2552.2 | 106.5 | 743.9 | 1.6 | -8.5 | .0 | 744.0 |
| 4 | 1928.4 | 106.5 | 743.9 | 1.5 | -8.0 | .0 | 744.0 |
| 5 | 1304.7 | 106.5 | 743.9 | 1.4 | -7.5 | .0 | 743.9 |
| 6 | 680.9 | 106.5 | 743.9 | 1.3 | -7.0 | .0 | 743.9 |
| 7 | 57.2 | 419.5 | 56.6 | 3.7 | -13.7 | .0 | 58.2 |
| 8 | 3487.5 | 419.2 | 57.6 | 4.7 | -17.9 | .0 | 60.3 |
| 9 | 2863.7 | 81.0 | 800.9 | 1.7 | -8.8 | .0 | 800.9 |
| 10 | 2240.0 | 81.0 | 800.9 | 1.6 | -8.3 | .0 | 800.9 |
| 11 | 1616.2 | 81.0 | 800.9 | 1.5 | -7.8 | .0 | 800.9 |
| 12 | 992.5 | 81.0 | 800.9 | 1.4 | -7.3 | .0 | 800.9 |
| 13 | 368.7 | 419.2 | 57.6 | 3.3 | -12.8 | .0 | 59.0 |
| 14 | 3175.3 | 517.5 | -145.6 | 5.3 | -19.3 | .0 | 146.9 |
| 15 | 2551.5 | 106.2 | 745.0 | 1.6 | -8.5 | .0 | 745.1 |
| 16 | 1927.8 | 106.2 | 745.0 | 1.5 | -8.0 | .0 | 745.1 |
| 17 | 1304.0 | 106.2 | 745.0 | 1.4 | -7.5 | .0 | 745.1 |
| 18 | 680.3 | 419.0 | 58.6 | 4.0 | -14.8 | .0 | 60.5 |
| 19 | 3802.4 | 614.9 | -346.6 | 5.6 | -20.5 | .0 | 347.2 |
| 20 | 3178.7 | 156.4 | 628.7 | 1.7 | -9.0 | .0 | 628.8 |
| 21 | 2554.9 | 107.5 | 739.1 | 1.6 | -8.5 | .0 | 739.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1931.2 | 107.5 | 739.1 | 1.5 | -8.0 | .0 | 739.1 |
| 23 | 1307.4 | 107.5 | 739.1 | 1.4 | -7.5 | .0 | 739.1 |
| 24 | 683.7 | 107.5 | 739.1 | 1.3 | -7.0 | .0 | 739.1 |
| 25 | 60.0 | 421.9 | 47.8 | 3.7 | -13.7 | .0 | 49.7 |
| 26 | 3490.9 | 422.2 | 46.8 | 4.7 | -17.9 | .0 | 50.1 |
| 27 | 2867.1 | 82.1 | 795.5 | 1.7 | -8.8 | .0 | 795.5 |
| 28 | 2243.4 | 82.1 | 795.5 | 1.6 | -8.3 | .0 | 795.5 |
| 29 | 1619.6 | 82.1 | 795.5 | 1.5 | -7.8 | .0 | 795.5 |
| 30 | 995.9 | 82.1 | 795.5 | 1.4 | -7.3 | .0 | 795.5 |
| 31 | 372.1 | 422.2 | 46.8 | 3.3 | -12.8 | .0 | 48.5 |
| 32 | 3179.3 | 521.6 | -160.0 | 5.3 | -19.3 | .0 | 161.2 |
| 33 | 2555.6 | 107.7 | 738.0 | 1.6 | -8.5 | .0 | 738.0 |
| 34 | 1931.8 | 107.7 | 738.0 | 1.5 | -8.0 | .0 | 738.0 |
| 35 | 1308.1 | 107.7 | 738.0 | 1.4 | -7.5 | .0 | 738.0 |
| 36 | 684.3 | 422.5 | 45.7 | 4.0 | -14.8 | .0 | 48.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 26
spalla fissa - n777 _FREQ_3- n789 _FREQ_3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31989.9 | 4039.3 | 65984.4 | -14308.2 | -51957.3 | -36514.5 |
| 2 | 31477.8 | 4909.0 | 65332.2 | 13808.2 | 51728.1 | 35307.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63467.7 | 8948.3 | 131316.6 | -500.0 | -5708.7 | -10512.6 |

Punto di applic. carico verticale: Xv = 2.069 m Yv = -.090 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.815 | 9.145 | 1.384 | -.242 | -.009 | -.032 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3408.4 | 685.5 | -778.6 | -51.3 | 169.3 | .0 | 796.8 |
| 2 | 2854.6 | 194.7 | 314.6 | -13.4 | 57.4 | .0 | 319.8 |
| 3 | 2300.8 | 140.8 | 445.7 | -10.7 | 44.8 | .0 | 448.0 |
| 4 | 1747.0 | 140.8 | 445.7 | -8.1 | 32.1 | .0 | 446.9 |
| 5 | 1193.2 | 140.8 | 445.7 | -5.5 | 19.4 | .0 | 446.2 |
| 6 | 639.4 | 140.8 | 445.7 | -2.8 | 6.7 | .0 | 445.8 |
| 7 | 85.6 | 480.8 | -344.2 | -2.3 | -1.9 | .0 | 344.2 |
| 8 | 3127.8 | 487.8 | -369.8 | -40.4 | 137.8 | .0 | 394.6 |
| 9 | 2574.0 | 115.2 | 502.3 | -12.0 | 51.1 | .0 | 504.9 |
| 10 | 2020.2 | 115.2 | 502.3 | -9.4 | 38.4 | .0 | 503.8 |
| 11 | 1466.4 | 115.2 | 502.3 | -6.8 | 25.7 | .0 | 503.0 |
| 12 | 912.6 | 115.2 | 502.3 | -4.2 | 13.1 | .0 | 502.5 |
| 13 | 358.8 | 487.8 | -369.8 | -5.3 | 9.9 | .0 | 369.9 |
| 14 | 2847.2 | 602.4 | -628.5 | -43.1 | 140.7 | .0 | 644.1 |
| 15 | 2293.4 | 146.8 | 417.9 | -10.7 | 44.8 | .0 | 420.3 |
| 16 | 1739.6 | 146.8 | 417.9 | -8.1 | 32.1 | .0 | 419.1 |
| 17 | 1185.8 | 146.8 | 417.9 | -5.5 | 19.4 | .0 | 418.3 |
| 18 | 632.0 | 494.8 | -395.4 | -10.4 | 26.6 | .0 | 396.3 |
| 19 | 3440.4 | 605.1 | -507.6 | -51.3 | 169.3 | .0 | 535.1 |
| 20 | 2886.6 | 162.6 | 454.8 | -13.4 | 57.4 | .0 | 458.4 |
| 21 | 2332.8 | 114.7 | 566.9 | -10.7 | 44.8 | .0 | 568.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1779.0 | 114.7 | 566.9 | -8.1 | 32.1 | .0 | 567.8 |
| 23 | 1225.2 | 114.7 | 566.9 | -5.5 | 19.4 | .0 | 567.2 |
| 24 | 671.4 | 114.7 | 566.9 | -2.8 | 6.7 | .0 | 566.9 |
| 25 | 117.6 | 419.7 | -121.7 | -2.3 | -1.9 | .0 | 121.7 |
| 26 | 3167.2 | 412.7 | -96.1 | -40.4 | 137.8 | .0 | 168.0 |
| 27 | 2613.4 | 87.0 | 638.0 | -12.0 | 51.1 | .0 | 640.1 |
| 28 | 2059.6 | 87.0 | 638.0 | -9.4 | 38.4 | .0 | 639.2 |
| 29 | 1505.8 | 87.0 | 638.0 | -6.8 | 25.7 | .0 | 638.5 |
| 30 | 952.0 | 87.0 | 638.0 | -4.2 | 13.1 | .0 | 638.2 |
| 31 | 398.2 | 412.7 | -96.1 | -5.3 | 9.9 | .0 | 96.6 |
| 32 | 2893.9 | 498.6 | -266.1 | -43.1 | 140.7 | .0 | 301.0 |
| 33 | 2340.1 | 108.7 | 594.7 | -10.7 | 44.8 | .0 | 596.4 |
| 34 | 1786.4 | 108.7 | 594.7 | -8.1 | 32.1 | .0 | 595.6 |
| 35 | 1232.6 | 108.7 | 594.7 | -5.5 | 19.4 | .0 | 595.0 |
| 36 | 678.8 | 405.6 | -70.6 | -10.4 | 26.6 | .0 | 75.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 27
spalla fissa - n777 _FREQ_4- n789 _FREQ_4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33397.7 | 4118.5 | 72285.6 | -15111.5 | -54858.9 | -38025.3 |
| 2 | 34358.1 | 4129.8 | 76150.6 | 15231.5 | 56488.3 | 38746.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67755.8 | 8248.3 | 148436.2 | 120.0 | 11905.7 | 600.2 |

Punto di applic. carico verticale: Xv = 2.191 m Yv = .176 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.411 | 9.345 | 1.503 | .109 | .015 | .002 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3710.9 | 614.4 | -407.8 | 8.7 | -14.8 | .0 | 408.1 |
| 2 | 3109.8 | 159.5 | 567.6 | 1.8 | 2.3 | .0 | 567.6 |
| 3 | 2508.8 | 110.7 | 679.2 | 1.7 | 3.1 | .0 | 679.2 |
| 4 | 1907.7 | 110.7 | 679.2 | 1.5 | 3.8 | .0 | 679.2 |
| 5 | 1306.7 | 110.7 | 679.2 | 1.4 | 4.5 | .0 | 679.2 |
| 6 | 705.7 | 110.7 | 679.2 | 1.2 | 5.2 | .0 | 679.2 |
| 7 | 104.6 | 423.2 | -14.6 | 5.9 | -5.0 | .0 | 15.4 |
| 8 | 3416.2 | 422.8 | -13.1 | 7.1 | -10.7 | .0 | 17.0 |
| 9 | 2815.2 | 85.1 | 737.7 | 1.8 | 2.7 | .0 | 737.7 |
| 10 | 2214.2 | 85.1 | 737.7 | 1.6 | 3.4 | .0 | 737.7 |
| 11 | 1613.1 | 85.1 | 737.7 | 1.5 | 4.1 | .0 | 737.7 |
| 12 | 1012.1 | 85.1 | 737.7 | 1.3 | 4.9 | .0 | 737.7 |
| 13 | 411.0 | 422.8 | -13.1 | 5.1 | -3.4 | .0 | 13.6 |
| 14 | 3121.6 | 520.4 | -216.4 | 8.3 | -13.2 | .0 | 216.8 |
| 15 | 2520.6 | 110.4 | 680.8 | 1.7 | 3.1 | .0 | 680.8 |
| 16 | 1919.5 | 110.4 | 680.8 | 1.5 | 3.8 | .0 | 680.8 |
| 17 | 1318.5 | 110.4 | 680.8 | 1.4 | 4.5 | .0 | 680.8 |
| 18 | 717.4 | 422.4 | -11.7 | 6.4 | -6.6 | .0 | 13.4 |
| 19 | 3659.6 | 619.0 | -423.3 | 8.7 | -14.8 | .0 | 423.6 |
| 20 | 3058.6 | 161.3 | 559.6 | 1.8 | 2.3 | .0 | 559.6 |
| 21 | 2457.5 | 112.2 | 672.3 | 1.7 | 3.1 | .0 | 672.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1856.5 | 112.2 | 672.3 | 1.5 | 3.8 | .0 | 672.3 |
| 23 | 1255.4 | 112.2 | 672.3 | 1.4 | 4.5 | .0 | 672.3 |
| 24 | 654.4 | 112.2 | 672.3 | 1.2 | 5.2 | .0 | 672.3 |
| 25 | 53.4 | 426.7 | -27.3 | 5.9 | -5.0 | .0 | 27.8 |
| 26 | 3353.2 | 427.1 | -28.8 | 7.1 | -10.7 | .0 | 30.7 |
| 27 | 2752.1 | 86.7 | 729.9 | 1.8 | 2.7 | .0 | 729.9 |
| 28 | 2151.1 | 86.7 | 729.9 | 1.6 | 3.4 | .0 | 729.9 |
| 29 | 1550.1 | 86.7 | 729.9 | 1.5 | 4.1 | .0 | 729.9 |
| 30 | 949.0 | 86.7 | 729.9 | 1.3 | 4.9 | .0 | 729.9 |
| 31 | 348.0 | 427.1 | -28.8 | 5.1 | -3.4 | .0 | 29.0 |
| 32 | 3046.8 | 526.3 | -237.1 | 8.3 | -13.2 | .0 | 237.5 |
| 33 | 2445.7 | 112.5 | 670.7 | 1.7 | 3.1 | .0 | 670.7 |
| 34 | 1844.7 | 112.5 | 670.7 | 1.5 | 3.8 | .0 | 670.7 |
| 35 | 1243.6 | 112.5 | 670.7 | 1.4 | 4.5 | .0 | 670.7 |
| 36 | 642.6 | 427.5 | -30.2 | 6.4 | -6.6 | .0 | 30.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 28
spalla fissa - n777 _FREQ_5- n789 _FREQ_5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34358.1 | 4128.4 | 76144.9 | -15228.2 | -56548.7 | -38641.3 |
| 2 | 33397.6 | 4119.9 | 72291.3 | 15108.2 | 54918.4 | 37949.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67755.7 | 8248.3 | 148436.2 | -120.0 | -11907.6 | -601.0 |

Punto di applic. carico verticale: Xv = 2.191 m Yv = -.176 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.411 | 9.345 | 1.503 | -.109 | -.015 | -.002 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3659.6 | 619.0 | -423.3 | -8.7 | 14.8 | .0 | 423.6 |
| 2 | 3058.5 | 161.3 | 559.6 | -1.8 | -2.3 | .0 | 559.6 |
| 3 | 2457.5 | 112.2 | 672.3 | -1.7 | -3.1 | .0 | 672.3 |
| 4 | 1856.5 | 112.2 | 672.3 | -1.5 | -3.8 | .0 | 672.3 |
| 5 | 1255.4 | 112.2 | 672.3 | -1.4 | -4.5 | .0 | 672.3 |
| 6 | 654.4 | 112.2 | 672.3 | -1.2 | -5.2 | .0 | 672.3 |
| 7 | 53.3 | 426.7 | -27.3 | -5.9 | 5.0 | .0 | 27.8 |
| 8 | 3353.2 | 427.1 | -28.8 | -7.1 | 10.7 | .0 | 30.7 |
| 9 | 2752.1 | 86.7 | 729.9 | -1.8 | -2.7 | .0 | 729.9 |
| 10 | 2151.1 | 86.7 | 729.9 | -1.6 | -3.4 | .0 | 729.9 |
| 11 | 1550.1 | 86.7 | 729.9 | -1.5 | -4.2 | .0 | 729.9 |
| 12 | 949.0 | 86.7 | 729.9 | -1.3 | -4.9 | .0 | 729.9 |
| 13 | 348.0 | 427.1 | -28.8 | -5.1 | 3.4 | .0 | 29.0 |
| 14 | 3046.8 | 526.3 | -237.1 | -8.3 | 13.2 | .0 | 237.5 |
| 15 | 2445.7 | 112.5 | 670.7 | -1.7 | -3.1 | .0 | 670.7 |
| 16 | 1844.7 | 112.5 | 670.7 | -1.5 | -3.8 | .0 | 670.7 |
| 17 | 1243.6 | 112.5 | 670.7 | -1.4 | -4.5 | .0 | 670.7 |
| 18 | 642.6 | 427.5 | -30.2 | -6.4 | 6.6 | .0 | 31.0 |
| 19 | 3710.9 | 614.4 | -407.8 | -8.7 | 14.8 | .0 | 408.1 |
| 20 | 3109.8 | 159.5 | 567.6 | -1.8 | -2.3 | .0 | 567.6 |
| 21 | 2508.8 | 110.7 | 679.2 | -1.7 | -3.1 | .0 | 679.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1907.7 | 110.7 | 679.2 | -1.5 | -3.8 | .0 | 679.2 |
| 23 | 1306.7 | 110.7 | 679.2 | -1.4 | -4.5 | .0 | 679.2 |
| 24 | 705.7 | 110.7 | 679.2 | -1.2 | -5.2 | .0 | 679.2 |
| 25 | 104.6 | 423.2 | -14.6 | -5.9 | 5.0 | .0 | 15.4 |
| 26 | 3416.2 | 422.8 | -13.1 | -7.1 | 10.7 | .0 | 17.0 |
| 27 | 2815.2 | 85.1 | 737.7 | -1.8 | -2.7 | .0 | 737.7 |
| 28 | 2214.2 | 85.1 | 737.7 | -1.6 | -3.4 | .0 | 737.7 |
| 29 | 1613.1 | 85.1 | 737.7 | -1.5 | -4.2 | .0 | 737.7 |
| 30 | 1012.1 | 85.1 | 737.7 | -1.3 | -4.9 | .0 | 737.7 |
| 31 | 411.0 | 422.8 | -13.1 | -5.1 | 3.4 | .0 | 13.6 |
| 32 | 3121.6 | 520.4 | -216.4 | -8.3 | 13.2 | .0 | 216.8 |
| 33 | 2520.6 | 110.4 | 680.8 | -1.7 | -3.1 | .0 | 680.8 |
| 34 | 1919.5 | 110.4 | 680.8 | -1.5 | -3.8 | .0 | 680.8 |
| 35 | 1318.5 | 110.4 | 680.8 | -1.4 | -4.5 | .0 | 680.8 |
| 36 | 717.4 | 422.4 | -11.7 | -6.4 | 6.6 | .0 | 13.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 29
spalla fissa - n777 _FREQ_6-n789 _FREQ_6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34513.4 | 5371.3 | 83635.5 | -15434.0 | -57116.6 | -45020.0 |
| 2 | 34532.4 | 5359.1 | 83683.2 | 15479.0 | 57090.9 | 45128.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69045.8 | 10730.4 | 167318.7 | 45.0 | 177.6 | 238.8 |

Punto di applic. carico verticale: Xv = 2.423 m Yv = .003 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.590 | 11.295 | 1.742 | .020 | .000 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4008.6 | 780.8 | -704.4 | 2.9 | -9.8 | .0 | 704.4 |
| 2 | 3312.0 | 212.3 | 538.1 | .9 | -3.8 | .0 | 538.1 |
| 3 | 2615.3 | 150.7 | 683.7 | .8 | -3.5 | .0 | 683.7 |
| 4 | 1918.7 | 150.7 | 683.7 | .7 | -3.3 | .0 | 683.7 |
| 5 | 1222.0 | 150.7 | 683.7 | .7 | -3.0 | .0 | 683.7 |
| 6 | 525.4 | 150.7 | 683.7 | .6 | -2.7 | .0 | 683.7 |
| 7 | -171.3 | 542.8 | -207.2 | 1.8 | -5.9 | .0 | 207.2 |
| 8 | 3660.5 | 542.6 | -206.6 | 2.4 | -8.4 | .0 | 206.7 |
| 9 | 2963.8 | 118.3 | 760.1 | .8 | -3.7 | .0 | 760.2 |
| 10 | 2267.2 | 118.3 | 760.1 | .8 | -3.4 | .0 | 760.2 |
| 11 | 1570.5 | 118.3 | 760.1 | .7 | -3.1 | .0 | 760.2 |
| 12 | 873.9 | 118.3 | 760.1 | .7 | -2.8 | .0 | 760.1 |
| 13 | 177.2 | 542.6 | -206.6 | 1.6 | -5.5 | .0 | 206.6 |
| 14 | 3312.3 | 664.7 | -465.5 | 2.8 | -9.2 | .0 | 465.6 |
| 15 | 2615.7 | 150.5 | 684.3 | .8 | -3.5 | .0 | 684.3 |
| 16 | 1919.0 | 150.5 | 684.3 | .7 | -3.3 | .0 | 684.3 |
| 17 | 1222.4 | 150.5 | 684.3 | .7 | -3.0 | .0 | 684.3 |
| 18 | 525.7 | 542.5 | -206.0 | 2.0 | -6.6 | .0 | 206.1 |
| 19 | 4007.1 | 782.6 | -710.5 | 2.9 | -9.8 | .0 | 710.6 |
| 20 | 3310.5 | 213.0 | 534.9 | .9 | -3.8 | .0 | 534.9 |
| 21 | 2613.8 | 151.2 | 680.9 | .8 | -3.5 | .0 | 680.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1917.2 | 151.2 | 680.9 | .7 | -3.3 | .0 | 680.9 |
| 23 | 1220.5 | 151.2 | 680.9 | .7 | -3.0 | .0 | 680.9 |
| 24 | 523.9 | 151.2 | 680.9 | .6 | -2.7 | .0 | 680.9 |
| 25 | -172.8 | 544.2 | -212.2 | 1.8 | -5.9 | .0 | 212.3 |
| 26 | 3658.6 | 544.3 | -212.8 | 2.4 | -8.4 | .0 | 213.0 |
| 27 | 2962.0 | 118.9 | 757.1 | .8 | -3.7 | .0 | 757.1 |
| 28 | 2265.3 | 118.9 | 757.1 | .8 | -3.4 | .0 | 757.1 |
| 29 | 1568.7 | 118.9 | 757.1 | .7 | -3.1 | .0 | 757.1 |
| 30 | 872.0 | 118.9 | 757.1 | .7 | -2.8 | .0 | 757.1 |
| 31 | 175.4 | 544.3 | -212.8 | 1.6 | -5.5 | .0 | 212.9 |
| 32 | 3310.2 | 667.1 | -473.8 | 2.8 | -9.2 | .0 | 473.9 |
| 33 | 2613.5 | 151.4 | 680.3 | .8 | -3.5 | .0 | 680.3 |
| 34 | 1916.9 | 151.4 | 680.3 | .7 | -3.3 | .0 | 680.3 |
| 35 | 1220.2 | 151.4 | 680.3 | .7 | -3.0 | .0 | 680.3 |
| 36 | 523.6 | 544.5 | -213.4 | 2.0 | -6.6 | .0 | 213.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 30
spalla fissa - n777 _FREQ_7 - n789 _FREQ_7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34513.4 | 2538.3 | 69192.0 | -15531.5 | -56670.2 | -32320.0 |
| 2 | 34532.4 | 2528.1 | 69240.3 | 15576.5 | 56643.9 | 32406.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69045.8 | 5066.4 | 138432.3 | 45.0 | 177.0 | 195.2 |

Punto di applic. carico verticale: Xv = 2.005 m Yv = .003 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.590 | 7.319 | 1.314 | .020 | .000 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3495.0 | 415.7 | 53.0 | 2.8 | -9.4 | .0 | 53.8 |
| 2 | 2969.5 | 90.9 | 708.1 | .8 | -3.7 | .0 | 708.1 |
| 3 | 2444.1 | 57.3 | 776.8 | .8 | -3.5 | .0 | 776.8 |
| 4 | 1918.7 | 57.3 | 776.8 | .7 | -3.3 | .0 | 776.8 |
| 5 | 1393.3 | 57.3 | 776.8 | .7 | -3.0 | .0 | 776.8 |
| 6 | 867.8 | 57.3 | 776.8 | .6 | -2.8 | .0 | 776.8 |
| 7 | 342.4 | 277.7 | 323.5 | 1.9 | -6.3 | .0 | 323.6 |
| 8 | 3232.4 | 277.5 | 324.0 | 2.4 | -8.2 | .0 | 324.1 |
| 9 | 2707.0 | 39.9 | 811.2 | .8 | -3.6 | .0 | 811.2 |
| 10 | 2181.6 | 39.9 | 811.2 | .8 | -3.4 | .0 | 811.2 |
| 11 | 1656.1 | 39.9 | 811.2 | .7 | -3.1 | .0 | 811.2 |
| 12 | 1130.7 | 39.9 | 811.2 | .7 | -2.9 | .0 | 811.2 |
| 13 | 605.3 | 277.5 | 324.0 | 1.7 | -5.8 | .0 | 324.0 |
| 14 | 2969.9 | 348.0 | 184.2 | 2.7 | -8.9 | .0 | 184.4 |
| 15 | 2444.5 | 57.2 | 777.3 | .8 | -3.5 | .0 | 777.3 |
| 16 | 1919.0 | 57.2 | 777.3 | .7 | -3.3 | .0 | 777.3 |
| 17 | 1393.6 | 57.2 | 777.3 | .7 | -3.0 | .0 | 777.3 |
| 18 | 868.2 | 277.4 | 324.5 | 2.1 | -6.8 | .0 | 324.5 |
| 19 | 3493.5 | 417.2 | 48.0 | 2.8 | -9.4 | .0 | 48.9 |
| 20 | 2968.1 | 91.5 | 705.5 | .8 | -3.7 | .0 | 705.5 |
| 21 | 2442.6 | 57.8 | 774.6 | .8 | -3.5 | .0 | 774.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1917.2 | 57.8 | 774.6 | .7 | -3.3 | .0 | 774.6 |
| 23 | 1391.8 | 57.8 | 774.6 | .7 | -3.0 | .0 | 774.6 |
| 24 | 866.3 | 57.8 | 774.6 | .6 | -2.8 | .0 | 774.6 |
| 25 | 340.9 | 278.8 | 319.4 | 1.9 | -6.3 | .0 | 319.4 |
| 26 | 3230.6 | 278.9 | 318.9 | 2.4 | -8.2 | .0 | 319.0 |
| 27 | 2705.2 | 40.4 | 808.7 | .8 | -3.6 | .0 | 808.7 |
| 28 | 2179.7 | 40.4 | 808.7 | .8 | -3.4 | .0 | 808.7 |
| 29 | 1654.3 | 40.4 | 808.7 | .7 | -3.1 | .0 | 808.7 |
| 30 | 1128.9 | 40.4 | 808.7 | .7 | -2.9 | .0 | 808.7 |
| 31 | 603.5 | 278.9 | 318.9 | 1.7 | -5.8 | .0 | 319.0 |
| 32 | 2967.7 | 349.9 | 177.5 | 2.7 | -8.9 | .0 | 177.7 |
| 33 | 2442.3 | 57.9 | 774.0 | .8 | -3.5 | .0 | 774.0 |
| 34 | 1916.9 | 57.9 | 774.0 | .7 | -3.3 | .0 | 774.0 |
| 35 | 1391.4 | 57.9 | 774.0 | .7 | -3.0 | .0 | 774.0 |
| 36 | 866.0 | 279.0 | 318.4 | 2.1 | -6.8 | .0 | 318.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 31
spalla fissa - n777 _PERM_1- n789 _PERM_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31733.9 | 4473.3 | 65655.1 | -14065.0 | -51717.9 | -36091.6 |
| 2 | 31733.9 | 4475.0 | 65661.5 | 14065.0 | 51717.6 | 36109.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63467.8 | 8948.3 | 131316.6 | .0 | -.3 | -.2 |

Punto di applic. carico verticale: Xv = 2.069 m Yv = .000 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.815 | 9.145 | 1.384 | .000 | .000 | .000 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3424.4 | 645.3 | -643.1 | .0 | .0 | .0 | 643.1 |
| 2 | 2870.6 | 178.6 | 384.7 | .0 | .0 | .0 | 384.7 |
| 3 | 2316.8 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 4 | 1763.0 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 5 | 1209.2 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 6 | 655.4 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 7 | 101.6 | 450.2 | -233.0 | .0 | .0 | .0 | 233.0 |
| 8 | 3147.5 | 450.2 | -233.0 | .0 | .0 | .0 | 233.0 |
| 9 | 2593.7 | 101.1 | 570.2 | .0 | .0 | .0 | 570.2 |
| 10 | 2039.9 | 101.1 | 570.2 | .0 | .0 | .0 | 570.2 |
| 11 | 1486.1 | 101.1 | 570.2 | .0 | .0 | .0 | 570.2 |
| 12 | 932.3 | 101.1 | 570.2 | .0 | .0 | .0 | 570.2 |
| 13 | 378.5 | 450.2 | -233.0 | .0 | .0 | .0 | 233.0 |
| 14 | 2870.6 | 550.5 | -447.3 | .0 | .0 | .0 | 447.3 |
| 15 | 2316.8 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 16 | 1763.0 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 17 | 1209.2 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |
| 18 | 655.4 | 450.2 | -233.0 | .0 | .0 | .0 | 233.0 |
| 19 | 3424.4 | 645.3 | -643.1 | .0 | .0 | .0 | 643.1 |
| 20 | 2870.6 | 178.6 | 384.7 | .0 | .0 | .0 | 384.7 |
| 21 | 2316.8 | 127.8 | 506.3 | .0 | .0 | .0 | 506.3 |

```
  22   1763.0    127.8    506.3       .0       .0       .0     506.3
  23   1209.2    127.8    506.3       .0       .0       .0     506.3
  24    655.4    127.8    506.3       .0       .0       .0     506.3
  25    101.6    450.2   -233.0       .0       .0       .0     233.0
  26   3147.5    450.2   -233.0       .0       .0       .0     233.0
  27   2593.7    101.1    570.2       .0       .0       .0     570.2
  28   2039.9    101.1    570.2       .0       .0       .0     570.2
  29   1486.1    101.1    570.2       .0       .0       .0     570.2
  30    932.3    101.1    570.2       .0       .0       .0     570.2
  31    378.5    450.2   -233.0       .0       .0       .0     233.0
  32   2870.6    550.5   -447.3       .0       .0       .0     447.3
  33   2316.8    127.8    506.3       .0       .0       .0     506.3
  34   1763.0    127.8    506.3       .0       .0       .0     506.3
  35   1209.2    127.8    506.3       .0       .0       .0     506.3
  36    655.4    450.2   -233.0       .0       .0       .0     233.0
 -------------------------------------------------------------------

 Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla fissa - SLE RARA QP FREQ

CONDIZIONE DI CARICO 32
spalla fissa - n777 _PERM_2 - n789 _PERM_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31733.9 | 3423.7 | 60301.0 | -14101.2 | -51552.5 | -31382.8 |
| 2 | 31733.9 | 3424.6 | 60305.6 | 14101.2 | 51551.9 | 31392.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63467.8 | 6848.3 | 120606.6 | .0 | -.6 | .4 |

Punto di applic. carico verticale: Xv = 1.900 m Yv = .000 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.815 | 7.670 | 1.226 | .000 | .000 | .000 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3233.9 | 509.9 | -362.1 | .0 | .0 | .0 | 362.1 |
| 2 | 2743.6 | 133.6 | 447.8 | .0 | .0 | .0 | 447.8 |
| 3 | 2253.3 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 4 | 1763.0 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 5 | 1272.7 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 6 | 782.4 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 7 | 292.1 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 8 | 2988.8 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 9 | 2498.5 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 10 | 2008.1 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 11 | 1517.8 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 12 | 1027.5 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 13 | 537.2 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 14 | 2743.6 | 433.0 | -206.1 | .0 | .0 | .0 | 206.1 |
| 15 | 2253.3 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 16 | 1763.0 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 17 | 1272.7 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 18 | 782.4 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 19 | 3233.9 | 509.9 | -362.1 | .0 | .0 | .0 | 362.1 |
| 20 | 2743.6 | 133.6 | 447.8 | .0 | .0 | .0 | 447.8 |
| 21 | 2253.3 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1763.0 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 23 | 1272.7 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 24 | 782.4 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 25 | 292.1 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 26 | 2988.8 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 27 | 2498.5 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 28 | 2008.2 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 29 | 1517.8 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 30 | 1027.5 | 72.0 | 589.2 | .0 | .0 | .0 | 589.2 |
| 31 | 537.2 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |
| 32 | 2743.6 | 433.0 | -206.1 | .0 | .0 | .0 | 206.1 |
| 33 | 2253.3 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 34 | 1763.0 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 35 | 1272.7 | 93.1 | 540.9 | .0 | .0 | .0 | 540.9 |
| 36 | 782.4 | 351.9 | -36.0 | .0 | .0 | .0 | 36.0 |

Mris = (Mxp^2 + Myp^2)^0.5

### 9.3 Spalla appoggi mobili – Analisi SLU statica e sismica

```
                 M A P  -  Matrix Analysis of Piles
 Programma per l'analisi di palificate collegate da un plinto rigido

                 (C)  G.Guiducci, S.G.I. - luglio 1994

                                                      pag./  2

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica
```

Geometria Palificata

| palo | vin | X m | Y m | Z m | axz deg | ayz deg | axy deg | Box m | Boy m |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 2 | 0 | 4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 3 | 0 | 2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 4 | 0 | .000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 5 | 0 | -2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 6 | 0 | -4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 7 | 0 | -6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 8 | 0 | 5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 9 | 0 | 3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 10 | 0 | 1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 11 | 0 | -1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 12 | 0 | -3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 13 | 0 | -5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 14 | 0 | 4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 15 | 0 | 2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 16 | 0 | .000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 17 | 0 | -2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 18 | 0 | -4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 19 | 0 | 6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 20 | 0 | 4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 21 | 0 | 2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 22 | 0 | .000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 23 | 0 | -2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 24 | 0 | -4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 25 | 0 | -6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 26 | 0 | 5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 27 | 0 | 3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 28 | 0 | 1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 29 | 0 | -1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 30 | 0 | -3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 31 | 0 | -5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 32 | 0 | 4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 33 | 0 | 2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 34 | 0 | .000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 35 | 0 | -2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 36 | 0 | -4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |

```
vin     = 0 - incastro;   1 - cerniera;   2 - appoggio
X, Y, Z = Coordinate testa pali
axz     = Inclinazione palo nel piano  Xp Z  rispetto alla verticale
             (positiva se verso  Xp positivo)
ayz     = Inclinazione palo nel piano  Yp Z  rispetto alla verticale
             (positiva se verso  Yp  positivo)
axy     = Rotazione assi  Xp Yp     (positiva se antioraria)
Box     = Lato dell'elemento parallelo all'asse  Xp
Boy     = Lato dell'elemento parallelo all'asse  Yp
          se  Boy = 0    D = Box:  diametro
          altrimenti     D = sqr (Box * Boy * 1.273): diametro equivalente
```

Caratterizzazione dei pali soggetti a carichi assiali e torsionali (uguali per tutti i pali)

| palo | AK kN/m | TK kN*m/rad |
|---|---|---|
| 1 | 200000. | .0 |

AK = Rigidezza assiale palo-terreno
TK = Rigidezza torsionale palo-terreno

Baricentro palificata: Xg = .000 m Yg = .000 m
Rotazione direzioni princip. di inerzia: .00 deg

Caratterizzazione del terreno per pali soggetti a carichi trasversali

Terreno tipo 1

| Prof. m | E kN/m2 |
|---|---|
| .00 | 33750.0 |
| 3.00 | 35250.0 |
| 3.10 | 150000.0 |
| 8.00 | 150000.0 |
| 8.10 | 36750.0 |
| 13.00 | 44250.0 |
| 13.10 | 150000.0 |
| 26.00 | 150000.0 |
| 26.10 | 52500.0 |
| 60.00 | 75000.0 |

Caratterizzazione dei pali soggetti a carichi trasversali

| palo | Lp m | EJx kN*m2 | Itx | Ridx | EJy kN*m2 | Ity | Ridy |
|---|---|---|---|---|---|---|---|
| 1 | 45.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 2 | 45.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 3 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 4 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 5 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 6 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 7 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 8 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 9 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 10 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 11 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 12 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 13 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 14 | 45.00 | 7455147. | 1 | .250 | 7455147. | 1 | .250 |
| 15 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 16 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 17 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 18 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 19 | 45.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 20 | 45.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 21 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 22 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 23 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 24 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 25 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 26 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 27 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 28 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 29 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 30 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 31 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 32 | 45.00 | 7455147. | 1 | .250 | 7455147. | 1 | .250 |
| 33 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 34 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 35 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 36 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |

Lp = Lunghezza palo (compreso eventuale tratto fuori terra)
EJ = Rigidezza flessionale del palo
It = Tipo di terreno
Rid = Moltiplicatore del modulo di reazione orizzontale

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 1
spalla mobile - n777 _STRM1- n789 _STRM1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 37242.8 | 6884.3 | 61621.6 | -16091.9 | -59466.5 | -40694.8 |
| 2 | 37966.8 | 6762.6 | 64185.2 | 16631.9 | 60085.1 | 41998.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 75209.6 | 13646.9 | 125806.8 | 540.0 | 8365.4 | 2605.6 |

Punto di applic. carico verticale: Xv = 1.673 m Yv = .111 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 10.446 | 12.064 | 1.516 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3930.2 | 907.4 | -1490.3 | 35.0 | -112.1 | .0 | 1494.5 |
| 2 | 3323.8 | 282.2 | -13.0 | 10.1 | -40.5 | .0 | 42.5 |
| 3 | 2717.5 | 210.7 | 176.2 | 9.4 | -37.2 | .0 | 180.0 |
| 4 | 2111.1 | 210.7 | 176.2 | 8.7 | -34.0 | .0 | 179.4 |
| 5 | 1504.8 | 210.7 | 176.2 | 8.1 | -30.7 | .0 | 178.8 |
| 6 | 898.5 | 210.7 | 176.2 | 7.4 | -27.4 | .0 | 178.3 |
| 7 | 292.1 | 648.8 | -913.2 | 22.9 | -68.8 | .0 | 915.8 |
| 8 | 3632.0 | 647.1 | -906.7 | 29.0 | -96.0 | .0 | 911.8 |
| 9 | 3025.7 | 173.0 | 278.5 | 9.7 | -38.9 | .0 | 281.2 |
| 10 | 2419.4 | 173.0 | 278.5 | 9.1 | -35.6 | .0 | 280.8 |
| 11 | 1813.0 | 173.0 | 278.5 | 8.4 | -32.3 | .0 | 280.4 |
| 12 | 1206.7 | 173.0 | 278.5 | 7.8 | -29.1 | .0 | 280.0 |
| 13 | 600.3 | 647.1 | -906.7 | 20.3 | -63.5 | .0 | 909.0 |
| 14 | 3333.9 | 778.1 | -1201.7 | 32.9 | -104.9 | .0 | 1206.3 |
| 15 | 2727.6 | 209.2 | 183.3 | 9.4 | -37.2 | .0 | 187.0 |
| 16 | 2121.2 | 209.2 | 183.3 | 8.7 | -34.0 | .0 | 186.4 |
| 17 | 1514.9 | 209.2 | 183.3 | 8.1 | -30.7 | .0 | 185.8 |
| 18 | 908.6 | 645.4 | -900.2 | 24.9 | -76.0 | .0 | 903.4 |
| 19 | 3886.2 | 927.2 | -1558.8 | 35.0 | -112.1 | .0 | 1562.8 |
| 20 | 3279.9 | 290.2 | -48.9 | 10.1 | -40.5 | .0 | 63.5 |
| 21 | 2673.5 | 217.2 | 145.1 | 9.4 | -37.2 | .0 | 149.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2067.2 | 217.2 | 145.1 | 8.7 | -34.0 | .0 | 149.0 |
| 23 | 1460.8 | 217.2 | 145.1 | 8.1 | -30.7 | .0 | 148.3 |
| 24 | 854.5 | 217.2 | 145.1 | 7.4 | -27.4 | .0 | 147.7 |
| 25 | 248.2 | 663.9 | -969.7 | 22.9 | -68.8 | .0 | 972.1 |
| 26 | 3578.0 | 665.7 | -976.2 | 29.0 | -96.0 | .0 | 980.9 |
| 27 | 2971.6 | 180.0 | 243.6 | 9.7 | -38.9 | .0 | 246.7 |
| 28 | 2365.3 | 180.0 | 243.6 | 9.1 | -35.6 | .0 | 246.2 |
| 29 | 1759.0 | 180.0 | 243.6 | 8.4 | -32.3 | .0 | 245.7 |
| 30 | 1152.6 | 180.0 | 243.6 | 7.8 | -29.1 | .0 | 245.3 |
| 31 | 546.3 | 665.7 | -976.2 | 20.3 | -63.5 | .0 | 978.2 |
| 32 | 3269.8 | 803.7 | -1293.5 | 32.9 | -104.9 | .0 | 1297.7 |
| 33 | 2663.4 | 218.7 | 137.9 | 9.4 | -37.2 | .0 | 142.9 |
| 34 | 2057.1 | 218.7 | 137.9 | 8.7 | -34.0 | .0 | 142.1 |
| 35 | 1450.7 | 218.7 | 137.9 | 8.1 | -30.7 | .0 | 141.3 |
| 36 | 844.4 | 667.4 | -982.7 | 24.9 | -76.0 | .0 | 985.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 1
spalla mobile - n777 _STRM1- n789 _STRM1

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 927.2 | -1558.8 | 35.0 | -112.1 | 927.9 | 1562.8 |
| 1.41 | 768.6 | -371.6 | 31.1 | -65.7 | 769.3 | 377.4 |
| 2.81 | 641.9 | 614.3 | 27.6 | -24.6 | 642.5 | 614.7 |
| 4.22 | 331.3 | 1337.3 | 18.0 | 8.8 | 331.8 | 1337.3 |
| 5.63 | 61.4 | 1592.5 | 8.6 | 26.9 | 62.0 | 1592.7 |
| 7.03 | -101.9 | 1547.6 | 1.8 | 33.8 | 101.9 | 1548.0 |
| 8.44 | -175.5 | 1334.0 | -2.1 | 32.8 | 175.5 | 1334.4 |
| 9.84 | -182.2 | 1080.5 | -2.8 | 29.3 | 182.3 | 1080.9 |
| 11.25 | -179.3 | 824.7 | -3.2 | 25.0 | 179.3 | 825.1 |
| 13.50 | -154.4 | 434.4 | -3.4 | 17.4 | 154.4 | 434.8 |
| 15.75 | -94.5 | 155.7 | -2.9 | 10.2 | 94.6 | 156.0 |
| 18.00 | -46.0 | 2.2 | -2.0 | 4.6 | 46.0 | 5.1 |
| 20.25 | -14.5 | -61.1 | -1.1 | 1.2 | 14.5 | 61.1 |
| 22.50 | 2.6 | -71.7 | -.4 | -.6 | 2.6 | 71.7 |
| 26.25 | 7.8 | -45.5 | .0 | -1.0 | 7.8 | 45.5 |
| 30.00 | 5.6 | -19.4 | .1 | -.7 | 5.6 | 19.4 |
| 33.75 | 2.5 | -4.2 | .1 | -.4 | 2.5 | 4.2 |
| 39.38 | .0 | 1.7 | .0 | -.1 | .1 | 1.7 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 2
spalla mobile - n777 _STRM2- n789 _STRM2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 37242.8 | 4994.9 | 51984.4 | -16156.9 | -59168.8 | -32218.9 |
| 2 | 37966.7 | 4871.9 | 54544.4 | 16696.9 | 59786.7 | 33508.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 75209.5 | 9866.8 | 106528.8 | 540.0 | 8363.6 | 2605.2 |

Punto di applic. carico verticale: Xv = 1.416 m Yv = .111 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 10.446 | 9.260 | 1.225 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3581.4 | 665.5 | -969.0 | 35.0 | -112.1 | .0 | 975.4 |
| 2 | 3091.3 | 200.6 | 112.9 | 10.1 | -40.5 | .0 | 119.9 |
| 3 | 2601.2 | 147.9 | 249.2 | 9.4 | -37.2 | .0 | 252.0 |
| 4 | 2111.1 | 147.9 | 249.2 | 8.7 | -34.0 | .0 | 251.5 |
| 5 | 1621.0 | 147.9 | 249.2 | 8.1 | -30.7 | .0 | 251.1 |
| 6 | 1130.9 | 147.9 | 249.2 | 7.4 | -27.4 | .0 | 250.7 |
| 7 | 640.8 | 472.6 | -544.0 | 22.9 | -68.8 | .0 | 548.4 |
| 8 | 3341.4 | 470.8 | -537.5 | 29.0 | -96.0 | .0 | 546.0 |
| 9 | 2851.3 | 120.0 | 323.3 | 9.7 | -38.9 | .0 | 325.6 |
| 10 | 2361.2 | 120.0 | 323.3 | 9.1 | -35.6 | .0 | 325.3 |
| 11 | 1871.1 | 120.0 | 323.3 | 8.4 | -32.3 | .0 | 324.9 |
| 12 | 1381.0 | 120.0 | 323.3 | 7.8 | -29.1 | .0 | 324.6 |
| 13 | 890.9 | 470.8 | -537.5 | 20.3 | -63.5 | .0 | 541.3 |
| 14 | 3101.4 | 567.9 | -752.4 | 32.9 | -104.9 | .0 | 759.7 |
| 15 | 2611.3 | 146.4 | 256.3 | 9.4 | -37.2 | .0 | 259.0 |
| 16 | 2121.2 | 146.4 | 256.3 | 8.7 | -34.0 | .0 | 258.6 |
| 17 | 1631.1 | 146.4 | 256.3 | 8.1 | -30.7 | .0 | 258.2 |
| 18 | 1141.0 | 469.1 | -531.1 | 24.9 | -76.0 | .0 | 536.5 |
| 19 | 3537.5 | 685.2 | -1037.5 | 35.0 | -112.1 | .0 | 1043.5 |
| 20 | 3047.4 | 208.6 | 77.0 | 10.1 | -40.5 | .0 | 87.0 |
| 21 | 2557.3 | 154.4 | 218.1 | 9.4 | -37.2 | .0 | 221.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2067.2 | 154.4 | 218.1 | 8.7 | -34.0 | .0 | 220.8 |
| 23 | 1577.1 | 154.4 | 218.1 | 8.1 | -30.7 | .0 | 220.3 |
| 24 | 1087.0 | 154.4 | 218.1 | 7.4 | -27.4 | .0 | 219.9 |
| 25 | 596.9 | 487.6 | -600.5 | 22.9 | -68.8 | .0 | 604.4 |
| 26 | 3287.4 | 489.4 | -607.0 | 29.0 | -96.0 | .0 | 614.5 |
| 27 | 2797.3 | 127.0 | 288.4 | 9.7 | -38.9 | .0 | 291.0 |
| 28 | 2307.2 | 127.0 | 288.4 | 9.1 | -35.6 | .0 | 290.6 |
| 29 | 1817.1 | 127.0 | 288.4 | 8.4 | -32.3 | .0 | 290.2 |
| 30 | 1327.0 | 127.0 | 288.4 | 7.8 | -29.1 | .0 | 289.9 |
| 31 | 836.9 | 489.4 | -607.0 | 20.3 | -63.5 | .0 | 610.3 |
| 32 | 3037.3 | 593.5 | -844.2 | 32.9 | -104.9 | .0 | 850.7 |
| 33 | 2547.2 | 155.9 | 211.0 | 9.4 | -37.2 | .0 | 214.3 |
| 34 | 2057.1 | 155.9 | 211.0 | 8.7 | -34.0 | .0 | 213.7 |
| 35 | 1567.0 | 155.9 | 211.0 | 8.1 | -30.7 | .0 | 213.2 |
| 36 | 1076.9 | 491.1 | -613.5 | 24.9 | -76.0 | .0 | 618.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 3
spalla mobile - n777 _STRM3 - n789 _STRM3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 50892.2 | 6921.1 | 127506.0 | -22899.0 | -85284.7 | -64753.8 |
| 2 | 51443.3 | 6725.8 | 129183.6 | 23656.5 | 85285.1 | 66319.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 102335.5 | 13646.9 | 256689.6 | 757.5 | 5897.2 | 3655.1 |

Punto di applic. carico verticale: Xv = 2.508 m Yv = .058 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 14.213 | 16.584 | 2.603 | .374 | .011 | .012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5984.5 | 1005.2 | -644.1 | 48.6 | -162.8 | .0 | 664.3 |
| 2 | 4943.4 | 261.1 | 980.6 | 14.3 | -63.1 | .0 | 982.6 |
| 3 | 3902.4 | 179.9 | 1170.5 | 13.4 | -58.5 | .0 | 1172.0 |
| 4 | 2861.4 | 179.9 | 1170.5 | 12.5 | -53.9 | .0 | 1171.8 |
| 5 | 1820.4 | 179.9 | 1170.5 | 11.6 | -49.3 | .0 | 1171.6 |
| 6 | 779.4 | 179.9 | 1170.5 | 10.6 | -44.8 | .0 | 1171.4 |
| 7 | -261.7 | 692.4 | 9.6 | 31.6 | -102.0 | .0 | 102.4 |
| 8 | 5468.3 | 690.0 | 18.7 | 40.4 | -140.4 | .0 | 141.6 |
| 9 | 4427.2 | 137.4 | 1270.2 | 13.9 | -60.8 | .0 | 1271.7 |
| 10 | 3386.2 | 137.4 | 1270.2 | 12.9 | -56.2 | .0 | 1271.5 |
| 11 | 2345.2 | 137.4 | 1270.2 | 12.0 | -51.6 | .0 | 1271.3 |
| 12 | 1304.2 | 137.4 | 1270.2 | 11.1 | -47.1 | .0 | 1271.1 |
| 13 | 263.2 | 690.0 | 18.7 | 28.2 | -94.9 | .0 | 96.7 |
| 14 | 4952.1 | 847.4 | -311.2 | 45.7 | -152.7 | .0 | 346.6 |
| 15 | 3911.0 | 177.8 | 1180.6 | 13.4 | -58.5 | .0 | 1182.0 |
| 16 | 2870.0 | 177.8 | 1180.6 | 12.5 | -53.9 | .0 | 1181.8 |
| 17 | 1829.0 | 177.8 | 1180.6 | 11.6 | -49.3 | .0 | 1181.6 |
| 18 | 788.0 | 687.5 | 27.8 | 34.4 | -112.1 | .0 | 115.5 |
| 19 | 5947.0 | 1033.0 | -740.2 | 48.6 | -162.8 | .0 | 757.9 |
| 20 | 4905.9 | 272.3 | 930.2 | 14.3 | -63.1 | .0 | 932.3 |
| 21 | 3864.9 | 189.0 | 1127.0 | 13.4 | -58.5 | .0 | 1128.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2823.9 | 189.0 | 1127.0 | 12.5 | -53.9 | .0 | 1128.2 |
| 23 | 1782.9 | 189.0 | 1127.0 | 11.6 | -49.3 | .0 | 1128.0 |
| 24 | 741.9 | 189.0 | 1127.0 | 10.6 | -44.8 | .0 | 1127.8 |
| 25 | -299.2 | 713.6 | -69.7 | 31.6 | -102.0 | .0 | 123.5 |
| 26 | 5422.1 | 716.0 | -78.8 | 40.4 | -140.4 | .0 | 161.0 |
| 27 | 4381.1 | 147.3 | 1221.2 | 13.9 | -60.8 | .0 | 1222.7 |
| 28 | 3340.1 | 147.3 | 1221.2 | 12.9 | -56.2 | .0 | 1222.5 |
| 29 | 2299.1 | 147.3 | 1221.2 | 12.0 | -51.6 | .0 | 1222.3 |
| 30 | 1258.1 | 147.3 | 1221.2 | 11.1 | -47.1 | .0 | 1222.1 |
| 31 | 217.0 | 716.0 | -78.8 | 28.2 | -94.9 | .0 | 123.3 |
| 32 | 4897.3 | 883.3 | -440.0 | 45.7 | -152.7 | .0 | 465.7 |
| 33 | 3856.3 | 191.1 | 1116.9 | 13.4 | -58.5 | .0 | 1118.5 |
| 34 | 2815.3 | 191.1 | 1116.9 | 12.5 | -53.9 | .0 | 1118.2 |
| 35 | 1774.3 | 191.1 | 1116.9 | 11.6 | -49.3 | .0 | 1118.0 |
| 36 | 733.2 | 718.4 | -87.9 | 34.4 | -112.1 | .0 | 142.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 3
spalla mobile - n777 _STRM3 - n789 _STRM3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1005.2 | -644.1 | 48.6 | -162.8 | 1006.4 | 664.3 |
| 1.41 | 794.5 | 612.7 | 43.4 | -98.2 | 795.6 | 620.5 |
| 2.81 | 633.3 | 1607.9 | 38.7 | -40.6 | 634.5 | 1608.4 |
| 4.22 | 259.6 | 2279.9 | 25.6 | 6.4 | 260.9 | 2279.9 |
| 5.63 | -47.2 | 2401.3 | 12.6 | 32.7 | 48.9 | 2401.5 |
| 7.03 | -214.3 | 2196.3 | 3.2 | 43.2 | 214.3 | 2196.7 |
| 8.44 | -275.2 | 1834.0 | -2.3 | 42.7 | 275.3 | 1834.5 |
| 9.84 | -274.7 | 1444.9 | -3.4 | 38.6 | 274.7 | 1445.4 |
| 11.25 | -262.3 | 1065.1 | -4.0 | 33.4 | 262.3 | 1065.6 |
| 13.50 | -216.6 | 502.6 | -4.3 | 23.8 | 216.7 | 503.2 |
| 15.75 | -121.1 | 128.1 | -3.8 | 14.3 | 121.1 | 128.9 |
| 18.00 | -51.1 | -57.3 | -2.7 | 6.8 | 51.2 | 57.7 |
| 20.25 | -9.7 | -118.3 | -1.6 | 2.0 | 9.8 | 118.3 |
| 22.50 | 9.9 | -113.6 | -.7 | -.5 | 9.9 | 113.6 |
| 26.25 | 12.5 | -63.9 | .0 | -1.3 | 12.5 | 63.9 |
| 30.00 | 8.1 | -24.4 | .1 | -1.0 | 8.1 | 24.4 |
| 33.75 | 3.3 | -3.1 | .1 | -.5 | 3.3 | 3.2 |
| 39.38 | -.2 | 3.2 | .0 | -.1 | .2 | 3.2 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 3
spalla mobile - n777 _STRM3 - n789 _STRM3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 713.6 | -69.7 | 31.6 | -102.0 | 714.3 | 123.5 |
| 1.41 | 570.9 | 827.8 | 28.1 | -60.1 | 571.6 | 830.0 |
| 2.81 | 460.1 | 1547.3 | 25.0 | -22.8 | 460.8 | 1547.5 |
| 4.22 | 196.3 | 2041.6 | 16.3 | 7.4 | 197.0 | 2041.6 |
| 5.63 | -30.1 | 2140.0 | 7.8 | 23.9 | 31.1 | 2140.1 |
| 7.03 | -163.7 | 1989.5 | 1.7 | 30.2 | 163.8 | 1989.7 |
| 8.44 | -221.1 | 1703.8 | -1.8 | 29.4 | 221.1 | 1704.0 |
| 9.84 | -224.9 | 1388.4 | -2.5 | 26.3 | 224.9 | 1388.6 |
| 11.25 | -219.8 | 1074.0 | -2.9 | 22.5 | 219.9 | 1074.3 |
| 13.50 | -191.4 | 594.9 | -3.0 | 15.7 | 191.4 | 595.1 |
| 15.75 | -123.8 | 241.4 | -2.6 | 9.2 | 123.8 | 241.6 |
| 18.00 | -66.8 | 31.5 | -1.8 | 4.2 | 66.8 | 31.7 |
| 20.25 | -26.9 | -69.0 | -1.0 | 1.1 | 26.9 | 69.0 |
| 22.50 | -2.1 | -98.9 | -.4 | -.5 | 2.1 | 98.9 |
| 26.25 | 9.6 | -75.0 | .0 | -.9 | 9.6 | 75.0 |
| 30.00 | 8.2 | -40.1 | .1 | -.6 | 8.2 | 40.1 |
| 33.75 | 4.7 | -15.3 | .1 | -.3 | 4.7 | 15.3 |
| 39.38 | 1.0 | -.4 | .0 | -.1 | 1.0 | .4 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 4
spalla mobile - n777 _STRM4- n789 _STRM4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 50892.2 | 5031.7 | 117868.8 | -22964.0 | -84986.9 | -56277.9 |
| 2 | 51443.3 | 4835.1 | 119542.8 | 23721.5 | 84986.7 | 57829.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 102335.5 | 9866.8 | 237411.6 | 757.5 | 5896.6 | 3654.7 |

Punto di applic. carico verticale: Xv = 2.320 m Yv = .058 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 14.213 | 13.780 | 2.312 | .374 | .011 | .012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5635.7 | 763.2 | -122.7 | 48.6 | -162.8 | .0 | 203.9 |
| 2 | 4711.0 | 179.5 | 1106.5 | 14.3 | -63.1 | .0 | 1108.3 |
| 3 | 3786.2 | 117.1 | 1243.6 | 13.4 | -58.5 | .0 | 1245.0 |
| 4 | 2861.4 | 117.1 | 1243.6 | 12.5 | -53.9 | .0 | 1244.8 |
| 5 | 1936.6 | 117.1 | 1243.6 | 11.6 | -49.3 | .0 | 1244.6 |
| 6 | 1011.8 | 117.1 | 1243.6 | 10.6 | -44.8 | .0 | 1244.4 |
| 7 | 87.1 | 516.1 | 378.8 | 31.6 | -102.0 | .0 | 392.2 |
| 8 | 5177.7 | 513.7 | 387.9 | 40.4 | -140.4 | .0 | 412.5 |
| 9 | 4252.9 | 84.5 | 1315.0 | 13.9 | -60.8 | .0 | 1316.4 |
| 10 | 3328.1 | 84.5 | 1315.0 | 12.9 | -56.2 | .0 | 1316.2 |
| 11 | 2403.3 | 84.5 | 1315.0 | 12.0 | -51.6 | .0 | 1316.1 |
| 12 | 1478.5 | 84.5 | 1315.0 | 11.1 | -47.1 | .0 | 1315.9 |
| 13 | 553.8 | 513.7 | 387.9 | 28.2 | -94.9 | .0 | 399.3 |
| 14 | 4719.6 | 637.1 | 138.1 | 45.7 | -152.7 | .0 | 205.9 |
| 15 | 3794.8 | 115.0 | 1253.6 | 13.4 | -58.5 | .0 | 1255.0 |
| 16 | 2870.0 | 115.0 | 1253.6 | 12.5 | -53.9 | .0 | 1254.8 |
| 17 | 1945.2 | 115.0 | 1253.6 | 11.6 | -49.3 | .0 | 1254.6 |
| 18 | 1020.5 | 511.3 | 397.0 | 34.4 | -112.1 | .0 | 412.5 |
| 19 | 5598.2 | 791.0 | -218.9 | 48.6 | -162.8 | .0 | 272.8 |
| 20 | 4673.5 | 190.7 | 1056.1 | 14.3 | -63.1 | .0 | 1058.0 |
| 21 | 3748.7 | 126.2 | 1200.0 | 13.4 | -58.5 | .0 | 1201.4 |

```
 22   2823.9    126.2   1200.0     12.5    -53.9       .0    1201.2
 23   1899.1    126.2   1200.0     11.6    -49.3       .0    1201.0
 24    974.4    126.2   1200.0     10.6    -44.8       .0    1200.8
 25     49.6    537.3    299.5     31.6   -102.0       .0     316.4
 26   5131.5    539.7    290.4     40.4   -140.4       .0     322.6
 27   4206.8     94.4   1266.1     13.9    -60.8       .0    1267.5
 28   3282.0     94.4   1266.1     12.9    -56.2       .0    1267.3
 29   2357.2     94.4   1266.1     12.0    -51.6       .0    1267.1
 30   1432.4     94.4   1266.1     11.1    -47.1       .0    1266.9
 31    507.7    539.7    290.4     28.2    -94.9       .0     305.5
 32   4664.8    673.0      9.3     45.7   -152.7       .0     153.0
 33   3740.1    128.3   1190.0     13.4    -58.5       .0    1191.4
 34   2815.3    128.3   1190.0     12.5    -53.9       .0    1191.2
 35   1890.5    128.3   1190.0     11.6    -49.3       .0    1191.0
 36    965.7    542.2    281.3     34.4   -112.1       .0     302.9
-------------------------------------------------------------------

Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 5
spalla mobile - n777 _STRM5- n789 _STRM5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 37242.8 | 6884.3 | 61621.6 | -16091.9 | -59466.5 | -40694.8 |
| 2 | 37966.8 | 6762.6 | 64185.2 | 16631.9 | 60085.1 | 41998.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 75209.6 | 13646.9 | 125806.8 | 540.0 | 8365.4 | 2605.6 |

Punto di applic. carico verticale: Xv = 1.673 m Yv = .111 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 10.446 | 12.064 | 1.516 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3930.2 | 907.4 | -1490.3 | 35.0 | -112.1 | .0 | 1494.5 |
| 2 | 3323.8 | 282.2 | -13.0 | 10.1 | -40.5 | .0 | 42.5 |
| 3 | 2717.5 | 210.7 | 176.2 | 9.4 | -37.2 | .0 | 180.0 |
| 4 | 2111.1 | 210.7 | 176.2 | 8.7 | -34.0 | .0 | 179.4 |
| 5 | 1504.8 | 210.7 | 176.2 | 8.1 | -30.7 | .0 | 178.8 |
| 6 | 898.5 | 210.7 | 176.2 | 7.4 | -27.4 | .0 | 178.3 |
| 7 | 292.1 | 648.8 | -913.2 | 22.9 | -68.8 | .0 | 915.8 |
| 8 | 3632.0 | 647.1 | -906.7 | 29.0 | -96.0 | .0 | 911.8 |
| 9 | 3025.7 | 173.0 | 278.5 | 9.7 | -38.9 | .0 | 281.2 |
| 10 | 2419.4 | 173.0 | 278.5 | 9.1 | -35.6 | .0 | 280.8 |
| 11 | 1813.0 | 173.0 | 278.5 | 8.4 | -32.3 | .0 | 280.4 |
| 12 | 1206.7 | 173.0 | 278.5 | 7.8 | -29.1 | .0 | 280.0 |
| 13 | 600.3 | 647.1 | -906.7 | 20.3 | -63.5 | .0 | 909.0 |
| 14 | 3333.9 | 778.1 | -1201.7 | 32.9 | -104.9 | .0 | 1206.3 |
| 15 | 2727.6 | 209.2 | 183.3 | 9.4 | -37.2 | .0 | 187.0 |
| 16 | 2121.2 | 209.2 | 183.3 | 8.7 | -34.0 | .0 | 186.4 |
| 17 | 1514.9 | 209.2 | 183.3 | 8.1 | -30.7 | .0 | 185.8 |
| 18 | 908.6 | 645.4 | -900.2 | 24.9 | -76.0 | .0 | 903.4 |
| 19 | 3886.2 | 927.2 | -1558.8 | 35.0 | -112.1 | .0 | 1562.8 |
| 20 | 3279.9 | 290.2 | -48.9 | 10.1 | -40.5 | .0 | 63.5 |
| 21 | 2673.5 | 217.2 | 145.1 | 9.4 | -37.2 | .0 | 149.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2067.2 | 217.2 | 145.1 | 8.7 | -34.0 | .0 | 149.0 |
| 23 | 1460.8 | 217.2 | 145.1 | 8.1 | -30.7 | .0 | 148.3 |
| 24 | 854.5 | 217.2 | 145.1 | 7.4 | -27.4 | .0 | 147.7 |
| 25 | 248.2 | 663.9 | -969.7 | 22.9 | -68.8 | .0 | 972.1 |
| 26 | 3578.0 | 665.7 | -976.2 | 29.0 | -96.0 | .0 | 980.9 |
| 27 | 2971.6 | 180.0 | 243.6 | 9.7 | -38.9 | .0 | 246.7 |
| 28 | 2365.3 | 180.0 | 243.6 | 9.1 | -35.6 | .0 | 246.2 |
| 29 | 1759.0 | 180.0 | 243.6 | 8.4 | -32.3 | .0 | 245.7 |
| 30 | 1152.6 | 180.0 | 243.6 | 7.8 | -29.1 | .0 | 245.3 |
| 31 | 546.3 | 665.7 | -976.2 | 20.3 | -63.5 | .0 | 978.2 |
| 32 | 3269.8 | 803.7 | -1293.5 | 32.9 | -104.9 | .0 | 1297.7 |
| 33 | 2663.4 | 218.7 | 137.9 | 9.4 | -37.2 | .0 | 142.9 |
| 34 | 2057.1 | 218.7 | 137.9 | 8.7 | -34.0 | .0 | 142.1 |
| 35 | 1450.7 | 218.7 | 137.9 | 8.1 | -30.7 | .0 | 141.3 |
| 36 | 844.4 | 667.4 | -982.7 | 24.9 | -76.0 | .0 | 985.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 6
spalla mobile - n777 _STRM6- n789 _STRM6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48663.7 | 5060.7 | 107499.0 | -21860.1 | -80928.9 | -52630.3 |
| 2 | 49943.9 | 4806.2 | 111925.5 | 22934.1 | 81860.2 | 55089.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.6 | 9866.9 | 219424.5 | 1074.0 | 14629.5 | 5181.9 |

Punto di applic. carico verticale: Xv = 2.225 m Yv = .148 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 13.159 | 2.163 | .562 | .023 | .017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5373.8 | 743.5 | -217.1 | 69.4 | -224.9 | .0 | 312.6 |
| 2 | 4508.7 | 179.8 | 981.4 | 20.1 | -82.7 | .0 | 984.9 |
| 3 | 3643.7 | 119.2 | 1116.9 | 18.8 | -76.2 | .0 | 1119.5 |
| 4 | 2778.7 | 119.2 | 1116.9 | 17.5 | -69.7 | .0 | 1119.1 |
| 5 | 1913.6 | 119.2 | 1116.9 | 16.2 | -63.2 | .0 | 1118.7 |
| 6 | 1048.6 | 119.2 | 1116.9 | 14.9 | -56.7 | .0 | 1118.3 |
| 7 | 183.5 | 505.3 | 270.0 | 45.3 | -138.7 | .0 | 303.6 |
| 8 | 4950.4 | 501.9 | 282.9 | 57.6 | -192.8 | .0 | 342.4 |
| 9 | 4085.3 | 87.1 | 1189.9 | 19.4 | -79.4 | .0 | 1192.6 |
| 10 | 3220.3 | 87.1 | 1189.9 | 18.1 | -73.0 | .0 | 1192.2 |
| 11 | 2355.2 | 87.1 | 1189.9 | 16.8 | -66.5 | .0 | 1191.8 |
| 12 | 1490.2 | 87.1 | 1189.9 | 15.5 | -60.0 | .0 | 1191.5 |
| 13 | 625.2 | 501.9 | 282.9 | 40.4 | -128.3 | .0 | 310.7 |
| 14 | 4526.9 | 619.4 | 45.1 | 65.4 | -210.5 | .0 | 215.3 |
| 15 | 3661.9 | 116.3 | 1131.1 | 18.8 | -76.2 | .0 | 1133.7 |
| 16 | 2796.8 | 116.3 | 1131.1 | 17.5 | -69.7 | .0 | 1133.3 |
| 17 | 1931.8 | 116.3 | 1131.1 | 16.2 | -63.2 | .0 | 1132.9 |
| 18 | 1066.8 | 498.4 | 295.8 | 49.3 | -153.0 | .0 | 333.1 |
| 19 | 5294.7 | 782.8 | -353.4 | 69.4 | -224.9 | .0 | 418.9 |
| 20 | 4429.6 | 195.7 | 910.0 | 20.1 | -82.7 | .0 | 913.8 |
| 21 | 3564.6 | 132.2 | 1055.1 | 18.8 | -76.2 | .0 | 1057.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2699.5 | 132.2 | 1055.1 | 17.5 | -69.7 | .0 | 1057.4 |
| 23 | 1834.5 | 132.2 | 1055.1 | 16.2 | -63.2 | .0 | 1057.0 |
| 24 | 969.5 | 132.2 | 1055.1 | 14.9 | -56.7 | .0 | 1056.6 |
| 25 | 104.4 | 535.3 | 157.7 | 45.3 | -138.7 | .0 | 210.0 |
| 26 | 4853.0 | 538.8 | 144.8 | 57.6 | -192.8 | .0 | 241.2 |
| 27 | 3988.0 | 101.1 | 1120.5 | 19.4 | -79.4 | .0 | 1123.3 |
| 28 | 3123.0 | 101.1 | 1120.5 | 18.1 | -73.0 | .0 | 1122.9 |
| 29 | 2257.9 | 101.1 | 1120.5 | 16.8 | -66.5 | .0 | 1122.5 |
| 30 | 1392.9 | 101.1 | 1120.5 | 15.5 | -60.0 | .0 | 1122.1 |
| 31 | 527.8 | 538.8 | 144.8 | 40.4 | -128.3 | .0 | 193.5 |
| 32 | 4411.4 | 670.3 | -137.4 | 65.4 | -210.5 | .0 | 251.4 |
| 33 | 3546.4 | 135.2 | 1040.9 | 18.8 | -76.2 | .0 | 1043.7 |
| 34 | 2681.4 | 135.2 | 1040.9 | 17.5 | -69.7 | .0 | 1043.2 |
| 35 | 1816.3 | 135.2 | 1040.9 | 16.2 | -63.2 | .0 | 1042.8 |
| 36 | 951.3 | 542.2 | 131.9 | 49.3 | -153.0 | .0 | 202.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 7
spalla mobile - n777 _STRM7- n789 _STRM7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 49944.0 | 6694.3 | 121556.6 | -22839.5 | -82695.5 | -62742.1 |
| 2 | 48663.6 | 6952.5 | 117145.9 | 21765.5 | 81762.9 | 60323.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.6 | 13646.8 | 238702.5 | -1074.0 | -14632.9 | -5181.4 |

Punto di applic. carico verticale: Xv = 2.421 m Yv = -.148 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 15.963 | 2.453 | -.562 | -.023 | -.017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5643.4 | 1024.8 | -874.6 | -69.4 | 224.9 | .0 | 903.1 |
| 2 | 4662.1 | 277.3 | 784.1 | -20.1 | 82.7 | .0 | 788.5 |
| 3 | 3680.8 | 195.0 | 982.1 | -18.8 | 76.2 | .0 | 985.0 |
| 4 | 2699.5 | 195.0 | 982.1 | -17.5 | 69.7 | .0 | 984.5 |
| 5 | 1718.3 | 195.0 | 982.1 | -16.2 | 63.2 | .0 | 984.1 |
| 6 | 737.0 | 195.0 | 982.1 | -14.9 | 56.7 | .0 | 983.7 |
| 7 | -244.3 | 711.6 | -211.4 | -45.3 | 138.7 | .0 | 252.8 |
| 8 | 5143.6 | 715.0 | -224.3 | -57.6 | 192.8 | .0 | 295.8 |
| 9 | 4162.4 | 154.0 | 1075.7 | -19.4 | 79.4 | .0 | 1078.6 |
| 10 | 3181.1 | 154.0 | 1075.7 | -18.1 | 73.0 | .0 | 1078.2 |
| 11 | 2199.8 | 154.0 | 1075.7 | -16.8 | 66.5 | .0 | 1077.7 |
| 12 | 1218.5 | 154.0 | 1075.7 | -15.5 | 60.0 | .0 | 1077.4 |
| 13 | 237.2 | 715.0 | -224.3 | -40.4 | 128.3 | .0 | 258.4 |
| 14 | 4643.9 | 880.5 | -586.7 | -65.4 | 210.5 | .0 | 623.3 |
| 15 | 3662.6 | 197.9 | 967.9 | -18.8 | 76.2 | .0 | 970.8 |
| 16 | 2681.3 | 197.9 | 967.9 | -17.5 | 69.7 | .0 | 970.4 |
| 17 | 1700.1 | 197.9 | 967.9 | -16.2 | 63.2 | .0 | 969.9 |
| 18 | 718.8 | 718.5 | -237.2 | -49.3 | 153.0 | .0 | 282.3 |
| 19 | 5722.5 | 985.4 | -738.4 | -69.4 | 224.9 | .0 | 771.9 |
| 20 | 4741.2 | 261.4 | 855.5 | -20.1 | 82.7 | .0 | 859.5 |
| 21 | 3759.9 | 182.0 | 1043.9 | -18.8 | 76.2 | .0 | 1046.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2778.7 | 182.0 | 1043.9 | -17.5 | 69.7 | .0 | 1046.2 |
| 23 | 1797.4 | 182.0 | 1043.9 | -16.2 | 63.2 | .0 | 1045.8 |
| 24 | 816.1 | 182.0 | 1043.9 | -14.9 | 56.7 | .0 | 1045.4 |
| 25 | -165.2 | 681.6 | -99.1 | -45.3 | 138.7 | .0 | 170.5 |
| 26 | 5241.0 | 678.1 | -86.2 | -57.6 | 192.8 | .0 | 211.2 |
| 27 | 4259.7 | 140.1 | 1145.1 | -19.4 | 79.4 | .0 | 1147.9 |
| 28 | 3278.4 | 140.1 | 1145.1 | -18.1 | 73.0 | .0 | 1147.4 |
| 29 | 2297.1 | 140.1 | 1145.1 | -16.8 | 66.5 | .0 | 1147.0 |
| 30 | 1315.8 | 140.1 | 1145.1 | -15.5 | 60.0 | .0 | 1146.7 |
| 31 | 334.6 | 678.1 | -86.2 | -40.4 | 128.3 | .0 | 154.6 |
| 32 | 4759.4 | 829.6 | -404.2 | -65.4 | 210.5 | .0 | 455.7 |
| 33 | 3778.1 | 179.0 | 1058.1 | -18.8 | 76.2 | .0 | 1060.8 |
| 34 | 2796.9 | 179.0 | 1058.1 | -17.5 | 69.7 | .0 | 1060.4 |
| 35 | 1815.6 | 179.0 | 1058.1 | -16.2 | 63.2 | .0 | 1059.9 |
| 36 | 834.3 | 674.7 | -73.3 | -49.3 | 153.0 | .0 | 169.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 8
spalla mobile - n777 _STRM8 - n789 _STRM8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 49944.0 | 4805.0 | 111919.3 | -22904.5 | -82397.7 | -54266.3 |
| 2 | 48663.6 | 5061.9 | 107505.1 | 21830.5 | 81464.5 | 51833.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 98607.6 | 9866.9 | 219424.4 | -1074.0 | -14633.5 | -5181.9 |

Punto di applic. carico verticale: Xv = 2.225 m Yv = -.148 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.695 | 13.159 | 2.163 | -.562 | -.023 | -.017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5294.7 | 782.8 | -353.4 | -69.4 | 224.9 | .0 | 418.9 |
| 2 | 4429.6 | 195.7 | 910.0 | -20.1 | 82.7 | .0 | 913.8 |
| 3 | 3564.6 | 132.2 | 1055.1 | -18.8 | 76.2 | .0 | 1057.8 |
| 4 | 2699.5 | 132.2 | 1055.1 | -17.5 | 69.7 | .0 | 1057.4 |
| 5 | 1834.5 | 132.2 | 1055.1 | -16.2 | 63.2 | .0 | 1057.0 |
| 6 | 969.5 | 132.2 | 1055.1 | -14.9 | 56.7 | .0 | 1056.6 |
| 7 | 104.4 | 535.3 | 157.7 | -45.3 | 138.7 | .0 | 210.0 |
| 8 | 4853.0 | 538.8 | 144.8 | -57.6 | 192.8 | .0 | 241.2 |
| 9 | 3988.0 | 101.1 | 1120.5 | -19.4 | 79.4 | .0 | 1123.3 |
| 10 | 3123.0 | 101.1 | 1120.5 | -18.1 | 73.0 | .0 | 1122.9 |
| 11 | 2257.9 | 101.1 | 1120.5 | -16.8 | 66.5 | .0 | 1122.5 |
| 12 | 1392.9 | 101.1 | 1120.5 | -15.5 | 60.0 | .0 | 1122.1 |
| 13 | 527.8 | 538.8 | 144.8 | -40.4 | 128.3 | .0 | 193.5 |
| 14 | 4411.4 | 670.3 | -137.4 | -65.4 | 210.5 | .0 | 251.4 |
| 15 | 3546.4 | 135.2 | 1040.9 | -18.8 | 76.2 | .0 | 1043.7 |
| 16 | 2681.3 | 135.2 | 1040.9 | -17.5 | 69.7 | .0 | 1043.2 |
| 17 | 1816.3 | 135.2 | 1040.9 | -16.2 | 63.2 | .0 | 1042.8 |
| 18 | 951.3 | 542.2 | 131.9 | -49.3 | 153.0 | .0 | 202.0 |
| 19 | 5373.8 | 743.5 | -217.1 | -69.4 | 224.9 | .0 | 312.6 |
| 20 | 4508.7 | 179.8 | 981.4 | -20.1 | 82.7 | .0 | 984.9 |
| 21 | 3643.7 | 119.2 | 1116.9 | -18.8 | 76.2 | .0 | 1119.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2778.7 | 119.2 | 1116.9 | -17.5 | 69.7 | .0 | 1119.1 |
| 23 | 1913.6 | 119.2 | 1116.9 | -16.2 | 63.2 | .0 | 1118.7 |
| 24 | 1048.6 | 119.2 | 1116.9 | -14.9 | 56.7 | .0 | 1118.3 |
| 25 | 183.5 | 505.3 | 270.0 | -45.3 | 138.7 | .0 | 303.6 |
| 26 | 4950.4 | 501.9 | 282.9 | -57.6 | 192.8 | .0 | 342.4 |
| 27 | 4085.3 | 87.1 | 1189.9 | -19.4 | 79.4 | .0 | 1192.6 |
| 28 | 3220.3 | 87.1 | 1189.9 | -18.1 | 73.0 | .0 | 1192.2 |
| 29 | 2355.2 | 87.1 | 1189.9 | -16.8 | 66.5 | .0 | 1191.8 |
| 30 | 1490.2 | 87.1 | 1189.9 | -15.5 | 60.0 | .0 | 1191.5 |
| 31 | 625.2 | 501.9 | 282.9 | -40.4 | 128.3 | .0 | 310.7 |
| 32 | 4526.9 | 619.4 | 45.1 | -65.4 | 210.5 | .0 | 215.3 |
| 33 | 3661.9 | 116.3 | 1131.1 | -18.8 | 76.2 | .0 | 1133.7 |
| 34 | 2796.9 | 116.3 | 1131.1 | -17.5 | 69.7 | .0 | 1133.3 |
| 35 | 1931.8 | 116.3 | 1131.1 | -16.2 | 63.2 | .0 | 1132.9 |
| 36 | 1066.8 | 498.4 | 295.8 | -49.3 | 153.0 | .0 | 333.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 9
spalla mobile - n777 _STRM9- n789 _STRM9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 45742.3 | 6918.4 | 103490.3 | -20631.3 | -75732.2 | -56709.4 |
| 2 | 48298.8 | 6728.4 | 113178.7 | 21705.3 | 79046.2 | 59859.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 94041.1 | 13646.8 | 216669.0 | 1074.0 | 30668.6 | 5182.6 |

Punto di applic. carico verticale: Xv = 2.304 m Yv = .326 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.061 | 15.202 | 2.270 | .642 | .042 | .017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5409.3 | 968.3 | -878.5 | 70.7 | -209.7 | .0 | 903.2 |
| 2 | 4501.2 | 264.7 | 689.5 | 19.5 | -65.5 | .0 | 692.6 |
| 3 | 3593.1 | 187.0 | 877.5 | 18.2 | -59.0 | .0 | 879.5 |
| 4 | 2685.0 | 187.0 | 877.5 | 16.9 | -52.5 | .0 | 879.1 |
| 5 | 1776.9 | 187.0 | 877.5 | 15.6 | -46.0 | .0 | 878.7 |
| 6 | 868.8 | 187.0 | 877.5 | 14.3 | -39.5 | .0 | 878.4 |
| 7 | -39.3 | 673.7 | -252.6 | 46.7 | -123.5 | .0 | 281.1 |
| 8 | 4972.0 | 670.3 | -239.7 | 58.5 | -176.9 | .0 | 297.9 |
| 9 | 4063.9 | 145.8 | 979.4 | 18.8 | -62.2 | .0 | 981.3 |
| 10 | 3155.8 | 145.8 | 979.4 | 17.5 | -55.7 | .0 | 980.9 |
| 11 | 2247.7 | 145.8 | 979.4 | 16.2 | -49.2 | .0 | 980.6 |
| 12 | 1339.6 | 145.8 | 979.4 | 14.9 | -42.7 | .0 | 980.3 |
| 13 | 431.5 | 670.3 | -239.7 | 41.2 | -112.4 | .0 | 264.7 |
| 14 | 4534.7 | 817.1 | -550.9 | 66.7 | -195.3 | .0 | 584.5 |
| 15 | 3626.6 | 184.0 | 891.7 | 18.2 | -59.0 | .0 | 893.7 |
| 16 | 2718.5 | 184.0 | 891.7 | 16.9 | -52.5 | .0 | 893.3 |
| 17 | 1810.4 | 184.0 | 891.7 | 15.6 | -46.0 | .0 | 892.9 |
| 18 | 902.2 | 666.8 | -226.7 | 50.7 | -137.8 | .0 | 265.4 |
| 19 | 5263.8 | 1007.7 | -1014.8 | 70.7 | -209.7 | .0 | 1036.2 |
| 20 | 4355.7 | 280.6 | 618.1 | 19.5 | -65.5 | .0 | 621.5 |
| 21 | 3447.6 | 199.9 | 815.7 | 18.2 | -59.0 | .0 | 817.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2539.5 | 199.9 | 815.7 | 16.9 | -52.5 | .0 | 817.4 |
| 23 | 1631.4 | 199.9 | 815.7 | 15.6 | -46.0 | .0 | 817.0 |
| 24 | 723.3 | 199.9 | 815.7 | 14.3 | -39.5 | .0 | 816.7 |
| 25 | -184.8 | 703.7 | -364.9 | 46.7 | -123.5 | .0 | 385.2 |
| 26 | 4793.0 | 707.2 | -377.8 | 58.5 | -176.9 | .0 | 417.2 |
| 27 | 3884.9 | 159.8 | 909.9 | 18.8 | -62.2 | .0 | 912.0 |
| 28 | 2976.8 | 159.8 | 909.9 | 17.5 | -55.7 | .0 | 911.6 |
| 29 | 2068.7 | 159.8 | 909.9 | 16.2 | -49.2 | .0 | 911.2 |
| 30 | 1160.6 | 159.8 | 909.9 | 14.9 | -42.7 | .0 | 910.9 |
| 31 | 252.5 | 707.2 | -377.8 | 41.2 | -112.4 | .0 | 394.2 |
| 32 | 4322.3 | 868.0 | -733.5 | 66.7 | -195.3 | .0 | 759.1 |
| 33 | 3414.2 | 202.9 | 801.5 | 18.2 | -59.0 | .0 | 803.7 |
| 34 | 2506.0 | 202.9 | 801.5 | 16.9 | -52.5 | .0 | 803.2 |
| 35 | 1597.9 | 202.9 | 801.5 | 15.6 | -46.0 | .0 | 802.8 |
| 36 | 689.8 | 710.6 | -390.7 | 50.7 | -137.8 | .0 | 414.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 10
spalla mobile - n777 _STRM10- n789 _STRM10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 45742.4 | 5029.1 | 93853.0 | -20696.4 | -75434.4 | -48233.6 |
| 2 | 48298.7 | 4837.8 | 103538.0 | 21770.4 | 78747.8 | 51368.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 94041.1 | 9866.9 | 197391.0 | 1074.0 | 30665.8 | 5182.1 |

Punto di applic. carico verticale: Xv = 2.099 m Yv = .326 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.061 | 12.398 | 1.980 | .642 | .042 | .017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5060.6 | 726.3 | -357.2 | 70.7 | -209.7 | .0 | 414.2 |
| 2 | 4268.7 | 183.1 | 815.4 | 19.5 | -65.5 | .0 | 818.0 |
| 3 | 3476.9 | 124.2 | 950.6 | 18.2 | -59.0 | .0 | 952.4 |
| 4 | 2685.0 | 124.2 | 950.6 | 16.9 | -52.5 | .0 | 952.0 |
| 5 | 1893.1 | 124.2 | 950.6 | 15.6 | -46.0 | .0 | 951.7 |
| 6 | 1101.3 | 124.2 | 950.6 | 14.3 | -39.5 | .0 | 951.4 |
| 7 | 309.4 | 497.5 | 116.6 | 46.7 | -123.5 | .0 | 169.8 |
| 8 | 4681.4 | 494.0 | 129.5 | 58.5 | -176.9 | .0 | 219.3 |
| 9 | 3889.5 | 92.9 | 1024.2 | 18.8 | -62.2 | .0 | 1026.1 |
| 10 | 3097.7 | 92.9 | 1024.2 | 17.5 | -55.7 | .0 | 1025.7 |
| 11 | 2305.8 | 92.9 | 1024.2 | 16.2 | -49.2 | .0 | 1025.4 |
| 12 | 1513.9 | 92.9 | 1024.2 | 14.9 | -42.7 | .0 | 1025.1 |
| 13 | 722.1 | 494.0 | 129.5 | 41.2 | -112.4 | .0 | 171.5 |
| 14 | 4302.2 | 606.9 | -101.7 | 66.7 | -195.3 | .0 | 220.2 |
| 15 | 3510.3 | 121.2 | 964.8 | 18.2 | -59.0 | .0 | 966.6 |
| 16 | 2718.5 | 121.2 | 964.8 | 16.9 | -52.5 | .0 | 966.2 |
| 17 | 1926.6 | 121.2 | 964.8 | 15.6 | -46.0 | .0 | 965.9 |
| 18 | 1134.7 | 490.6 | 142.4 | 50.7 | -137.8 | .0 | 198.2 |
| 19 | 4915.1 | 765.7 | -493.5 | 70.7 | -209.7 | .0 | 536.2 |
| 20 | 4123.2 | 199.0 | 744.0 | 19.5 | -65.5 | .0 | 746.9 |
| 21 | 3331.4 | 137.2 | 888.8 | 18.2 | -59.0 | .0 | 890.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2539.5 | 137.2 | 888.8 | 16.9 | -52.5 | .0 | 890.3 |
| 23 | 1747.6 | 137.2 | 888.8 | 15.6 | -46.0 | .0 | 889.9 |
| 24 | 955.8 | 137.2 | 888.8 | 14.3 | -39.5 | .0 | 889.6 |
| 25 | 163.9 | 527.5 | 4.3 | 46.7 | -123.5 | .0 | 123.6 |
| 26 | 4502.4 | 530.9 | -8.6 | 58.5 | -176.9 | .0 | 177.2 |
| 27 | 3710.6 | 106.9 | 954.7 | 18.8 | -62.2 | .0 | 956.8 |
| 28 | 2918.7 | 106.9 | 954.7 | 17.5 | -55.7 | .0 | 956.4 |
| 29 | 2126.8 | 106.9 | 954.7 | 16.2 | -49.2 | .0 | 956.0 |
| 30 | 1335.0 | 106.9 | 954.7 | 14.9 | -42.7 | .0 | 955.7 |
| 31 | 543.1 | 530.9 | -8.6 | 41.2 | -112.4 | .0 | 112.7 |
| 32 | 4089.8 | 657.8 | -284.2 | 66.7 | -195.3 | .0 | 344.9 |
| 33 | 3297.9 | 140.1 | 874.5 | 18.2 | -59.0 | .0 | 876.5 |
| 34 | 2506.1 | 140.1 | 874.5 | 16.9 | -52.5 | .0 | 876.1 |
| 35 | 1714.2 | 140.1 | 874.5 | 15.6 | -46.0 | .0 | 875.8 |
| 36 | 922.3 | 534.4 | -21.5 | 50.7 | -137.8 | .0 | 139.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 11
spalla mobile - n777 _STRM11- n789 _STRM11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48298.8 | 6725.8 | 113168.9 | -21675.7 | -79583.0 | -59021.1 |
| 2 | 45742.3 | 6921.0 | 103500.1 | 20601.7 | 76268.4 | 55927.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 94041.1 | 13646.8 | 216669.0 | -1074.0 | -30669.1 | -5182.2 |

Punto di applic. carico verticale: Xv = 2.304 m Yv = -.326 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.061 | 15.202 | 2.270 | -.642 | -.042 | -.017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5263.8 | 1007.7 | -1014.8 | -70.7 | 209.7 | .0 | 1036.2 |
| 2 | 4355.7 | 280.6 | 618.1 | -19.5 | 65.5 | .0 | 621.5 |
| 3 | 3447.6 | 199.9 | 815.7 | -18.2 | 59.0 | .0 | 817.8 |
| 4 | 2539.5 | 199.9 | 815.7 | -16.9 | 52.5 | .0 | 817.4 |
| 5 | 1631.4 | 199.9 | 815.7 | -15.6 | 46.0 | .0 | 817.0 |
| 6 | 723.3 | 199.9 | 815.7 | -14.3 | 39.5 | .0 | 816.7 |
| 7 | -184.8 | 703.7 | -364.9 | -46.7 | 123.5 | .0 | 385.2 |
| 8 | 4793.0 | 707.2 | -377.8 | -58.5 | 176.9 | .0 | 417.2 |
| 9 | 3884.9 | 159.8 | 909.9 | -18.8 | 62.2 | .0 | 912.0 |
| 10 | 2976.8 | 159.8 | 909.9 | -17.5 | 55.7 | .0 | 911.6 |
| 11 | 2068.7 | 159.8 | 909.9 | -16.2 | 49.2 | .0 | 911.2 |
| 12 | 1160.6 | 159.8 | 909.9 | -14.9 | 42.7 | .0 | 910.9 |
| 13 | 252.5 | 707.2 | -377.8 | -41.2 | 112.4 | .0 | 394.2 |
| 14 | 4322.3 | 868.0 | -733.5 | -66.7 | 195.3 | .0 | 759.1 |
| 15 | 3414.1 | 202.9 | 801.5 | -18.2 | 59.0 | .0 | 803.7 |
| 16 | 2506.0 | 202.9 | 801.5 | -16.9 | 52.5 | .0 | 803.2 |
| 17 | 1597.9 | 202.9 | 801.5 | -15.6 | 46.0 | .0 | 802.8 |
| 18 | 689.8 | 710.6 | -390.7 | -50.7 | 137.8 | .0 | 414.3 |
| 19 | 5409.3 | 968.3 | -878.5 | -70.7 | 209.7 | .0 | 903.2 |
| 20 | 4501.2 | 264.7 | 689.5 | -19.5 | 65.5 | .0 | 692.6 |
| 21 | 3593.1 | 187.0 | 877.5 | -18.2 | 59.0 | .0 | 879.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2685.0 | 187.0 | 877.5 | -16.9 | 52.5 | .0 | 879.1 |
| 23 | 1776.9 | 187.0 | 877.5 | -15.6 | 46.0 | .0 | 878.7 |
| 24 | 868.8 | 187.0 | 877.5 | -14.3 | 39.5 | .0 | 878.4 |
| 25 | -39.3 | 673.7 | -252.6 | -46.7 | 123.5 | .0 | 281.1 |
| 26 | 4972.0 | 670.3 | -239.7 | -58.5 | 176.9 | .0 | 297.9 |
| 27 | 4063.9 | 145.8 | 979.4 | -18.8 | 62.2 | .0 | 981.3 |
| 28 | 3155.8 | 145.8 | 979.4 | -17.5 | 55.7 | .0 | 980.9 |
| 29 | 2247.7 | 145.8 | 979.4 | -16.2 | 49.2 | .0 | 980.6 |
| 30 | 1339.6 | 145.8 | 979.4 | -14.9 | 42.7 | .0 | 980.3 |
| 31 | 431.5 | 670.3 | -239.7 | -41.2 | 112.4 | .0 | 264.7 |
| 32 | 4534.7 | 817.1 | -550.9 | -66.7 | 195.3 | .0 | 584.5 |
| 33 | 3626.6 | 184.0 | 891.7 | -18.2 | 59.0 | .0 | 893.7 |
| 34 | 2718.5 | 184.0 | 891.7 | -16.9 | 52.5 | .0 | 893.3 |
| 35 | 1810.4 | 184.0 | 891.7 | -15.6 | 46.0 | .0 | 892.9 |
| 36 | 902.3 | 666.8 | -226.8 | -50.7 | 137.8 | .0 | 265.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 12
spalla mobile - n777 _STRM12- n789 _STRM12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 48298.8 | 4836.5 | 103531.7 | -21740.8 | -79285.2 | -50545.3 |
| 2 | 45742.3 | 5030.3 | 93859.3 | 20666.8 | 75970.0 | 47437.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 94041.1 | 9866.8 | 197391.0 | -1074.0 | -30669.8 | -5181.7 |

Punto di applic. carico verticale: Xv = 2.099 m Yv = -.326 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 13.061 | 12.398 | 1.980 | -.642 | -.042 | -.017 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4915.1 | 765.7 | -493.5 | -70.7 | 209.7 | .0 | 536.2 |
| 2 | 4123.2 | 199.0 | 744.0 | -19.5 | 65.5 | .0 | 746.9 |
| 3 | 3331.4 | 137.1 | 888.8 | -18.2 | 59.0 | .0 | 890.7 |
| 4 | 2539.5 | 137.1 | 888.8 | -16.9 | 52.5 | .0 | 890.3 |
| 5 | 1747.6 | 137.1 | 888.8 | -15.6 | 46.0 | .0 | 890.0 |
| 6 | 955.8 | 137.1 | 888.8 | -14.3 | 39.5 | .0 | 889.6 |
| 7 | 163.9 | 527.5 | 4.3 | -46.7 | 123.5 | .0 | 123.6 |
| 8 | 4502.4 | 530.9 | -8.6 | -58.5 | 176.9 | .0 | 177.1 |
| 9 | 3710.6 | 106.9 | 954.7 | -18.8 | 62.2 | .0 | 956.8 |
| 10 | 2918.7 | 106.9 | 954.7 | -17.5 | 55.7 | .0 | 956.4 |
| 11 | 2126.8 | 106.9 | 954.7 | -16.2 | 49.2 | .0 | 956.0 |
| 12 | 1335.0 | 106.9 | 954.7 | -14.9 | 42.7 | .0 | 955.7 |
| 13 | 543.1 | 530.9 | -8.6 | -41.2 | 112.4 | .0 | 112.7 |
| 14 | 4089.8 | 657.8 | -284.2 | -66.7 | 195.3 | .0 | 344.8 |
| 15 | 3297.9 | 140.1 | 874.6 | -18.2 | 59.0 | .0 | 876.5 |
| 16 | 2506.0 | 140.1 | 874.6 | -16.9 | 52.5 | .0 | 876.1 |
| 17 | 1714.2 | 140.1 | 874.6 | -15.6 | 46.0 | .0 | 875.8 |
| 18 | 922.3 | 534.4 | -21.5 | -50.7 | 137.8 | .0 | 139.5 |
| 19 | 5060.6 | 726.3 | -357.2 | -70.7 | 209.7 | .0 | 414.2 |
| 20 | 4268.7 | 183.1 | 815.4 | -19.5 | 65.5 | .0 | 818.0 |
| 21 | 3476.9 | 124.2 | 950.6 | -18.2 | 59.0 | .0 | 952.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2685.0 | 124.2 | 950.6 | -16.9 | 52.5 | .0 | 952.0 |
| 23 | 1893.1 | 124.2 | 950.6 | -15.6 | 46.0 | .0 | 951.7 |
| 24 | 1101.3 | 124.2 | 950.6 | -14.3 | 39.5 | .0 | 951.4 |
| 25 | 309.4 | 497.5 | 116.6 | -46.7 | 123.5 | .0 | 169.8 |
| 26 | 4681.4 | 494.0 | 129.5 | -58.5 | 176.9 | .0 | 219.3 |
| 27 | 3889.5 | 92.9 | 1024.2 | -18.8 | 62.2 | .0 | 1026.1 |
| 28 | 3097.7 | 92.9 | 1024.2 | -17.5 | 55.7 | .0 | 1025.7 |
| 29 | 2305.8 | 92.9 | 1024.2 | -16.2 | 49.2 | .0 | 1025.4 |
| 30 | 1513.9 | 92.9 | 1024.2 | -14.9 | 42.7 | .0 | 1025.1 |
| 31 | 722.1 | 494.0 | 129.5 | -41.2 | 112.4 | .0 | 171.5 |
| 32 | 4302.2 | 606.9 | -101.7 | -66.7 | 195.3 | .0 | 220.2 |
| 33 | 3510.3 | 121.2 | 964.8 | -18.2 | 59.0 | .0 | 966.6 |
| 34 | 2718.5 | 121.2 | 964.8 | -16.9 | 52.5 | .0 | 966.2 |
| 35 | 1926.6 | 121.2 | 964.8 | -15.6 | 46.0 | .0 | 965.9 |
| 36 | 1134.7 | 490.6 | 142.4 | -50.7 | 137.8 | .0 | 198.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 13
spalla mobile - n777 _STRM13- n789 _STRM13

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 43549.8 | 7514.1 | 95265.6 | -19284.8 | -71453.3 | -54731.7 |
| 2 | 44273.8 | 7392.7 | 97829.8 | 19824.8 | 72071.8 | 56037.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 87823.6 | 14906.8 | 193095.4 | 540.0 | 8365.3 | 2605.1 |

Punto di applic. carico verticale: Xv = 2.199 m Yv = .095 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 12.198 | 15.101 | 2.118 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 5003.2 | 1035.4 | -1276.9 | 35.0 | -112.1 | .0 | 1281.9 |
| 2 | 4156.0 | 300.3 | 403.7 | 10.1 | -40.5 | .0 | 405.7 |
| 3 | 3308.7 | 217.9 | 611.3 | 9.4 | -37.2 | .0 | 612.4 |
| 4 | 2461.5 | 217.9 | 611.3 | 8.7 | -34.0 | .0 | 612.2 |
| 5 | 1614.3 | 217.9 | 611.3 | 8.1 | -30.7 | .0 | 612.1 |
| 6 | 767.1 | 217.9 | 611.3 | 7.4 | -27.4 | .0 | 611.9 |
| 7 | -80.1 | 729.3 | -612.5 | 22.9 | -68.8 | .0 | 616.3 |
| 8 | 4584.6 | 727.5 | -606.0 | 29.0 | -96.0 | .0 | 613.5 |
| 9 | 3737.4 | 174.7 | 721.4 | 9.7 | -38.9 | .0 | 722.5 |
| 10 | 2890.2 | 174.7 | 721.4 | 9.1 | -35.6 | .0 | 722.3 |
| 11 | 2043.0 | 174.7 | 721.4 | 8.4 | -32.3 | .0 | 722.2 |
| 12 | 1195.7 | 174.7 | 721.4 | 7.8 | -29.1 | .0 | 722.0 |
| 13 | 348.5 | 727.5 | -606.0 | 20.3 | -63.5 | .0 | 609.3 |
| 14 | 4166.1 | 882.8 | -946.0 | 32.9 | -104.9 | .0 | 951.8 |
| 15 | 3318.9 | 216.4 | 618.4 | 9.4 | -37.2 | .0 | 619.6 |
| 16 | 2471.6 | 216.4 | 618.4 | 8.7 | -34.0 | .0 | 619.4 |
| 17 | 1624.4 | 216.4 | 618.4 | 8.1 | -30.7 | .0 | 619.2 |
| 18 | 777.2 | 725.8 | -599.5 | 24.9 | -76.0 | .0 | 604.3 |
| 19 | 4959.2 | 1055.2 | -1345.5 | 35.0 | -112.1 | .0 | 1350.1 |
| 20 | 4112.0 | 308.3 | 367.8 | 10.1 | -40.5 | .0 | 370.0 |
| 21 | 3264.8 | 224.4 | 580.2 | 9.4 | -37.2 | .0 | 581.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2417.6 | 224.4 | 580.2 | 8.7 | -34.0 | .0 | 581.2 |
| 23 | 1570.3 | 224.4 | 580.2 | 8.1 | -30.7 | .0 | 581.0 |
| 24 | 723.1 | 224.4 | 580.2 | 7.4 | -27.4 | .0 | 580.9 |
| 25 | -124.1 | 744.3 | -668.9 | 22.9 | -68.8 | .0 | 672.4 |
| 26 | 4530.6 | 746.1 | -675.4 | 29.0 | -96.0 | .0 | 682.2 |
| 27 | 3683.3 | 181.8 | 686.5 | 9.7 | -38.9 | .0 | 687.6 |
| 28 | 2836.1 | 181.8 | 686.5 | 9.1 | -35.6 | .0 | 687.5 |
| 29 | 1988.9 | 181.8 | 686.5 | 8.4 | -32.3 | .0 | 687.3 |
| 30 | 1141.7 | 181.8 | 686.5 | 7.8 | -29.1 | .0 | 687.1 |
| 31 | 294.5 | 746.1 | -675.4 | 20.3 | -63.5 | .0 | 678.4 |
| 32 | 4101.9 | 908.4 | -1037.7 | 32.9 | -104.9 | .0 | 1043.0 |
| 33 | 3254.7 | 225.9 | 573.1 | 9.4 | -37.2 | .0 | 574.3 |
| 34 | 2407.5 | 225.9 | 573.1 | 8.7 | -34.0 | .0 | 574.1 |
| 35 | 1560.2 | 225.9 | 573.1 | 8.1 | -30.7 | .0 | 573.9 |
| 36 | 713.0 | 747.8 | -681.9 | 24.9 | -76.0 | .0 | 686.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 13
spalla mobile - n777 _STRM13- n789 _STRM13

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1055.2 | -1345.5 | 35.0 | -112.1 | 1055.8 | 1350.1 |
| 1.41 | 858.8 | -6.8 | 31.1 | -65.7 | 859.4 | 66.1 |
| 2.81 | 704.9 | 1084.9 | 27.6 | -24.6 | 705.4 | 1085.2 |
| 4.22 | 336.3 | 1861.9 | 18.0 | 8.8 | 336.7 | 1861.9 |
| 5.63 | 23.3 | 2088.8 | 8.6 | 26.9 | 24.8 | 2088.9 |
| 7.03 | -158.5 | 1973.7 | 1.8 | 33.8 | 158.5 | 1973.9 |
| 8.44 | -234.5 | 1677.0 | -2.1 | 32.8 | 234.5 | 1677.3 |
| 9.84 | -239.0 | 1341.7 | -2.8 | 29.3 | 239.0 | 1342.0 |
| 11.25 | -231.8 | 1008.6 | -3.2 | 25.0 | 231.9 | 1008.9 |
| 13.50 | -195.9 | 507.3 | -3.4 | 17.4 | 195.9 | 507.6 |
| 15.75 | -115.2 | 160.5 | -2.9 | 10.2 | 115.2 | 160.8 |
| 18.00 | -52.9 | -22.0 | -2.0 | 4.6 | 52.9 | 22.5 |
| 20.25 | -14.0 | -90.8 | -1.1 | 1.2 | 14.1 | 90.9 |
| 22.50 | 5.9 | -96.3 | -.4 | -.6 | 5.9 | 96.3 |
| 26.25 | 10.6 | -57.7 | .0 | -1.0 | 10.6 | 57.7 |
| 30.00 | 7.2 | -23.5 | .1 | -.7 | 7.2 | 23.5 |
| 33.75 | 3.1 | -4.2 | .1 | -.4 | 3.1 | 4.2 |
| 39.38 | -.1 | 2.5 | .0 | -.1 | .1 | 2.5 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 14
spalla mobile - n777 _STRM14- n789 _STRM14

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 43549.8 | 4365.3 | 79203.5 | -19393.2 | -70957.0 | -40605.3 |
| 2 | 44273.7 | 4241.6 | 81761.9 | 19933.2 | 71574.5 | 41887.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 87823.5 | 8606.9 | 160965.4 | 540.0 | 8363.2 | 2605.7 |

Punto di applic. carico verticale: Xv = 1.833 m Yv = .095 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 12.198 | 10.427 | 1.634 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4422.0 | 632.1 | -408.1 | 35.0 | -112.1 | .0 | 423.3 |
| 2 | 3768.5 | 164.3 | 613.5 | 10.1 | -40.5 | .0 | 614.9 |
| 3 | 3115.0 | 113.3 | 733.1 | 9.4 | -37.2 | .0 | 734.0 |
| 4 | 2461.5 | 113.3 | 733.1 | 8.7 | -34.0 | .0 | 733.8 |
| 5 | 1808.0 | 113.3 | 733.1 | 8.1 | -30.7 | .0 | 733.7 |
| 6 | 1154.5 | 113.3 | 733.1 | 7.4 | -27.4 | .0 | 733.6 |
| 7 | 501.1 | 435.5 | 2.8 | 22.9 | -68.8 | .0 | 68.8 |
| 8 | 4100.3 | 433.7 | 9.3 | 29.0 | -96.0 | .0 | 96.4 |
| 9 | 3446.8 | 86.5 | 796.2 | 9.7 | -38.9 | .0 | 797.1 |
| 10 | 2793.3 | 86.5 | 796.2 | 9.1 | -35.6 | .0 | 797.0 |
| 11 | 2139.8 | 86.5 | 796.2 | 8.4 | -32.3 | .0 | 796.8 |
| 12 | 1486.3 | 86.5 | 796.2 | 7.8 | -29.1 | .0 | 796.7 |
| 13 | 832.9 | 433.7 | 9.3 | 20.3 | -63.5 | .0 | 64.2 |
| 14 | 3778.6 | 532.4 | -197.2 | 32.9 | -104.9 | .0 | 223.3 |
| 15 | 3125.1 | 111.8 | 740.2 | 9.4 | -37.2 | .0 | 741.1 |
| 16 | 2471.6 | 111.8 | 740.2 | 8.7 | -34.0 | .0 | 741.0 |
| 17 | 1818.1 | 111.8 | 740.2 | 8.1 | -30.7 | .0 | 740.8 |
| 18 | 1164.7 | 432.0 | 15.8 | 24.9 | -76.0 | .0 | 77.6 |
| 19 | 4378.0 | 651.9 | -476.7 | 35.0 | -112.1 | .0 | 489.7 |
| 20 | 3724.5 | 172.3 | 577.6 | 10.1 | -40.5 | .0 | 579.0 |
| 21 | 3071.1 | 119.8 | 702.0 | 9.4 | -37.2 | .0 | 703.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2417.6 | 119.8 | 702.0 | 8.7 | -34.0 | .0 | 702.8 |
| 23 | 1764.1 | 119.8 | 702.0 | 8.1 | -30.7 | .0 | 702.6 |
| 24 | 1110.6 | 119.8 | 702.0 | 7.4 | -27.4 | .0 | 702.5 |
| 25 | 457.1 | 450.6 | -53.6 | 22.9 | -68.8 | .0 | 87.2 |
| 26 | 4046.2 | 452.3 | -60.1 | 29.0 | -96.0 | .0 | 113.2 |
| 27 | 3392.7 | 93.5 | 761.2 | 9.7 | -38.9 | .0 | 762.2 |
| 28 | 2739.3 | 93.5 | 761.2 | 9.1 | -35.6 | .0 | 762.1 |
| 29 | 2085.8 | 93.5 | 761.2 | 8.4 | -32.3 | .0 | 761.9 |
| 30 | 1432.3 | 93.5 | 761.2 | 7.8 | -29.1 | .0 | 761.8 |
| 31 | 778.8 | 452.3 | -60.1 | 20.3 | -63.5 | .0 | 87.4 |
| 32 | 3714.4 | 558.0 | -288.9 | 32.9 | -104.9 | .0 | 307.4 |
| 33 | 3060.9 | 121.3 | 694.8 | 9.4 | -37.2 | .0 | 695.8 |
| 34 | 2407.5 | 121.3 | 694.8 | 8.7 | -34.0 | .0 | 695.7 |
| 35 | 1754.0 | 121.3 | 694.8 | 8.1 | -30.7 | .0 | 695.5 |
| 36 | 1100.5 | 454.0 | -66.6 | 24.9 | -76.0 | .0 | 101.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 15
spalla mobile - n777 _STRM17- n789 _STRM17

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 43549.8 | 6884.4 | 92053.1 | -19306.5 | -71354.0 | -51906.4 |
| 2 | 44273.7 | 6762.5 | 94616.2 | 19846.5 | 71972.4 | 53207.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 87823.5 | 13646.9 | 186669.3 | 540.0 | 8364.1 | 2605.6 |

Punto di applic. carico verticale: Xv = 2.126 m Yv = .095 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 12.198 | 14.166 | 2.021 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4886.9 | 954.8 | -1103.2 | 35.0 | -112.1 | .0 | 1108.9 |
| 2 | 4078.5 | 273.1 | 445.6 | 10.1 | -40.5 | .0 | 447.5 |
| 3 | 3270.0 | 197.0 | 635.6 | 9.4 | -37.2 | .0 | 636.7 |
| 4 | 2461.5 | 197.0 | 635.6 | 8.7 | -34.0 | .0 | 636.6 |
| 5 | 1653.0 | 197.0 | 635.6 | 8.1 | -30.7 | .0 | 636.4 |
| 6 | 844.6 | 197.0 | 635.6 | 7.4 | -27.4 | .0 | 636.2 |
| 7 | 36.1 | 670.5 | -489.4 | 22.9 | -68.8 | .0 | 494.2 |
| 8 | 4487.8 | 668.8 | -482.9 | 29.0 | -96.0 | .0 | 492.4 |
| 9 | 3679.3 | 157.1 | 736.4 | 9.7 | -38.9 | .0 | 737.4 |
| 10 | 2870.8 | 157.1 | 736.4 | 9.1 | -35.6 | .0 | 737.2 |
| 11 | 2062.3 | 157.1 | 736.4 | 8.4 | -32.3 | .0 | 737.1 |
| 12 | 1253.9 | 157.1 | 736.4 | 7.8 | -29.1 | .0 | 737.0 |
| 13 | 445.4 | 668.8 | -482.9 | 20.3 | -63.5 | .0 | 487.1 |
| 14 | 4088.6 | 812.7 | -796.2 | 32.9 | -104.9 | .0 | 803.1 |
| 15 | 3280.1 | 195.5 | 642.8 | 9.4 | -37.2 | .0 | 643.9 |
| 16 | 2471.6 | 195.5 | 642.8 | 8.7 | -34.0 | .0 | 643.7 |
| 17 | 1663.1 | 195.5 | 642.8 | 8.1 | -30.7 | .0 | 643.5 |
| 18 | 854.7 | 667.0 | -476.4 | 24.9 | -76.0 | .0 | 482.4 |
| 19 | 4843.0 | 974.5 | -1171.7 | 35.0 | -112.1 | .0 | 1177.1 |
| 20 | 4034.5 | 281.1 | 409.7 | 10.1 | -40.5 | .0 | 411.7 |
| 21 | 3226.0 | 203.5 | 604.6 | 9.4 | -37.2 | .0 | 605.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2417.6 | 203.5 | 604.6 | 8.7 | -34.0 | .0 | 605.5 |
| 23 | 1609.1 | 203.5 | 604.6 | 8.1 | -30.7 | .0 | 605.4 |
| 24 | 800.6 | 203.5 | 604.6 | 7.4 | -27.4 | .0 | 605.2 |
| 25 | -7.9 | 685.6 | -545.9 | 22.9 | -68.8 | .0 | 550.2 |
| 26 | 4433.7 | 687.3 | -552.4 | 29.0 | -96.0 | .0 | 560.6 |
| 27 | 3625.2 | 164.1 | 701.5 | 9.7 | -38.9 | .0 | 702.5 |
| 28 | 2816.7 | 164.1 | 701.5 | 9.1 | -35.6 | .0 | 702.4 |
| 29 | 2008.3 | 164.1 | 701.5 | 8.4 | -32.3 | .0 | 702.2 |
| 30 | 1199.8 | 164.1 | 701.5 | 7.8 | -29.1 | .0 | 702.1 |
| 31 | 391.3 | 687.3 | -552.4 | 20.3 | -63.5 | .0 | 556.0 |
| 32 | 4024.4 | 838.3 | -888.0 | 32.9 | -104.9 | .0 | 894.2 |
| 33 | 3215.9 | 205.0 | 597.4 | 9.4 | -37.2 | .0 | 598.6 |
| 34 | 2407.5 | 205.0 | 597.4 | 8.7 | -34.0 | .0 | 598.4 |
| 35 | 1599.0 | 205.0 | 597.4 | 8.1 | -30.7 | .0 | 598.2 |
| 36 | 790.5 | 689.1 | -558.9 | 24.9 | -76.0 | .0 | 564.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobileSLU statica

CONDIZIONE DI CARICO 16
spalla mobile - n777 _STRM18- n789 _STRM18

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 43549.8 | 4995.0 | 82415.9 | -19371.5 | -71056.3 | -43430.6 |
| 2 | 44273.7 | 4871.8 | 84975.5 | 19911.5 | 71674.0 | 44717.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 87823.5 | 9866.8 | 167391.4 | 540.0 | 8363.4 | 2605.1 |

Punto di applic. carico verticale: Xv = 1.906 m Yv = .095 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 12.198 | 11.362 | 1.731 | .288 | .013 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4538.2 | 712.8 | -581.9 | 35.0 | -112.1 | .0 | 592.6 |
| 2 | 3846.0 | 191.5 | 571.6 | 10.1 | -40.5 | .0 | 573.0 |
| 3 | 3153.7 | 134.2 | 708.7 | 9.4 | -37.2 | .0 | 709.7 |
| 4 | 2461.5 | 134.2 | 708.7 | 8.7 | -34.0 | .0 | 709.5 |
| 5 | 1769.3 | 134.2 | 708.7 | 8.1 | -30.7 | .0 | 709.4 |
| 6 | 1077.1 | 134.2 | 708.7 | 7.4 | -27.4 | .0 | 709.2 |
| 7 | 384.8 | 494.2 | -120.2 | 22.9 | -68.8 | .0 | 138.5 |
| 8 | 4197.1 | 492.5 | -113.7 | 29.0 | -96.0 | .0 | 148.8 |
| 9 | 3504.9 | 104.2 | 781.2 | 9.7 | -38.9 | .0 | 782.2 |
| 10 | 2812.7 | 104.2 | 781.2 | 9.1 | -35.6 | .0 | 782.0 |
| 11 | 2120.5 | 104.2 | 781.2 | 8.4 | -32.3 | .0 | 781.9 |
| 12 | 1428.2 | 104.2 | 781.2 | 7.8 | -29.1 | .0 | 781.8 |
| 13 | 736.0 | 492.5 | -113.7 | 20.3 | -63.5 | .0 | 130.3 |
| 14 | 3856.1 | 602.5 | -346.9 | 32.9 | -104.9 | .0 | 362.4 |
| 15 | 3163.9 | 132.7 | 715.8 | 9.4 | -37.2 | .0 | 716.8 |
| 16 | 2471.6 | 132.7 | 715.8 | 8.7 | -34.0 | .0 | 716.7 |
| 17 | 1779.4 | 132.7 | 715.8 | 8.1 | -30.7 | .0 | 716.5 |
| 18 | 1087.2 | 490.8 | -107.2 | 24.9 | -76.0 | .0 | 131.4 |
| 19 | 4494.3 | 732.6 | -650.4 | 35.0 | -112.1 | .0 | 660.0 |
| 20 | 3802.0 | 199.5 | 535.7 | 10.1 | -40.5 | .0 | 537.2 |
| 21 | 3109.8 | 140.7 | 677.6 | 9.4 | -37.2 | .0 | 678.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 2417.6 | 140.7 | 677.6 | 8.7 | -34.0 | .0 | 678.5 |
| 23 | 1725.3 | 140.7 | 677.6 | 8.1 | -30.7 | .0 | 678.3 |
| 24 | 1033.1 | 140.7 | 677.6 | 7.4 | -27.4 | .0 | 678.2 |
| 25 | 340.9 | 509.3 | -176.7 | 22.9 | -68.8 | .0 | 189.6 |
| 26 | 4143.1 | 511.1 | -183.2 | 29.0 | -96.0 | .0 | 206.8 |
| 27 | 3450.9 | 111.2 | 746.3 | 9.7 | -38.9 | .0 | 747.3 |
| 28 | 2758.6 | 111.2 | 746.3 | 9.1 | -35.6 | .0 | 747.2 |
| 29 | 2066.4 | 111.2 | 746.3 | 8.4 | -32.3 | .0 | 747.0 |
| 30 | 1374.2 | 111.2 | 746.3 | 7.8 | -29.1 | .0 | 746.9 |
| 31 | 681.9 | 511.1 | -183.2 | 20.3 | -63.5 | .0 | 193.9 |
| 32 | 3791.9 | 628.1 | -438.7 | 32.9 | -104.9 | .0 | 451.0 |
| 33 | 3099.7 | 142.2 | 670.5 | 9.4 | -37.2 | .0 | 671.5 |
| 34 | 2407.5 | 142.2 | 670.5 | 8.7 | -34.0 | .0 | 671.4 |
| 35 | 1715.2 | 142.2 | 670.5 | 8.1 | -30.7 | .0 | 671.2 |
| 36 | 1023.0 | 512.8 | -189.6 | 24.9 | -76.0 | .0 | 204.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 17
spalla mobile - n777 _SisM1- n789 _SisM1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25586.6 | 11273.7 | 71152.5 | -8372.9 | -43378.1 | -50534.7 |
| 2 | 28873.5 | 10549.1 | 79490.9 | 14925.3 | 42026.9 | 57634.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54460.1 | 21822.8 | 150643.4 | 6552.4 | 33818.6 | 14852.8 |

Punto di applic. carico verticale: Xv = 2.766 m Yv = .621 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.564 | 17.546 | 2.004 | 3.154 | .073 | .048 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4044.7 | 1371.2 | -2564.0 | 379.7 | -1285.1 | .0 | 2868.0 |
| 2 | 3242.9 | 442.4 | -328.1 | 116.1 | -522.1 | .0 | 616.6 |
| 3 | 2441.2 | 335.0 | -36.1 | 112.4 | -503.5 | .0 | 504.8 |
| 4 | 1639.4 | 335.0 | -36.1 | 108.6 | -484.9 | .0 | 486.2 |
| 5 | 837.6 | 335.0 | -36.1 | 104.9 | -466.3 | .0 | 467.7 |
| 6 | 35.8 | 335.0 | -36.1 | 101.1 | -447.7 | .0 | 449.1 |
| 7 | -765.9 | 988.6 | -1696.5 | 310.7 | -1037.9 | .0 | 1988.8 |
| 8 | 3672.9 | 978.7 | -1659.5 | 320.6 | -1127.0 | .0 | 2006.0 |
| 9 | 2871.2 | 275.3 | 136.7 | 114.3 | -512.8 | .0 | 530.7 |
| 10 | 2069.4 | 275.3 | 136.7 | 110.5 | -494.2 | .0 | 512.8 |
| 11 | 1267.6 | 275.3 | 136.7 | 106.8 | -475.6 | .0 | 494.9 |
| 12 | 465.8 | 275.3 | 136.7 | 103.0 | -457.0 | .0 | 477.0 |
| 13 | -335.9 | 978.7 | -1659.5 | 271.2 | -942.1 | .0 | 1908.2 |
| 14 | 3301.1 | 1163.1 | -2070.1 | 368.2 | -1243.9 | .0 | 2415.1 |
| 15 | 2499.4 | 326.4 | 4.6 | 112.4 | -503.5 | .0 | 503.5 |
| 16 | 1697.6 | 326.4 | 4.6 | 108.6 | -484.9 | .0 | 484.9 |
| 17 | 895.8 | 326.4 | 4.6 | 104.9 | -466.3 | .0 | 466.3 |
| 18 | 94.1 | 968.8 | -1622.5 | 322.2 | -1079.1 | .0 | 1948.6 |
| 19 | 3791.5 | 1484.0 | -2954.6 | 379.7 | -1285.1 | .0 | 3222.0 |
| 20 | 2989.7 | 488.0 | -532.7 | 116.1 | -522.1 | .0 | 745.9 |
| 21 | 2187.9 | 372.1 | -213.3 | 112.4 | -503.5 | .0 | 546.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1386.2 | 372.1 | -213.3 | 108.6 | -484.9 | .0 | 529.7 |
| 23 | 584.4 | 372.1 | -213.3 | 104.9 | -466.3 | .0 | 512.7 |
| 24 | -217.4 | 372.1 | -213.3 | 101.1 | -447.7 | .0 | 495.9 |
| 25 | -1019.1 | 1074.6 | -2018.3 | 310.7 | -1037.9 | .0 | 2269.6 |
| 26 | 3361.5 | 1084.5 | -2055.3 | 320.6 | -1127.0 | .0 | 2344.1 |
| 27 | 2559.7 | 315.4 | -62.3 | 114.3 | -512.8 | .0 | 516.6 |
| 28 | 1758.0 | 315.4 | -62.3 | 110.5 | -494.2 | .0 | 498.1 |
| 29 | 956.2 | 315.4 | -62.3 | 106.8 | -475.6 | .0 | 479.7 |
| 30 | 154.4 | 315.4 | -62.3 | 103.0 | -457.0 | .0 | 461.2 |
| 31 | -647.4 | 1084.5 | -2055.3 | 271.2 | -942.1 | .0 | 2260.9 |
| 32 | 2931.5 | 1309.0 | -2593.3 | 368.2 | -1243.9 | .0 | 2876.2 |
| 33 | 2129.7 | 380.6 | -254.0 | 112.4 | -503.5 | .0 | 563.9 |
| 34 | 1328.0 | 380.6 | -254.0 | 108.6 | -484.9 | .0 | 547.4 |
| 35 | 526.2 | 380.6 | -254.0 | 104.9 | -466.3 | .0 | 531.0 |
| 36 | -275.6 | 1094.4 | -2092.3 | 322.2 | -1079.1 | .0 | 2354.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 18
spalla mobile - n777 _SisM2- n789 _SisM2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25586.6 | 10224.1 | 65798.5 | -8409.1 | -43212.7 | -45825.9 |
| 2 | 28873.5 | 9498.7 | 74135.0 | 14961.5 | 41861.1 | 52917.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54460.1 | 19722.8 | 139933.5 | 6552.4 | 33818.2 | 14853.4 |

Punto di applic. carico verticale: Xv = 2.569 m Yv = .621 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.564 | 15.989 | 1.843 | 3.154 | .073 | .048 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3851.0 | 1236.8 | -2274.4 | 379.7 | -1285.1 | .0 | 2612.3 |
| 2 | 3113.8 | 397.1 | -258.1 | 116.1 | -522.1 | .0 | 582.4 |
| 3 | 2376.6 | 300.1 | 4.5 | 112.4 | -503.5 | .0 | 503.5 |
| 4 | 1639.4 | 300.1 | 4.5 | 108.6 | -484.9 | .0 | 484.9 |
| 5 | 902.2 | 300.1 | 4.5 | 104.9 | -466.3 | .0 | 466.3 |
| 6 | 165.0 | 300.1 | 4.5 | 101.1 | -447.7 | .0 | 447.7 |
| 7 | -572.2 | 890.7 | -1491.3 | 310.7 | -1037.9 | .0 | 1817.0 |
| 8 | 3511.5 | 880.8 | -1454.3 | 320.6 | -1127.0 | .0 | 1839.9 |
| 9 | 2774.3 | 245.9 | 161.6 | 114.3 | -512.8 | .0 | 537.7 |
| 10 | 2037.1 | 245.9 | 161.6 | 110.5 | -494.2 | .0 | 520.0 |
| 11 | 1299.9 | 245.9 | 161.6 | 106.8 | -475.6 | .0 | 502.3 |
| 12 | 562.7 | 245.9 | 161.6 | 103.0 | -457.0 | .0 | 484.7 |
| 13 | -174.5 | 880.8 | -1454.3 | 271.2 | -942.1 | .0 | 1732.8 |
| 14 | 3172.0 | 1046.3 | -1820.5 | 368.2 | -1243.9 | .0 | 2204.9 |
| 15 | 2434.8 | 291.6 | 45.2 | 112.4 | -503.5 | .0 | 505.5 |
| 16 | 1697.6 | 291.6 | 45.2 | 108.6 | -484.9 | .0 | 487.0 |
| 17 | 960.4 | 291.6 | 45.2 | 104.9 | -466.3 | .0 | 468.5 |
| 18 | 223.2 | 870.9 | -1417.4 | 322.2 | -1079.1 | .0 | 1781.4 |
| 19 | 3597.8 | 1349.6 | -2665.0 | 379.7 | -1285.1 | .0 | 2958.7 |
| 20 | 2860.6 | 442.7 | -462.7 | 116.1 | -522.1 | .0 | 697.7 |
| 21 | 2123.4 | 337.2 | -172.7 | 112.4 | -503.5 | .0 | 532.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1386.2 | 337.2 | -172.7 | 108.6 | -484.9 | .0 | 514.7 |
| 23 | 649.0 | 337.2 | -172.7 | 104.9 | -466.3 | .0 | 497.2 |
| 24 | -88.2 | 337.2 | -172.7 | 101.1 | -447.7 | .0 | 479.8 |
| 25 | -825.4 | 976.7 | -1813.2 | 310.7 | -1037.9 | .0 | 2089.3 |
| 26 | 3200.0 | 986.6 | -1850.2 | 320.6 | -1127.0 | .0 | 2166.5 |
| 27 | 2462.9 | 286.0 | -37.4 | 114.3 | -512.8 | .0 | 514.2 |
| 28 | 1725.7 | 286.0 | -37.4 | 110.5 | -494.2 | .0 | 495.6 |
| 29 | 988.5 | 286.0 | -37.4 | 106.8 | -475.6 | .0 | 477.1 |
| 30 | 251.3 | 286.0 | -37.4 | 103.0 | -457.0 | .0 | 458.5 |
| 31 | -485.9 | 986.6 | -1850.2 | 271.2 | -942.1 | .0 | 2076.3 |
| 32 | 2802.3 | 1192.2 | -2343.7 | 368.2 | -1243.9 | .0 | 2653.4 |
| 33 | 2065.2 | 345.7 | -213.4 | 112.4 | -503.5 | .0 | 546.8 |
| 34 | 1328.0 | 345.7 | -213.4 | 108.6 | -484.9 | .0 | 529.8 |
| 35 | 590.8 | 345.7 | -213.4 | 104.9 | -466.3 | .0 | 512.8 |
| 36 | -146.4 | 996.5 | -1887.2 | 322.2 | -1079.1 | .0 | 2174.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 19
spalla mobile - n777 _SisM3- n789 _SisM3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34086.7 | 10513.4 | 107998.0 | -14309.7 | -56794.3 | -65131.2 |
| 2 | 32286.4 | 11309.3 | 100125.8 | 14896.1 | 54044.4 | 59714.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66373.1 | 21822.7 | 208123.8 | 586.4 | -22013.1 | -13933.1 |

Punto di applic. carico verticale: Xv = 3.136 m Yv = -.332 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.218 | 19.531 | 2.482 | .158 | -.023 | -.045 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4781.2 | 1525.2 | -2577.0 | -3.5 | -11.7 | .0 | 2577.0 |
| 2 | 3788.5 | 478.0 | -93.2 | 3.6 | -35.4 | .0 | 99.7 |
| 3 | 2795.9 | 358.0 | 226.2 | 7.1 | -52.9 | .0 | 232.3 |
| 4 | 1803.2 | 358.0 | 226.2 | 10.6 | -70.3 | .0 | 236.9 |
| 5 | 810.5 | 358.0 | 226.2 | 14.2 | -87.7 | .0 | 242.6 |
| 6 | -182.1 | 358.0 | 226.2 | 17.7 | -105.2 | .0 | 249.5 |
| 7 | -1174.8 | 1092.4 | -1608.1 | 61.1 | -243.6 | .0 | 1626.4 |
| 8 | 4275.6 | 1101.7 | -1642.8 | 2.0 | -30.6 | .0 | 1643.1 |
| 9 | 3282.9 | 299.2 | 376.3 | 5.4 | -44.1 | .0 | 378.9 |
| 10 | 2290.2 | 299.2 | 376.3 | 8.9 | -61.6 | .0 | 381.3 |
| 11 | 1297.6 | 299.2 | 376.3 | 12.4 | -79.0 | .0 | 384.5 |
| 12 | 304.9 | 299.2 | 376.3 | 15.9 | -96.5 | .0 | 388.5 |
| 13 | -687.8 | 1101.7 | -1642.8 | 48.3 | -204.2 | .0 | 1655.4 |
| 14 | 3769.9 | 1337.1 | -2194.1 | 7.2 | -50.4 | .0 | 2194.7 |
| 15 | 2777.3 | 366.0 | 188.0 | 7.1 | -52.9 | .0 | 195.3 |
| 16 | 1784.6 | 366.0 | 188.0 | 10.6 | -70.3 | .0 | 200.7 |
| 17 | 791.9 | 366.0 | 188.0 | 14.2 | -87.7 | .0 | 207.5 |
| 18 | -200.8 | 1111.0 | -1677.5 | 50.4 | -205.0 | .0 | 1690.0 |
| 19 | 4862.2 | 1419.4 | -2210.5 | -3.5 | -11.7 | .0 | 2210.5 |
| 20 | 3869.5 | 435.2 | 98.8 | 3.6 | -35.4 | .0 | 105.0 |
| 21 | 2876.9 | 323.2 | 392.4 | 7.1 | -52.9 | .0 | 395.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1884.2 | 323.2 | 392.4 | 10.6 | -70.3 | .0 | 398.6 |
| 23 | 891.5 | 323.2 | 392.4 | 14.2 | -87.7 | .0 | 402.1 |
| 24 | -101.1 | 323.2 | 392.4 | 17.7 | -105.2 | .0 | 406.2 |
| 25 | -1093.8 | 1011.7 | -1306.1 | 61.1 | -243.6 | .0 | 1328.7 |
| 26 | 4375.2 | 1002.5 | -1271.4 | 2.0 | -30.6 | .0 | 1271.8 |
| 27 | 3382.5 | 261.6 | 563.0 | 5.4 | -44.1 | .0 | 564.8 |
| 28 | 2389.8 | 261.6 | 563.0 | 8.9 | -61.6 | .0 | 566.4 |
| 29 | 1397.2 | 261.6 | 563.0 | 12.4 | -79.0 | .0 | 568.5 |
| 30 | 404.5 | 261.6 | 563.0 | 15.9 | -96.5 | .0 | 571.2 |
| 31 | -588.2 | 1002.5 | -1271.4 | 48.3 | -204.2 | .0 | 1287.7 |
| 32 | 3888.2 | 1200.3 | -1703.3 | 7.2 | -50.4 | .0 | 1704.1 |
| 33 | 2895.5 | 315.1 | 430.6 | 7.1 | -52.9 | .0 | 433.8 |
| 34 | 1902.8 | 315.1 | 430.6 | 10.6 | -70.3 | .0 | 436.3 |
| 35 | 910.1 | 315.1 | 430.6 | 14.2 | -87.7 | .0 | 439.4 |
| 36 | -82.5 | 993.2 | -1236.7 | 50.4 | -205.0 | .0 | 1253.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 19
spalla mobile - n777 _SisM3- n789 _SisM3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1419.4 | -2210.5 | -3.5 | -11.7 | 1419.4 | 2210.5 |
| 1.41 | 1170.1 | -398.2 | -2.4 | -15.8 | 1170.1 | 398.5 |
| 2.81 | 972.2 | 1098.6 | -1.5 | -18.5 | 972.2 | 1098.8 |
| 4.22 | 490.5 | 2186.6 | .2 | -19.6 | 490.5 | 2186.7 |
| 5.63 | 74.9 | 2551.2 | 1.5 | -18.2 | 74.9 | 2551.3 |
| 7.03 | -173.5 | 2456.2 | 2.1 | -15.6 | 173.5 | 2456.3 |
| 8.44 | -282.9 | 2107.3 | 2.1 | -12.6 | 282.9 | 2107.3 |
| 9.84 | -291.9 | 1700.1 | 2.0 | -9.7 | 291.9 | 1700.1 |
| 11.25 | -285.8 | 1291.2 | 1.9 | -6.9 | 285.8 | 1291.3 |
| 13.50 | -244.6 | 670.3 | 1.5 | -2.9 | 244.6 | 670.3 |
| 15.75 | -147.8 | 231.5 | .8 | -.4 | 147.8 | 231.5 |
| 18.00 | -70.6 | -6.7 | .3 | .8 | 70.6 | 6.8 |
| 20.25 | -21.2 | -102.3 | .0 | 1.1 | 21.2 | 102.3 |
| 22.50 | 5.2 | -115.8 | -.1 | 1.0 | 5.2 | 115.8 |
| 26.25 | 12.7 | -72.1 | -.1 | .5 | 12.7 | 72.1 |
| 30.00 | 8.9 | -30.3 | -.1 | .2 | 8.9 | 30.3 |
| 33.75 | 3.9 | -6.1 | .0 | .0 | 3.9 | 6.1 |
| 39.38 | .0 | 2.8 | .0 | .0 | .0 | 2.8 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 20
spalla mobile - n777 _SisM4- n789 _SisM4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34086.7 | 9463.8 | 102644.0 | -14345.9 | -56628.9 | -60422.4 |
| 2 | 32286.4 | 10258.9 | 94769.8 | 14932.3 | 53878.6 | 54997.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66373.1 | 19722.7 | 197413.8 | 586.4 | -22013.5 | -13932.6 |

Punto di applic. carico verticale: Xv = 2.974 m Yv = -.332 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.218 | 17.974 | 2.320 | .158 | -.023 | -.045 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4587.5 | 1390.8 | -2287.3 | -3.5 | -11.7 | .0 | 2287.4 |
| 2 | 3659.4 | 432.7 | -23.2 | 3.6 | -35.4 | .0 | 42.3 |
| 3 | 2731.3 | 323.1 | 266.8 | 7.1 | -52.9 | .0 | 272.0 |
| 4 | 1803.2 | 323.1 | 266.8 | 10.6 | -70.3 | .0 | 275.9 |
| 5 | 875.1 | 323.1 | 266.8 | 14.2 | -87.7 | .0 | 280.8 |
| 6 | -53.0 | 323.1 | 266.8 | 17.7 | -105.2 | .0 | 286.8 |
| 7 | -981.1 | 994.5 | -1403.0 | 61.1 | -243.6 | .0 | 1424.0 |
| 8 | 4114.1 | 1003.8 | -1437.7 | 2.0 | -30.6 | .0 | 1438.0 |
| 9 | 3186.0 | 269.8 | 401.2 | 5.4 | -44.1 | .0 | 403.6 |
| 10 | 2257.9 | 269.8 | 401.2 | 8.9 | -61.6 | .0 | 405.9 |
| 11 | 1329.8 | 269.8 | 401.2 | 12.4 | -79.0 | .0 | 408.9 |
| 12 | 401.8 | 269.8 | 401.2 | 15.9 | -96.5 | .0 | 412.7 |
| 13 | -526.3 | 1003.8 | -1437.7 | 48.3 | -204.2 | .0 | 1452.1 |
| 14 | 3640.8 | 1220.3 | -1944.5 | 7.2 | -50.4 | .0 | 1945.2 |
| 15 | 2712.7 | 331.1 | 228.6 | 7.1 | -52.9 | .0 | 234.6 |
| 16 | 1784.6 | 331.1 | 228.6 | 10.6 | -70.3 | .0 | 239.2 |
| 17 | 856.5 | 331.1 | 228.6 | 14.2 | -87.7 | .0 | 244.9 |
| 18 | -71.6 | 1013.0 | -1472.4 | 50.4 | -205.0 | .0 | 1486.6 |
| 19 | 4668.5 | 1285.0 | -1920.9 | -3.5 | -11.7 | .0 | 1920.9 |
| 20 | 3740.4 | 389.9 | 168.7 | 3.6 | -35.4 | .0 | 172.4 |
| 21 | 2812.3 | 288.3 | 432.9 | 7.1 | -52.9 | .0 | 436.2 |

```
  22   1884.2    288.3    432.9     10.6    -70.3       .0     438.6
  23    956.1    288.3    432.9     14.2    -87.7       .0     441.8
  24     28.0    288.3    432.9     17.7   -105.2       .0     445.5
  25   -900.1    913.8  -1101.0     61.1   -243.6       .0    1127.7
  26   4213.7    904.5  -1066.3      2.0    -30.6       .0    1066.8
  27   3285.6    232.2    587.9      5.4    -44.1       .0     589.6
  28   2357.5    232.2    587.9      8.9    -61.6       .0     591.1
  29   1429.5    232.2    587.9     12.4    -79.0       .0     593.2
  30    501.4    232.2    587.9     15.9    -96.5       .0     595.8
  31   -426.7    904.5  -1066.3     48.3   -204.2       .0    1085.7
  32   3759.0   1083.5  -1453.7      7.2    -50.4       .0    1454.6
  33   2830.9    280.3    471.1      7.1    -52.9       .0     474.1
  34   1902.8    280.3    471.1     10.6    -70.3       .0     476.4
  35    974.7    280.3    471.1     14.2    -87.7       .0     479.2
  36     46.6    895.3  -1031.6     50.4   -205.0       .0    1051.8
 -------------------------------------------------------------------

 Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 21
spalla mobile - n777 _SisM5- n789 _SisM5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25196.3 | 11771.0 | 72466.9 | -7320.6 | -44436.9 | -50796.6 |
| 2 | 32937.4 | 10051.8 | 95902.1 | 17962.7 | 45849.4 | 66986.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58133.7 | 21822.8 | 168369.0 | 10642.1 | 84242.2 | 34585.1 |

Punto di applic. carico verticale: Xv = 2.896 m Yv = 1.449 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.074 | 18.159 | 2.152 | 5.268 | .153 | .112 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4463.1 | 1310.1 | -2191.7 | 643.3 | -2146.5 | .0 | 3067.8 |
| 2 | 3602.4 | 409.5 | -58.5 | 192.8 | -842.7 | .0 | 844.7 |
| 3 | 2741.8 | 306.3 | 215.4 | 184.1 | -799.4 | .0 | 827.9 |
| 4 | 1881.1 | 306.3 | 215.4 | 175.4 | -756.0 | .0 | 786.1 |
| 5 | 1020.5 | 306.3 | 215.4 | 166.6 | -712.7 | .0 | 744.6 |
| 6 | 159.9 | 306.3 | 215.4 | 157.9 | -669.4 | .0 | 703.2 |
| 7 | -700.8 | 937.8 | -1359.2 | 482.8 | -1571.0 | .0 | 2077.4 |
| 8 | 4094.0 | 914.8 | -1273.1 | 539.7 | -1866.6 | .0 | 2259.4 |
| 9 | 3233.3 | 244.1 | 402.3 | 188.4 | -821.0 | .0 | 914.3 |
| 10 | 2372.7 | 244.1 | 402.3 | 179.7 | -777.7 | .0 | 875.6 |
| 11 | 1512.0 | 244.1 | 402.3 | 171.0 | -734.4 | .0 | 837.4 |
| 12 | 651.4 | 244.1 | 402.3 | 162.3 | -691.1 | .0 | 799.6 |
| 13 | -209.2 | 914.8 | -1273.1 | 424.6 | -1435.8 | .0 | 1918.9 |
| 14 | 3724.9 | 1076.2 | -1604.5 | 616.6 | -2050.6 | .0 | 2603.7 |
| 15 | 2864.2 | 286.5 | 310.2 | 184.1 | -799.4 | .0 | 857.4 |
| 16 | 2003.6 | 286.5 | 310.2 | 175.4 | -756.0 | .0 | 817.2 |
| 17 | 1142.9 | 286.5 | 310.2 | 166.6 | -712.7 | .0 | 777.3 |
| 18 | 282.3 | 891.7 | -1186.9 | 509.6 | -1666.9 | .0 | 2046.3 |
| 19 | 3930.4 | 1572.7 | -3101.4 | 643.3 | -2146.5 | .0 | 3771.8 |
| 20 | 3069.8 | 515.6 | -535.0 | 192.8 | -842.7 | .0 | 998.2 |
| 21 | 2209.2 | 392.7 | -197.1 | 184.1 | -799.4 | .0 | 823.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1348.5 | 392.7 | -197.1 | 175.4 | -756.0 | .0 | 781.3 |
| 23 | 487.9 | 392.7 | -197.1 | 166.6 | -712.7 | .0 | 739.5 |
| 24 | -372.8 | 392.7 | -197.1 | 157.9 | -669.4 | .0 | 697.8 |
| 25 | -1233.4 | 1138.1 | -2108.7 | 482.8 | -1571.0 | .0 | 2629.6 |
| 26 | 3438.9 | 1161.1 | -2194.9 | 539.7 | -1866.6 | .0 | 2881.2 |
| 27 | 2578.3 | 337.4 | -61.1 | 188.4 | -821.0 | .0 | 823.3 |
| 28 | 1717.6 | 337.4 | -61.1 | 179.7 | -777.7 | .0 | 780.1 |
| 29 | 857.0 | 337.4 | -61.1 | 171.0 | -734.4 | .0 | 736.9 |
| 30 | -3.7 | 337.4 | -61.1 | 162.3 | -691.1 | .0 | 693.8 |
| 31 | -864.3 | 1161.1 | -2194.9 | 424.6 | -1435.8 | .0 | 2622.8 |
| 32 | 2947.4 | 1416.0 | -2822.8 | 616.6 | -2050.6 | .0 | 3489.0 |
| 33 | 2086.7 | 412.6 | -291.9 | 184.1 | -799.4 | .0 | 851.0 |
| 34 | 1226.1 | 412.6 | -291.9 | 175.4 | -756.0 | .0 | 810.4 |
| 35 | 365.4 | 412.6 | -291.9 | 166.6 | -712.7 | .0 | 770.2 |
| 36 | -495.2 | 1184.1 | -2281.0 | 509.6 | -1666.9 | .0 | 2825.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 21
spalla mobile - n777 _SisM5- n789 _SisM5

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1572.7 | -3101.4 | 643.3 | -2146.5 | 1699.2 | 3771.8 |
| 1.41 | 1320.7 | -1074.6 | 574.7 | -1290.9 | 1440.4 | 1679.6 |
| 2.81 | 1116.2 | 629.9 | 512.3 | -528.2 | 1228.2 | 822.1 |
| 4.22 | 605.5 | 1905.1 | 337.9 | 94.0 | 693.4 | 1907.4 |
| 5.63 | 154.0 | 2405.9 | 166.4 | 439.9 | 226.7 | 2445.8 |
| 7.03 | -127.5 | 2398.2 | 41.3 | 578.2 | 134.0 | 2466.9 |
| 8.44 | -260.4 | 2093.1 | -31.5 | 569.8 | 262.3 | 2169.2 |
| 9.84 | -275.3 | 1713.1 | -45.4 | 514.6 | 279.1 | 1788.8 |
| 11.25 | -274.3 | 1324.1 | -54.0 | 444.2 | 279.6 | 1396.6 |
| 13.50 | -240.3 | 723.0 | -58.2 | 316.2 | 247.2 | 789.1 |
| 15.75 | -152.2 | 281.9 | -51.2 | 189.2 | 160.6 | 339.5 |
| 18.00 | -77.4 | 29.8 | -36.2 | 90.1 | 85.5 | 94.9 |
| 20.25 | -27.2 | -80.9 | -21.1 | 26.3 | 34.5 | 85.0 |
| 22.50 | 1.3 | -106.0 | -8.6 | -7.0 | 8.7 | 106.2 |
| 26.25 | 11.5 | -70.7 | .4 | -17.4 | 11.5 | 72.8 |
| 30.00 | 8.5 | -31.5 | 1.6 | -12.8 | 8.7 | 34.0 |
| 33.75 | 4.0 | -7.7 | 1.4 | -6.8 | 4.3 | 10.3 |
| 39.38 | .2 | 2.2 | .6 | -1.2 | .6 | 2.5 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 22
spalla mobile - n777 _SisM6- n789 _SisM6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25196.4 | 10721.4 | 67112.9 | -7356.7 | -44271.4 | -46087.8 |
| 2 | 32937.4 | 9001.4 | 90546.2 | 17998.9 | 45683.6 | 62269.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58133.8 | 19722.8 | 157659.1 | 10642.2 | 84240.9 | 34585.8 |

Punto di applic. carico verticale: Xv = 2.712 m Yv = 1.449 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.074 | 16.601 | 1.990 | 5.268 | .153 | .112 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4269.3 | 1175.6 | -1902.1 | 643.4 | -2146.6 | .0 | 2868.1 |
| 2 | 3473.3 | 364.1 | 11.4 | 192.8 | -842.7 | .0 | 842.8 |
| 3 | 2677.2 | 271.4 | 256.0 | 184.1 | -799.4 | .0 | 839.3 |
| 4 | 1881.1 | 271.4 | 256.0 | 175.4 | -756.0 | .0 | 798.2 |
| 5 | 1085.1 | 271.4 | 256.0 | 166.6 | -712.7 | .0 | 757.3 |
| 6 | 289.0 | 271.4 | 256.0 | 157.9 | -669.4 | .0 | 716.7 |
| 7 | -507.1 | 839.9 | -1154.1 | 482.8 | -1571.0 | .0 | 1949.3 |
| 8 | 3932.5 | 816.8 | -1068.0 | 539.7 | -1866.6 | .0 | 2150.5 |
| 9 | 3136.4 | 214.7 | 427.2 | 188.4 | -821.0 | .0 | 925.5 |
| 10 | 2340.4 | 214.7 | 427.2 | 179.7 | -777.7 | .0 | 887.3 |
| 11 | 1544.3 | 214.7 | 427.2 | 171.0 | -734.4 | .0 | 849.6 |
| 12 | 748.3 | 214.7 | 427.2 | 162.3 | -691.1 | .0 | 812.5 |
| 13 | -47.8 | 816.8 | -1068.0 | 424.6 | -1435.9 | .0 | 1789.5 |
| 14 | 3595.7 | 959.4 | -1354.9 | 616.6 | -2050.6 | .0 | 2457.8 |
| 15 | 2799.6 | 251.6 | 350.8 | 184.1 | -799.4 | .0 | 872.9 |
| 16 | 2003.6 | 251.6 | 350.8 | 175.4 | -756.0 | .0 | 833.5 |
| 17 | 1207.5 | 251.6 | 350.8 | 166.6 | -712.7 | .0 | 794.4 |
| 18 | 411.5 | 793.8 | -981.8 | 509.6 | -1666.9 | .0 | 1934.6 |
| 19 | 3736.7 | 1438.3 | -2811.8 | 643.4 | -2146.6 | .0 | 3537.5 |
| 20 | 2940.6 | 470.3 | -465.1 | 192.8 | -842.7 | .0 | 962.5 |
| 21 | 2144.6 | 357.9 | -156.5 | 184.1 | -799.4 | .0 | 814.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1348.5 | 357.9 | -156.5 | 175.4 | -756.0 | .0 | 772.1 |
| 23 | 552.5 | 357.9 | -156.5 | 166.6 | -712.7 | .0 | 729.7 |
| 24 | -243.6 | 357.9 | -156.5 | 157.9 | -669.4 | .0 | 687.5 |
| 25 | -1039.7 | 1040.2 | -1903.6 | 482.8 | -1571.0 | .0 | 2468.1 |
| 26 | 3277.5 | 1063.2 | -1989.8 | 539.7 | -1866.6 | .0 | 2728.3 |
| 27 | 2481.4 | 308.0 | -36.2 | 188.4 | -821.0 | .0 | 821.8 |
| 28 | 1685.3 | 308.0 | -36.2 | 179.7 | -777.7 | .0 | 778.5 |
| 29 | 889.3 | 308.0 | -36.2 | 171.0 | -734.4 | .0 | 735.3 |
| 30 | 93.2 | 308.0 | -36.2 | 162.3 | -691.1 | .0 | 692.0 |
| 31 | -702.9 | 1063.2 | -1989.8 | 424.6 | -1435.9 | .0 | 2453.7 |
| 32 | 2818.2 | 1299.2 | -2573.2 | 616.6 | -2050.6 | .0 | 3290.3 |
| 33 | 2022.1 | 377.7 | -251.3 | 184.1 | -799.4 | .0 | 837.9 |
| 34 | 1226.1 | 377.7 | -251.3 | 175.4 | -756.0 | .0 | 796.7 |
| 35 | 430.0 | 377.7 | -251.3 | 166.6 | -712.7 | .0 | 755.7 |
| 36 | -366.0 | 1086.2 | -2075.9 | 509.6 | -1666.9 | .0 | 2662.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 23
spalla mobile - n777 _SisM7- n789 _SisM7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35140.2 | 10011.3 | 109839.6 | -15703.0 | -56965.6 | -66022.0 |
| 2 | 28811.4 | 11811.5 | 86600.3 | 12154.7 | 51374.4 | 51401.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63951.6 | 21822.8 | 196439.9 | -3548.3 | -73309.3 | -33882.9 |

Punto di applic. carico verticale: Xv = 3.072 m Yv = -1.146 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.882 | 19.128 | 2.385 | -1.981 | -.105 | -.110 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4455.6 | 1591.9 | -2913.6 | -270.1 | 858.9 | .0 | 3037.6 |
| 2 | 3501.8 | 510.4 | -318.7 | -73.9 | 288.4 | .0 | 429.8 |
| 3 | 2547.9 | 385.5 | 19.0 | -65.4 | 245.9 | .0 | 246.7 |
| 4 | 1594.0 | 385.5 | 19.0 | -56.8 | 203.5 | .0 | 204.4 |
| 5 | 640.2 | 385.5 | 19.0 | -48.3 | 161.1 | .0 | 162.2 |
| 6 | -313.7 | 385.5 | 19.0 | -39.7 | 118.6 | .0 | 120.1 |
| 7 | -1267.6 | 1146.0 | -1905.6 | -112.9 | 295.0 | .0 | 1928.3 |
| 8 | 3936.8 | 1168.6 | -1990.0 | -219.5 | 716.7 | .0 | 2115.2 |
| 9 | 2982.9 | 329.1 | 154.7 | -69.6 | 267.1 | .0 | 308.7 |
| 10 | 2029.0 | 329.1 | 154.7 | -61.1 | 224.7 | .0 | 272.8 |
| 11 | 1075.2 | 329.1 | 154.7 | -52.5 | 182.3 | .0 | 239.1 |
| 12 | 121.3 | 329.1 | 154.7 | -44.0 | 139.8 | .0 | 208.6 |
| 13 | -832.6 | 1168.6 | -1990.0 | -106.8 | 294.7 | .0 | 2011.7 |
| 14 | 3417.9 | 1428.5 | -2623.4 | -243.9 | 764.9 | .0 | 2732.6 |
| 15 | 2464.1 | 405.0 | -73.9 | -65.4 | 245.9 | .0 | 256.8 |
| 16 | 1510.2 | 405.0 | -73.9 | -56.8 | 203.5 | .0 | 216.5 |
| 17 | 556.3 | 405.0 | -73.9 | -48.3 | 161.1 | .0 | 177.2 |
| 18 | -397.5 | 1191.1 | -2074.4 | -139.1 | 389.0 | .0 | 2110.6 |
| 19 | 4820.4 | 1334.6 | -2022.4 | -270.1 | 858.9 | .0 | 2197.3 |
| 20 | 3866.6 | 406.4 | 148.2 | -73.9 | 288.4 | .0 | 324.2 |
| 21 | 2912.7 | 300.9 | 423.1 | -65.4 | 245.9 | .0 | 489.4 |

```
  22   1958.8    300.9    423.1    -56.8    203.5       .0     469.5
  23   1005.0    300.9    423.1    -48.3    161.1       .0     452.7
  24     51.1    300.9    423.1    -39.7    118.6       .0     439.4
  25   -902.8    949.8  -1171.4   -112.9    295.0       .0    1207.9
  26   4385.4    927.2  -1087.0   -219.5    716.7       .0    1302.0
  27   3431.6    237.7    608.8    -69.6    267.1       .0     664.8
  28   2477.7    237.7    608.8    -61.1    224.7       .0     648.9
  29   1523.8    237.7    608.8    -52.5    182.3       .0     635.5
  30    570.0    237.7    608.8    -44.0    139.8       .0     624.6
  31   -383.9    927.2  -1087.0   -106.8    294.7       .0    1126.2
  32   3950.4   1095.6  -1429.8   -243.9    764.9       .0    1621.6
  33   2996.5    281.4    516.0    -65.4    245.9       .0     571.6
  34   2042.7    281.4    516.0    -56.8    203.5       .0     554.7
  35   1088.8    281.4    516.0    -48.3    161.1       .0     540.6
  36    134.9    904.7  -1002.6   -139.1    389.0       .0    1075.4
 -------------------------------------------------------------------

 Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 23
spalla mobile - n777 _SisM7- n789 _SisM7

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 7
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1146.0 | -1905.6 | -112.9 | 295.0 | 1151.6 | 1928.3 |
| 1.41 | 970.0 | -423.1 | -98.1 | 147.0 | 975.0 | 447.9 |
| 2.81 | 826.2 | 834.2 | -85.4 | 18.3 | 830.6 | 834.4 |
| 4.22 | 460.9 | 1787.2 | -52.1 | -82.8 | 463.9 | 1789.1 |
| 5.63 | 126.7 | 2178.1 | -20.7 | -132.1 | 128.4 | 2182.1 |
| 7.03 | -93.3 | 2183.7 | .7 | -144.6 | 93.3 | 2188.4 |
| 8.44 | -206.2 | 1947.1 | 12.3 | -132.9 | 206.6 | 1951.6 |
| 9.84 | -222.4 | 1643.4 | 14.2 | -114.1 | 222.8 | 1647.3 |
| 11.25 | -226.9 | 1325.7 | 15.0 | -93.4 | 227.4 | 1329.0 |
| 13.50 | -209.5 | 820.7 | 14.4 | -59.5 | 210.0 | 822.8 |
| 15.75 | -151.3 | 411.7 | 10.8 | -30.8 | 151.7 | 412.8 |
| 18.00 | -92.6 | 139.6 | 6.7 | -11.3 | 92.8 | 140.1 |
| 20.25 | -46.2 | -12.2 | 3.4 | -.3 | 46.3 | 12.2 |
| 22.50 | -13.2 | -76.9 | 1.0 | 4.5 | 13.2 | 77.1 |
| 26.25 | 6.8 | -75.8 | -.4 | 4.6 | 6.8 | 76.0 |
| 30.00 | 7.6 | -46.6 | -.5 | 2.7 | 7.6 | 46.6 |
| 33.75 | 5.2 | -21.5 | -.3 | 1.2 | 5.2 | 21.5 |
| 39.38 | 1.6 | -2.6 | -.1 | .1 | 1.6 | 2.6 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 24
spalla mobile - n777 _SisM8- n789 _SisM8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 35140.2 | 8961.7 | 104485.6 | -15739.2 | -56800.2 | -61313.2 |
| 2 | 28811.4 | 10761.1 | 81244.3 | 12190.9 | 51208.7 | 46684.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63951.6 | 19722.8 | 185729.9 | -3548.3 | -73309.6 | -33882.4 |

Punto di applic. carico verticale: Xv = 2.904 m Yv = -1.146 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.882 | 17.570 | 2.223 | -1.981 | -.105 | -.110 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4261.9 | 1457.4 | -2624.0 | -270.1 | 858.9 | .0 | 2761.0 |
| 2 | 3372.6 | 465.0 | -248.7 | -73.9 | 288.4 | .0 | 380.8 |
| 3 | 2483.3 | 350.7 | 59.6 | -65.4 | 245.9 | .0 | 253.0 |
| 4 | 1594.0 | 350.7 | 59.6 | -56.8 | 203.5 | .0 | 212.0 |
| 5 | 704.8 | 350.7 | 59.6 | -48.3 | 161.1 | .0 | 171.7 |
| 6 | -184.5 | 350.7 | 59.6 | -39.7 | 118.6 | .0 | 132.8 |
| 7 | -1073.8 | 1048.1 | -1700.5 | -112.9 | 295.0 | .0 | 1725.9 |
| 8 | 3775.3 | 1070.7 | -1784.9 | -219.5 | 716.7 | .0 | 1923.4 |
| 9 | 2886.0 | 299.7 | 179.7 | -69.6 | 267.1 | .0 | 321.9 |
| 10 | 1996.8 | 299.7 | 179.7 | -61.1 | 224.7 | .0 | 287.7 |
| 11 | 1107.5 | 299.7 | 179.7 | -52.5 | 182.3 | .0 | 255.9 |
| 12 | 218.2 | 299.7 | 179.7 | -44.0 | 139.8 | .0 | 227.7 |
| 13 | -671.1 | 1070.7 | -1784.9 | -106.8 | 294.7 | .0 | 1809.1 |
| 14 | 3288.8 | 1311.7 | -2373.7 | -243.9 | 764.9 | .0 | 2493.9 |
| 15 | 2399.5 | 370.1 | -33.3 | -65.4 | 245.9 | .0 | 248.2 |
| 16 | 1510.2 | 370.1 | -33.3 | -56.8 | 203.5 | .0 | 206.2 |
| 17 | 620.9 | 370.1 | -33.3 | -48.3 | 161.1 | .0 | 164.5 |
| 18 | -268.4 | 1093.2 | -1869.3 | -139.1 | 389.0 | .0 | 1909.4 |
| 19 | 4626.7 | 1200.1 | -1732.8 | -270.1 | 858.9 | .0 | 1934.0 |
| 20 | 3737.4 | 361.0 | 218.1 | -73.9 | 288.4 | .0 | 361.6 |
| 21 | 2848.1 | 266.0 | 463.7 | -65.4 | 245.9 | .0 | 524.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1958.8 | 266.0 | 463.7 | -56.8 | 203.5 | .0 | 506.4 |
| 23 | 1069.5 | 266.0 | 463.7 | -48.3 | 161.1 | .0 | 490.9 |
| 24 | 180.2 | 266.0 | 463.7 | -39.7 | 118.6 | .0 | 478.6 |
| 25 | -709.0 | 851.9 | -966.3 | -112.9 | 295.0 | .0 | 1010.3 |
| 26 | 4224.0 | 829.3 | -881.9 | -219.5 | 716.7 | .0 | 1136.4 |
| 27 | 3334.7 | 208.3 | 633.7 | -69.6 | 267.1 | .0 | 687.7 |
| 28 | 2445.4 | 208.3 | 633.7 | -61.1 | 224.7 | .0 | 672.3 |
| 29 | 1556.1 | 208.3 | 633.7 | -52.5 | 182.3 | .0 | 659.4 |
| 30 | 666.8 | 208.3 | 633.7 | -44.0 | 139.8 | .0 | 648.9 |
| 31 | -222.5 | 829.3 | -881.9 | -106.8 | 294.7 | .0 | 929.8 |
| 32 | 3821.3 | 978.8 | -1180.2 | -243.9 | 764.9 | .0 | 1406.4 |
| 33 | 2932.0 | 246.5 | 556.6 | -65.4 | 245.9 | .0 | 608.5 |
| 34 | 2042.7 | 246.5 | 556.6 | -56.8 | 203.5 | .0 | 592.6 |
| 35 | 1153.4 | 246.5 | 556.6 | -48.3 | 161.1 | .0 | 579.4 |
| 36 | 264.1 | 806.8 | -797.5 | -139.1 | 389.0 | .0 | 887.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 25
spalla mobile - n777 _SisM9- n789 _SisM9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24692.7 | 11765.6 | 70114.2 | -7120.0 | -43489.5 | -50038.5 |
| 2 | 32653.8 | 10057.2 | 94456.0 | 17762.1 | 45312.7 | 66344.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57346.5 | 21822.8 | 164570.2 | 10642.1 | 87007.0 | 34586.3 |

Punto di applic. carico verticale: Xv = 2.870 m Yv = 1.517 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.965 | 18.027 | 2.120 | 5.282 | .156 | .112 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4409.1 | 1307.1 | -2215.9 | 643.6 | -2143.9 | .0 | 3083.3 |
| 2 | 3561.0 | 410.0 | -87.2 | 192.7 | -839.7 | .0 | 844.2 |
| 3 | 2713.0 | 307.2 | 186.7 | 184.0 | -796.4 | .0 | 818.0 |
| 4 | 1865.0 | 307.2 | 186.7 | 175.3 | -753.1 | .0 | 775.9 |
| 5 | 1017.0 | 307.2 | 186.7 | 166.5 | -709.8 | .0 | 733.9 |
| 6 | 168.9 | 307.2 | 186.7 | 157.8 | -666.4 | .0 | 692.1 |
| 7 | -679.1 | 936.4 | -1385.7 | 483.1 | -1568.3 | .0 | 2092.8 |
| 8 | 4047.6 | 913.4 | -1299.5 | 539.9 | -1863.9 | .0 | 2272.2 |
| 9 | 3199.6 | 245.1 | 373.7 | 188.3 | -818.0 | .0 | 899.4 |
| 10 | 2351.5 | 245.1 | 373.7 | 179.6 | -774.7 | .0 | 860.2 |
| 11 | 1503.5 | 245.1 | 373.7 | 170.9 | -731.4 | .0 | 821.4 |
| 12 | 655.5 | 245.1 | 373.7 | 162.2 | -688.1 | .0 | 783.0 |
| 13 | -192.5 | 913.4 | -1299.5 | 424.7 | -1433.1 | .0 | 1934.6 |
| 14 | 3686.1 | 1074.1 | -1629.8 | 616.8 | -2048.0 | .0 | 2617.3 |
| 15 | 2838.1 | 287.3 | 281.5 | 184.0 | -796.4 | .0 | 844.7 |
| 16 | 1990.1 | 287.3 | 281.5 | 175.3 | -753.1 | .0 | 804.0 |
| 17 | 1142.0 | 287.3 | 281.5 | 166.5 | -709.8 | .0 | 763.5 |
| 18 | 294.0 | 890.4 | -1213.4 | 509.8 | -1664.3 | .0 | 2059.6 |
| 19 | 3865.0 | 1569.7 | -3125.6 | 643.6 | -2143.9 | .0 | 3790.2 |
| 20 | 3017.0 | 516.2 | -563.7 | 192.7 | -839.7 | .0 | 1011.3 |
| 21 | 2169.0 | 393.6 | -225.8 | 184.0 | -796.4 | .0 | 827.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1320.9 | 393.6 | -225.8 | 175.3 | -753.1 | .0 | 786.2 |
| 23 | 472.9 | 393.6 | -225.8 | 166.5 | -709.8 | .0 | 744.8 |
| 24 | -375.1 | 393.6 | -225.8 | 157.8 | -666.4 | .0 | 703.6 |
| 25 | -1223.1 | 1136.7 | -2135.2 | 483.1 | -1568.3 | .0 | 2649.3 |
| 26 | 3378.5 | 1159.7 | -2221.3 | 539.9 | -1863.9 | .0 | 2899.7 |
| 27 | 2530.4 | 338.4 | -89.7 | 188.3 | -818.0 | .0 | 822.9 |
| 28 | 1682.4 | 338.4 | -89.7 | 179.6 | -774.7 | .0 | 779.9 |
| 29 | 834.4 | 338.4 | -89.7 | 170.9 | -731.4 | .0 | 736.9 |
| 30 | -13.6 | 338.4 | -89.7 | 162.2 | -688.1 | .0 | 693.9 |
| 31 | -861.7 | 1159.7 | -2221.3 | 424.7 | -1433.1 | .0 | 2643.5 |
| 32 | 2891.9 | 1413.8 | -2848.1 | 616.8 | -2048.0 | .0 | 3508.0 |
| 33 | 2043.9 | 413.5 | -320.6 | 184.0 | -796.4 | .0 | 858.5 |
| 34 | 1195.9 | 413.5 | -320.6 | 175.3 | -753.1 | .0 | 818.5 |
| 35 | 347.8 | 413.5 | -320.6 | 166.5 | -709.8 | .0 | 778.8 |
| 36 | -500.2 | 1182.8 | -2307.5 | 509.8 | -1664.3 | .0 | 2845.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 26
spalla mobile - n777 _SisM10- n789 _SisM10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24692.7 | 10715.9 | 64760.1 | -7156.1 | -43324.1 | -45329.7 |
| 2 | 32653.8 | 9006.8 | 89100.0 | 17798.2 | 45147.0 | 61628.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57346.5 | 19722.7 | 153860.1 | 10642.1 | 87006.7 | 34585.8 |

Punto di applic. carico verticale: Xv = 2.683 m Yv = 1.517 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.965 | 16.470 | 1.959 | 5.282 | .156 | .112 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4215.3 | 1172.7 | -1926.3 | 643.6 | -2143.9 | .0 | 2882.2 |
| 2 | 3431.9 | 364.7 | -17.2 | 192.7 | -839.7 | .0 | 839.9 |
| 3 | 2648.4 | 272.3 | 227.3 | 184.0 | -796.4 | .0 | 828.2 |
| 4 | 1865.0 | 272.3 | 227.3 | 175.3 | -753.1 | .0 | 786.6 |
| 5 | 1081.5 | 272.3 | 227.3 | 166.5 | -709.8 | .0 | 745.3 |
| 6 | 298.1 | 272.3 | 227.3 | 157.8 | -666.4 | .0 | 704.1 |
| 7 | -485.3 | 838.5 | -1180.5 | 483.1 | -1568.3 | .0 | 1963.0 |
| 8 | 3886.1 | 815.5 | -1094.4 | 539.9 | -1863.9 | .0 | 2161.4 |
| 9 | 3102.7 | 215.7 | 398.6 | 188.3 | -818.0 | .0 | 910.0 |
| 10 | 2319.2 | 215.7 | 398.6 | 179.6 | -774.7 | .0 | 871.3 |
| 11 | 1535.8 | 215.7 | 398.6 | 170.9 | -731.4 | .0 | 833.0 |
| 12 | 752.4 | 215.7 | 398.6 | 162.2 | -688.1 | .0 | 795.2 |
| 13 | -31.1 | 815.5 | -1094.4 | 424.7 | -1433.1 | .0 | 1803.2 |
| 14 | 3556.9 | 957.3 | -1380.2 | 616.8 | -2048.0 | .0 | 2469.6 |
| 15 | 2773.5 | 252.4 | 322.1 | 184.0 | -796.4 | .0 | 859.1 |
| 16 | 1990.1 | 252.4 | 322.1 | 175.3 | -753.1 | .0 | 819.1 |
| 17 | 1206.6 | 252.4 | 322.1 | 166.5 | -709.8 | .0 | 779.4 |
| 18 | 423.2 | 792.4 | -1008.2 | 509.8 | -1664.3 | .0 | 1945.9 |
| 19 | 3671.3 | 1435.3 | -2836.0 | 643.6 | -2143.9 | .0 | 3555.1 |
| 20 | 2887.8 | 470.9 | -493.7 | 192.7 | -839.7 | .0 | 974.1 |
| 21 | 2104.4 | 358.7 | -185.2 | 184.0 | -796.4 | .0 | 817.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1320.9 | 358.7 | -185.2 | 175.3 | -753.1 | .0 | 775.5 |
| 23 | 537.5 | 358.7 | -185.2 | 166.5 | -709.8 | .0 | 733.5 |
| 24 | -246.0 | 358.7 | -185.2 | 157.8 | -666.4 | .0 | 691.7 |
| 25 | -1029.4 | 1038.8 | -1930.1 | 483.1 | -1568.3 | .0 | 2486.9 |
| 26 | 3217.0 | 1061.8 | -2016.2 | 539.9 | -1863.9 | .0 | 2745.7 |
| 27 | 2433.6 | 309.0 | -64.8 | 188.3 | -818.0 | .0 | 820.6 |
| 28 | 1650.1 | 309.0 | -64.8 | 179.6 | -774.7 | .0 | 777.4 |
| 29 | 866.7 | 309.0 | -64.8 | 170.9 | -731.4 | .0 | 734.3 |
| 30 | 83.2 | 309.0 | -64.8 | 162.2 | -688.1 | .0 | 691.1 |
| 31 | -700.2 | 1061.8 | -2016.2 | 424.7 | -1433.1 | .0 | 2473.6 |
| 32 | 2762.7 | 1297.0 | -2598.5 | 616.8 | -2048.0 | .0 | 3308.5 |
| 33 | 1979.3 | 378.6 | -280.0 | 184.0 | -796.4 | .0 | 844.2 |
| 34 | 1195.9 | 378.6 | -280.0 | 175.3 | -753.1 | .0 | 803.4 |
| 35 | 412.4 | 378.6 | -280.0 | 166.5 | -709.8 | .0 | 763.0 |
| 36 | -371.0 | 1084.8 | -2102.4 | 509.8 | -1664.3 | .0 | 2681.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 27
spalla mobile - n777 _SisM11- n789 _SisM11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34856.5 | 10016.7 | 108393.4 | -15502.4 | -56429.0 | -65380.5 |
| 2 | 28307.7 | 11806.0 | 84247.6 | 11954.1 | 50427.1 | 50643.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63164.2 | 21822.7 | 192641.0 | -3548.3 | -76074.1 | -33882.7 |

Punto di applic. carico verticale: Xv = 3.050 m Yv = -1.204 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.773 | 18.997 | 2.353 | -1.995 | -.108 | -.110 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4390.2 | 1588.9 | -2937.8 | -270.4 | 856.2 | .0 | 3060.0 |
| 2 | 3448.9 | 510.9 | -347.3 | -73.8 | 285.4 | .0 | 449.5 |
| 3 | 2507.7 | 386.4 | -9.6 | -65.3 | 243.0 | .0 | 243.1 |
| 4 | 1566.4 | 386.4 | -9.6 | -56.7 | 200.5 | .0 | 200.8 |
| 5 | 625.2 | 386.4 | -9.6 | -48.2 | 158.1 | .0 | 158.4 |
| 6 | -316.1 | 386.4 | -9.6 | -39.6 | 115.7 | .0 | 116.1 |
| 7 | -1257.3 | 1144.7 | -1932.1 | -113.1 | 292.4 | .0 | 1954.1 |
| 8 | 3876.3 | 1167.2 | -2016.5 | -219.7 | 714.0 | .0 | 2139.1 |
| 9 | 2935.1 | 330.1 | 126.2 | -69.5 | 264.2 | .0 | 292.8 |
| 10 | 1993.8 | 330.1 | 126.2 | -61.0 | 221.7 | .0 | 255.1 |
| 11 | 1052.6 | 330.1 | 126.2 | -52.4 | 179.3 | .0 | 219.2 |
| 12 | 111.3 | 330.1 | 126.2 | -43.9 | 136.9 | .0 | 186.2 |
| 13 | -829.9 | 1167.2 | -2016.5 | -106.9 | 292.0 | .0 | 2037.5 |
| 14 | 3362.5 | 1426.3 | -2648.7 | -244.2 | 762.3 | .0 | 2756.2 |
| 15 | 2421.2 | 405.8 | -102.5 | -65.3 | 243.0 | .0 | 263.7 |
| 16 | 1480.0 | 405.8 | -102.5 | -56.7 | 200.5 | .0 | 225.2 |
| 17 | 538.7 | 405.8 | -102.5 | -48.2 | 158.1 | .0 | 188.4 |
| 18 | -402.5 | 1189.8 | -2100.9 | -139.3 | 386.3 | .0 | 2136.1 |
| 19 | 4766.4 | 1331.6 | -2046.6 | -270.4 | 856.2 | .0 | 2218.5 |
| 20 | 3825.2 | 406.9 | 119.6 | -73.8 | 285.4 | .0 | 309.4 |
| 21 | 2883.9 | 301.7 | 394.4 | -65.3 | 243.0 | .0 | 463.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1942.7 | 301.7 | 394.4 | -56.7 | 200.5 | .0 | 442.5 |
| 23 | 1001.4 | 301.7 | 394.4 | -48.2 | 158.1 | .0 | 424.9 |
| 24 | 60.2 | 301.7 | 394.4 | -39.6 | 115.7 | .0 | 411.0 |
| 25 | -881.1 | 948.4 | -1197.8 | -113.1 | 292.4 | .0 | 1233.0 |
| 26 | 4339.0 | 925.9 | -1113.4 | -219.7 | 714.0 | .0 | 1322.7 |
| 27 | 3397.8 | 238.7 | 580.2 | -69.5 | 264.2 | .0 | 637.5 |
| 28 | 2456.5 | 238.7 | 580.2 | -61.0 | 221.7 | .0 | 621.1 |
| 29 | 1515.3 | 238.7 | 580.2 | -52.4 | 179.3 | .0 | 607.3 |
| 30 | 574.0 | 238.7 | 580.2 | -43.9 | 136.9 | .0 | 596.1 |
| 31 | -367.2 | 925.9 | -1113.4 | -106.9 | 292.0 | .0 | 1151.0 |
| 32 | 3911.7 | 1093.5 | -1455.1 | -244.2 | 762.3 | .0 | 1642.7 |
| 33 | 2970.4 | 282.3 | 487.3 | -65.3 | 243.0 | .0 | 544.5 |
| 34 | 2029.2 | 282.3 | 487.3 | -56.7 | 200.5 | .0 | 527.0 |
| 35 | 1087.9 | 282.3 | 487.3 | -48.2 | 158.1 | .0 | 512.3 |
| 36 | 146.7 | 903.3 | -1029.0 | -139.3 | 386.3 | .0 | 1099.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 28
spalla mobile - n777 _SisM12- n789 _SisM12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34856.5 | 8967.1 | 103039.4 | -15538.5 | -56263.5 | -60671.6 |
| 2 | 28307.7 | 10755.7 | 78891.6 | 11990.2 | 50261.3 | 45926.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63164.2 | 19722.8 | 181931.0 | -3548.3 | -76074.4 | -33883.1 |

Punto di applic. carico verticale: Xv = 2.880 m Yv = -1.204 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.773 | 17.439 | 2.192 | -1.995 | -.108 | -.110 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4196.5 | 1454.5 | -2648.2 | -270.4 | 856.2 | .0 | 2783.2 |
| 2 | 3319.8 | 465.6 | -277.3 | -73.8 | 285.4 | .0 | 398.0 |
| 3 | 2443.1 | 351.5 | 30.9 | -65.3 | 243.0 | .0 | 244.9 |
| 4 | 1566.4 | 351.5 | 30.9 | -56.7 | 200.5 | .0 | 202.9 |
| 5 | 689.8 | 351.5 | 30.9 | -48.2 | 158.1 | .0 | 161.1 |
| 6 | -186.9 | 351.5 | 30.9 | -39.6 | 115.7 | .0 | 119.7 |
| 7 | -1063.6 | 1046.8 | -1727.0 | -113.1 | 292.4 | .0 | 1751.6 |
| 8 | 3714.9 | 1069.3 | -1811.4 | -219.7 | 714.0 | .0 | 1947.0 |
| 9 | 2838.2 | 300.7 | 151.1 | -69.5 | 264.2 | .0 | 304.3 |
| 10 | 1961.5 | 300.7 | 151.1 | -61.0 | 221.7 | .0 | 268.3 |
| 11 | 1084.9 | 300.7 | 151.1 | -52.4 | 179.3 | .0 | 234.5 |
| 12 | 208.2 | 300.7 | 151.1 | -43.9 | 136.9 | .0 | 203.8 |
| 13 | -668.5 | 1069.3 | -1811.4 | -106.9 | 292.0 | .0 | 1834.8 |
| 14 | 3233.3 | 1309.5 | -2399.1 | -244.2 | 762.3 | .0 | 2517.3 |
| 15 | 2356.6 | 371.0 | -62.0 | -65.3 | 243.0 | .0 | 250.7 |
| 16 | 1480.0 | 371.0 | -62.0 | -56.7 | 200.5 | .0 | 209.9 |
| 17 | 603.3 | 371.0 | -62.0 | -48.2 | 158.1 | .0 | 169.8 |
| 18 | -273.4 | 1091.9 | -1895.8 | -139.3 | 386.3 | .0 | 1934.7 |
| 19 | 4572.7 | 1197.2 | -1757.0 | -270.4 | 856.2 | .0 | 1954.5 |
| 20 | 3696.0 | 361.6 | 189.5 | -73.8 | 285.4 | .0 | 342.6 |
| 21 | 2819.3 | 266.8 | 435.0 | -65.3 | 243.0 | .0 | 498.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1942.7 | 266.8 | 435.0 | -56.7 | 200.5 | .0 | 479.0 |
| 23 | 1066.0 | 266.8 | 435.0 | -48.2 | 158.1 | .0 | 462.8 |
| 24 | 189.3 | 266.8 | 435.0 | -39.6 | 115.7 | .0 | 450.1 |
| 25 | -687.3 | 850.5 | -992.7 | -113.1 | 292.4 | .0 | 1034.9 |
| 26 | 4177.6 | 828.0 | -908.3 | -219.7 | 714.0 | .0 | 1155.3 |
| 27 | 3300.9 | 209.3 | 605.1 | -69.5 | 264.2 | .0 | 660.3 |
| 28 | 2424.3 | 209.3 | 605.1 | -61.0 | 221.7 | .0 | 644.5 |
| 29 | 1547.6 | 209.3 | 605.1 | -52.4 | 179.3 | .0 | 631.1 |
| 30 | 670.9 | 209.3 | 605.1 | -43.9 | 136.9 | .0 | 620.4 |
| 31 | -205.8 | 828.0 | -908.3 | -106.9 | 292.0 | .0 | 954.1 |
| 32 | 3782.5 | 976.7 | -1205.5 | -244.2 | 762.3 | .0 | 1426.3 |
| 33 | 2905.8 | 247.4 | 527.9 | -65.3 | 243.0 | .0 | 581.1 |
| 34 | 2029.2 | 247.4 | 527.9 | -56.7 | 200.5 | .0 | 564.7 |
| 35 | 1152.5 | 247.4 | 527.9 | -48.2 | 158.1 | .0 | 551.1 |
| 36 | 275.8 | 805.4 | -823.9 | -139.3 | 386.3 | .0 | 910.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 29
spalla mobile - n777 _SisM13- n789 _SisM13

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 26326.6 | 11278.1 | 74698.6 | -8721.0 | -44778.4 | -51790.1 |
| 2 | 29528.0 | 10544.7 | 82673.2 | 15288.4 | 43247.4 | 58868.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 55854.6 | 21822.8 | 157371.8 | 6567.4 | 32724.0 | 14926.2 |

Punto di applic. carico verticale: Xv = 2.818 m Yv = .586 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.758 | 17.779 | 2.060 | 3.155 | .072 | .048 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4148.3 | 1376.2 | -2520.2 | 380.5 | -1289.5 | .0 | 2831.0 |
| 2 | 3324.2 | 441.3 | -276.8 | 116.5 | -524.6 | .0 | 593.2 |
| 3 | 2500.1 | 333.4 | 15.1 | 112.7 | -506.0 | .0 | 506.2 |
| 4 | 1676.0 | 333.4 | 15.1 | 108.9 | -487.3 | .0 | 487.5 |
| 5 | 851.9 | 333.4 | 15.1 | 105.2 | -468.6 | .0 | 468.8 |
| 6 | 27.8 | 333.4 | 15.1 | 101.4 | -449.9 | .0 | 450.1 |
| 7 | -796.4 | 990.8 | -1648.8 | 311.2 | -1041.1 | .0 | 1950.0 |
| 8 | 3764.9 | 980.9 | -1611.6 | 321.4 | -1131.0 | .0 | 1968.9 |
| 9 | 2940.8 | 273.5 | 187.8 | 114.6 | -515.3 | .0 | 548.5 |
| 10 | 2116.7 | 273.5 | 187.8 | 110.8 | -496.6 | .0 | 530.9 |
| 11 | 1292.5 | 273.5 | 187.8 | 107.0 | -477.9 | .0 | 513.5 |
| 12 | 468.4 | 273.5 | 187.8 | 103.3 | -459.2 | .0 | 496.2 |
| 13 | -355.7 | 980.9 | -1611.6 | 271.7 | -945.1 | .0 | 1868.3 |
| 14 | 3381.5 | 1166.5 | -2024.0 | 369.0 | -1248.1 | .0 | 2377.9 |
| 15 | 2557.3 | 324.8 | 56.0 | 112.7 | -506.0 | .0 | 509.0 |
| 16 | 1733.2 | 324.8 | 56.0 | 108.9 | -487.3 | .0 | 490.5 |
| 17 | 909.1 | 324.8 | 56.0 | 105.2 | -468.6 | .0 | 471.9 |
| 18 | 85.0 | 970.9 | -1574.5 | 322.8 | -1082.5 | .0 | 1910.7 |
| 19 | 3899.4 | 1489.5 | -2912.8 | 380.5 | -1289.5 | .0 | 3185.5 |
| 20 | 3075.3 | 487.1 | -482.5 | 116.5 | -524.6 | .0 | 712.8 |
| 21 | 2251.2 | 370.7 | -162.9 | 112.7 | -506.0 | .0 | 531.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1427.0 | 370.7 | -162.9 | 108.9 | -487.3 | .0 | 513.8 |
| 23 | 602.9 | 370.7 | -162.9 | 105.2 | -468.6 | .0 | 496.1 |
| 24 | -221.2 | 370.7 | -162.9 | 101.4 | -449.9 | .0 | 478.5 |
| 25 | -1045.3 | 1077.2 | -1972.3 | 311.2 | -1041.1 | .0 | 2230.2 |
| 26 | 3458.7 | 1087.2 | -2009.5 | 321.4 | -1131.0 | .0 | 2305.9 |
| 27 | 2634.6 | 313.7 | -12.2 | 114.6 | -515.3 | .0 | 515.4 |
| 28 | 1810.5 | 313.7 | -12.2 | 110.8 | -496.6 | .0 | 496.8 |
| 29 | 986.4 | 313.7 | -12.2 | 107.0 | -477.9 | .0 | 478.1 |
| 30 | 162.3 | 313.7 | -12.2 | 103.3 | -459.2 | .0 | 459.4 |
| 31 | -661.9 | 1087.2 | -2009.5 | 271.7 | -945.1 | .0 | 2220.6 |
| 32 | 3018.1 | 1313.2 | -2549.8 | 369.0 | -1248.1 | .0 | 2838.9 |
| 33 | 2193.9 | 379.2 | -203.8 | 112.7 | -506.0 | .0 | 545.5 |
| 34 | 1369.8 | 379.2 | -203.8 | 108.9 | -487.3 | .0 | 528.2 |
| 35 | 545.7 | 379.2 | -203.8 | 105.2 | -468.6 | .0 | 511.0 |
| 36 | -278.4 | 1097.1 | -2046.6 | 322.8 | -1082.5 | .0 | 2315.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 30
spalla mobile - n777 _SisM14- n789 _SisM14

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 26326.6 | 10228.4 | 69344.6 | -8757.1 | -44613.0 | -47081.3 |
| 2 | 29528.0 | 9494.3 | 77317.3 | 15324.5 | 43081.7 | 54152.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 55854.6 | 19722.7 | 146661.9 | 6567.4 | 32723.7 | 14925.7 |

Punto di applic. carico verticale: Xv = 2.626 m Yv = .586 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.758 | 16.221 | 1.899 | 3.155 | .072 | .048 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3954.6 | 1241.7 | -2230.6 | 380.5 | -1289.5 | .0 | 2576.5 |
| 2 | 3195.1 | 395.9 | -206.9 | 116.5 | -524.6 | .0 | 564.0 |
| 3 | 2435.5 | 298.5 | 55.7 | 112.7 | -506.0 | .0 | 509.0 |
| 4 | 1676.0 | 298.5 | 55.7 | 108.9 | -487.3 | .0 | 490.4 |
| 5 | 916.5 | 298.5 | 55.7 | 105.2 | -468.6 | .0 | 471.9 |
| 6 | 156.9 | 298.5 | 55.7 | 101.4 | -449.9 | .0 | 453.3 |
| 7 | -602.6 | 892.9 | -1443.7 | 311.2 | -1041.1 | .0 | 1779.9 |
| 8 | 3603.4 | 882.9 | -1406.5 | 321.4 | -1131.0 | .0 | 1804.9 |
| 9 | 2843.9 | 244.1 | 212.8 | 114.6 | -515.3 | .0 | 557.5 |
| 10 | 2084.4 | 244.1 | 212.8 | 110.8 | -496.6 | .0 | 540.3 |
| 11 | 1324.8 | 244.1 | 212.8 | 107.0 | -477.9 | .0 | 523.1 |
| 12 | 565.3 | 244.1 | 212.8 | 103.3 | -459.2 | .0 | 506.1 |
| 13 | -194.2 | 882.9 | -1406.5 | 271.7 | -945.1 | .0 | 1694.6 |
| 14 | 3252.3 | 1049.7 | -1774.4 | 369.0 | -1248.1 | .0 | 2169.4 |
| 15 | 2492.8 | 289.9 | 96.6 | 112.7 | -506.0 | .0 | 515.1 |
| 16 | 1733.2 | 289.9 | 96.6 | 108.9 | -487.3 | .0 | 496.7 |
| 17 | 973.7 | 289.9 | 96.6 | 105.2 | -468.6 | .0 | 478.4 |
| 18 | 214.1 | 873.0 | -1369.3 | 322.8 | -1082.5 | .0 | 1745.5 |
| 19 | 3705.7 | 1355.1 | -2623.2 | 380.5 | -1289.5 | .0 | 2923.0 |
| 20 | 2946.1 | 441.8 | -412.5 | 116.5 | -524.6 | .0 | 667.4 |
| 21 | 2186.6 | 335.8 | -122.3 | 112.7 | -506.0 | .0 | 520.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1427.0 | 335.8 | -122.3 | 108.9 | -487.3 | .0 | 502.4 |
| 23 | 667.5 | 335.8 | -122.3 | 105.2 | -468.6 | .0 | 484.3 |
| 24 | -92.0 | 335.8 | -122.3 | 101.4 | -449.9 | .0 | 466.2 |
| 25 | -851.6 | 979.3 | -1767.2 | 311.2 | -1041.1 | .0 | 2051.0 |
| 26 | 3297.3 | 989.2 | -1804.3 | 321.4 | -1131.0 | .0 | 2129.5 |
| 27 | 2537.7 | 284.3 | 12.7 | 114.6 | -515.3 | .0 | 515.5 |
| 28 | 1778.2 | 284.3 | 12.7 | 110.8 | -496.6 | .0 | 496.8 |
| 29 | 1018.7 | 284.3 | 12.7 | 107.0 | -477.9 | .0 | 478.1 |
| 30 | 259.1 | 284.3 | 12.7 | 103.3 | -459.2 | .0 | 459.4 |
| 31 | -500.4 | 989.2 | -1804.3 | 271.7 | -945.1 | .0 | 2036.9 |
| 32 | 2888.9 | 1196.4 | -2300.1 | 369.0 | -1248.1 | .0 | 2616.9 |
| 33 | 2129.4 | 344.4 | -163.2 | 112.7 | -506.0 | .0 | 531.6 |
| 34 | 1369.8 | 344.4 | -163.2 | 108.9 | -487.3 | .0 | 513.9 |
| 35 | 610.3 | 344.4 | -163.2 | 105.2 | -468.6 | .0 | 496.2 |
| 36 | -149.3 | 999.2 | -1841.5 | 322.8 | -1082.5 | .0 | 2136.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 31
spalla mobile - n777 _SisM17- n789 _SisM17

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 26326.6 | 11278.1 | 74698.6 | -8721.0 | -44778.4 | -51790.1 |
| 2 | 29528.0 | 10544.7 | 82673.2 | 15288.4 | 43247.4 | 58868.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 55854.6 | 21822.8 | 157371.8 | 6567.4 | 32724.0 | 14926.2 |

Punto di applic. carico verticale: Xv = 2.818 m Yv = .586 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.758 | 17.779 | 2.060 | 3.155 | .072 | .048 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4148.3 | 1376.2 | -2520.2 | 380.5 | -1289.5 | .0 | 2831.0 |
| 2 | 3324.2 | 441.3 | -276.8 | 116.5 | -524.6 | .0 | 593.2 |
| 3 | 2500.1 | 333.4 | 15.1 | 112.7 | -506.0 | .0 | 506.2 |
| 4 | 1676.0 | 333.4 | 15.1 | 108.9 | -487.3 | .0 | 487.5 |
| 5 | 851.9 | 333.4 | 15.1 | 105.2 | -468.6 | .0 | 468.8 |
| 6 | 27.8 | 333.4 | 15.1 | 101.4 | -449.9 | .0 | 450.1 |
| 7 | -796.4 | 990.8 | -1648.8 | 311.2 | -1041.1 | .0 | 1950.0 |
| 8 | 3764.9 | 980.9 | -1611.6 | 321.4 | -1131.0 | .0 | 1968.9 |
| 9 | 2940.8 | 273.5 | 187.8 | 114.6 | -515.3 | .0 | 548.5 |
| 10 | 2116.7 | 273.5 | 187.8 | 110.8 | -496.6 | .0 | 530.9 |
| 11 | 1292.5 | 273.5 | 187.8 | 107.0 | -477.9 | .0 | 513.5 |
| 12 | 468.4 | 273.5 | 187.8 | 103.3 | -459.2 | .0 | 496.2 |
| 13 | -355.7 | 980.9 | -1611.6 | 271.7 | -945.1 | .0 | 1868.3 |
| 14 | 3381.5 | 1166.5 | -2024.0 | 369.0 | -1248.1 | .0 | 2377.9 |
| 15 | 2557.3 | 324.8 | 56.0 | 112.7 | -506.0 | .0 | 509.0 |
| 16 | 1733.2 | 324.8 | 56.0 | 108.9 | -487.3 | .0 | 490.5 |
| 17 | 909.1 | 324.8 | 56.0 | 105.2 | -468.6 | .0 | 471.9 |
| 18 | 85.0 | 970.9 | -1574.5 | 322.8 | -1082.5 | .0 | 1910.7 |
| 19 | 3899.4 | 1489.5 | -2912.8 | 380.5 | -1289.5 | .0 | 3185.5 |
| 20 | 3075.3 | 487.1 | -482.5 | 116.5 | -524.6 | .0 | 712.8 |
| 21 | 2251.2 | 370.7 | -162.9 | 112.7 | -506.0 | .0 | 531.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1427.0 | 370.7 | -162.9 | 108.9 | -487.3 | .0 | 513.8 |
| 23 | 602.9 | 370.7 | -162.9 | 105.2 | -468.6 | .0 | 496.1 |
| 24 | -221.2 | 370.7 | -162.9 | 101.4 | -449.9 | .0 | 478.5 |
| 25 | -1045.3 | 1077.2 | -1972.3 | 311.2 | -1041.1 | .0 | 2230.2 |
| 26 | 3458.7 | 1087.2 | -2009.5 | 321.4 | -1131.0 | .0 | 2305.9 |
| 27 | 2634.6 | 313.7 | -12.2 | 114.6 | -515.3 | .0 | 515.4 |
| 28 | 1810.5 | 313.7 | -12.2 | 110.8 | -496.6 | .0 | 496.8 |
| 29 | 986.4 | 313.7 | -12.2 | 107.0 | -477.9 | .0 | 478.1 |
| 30 | 162.3 | 313.7 | -12.2 | 103.3 | -459.2 | .0 | 459.4 |
| 31 | -661.9 | 1087.2 | -2009.5 | 271.7 | -945.1 | .0 | 2220.6 |
| 32 | 3018.1 | 1313.2 | -2549.8 | 369.0 | -1248.1 | .0 | 2838.9 |
| 33 | 2193.9 | 379.2 | -203.8 | 112.7 | -506.0 | .0 | 545.5 |
| 34 | 1369.8 | 379.2 | -203.8 | 108.9 | -487.3 | .0 | 528.2 |
| 35 | 545.7 | 379.2 | -203.8 | 105.2 | -468.6 | .0 | 511.0 |
| 36 | -278.4 | 1097.1 | -2046.6 | 322.8 | -1082.5 | .0 | 2315.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 32
spalla mobile - n777 _SisM18- n789 _SisM18

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 26326.6 | 10228.4 | 69344.6 | -8757.1 | -44613.0 | -47081.3 |
| 2 | 29528.0 | 9494.3 | 77317.3 | 15324.5 | 43081.7 | 54152.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 55854.6 | 19722.7 | 146661.9 | 6567.4 | 32723.7 | 14925.7 |

Punto di applic. carico verticale: Xv = 2.626 m Yv = .586 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.758 | 16.221 | 1.899 | 3.155 | .072 | .048 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3954.6 | 1241.7 | -2230.6 | 380.5 | -1289.5 | .0 | 2576.5 |
| 2 | 3195.1 | 395.9 | -206.9 | 116.5 | -524.6 | .0 | 564.0 |
| 3 | 2435.5 | 298.5 | 55.7 | 112.7 | -506.0 | .0 | 509.0 |
| 4 | 1676.0 | 298.5 | 55.7 | 108.9 | -487.3 | .0 | 490.4 |
| 5 | 916.5 | 298.5 | 55.7 | 105.2 | -468.6 | .0 | 471.9 |
| 6 | 156.9 | 298.5 | 55.7 | 101.4 | -449.9 | .0 | 453.3 |
| 7 | -602.6 | 892.9 | -1443.7 | 311.2 | -1041.1 | .0 | 1779.9 |
| 8 | 3603.4 | 882.9 | -1406.5 | 321.4 | -1131.0 | .0 | 1804.9 |
| 9 | 2843.9 | 244.1 | 212.8 | 114.6 | -515.3 | .0 | 557.5 |
| 10 | 2084.4 | 244.1 | 212.8 | 110.8 | -496.6 | .0 | 540.3 |
| 11 | 1324.8 | 244.1 | 212.8 | 107.0 | -477.9 | .0 | 523.1 |
| 12 | 565.3 | 244.1 | 212.8 | 103.3 | -459.2 | .0 | 506.1 |
| 13 | -194.2 | 882.9 | -1406.5 | 271.7 | -945.1 | .0 | 1694.6 |
| 14 | 3252.3 | 1049.7 | -1774.4 | 369.0 | -1248.1 | .0 | 2169.4 |
| 15 | 2492.8 | 289.9 | 96.6 | 112.7 | -506.0 | .0 | 515.1 |
| 16 | 1733.2 | 289.9 | 96.6 | 108.9 | -487.3 | .0 | 496.7 |
| 17 | 973.7 | 289.9 | 96.6 | 105.2 | -468.6 | .0 | 478.4 |
| 18 | 214.1 | 873.0 | -1369.3 | 322.8 | -1082.5 | .0 | 1745.5 |
| 19 | 3705.7 | 1355.1 | -2623.2 | 380.5 | -1289.5 | .0 | 2923.0 |
| 20 | 2946.1 | 441.8 | -412.5 | 116.5 | -524.6 | .0 | 667.4 |
| 21 | 2186.6 | 335.8 | -122.3 | 112.7 | -506.0 | .0 | 520.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1427.0 | 335.8 | -122.3 | 108.9 | -487.3 | .0 | 502.4 |
| 23 | 667.5 | 335.8 | -122.3 | 105.2 | -468.6 | .0 | 484.3 |
| 24 | -92.0 | 335.8 | -122.3 | 101.4 | -449.9 | .0 | 466.2 |
| 25 | -851.6 | 979.3 | -1767.2 | 311.2 | -1041.1 | .0 | 2051.0 |
| 26 | 3297.3 | 989.2 | -1804.3 | 321.4 | -1131.0 | .0 | 2129.5 |
| 27 | 2537.7 | 284.3 | 12.7 | 114.6 | -515.3 | .0 | 515.5 |
| 28 | 1778.2 | 284.3 | 12.7 | 110.8 | -496.6 | .0 | 496.8 |
| 29 | 1018.7 | 284.3 | 12.7 | 107.0 | -477.9 | .0 | 478.1 |
| 30 | 259.1 | 284.3 | 12.7 | 103.3 | -459.2 | .0 | 459.4 |
| 31 | -500.4 | 989.2 | -1804.3 | 271.7 | -945.1 | .0 | 2036.9 |
| 32 | 2888.9 | 1196.4 | -2300.1 | 369.0 | -1248.1 | .0 | 2616.9 |
| 33 | 2129.4 | 344.4 | -163.2 | 112.7 | -506.0 | .0 | 531.6 |
| 34 | 1369.8 | 344.4 | -163.2 | 108.9 | -487.3 | .0 | 513.9 |
| 35 | 610.3 | 344.4 | -163.2 | 105.2 | -468.6 | .0 | 496.2 |
| 36 | -149.3 | 999.2 | -1841.5 | 322.8 | -1082.5 | .0 | 2136.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 33
spalla mobile - n777 _SisM21- n789 _SisM21

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24763.1 | 7097.3 | 59811.5 | -4295.5 | -45693.0 | -35993.5 |
| 2 | 29697.0 | 6449.3 | 68326.7 | 19124.0 | 39460.4 | 44733.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 54460.1 | 13546.6 | 128138.2 | 14828.5 | 46560.1 | 15673.6 |

Punto di applic. carico verticale: Xv = 2.353 m Yv = .855 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.564 | 12.088 | 1.532 | 6.989 | .129 | .051 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3575.4 | 853.6 | -1286.5 | 815.1 | -2787.4 | .0 | 3070.0 |
| 2 | 2962.7 | 259.6 | 101.8 | 254.9 | -1168.8 | .0 | 1173.2 |
| 3 | 2350.0 | 192.1 | 277.5 | 250.9 | -1149.2 | .0 | 1182.2 |
| 4 | 1737.3 | 192.1 | 277.5 | 246.9 | -1129.5 | .0 | 1163.1 |
| 5 | 1124.6 | 192.1 | 277.5 | 243.0 | -1109.9 | .0 | 1144.1 |
| 6 | 511.9 | 192.1 | 277.5 | 239.0 | -1090.3 | .0 | 1125.0 |
| 7 | -100.8 | 607.3 | -742.0 | 742.3 | -2526.6 | .0 | 2633.3 |
| 8 | 3320.6 | 596.9 | -703.0 | 694.2 | -2468.6 | .0 | 2566.7 |
| 9 | 2707.9 | 153.2 | 388.6 | 252.9 | -1159.0 | .0 | 1222.4 |
| 10 | 2095.2 | 153.2 | 388.6 | 248.9 | -1139.4 | .0 | 1203.8 |
| 11 | 1482.5 | 153.2 | 388.6 | 245.0 | -1119.7 | .0 | 1185.3 |
| 12 | 869.8 | 153.2 | 388.6 | 241.0 | -1100.1 | .0 | 1166.7 |
| 13 | 257.1 | 596.9 | -703.0 | 642.0 | -2273.4 | .0 | 2379.6 |
| 14 | 3065.9 | 710.0 | -940.7 | 802.9 | -2744.0 | .0 | 2900.7 |
| 15 | 2453.2 | 183.1 | 320.4 | 250.9 | -1149.2 | .0 | 1193.0 |
| 16 | 1840.5 | 183.1 | 320.4 | 246.9 | -1129.5 | .0 | 1174.1 |
| 17 | 1227.8 | 183.1 | 320.4 | 243.0 | -1109.9 | .0 | 1155.2 |
| 18 | 615.1 | 586.5 | -664.0 | 754.4 | -2570.1 | .0 | 2654.5 |
| 19 | 3126.4 | 972.6 | -1698.8 | 815.1 | -2787.4 | .0 | 3264.3 |
| 20 | 2513.7 | 307.7 | -114.2 | 254.9 | -1168.8 | .0 | 1174.4 |
| 21 | 1901.0 | 231.2 | 90.6 | 250.9 | -1149.2 | .0 | 1152.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1288.3 | 231.2 | 90.6 | 246.9 | -1129.5 | .0 | 1133.2 |
| 23 | 675.6 | 231.2 | 90.6 | 243.0 | -1109.9 | .0 | 1113.6 |
| 24 | 62.9 | 231.2 | 90.6 | 239.0 | -1090.3 | .0 | 1094.0 |
| 25 | -549.8 | 698.1 | -1081.7 | 742.3 | -2526.6 | .0 | 2748.4 |
| 26 | 2768.4 | 708.5 | -1120.7 | 694.2 | -2468.6 | .0 | 2711.1 |
| 27 | 2155.7 | 195.5 | 178.6 | 252.9 | -1159.0 | .0 | 1172.7 |
| 28 | 1543.0 | 195.5 | 178.6 | 248.9 | -1139.4 | .0 | 1153.3 |
| 29 | 930.3 | 195.5 | 178.6 | 245.0 | -1119.7 | .0 | 1133.9 |
| 30 | 317.6 | 195.5 | 178.6 | 241.0 | -1100.1 | .0 | 1114.5 |
| 31 | -295.1 | 708.5 | -1120.7 | 642.0 | -2273.4 | .0 | 2534.6 |
| 32 | 2410.5 | 863.9 | -1492.8 | 802.9 | -2744.0 | .0 | 3123.7 |
| 33 | 1797.8 | 240.2 | 47.6 | 250.9 | -1149.2 | .0 | 1150.2 |
| 34 | 1185.1 | 240.2 | 47.6 | 246.9 | -1129.5 | .0 | 1130.5 |
| 35 | 572.4 | 240.2 | 47.6 | 243.0 | -1109.9 | .0 | 1110.9 |
| 36 | -40.3 | 719.0 | -1159.8 | 754.4 | -2570.1 | .0 | 2819.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 34
spalla mobile - n777 _SisM22 - n789 _SisM22

Coordinate Centri di Carico (c.c.)

| c.c. | Xc<br>m | Yc<br>m | Zc<br>m | Alfc<br>deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc<br>kN | Fxc<br>kN | Mxc<br>kN*m | Fyc<br>kN | Myc<br>kN*m | Mzc<br>kN*m |
|---|---|---|---|---|---|---|
| 1 | 24763.1 | 6047.7 | 54457.4 | -4331.6 | -45527.6 | -31284.7 |
| 2 | 29697.0 | 5399.0 | 62970.7 | 19160.1 | 39294.6 | 40016.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz<br>kN | Fx<br>kN | Mx<br>kN*m | Fy<br>kN | My<br>kN*m | Mz<br>kN*m |
|---|---|---|---|---|---|
| 54460.1 | 11446.7 | 117428.1 | 14828.5 | 46559.7 | 15673.1 |

Punto di applic. carico verticale: Xv = 2.156 m Yv = .855 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz<br>mm | dx<br>mm | rx<br>mRad | dy<br>mm | ry<br>mRad | rz<br>mRad |
|---|---|---|---|---|---|
| 7.564 | 10.530 | 1.370 | 6.989 | .129 | .051 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp<br>kN | Fxp<br>kN | Mxp<br>kN*m | Fyp<br>kN | Myp<br>kN*m | Mzp<br>kN*m | Mris<br>kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3381.6 | 719.2 | -996.9 | 815.1 | -2787.4 | .0 | 2960.3 |
| 2 | 2833.5 | 214.2 | 171.7 | 254.9 | -1168.8 | .0 | 1181.3 |
| 3 | 2285.4 | 157.2 | 318.1 | 250.9 | -1149.2 | .0 | 1192.4 |
| 4 | 1737.3 | 157.2 | 318.1 | 246.9 | -1129.5 | .0 | 1173.5 |
| 5 | 1189.1 | 157.2 | 318.1 | 243.0 | -1109.9 | .0 | 1154.6 |
| 6 | 641.0 | 157.2 | 318.1 | 239.0 | -1090.3 | .0 | 1135.7 |
| 7 | 92.9 | 509.4 | -537.0 | 742.3 | -2526.6 | .0 | 2583.0 |
| 8 | 3159.2 | 499.0 | -497.9 | 694.2 | -2468.6 | .0 | 2518.3 |
| 9 | 2611.1 | 123.8 | 413.5 | 252.9 | -1159.0 | .0 | 1230.5 |
| 10 | 2062.9 | 123.8 | 413.5 | 248.9 | -1139.4 | .0 | 1212.1 |
| 11 | 1514.8 | 123.8 | 413.5 | 245.0 | -1119.7 | .0 | 1193.6 |
| 12 | 966.7 | 123.8 | 413.5 | 241.0 | -1100.1 | .0 | 1175.3 |
| 13 | 418.6 | 499.0 | -497.9 | 642.0 | -2273.4 | .0 | 2327.2 |
| 14 | 2936.7 | 593.2 | -691.1 | 802.9 | -2744.0 | .0 | 2829.7 |
| 15 | 2388.6 | 148.2 | 361.0 | 250.9 | -1149.2 | .0 | 1204.5 |
| 16 | 1840.5 | 148.2 | 361.0 | 246.9 | -1129.5 | .0 | 1185.8 |
| 17 | 1292.4 | 148.2 | 361.0 | 243.0 | -1109.9 | .0 | 1167.2 |
| 18 | 744.2 | 488.5 | -458.9 | 754.4 | -2570.1 | .0 | 2610.7 |
| 19 | 2932.7 | 838.2 | -1409.2 | 815.1 | -2787.4 | .0 | 3123.4 |
| 20 | 2384.5 | 262.3 | -44.2 | 254.9 | -1168.8 | .0 | 1169.6 |
| 21 | 1836.4 | 196.4 | 131.1 | 250.9 | -1149.2 | .0 | 1156.6 |

```
  22   1288.3    196.4    131.1    246.9  -1129.5       .0    1137.1
  23    740.2    196.4    131.1    243.0  -1109.9       .0    1117.6
  24    192.1    196.4    131.1    239.0  -1090.3       .0    1098.1
  25   -356.1    600.2   -876.6    742.3  -2526.6       .0    2674.4
  26   2607.0    610.6   -915.6    694.2  -2468.6       .0    2632.9
  27   2058.9    166.1    203.5    252.9  -1159.0       .0    1176.7
  28   1510.8    166.1    203.5    248.9  -1139.4       .0    1157.4
  29    962.6    166.1    203.5    245.0  -1119.7       .0    1138.1
  30    414.5    166.1    203.5    241.0  -1100.1       .0    1118.8
  31   -133.6    610.6   -915.6    642.0  -2273.4       .0    2450.8
  32   2281.3    747.1  -1243.2    802.9  -2744.0       .0    3012.4
  33   1733.2    205.4     88.2    250.9  -1149.2       .0    1152.6
  34   1185.1    205.4     88.2    246.9  -1129.5       .0    1133.0
  35    637.0    205.4     88.2    243.0  -1109.9       .0    1113.4
  36     88.8    621.0   -954.7    754.4  -2570.1       .0    2741.7
 -------------------------------------------------------------------

 Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 35
spalla mobile - n777 _SisM23- n789 _SisM23

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33263.1 | 6337.1 | 96657.0 | -10232.3 | -59109.2 | -50590.0 |
| 2 | 33110.0 | 7209.6 | 88961.5 | 19094.8 | 51477.9 | 46813.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66373.1 | 13546.7 | 185618.5 | 8862.5 | -9269.5 | -13112.4 |

Punto di applic. carico verticale: Xv = 2.797 m Yv = -.140 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.218 | 14.073 | 2.009 | 3.993 | .033 | -.043 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4311.9 | 1007.6 | -1299.5 | 431.9 | -1514.0 | .0 | 1995.3 |
| 2 | 3508.3 | 295.2 | 336.6 | 142.3 | -682.1 | .0 | 760.7 |
| 3 | 2704.7 | 215.1 | 539.8 | 145.6 | -698.5 | .0 | 882.8 |
| 4 | 1901.1 | 215.1 | 539.8 | 149.0 | -715.0 | .0 | 895.8 |
| 5 | 1097.5 | 215.1 | 539.8 | 152.3 | -731.4 | .0 | 909.0 |
| 6 | 293.9 | 215.1 | 539.8 | 155.6 | -747.8 | .0 | 922.3 |
| 7 | -509.7 | 711.1 | -653.7 | 492.7 | -1732.2 | .0 | 1851.5 |
| 8 | 3923.3 | 719.9 | -686.4 | 375.5 | -1372.1 | .0 | 1534.2 |
| 9 | 3119.7 | 177.0 | 628.2 | 144.0 | -690.3 | .0 | 933.4 |
| 10 | 2316.1 | 177.0 | 628.2 | 147.3 | -706.7 | .0 | 945.6 |
| 11 | 1512.5 | 177.0 | 628.2 | 150.6 | -723.2 | .0 | 957.9 |
| 12 | 708.9 | 177.0 | 628.2 | 153.9 | -739.6 | .0 | 970.4 |
| 13 | -94.7 | 719.9 | -686.4 | 419.2 | -1535.5 | .0 | 1681.9 |
| 14 | 3534.7 | 884.0 | -1064.7 | 442.0 | -1550.4 | .0 | 1880.8 |
| 15 | 2731.1 | 222.6 | 503.8 | 145.6 | -698.5 | .0 | 861.3 |
| 16 | 1927.5 | 222.6 | 503.8 | 149.0 | -715.0 | .0 | 874.6 |
| 17 | 1123.9 | 222.6 | 503.8 | 152.3 | -731.4 | .0 | 888.1 |
| 18 | 320.3 | 728.6 | -719.0 | 482.6 | -1695.9 | .0 | 1842.0 |
| 19 | 4197.1 | 908.0 | -954.6 | 431.9 | -1514.0 | .0 | 1789.9 |
| 20 | 3393.5 | 254.9 | 517.3 | 142.3 | -682.1 | .0 | 856.1 |
| 21 | 2589.9 | 182.3 | 696.2 | 145.6 | -698.5 | .0 | 986.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1786.3 | 182.3 | 696.2 | 149.0 | -715.0 | .0 | 997.9 |
| 23 | 982.7 | 182.3 | 696.2 | 152.3 | -731.4 | .0 | 1009.7 |
| 24 | 179.1 | 182.3 | 696.2 | 155.6 | -747.8 | .0 | 1021.7 |
| 25 | -624.5 | 635.2 | -369.5 | 492.7 | -1732.2 | .0 | 1771.2 |
| 26 | 3782.1 | 626.5 | -336.9 | 375.5 | -1372.1 | .0 | 1412.9 |
| 27 | 2978.5 | 141.7 | 803.9 | 144.0 | -690.3 | .0 | 1059.6 |
| 28 | 2174.9 | 141.7 | 803.9 | 147.3 | -706.7 | .0 | 1070.4 |
| 29 | 1371.3 | 141.7 | 803.9 | 150.6 | -723.2 | .0 | 1081.3 |
| 30 | 567.7 | 141.7 | 803.9 | 153.9 | -739.6 | .0 | 1092.4 |
| 31 | -235.9 | 626.5 | -336.9 | 419.2 | -1535.5 | .0 | 1572.0 |
| 32 | 3367.1 | 755.2 | -602.8 | 442.0 | -1550.4 | .0 | 1663.5 |
| 33 | 2563.5 | 174.8 | 732.1 | 145.6 | -698.5 | .0 | 1011.9 |
| 34 | 1759.9 | 174.8 | 732.1 | 149.0 | -715.0 | .0 | 1023.3 |
| 35 | 956.3 | 174.8 | 732.1 | 152.3 | -731.4 | .0 | 1034.8 |
| 36 | 152.7 | 617.8 | -304.2 | 482.6 | -1695.9 | .0 | 1722.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 36
spalla mobile - n777 _SisM24- n789 _SisM24

Coordinate Centri di Carico (c.c.)

| c.c. | Xc<br>m | Yc<br>m | Zc<br>m | Alfc<br>deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc<br>kN | Fxc<br>kN | Mxc<br>kN*m | Fyc<br>kN | Myc<br>kN*m | Mzc<br>kN*m |
|---|---|---|---|---|---|---|
| 1 | 33263.2 | 5287.4 | 91302.9 | -10268.4 | -58943.8 | -45881.2 |
| 2 | 33110.0 | 6159.2 | 83605.5 | 19130.9 | 51312.2 | 42096.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz<br>kN | Fx<br>kN | Mx<br>kN*m | Fy<br>kN | My<br>kN*m | Mz<br>kN*m |
|---|---|---|---|---|---|
| 66373.2 | 11446.6 | 174908.4 | 8862.5 | -9270.8 | -13112.9 |

Punto di applic. carico verticale: Xv = 2.635 m Yv = -.140 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz<br>mm | dx<br>mm | rx<br>mRad | dy<br>mm | ry<br>mRad | rz<br>mRad |
|---|---|---|---|---|---|
| 9.219 | 12.515 | 1.848 | 3.993 | .033 | -.043 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp<br>kN | Fxp<br>kN | Mxp<br>kN*m | Fyp<br>kN | Myp<br>kN*m | Mzp<br>kN*m | Mris<br>kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4118.1 | 873.2 | -1009.9 | 431.9 | -1514.0 | .0 | 1819.9 |
| 2 | 3379.1 | 249.8 | 406.6 | 142.3 | -682.1 | .0 | 794.1 |
| 3 | 2640.1 | 180.2 | 580.4 | 145.6 | -698.5 | .0 | 908.2 |
| 4 | 1901.1 | 180.2 | 580.4 | 149.0 | -715.0 | .0 | 920.9 |
| 5 | 1162.1 | 180.2 | 580.4 | 152.3 | -731.4 | .0 | 933.7 |
| 6 | 423.0 | 180.2 | 580.4 | 155.6 | -747.8 | .0 | 946.6 |
| 7 | -316.0 | 613.2 | -448.6 | 492.7 | -1732.3 | .0 | 1789.4 |
| 8 | 3761.8 | 622.0 | -481.2 | 375.5 | -1372.1 | .0 | 1454.1 |
| 9 | 3022.8 | 147.6 | 653.1 | 144.0 | -690.3 | .0 | 950.3 |
| 10 | 2283.8 | 147.6 | 653.1 | 147.3 | -706.7 | .0 | 962.3 |
| 11 | 1544.8 | 147.6 | 653.1 | 150.6 | -723.2 | .0 | 974.4 |
| 12 | 805.7 | 147.6 | 653.1 | 153.9 | -739.6 | .0 | 986.7 |
| 13 | 66.7 | 622.0 | -481.2 | 419.2 | -1535.5 | .0 | 1609.1 |
| 14 | 3405.5 | 767.2 | -815.1 | 442.0 | -1550.4 | .0 | 1751.6 |
| 15 | 2666.5 | 187.7 | 544.4 | 145.6 | -698.5 | .0 | 885.6 |
| 16 | 1927.5 | 187.7 | 544.4 | 149.0 | -715.0 | .0 | 898.6 |
| 17 | 1188.4 | 187.7 | 544.4 | 152.3 | -731.4 | .0 | 911.8 |
| 18 | 449.4 | 630.7 | -513.9 | 482.6 | -1695.9 | .0 | 1772.0 |
| 19 | 4003.4 | 773.6 | -665.0 | 431.9 | -1514.0 | .0 | 1653.6 |
| 20 | 3264.4 | 209.6 | 587.2 | 142.3 | -682.1 | .0 | 900.1 |
| 21 | 2525.3 | 147.4 | 736.8 | 145.6 | -698.5 | .0 | 1015.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1786.3 | 147.4 | 736.8 | 149.0 | -715.0 | .0 | 1026.6 |
| 23 | 1047.3 | 147.4 | 736.8 | 152.3 | -731.4 | .0 | 1038.1 |
| 24 | 308.3 | 147.4 | 736.8 | 155.6 | -747.8 | .0 | 1049.8 |
| 25 | -430.7 | 537.3 | -164.4 | 492.7 | -1732.3 | .0 | 1740.0 |
| 26 | 3620.7 | 528.6 | -131.7 | 375.5 | -1372.1 | .0 | 1378.5 |
| 27 | 2881.7 | 112.2 | 828.8 | 144.0 | -690.3 | .0 | 1078.6 |
| 28 | 2142.6 | 112.2 | 828.8 | 147.3 | -706.7 | .0 | 1089.2 |
| 29 | 1403.6 | 112.2 | 828.8 | 150.6 | -723.2 | .0 | 1100.0 |
| 30 | 664.6 | 112.2 | 828.8 | 153.9 | -739.6 | .0 | 1110.8 |
| 31 | -74.4 | 528.6 | -131.7 | 419.2 | -1535.5 | .0 | 1541.1 |
| 32 | 3238.0 | 638.4 | -353.2 | 442.0 | -1550.4 | .0 | 1590.1 |
| 33 | 2499.0 | 139.9 | 772.7 | 145.6 | -698.5 | .0 | 1041.6 |
| 34 | 1759.9 | 139.9 | 772.7 | 149.0 | -715.0 | .0 | 1052.7 |
| 35 | 1020.9 | 139.9 | 772.7 | 152.3 | -731.4 | .0 | 1063.9 |
| 36 | 281.9 | 519.8 | -99.1 | 482.6 | -1695.9 | .0 | 1698.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 37
spalla mobile - n777 _SisM25- n789 _SisM25

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24372.8 | 7594.6 | 61125.8 | -3243.1 | -46751.8 | -36255.4 |
| 2 | 33761.0 | 5952.0 | 84737.8 | 22161.4 | 43282.9 | 54085.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58133.8 | 13546.6 | 145863.6 | 18918.3 | 96984.8 | 35406.0 |

Punto di applic. carico verticale: Xv = 2.509 m Yv = 1.668 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.074 | 12.700 | 1.679 | 9.103 | .209 | .115 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3993.7 | 792.5 | -914.3 | 1078.8 | -3648.9 | .0 | 3761.7 |
| 2 | 3322.1 | 226.6 | 371.3 | 331.5 | -1489.4 | .0 | 1535.0 |
| 3 | 2650.6 | 163.4 | 529.0 | 322.6 | -1445.0 | .0 | 1538.8 |
| 4 | 1979.0 | 163.4 | 529.0 | 313.7 | -1400.7 | .0 | 1497.3 |
| 5 | 1307.4 | 163.4 | 529.0 | 304.7 | -1356.4 | .0 | 1455.9 |
| 6 | 635.9 | 163.4 | 529.0 | 295.8 | -1312.0 | .0 | 1414.6 |
| 7 | -35.7 | 556.5 | -404.8 | 914.4 | -3059.6 | .0 | 3086.3 |
| 8 | 3741.7 | 532.9 | -316.6 | 913.2 | -3208.1 | .0 | 3223.7 |
| 9 | 3070.1 | 121.9 | 654.2 | 327.1 | -1467.2 | .0 | 1606.4 |
| 10 | 2398.5 | 121.9 | 654.2 | 318.1 | -1422.9 | .0 | 1566.1 |
| 11 | 1727.0 | 121.9 | 654.2 | 309.2 | -1378.5 | .0 | 1525.9 |
| 12 | 1055.4 | 121.9 | 654.2 | 300.3 | -1334.2 | .0 | 1485.9 |
| 13 | 383.8 | 532.9 | -316.6 | 795.4 | -2767.2 | .0 | 2785.2 |
| 14 | 3489.6 | 623.1 | -475.0 | 1051.4 | -3550.7 | .0 | 3582.3 |
| 15 | 2818.0 | 143.1 | 626.0 | 322.6 | -1445.0 | .0 | 1574.8 |
| 16 | 2146.5 | 143.1 | 626.0 | 313.7 | -1400.7 | .0 | 1534.2 |
| 17 | 1474.9 | 143.1 | 626.0 | 304.7 | -1356.4 | .0 | 1493.9 |
| 18 | 803.3 | 509.4 | -228.4 | 941.8 | -3157.8 | .0 | 3166.1 |
| 19 | 3265.3 | 1061.3 | -1845.5 | 1078.8 | -3648.9 | .0 | 4089.0 |
| 20 | 2593.8 | 335.3 | -116.5 | 331.5 | -1489.4 | .0 | 1493.9 |
| 21 | 1922.2 | 251.9 | 106.7 | 322.6 | -1445.0 | .0 | 1449.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1250.6 | 251.9 | 106.7 | 313.7 | -1400.7 | .0 | 1404.8 |
| 23 | 579.1 | 251.9 | 106.7 | 304.7 | -1356.4 | .0 | 1360.5 |
| 24 | -92.5 | 251.9 | 106.7 | 295.8 | -1312.0 | .0 | 1316.3 |
| 25 | -764.1 | 761.5 | -1172.1 | 914.4 | -3059.6 | .0 | 3276.5 |
| 26 | 2845.8 | 785.1 | -1260.3 | 913.2 | -3208.1 | .0 | 3446.8 |
| 27 | 2174.3 | 217.5 | 179.7 | 327.1 | -1467.2 | .0 | 1478.2 |
| 28 | 1502.7 | 217.5 | 179.7 | 318.1 | -1422.9 | .0 | 1434.2 |
| 29 | 831.1 | 217.5 | 179.7 | 309.2 | -1378.5 | .0 | 1390.2 |
| 30 | 159.6 | 217.5 | 179.7 | 300.3 | -1334.2 | .0 | 1346.2 |
| 31 | -512.0 | 785.1 | -1260.3 | 795.4 | -2767.2 | .0 | 3040.6 |
| 32 | 2426.3 | 970.9 | -1722.2 | 1051.4 | -3550.7 | .0 | 3946.3 |
| 33 | 1754.8 | 272.2 | 9.6 | 322.6 | -1445.0 | .0 | 1445.1 |
| 34 | 1083.2 | 272.2 | 9.6 | 313.7 | -1400.7 | .0 | 1400.7 |
| 35 | 411.6 | 272.2 | 9.6 | 304.7 | -1356.4 | .0 | 1356.4 |
| 36 | -259.9 | 808.7 | -1348.5 | 941.8 | -3157.8 | .0 | 3433.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 38
spalla mobile - n777 _SisM26- n789 _SisM26

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 24372.8 | 6545.0 | 55771.8 | -3279.3 | -46586.4 | -31546.6 |
| 2 | 33761.0 | 4901.6 | 79381.9 | 22197.5 | 43117.1 | 49368.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 58133.8 | 11446.6 | 135153.7 | 18918.2 | 96984.4 | 35406.6 |

Punto di applic. carico verticale: Xv = 2.325 m Yv = 1.668 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.074 | 11.142 | 1.517 | 9.103 | .209 | .115 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3800.0 | 658.0 | -624.7 | 1078.7 | -3648.8 | .0 | 3701.9 |
| 2 | 3193.0 | 181.3 | 441.2 | 331.5 | -1489.4 | .0 | 1553.4 |
| 3 | 2586.0 | 128.5 | 569.6 | 322.6 | -1445.0 | .0 | 1553.2 |
| 4 | 1979.0 | 128.5 | 569.6 | 313.7 | -1400.7 | .0 | 1512.1 |
| 5 | 1372.0 | 128.5 | 569.6 | 304.7 | -1356.3 | .0 | 1471.1 |
| 6 | 765.0 | 128.5 | 569.6 | 295.8 | -1312.0 | .0 | 1430.3 |
| 7 | 158.0 | 458.6 | -199.7 | 914.4 | -3059.6 | .0 | 3066.1 |
| 8 | 3580.2 | 435.0 | -111.5 | 913.2 | -3208.1 | .0 | 3210.0 |
| 9 | 2973.2 | 92.5 | 679.1 | 327.1 | -1467.2 | .0 | 1616.7 |
| 10 | 2366.2 | 92.5 | 679.1 | 318.1 | -1422.9 | .0 | 1576.6 |
| 11 | 1759.2 | 92.5 | 679.1 | 309.2 | -1378.5 | .0 | 1536.7 |
| 12 | 1152.3 | 92.5 | 679.1 | 300.3 | -1334.2 | .0 | 1497.1 |
| 13 | 545.3 | 435.0 | -111.5 | 795.4 | -2767.1 | .0 | 2769.4 |
| 14 | 3360.4 | 506.3 | -225.4 | 1051.4 | -3550.6 | .0 | 3557.8 |
| 15 | 2753.4 | 108.2 | 666.6 | 322.6 | -1445.0 | .0 | 1591.4 |
| 16 | 2146.5 | 108.2 | 666.6 | 313.7 | -1400.7 | .0 | 1551.2 |
| 17 | 1539.5 | 108.2 | 666.6 | 304.7 | -1356.3 | .0 | 1511.3 |
| 18 | 932.5 | 411.4 | -23.3 | 941.8 | -3157.8 | .0 | 3157.9 |
| 19 | 3071.6 | 926.9 | -1555.9 | 1078.7 | -3648.8 | .0 | 3966.7 |
| 20 | 2464.6 | 290.0 | -46.6 | 331.5 | -1489.4 | .0 | 1490.1 |
| 21 | 1857.6 | 217.0 | 147.3 | 322.6 | -1445.0 | .0 | 1452.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1250.6 | 217.0 | 147.3 | 313.7 | -1400.7 | .0 | 1408.4 |
| 23 | 643.7 | 217.0 | 147.3 | 304.7 | -1356.3 | .0 | 1364.3 |
| 24 | 36.7 | 217.0 | 147.3 | 295.8 | -1312.0 | .0 | 1320.2 |
| 25 | -570.3 | 663.6 | -967.0 | 914.4 | -3059.6 | .0 | 3208.8 |
| 26 | 2684.4 | 687.2 | -1055.2 | 913.2 | -3208.1 | .0 | 3377.2 |
| 27 | 2077.4 | 188.1 | 204.6 | 327.1 | -1467.2 | .0 | 1481.4 |
| 28 | 1470.4 | 188.1 | 204.6 | 318.1 | -1422.9 | .0 | 1437.5 |
| 29 | 863.4 | 188.1 | 204.6 | 309.2 | -1378.5 | .0 | 1393.6 |
| 30 | 256.4 | 188.1 | 204.6 | 300.3 | -1334.2 | .0 | 1349.8 |
| 31 | -350.5 | 687.2 | -1055.2 | 795.4 | -2767.1 | .0 | 2961.5 |
| 32 | 2297.2 | 854.1 | -1472.6 | 1051.4 | -3550.6 | .0 | 3843.9 |
| 33 | 1690.2 | 237.3 | 50.2 | 322.6 | -1445.0 | .0 | 1445.9 |
| 34 | 1083.2 | 237.3 | 50.2 | 313.7 | -1400.7 | .0 | 1401.6 |
| 35 | 476.2 | 237.3 | 50.2 | 304.7 | -1356.3 | .0 | 1357.3 |
| 36 | -130.8 | 710.8 | -1143.4 | 941.8 | -3157.8 | .0 | 3358.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 39
spalla mobile - n777 _SisM27 - n789 _SisM27

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34316.6 | 5834.9 | 98498.5 | -11625.6 | -59280.5 | -51480.8 |
| 2 | 29634.9 | 7711.7 | 75436.0 | 16353.4 | 48807.9 | 38500.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63951.5 | 13546.6 | 173934.5 | 4727.8 | -60566.8 | -33062.2 |

Punto di applic. carico verticale: Xv = 2.720 m Yv = -.947 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.882 | 13.669 | 1.912 | 1.854 | -.049 | -.107 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3986.3 | 1074.3 | -1636.2 | 165.3 | -643.5 | .0 | 1758.2 |
| 2 | 3221.5 | 327.5 | 111.2 | 64.8 | -358.4 | .0 | 375.2 |
| 3 | 2456.7 | 242.6 | 332.6 | 73.2 | -399.8 | .0 | 520.0 |
| 4 | 1691.9 | 242.6 | 332.6 | 81.5 | -441.2 | .0 | 552.5 |
| 5 | 927.1 | 242.6 | 332.6 | 89.8 | -482.6 | .0 | 586.1 |
| 6 | 162.3 | 242.6 | 332.6 | 98.2 | -524.0 | .0 | 620.6 |
| 7 | -602.5 | 764.8 | -951.2 | 318.7 | -1193.7 | .0 | 1526.3 |
| 8 | 3584.5 | 786.8 | -1033.6 | 154.0 | -624.8 | .0 | 1207.7 |
| 9 | 2819.7 | 207.0 | 406.6 | 69.0 | -379.1 | .0 | 555.9 |
| 10 | 2054.9 | 207.0 | 406.6 | 77.3 | -420.5 | .0 | 584.9 |
| 11 | 1290.1 | 207.0 | 406.6 | 85.7 | -461.9 | .0 | 615.4 |
| 12 | 525.3 | 207.0 | 406.6 | 94.0 | -503.3 | .0 | 647.0 |
| 13 | -239.5 | 786.8 | -1033.6 | 264.0 | -1036.6 | .0 | 1463.8 |
| 14 | 3182.6 | 975.4 | -1493.9 | 190.8 | -735.2 | .0 | 1665.0 |
| 15 | 2417.9 | 261.6 | 242.0 | 73.2 | -399.8 | .0 | 467.3 |
| 16 | 1653.1 | 261.6 | 242.0 | 81.5 | -441.2 | .0 | 503.2 |
| 17 | 888.3 | 261.6 | 242.0 | 89.8 | -482.6 | .0 | 539.8 |
| 18 | 123.5 | 808.8 | -1115.9 | 293.1 | -1102.0 | .0 | 1568.3 |
| 19 | 4155.3 | 823.2 | -766.6 | 165.3 | -643.5 | .0 | 1000.8 |
| 20 | 3390.5 | 226.1 | 566.7 | 64.8 | -358.4 | .0 | 670.5 |
| 21 | 2625.7 | 160.0 | 726.9 | 73.2 | -399.8 | .0 | 829.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1860.9 | 160.0 | 726.9 | 81.5 | -441.2 | .0 | 850.3 |
| 23 | 1096.1 | 160.0 | 726.9 | 89.8 | -482.6 | .0 | 872.5 |
| 24 | 331.4 | 160.0 | 726.9 | 98.2 | -524.0 | .0 | 896.1 |
| 25 | -433.4 | 573.3 | -234.7 | 318.7 | -1193.7 | .0 | 1216.5 |
| 26 | 3792.4 | 551.3 | -152.4 | 154.0 | -624.8 | .0 | 643.1 |
| 27 | 3027.6 | 117.8 | 849.7 | 69.0 | -379.1 | .0 | 930.4 |
| 28 | 2262.8 | 117.8 | 849.7 | 77.3 | -420.5 | .0 | 948.0 |
| 29 | 1498.0 | 117.8 | 849.7 | 85.7 | -461.9 | .0 | 967.1 |
| 30 | 733.2 | 117.8 | 849.7 | 94.0 | -503.3 | .0 | 987.5 |
| 31 | -31.6 | 551.3 | -152.4 | 264.0 | -1036.6 | .0 | 1047.7 |
| 32 | 3429.4 | 650.6 | -329.3 | 190.8 | -735.2 | .0 | 805.5 |
| 33 | 2664.6 | 141.0 | 817.6 | 73.2 | -399.8 | .0 | 910.1 |
| 34 | 1899.8 | 141.0 | 817.6 | 81.5 | -441.2 | .0 | 929.0 |
| 35 | 1135.0 | 141.0 | 817.6 | 89.8 | -482.6 | .0 | 949.4 |
| 36 | 370.2 | 529.3 | -70.0 | 293.1 | -1102.0 | .0 | 1104.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 40
spalla mobile - n777 _SisM28- n789 _SisM28

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34316.7 | 4785.3 | 93144.5 | -11661.7 | -59115.1 | -46772.0 |
| 2 | 29634.9 | 6661.4 | 70080.1 | 16389.5 | 48642.2 | 33783.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63951.6 | 11446.7 | 163224.6 | 4727.8 | -60568.2 | -33062.7 |

Punto di applic. carico verticale: Xv = 2.552 m Yv = -.947 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.882 | 12.112 | 1.751 | 1.854 | -.049 | -.107 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3792.6 | 939.8 | -1346.6 | 165.2 | -643.4 | .0 | 1492.4 |
| 2 | 3092.4 | 282.2 | 181.1 | 64.8 | -358.4 | .0 | 401.5 |
| 3 | 2392.1 | 207.7 | 373.2 | 73.2 | -399.8 | .0 | 546.9 |
| 4 | 1691.9 | 207.7 | 373.2 | 81.5 | -441.2 | .0 | 577.8 |
| 5 | 991.7 | 207.7 | 373.2 | 89.8 | -482.6 | .0 | 610.0 |
| 6 | 291.5 | 207.7 | 373.2 | 98.2 | -524.0 | .0 | 643.3 |
| 7 | -408.7 | 666.8 | -746.1 | 318.7 | -1193.7 | .0 | 1407.7 |
| 8 | 3423.0 | 688.8 | -828.5 | 154.0 | -624.8 | .0 | 1037.7 |
| 9 | 2722.8 | 177.6 | 431.5 | 69.0 | -379.1 | .0 | 574.4 |
| 10 | 2022.6 | 177.6 | 431.5 | 77.3 | -420.5 | .0 | 602.5 |
| 11 | 1322.4 | 177.6 | 431.5 | 85.7 | -461.9 | .0 | 632.1 |
| 12 | 622.2 | 177.6 | 431.5 | 94.0 | -503.3 | .0 | 663.0 |
| 13 | -78.1 | 688.8 | -828.5 | 264.0 | -1036.6 | .0 | 1327.0 |
| 14 | 3053.5 | 858.6 | -1244.3 | 190.8 | -735.2 | .0 | 1445.3 |
| 15 | 2353.3 | 226.7 | 282.6 | 73.2 | -399.8 | .0 | 489.5 |
| 16 | 1653.1 | 226.7 | 282.6 | 81.5 | -441.2 | .0 | 523.9 |
| 17 | 952.8 | 226.7 | 282.6 | 89.8 | -482.6 | .0 | 559.2 |
| 18 | 252.6 | 710.9 | -910.8 | 293.1 | -1102.0 | .0 | 1429.7 |
| 19 | 3961.6 | 688.8 | -477.0 | 165.2 | -643.4 | .0 | 800.9 |
| 20 | 3261.4 | 180.7 | 636.6 | 64.8 | -358.4 | .0 | 730.6 |
| 21 | 2561.2 | 125.1 | 767.5 | 73.2 | -399.8 | .0 | 865.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1860.9 | 125.1 | 767.5 | 81.5 | -441.2 | .0 | 885.3 |
| 23 | 1160.7 | 125.1 | 767.5 | 89.8 | -482.6 | .0 | 906.6 |
| 24 | 460.5 | 125.1 | 767.5 | 98.2 | -524.0 | .0 | 929.3 |
| 25 | -239.7 | 475.4 | -29.6 | 318.7 | -1193.7 | .0 | 1194.0 |
| 26 | 3630.9 | 453.3 | 52.7 | 154.0 | -624.8 | .0 | 627.0 |
| 27 | 2930.7 | 88.4 | 874.6 | 69.0 | -379.1 | .0 | 953.2 |
| 28 | 2230.5 | 88.4 | 874.6 | 77.3 | -420.5 | .0 | 970.4 |
| 29 | 1530.3 | 88.4 | 874.6 | 85.7 | -461.9 | .0 | 989.0 |
| 30 | 830.1 | 88.4 | 874.6 | 94.0 | -503.3 | .0 | 1009.0 |
| 31 | 129.8 | 453.3 | 52.7 | 264.0 | -1036.6 | .0 | 1037.9 |
| 32 | 3300.2 | 533.8 | -79.7 | 190.8 | -735.2 | .0 | 739.5 |
| 33 | 2600.0 | 106.1 | 858.1 | 73.2 | -399.8 | .0 | 946.7 |
| 34 | 1899.8 | 106.1 | 858.1 | 81.5 | -441.2 | .0 | 964.9 |
| 35 | 1199.6 | 106.1 | 858.1 | 89.8 | -482.6 | .0 | 984.5 |
| 36 | 499.4 | 431.3 | 135.1 | 293.1 | -1102.0 | .0 | 1110.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 41
spalla mobile - n777 _SisM29 - n789 _SisM29

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 23869.1 | 7589.2 | 58773.1 | -3042.5 | -45804.5 | -35497.4 |
| 2 | 33477.3 | 5957.5 | 83291.7 | 21960.7 | 42746.3 | 53444.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57346.4 | 13546.7 | 142064.8 | 18918.2 | 99749.5 | 35405.9 |

Punto di applic. carico verticale: Xv = 2.477 m Yv = 1.739 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.965 | 12.569 | 1.647 | 9.116 | .213 | .115 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3939.7 | 789.5 | -938.4 | 1079.0 | -3646.2 | .0 | 3765.1 |
| 2 | 3280.8 | 227.2 | 342.6 | 331.4 | -1486.4 | .0 | 1525.4 |
| 3 | 2621.8 | 164.3 | 500.3 | 322.5 | -1442.1 | .0 | 1526.4 |
| 4 | 1962.9 | 164.3 | 500.3 | 313.6 | -1397.7 | .0 | 1484.6 |
| 5 | 1303.9 | 164.3 | 500.3 | 304.6 | -1353.4 | .0 | 1442.9 |
| 6 | 645.0 | 164.3 | 500.3 | 295.7 | -1309.0 | .0 | 1401.4 |
| 7 | -14.0 | 555.1 | -431.3 | 914.7 | -3057.0 | .0 | 3087.3 |
| 8 | 3695.3 | 531.6 | -343.1 | 913.4 | -3205.4 | .0 | 3223.7 |
| 9 | 3036.3 | 122.9 | 625.6 | 327.0 | -1464.2 | .0 | 1592.3 |
| 10 | 2377.4 | 122.9 | 625.6 | 318.0 | -1419.9 | .0 | 1551.6 |
| 11 | 1718.4 | 122.9 | 625.6 | 309.1 | -1375.5 | .0 | 1511.1 |
| 12 | 1059.5 | 122.9 | 625.6 | 300.2 | -1331.2 | .0 | 1470.9 |
| 13 | 400.5 | 531.6 | -343.1 | 795.5 | -2764.4 | .0 | 2785.6 |
| 14 | 3450.8 | 621.0 | -500.4 | 1051.6 | -3548.0 | .0 | 3583.1 |
| 15 | 2791.9 | 143.9 | 597.3 | 322.5 | -1442.1 | .0 | 1560.9 |
| 16 | 2132.9 | 143.9 | 597.3 | 313.6 | -1397.7 | .0 | 1520.0 |
| 17 | 1474.0 | 143.9 | 597.3 | 304.6 | -1353.4 | .0 | 1479.3 |
| 18 | 815.0 | 508.0 | -254.9 | 942.0 | -3155.2 | .0 | 3165.5 |
| 19 | 3199.9 | 1058.4 | -1869.7 | 1079.0 | -3646.2 | .0 | 4097.7 |
| 20 | 2541.0 | 335.9 | -145.2 | 331.4 | -1486.4 | .0 | 1493.5 |
| 21 | 1882.0 | 252.7 | 78.0 | 322.5 | -1442.1 | .0 | 1444.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1223.0 | 252.7 | 78.0 | 313.6 | -1397.7 | .0 | 1399.9 |
| 23 | 564.1 | 252.7 | 78.0 | 304.6 | -1353.4 | .0 | 1355.6 |
| 24 | -94.9 | 252.7 | 78.0 | 295.7 | -1309.0 | .0 | 1311.4 |
| 25 | -753.8 | 760.2 | -1198.5 | 914.7 | -3057.0 | .0 | 3283.6 |
| 26 | 2785.4 | 783.8 | -1286.7 | 913.4 | -3205.4 | .0 | 3454.0 |
| 27 | 2126.4 | 218.5 | 151.2 | 327.0 | -1464.2 | .0 | 1472.0 |
| 28 | 1467.5 | 218.5 | 151.2 | 318.0 | -1419.9 | .0 | 1427.9 |
| 29 | 808.5 | 218.5 | 151.2 | 309.1 | -1375.5 | .0 | 1383.8 |
| 30 | 149.6 | 218.5 | 151.2 | 300.2 | -1331.2 | .0 | 1339.8 |
| 31 | -509.4 | 783.8 | -1286.7 | 795.5 | -2764.4 | .0 | 3049.2 |
| 32 | 2370.9 | 968.8 | -1747.5 | 1051.6 | -3548.0 | .0 | 3955.0 |
| 33 | 1711.9 | 273.1 | -19.0 | 322.5 | -1442.1 | .0 | 1442.2 |
| 34 | 1053.0 | 273.1 | -19.0 | 313.6 | -1397.7 | .0 | 1397.8 |
| 35 | 394.0 | 273.1 | -19.0 | 304.6 | -1353.4 | .0 | 1353.5 |
| 36 | -264.9 | 807.3 | -1374.9 | 942.0 | -3155.2 | .0 | 3441.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 41
spalla mobile - n777 _SisM29 - n789 _SisM29

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 1058.4 | -1869.7 | 1079.0 | -3646.2 | 1511.4 | 4097.7 |
| 1.41 | 880.7 | -512.0 | 965.4 | -2210.0 | 1306.8 | 2268.5 |
| 2.81 | 738.2 | 619.7 | 861.7 | -927.9 | 1134.6 | 1115.8 |
| 4.22 | 386.8 | 1454.7 | 570.8 | 120.1 | 689.5 | 1459.6 |
| 5.63 | 80.0 | 1759.4 | 283.9 | 706.7 | 294.9 | 1896.1 |
| 7.03 | -107.4 | 1721.7 | 73.7 | 945.4 | 130.2 | 1964.2 |
| 8.44 | -192.9 | 1489.2 | -49.1 | 937.1 | 199.1 | 1759.5 |
| 9.84 | -201.3 | 1209.7 | -72.6 | 849.7 | 214.0 | 1478.3 |
| 11.25 | -198.7 | 926.6 | -87.4 | 736.2 | 217.1 | 1183.5 |
| 13.50 | -172.0 | 493.1 | -95.2 | 528.0 | 196.6 | 722.5 |
| 15.75 | -106.3 | 181.2 | -84.9 | 318.7 | 136.0 | 366.6 |
| 18.00 | -52.4 | 7.6 | -60.5 | 153.6 | 80.0 | 153.8 |
| 20.25 | -17.1 | -65.2 | -35.6 | 46.5 | 39.5 | 80.1 |
| 22.50 | 2.3 | -78.8 | -14.8 | -9.8 | 15.0 | 79.4 |
| 26.25 | 8.6 | -50.6 | .5 | -28.3 | 8.6 | 58.0 |
| 30.00 | 6.2 | -21.9 | 2.5 | -21.2 | 6.7 | 30.4 |
| 33.75 | 2.8 | -4.9 | 2.3 | -11.4 | 3.6 | 12.4 |
| 39.38 | .1 | 1.8 | .9 | -2.0 | .9 | 2.7 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 42
spalla mobile - n777 _SisM30 - n789 _SisM30

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 23869.1 | 6539.6 | 53419.1 | -3078.6 | -45639.0 | -30788.6 |
| 2 | 33477.3 | 4907.1 | 77935.7 | 21996.8 | 42580.5 | 48727.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57346.4 | 11446.7 | 131354.8 | 18918.2 | 99749.2 | 35406.5 |

Punto di applic. carico verticale: Xv = 2.291 m Yv = 1.739 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.965 | 11.011 | 1.486 | 9.116 | .213 | .115 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3746.0 | 655.1 | -648.8 | 1079.0 | -3646.2 | .0 | 3703.5 |
| 2 | 3151.6 | 181.9 | 412.6 | 331.4 | -1486.4 | .0 | 1542.6 |
| 3 | 2557.2 | 129.4 | 540.9 | 322.5 | -1442.1 | .0 | 1540.2 |
| 4 | 1962.9 | 129.4 | 540.9 | 313.6 | -1397.7 | .0 | 1498.7 |
| 5 | 1368.5 | 129.4 | 540.9 | 304.6 | -1353.4 | .0 | 1457.5 |
| 6 | 774.1 | 129.4 | 540.9 | 295.7 | -1309.0 | .0 | 1416.4 |
| 7 | 179.7 | 457.2 | -226.2 | 914.7 | -3057.0 | .0 | 3065.4 |
| 8 | 3533.8 | 433.7 | -138.0 | 913.4 | -3205.4 | .0 | 3208.3 |
| 9 | 2939.5 | 93.5 | 650.5 | 327.0 | -1464.2 | .0 | 1602.2 |
| 10 | 2345.1 | 93.5 | 650.5 | 318.0 | -1419.9 | .0 | 1561.8 |
| 11 | 1750.7 | 93.5 | 650.5 | 309.1 | -1375.5 | .0 | 1521.6 |
| 12 | 1156.3 | 93.5 | 650.5 | 300.2 | -1331.2 | .0 | 1481.6 |
| 13 | 562.0 | 433.7 | -138.0 | 795.5 | -2764.4 | .0 | 2767.8 |
| 14 | 3321.7 | 504.2 | -250.8 | 1051.6 | -3548.0 | .0 | 3556.9 |
| 15 | 2727.3 | 109.1 | 637.9 | 322.5 | -1442.1 | .0 | 1576.9 |
| 16 | 2132.9 | 109.1 | 637.9 | 313.6 | -1397.7 | .0 | 1536.4 |
| 17 | 1538.6 | 109.1 | 637.9 | 304.6 | -1353.4 | .0 | 1496.2 |
| 18 | 944.2 | 410.1 | -49.8 | 942.0 | -3155.2 | .0 | 3155.6 |
| 19 | 3006.2 | 923.9 | -1580.1 | 1079.0 | -3646.2 | .0 | 3973.9 |
| 20 | 2411.8 | 290.5 | -75.2 | 331.4 | -1486.4 | .0 | 1488.3 |
| 21 | 1817.4 | 217.9 | 118.6 | 322.5 | -1442.1 | .0 | 1446.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1223.0 | 217.9 | 118.6 | 313.6 | -1397.7 | .0 | 1402.7 |
| 23 | 628.7 | 217.9 | 118.6 | 304.6 | -1353.4 | .0 | 1358.6 |
| 24 | 34.3 | 217.9 | 118.6 | 295.7 | -1309.0 | .0 | 1314.4 |
| 25 | -560.1 | 662.3 | -993.4 | 914.7 | -3057.0 | .0 | 3214.4 |
| 26 | 2623.9 | 685.8 | -1081.6 | 913.4 | -3205.4 | .0 | 3382.9 |
| 27 | 2029.6 | 189.1 | 176.1 | 327.0 | -1464.2 | .0 | 1474.8 |
| 28 | 1435.2 | 189.1 | 176.1 | 318.0 | -1419.9 | .0 | 1430.8 |
| 29 | 840.8 | 189.1 | 176.1 | 309.1 | -1375.5 | .0 | 1386.8 |
| 30 | 246.5 | 189.1 | 176.1 | 300.2 | -1331.2 | .0 | 1342.8 |
| 31 | -347.9 | 685.8 | -1081.6 | 795.5 | -2764.4 | .0 | 2968.5 |
| 32 | 2241.7 | 852.0 | -1498.0 | 1051.6 | -3548.0 | .0 | 3851.3 |
| 33 | 1647.3 | 238.2 | 21.5 | 322.5 | -1442.1 | .0 | 1442.2 |
| 34 | 1053.0 | 238.2 | 21.5 | 313.6 | -1397.7 | .0 | 1397.9 |
| 35 | 458.6 | 238.2 | 21.5 | 304.6 | -1353.4 | .0 | 1353.5 |
| 36 | -135.8 | 709.4 | -1169.8 | 942.0 | -3155.2 | .0 | 3365.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 43
spalla mobile - n777 _SisM31- n789 _SisM31

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34033.0 | 5840.4 | 97052.4 | -11424.9 | -58743.9 | -50839.3 |
| 2 | 29131.3 | 7706.3 | 73083.3 | 16152.7 | 47860.6 | 37742.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63164.3 | 13546.7 | 170135.7 | 4727.8 | -63331.5 | -33061.9 |

Punto di applic. carico verticale: Xv = 2.694 m Yv = -1.003 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.773 | 13.538 | 1.880 | 1.840 | -.052 | -.107 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3920.9 | 1071.3 | -1660.3 | 165.0 | -646.1 | .0 | 1781.6 |
| 2 | 3168.7 | 328.1 | 82.5 | 64.9 | -361.3 | .0 | 370.6 |
| 3 | 2416.5 | 243.5 | 303.9 | 73.3 | -402.7 | .0 | 504.5 |
| 4 | 1664.3 | 243.5 | 303.9 | 81.6 | -444.1 | .0 | 538.2 |
| 5 | 912.1 | 243.5 | 303.9 | 89.9 | -485.5 | .0 | 572.8 |
| 6 | 160.0 | 243.5 | 303.9 | 98.3 | -526.9 | .0 | 608.3 |
| 7 | -592.2 | 763.4 | -977.7 | 318.5 | -1196.3 | .0 | 1545.0 |
| 8 | 3524.0 | 785.4 | -1060.0 | 153.9 | -627.5 | .0 | 1231.8 |
| 9 | 2771.9 | 208.0 | 378.0 | 69.1 | -382.0 | .0 | 537.5 |
| 10 | 2019.7 | 208.0 | 378.0 | 77.4 | -423.4 | .0 | 567.6 |
| 11 | 1267.5 | 208.0 | 378.0 | 85.8 | -464.8 | .0 | 599.2 |
| 12 | 515.3 | 208.0 | 378.0 | 94.1 | -506.2 | .0 | 631.8 |
| 13 | -236.9 | 785.4 | -1060.0 | 263.9 | -1039.3 | .0 | 1484.5 |
| 14 | 3127.2 | 973.2 | -1519.2 | 190.6 | -737.8 | .0 | 1688.9 |
| 15 | 2375.0 | 262.5 | 213.3 | 73.3 | -402.7 | .0 | 455.7 |
| 16 | 1622.8 | 262.5 | 213.3 | 81.6 | -444.1 | .0 | 492.7 |
| 17 | 870.7 | 262.5 | 213.3 | 89.9 | -485.5 | .0 | 530.3 |
| 18 | 118.5 | 807.4 | -1142.4 | 292.9 | -1104.6 | .0 | 1589.1 |
| 19 | 4101.3 | 820.3 | -790.7 | 165.0 | -646.1 | .0 | 1021.1 |
| 20 | 3349.2 | 226.6 | 538.0 | 64.9 | -361.3 | .0 | 648.1 |
| 21 | 2597.0 | 160.9 | 698.2 | 73.3 | -402.7 | .0 | 806.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1844.8 | 160.9 | 698.2 | 81.6 | -444.1 | .0 | 827.5 |
| 23 | 1092.6 | 160.9 | 698.2 | 89.9 | -485.5 | .0 | 850.5 |
| 24 | 340.4 | 160.9 | 698.2 | 98.3 | -526.9 | .0 | 874.8 |
| 25 | -411.7 | 571.9 | -261.2 | 318.5 | -1196.3 | .0 | 1224.5 |
| 26 | 3746.0 | 549.9 | -178.8 | 153.9 | -627.5 | .0 | 652.5 |
| 27 | 2993.8 | 118.8 | 821.1 | 69.1 | -382.0 | .0 | 905.6 |
| 28 | 2241.6 | 118.8 | 821.1 | 77.4 | -423.4 | .0 | 923.8 |
| 29 | 1489.5 | 118.8 | 821.1 | 85.8 | -464.8 | .0 | 943.5 |
| 30 | 737.3 | 118.8 | 821.1 | 94.1 | -506.2 | .0 | 964.6 |
| 31 | -14.9 | 549.9 | -178.8 | 263.9 | -1039.3 | .0 | 1054.6 |
| 32 | 3390.6 | 648.4 | -354.6 | 190.6 | -737.8 | .0 | 818.6 |
| 33 | 2638.5 | 141.9 | 788.9 | 73.3 | -402.7 | .0 | 885.7 |
| 34 | 1886.3 | 141.9 | 788.9 | 81.6 | -444.1 | .0 | 905.3 |
| 35 | 1134.1 | 141.9 | 788.9 | 89.9 | -485.5 | .0 | 926.3 |
| 36 | 381.9 | 527.9 | -96.5 | 292.9 | -1104.6 | .0 | 1108.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 44
spalla mobile - n777 _SisM32- n789 _SisM32

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34033.0 | 4790.7 | 91698.4 | -11461.0 | -58578.5 | -46130.5 |
| 2 | 29131.3 | 6655.9 | 67727.3 | 16188.9 | 47694.9 | 33025.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63164.3 | 11446.6 | 159425.7 | 4727.9 | -63331.8 | -33062.4 |

Punto di applic. carico verticale: Xv = 2.524 m Yv = -1.003 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.773 | 11.980 | 1.719 | 1.840 | -.052 | -.107 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3727.1 | 936.9 | -1370.7 | 165.0 | -646.1 | .0 | 1515.4 |
| 2 | 3039.5 | 282.8 | 152.5 | 64.9 | -361.3 | .0 | 392.2 |
| 3 | 2351.9 | 208.6 | 344.5 | 73.3 | -402.7 | .0 | 530.0 |
| 4 | 1664.3 | 208.6 | 344.5 | 81.6 | -444.1 | .0 | 562.1 |
| 5 | 976.7 | 208.6 | 344.5 | 89.9 | -485.5 | .0 | 595.4 |
| 6 | 289.1 | 208.6 | 344.5 | 98.3 | -527.0 | .0 | 629.6 |
| 7 | -398.5 | 665.5 | -772.6 | 318.5 | -1196.3 | .0 | 1424.1 |
| 8 | 3362.6 | 687.5 | -854.9 | 153.9 | -627.5 | .0 | 1060.5 |
| 9 | 2675.0 | 178.6 | 403.0 | 69.1 | -382.0 | .0 | 555.3 |
| 10 | 1987.4 | 178.6 | 403.0 | 77.4 | -423.4 | .0 | 584.5 |
| 11 | 1299.8 | 178.6 | 403.0 | 85.8 | -464.8 | .0 | 615.2 |
| 12 | 612.2 | 178.6 | 403.0 | 94.1 | -506.3 | .0 | 647.0 |
| 13 | -75.4 | 687.5 | -854.9 | 263.9 | -1039.3 | .0 | 1345.8 |
| 14 | 2998.0 | 856.4 | -1269.6 | 190.6 | -737.8 | .0 | 1468.4 |
| 15 | 2310.4 | 227.6 | 253.9 | 73.3 | -402.7 | .0 | 476.1 |
| 16 | 1622.8 | 227.6 | 253.9 | 81.6 | -444.1 | .0 | 511.6 |
| 17 | 935.2 | 227.6 | 253.9 | 89.9 | -485.5 | .0 | 547.9 |
| 18 | 247.6 | 709.5 | -937.3 | 292.9 | -1104.6 | .0 | 1448.7 |
| 19 | 3907.6 | 685.8 | -501.1 | 165.0 | -646.1 | .0 | 817.6 |
| 20 | 3220.0 | 181.3 | 608.0 | 64.9 | -361.3 | .0 | 707.3 |
| 21 | 2532.4 | 126.0 | 738.8 | 73.3 | -402.7 | .0 | 841.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1844.8 | 126.0 | 738.8 | 81.6 | -444.1 | .0 | 862.0 |
| 23 | 1157.2 | 126.0 | 738.8 | 89.9 | -485.5 | .0 | 884.1 |
| 24 | 469.6 | 126.0 | 738.8 | 98.3 | -527.0 | .0 | 907.5 |
| 25 | -218.0 | 474.0 | -56.1 | 318.5 | -1196.3 | .0 | 1197.6 |
| 26 | 3584.5 | 452.0 | 26.3 | 153.9 | -627.5 | .0 | 628.1 |
| 27 | 2896.9 | 89.4 | 846.0 | 69.1 | -382.0 | .0 | 928.3 |
| 28 | 2209.3 | 89.4 | 846.0 | 77.4 | -423.4 | .0 | 946.1 |
| 29 | 1521.7 | 89.4 | 846.0 | 85.8 | -464.8 | .0 | 965.3 |
| 30 | 834.1 | 89.4 | 846.0 | 94.1 | -506.3 | .0 | 985.9 |
| 31 | 146.5 | 452.0 | 26.3 | 263.9 | -1039.3 | .0 | 1039.6 |
| 32 | 3261.5 | 531.6 | -105.0 | 190.6 | -737.8 | .0 | 745.2 |
| 33 | 2573.9 | 107.0 | 829.5 | 73.3 | -402.7 | .0 | 922.1 |
| 34 | 1886.3 | 107.0 | 829.5 | 81.6 | -444.1 | .0 | 940.9 |
| 35 | 1198.7 | 107.0 | 829.5 | 89.9 | -485.5 | .0 | 961.1 |
| 36 | 511.1 | 430.0 | 108.6 | 292.9 | -1104.6 | .0 | 1109.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 45
spalla mobile - n777 _SisM33 - n789 _SisM33

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25503.0 | 7101.7 | 63357.6 | -4643.5 | -47093.3 | -37248.9 |
| 2 | 30351.6 | 6445.0 | 71509.0 | 19487.1 | 40680.9 | 45968.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 55854.6 | 13546.7 | 134866.6 | 14843.6 | 45467.6 | 15745.9 |

Punto di applic. carico verticale: Xv = 2.415 m Yv = .814 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.758 | 12.320 | 1.588 | 6.990 | .128 | .051 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3679.0 | 858.6 | -1242.8 | 815.9 | -2791.8 | .0 | 3055.9 |
| 2 | 3044.0 | 258.4 | 153.0 | 255.2 | -1171.4 | .0 | 1181.3 |
| 3 | 2408.9 | 190.5 | 328.7 | 251.2 | -1151.6 | .0 | 1197.6 |
| 4 | 1773.9 | 190.5 | 328.7 | 247.2 | -1131.9 | .0 | 1178.7 |
| 5 | 1138.8 | 190.5 | 328.7 | 243.3 | -1112.2 | .0 | 1159.8 |
| 6 | 503.8 | 190.5 | 328.7 | 239.3 | -1092.5 | .0 | 1140.9 |
| 7 | -131.3 | 609.5 | -694.4 | 742.8 | -2529.8 | .0 | 2623.4 |
| 8 | 3412.6 | 599.0 | -655.2 | 694.9 | -2472.6 | .0 | 2557.9 |
| 9 | 2777.6 | 151.3 | 439.7 | 253.2 | -1161.5 | .0 | 1241.9 |
| 10 | 2142.5 | 151.3 | 439.7 | 249.2 | -1141.8 | .0 | 1223.5 |
| 11 | 1507.5 | 151.3 | 439.7 | 245.3 | -1122.1 | .0 | 1205.1 |
| 12 | 872.4 | 151.3 | 439.7 | 241.3 | -1102.3 | .0 | 1186.8 |
| 13 | 237.4 | 599.0 | -655.2 | 642.5 | -2276.4 | .0 | 2368.9 |
| 14 | 3146.2 | 713.4 | -894.6 | 803.7 | -2748.2 | .0 | 2890.1 |
| 15 | 2511.1 | 181.4 | 371.9 | 251.2 | -1151.6 | .0 | 1210.2 |
| 16 | 1876.1 | 181.4 | 371.9 | 247.2 | -1131.9 | .0 | 1191.4 |
| 17 | 1241.1 | 181.4 | 371.9 | 243.3 | -1112.2 | .0 | 1172.7 |
| 18 | 606.0 | 588.5 | -616.0 | 755.0 | -2573.5 | .0 | 2646.1 |
| 19 | 3234.3 | 978.1 | -1656.9 | 815.9 | -2791.8 | .0 | 3246.5 |
| 20 | 2599.3 | 306.8 | -64.0 | 255.2 | -1171.4 | .0 | 1173.1 |
| 21 | 1964.2 | 229.8 | 140.9 | 251.2 | -1151.6 | .0 | 1160.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1329.2 | 229.8 | 140.9 | 247.2 | -1131.9 | .0 | 1140.7 |
| 23 | 694.1 | 229.8 | 140.9 | 243.3 | -1112.2 | .0 | 1121.1 |
| 24 | 59.1 | 229.8 | 140.9 | 239.3 | -1092.5 | .0 | 1101.5 |
| 25 | -576.0 | 700.7 | -1035.6 | 742.8 | -2529.8 | .0 | 2733.6 |
| 26 | 2865.7 | 711.2 | -1074.9 | 694.9 | -2472.6 | .0 | 2696.1 |
| 27 | 2230.6 | 193.8 | 228.7 | 253.2 | -1161.5 | .0 | 1183.8 |
| 28 | 1595.6 | 193.8 | 228.7 | 249.2 | -1141.8 | .0 | 1164.5 |
| 29 | 960.5 | 193.8 | 228.7 | 245.3 | -1122.1 | .0 | 1145.1 |
| 30 | 325.5 | 193.8 | 228.7 | 241.3 | -1102.3 | .0 | 1125.8 |
| 31 | -309.6 | 711.2 | -1074.9 | 642.5 | -2276.4 | .0 | 2517.4 |
| 32 | 2497.0 | 868.1 | -1449.2 | 803.7 | -2748.2 | .0 | 3106.9 |
| 33 | 1862.0 | 238.8 | 97.7 | 251.2 | -1151.6 | .0 | 1155.8 |
| 34 | 1226.9 | 238.8 | 97.7 | 247.2 | -1131.9 | .0 | 1136.1 |
| 35 | 591.9 | 238.8 | 97.7 | 243.3 | -1112.2 | .0 | 1116.5 |
| 36 | -43.2 | 721.7 | -1114.1 | 755.0 | -2573.5 | .0 | 2804.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLV

CONDIZIONE DI CARICO 46
spalla mobile - n777 _SisM34 - n789 _SisM34

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 25503.0 | 6052.0 | 58003.6 | -4679.7 | -46927.9 | -32540.1 |
| 2 | 30351.6 | 5394.6 | 66153.0 | 19523.2 | 40515.2 | 41251.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 55854.6 | 11446.6 | 124156.6 | 14843.5 | 45467.3 | 15745.4 |

Punto di applic. carico verticale: Xv = 2.223 m Yv = .814 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 7.758 | 10.762 | 1.426 | 6.990 | .128 | .051 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3485.3 | 724.1 | -953.2 | 815.9 | -2791.8 | .0 | 2950.0 |
| 2 | 2914.8 | 213.1 | 222.9 | 255.2 | -1171.3 | .0 | 1192.4 |
| 3 | 2344.3 | 155.6 | 369.3 | 251.2 | -1151.6 | .0 | 1209.4 |
| 4 | 1773.9 | 155.6 | 369.3 | 247.2 | -1131.9 | .0 | 1190.6 |
| 5 | 1203.4 | 155.6 | 369.3 | 243.3 | -1112.2 | .0 | 1171.9 |
| 6 | 632.9 | 155.6 | 369.3 | 239.3 | -1092.5 | .0 | 1153.2 |
| 7 | 62.5 | 511.6 | -489.3 | 742.8 | -2529.8 | .0 | 2576.7 |
| 8 | 3251.1 | 501.1 | -450.1 | 694.9 | -2472.5 | .0 | 2513.2 |
| 9 | 2680.7 | 121.9 | 464.6 | 253.2 | -1161.5 | .0 | 1251.0 |
| 10 | 2110.2 | 121.9 | 464.6 | 249.2 | -1141.8 | .0 | 1232.7 |
| 11 | 1539.8 | 121.9 | 464.6 | 245.3 | -1122.1 | .0 | 1214.4 |
| 12 | 969.3 | 121.9 | 464.6 | 241.3 | -1102.3 | .0 | 1196.3 |
| 13 | 398.8 | 501.1 | -450.1 | 642.5 | -2276.4 | .0 | 2320.5 |
| 14 | 3017.0 | 596.6 | -645.0 | 803.7 | -2748.1 | .0 | 2822.8 |
| 15 | 2446.6 | 146.5 | 412.5 | 251.2 | -1151.6 | .0 | 1223.3 |
| 16 | 1876.1 | 146.5 | 412.5 | 247.2 | -1131.9 | .0 | 1204.7 |
| 17 | 1305.6 | 146.5 | 412.5 | 243.3 | -1112.2 | .0 | 1186.2 |
| 18 | 735.2 | 490.6 | -410.9 | 755.0 | -2573.4 | .0 | 2606.0 |
| 19 | 3040.6 | 843.7 | -1367.3 | 815.9 | -2791.8 | .0 | 3108.6 |
| 20 | 2470.1 | 261.4 | 6.0 | 255.2 | -1171.3 | .0 | 1171.4 |
| 21 | 1899.6 | 194.9 | 181.5 | 251.2 | -1151.6 | .0 | 1165.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1329.2 | 194.9 | 181.5 | 247.2 | -1131.9 | .0 | 1146.4 |
| 23 | 758.7 | 194.9 | 181.5 | 243.3 | -1112.2 | .0 | 1126.9 |
| 24 | 188.2 | 194.9 | 181.5 | 239.3 | -1092.5 | .0 | 1107.5 |
| 25 | -382.2 | 602.8 | -830.5 | 742.8 | -2529.8 | .0 | 2662.6 |
| 26 | 2704.2 | 613.3 | -869.7 | 694.9 | -2472.5 | .0 | 2621.0 |
| 27 | 2133.7 | 164.4 | 253.6 | 253.2 | -1161.5 | .0 | 1188.9 |
| 28 | 1563.3 | 164.4 | 253.6 | 249.2 | -1141.8 | .0 | 1169.6 |
| 29 | 992.8 | 164.4 | 253.6 | 245.3 | -1122.1 | .0 | 1150.4 |
| 30 | 422.4 | 164.4 | 253.6 | 241.3 | -1102.3 | .0 | 1131.1 |
| 31 | -148.1 | 613.3 | -869.7 | 642.5 | -2276.4 | .0 | 2436.9 |
| 32 | 2367.9 | 751.3 | -1199.6 | 803.7 | -2748.1 | .0 | 2998.5 |
| 33 | 1797.4 | 204.0 | 138.3 | 251.2 | -1151.6 | .0 | 1159.9 |
| 34 | 1226.9 | 204.0 | 138.3 | 247.2 | -1131.9 | .0 | 1140.3 |
| 35 | 656.5 | 204.0 | 138.3 | 243.3 | -1112.2 | .0 | 1120.8 |
| 36 | 86.0 | 623.7 | -909.0 | 755.0 | -2573.4 | .0 | 2729.3 |

Mris = (Mxp^2 + Myp^2)^0.5

## 9.4 Spalla appoggi mobili – Analisi SLE

```
                 M A P  -  Matrix Analysis of Piles
 Programma per l'analisi di palificate collegate da un plinto rigido

                 (C)  G.Guiducci, S.G.I. - luglio 1994

                                                      pag./  2

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS
```

Geometria Palificata

| palo | vin | X m | Y m | Z m | axz deg | ayz deg | axy deg | Box m | Boy m |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 2 | 0 | 4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 3 | 0 | 2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 4 | 0 | .000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 5 | 0 | -2.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 6 | 0 | -4.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 7 | 0 | -6.000 | 8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 8 | 0 | 5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 9 | 0 | 3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 10 | 0 | 1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 11 | 0 | -1.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 12 | 0 | -3.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 13 | 0 | -5.000 | 10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 14 | 0 | 4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 15 | 0 | 2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 16 | 0 | .000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 17 | 0 | -2.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 18 | 0 | -4.000 | 12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 19 | 0 | 6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 20 | 0 | 4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 21 | 0 | 2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 22 | 0 | .000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 23 | 0 | -2.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 24 | 0 | -4.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 25 | 0 | -6.000 | -8.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 26 | 0 | 5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 27 | 0 | 3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 28 | 0 | 1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 29 | 0 | -1.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 30 | 0 | -3.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 31 | 0 | -5.000 | -10.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 32 | 0 | 4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 33 | 0 | 2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 34 | 0 | .000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 35 | 0 | -2.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |
| 36 | 0 | -4.000 | -12.700 | .000 | .00 | .00 | .00 | 1.50 | .00 |

```
vin     = 0 - incastro;   1 - cerniera;   2 - appoggio
X, Y, Z = Coordinate testa pali
axz     = Inclinazione palo nel piano  Xp Z  rispetto alla verticale
             (positiva se verso  Xp positivo)
ayz     = Inclinazione palo nel piano  Yp Z  rispetto alla verticale
             (positiva se verso  Yp  positivo)
axy     = Rotazione assi  Xp Yp     (positiva se antioraria)
Box     = Lato dell'elemento parallelo all'asse  Xp
Boy     = Lato dell'elemento parallelo all'asse  Yp
          se  Boy = 0    D = Box:  diametro
          altrimenti     D = sqr (Box * Boy * 1.273): diametro equivalente
```

Caratterizzazione dei pali soggetti a carichi assiali e torsionali
(uguali per tutti i pali)

| palo | AK kN/m | TK kN*m/rad |
|---|---|---|
| 1 | 200000. | .0 |

AK = Rigidezza assiale palo-terreno
TK = Rigidezza torsionale palo-terreno

Baricentro palificata: Xg = .000 m Yg = .000 m
Rotazione direzioni princip. di inerzia: .00 deg

Caratterizzazione del terreno per pali soggetti a carichi trasversali

Terreno tipo 1

| Prof. m | E kN/m2 |
|---|---|
| .00 | 33750.0 |
| 3.00 | 35250.0 |
| 3.10 | 150000.0 |
| 8.00 | 150000.0 |
| 8.10 | 36750.0 |
| 13.00 | 44250.0 |
| 13.10 | 150000.0 |
| 26.00 | 150000.0 |
| 26.10 | 52500.0 |
| 60.00 | 75000.0 |

Caratterizzazione dei pali soggetti a carichi trasversali

| palo | Lp m | EJx kN*m2 | Itx | Ridx | EJy kN*m2 | Ity | Ridy |
|---|---|---|---|---|---|---|---|
| 1 | 45.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 2 | 45.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 3 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 4 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 5 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 6 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 7 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 8 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 9 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 10 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 11 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 12 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 13 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 14 | 45.00 | 7455147. | 1 | .250 | 7455147. | 1 | .250 |
| 15 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 16 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 17 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 18 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 19 | 45.00 | 7455147. | 1 | .300 | 7455147. | 1 | .250 |
| 20 | 45.00 | 7455147. | 1 | .080 | 7455147. | 1 | .050 |
| 21 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 22 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 23 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 24 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 25 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |
| 26 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |
| 27 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 28 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 29 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 30 | 45.00 | 7455147. | 1 | .050 | 7455147. | 1 | .050 |
| 31 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .200 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 32 | 45.00 | 7455147. | 1 | .250 | 7455147. | 1 | .250 |
| 33 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 34 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 35 | 45.00 | 7455147. | 1 | .060 | 7455147. | 1 | .050 |
| 36 | 45.00 | 7455147. | 1 | .200 | 7455147. | 1 | .250 |

Lp  = Lunghezza palo (compreso eventuale tratto fuori terra)
EJ  = Rigidezza flessionale del palo
It  = Tipo di terreno
Rid = Moltiplicatore del modulo di reazione orizzontale

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 1
spalla mobile - n777 _FESSM_1- n789 _FESSM_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32505.2 | 4646.3 | 70693.9 | -14481.1 | -53499.8 | -38517.1 |
| 2 | 33937.4 | 4512.1 | 76047.7 | 15177.1 | 55228.3 | 40439.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.6 | 9158.4 | 146741.6 | 696.0 | 17053.0 | 3358.2 |

Punto di applic. carico verticale: Xv = 2.209 m Yv = .257 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 10.248 | 1.535 | .402 | .024 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3728.5 | 651.3 | -582.6 | 45.6 | -138.6 | .0 | 598.9 |
| 2 | 3114.7 | 177.6 | 471.9 | 12.7 | -45.5 | .0 | 474.1 |
| 3 | 2500.8 | 125.3 | 598.3 | 11.9 | -41.2 | .0 | 599.7 |
| 4 | 1886.9 | 125.3 | 598.3 | 11.0 | -37.0 | .0 | 599.4 |
| 5 | 1273.1 | 125.3 | 598.3 | 10.2 | -32.8 | .0 | 599.2 |
| 6 | 659.2 | 125.3 | 598.3 | 9.4 | -28.6 | .0 | 598.9 |
| 7 | 45.3 | 453.0 | -161.5 | 30.0 | -82.7 | .0 | 181.4 |
| 8 | 3431.1 | 450.7 | -153.1 | 37.7 | -117.5 | .0 | 193.0 |
| 9 | 2817.2 | 97.7 | 666.5 | 12.3 | -43.4 | .0 | 667.9 |
| 10 | 2203.4 | 97.7 | 666.5 | 11.5 | -39.1 | .0 | 667.6 |
| 11 | 1589.5 | 97.7 | 666.5 | 10.6 | -34.9 | .0 | 667.4 |
| 12 | 975.6 | 97.7 | 666.5 | 9.8 | -30.7 | .0 | 667.2 |
| 13 | 361.8 | 450.7 | -153.1 | 26.6 | -75.6 | .0 | 170.8 |
| 14 | 3133.7 | 549.7 | -363.0 | 43.0 | -129.3 | .0 | 385.3 |
| 15 | 2519.8 | 123.4 | 607.5 | 11.9 | -41.2 | .0 | 608.9 |
| 16 | 1905.9 | 123.4 | 607.5 | 11.0 | -37.0 | .0 | 608.6 |
| 17 | 1292.1 | 123.4 | 607.5 | 10.2 | -32.8 | .0 | 608.4 |
| 18 | 678.2 | 448.5 | -144.8 | 32.6 | -92.0 | .0 | 171.5 |
| 19 | 3645.9 | 676.8 | -671.0 | 45.6 | -138.6 | .0 | 685.1 |
| 20 | 3032.0 | 187.9 | 425.7 | 12.7 | -45.5 | .0 | 428.1 |
| 21 | 2418.2 | 133.7 | 558.2 | 11.9 | -41.2 | .0 | 559.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1804.3 | 133.7 | 558.2 | 11.0 | -37.0 | .0 | 559.4 |
| 23 | 1190.5 | 133.7 | 558.2 | 10.2 | -32.8 | .0 | 559.2 |
| 24 | 576.6 | 133.7 | 558.2 | 9.4 | -28.6 | .0 | 558.9 |
| 25 | -37.3 | 472.4 | -234.3 | 30.0 | -82.7 | .0 | 248.4 |
| 26 | 3329.5 | 474.6 | -242.6 | 37.7 | -117.5 | .0 | 269.6 |
| 27 | 2715.6 | 106.7 | 621.5 | 12.3 | -43.4 | .0 | 623.0 |
| 28 | 2101.8 | 106.7 | 621.5 | 11.5 | -39.1 | .0 | 622.7 |
| 29 | 1487.9 | 106.7 | 621.5 | 10.6 | -34.9 | .0 | 622.5 |
| 30 | 874.0 | 106.7 | 621.5 | 9.8 | -30.7 | .0 | 622.2 |
| 31 | 260.2 | 474.6 | -242.6 | 26.6 | -75.6 | .0 | 254.2 |
| 32 | 3013.1 | 582.7 | -481.2 | 43.0 | -129.3 | .0 | 498.3 |
| 33 | 2399.2 | 135.6 | 549.0 | 11.9 | -41.2 | .0 | 550.6 |
| 34 | 1785.3 | 135.6 | 549.0 | 11.0 | -37.0 | .0 | 550.3 |
| 35 | 1171.5 | 135.6 | 549.0 | 10.2 | -32.8 | .0 | 550.0 |
| 36 | 557.6 | 476.9 | -251.0 | 32.6 | -92.0 | .0 | 267.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 2
spalla mobile - n777 _FESSM_2- n789 _FESSM_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32505.3 | 3386.7 | 64269.0 | -14524.5 | -53301.3 | -32866.5 |
| 2 | 33937.4 | 3251.6 | 69620.5 | 15220.5 | 55029.4 | 34779.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.7 | 6638.3 | 133889.5 | 696.0 | 17051.5 | 3358.4 |

Punto di applic. carico verticale: Xv = 2.015 m Yv = .257 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 8.379 | 1.341 | .402 | .024 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3496.0 | 490.0 | -235.1 | 45.6 | -138.6 | .0 | 272.9 |
| 2 | 2959.7 | 123.2 | 555.9 | 12.7 | -45.5 | .0 | 557.7 |
| 3 | 2423.3 | 83.5 | 647.0 | 11.9 | -41.2 | .0 | 648.3 |
| 4 | 1886.9 | 83.5 | 647.0 | 11.0 | -37.0 | .0 | 648.0 |
| 5 | 1350.6 | 83.5 | 647.0 | 10.2 | -32.8 | .0 | 647.8 |
| 6 | 814.2 | 83.5 | 647.0 | 9.4 | -28.6 | .0 | 647.6 |
| 7 | 277.8 | 335.4 | 84.6 | 30.0 | -82.7 | .0 | 118.3 |
| 8 | 3237.3 | 333.2 | 93.0 | 37.7 | -117.5 | .0 | 149.8 |
| 9 | 2701.0 | 62.4 | 696.4 | 12.3 | -43.4 | .0 | 697.7 |
| 10 | 2164.6 | 62.4 | 696.4 | 11.5 | -39.1 | .0 | 697.5 |
| 11 | 1628.2 | 62.4 | 696.4 | 10.6 | -34.9 | .0 | 697.3 |
| 12 | 1091.9 | 62.4 | 696.4 | 9.8 | -30.7 | .0 | 697.1 |
| 13 | 555.5 | 333.2 | 93.0 | 26.6 | -75.6 | .0 | 119.9 |
| 14 | 2978.7 | 409.5 | -63.4 | 43.0 | -129.3 | .0 | 144.0 |
| 15 | 2442.3 | 81.5 | 656.2 | 11.9 | -41.2 | .0 | 657.5 |
| 16 | 1905.9 | 81.5 | 656.2 | 11.0 | -37.0 | .0 | 657.2 |
| 17 | 1369.6 | 81.5 | 656.2 | 10.2 | -32.8 | .0 | 657.0 |
| 18 | 833.2 | 331.0 | 101.4 | 32.6 | -92.0 | .0 | 136.9 |
| 19 | 3413.4 | 515.5 | -323.4 | 45.6 | -138.6 | .0 | 351.9 |
| 20 | 2877.1 | 133.5 | 509.6 | 12.7 | -45.5 | .0 | 511.6 |
| 21 | 2340.7 | 91.9 | 606.9 | 11.9 | -41.2 | .0 | 608.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1804.3 | 91.9 | 606.9 | 11.0 | -37.0 | .0 | 608.0 |
| 23 | 1268.0 | 91.9 | 606.9 | 10.2 | -32.8 | .0 | 607.8 |
| 24 | 731.6 | 91.9 | 606.9 | 9.4 | -28.6 | .0 | 607.6 |
| 25 | 195.2 | 354.9 | 11.9 | 30.0 | -82.7 | .0 | 83.5 |
| 26 | 3135.7 | 357.1 | 3.5 | 37.7 | -117.5 | .0 | 117.5 |
| 27 | 2599.4 | 71.4 | 651.4 | 12.3 | -43.4 | .0 | 652.8 |
| 28 | 2063.0 | 71.4 | 651.4 | 11.5 | -39.1 | .0 | 652.5 |
| 29 | 1526.6 | 71.4 | 651.4 | 10.6 | -34.9 | .0 | 652.3 |
| 30 | 990.3 | 71.4 | 651.4 | 9.8 | -30.7 | .0 | 652.1 |
| 31 | 453.9 | 357.1 | 3.5 | 26.6 | -75.6 | .0 | 75.7 |
| 32 | 2858.1 | 442.5 | -181.7 | 43.0 | -129.3 | .0 | 223.0 |
| 33 | 2321.7 | 93.8 | 597.7 | 11.9 | -41.2 | .0 | 599.1 |
| 34 | 1785.3 | 93.8 | 597.7 | 11.0 | -37.0 | .0 | 598.9 |
| 35 | 1249.0 | 93.8 | 597.7 | 10.2 | -32.8 | .0 | 598.6 |
| 36 | 712.6 | 359.4 | -4.9 | 32.6 | -92.0 | .0 | 92.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 3
spalla mobile - n777 _FESSM_3- n789 _FESSM_3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34530.8 | 4635.0 | 80009.6 | -15372.9 | -57202.8 | -41590.3 |
| 2 | 34941.9 | 4523.3 | 81351.9 | 15822.9 | 57359.2 | 42566.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69472.7 | 9158.3 | 161361.5 | 450.0 | 4555.1 | 2171.4 |

Punto di applic. carico verticale: Xv = 2.323 m Yv = .066 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.649 | 10.753 | 1.656 | .228 | .008 | .007 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3930.4 | 667.2 | -505.2 | 28.9 | -95.7 | .0 | 514.2 |
| 2 | 3267.9 | 177.3 | 574.0 | 8.5 | -36.3 | .0 | 575.1 |
| 3 | 2605.5 | 123.5 | 701.6 | 7.9 | -33.6 | .0 | 702.4 |
| 4 | 1943.1 | 123.5 | 701.6 | 7.4 | -30.9 | .0 | 702.2 |
| 5 | 1280.7 | 123.5 | 701.6 | 6.8 | -28.2 | .0 | 702.1 |
| 6 | 618.3 | 123.5 | 701.6 | 6.3 | -25.5 | .0 | 702.0 |
| 7 | -44.1 | 461.6 | -72.5 | 18.9 | -59.6 | .0 | 93.9 |
| 8 | 3602.2 | 460.1 | -67.1 | 24.1 | -82.4 | .0 | 106.3 |
| 9 | 2939.8 | 95.5 | 768.5 | 8.2 | -35.0 | .0 | 769.3 |
| 10 | 2277.4 | 95.5 | 768.5 | 7.7 | -32.3 | .0 | 769.2 |
| 11 | 1615.0 | 95.5 | 768.5 | 7.1 | -29.5 | .0 | 769.1 |
| 12 | 952.5 | 95.5 | 768.5 | 6.6 | -26.8 | .0 | 769.0 |
| 13 | 290.1 | 460.1 | -67.1 | 16.8 | -55.3 | .0 | 87.0 |
| 14 | 3274.1 | 563.8 | -286.4 | 27.3 | -89.7 | .0 | 300.2 |
| 15 | 2611.7 | 122.3 | 707.5 | 7.9 | -33.6 | .0 | 708.3 |
| 16 | 1949.2 | 122.3 | 707.5 | 7.4 | -30.9 | .0 | 708.2 |
| 17 | 1286.8 | 122.3 | 707.5 | 6.8 | -28.2 | .0 | 708.1 |
| 18 | 624.4 | 458.7 | -61.7 | 20.5 | -65.6 | .0 | 90.1 |
| 19 | 3903.7 | 683.7 | -562.4 | 28.9 | -95.7 | .0 | 570.5 |
| 20 | 3241.3 | 183.9 | 544.0 | 8.5 | -36.3 | .0 | 545.2 |
| 21 | 2578.9 | 128.9 | 675.7 | 7.9 | -33.6 | .0 | 676.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1916.5 | 128.9 | 675.7 | 7.4 | -30.9 | .0 | 676.4 |
| 23 | 1254.1 | 128.9 | 675.7 | 6.8 | -28.2 | .0 | 676.3 |
| 24 | 591.6 | 128.9 | 675.7 | 6.3 | -25.5 | .0 | 676.1 |
| 25 | -70.8 | 474.2 | -119.6 | 18.9 | -59.6 | .0 | 133.6 |
| 26 | 3569.5 | 475.6 | -125.0 | 24.1 | -82.4 | .0 | 149.7 |
| 27 | 2907.0 | 101.3 | 739.4 | 8.2 | -35.0 | .0 | 740.3 |
| 28 | 2244.6 | 101.3 | 739.4 | 7.7 | -32.3 | .0 | 740.1 |
| 29 | 1582.2 | 101.3 | 739.4 | 7.1 | -29.5 | .0 | 740.0 |
| 30 | 919.8 | 101.3 | 739.4 | 6.6 | -26.8 | .0 | 739.9 |
| 31 | 257.4 | 475.6 | -125.0 | 16.8 | -55.3 | .0 | 136.7 |
| 32 | 3235.2 | 585.2 | -362.9 | 27.3 | -89.7 | .0 | 373.8 |
| 33 | 2572.8 | 130.2 | 669.7 | 7.9 | -33.6 | .0 | 670.6 |
| 34 | 1910.4 | 130.2 | 669.7 | 7.4 | -30.9 | .0 | 670.4 |
| 35 | 1247.9 | 130.2 | 669.7 | 6.8 | -28.2 | .0 | 670.3 |
| 36 | 585.5 | 477.1 | -130.4 | 20.5 | -65.6 | .0 | 146.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 3
spalla mobile - n777 _FESSM_3- n789 _FESSM_3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 667.2 | -505.2 | 28.9 | -95.7 | 667.8 | 514.2 |
| 1.41 | 530.2 | 331.2 | 25.8 | -57.3 | 530.8 | 336.1 |
| 2.81 | 425.0 | 997.1 | 23.0 | -23.0 | 425.6 | 997.4 |
| 4.22 | 179.7 | 1451.5 | 15.1 | 4.9 | 180.4 | 1451.5 |
| 5.63 | -22.9 | 1543.6 | 7.4 | 20.3 | 24.0 | 1543.7 |
| 7.03 | -134.5 | 1419.2 | 1.8 | 26.4 | 134.5 | 1419.4 |
| 8.44 | -176.4 | 1188.4 | -1.5 | 25.9 | 176.4 | 1188.7 |
| 9.84 | -176.6 | 938.7 | -2.1 | 23.4 | 176.6 | 939.0 |
| 11.25 | -169.0 | 694.2 | -2.5 | 20.1 | 169.0 | 694.5 |
| 13.50 | -140.1 | 331.2 | -2.7 | 14.3 | 140.1 | 331.5 |
| 15.75 | -79.0 | 88.1 | -2.3 | 8.5 | 79.0 | 88.5 |
| 18.00 | -33.8 | -33.6 | -1.6 | 4.0 | 33.9 | 33.9 |
| 20.25 | -6.9 | -74.6 | -.9 | 1.1 | 6.9 | 74.6 |
| 22.50 | 6.1 | -72.7 | -.4 | -.3 | 6.1 | 72.8 |
| 26.25 | 8.0 | -41.3 | .0 | -.8 | 8.0 | 41.3 |
| 30.00 | 5.2 | -15.9 | .1 | -.6 | 5.2 | 15.9 |
| 33.75 | 2.1 | -2.2 | .1 | -.3 | 2.1 | 2.2 |
| 39.38 | -.1 | 2.0 | .0 | -.1 | .1 | 2.0 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 4
spalla mobile - n777 _FESSM_4- n789 _FESSM_4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34530.8 | 3375.5 | 73584.8 | -15416.3 | -57004.2 | -35939.7 |
| 2 | 34941.9 | 3262.9 | 74924.7 | 15866.3 | 57160.3 | 36906.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69472.7 | 6638.4 | 148509.5 | 450.0 | 4554.9 | 2171.5 |

Punto di applic. carico verticale: Xv = 2.138 m Yv = .066 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.649 | 8.884 | 1.462 | .228 | .008 | .007 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3697.9 | 505.9 | -157.7 | 28.9 | -95.7 | .0 | 184.5 |
| 2 | 3113.0 | 122.9 | 657.9 | 8.5 | -36.3 | .0 | 658.9 |
| 3 | 2528.0 | 81.7 | 750.3 | 7.9 | -33.6 | .0 | 751.0 |
| 4 | 1943.1 | 81.7 | 750.3 | 7.4 | -30.9 | .0 | 750.9 |
| 5 | 1358.2 | 81.7 | 750.3 | 6.8 | -28.2 | .0 | 750.8 |
| 6 | 773.3 | 81.7 | 750.3 | 6.3 | -25.5 | .0 | 750.7 |
| 7 | 188.3 | 344.1 | 173.6 | 18.9 | -59.6 | .0 | 183.5 |
| 8 | 3408.5 | 342.6 | 179.0 | 24.1 | -82.4 | .0 | 197.0 |
| 9 | 2823.6 | 60.2 | 798.4 | 8.2 | -35.0 | .0 | 799.2 |
| 10 | 2238.6 | 60.2 | 798.4 | 7.7 | -32.3 | .0 | 799.1 |
| 11 | 1653.7 | 60.2 | 798.4 | 7.1 | -29.5 | .0 | 799.0 |
| 12 | 1068.8 | 60.2 | 798.4 | 6.6 | -26.8 | .0 | 798.9 |
| 13 | 483.9 | 342.6 | 179.0 | 16.8 | -55.3 | .0 | 187.3 |
| 14 | 3119.1 | 423.7 | 13.1 | 27.3 | -89.7 | .0 | 90.7 |
| 15 | 2534.2 | 80.4 | 756.2 | 7.9 | -33.6 | .0 | 757.0 |
| 16 | 1949.2 | 80.4 | 756.2 | 7.4 | -30.9 | .0 | 756.8 |
| 17 | 1364.3 | 80.4 | 756.2 | 6.8 | -28.2 | .0 | 756.7 |
| 18 | 779.4 | 341.2 | 184.4 | 20.5 | -65.6 | .0 | 195.7 |
| 19 | 3671.3 | 522.4 | -214.8 | 28.9 | -95.7 | .0 | 235.2 |
| 20 | 3086.3 | 129.5 | 628.0 | 8.5 | -36.3 | .0 | 629.0 |
| 21 | 2501.4 | 87.1 | 724.4 | 7.9 | -33.6 | .0 | 725.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1916.5 | 87.1 | 724.4 | 7.4 | -30.9 | .0 | 725.0 |
| 23 | 1331.6 | 87.1 | 724.4 | 6.8 | -28.2 | .0 | 724.9 |
| 24 | 746.6 | 87.1 | 724.4 | 6.3 | -25.5 | .0 | 724.8 |
| 25 | 161.7 | 356.7 | 126.5 | 18.9 | -59.6 | .0 | 139.8 |
| 26 | 3375.7 | 358.1 | 121.1 | 24.1 | -82.4 | .0 | 146.5 |
| 27 | 2790.8 | 66.0 | 769.3 | 8.2 | -35.0 | .0 | 770.1 |
| 28 | 2205.9 | 66.0 | 769.3 | 7.7 | -32.3 | .0 | 770.0 |
| 29 | 1621.0 | 66.0 | 769.3 | 7.1 | -29.5 | .0 | 769.9 |
| 30 | 1036.0 | 66.0 | 769.3 | 6.6 | -26.8 | .0 | 769.8 |
| 31 | 451.1 | 358.1 | 121.1 | 16.8 | -55.3 | .0 | 133.1 |
| 32 | 3080.2 | 445.0 | -63.4 | 27.3 | -89.7 | .0 | 109.9 |
| 33 | 2495.3 | 88.3 | 718.4 | 7.9 | -33.6 | .0 | 719.2 |
| 34 | 1910.4 | 88.3 | 718.4 | 7.4 | -30.9 | .0 | 719.1 |
| 35 | 1325.4 | 88.3 | 718.4 | 6.8 | -28.2 | .0 | 719.0 |
| 36 | 740.5 | 359.6 | 115.7 | 20.5 | -65.6 | .0 | 133.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 4
spalla mobile - n777 _FESSM_4- n789 _FESSM_4

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 9
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 60.2 | 798.4 | 8.2 | -35.0 | 60.7 | 799.2 |
| 1.41 | 41.5 | 869.2 | 7.6 | -23.9 | 42.2 | 869.5 |
| 2.81 | 26.8 | 916.6 | 7.1 | -13.5 | 27.8 | 916.7 |
| 4.22 | -9.1 | 933.6 | 5.4 | -4.5 | 10.6 | 933.7 |
| 5.63 | -41.3 | 895.9 | 3.5 | 1.7 | 41.4 | 895.9 |
| 7.03 | -61.7 | 821.7 | 2.0 | 5.5 | 61.7 | 821.7 |
| 8.44 | -71.4 | 725.7 | .9 | 7.4 | 71.4 | 725.7 |
| 9.84 | -72.4 | 624.2 | .6 | 8.4 | 72.4 | 624.3 |
| 11.25 | -72.0 | 522.4 | .4 | 9.1 | 72.0 | 522.5 |
| 13.50 | -67.3 | 362.6 | .0 | 9.7 | 67.3 | 362.8 |
| 15.75 | -53.9 | 225.6 | -.5 | 9.0 | 53.9 | 225.8 |
| 18.00 | -39.4 | 120.7 | -.7 | 7.5 | 39.5 | 120.9 |
| 20.25 | -26.0 | 47.5 | -.8 | 5.8 | 26.0 | 47.8 |
| 22.50 | -13.7 | 2.4 | -.6 | 4.1 | 13.8 | 4.8 |
| 26.25 | -2.4 | -23.2 | -.4 | 2.3 | 2.4 | 23.3 |
| 30.00 | .6 | -25.7 | -.3 | 1.1 | .6 | 25.8 |
| 33.75 | 2.1 | -20.2 | -.1 | .4 | 2.1 | 20.2 |
| 39.38 | 2.0 | -7.1 | .0 | .0 | 2.0 | 7.1 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 5
spalla mobile - n777 _FESSM_5 - n789 _FESSM_5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32505.2 | 4646.3 | 70693.9 | -14481.1 | -53499.8 | -38517.1 |
| 2 | 33937.4 | 4512.1 | 76047.7 | 15177.1 | 55228.3 | 40439.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.6 | 9158.4 | 146741.6 | 696.0 | 17053.0 | 3358.2 |

Punto di applic. carico verticale: Xv = 2.209 m Yv = .257 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 10.248 | 1.535 | .402 | .024 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3728.5 | 651.3 | -582.6 | 45.6 | -138.6 | .0 | 598.9 |
| 2 | 3114.7 | 177.6 | 471.9 | 12.7 | -45.5 | .0 | 474.1 |
| 3 | 2500.8 | 125.3 | 598.3 | 11.9 | -41.2 | .0 | 599.7 |
| 4 | 1886.9 | 125.3 | 598.3 | 11.0 | -37.0 | .0 | 599.4 |
| 5 | 1273.1 | 125.3 | 598.3 | 10.2 | -32.8 | .0 | 599.2 |
| 6 | 659.2 | 125.3 | 598.3 | 9.4 | -28.6 | .0 | 598.9 |
| 7 | 45.3 | 453.0 | -161.5 | 30.0 | -82.7 | .0 | 181.4 |
| 8 | 3431.1 | 450.7 | -153.1 | 37.7 | -117.5 | .0 | 193.0 |
| 9 | 2817.2 | 97.7 | 666.5 | 12.3 | -43.4 | .0 | 667.9 |
| 10 | 2203.4 | 97.7 | 666.5 | 11.5 | -39.1 | .0 | 667.6 |
| 11 | 1589.5 | 97.7 | 666.5 | 10.6 | -34.9 | .0 | 667.4 |
| 12 | 975.6 | 97.7 | 666.5 | 9.8 | -30.7 | .0 | 667.2 |
| 13 | 361.8 | 450.7 | -153.1 | 26.6 | -75.6 | .0 | 170.8 |
| 14 | 3133.7 | 549.7 | -363.0 | 43.0 | -129.3 | .0 | 385.3 |
| 15 | 2519.8 | 123.4 | 607.5 | 11.9 | -41.2 | .0 | 608.9 |
| 16 | 1905.9 | 123.4 | 607.5 | 11.0 | -37.0 | .0 | 608.6 |
| 17 | 1292.1 | 123.4 | 607.5 | 10.2 | -32.8 | .0 | 608.4 |
| 18 | 678.2 | 448.5 | -144.8 | 32.6 | -92.0 | .0 | 171.5 |
| 19 | 3645.9 | 676.8 | -671.0 | 45.6 | -138.6 | .0 | 685.1 |
| 20 | 3032.0 | 187.9 | 425.7 | 12.7 | -45.5 | .0 | 428.1 |
| 21 | 2418.2 | 133.7 | 558.2 | 11.9 | -41.2 | .0 | 559.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1804.3 | 133.7 | 558.2 | 11.0 | -37.0 | .0 | 559.4 |
| 23 | 1190.5 | 133.7 | 558.2 | 10.2 | -32.8 | .0 | 559.2 |
| 24 | 576.6 | 133.7 | 558.2 | 9.4 | -28.6 | .0 | 558.9 |
| 25 | -37.3 | 472.4 | -234.3 | 30.0 | -82.7 | .0 | 248.4 |
| 26 | 3329.5 | 474.6 | -242.6 | 37.7 | -117.5 | .0 | 269.6 |
| 27 | 2715.6 | 106.7 | 621.5 | 12.3 | -43.4 | .0 | 623.0 |
| 28 | 2101.8 | 106.7 | 621.5 | 11.5 | -39.1 | .0 | 622.7 |
| 29 | 1487.9 | 106.7 | 621.5 | 10.6 | -34.9 | .0 | 622.5 |
| 30 | 874.0 | 106.7 | 621.5 | 9.8 | -30.7 | .0 | 622.2 |
| 31 | 260.2 | 474.6 | -242.6 | 26.6 | -75.6 | .0 | 254.2 |
| 32 | 3013.1 | 582.7 | -481.2 | 43.0 | -129.3 | .0 | 498.3 |
| 33 | 2399.2 | 135.6 | 549.0 | 11.9 | -41.2 | .0 | 550.6 |
| 34 | 1785.3 | 135.6 | 549.0 | 11.0 | -37.0 | .0 | 550.3 |
| 35 | 1171.5 | 135.6 | 549.0 | 10.2 | -32.8 | .0 | 550.0 |
| 36 | 557.6 | 476.9 | -251.0 | 32.6 | -92.0 | .0 | 267.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 6
spalla mobile - n777 _FESSM_6- n789 _FESSM_6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32505.3 | 3386.7 | 64269.0 | -14524.5 | -53301.3 | -32866.5 |
| 2 | 33937.4 | 3251.6 | 69620.5 | 15220.5 | 55029.4 | 34779.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.7 | 6638.3 | 133889.5 | 696.0 | 17051.5 | 3358.4 |

Punto di applic. carico verticale: Xv = 2.015 m Yv = .257 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 8.379 | 1.341 | .402 | .024 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3496.0 | 490.0 | -235.1 | 45.6 | -138.6 | .0 | 272.9 |
| 2 | 2959.7 | 123.2 | 555.9 | 12.7 | -45.5 | .0 | 557.7 |
| 3 | 2423.3 | 83.5 | 647.0 | 11.9 | -41.2 | .0 | 648.3 |
| 4 | 1886.9 | 83.5 | 647.0 | 11.0 | -37.0 | .0 | 648.0 |
| 5 | 1350.6 | 83.5 | 647.0 | 10.2 | -32.8 | .0 | 647.8 |
| 6 | 814.2 | 83.5 | 647.0 | 9.4 | -28.6 | .0 | 647.6 |
| 7 | 277.8 | 335.4 | 84.6 | 30.0 | -82.7 | .0 | 118.3 |
| 8 | 3237.3 | 333.2 | 93.0 | 37.7 | -117.5 | .0 | 149.8 |
| 9 | 2701.0 | 62.4 | 696.4 | 12.3 | -43.4 | .0 | 697.7 |
| 10 | 2164.6 | 62.4 | 696.4 | 11.5 | -39.1 | .0 | 697.5 |
| 11 | 1628.2 | 62.4 | 696.4 | 10.6 | -34.9 | .0 | 697.3 |
| 12 | 1091.9 | 62.4 | 696.4 | 9.8 | -30.7 | .0 | 697.1 |
| 13 | 555.5 | 333.2 | 93.0 | 26.6 | -75.6 | .0 | 119.9 |
| 14 | 2978.7 | 409.5 | -63.4 | 43.0 | -129.3 | .0 | 144.0 |
| 15 | 2442.3 | 81.5 | 656.2 | 11.9 | -41.2 | .0 | 657.5 |
| 16 | 1905.9 | 81.5 | 656.2 | 11.0 | -37.0 | .0 | 657.2 |
| 17 | 1369.6 | 81.5 | 656.2 | 10.2 | -32.8 | .0 | 657.0 |
| 18 | 833.2 | 331.0 | 101.4 | 32.6 | -92.0 | .0 | 136.9 |
| 19 | 3413.4 | 515.5 | -323.4 | 45.6 | -138.6 | .0 | 351.9 |
| 20 | 2877.1 | 133.5 | 509.6 | 12.7 | -45.5 | .0 | 511.6 |
| 21 | 2340.7 | 91.9 | 606.9 | 11.9 | -41.2 | .0 | 608.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1804.3 | 91.9 | 606.9 | 11.0 | -37.0 | .0 | 608.0 |
| 23 | 1268.0 | 91.9 | 606.9 | 10.2 | -32.8 | .0 | 607.8 |
| 24 | 731.6 | 91.9 | 606.9 | 9.4 | -28.6 | .0 | 607.6 |
| 25 | 195.2 | 354.9 | 11.9 | 30.0 | -82.7 | .0 | 83.5 |
| 26 | 3135.7 | 357.1 | 3.5 | 37.7 | -117.5 | .0 | 117.5 |
| 27 | 2599.4 | 71.4 | 651.4 | 12.3 | -43.4 | .0 | 652.8 |
| 28 | 2063.0 | 71.4 | 651.4 | 11.5 | -39.1 | .0 | 652.5 |
| 29 | 1526.6 | 71.4 | 651.4 | 10.6 | -34.9 | .0 | 652.3 |
| 30 | 990.3 | 71.4 | 651.4 | 9.8 | -30.7 | .0 | 652.1 |
| 31 | 453.9 | 357.1 | 3.5 | 26.6 | -75.6 | .0 | 75.7 |
| 32 | 2858.1 | 442.5 | -181.7 | 43.0 | -129.3 | .0 | 223.0 |
| 33 | 2321.7 | 93.8 | 597.7 | 11.9 | -41.2 | .0 | 599.1 |
| 34 | 1785.3 | 93.8 | 597.7 | 11.0 | -37.0 | .0 | 598.9 |
| 35 | 1249.0 | 93.8 | 597.7 | 10.2 | -32.8 | .0 | 598.6 |
| 36 | 712.6 | 359.4 | -4.9 | 32.6 | -92.0 | .0 | 92.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 7
spalla mobile - n777 _FESSM_7- n789 _FESSM_7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33350.3 | 4481.3 | 73621.8 | -15158.0 | -54480.3 | -39585.4 |
| 2 | 33092.4 | 4677.0 | 73119.8 | 14462.0 | 54943.1 | 38321.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.7 | 9158.3 | 146741.6 | -696.0 | -2296.8 | -3358.0 |

Punto di applic. carico verticale: Xv = 2.209 m Yv = -.035 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 10.248 | 1.535 | -.329 | -.006 | -.011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3676.5 | 676.8 | -671.0 | -44.4 | 152.5 | .0 | 688.1 |
| 2 | 3062.6 | 187.9 | 425.7 | -13.3 | 61.3 | .0 | 430.1 |
| 3 | 2448.7 | 133.7 | 558.2 | -12.4 | 57.1 | .0 | 561.1 |
| 4 | 1834.9 | 133.7 | 558.2 | -11.6 | 52.9 | .0 | 560.7 |
| 5 | 1221.0 | 133.7 | 558.2 | -10.7 | 48.7 | .0 | 560.3 |
| 6 | 607.1 | 133.7 | 558.2 | -9.9 | 44.5 | .0 | 560.0 |
| 7 | -6.7 | 472.4 | -234.3 | -28.8 | 96.7 | .0 | 253.4 |
| 8 | 3367.0 | 474.6 | -242.6 | -37.0 | 132.1 | .0 | 276.3 |
| 9 | 2753.2 | 106.7 | 621.5 | -12.9 | 59.2 | .0 | 624.3 |
| 10 | 2139.3 | 106.7 | 621.5 | -12.0 | 55.0 | .0 | 623.9 |
| 11 | 1525.5 | 106.7 | 621.5 | -11.2 | 50.8 | .0 | 623.6 |
| 12 | 911.6 | 106.7 | 621.5 | -10.3 | 46.6 | .0 | 623.2 |
| 13 | 297.7 | 474.6 | -242.6 | -25.8 | 90.3 | .0 | 258.9 |
| 14 | 3057.6 | 582.7 | -481.2 | -41.8 | 143.2 | .0 | 502.1 |
| 15 | 2443.8 | 135.6 | 549.0 | -12.4 | 57.1 | .0 | 552.0 |
| 16 | 1829.9 | 135.6 | 549.0 | -11.6 | 52.9 | .0 | 551.6 |
| 17 | 1216.1 | 135.6 | 549.0 | -10.7 | 48.7 | .0 | 551.2 |
| 18 | 602.2 | 476.9 | -251.0 | -31.4 | 106.0 | .0 | 272.4 |
| 19 | 3698.0 | 651.3 | -582.6 | -44.4 | 152.5 | .0 | 602.3 |
| 20 | 3084.1 | 177.6 | 472.0 | -13.3 | 61.3 | .0 | 475.9 |
| 21 | 2470.3 | 125.3 | 598.3 | -12.4 | 57.1 | .0 | 601.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1856.4 | 125.3 | 598.3 | -11.6 | 52.9 | .0 | 600.6 |
| 23 | 1242.5 | 125.3 | 598.3 | -10.7 | 48.7 | .0 | 600.2 |
| 24 | 628.7 | 125.3 | 598.3 | -9.9 | 44.5 | .0 | 599.9 |
| 25 | 14.8 | 452.9 | -161.5 | -28.8 | 96.7 | .0 | 188.2 |
| 26 | 3393.5 | 450.7 | -153.1 | -37.0 | 132.1 | .0 | 202.2 |
| 27 | 2779.7 | 97.7 | 666.5 | -12.9 | 59.2 | .0 | 669.1 |
| 28 | 2165.8 | 97.7 | 666.5 | -12.0 | 55.0 | .0 | 668.8 |
| 29 | 1551.9 | 97.7 | 666.5 | -11.2 | 50.8 | .0 | 668.4 |
| 30 | 938.1 | 97.7 | 666.5 | -10.3 | 46.6 | .0 | 668.1 |
| 31 | 324.2 | 450.7 | -153.1 | -25.8 | 90.3 | .0 | 177.8 |
| 32 | 3089.1 | 549.7 | -362.9 | -41.8 | 143.2 | .0 | 390.2 |
| 33 | 2475.2 | 123.4 | 607.5 | -12.4 | 57.1 | .0 | 610.1 |
| 34 | 1861.3 | 123.4 | 607.5 | -11.6 | 52.9 | .0 | 609.8 |
| 35 | 1247.5 | 123.4 | 607.5 | -10.7 | 48.7 | .0 | 609.4 |
| 36 | 633.6 | 448.5 | -144.8 | -31.4 | 106.0 | .0 | 179.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 8
spalla mobile - n777 _FESSM_8- n789 _FESSM_8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33350.3 | 3221.8 | 67197.0 | -15201.3 | -54281.8 | -33934.9 |
| 2 | 33092.3 | 3416.6 | 66692.6 | 14505.3 | 54744.2 | 32661.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66442.6 | 6638.4 | 133889.6 | -696.0 | -2298.2 | -3358.1 |

Punto di applic. carico verticale: Xv = 2.015 m Yv = -.035 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.228 | 8.379 | 1.341 | -.329 | -.006 | -.011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3444.0 | 515.5 | -323.4 | -44.4 | 152.5 | .0 | 357.6 |
| 2 | 2907.6 | 133.5 | 509.6 | -13.3 | 61.3 | .0 | 513.3 |
| 3 | 2371.2 | 91.9 | 606.9 | -12.4 | 57.1 | .0 | 609.6 |
| 4 | 1834.9 | 91.9 | 606.9 | -11.6 | 52.9 | .0 | 609.2 |
| 5 | 1298.5 | 91.9 | 606.9 | -10.7 | 48.7 | .0 | 608.9 |
| 6 | 762.1 | 91.9 | 606.9 | -9.9 | 44.5 | .0 | 608.5 |
| 7 | 225.8 | 354.9 | 11.8 | -28.8 | 96.7 | .0 | 97.4 |
| 8 | 3173.3 | 357.1 | 3.5 | -37.0 | 132.1 | .0 | 132.1 |
| 9 | 2636.9 | 71.4 | 651.4 | -12.9 | 59.2 | .0 | 654.1 |
| 10 | 2100.6 | 71.4 | 651.4 | -12.0 | 55.0 | .0 | 653.7 |
| 11 | 1564.2 | 71.4 | 651.4 | -11.2 | 50.8 | .0 | 653.3 |
| 12 | 1027.8 | 71.4 | 651.4 | -10.3 | 46.6 | .0 | 653.0 |
| 13 | 491.5 | 357.1 | 3.5 | -25.8 | 90.3 | .0 | 90.3 |
| 14 | 2902.6 | 442.5 | -181.7 | -41.8 | 143.2 | .0 | 231.4 |
| 15 | 2366.3 | 93.8 | 597.7 | -12.4 | 57.1 | .0 | 600.4 |
| 16 | 1829.9 | 93.8 | 597.7 | -11.6 | 52.9 | .0 | 600.0 |
| 17 | 1293.5 | 93.8 | 597.7 | -10.7 | 48.7 | .0 | 599.7 |
| 18 | 757.2 | 359.4 | -4.9 | -31.4 | 106.0 | .0 | 106.1 |
| 19 | 3465.5 | 490.0 | -235.1 | -44.4 | 152.5 | .0 | 280.3 |
| 20 | 2929.1 | 123.2 | 555.9 | -13.3 | 61.3 | .0 | 559.3 |
| 21 | 2392.8 | 83.5 | 647.0 | -12.4 | 57.1 | .0 | 649.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1856.4 | 83.5 | 647.0 | -11.6 | 52.9 | .0 | 649.1 |
| 23 | 1320.0 | 83.5 | 647.0 | -10.7 | 48.7 | .0 | 648.8 |
| 24 | 783.7 | 83.5 | 647.0 | -9.9 | 44.5 | .0 | 648.5 |
| 25 | 247.3 | 335.4 | 84.6 | -28.8 | 96.7 | .0 | 128.5 |
| 26 | 3199.8 | 333.2 | 93.0 | -37.0 | 132.1 | .0 | 161.5 |
| 27 | 2663.4 | 62.4 | 696.4 | -12.9 | 59.2 | .0 | 698.9 |
| 28 | 2127.1 | 62.4 | 696.4 | -12.0 | 55.0 | .0 | 698.5 |
| 29 | 1590.7 | 62.4 | 696.4 | -11.2 | 50.8 | .0 | 698.2 |
| 30 | 1054.3 | 62.4 | 696.4 | -10.3 | 46.6 | .0 | 697.9 |
| 31 | 518.0 | 333.2 | 93.0 | -25.8 | 90.3 | .0 | 129.6 |
| 32 | 2934.1 | 409.6 | -63.4 | -41.8 | 143.2 | .0 | 156.6 |
| 33 | 2397.7 | 81.5 | 656.2 | -12.4 | 57.1 | .0 | 658.6 |
| 34 | 1861.3 | 81.5 | 656.2 | -11.6 | 52.9 | .0 | 658.3 |
| 35 | 1325.0 | 81.5 | 656.2 | -10.7 | 48.7 | .0 | 658.0 |
| 36 | 788.6 | 331.0 | 101.3 | -31.4 | 106.0 | .0 | 146.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 9
spalla mobile - n777 _FESSM_9- n789 _FESSM_9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32674.5 | 4643.4 | 71551.8 | -14597.2 | -53819.9 | -38890.9 |
| 2 | 34223.6 | 4515.0 | 77387.3 | 15293.2 | 55766.6 | 40875.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66898.1 | 9158.4 | 148939.1 | 696.0 | 18522.1 | 3358.1 |

Punto di applic. carico verticale: Xv = 2.226 m Yv = .277 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.291 | 10.324 | 1.553 | .409 | .025 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3766.1 | 653.0 | -568.7 | 45.7 | -137.2 | .0 | 585.0 |
| 2 | 3145.0 | 177.3 | 488.5 | 12.7 | -43.9 | .0 | 490.5 |
| 3 | 2523.8 | 124.8 | 614.8 | 11.8 | -39.7 | .0 | 616.1 |
| 4 | 1902.6 | 124.8 | 614.8 | 11.0 | -35.5 | .0 | 615.9 |
| 5 | 1281.5 | 124.8 | 614.8 | 10.1 | -31.3 | .0 | 615.6 |
| 6 | 660.3 | 124.8 | 614.8 | 9.3 | -27.1 | .0 | 615.4 |
| 7 | 39.1 | 453.7 | -146.2 | 30.1 | -81.3 | .0 | 167.3 |
| 8 | 3465.7 | 451.5 | -137.8 | 37.8 | -116.0 | .0 | 180.2 |
| 9 | 2844.6 | 97.1 | 683.0 | 12.3 | -41.8 | .0 | 684.3 |
| 10 | 2223.4 | 97.1 | 683.0 | 11.4 | -37.6 | .0 | 684.0 |
| 11 | 1602.2 | 97.1 | 683.0 | 10.6 | -33.4 | .0 | 683.8 |
| 12 | 981.1 | 97.1 | 683.0 | 9.7 | -29.2 | .0 | 683.6 |
| 13 | 359.9 | 451.5 | -137.8 | 26.6 | -74.2 | .0 | 156.5 |
| 14 | 3165.3 | 551.0 | -348.3 | 43.1 | -127.9 | .0 | 371.0 |
| 15 | 2544.2 | 122.9 | 624.1 | 11.8 | -39.7 | .0 | 625.3 |
| 16 | 1923.0 | 122.9 | 624.1 | 11.0 | -35.5 | .0 | 625.1 |
| 17 | 1301.9 | 122.9 | 624.1 | 10.1 | -31.3 | .0 | 624.8 |
| 18 | 680.7 | 449.3 | -129.5 | 32.7 | -90.6 | .0 | 158.0 |
| 19 | 3677.4 | 678.5 | -657.0 | 45.7 | -137.2 | .0 | 671.2 |
| 20 | 3056.3 | 187.6 | 442.2 | 12.7 | -43.9 | .0 | 444.4 |
| 21 | 2435.1 | 133.2 | 574.8 | 11.8 | -39.7 | .0 | 576.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1813.9 | 133.2 | 574.8 | 11.0 | -35.5 | .0 | 575.9 |
| 23 | 1192.8 | 133.2 | 574.8 | 10.1 | -31.3 | .0 | 575.7 |
| 24 | 571.6 | 133.2 | 574.8 | 9.3 | -27.1 | .0 | 575.4 |
| 25 | -49.6 | 473.2 | -219.0 | 30.1 | -81.3 | .0 | 233.6 |
| 26 | 3356.6 | 475.4 | -227.3 | 37.8 | -116.0 | .0 | 255.2 |
| 27 | 2735.5 | 106.2 | 638.0 | 12.3 | -41.8 | .0 | 639.4 |
| 28 | 2114.3 | 106.2 | 638.0 | 11.4 | -37.6 | .0 | 639.1 |
| 29 | 1493.2 | 106.2 | 638.0 | 10.6 | -33.4 | .0 | 638.9 |
| 30 | 872.0 | 106.2 | 638.0 | 9.7 | -29.2 | .0 | 638.7 |
| 31 | 250.8 | 475.4 | -227.3 | 26.6 | -74.2 | .0 | 239.1 |
| 32 | 3035.9 | 583.9 | -466.6 | 43.1 | -127.9 | .0 | 483.8 |
| 33 | 2414.7 | 135.2 | 565.6 | 11.8 | -39.7 | .0 | 567.0 |
| 34 | 1793.5 | 135.2 | 565.6 | 11.0 | -35.5 | .0 | 566.7 |
| 35 | 1172.4 | 135.2 | 565.6 | 10.1 | -31.3 | .0 | 566.5 |
| 36 | 551.2 | 477.7 | -235.7 | 32.7 | -90.6 | .0 | 252.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 10
spalla mobile - n777 _FESSM_10- n789 _FESSM_10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32674.5 | 3383.8 | 65127.0 | -14640.6 | -53621.3 | -33240.4 |
| 2 | 34223.6 | 3254.5 | 70960.2 | 15336.6 | 55567.7 | 35215.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66898.1 | 6638.3 | 136087.2 | 696.0 | 18521.8 | 3358.1 |

Punto di applic. carico verticale: Xv = 2.034 m Yv = .277 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.291 | 8.455 | 1.359 | .409 | .025 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3533.6 | 491.7 | -221.1 | 45.7 | -137.2 | .0 | 260.2 |
| 2 | 2990.0 | 122.9 | 572.5 | 12.7 | -43.9 | .0 | 574.1 |
| 3 | 2446.3 | 83.0 | 663.6 | 11.8 | -39.7 | .0 | 664.7 |
| 4 | 1902.6 | 83.0 | 663.6 | 11.0 | -35.5 | .0 | 664.5 |
| 5 | 1359.0 | 83.0 | 663.6 | 10.1 | -31.3 | .0 | 664.3 |
| 6 | 815.3 | 83.0 | 663.6 | 9.3 | -27.1 | .0 | 664.1 |
| 7 | 271.6 | 336.2 | 99.9 | 30.1 | -81.3 | .0 | 128.8 |
| 8 | 3272.0 | 334.0 | 108.3 | 37.8 | -116.0 | .0 | 158.7 |
| 9 | 2728.3 | 61.8 | 712.9 | 12.3 | -41.8 | .0 | 714.1 |
| 10 | 2184.7 | 61.8 | 712.9 | 11.4 | -37.6 | .0 | 713.9 |
| 11 | 1641.0 | 61.8 | 712.9 | 10.6 | -33.4 | .0 | 713.7 |
| 12 | 1097.3 | 61.8 | 712.9 | 9.7 | -29.2 | .0 | 713.5 |
| 13 | 553.7 | 334.0 | 108.3 | 26.6 | -74.2 | .0 | 131.3 |
| 14 | 3010.4 | 410.8 | -48.8 | 43.1 | -127.9 | .0 | 136.9 |
| 15 | 2466.7 | 81.1 | 672.8 | 11.8 | -39.7 | .0 | 673.9 |
| 16 | 1923.0 | 81.1 | 672.8 | 11.0 | -35.5 | .0 | 673.7 |
| 17 | 1379.4 | 81.1 | 672.8 | 10.1 | -31.3 | .0 | 673.5 |
| 18 | 835.7 | 331.8 | 116.7 | 32.7 | -90.6 | .0 | 147.7 |
| 19 | 3444.9 | 517.2 | -309.4 | 45.7 | -137.2 | .0 | 338.5 |
| 20 | 2901.3 | 133.2 | 526.2 | 12.7 | -43.9 | .0 | 528.0 |
| 21 | 2357.6 | 91.4 | 623.5 | 11.8 | -39.7 | .0 | 624.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1813.9 | 91.4 | 623.5 | 11.0 | -35.5 | .0 | 624.5 |
| 23 | 1270.3 | 91.4 | 623.5 | 10.1 | -31.3 | .0 | 624.3 |
| 24 | 726.6 | 91.4 | 623.5 | 9.3 | -27.1 | .0 | 624.1 |
| 25 | 182.9 | 355.7 | 27.2 | 30.1 | -81.3 | .0 | 85.7 |
| 26 | 3162.9 | 357.9 | 18.8 | 37.8 | -116.0 | .0 | 117.5 |
| 27 | 2619.2 | 70.9 | 667.9 | 12.3 | -41.8 | .0 | 669.2 |
| 28 | 2075.6 | 70.9 | 667.9 | 11.4 | -37.6 | .0 | 669.0 |
| 29 | 1531.9 | 70.9 | 667.9 | 10.6 | -33.4 | .0 | 668.7 |
| 30 | 988.2 | 70.9 | 667.9 | 9.7 | -29.2 | .0 | 668.5 |
| 31 | 444.6 | 357.9 | 18.8 | 26.6 | -74.2 | .0 | 76.5 |
| 32 | 2880.9 | 443.8 | -167.1 | 43.1 | -127.9 | .0 | 210.4 |
| 33 | 2337.2 | 93.3 | 614.3 | 11.8 | -39.7 | .0 | 615.6 |
| 34 | 1793.5 | 93.3 | 614.3 | 11.0 | -35.5 | .0 | 615.3 |
| 35 | 1249.9 | 93.3 | 614.3 | 10.1 | -31.3 | .0 | 615.1 |
| 36 | 706.2 | 360.1 | 10.4 | 32.7 | -90.6 | .0 | 91.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 11
spalla mobile - n777 _FESSM_11- n789 _FESSM_11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34223.7 | 4513.3 | 77380.8 | -15274.0 | -56114.6 | -40332.1 |
| 2 | 32674.5 | 4645.1 | 71558.3 | 14578.0 | 54167.3 | 38384.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66898.2 | 9158.4 | 148939.1 | -696.0 | -18523.7 | -3358.1 |

Punto di applic. carico verticale: Xv = 2.226 m Yv = -.277 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.291 | 10.324 | 1.553 | -.409 | -.025 | -.011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3677.4 | 678.5 | -657.0 | -45.7 | 137.2 | .0 | 671.2 |
| 2 | 3056.3 | 187.6 | 442.2 | -12.7 | 43.9 | .0 | 444.4 |
| 3 | 2435.1 | 133.2 | 574.8 | -11.8 | 39.7 | .0 | 576.2 |
| 4 | 1813.9 | 133.2 | 574.8 | -11.0 | 35.5 | .0 | 575.9 |
| 5 | 1192.8 | 133.2 | 574.8 | -10.1 | 31.3 | .0 | 575.7 |
| 6 | 571.6 | 133.2 | 574.8 | -9.3 | 27.1 | .0 | 575.4 |
| 7 | -49.6 | 473.2 | -219.0 | -30.1 | 81.3 | .0 | 233.6 |
| 8 | 3356.6 | 475.4 | -227.3 | -37.8 | 116.0 | .0 | 255.2 |
| 9 | 2735.5 | 106.2 | 638.0 | -12.3 | 41.8 | .0 | 639.4 |
| 10 | 2114.3 | 106.2 | 638.0 | -11.4 | 37.6 | .0 | 639.1 |
| 11 | 1493.2 | 106.2 | 638.0 | -10.6 | 33.4 | .0 | 638.9 |
| 12 | 872.0 | 106.2 | 638.0 | -9.7 | 29.2 | .0 | 638.7 |
| 13 | 250.8 | 475.4 | -227.3 | -26.6 | 74.2 | .0 | 239.1 |
| 14 | 3035.9 | 583.9 | -466.6 | -43.1 | 127.9 | .0 | 483.8 |
| 15 | 2414.7 | 135.2 | 565.6 | -11.8 | 39.7 | .0 | 567.0 |
| 16 | 1793.5 | 135.2 | 565.6 | -11.0 | 35.5 | .0 | 566.7 |
| 17 | 1172.4 | 135.2 | 565.6 | -10.1 | 31.3 | .0 | 566.5 |
| 18 | 551.2 | 477.7 | -235.7 | -32.7 | 90.6 | .0 | 252.5 |
| 19 | 3766.1 | 653.0 | -568.7 | -45.7 | 137.2 | .0 | 585.0 |
| 20 | 3145.0 | 177.3 | 488.5 | -12.7 | 43.9 | .0 | 490.5 |
| 21 | 2523.8 | 124.8 | 614.8 | -11.8 | 39.7 | .0 | 616.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1902.6 | 124.8 | 614.8 | -11.0 | 35.5 | .0 | 615.9 |
| 23 | 1281.5 | 124.8 | 614.8 | -10.1 | 31.3 | .0 | 615.6 |
| 24 | 660.3 | 124.8 | 614.8 | -9.3 | 27.1 | .0 | 615.4 |
| 25 | 39.2 | 453.7 | -146.2 | -30.1 | 81.3 | .0 | 167.3 |
| 26 | 3465.7 | 451.5 | -137.8 | -37.8 | 116.0 | .0 | 180.2 |
| 27 | 2844.6 | 97.1 | 683.0 | -12.3 | 41.8 | .0 | 684.3 |
| 28 | 2223.4 | 97.1 | 683.0 | -11.4 | 37.6 | .0 | 684.0 |
| 29 | 1602.3 | 97.1 | 683.0 | -10.6 | 33.4 | .0 | 683.8 |
| 30 | 981.1 | 97.1 | 683.0 | -9.7 | 29.2 | .0 | 683.6 |
| 31 | 359.9 | 451.5 | -137.8 | -26.6 | 74.2 | .0 | 156.5 |
| 32 | 3165.4 | 551.0 | -348.3 | -43.1 | 127.9 | .0 | 371.0 |
| 33 | 2544.2 | 122.9 | 624.1 | -11.8 | 39.7 | .0 | 625.3 |
| 34 | 1923.0 | 122.9 | 624.1 | -11.0 | 35.5 | .0 | 625.1 |
| 35 | 1301.9 | 122.9 | 624.1 | -10.1 | 31.3 | .0 | 624.8 |
| 36 | 680.7 | 449.3 | -129.5 | -32.7 | 90.6 | .0 | 158.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 12
spalla mobile - n777 _FESSM_12- n789 _FESSM_12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34223.7 | 3253.7 | 70956.0 | -15317.4 | -55916.1 | -34681.5 |
| 2 | 32674.5 | 3384.6 | 65131.2 | 14621.4 | 53968.3 | 32724.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66898.2 | 6638.3 | 136087.2 | -696.0 | -18524.2 | -3358.0 |

Punto di applic. carico verticale: Xv = 2.034 m Yv = -.277 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.291 | 8.455 | 1.359 | -.409 | -.025 | -.011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3444.9 | 517.2 | -309.4 | -45.7 | 137.2 | .0 | 338.5 |
| 2 | 2901.3 | 133.2 | 526.2 | -12.7 | 43.9 | .0 | 528.0 |
| 3 | 2357.6 | 91.4 | 623.5 | -11.8 | 39.7 | .0 | 624.8 |
| 4 | 1813.9 | 91.4 | 623.5 | -11.0 | 35.5 | .0 | 624.5 |
| 5 | 1270.3 | 91.4 | 623.5 | -10.1 | 31.3 | .0 | 624.3 |
| 6 | 726.6 | 91.4 | 623.5 | -9.3 | 27.1 | .0 | 624.1 |
| 7 | 182.9 | 355.7 | 27.2 | -30.1 | 81.3 | .0 | 85.7 |
| 8 | 3162.9 | 357.9 | 18.8 | -37.8 | 116.0 | .0 | 117.5 |
| 9 | 2619.2 | 70.9 | 667.9 | -12.3 | 41.8 | .0 | 669.2 |
| 10 | 2075.6 | 70.9 | 667.9 | -11.4 | 37.6 | .0 | 669.0 |
| 11 | 1531.9 | 70.9 | 667.9 | -10.6 | 33.4 | .0 | 668.7 |
| 12 | 988.2 | 70.9 | 667.9 | -9.7 | 29.2 | .0 | 668.5 |
| 13 | 444.6 | 357.9 | 18.8 | -26.6 | 74.2 | .0 | 76.5 |
| 14 | 2880.9 | 443.8 | -167.1 | -43.1 | 127.9 | .0 | 210.4 |
| 15 | 2337.2 | 93.3 | 614.3 | -11.8 | 39.7 | .0 | 615.6 |
| 16 | 1793.5 | 93.3 | 614.3 | -11.0 | 35.5 | .0 | 615.3 |
| 17 | 1249.9 | 93.3 | 614.3 | -10.1 | 31.3 | .0 | 615.1 |
| 18 | 706.2 | 360.1 | 10.4 | -32.7 | 90.6 | .0 | 91.2 |
| 19 | 3533.6 | 491.7 | -221.1 | -45.7 | 137.2 | .0 | 260.2 |
| 20 | 2990.0 | 122.9 | 572.5 | -12.7 | 43.9 | .0 | 574.1 |
| 21 | 2446.3 | 83.0 | 663.6 | -11.8 | 39.7 | .0 | 664.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1902.6 | 83.0 | 663.6 | -11.0 | 35.5 | .0 | 664.5 |
| 23 | 1359.0 | 83.0 | 663.6 | -10.1 | 31.3 | .0 | 664.3 |
| 24 | 815.3 | 83.0 | 663.6 | -9.3 | 27.1 | .0 | 664.1 |
| 25 | 271.6 | 336.2 | 99.9 | -30.1 | 81.3 | .0 | 128.8 |
| 26 | 3272.0 | 334.0 | 108.3 | -37.8 | 116.0 | .0 | 158.7 |
| 27 | 2728.3 | 61.8 | 712.9 | -12.3 | 41.8 | .0 | 714.1 |
| 28 | 2184.7 | 61.8 | 712.9 | -11.4 | 37.6 | .0 | 713.9 |
| 29 | 1641.0 | 61.8 | 712.9 | -10.6 | 33.4 | .0 | 713.7 |
| 30 | 1097.3 | 61.8 | 712.9 | -9.7 | 29.2 | .0 | 713.5 |
| 31 | 553.7 | 334.0 | 108.3 | -26.6 | 74.2 | .0 | 131.3 |
| 32 | 3010.4 | 410.8 | -48.8 | -43.1 | 127.9 | .0 | 136.9 |
| 33 | 2466.7 | 81.1 | 672.8 | -11.8 | 39.7 | .0 | 673.9 |
| 34 | 1923.0 | 81.1 | 672.8 | -11.0 | 35.5 | .0 | 673.7 |
| 35 | 1379.4 | 81.1 | 672.8 | -10.1 | 31.3 | .0 | 673.5 |
| 36 | 835.7 | 331.8 | 116.7 | -32.7 | 90.6 | .0 | 147.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 13
spalla mobile - n777 _FESSM_13- n789 _FESSM_13

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33708.5 | 5049.6 | 78212.4 | -14974.1 | -55712.3 | -42083.8 |
| 2 | 34221.6 | 4948.7 | 79990.1 | 15406.1 | 56083.7 | 43087.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67930.1 | 9998.3 | 158202.5 | 432.0 | 5861.6 | 2083.6 |

Punto di applic. carico verticale: Xv = 2.329 m Yv = .086 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.435 | 11.119 | 1.659 | .226 | .009 | .007 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3893.4 | 715.5 | -669.6 | 27.9 | -90.5 | .0 | 675.7 |
| 2 | 3229.9 | 196.6 | 489.3 | 8.1 | -33.3 | .0 | 490.4 |
| 3 | 2566.3 | 139.2 | 628.6 | 7.6 | -30.7 | .0 | 629.4 |
| 4 | 1902.8 | 139.2 | 628.6 | 7.0 | -28.1 | .0 | 629.2 |
| 5 | 1239.3 | 139.2 | 628.6 | 6.5 | -25.5 | .0 | 629.1 |
| 6 | 575.8 | 139.2 | 628.6 | 6.0 | -22.8 | .0 | 629.0 |
| 7 | -87.8 | 498.4 | -207.4 | 18.2 | -55.8 | .0 | 214.7 |
| 8 | 3565.3 | 497.0 | -202.2 | 23.2 | -77.6 | .0 | 216.6 |
| 9 | 2901.8 | 109.3 | 702.0 | 7.8 | -32.0 | .0 | 702.7 |
| 10 | 2238.2 | 109.3 | 702.0 | 7.3 | -29.4 | .0 | 702.6 |
| 11 | 1574.7 | 109.3 | 702.0 | 6.8 | -26.8 | .0 | 702.5 |
| 12 | 911.2 | 109.3 | 702.0 | 6.2 | -24.2 | .0 | 702.4 |
| 13 | 247.6 | 497.0 | -202.2 | 16.2 | -51.6 | .0 | 208.7 |
| 14 | 3237.2 | 606.8 | -437.4 | 26.3 | -84.7 | .0 | 445.5 |
| 15 | 2573.6 | 138.1 | 634.3 | 7.6 | -30.7 | .0 | 635.1 |
| 16 | 1910.1 | 138.1 | 634.3 | 7.0 | -28.1 | .0 | 634.9 |
| 17 | 1246.6 | 138.1 | 634.3 | 6.5 | -25.5 | .0 | 634.8 |
| 18 | 583.0 | 495.6 | -197.0 | 19.8 | -61.6 | .0 | 206.4 |
| 19 | 3861.7 | 731.3 | -724.4 | 27.9 | -90.5 | .0 | 730.0 |
| 20 | 3198.1 | 203.0 | 460.6 | 8.1 | -33.3 | .0 | 461.8 |
| 21 | 2534.6 | 144.5 | 603.8 | 7.6 | -30.7 | .0 | 604.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1871.1 | 144.5 | 603.8 | 7.0 | -28.1 | .0 | 604.4 |
| 23 | 1207.6 | 144.5 | 603.8 | 6.5 | -25.5 | .0 | 604.3 |
| 24 | 544.0 | 144.5 | 603.8 | 6.0 | -22.8 | .0 | 604.2 |
| 25 | -119.5 | 510.4 | -252.5 | 18.2 | -55.8 | .0 | 258.6 |
| 26 | 3526.3 | 511.8 | -257.7 | 23.2 | -77.6 | .0 | 269.1 |
| 27 | 2862.7 | 114.9 | 674.1 | 7.8 | -32.0 | .0 | 674.8 |
| 28 | 2199.2 | 114.9 | 674.1 | 7.3 | -29.4 | .0 | 674.7 |
| 29 | 1535.7 | 114.9 | 674.1 | 6.8 | -26.8 | .0 | 674.6 |
| 30 | 872.1 | 114.9 | 674.1 | 6.2 | -24.2 | .0 | 674.5 |
| 31 | 208.6 | 511.8 | -257.7 | 16.2 | -51.6 | .0 | 262.8 |
| 32 | 3190.8 | 627.2 | -510.8 | 26.3 | -84.7 | .0 | 517.8 |
| 33 | 2527.3 | 145.7 | 598.1 | 7.6 | -30.7 | .0 | 598.8 |
| 34 | 1863.8 | 145.7 | 598.1 | 7.0 | -28.1 | .0 | 598.7 |
| 35 | 1200.3 | 145.7 | 598.1 | 6.5 | -25.5 | .0 | 598.6 |
| 36 | 536.7 | 513.2 | -262.9 | 19.8 | -61.6 | .0 | 270.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 13
spalla mobile - n777 _FESSM_13- n789 _FESSM_13

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 731.3 | -724.4 | 27.9 | -90.5 | 731.9 | 730.0 |
| 1.41 | 587.5 | 197.4 | 24.8 | -53.4 | 588.0 | 204.5 |
| 2.81 | 476.1 | 939.4 | 22.1 | -20.5 | 476.6 | 939.6 |
| 4.22 | 213.2 | 1455.6 | 14.4 | 6.2 | 213.7 | 1455.6 |
| 5.63 | -6.5 | 1581.9 | 6.9 | 20.8 | 9.5 | 1582.1 |
| 7.03 | -130.5 | 1471.1 | 1.5 | 26.4 | 130.5 | 1471.3 |
| 8.44 | -179.5 | 1239.4 | -1.6 | 25.8 | 179.5 | 1239.7 |
| 9.84 | -181.0 | 984.3 | -2.2 | 23.1 | 181.0 | 984.6 |
| 11.25 | -174.2 | 733.1 | -2.5 | 19.8 | 174.2 | 733.3 |
| 13.50 | -145.6 | 357.9 | -2.7 | 13.8 | 145.6 | 358.2 |
| 15.75 | -83.5 | 103.2 | -2.3 | 8.1 | 83.6 | 103.5 |
| 18.00 | -36.9 | -27.1 | -1.6 | 3.8 | 36.9 | 27.4 |
| 20.25 | -8.5 | -73.3 | -.9 | 1.0 | 8.6 | 73.3 |
| 22.50 | 5.5 | -73.9 | -.4 | -.4 | 5.5 | 73.9 |
| 26.25 | 8.1 | -42.9 | .0 | -.8 | 8.1 | 42.9 |
| 30.00 | 5.4 | -16.9 | .1 | -.6 | 5.4 | 16.9 |
| 33.75 | 2.2 | -2.6 | .1 | -.3 | 2.2 | 2.6 |
| 39.38 | -.1 | 2.0 | .0 | .0 | .1 | 2.0 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 13
spalla mobile - n777 _FESSM_13- n789 _FESSM_13

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 510.4 | -252.5 | 18.2 | -55.8 | 510.8 | 258.6 |
| 1.41 | 414.4 | 394.1 | 16.1 | -31.7 | 414.7 | 395.4 |
| 2.81 | 339.0 | 920.3 | 14.2 | -10.4 | 339.3 | 920.4 |
| 4.22 | 156.9 | 1291.8 | 9.1 | 6.7 | 157.2 | 1291.8 |
| 5.63 | -1.7 | 1388.6 | 4.2 | 15.8 | 4.5 | 1388.6 |
| 7.03 | -98.0 | 1308.8 | .7 | 19.0 | 98.0 | 1309.0 |
| 8.44 | -141.3 | 1129.6 | -1.3 | 18.2 | 141.4 | 1129.7 |
| 9.84 | -145.2 | 926.9 | -1.7 | 16.0 | 145.2 | 927.0 |
| 11.25 | -143.0 | 723.2 | -1.9 | 13.5 | 143.0 | 723.3 |
| 13.50 | -125.9 | 410.3 | -1.9 | 9.2 | 125.9 | 410.4 |
| 15.75 | -83.2 | 175.4 | -1.6 | 5.2 | 83.2 | 175.5 |
| 18.00 | -46.1 | 32.6 | -1.0 | 2.3 | 46.1 | 32.7 |
| 20.25 | -19.6 | -38.2 | -.6 | .5 | 19.6 | 38.2 |
| 22.50 | -2.6 | -61.5 | -.2 | -.4 | 2.6 | 61.5 |
| 26.25 | 5.9 | -48.6 | .0 | -.6 | 5.9 | 48.6 |
| 30.00 | 5.2 | -26.7 | .1 | -.4 | 5.2 | 26.7 |
| 33.75 | 3.1 | -10.6 | .0 | -.2 | 3.1 | 10.6 |
| 39.38 | .7 | -.5 | .0 | .0 | .7 | .5 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 14
spalla mobile - n777 _FESSM_14- n789 _FESSM_14

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33708.5 | 2950.4 | 67504.4 | -15046.4 | -55381.4 | -32666.1 |
| 2 | 34221.6 | 2847.9 | 69278.2 | 15478.4 | 55752.1 | 33654.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67930.1 | 5798.3 | 136782.6 | 432.0 | 5860.9 | 2084.8 |

Punto di applic. carico verticale: Xv = 2.014 m Yv = .086 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.435 | 8.004 | 1.336 | .226 | .009 | .007 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3505.9 | 446.6 | -90.4 | 27.9 | -90.5 | .0 | 127.9 |
| 2 | 2971.6 | 106.0 | 629.2 | 8.1 | -33.3 | .0 | 630.1 |
| 3 | 2437.2 | 69.5 | 709.8 | 7.6 | -30.7 | .0 | 710.5 |
| 4 | 1902.8 | 69.5 | 709.8 | 7.0 | -28.1 | .0 | 710.3 |
| 5 | 1368.4 | 69.5 | 709.8 | 6.5 | -25.5 | .0 | 710.2 |
| 6 | 834.1 | 69.5 | 709.8 | 6.0 | -22.8 | .0 | 710.2 |
| 7 | 299.7 | 302.5 | 202.9 | 18.2 | -55.8 | .0 | 210.4 |
| 8 | 3242.4 | 301.1 | 208.0 | 23.2 | -77.6 | .0 | 222.0 |
| 9 | 2708.0 | 50.5 | 751.8 | 7.8 | -32.0 | .0 | 752.5 |
| 10 | 2173.6 | 50.5 | 751.8 | 7.3 | -29.4 | .0 | 752.4 |
| 11 | 1639.3 | 50.5 | 751.8 | 6.8 | -26.8 | .0 | 752.3 |
| 12 | 1104.9 | 50.5 | 751.8 | 6.2 | -24.2 | .0 | 752.2 |
| 13 | 570.5 | 301.1 | 208.0 | 16.2 | -51.6 | .0 | 214.4 |
| 14 | 2978.8 | 373.2 | 61.8 | 26.3 | -84.7 | .0 | 104.9 |
| 15 | 2444.5 | 68.3 | 715.5 | 7.6 | -30.7 | .0 | 716.2 |
| 16 | 1910.1 | 68.3 | 715.5 | 7.0 | -28.1 | .0 | 716.1 |
| 17 | 1375.7 | 68.3 | 715.5 | 6.5 | -25.5 | .0 | 716.0 |
| 18 | 841.4 | 299.7 | 213.2 | 19.8 | -61.6 | .0 | 222.0 |
| 19 | 3474.2 | 462.5 | -145.2 | 27.9 | -90.5 | .0 | 171.1 |
| 20 | 2939.8 | 112.4 | 600.5 | 8.1 | -33.3 | .0 | 601.4 |
| 21 | 2405.5 | 74.7 | 684.9 | 7.6 | -30.7 | .0 | 685.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1871.1 | 74.7 | 684.9 | 7.0 | -28.1 | .0 | 685.5 |
| 23 | 1336.7 | 74.7 | 684.9 | 6.5 | -25.5 | .0 | 685.4 |
| 24 | 802.3 | 74.7 | 684.9 | 6.0 | -22.8 | .0 | 685.3 |
| 25 | 268.0 | 314.6 | 157.7 | 18.2 | -55.8 | .0 | 167.3 |
| 26 | 3203.4 | 316.0 | 152.5 | 23.2 | -77.6 | .0 | 171.1 |
| 27 | 2669.0 | 56.1 | 723.9 | 7.8 | -32.0 | .0 | 724.6 |
| 28 | 2134.6 | 56.1 | 723.9 | 7.3 | -29.4 | .0 | 724.5 |
| 29 | 1600.3 | 56.1 | 723.9 | 6.8 | -26.8 | .0 | 724.4 |
| 30 | 1065.9 | 56.1 | 723.9 | 6.2 | -24.2 | .0 | 724.3 |
| 31 | 531.5 | 316.0 | 152.5 | 16.2 | -51.6 | .0 | 161.0 |
| 32 | 2932.5 | 393.6 | -11.6 | 26.3 | -84.7 | .0 | 85.5 |
| 33 | 2398.2 | 75.9 | 679.2 | 7.6 | -30.7 | .0 | 679.9 |
| 34 | 1863.8 | 75.9 | 679.2 | 7.0 | -28.1 | .0 | 679.8 |
| 35 | 1329.4 | 75.9 | 679.2 | 6.5 | -25.5 | .0 | 679.7 |
| 36 | 795.0 | 317.4 | 147.3 | 19.8 | -61.6 | .0 | 159.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 15
spalla mobile - n777 _FESSM_17- n789 _FESSM_17

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34262.5 | 4632.3 | 78753.7 | -15264.1 | -56698.1 | -41181.8 |
| 2 | 34783.2 | 4526.0 | 80547.6 | 15714.1 | 57059.1 | 42216.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69045.7 | 9158.3 | 159301.3 | 450.0 | 5932.5 | 2171.7 |

Punto di applic. carico verticale: Xv = 2.307 m Yv = .086 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.590 | 10.682 | 1.639 | .235 | .009 | .007 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3900.8 | 665.6 | -518.3 | 29.0 | -94.4 | .0 | 526.9 |
| 2 | 3245.3 | 177.6 | 558.4 | 8.4 | -34.9 | .0 | 559.5 |
| 3 | 2589.7 | 124.0 | 686.0 | 7.9 | -32.1 | .0 | 686.8 |
| 4 | 1934.1 | 124.0 | 686.0 | 7.3 | -29.4 | .0 | 686.6 |
| 5 | 1278.5 | 124.0 | 686.0 | 6.8 | -26.7 | .0 | 686.5 |
| 6 | 623.0 | 124.0 | 686.0 | 6.2 | -24.0 | .0 | 686.4 |
| 7 | -32.6 | 460.9 | -86.9 | 19.0 | -58.3 | .0 | 104.6 |
| 8 | 3576.8 | 459.4 | -81.5 | 24.1 | -81.0 | .0 | 114.9 |
| 9 | 2921.2 | 96.0 | 753.0 | 8.1 | -33.5 | .0 | 753.8 |
| 10 | 2265.6 | 96.0 | 753.0 | 7.6 | -30.8 | .0 | 753.7 |
| 11 | 1610.0 | 96.0 | 753.0 | 7.1 | -28.1 | .0 | 753.6 |
| 12 | 954.5 | 96.0 | 753.0 | 6.5 | -25.3 | .0 | 753.5 |
| 13 | 298.9 | 459.4 | -81.5 | 16.9 | -53.9 | .0 | 97.7 |
| 14 | 3252.7 | 562.7 | -300.2 | 27.4 | -88.4 | .0 | 312.9 |
| 15 | 2597.1 | 122.7 | 692.0 | 7.9 | -32.1 | .0 | 692.7 |
| 16 | 1941.5 | 122.7 | 692.0 | 7.3 | -29.4 | .0 | 692.6 |
| 17 | 1286.0 | 122.7 | 692.0 | 6.8 | -26.7 | .0 | 692.5 |
| 18 | 630.4 | 458.0 | -76.1 | 20.6 | -64.3 | .0 | 99.6 |
| 19 | 3868.5 | 682.1 | -575.5 | 29.0 | -94.4 | .0 | 583.2 |
| 20 | 3212.9 | 184.2 | 528.5 | 8.4 | -34.9 | .0 | 529.7 |
| 21 | 2557.3 | 129.4 | 660.1 | 7.9 | -32.1 | .0 | 660.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1901.8 | 129.4 | 660.1 | 7.3 | -29.4 | .0 | 660.8 |
| 23 | 1246.2 | 129.4 | 660.1 | 6.8 | -26.7 | .0 | 660.7 |
| 24 | 590.6 | 129.4 | 660.1 | 6.2 | -24.0 | .0 | 660.5 |
| 25 | -65.0 | 473.4 | -133.9 | 19.0 | -58.3 | .0 | 146.1 |
| 26 | 3537.0 | 474.9 | -139.4 | 24.1 | -81.0 | .0 | 161.2 |
| 27 | 2881.4 | 101.8 | 723.9 | 8.1 | -33.5 | .0 | 724.7 |
| 28 | 2225.8 | 101.8 | 723.9 | 7.6 | -30.8 | .0 | 724.6 |
| 29 | 1570.3 | 101.8 | 723.9 | 7.1 | -28.1 | .0 | 724.5 |
| 30 | 914.7 | 101.8 | 723.9 | 6.5 | -25.3 | .0 | 724.4 |
| 31 | 259.1 | 474.9 | -139.4 | 16.9 | -53.9 | .0 | 149.4 |
| 32 | 3205.5 | 584.0 | -376.7 | 27.4 | -88.4 | .0 | 386.9 |
| 33 | 2549.9 | 130.6 | 654.2 | 7.9 | -32.1 | .0 | 654.9 |
| 34 | 1894.3 | 130.6 | 654.2 | 7.3 | -29.4 | .0 | 654.8 |
| 35 | 1238.8 | 130.6 | 654.2 | 6.8 | -26.7 | .0 | 654.7 |
| 36 | 583.2 | 476.3 | -144.8 | 20.6 | -64.3 | .0 | 158.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
SPALLA mobile SLE FESS

CONDIZIONE DI CARICO 16
spalla mobile - n777 _FESSM_18- n789 _FESSM_18

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 34262.5 | 3372.7 | 72328.8 | -15307.5 | -56499.5 | -35531.2 |
| 2 | 34783.2 | 3265.6 | 74120.5 | 15757.5 | 56860.2 | 36556.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 69045.7 | 6638.3 | 146449.3 | 450.0 | 5932.2 | 2170.8 |

Punto di applic. carico verticale: Xv = 2.121 m Yv = .086 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.590 | 8.813 | 1.445 | .235 | .009 | .007 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3668.3 | 504.3 | -170.8 | 29.0 | -94.4 | .0 | 195.2 |
| 2 | 3090.3 | 123.2 | 642.4 | 8.4 | -34.9 | .0 | 643.3 |
| 3 | 2512.2 | 82.1 | 734.7 | 7.9 | -32.1 | .0 | 735.4 |
| 4 | 1934.1 | 82.1 | 734.7 | 7.3 | -29.4 | .0 | 735.3 |
| 5 | 1356.0 | 82.1 | 734.7 | 6.8 | -26.7 | .0 | 735.2 |
| 6 | 777.9 | 82.1 | 734.7 | 6.2 | -24.0 | .0 | 735.1 |
| 7 | 199.9 | 343.4 | 159.2 | 19.0 | -58.3 | .0 | 169.6 |
| 8 | 3383.0 | 341.9 | 164.6 | 24.1 | -81.0 | .0 | 183.5 |
| 9 | 2804.9 | 60.7 | 782.9 | 8.1 | -33.5 | .0 | 783.6 |
| 10 | 2226.9 | 60.7 | 782.9 | 7.6 | -30.8 | .0 | 783.5 |
| 11 | 1648.8 | 60.7 | 782.9 | 7.1 | -28.1 | .0 | 783.4 |
| 12 | 1070.7 | 60.7 | 782.9 | 6.5 | -25.3 | .0 | 783.3 |
| 13 | 492.6 | 341.9 | 164.6 | 16.9 | -54.0 | .0 | 173.3 |
| 14 | 3097.7 | 422.5 | -.6 | 27.4 | -88.4 | .0 | 88.4 |
| 15 | 2519.6 | 80.9 | 740.7 | 7.9 | -32.1 | .0 | 741.4 |
| 16 | 1941.5 | 80.9 | 740.7 | 7.3 | -29.4 | .0 | 741.2 |
| 17 | 1363.5 | 80.9 | 740.7 | 6.8 | -26.7 | .0 | 741.1 |
| 18 | 785.4 | 340.5 | 170.0 | 20.7 | -64.3 | .0 | 181.8 |
| 19 | 3636.0 | 520.8 | -227.9 | 29.0 | -94.4 | .0 | 246.7 |
| 20 | 3057.9 | 129.8 | 612.5 | 8.4 | -34.9 | .0 | 613.4 |
| 21 | 2479.8 | 87.6 | 708.8 | 7.9 | -32.1 | .0 | 709.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1901.8 | 87.6 | 708.8 | 7.3 | -29.4 | .0 | 709.4 |
| 23 | 1323.7 | 87.6 | 708.8 | 6.8 | -26.7 | .0 | 709.3 |
| 24 | 745.6 | 87.6 | 708.8 | 6.2 | -24.0 | .0 | 709.2 |
| 25 | 167.5 | 355.9 | 112.2 | 19.0 | -58.3 | .0 | 126.4 |
| 26 | 3343.3 | 357.4 | 106.8 | 24.1 | -81.0 | .0 | 134.0 |
| 27 | 2765.2 | 66.6 | 753.8 | 8.1 | -33.5 | .0 | 754.6 |
| 28 | 2187.1 | 66.6 | 753.8 | 7.6 | -30.8 | .0 | 754.5 |
| 29 | 1609.0 | 66.6 | 753.8 | 7.1 | -28.1 | .0 | 754.3 |
| 30 | 1030.9 | 66.6 | 753.8 | 6.5 | -25.3 | .0 | 754.3 |
| 31 | 452.9 | 357.4 | 106.8 | 16.9 | -54.0 | .0 | 119.6 |
| 32 | 3050.5 | 443.8 | -77.1 | 27.4 | -88.4 | .0 | 117.3 |
| 33 | 2472.4 | 88.8 | 702.9 | 7.9 | -32.1 | .0 | 703.6 |
| 34 | 1894.3 | 88.8 | 702.9 | 7.3 | -29.4 | .0 | 703.5 |
| 35 | 1316.3 | 88.8 | 702.9 | 6.8 | -26.7 | .0 | 703.4 |
| 36 | 738.2 | 358.8 | 101.4 | 20.7 | -64.3 | .0 | 120.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 17
spalla mobile - n777 _RARAM_1- n789 _RARAM_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 29158.3 | 6168.2 | 76139.2 | -14058.5 | -20985.5 | -41629.8 |
| 2 | 30371.7 | 6032.9 | 80624.9 | 14718.5 | 21287.9 | 43488.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 59530.0 | 12201.1 | 156764.1 | 660.0 | 13285.8 | 3306.0 |

Punto di applic. carico verticale: Xv = 2.633 m Yv = .223 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.268 | 12.315 | 1.723 | .367 | .019 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3754.4 | 842.0 | -1037.9 | 43.3 | -135.2 | .0 | 1046.7 |
| 2 | 3065.2 | 244.2 | 328.8 | 12.2 | -46.5 | .0 | 332.1 |
| 3 | 2376.0 | 177.2 | 497.7 | 11.4 | -42.4 | .0 | 499.5 |
| 4 | 1686.8 | 177.2 | 497.7 | 10.6 | -38.2 | .0 | 499.1 |
| 5 | 997.6 | 177.2 | 497.7 | 9.7 | -34.1 | .0 | 498.8 |
| 6 | 308.4 | 177.2 | 497.7 | 8.9 | -29.9 | .0 | 498.6 |
| 7 | -380.7 | 593.0 | -497.5 | 27.9 | -80.1 | .0 | 503.9 |
| 8 | 3417.4 | 590.8 | -489.3 | 35.8 | -115.0 | .0 | 502.6 |
| 9 | 2728.2 | 141.8 | 588.7 | 11.8 | -44.4 | .0 | 590.4 |
| 10 | 2039.0 | 141.8 | 588.7 | 11.0 | -40.3 | .0 | 590.1 |
| 11 | 1349.9 | 141.8 | 588.7 | 10.2 | -36.2 | .0 | 589.8 |
| 12 | 660.7 | 141.8 | 588.7 | 9.3 | -32.0 | .0 | 589.6 |
| 13 | -28.5 | 590.8 | -489.3 | 24.8 | -73.8 | .0 | 494.8 |
| 14 | 3080.4 | 716.1 | -762.1 | 40.7 | -126.0 | .0 | 772.5 |
| 15 | 2391.3 | 175.3 | 506.7 | 11.4 | -42.4 | .0 | 508.5 |
| 16 | 1702.1 | 175.3 | 506.7 | 10.6 | -38.2 | .0 | 508.2 |
| 17 | 1012.9 | 175.3 | 506.7 | 9.7 | -34.1 | .0 | 507.9 |
| 18 | 323.7 | 588.6 | -481.0 | 30.5 | -89.3 | .0 | 489.3 |
| 19 | 3688.0 | 867.1 | -1124.9 | 43.3 | -135.2 | .0 | 1132.9 |
| 20 | 2998.8 | 254.4 | 283.3 | 12.2 | -46.5 | .0 | 287.1 |
| 21 | 2309.6 | 185.4 | 458.2 | 11.4 | -42.4 | .0 | 460.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1620.4 | 185.4 | 458.2 | 10.6 | -38.2 | .0 | 459.8 |
| 23 | 931.2 | 185.4 | 458.2 | 9.7 | -34.1 | .0 | 459.5 |
| 24 | 242.0 | 185.4 | 458.2 | 8.9 | -29.9 | .0 | 459.2 |
| 25 | -447.1 | 612.2 | -569.2 | 27.9 | -80.1 | .0 | 574.8 |
| 26 | 3335.7 | 614.4 | -577.4 | 35.8 | -115.0 | .0 | 588.7 |
| 27 | 2646.6 | 150.7 | 544.4 | 11.8 | -44.4 | .0 | 546.2 |
| 28 | 1957.4 | 150.7 | 544.4 | 11.0 | -40.3 | .0 | 545.9 |
| 29 | 1268.2 | 150.7 | 544.4 | 10.2 | -36.2 | .0 | 545.6 |
| 30 | 579.0 | 150.7 | 544.4 | 9.3 | -32.0 | .0 | 545.3 |
| 31 | -110.2 | 614.4 | -577.4 | 24.8 | -73.8 | .0 | 582.1 |
| 32 | 2983.5 | 748.5 | -878.6 | 40.7 | -126.0 | .0 | 887.6 |
| 33 | 2294.3 | 187.3 | 449.2 | 11.4 | -42.4 | .0 | 451.2 |
| 34 | 1605.1 | 187.3 | 449.2 | 10.6 | -38.2 | .0 | 450.8 |
| 35 | 916.0 | 187.3 | 449.2 | 9.7 | -34.1 | .0 | 450.5 |
| 36 | 226.8 | 616.6 | -585.6 | 30.5 | -89.3 | .0 | 592.4 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 18
spalla mobile - n777 _RARAM_2- n789 _RARAM_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
| --- | --- | --- | --- | --- |
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 29158.3 | 4908.2 | 69713.2 | -14053.7 | -21046.6 | -36988.6 |
| 2 | 30371.7 | 4772.9 | 74198.9 | 14713.7 | 21349.0 | 38846.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
| --- | --- | --- | --- | --- | --- |
| 59530.0 | 9681.1 | 143912.1 | 660.0 | 13285.8 | 3306.0 |

Punto di applic. carico verticale: Xv = 2.417 m Yv = .223 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
| --- | --- | --- | --- | --- | --- |
| 8.268 | 10.446 | 1.529 | .367 | .019 | .011 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 3521.9 | 680.7 | -690.4 | 43.3 | -135.2 | .0 | 703.5 |
| 2 | 2910.2 | 189.8 | 412.8 | 12.2 | -46.5 | .0 | 415.4 |
| 3 | 2298.5 | 135.3 | 546.4 | 11.4 | -42.4 | .0 | 548.0 |
| 4 | 1686.8 | 135.3 | 546.4 | 10.6 | -38.2 | .0 | 547.7 |
| 5 | 1075.1 | 135.3 | 546.4 | 9.7 | -34.1 | .0 | 547.4 |
| 6 | 463.4 | 135.3 | 546.4 | 8.9 | -29.9 | .0 | 547.2 |
| 7 | -148.2 | 475.5 | -251.4 | 27.9 | -80.1 | .0 | 263.8 |
| 8 | 3223.7 | 473.3 | -243.2 | 35.8 | -115.0 | .0 | 269.0 |
| 9 | 2612.0 | 106.5 | 618.6 | 11.8 | -44.4 | .0 | 620.2 |
| 10 | 2000.3 | 106.5 | 618.6 | 11.0 | -40.3 | .0 | 619.9 |
| 11 | 1388.6 | 106.5 | 618.6 | 10.2 | -36.2 | .0 | 619.6 |
| 12 | 776.9 | 106.5 | 618.6 | 9.3 | -32.0 | .0 | 619.4 |
| 13 | 165.2 | 473.3 | -243.2 | 24.8 | -73.8 | .0 | 254.1 |
| 14 | 2925.5 | 575.9 | -462.6 | 40.7 | -126.0 | .0 | 479.5 |
| 15 | 2313.8 | 133.4 | 555.4 | 11.4 | -42.4 | .0 | 557.0 |
| 16 | 1702.1 | 133.4 | 555.4 | 10.6 | -38.2 | .0 | 556.7 |
| 17 | 1090.4 | 133.4 | 555.4 | 9.7 | -34.1 | .0 | 556.5 |
| 18 | 478.7 | 471.1 | -234.9 | 30.5 | -89.3 | .0 | 251.3 |
| 19 | 3455.5 | 705.8 | -777.3 | 43.3 | -135.2 | .0 | 789.0 |
| 20 | 2843.8 | 200.0 | 367.2 | 12.2 | -46.5 | .0 | 370.1 |
| 21 | 2232.1 | 143.6 | 506.9 | 11.4 | -42.4 | .0 | 508.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1620.4 | 143.6 | 506.9 | 10.6 | -38.2 | .0 | 508.4 |
| 23 | 1008.7 | 143.6 | 506.9 | 9.7 | -34.1 | .0 | 508.1 |
| 24 | 397.0 | 143.6 | 506.9 | 8.9 | -29.9 | .0 | 507.8 |
| 25 | -214.7 | 494.7 | -323.0 | 27.9 | -80.1 | .0 | 332.8 |
| 26 | 3142.0 | 496.9 | -331.3 | 35.8 | -115.0 | .0 | 350.7 |
| 27 | 2530.3 | 115.4 | 574.3 | 11.8 | -44.4 | .0 | 576.0 |
| 28 | 1918.6 | 115.4 | 574.3 | 11.0 | -40.3 | .0 | 575.7 |
| 29 | 1306.9 | 115.4 | 574.3 | 10.2 | -36.2 | .0 | 575.4 |
| 30 | 695.2 | 115.4 | 574.3 | 9.3 | -32.0 | .0 | 575.2 |
| 31 | 83.6 | 496.9 | -331.3 | 24.8 | -73.8 | .0 | 339.4 |
| 32 | 2828.5 | 608.4 | -579.1 | 40.7 | -126.0 | .0 | 592.6 |
| 33 | 2216.8 | 145.5 | 497.9 | 11.4 | -42.4 | .0 | 499.7 |
| 34 | 1605.1 | 145.5 | 497.9 | 10.6 | -38.2 | .0 | 499.3 |
| 35 | 993.5 | 145.5 | 497.9 | 9.7 | -34.1 | .0 | 499.0 |
| 36 | 381.8 | 499.1 | -339.5 | 30.5 | -89.3 | .0 | 351.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 19
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33650.3 | 6167.8 | 97464.9 | -16323.4 | -24435.7 | -49572.6 |
| 2 | 34028.5 | 6033.3 | 98617.7 | 16833.4 | 24201.0 | 50714.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67678.8 | 12201.1 | 196082.6 | 510.0 | 3812.0 | 2580.7 |

Punto di applic. carico verticale: Xv = 2.897 m Yv = .056 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.400 | 13.673 | 2.049 | .251 | .007 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4351.6 | 875.4 | -797.4 | 33.0 | -110.8 | .0 | 805.0 |
| 2 | 3531.8 | 239.5 | 620.1 | 9.7 | -42.9 | .0 | 621.6 |
| 3 | 2712.0 | 169.2 | 790.2 | 9.1 | -39.7 | .0 | 791.2 |
| 4 | 1892.3 | 169.2 | 790.2 | 8.4 | -36.5 | .0 | 791.0 |
| 5 | 1072.5 | 169.2 | 790.2 | 7.8 | -33.2 | .0 | 790.9 |
| 6 | 252.7 | 169.2 | 790.2 | 7.1 | -30.0 | .0 | 790.7 |
| 7 | -567.0 | 609.1 | -231.6 | 21.0 | -67.8 | .0 | 241.3 |
| 8 | 3944.5 | 607.4 | -225.1 | 27.4 | -95.4 | .0 | 244.5 |
| 9 | 3124.7 | 132.5 | 879.7 | 9.4 | -41.3 | .0 | 880.6 |
| 10 | 2305.0 | 132.5 | 879.7 | 8.7 | -38.1 | .0 | 880.5 |
| 11 | 1485.2 | 132.5 | 879.7 | 8.1 | -34.9 | .0 | 880.3 |
| 12 | 665.4 | 132.5 | 879.7 | 7.4 | -31.6 | .0 | 880.2 |
| 13 | -154.3 | 607.4 | -225.1 | 18.8 | -63.3 | .0 | 233.9 |
| 14 | 3537.4 | 742.0 | -513.0 | 31.0 | -103.6 | .0 | 523.3 |
| 15 | 2717.7 | 167.7 | 797.3 | 9.1 | -39.7 | .0 | 798.2 |
| 16 | 1897.9 | 167.7 | 797.3 | 8.4 | -36.5 | .0 | 798.1 |
| 17 | 1078.2 | 167.7 | 797.3 | 7.8 | -33.2 | .0 | 797.9 |
| 18 | 258.4 | 605.7 | -218.7 | 23.0 | -75.0 | .0 | 231.2 |
| 19 | 4327.0 | 895.0 | -865.2 | 33.0 | -110.8 | .0 | 872.3 |
| 20 | 3507.2 | 247.4 | 584.6 | 9.7 | -42.9 | .0 | 586.2 |
| 21 | 2687.4 | 175.6 | 759.4 | 9.1 | -39.7 | .0 | 760.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1867.7 | 175.6 | 759.4 | 8.4 | -36.5 | .0 | 760.3 |
| 23 | 1047.9 | 175.6 | 759.4 | 7.8 | -33.2 | .0 | 760.1 |
| 24 | 228.1 | 175.6 | 759.4 | 7.1 | -30.0 | .0 | 760.0 |
| 25 | -591.6 | 624.1 | -287.5 | 21.0 | -67.8 | .0 | 295.4 |
| 26 | 3914.3 | 625.8 | -293.9 | 27.4 | -95.4 | .0 | 309.0 |
| 27 | 3094.5 | 139.5 | 845.1 | 9.4 | -41.3 | .0 | 846.1 |
| 28 | 2274.7 | 139.5 | 845.1 | 8.7 | -38.1 | .0 | 845.9 |
| 29 | 1455.0 | 139.5 | 845.1 | 8.1 | -34.9 | .0 | 845.8 |
| 30 | 635.2 | 139.5 | 845.1 | 7.4 | -31.6 | .0 | 845.7 |
| 31 | -184.6 | 625.8 | -293.9 | 18.8 | -63.3 | .0 | 300.7 |
| 32 | 3501.5 | 767.3 | -603.9 | 31.0 | -103.6 | .0 | 612.7 |
| 33 | 2681.8 | 177.1 | 752.3 | 9.1 | -39.7 | .0 | 753.4 |
| 34 | 1862.0 | 177.1 | 752.3 | 8.4 | -36.5 | .0 | 753.2 |
| 35 | 1042.3 | 177.1 | 752.3 | 7.8 | -33.2 | .0 | 753.1 |
| 36 | 222.5 | 627.5 | -300.4 | 23.0 | -75.0 | .0 | 309.6 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 19
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 875.4 | -797.4 | 33.0 | -110.8 | 876.0 | 805.0 |
| 1.41 | 700.6 | 303.9 | 29.5 | -66.9 | 701.2 | 311.2 |
| 2.81 | 565.6 | 1187.1 | 26.3 | -27.8 | 566.3 | 1187.4 |
| 4.22 | 248.6 | 1797.6 | 17.4 | 4.2 | 249.2 | 1797.6 |
| 5.63 | -15.4 | 1938.4 | 8.6 | 22.0 | 17.6 | 1938.6 |
| 7.03 | -163.2 | 1795.3 | 2.2 | 29.2 | 163.2 | 1795.6 |
| 8.44 | -220.5 | 1509.4 | -1.5 | 28.9 | 220.5 | 1509.6 |
| 9.84 | -221.8 | 1196.4 | -2.3 | 26.1 | 221.8 | 1196.7 |
| 11.25 | -213.0 | 888.8 | -2.7 | 22.6 | 213.0 | 889.1 |
| 13.50 | -177.5 | 430.5 | -2.9 | 16.2 | 177.5 | 430.8 |
| 15.75 | -101.2 | 120.8 | -2.6 | 9.7 | 101.3 | 121.1 |
| 18.00 | -44.2 | -36.4 | -1.8 | 4.7 | 44.3 | 36.7 |
| 20.25 | -9.8 | -91.2 | -1.1 | 1.4 | 9.8 | 91.2 |
| 22.50 | 7.0 | -90.8 | -.4 | -.3 | 7.0 | 90.8 |
| 26.25 | 10.0 | -52.3 | .0 | -.9 | 10.0 | 52.4 |
| 30.00 | 6.6 | -20.5 | .1 | -.6 | 6.6 | 20.5 |
| 33.75 | 2.7 | -3.0 | .1 | -.3 | 2.7 | 3.0 |
| 39.38 | -.1 | 2.5 | .0 | -.1 | .1 | 2.5 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 19
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 25
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 624.1 | -287.5 | 21.0 | -67.8 | 624.4 | 295.4 |
| 1.41 | 506.0 | 502.6 | 18.7 | -40.0 | 506.3 | 504.2 |
| 2.81 | 413.4 | 1144.8 | 16.6 | -15.2 | 413.8 | 1144.9 |
| 4.22 | 190.1 | 1597.1 | 10.8 | 4.8 | 190.4 | 1597.1 |
| 5.63 | -4.2 | 1712.6 | 5.2 | 15.8 | 6.7 | 1712.7 |
| 7.03 | -121.8 | 1612.2 | 1.1 | 20.0 | 121.8 | 1612.3 |
| 8.44 | -174.6 | 1390.4 | -1.2 | 19.5 | 174.6 | 1390.5 |
| 9.84 | -179.2 | 1140.2 | -1.6 | 17.4 | 179.2 | 1140.3 |
| 11.25 | -176.3 | 888.9 | -1.9 | 14.9 | 176.3 | 889.0 |
| 13.50 | -155.0 | 503.3 | -2.0 | 10.4 | 155.0 | 503.4 |
| 15.75 | -102.3 | 214.2 | -1.7 | 6.1 | 102.3 | 214.3 |
| 18.00 | -56.6 | 38.8 | -1.2 | 2.8 | 56.6 | 38.9 |
| 20.25 | -23.9 | -47.9 | -.7 | .7 | 23.9 | 47.9 |
| 22.50 | -3.1 | -76.1 | -.3 | -.3 | 3.1 | 76.1 |
| 26.25 | 7.3 | -59.9 | .0 | -.6 | 7.3 | 59.9 |
| 30.00 | 6.4 | -32.8 | .1 | -.4 | 6.5 | 32.8 |
| 33.75 | 3.8 | -13.0 | .0 | -.2 | 3.8 | 13.0 |
| 39.38 | .9 | -.6 | .0 | .0 | .9 | .6 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 19
spalla mobile - n777 _RARAM_3 - n789 _RARAM_3

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 19
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 895.0 | -865.2 | 33.0 | -110.8 | 895.6 | 872.3 |
| 1.41 | 718.1 | 262.1 | 29.5 | -66.9 | 718.8 | 270.5 |
| 2.81 | 581.3 | 1168.6 | 26.3 | -27.8 | 581.9 | 1169.0 |
| 4.22 | 258.9 | 1798.1 | 17.4 | 4.2 | 259.5 | 1798.1 |
| 5.63 | -10.3 | 1949.6 | 8.6 | 22.0 | 13.4 | 1949.7 |
| 7.03 | -161.8 | 1810.7 | 2.2 | 29.2 | 161.9 | 1810.9 |
| 8.44 | -221.3 | 1524.6 | -1.5 | 28.9 | 221.3 | 1524.9 |
| 9.84 | -223.1 | 1210.1 | -2.3 | 26.1 | 223.1 | 1210.4 |
| 11.25 | -214.5 | 900.6 | -2.7 | 22.6 | 214.6 | 900.8 |
| 13.50 | -179.1 | 438.6 | -2.9 | 16.2 | 179.1 | 438.9 |
| 15.75 | -102.6 | 125.4 | -2.6 | 9.7 | 102.6 | 125.8 |
| 18.00 | -45.2 | -34.4 | -1.8 | 4.7 | 45.2 | 34.7 |
| 20.25 | -10.3 | -90.8 | -1.1 | 1.4 | 10.3 | 90.8 |
| 22.50 | 6.8 | -91.2 | -.4 | -.3 | 6.9 | 91.2 |
| 26.25 | 10.0 | -52.8 | .0 | -.9 | 10.0 | 52.8 |
| 30.00 | 6.6 | -20.8 | .1 | -.6 | 6.6 | 20.8 |
| 33.75 | 2.8 | -3.2 | .1 | -.3 | 2.8 | 3.2 |
| 39.38 | -.1 | 2.5 | .0 | -.1 | .1 | 2.5 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 20
spalla mobile - n777 _RARAM_4- n789 _RARAM_4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33650.3 | 4907.8 | 91038.9 | -16318.6 | -24496.8 | -44931.4 |
| 2 | 34028.5 | 4773.3 | 92191.7 | 16828.6 | 24262.1 | 46073.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 67678.8 | 9681.1 | 183230.6 | 510.0 | 3812.0 | 2580.8 |

Punto di applic. carico verticale: Xv = 2.707 m Yv = .056 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.400 | 11.804 | 1.856 | .251 | .007 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4119.1 | 714.0 | -449.8 | 33.0 | -110.8 | .0 | 463.3 |
| 2 | 3376.8 | 185.1 | 704.1 | 9.7 | -42.9 | .0 | 705.4 |
| 3 | 2634.5 | 127.3 | 838.9 | 9.1 | -39.7 | .0 | 839.8 |
| 4 | 1892.3 | 127.3 | 838.9 | 8.4 | -36.5 | .0 | 839.7 |
| 5 | 1150.0 | 127.3 | 838.9 | 7.8 | -33.2 | .0 | 839.5 |
| 6 | 407.7 | 127.3 | 838.9 | 7.1 | -30.0 | .0 | 839.4 |
| 7 | -334.5 | 491.6 | 14.6 | 21.0 | -67.8 | .0 | 69.4 |
| 8 | 3750.8 | 489.9 | 21.0 | 27.4 | -95.4 | .0 | 97.7 |
| 9 | 3008.5 | 97.2 | 909.5 | 9.4 | -41.3 | .0 | 910.5 |
| 10 | 2266.2 | 97.2 | 909.5 | 8.7 | -38.1 | .0 | 910.3 |
| 11 | 1524.0 | 97.2 | 909.5 | 8.1 | -34.9 | .0 | 910.2 |
| 12 | 781.7 | 97.2 | 909.5 | 7.4 | -31.6 | .0 | 910.1 |
| 13 | 39.4 | 489.9 | 21.0 | 18.8 | -63.3 | .0 | 66.7 |
| 14 | 3382.5 | 601.8 | -213.4 | 31.0 | -103.6 | .0 | 237.2 |
| 15 | 2640.2 | 125.9 | 846.0 | 9.1 | -39.7 | .0 | 846.9 |
| 16 | 1897.9 | 125.9 | 846.0 | 8.4 | -36.5 | .0 | 846.7 |
| 17 | 1155.6 | 125.9 | 846.0 | 7.8 | -33.2 | .0 | 846.6 |
| 18 | 413.4 | 488.2 | 27.4 | 23.0 | -75.0 | .0 | 79.8 |
| 19 | 4094.5 | 733.6 | -517.7 | 33.0 | -110.8 | .0 | 529.4 |
| 20 | 3352.2 | 193.0 | 668.5 | 9.7 | -42.9 | .0 | 669.9 |
| 21 | 2609.9 | 133.8 | 808.1 | 9.1 | -39.7 | .0 | 809.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1867.7 | 133.8 | 808.1 | 8.4 | -36.5 | .0 | 808.9 |
| 23 | 1125.4 | 133.8 | 808.1 | 7.8 | -33.2 | .0 | 808.8 |
| 24 | 383.1 | 133.8 | 808.1 | 7.1 | -30.0 | .0 | 808.7 |
| 25 | -359.1 | 506.6 | -41.4 | 21.0 | -67.8 | .0 | 79.4 |
| 26 | 3720.5 | 508.3 | -47.8 | 27.4 | -95.4 | .0 | 106.7 |
| 27 | 2978.2 | 104.2 | 875.0 | 9.4 | -41.3 | .0 | 875.9 |
| 28 | 2236.0 | 104.2 | 875.0 | 8.7 | -38.1 | .0 | 875.8 |
| 29 | 1493.7 | 104.2 | 875.0 | 8.1 | -34.9 | .0 | 875.7 |
| 30 | 751.4 | 104.2 | 875.0 | 7.4 | -31.6 | .0 | 875.5 |
| 31 | 9.2 | 508.3 | -47.8 | 18.8 | -63.3 | .0 | 79.3 |
| 32 | 3346.6 | 627.2 | -304.3 | 31.0 | -103.6 | .0 | 321.5 |
| 33 | 2604.3 | 135.3 | 801.0 | 9.1 | -39.7 | .0 | 802.0 |
| 34 | 1862.0 | 135.3 | 801.0 | 8.4 | -36.5 | .0 | 801.9 |
| 35 | 1119.7 | 135.3 | 801.0 | 7.8 | -33.2 | .0 | 801.7 |
| 36 | 377.5 | 510.0 | -54.2 | 23.0 | -75.0 | .0 | 92.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 21
spalla mobile - n777 _RARAM_5- n789 _RARAM_5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32116.5 | 6186.6 | 90320.7 | -15527.5 | -23307.5 | -46910.3 |
| 2 | 32991.4 | 6014.5 | 93357.1 | 16247.5 | 23261.7 | 48701.5 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 65107.9 | 12201.1 | 183677.8 | 720.0 | 9315.6 | 3632.7 |

Punto di applic. carico verticale: Xv = 2.821 m Yv = .143 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.043 | 13.245 | 1.946 | .374 | .015 | .012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4169.8 | 861.7 | -862.4 | 46.8 | -152.6 | .0 | 875.8 |
| 2 | 3391.2 | 239.7 | 533.9 | 13.6 | -56.4 | .0 | 536.9 |
| 3 | 2612.6 | 170.7 | 702.8 | 12.6 | -51.8 | .0 | 704.7 |
| 4 | 1834.1 | 170.7 | 702.8 | 11.7 | -47.3 | .0 | 704.4 |
| 5 | 1055.5 | 170.7 | 702.8 | 10.8 | -42.7 | .0 | 704.1 |
| 6 | 276.9 | 170.7 | 702.8 | 9.9 | -38.2 | .0 | 703.8 |
| 7 | -501.6 | 601.7 | -306.6 | 30.0 | -92.1 | .0 | 320.1 |
| 8 | 3786.3 | 599.2 | -297.5 | 38.9 | -130.8 | .0 | 325.0 |
| 9 | 3007.8 | 134.3 | 793.4 | 13.1 | -54.1 | .0 | 795.2 |
| 10 | 2229.2 | 134.3 | 793.4 | 12.2 | -49.5 | .0 | 794.9 |
| 11 | 1450.6 | 134.3 | 793.4 | 11.3 | -45.0 | .0 | 794.7 |
| 12 | 672.1 | 134.3 | 793.4 | 10.4 | -40.4 | .0 | 794.4 |
| 13 | -106.5 | 599.2 | -297.5 | 26.8 | -85.5 | .0 | 309.6 |
| 14 | 3402.9 | 729.7 | -577.1 | 44.0 | -142.5 | .0 | 594.4 |
| 15 | 2624.3 | 168.6 | 712.8 | 12.6 | -51.8 | .0 | 714.6 |
| 16 | 1845.8 | 168.6 | 712.8 | 11.7 | -47.3 | .0 | 714.3 |
| 17 | 1067.2 | 168.6 | 712.8 | 10.8 | -42.7 | .0 | 714.0 |
| 18 | 288.6 | 596.8 | -288.5 | 32.8 | -102.2 | .0 | 306.0 |
| 19 | 4118.7 | 889.3 | -958.0 | 46.8 | -152.6 | .0 | 970.0 |
| 20 | 3340.2 | 250.8 | 483.8 | 13.6 | -56.4 | .0 | 487.1 |
| 21 | 2561.6 | 179.8 | 659.5 | 12.6 | -51.8 | .0 | 661.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1783.1 | 179.8 | 659.5 | 11.7 | -47.3 | .0 | 661.2 |
| 23 | 1004.5 | 179.8 | 659.5 | 10.8 | -42.7 | .0 | 660.9 |
| 24 | 225.9 | 179.8 | 659.5 | 9.9 | -38.2 | .0 | 660.6 |
| 25 | -552.6 | 622.7 | -385.3 | 30.0 | -92.1 | .0 | 396.1 |
| 26 | 3723.6 | 625.1 | -394.3 | 38.9 | -130.8 | .0 | 415.4 |
| 27 | 2945.0 | 144.1 | 744.7 | 13.1 | -54.1 | .0 | 746.7 |
| 28 | 2166.5 | 144.1 | 744.7 | 12.2 | -49.5 | .0 | 746.3 |
| 29 | 1387.9 | 144.1 | 744.7 | 11.3 | -45.0 | .0 | 746.1 |
| 30 | 609.3 | 144.1 | 744.7 | 10.4 | -40.4 | .0 | 745.8 |
| 31 | -169.2 | 625.1 | -394.3 | 26.8 | -85.5 | .0 | 403.5 |
| 32 | 3328.5 | 765.4 | -705.0 | 44.0 | -142.5 | .0 | 719.3 |
| 33 | 2549.9 | 181.8 | 649.5 | 12.6 | -51.8 | .0 | 651.6 |
| 34 | 1771.3 | 181.8 | 649.5 | 11.7 | -47.3 | .0 | 651.2 |
| 35 | 992.8 | 181.8 | 649.5 | 10.8 | -42.7 | .0 | 650.9 |
| 36 | 214.2 | 627.5 | -403.4 | 32.8 | -102.2 | .0 | 416.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 22
spalla mobile - n777 _RARAM_7- n789 _RARAM_7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32991.4 | 6013.1 | 93353.3 | -16247.2 | -23527.2 | -48212.0 |
| 2 | 32116.5 | 6188.0 | 90324.5 | 15527.2 | 23572.6 | 46419.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 65107.9 | 12201.1 | 183677.8 | -720.0 | -9316.0 | -3663.5 |

Punto di applic. carico verticale: Xv = 2.821 m Yv = -.143 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.043 | 13.245 | 1.946 | -.374 | -.015 | -.012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4118.7 | 889.4 | -958.4 | -46.9 | 152.8 | .0 | 970.5 |
| 2 | 3340.2 | 250.9 | 483.6 | -13.6 | 56.4 | .0 | 486.9 |
| 3 | 2561.6 | 179.8 | 659.3 | -12.7 | 51.9 | .0 | 661.3 |
| 4 | 1783.1 | 179.8 | 659.3 | -11.7 | 47.3 | .0 | 661.0 |
| 5 | 1004.5 | 179.8 | 659.3 | -10.8 | 42.7 | .0 | 660.7 |
| 6 | 225.9 | 179.8 | 659.3 | -9.9 | 38.1 | .0 | 660.4 |
| 7 | -552.6 | 622.8 | -385.6 | -29.9 | 91.8 | .0 | 396.4 |
| 8 | 3723.6 | 625.2 | -394.7 | -38.9 | 130.9 | .0 | 415.9 |
| 9 | 2945.0 | 144.2 | 744.5 | -13.1 | 54.1 | .0 | 746.5 |
| 10 | 2166.5 | 144.2 | 744.5 | -12.2 | 49.6 | .0 | 746.1 |
| 11 | 1387.9 | 144.2 | 744.5 | -11.3 | 45.0 | .0 | 745.9 |
| 12 | 609.3 | 144.2 | 744.5 | -10.3 | 40.4 | .0 | 745.6 |
| 13 | -169.2 | 625.2 | -394.7 | -26.7 | 85.3 | .0 | 403.9 |
| 14 | 3328.5 | 765.6 | -705.6 | -44.1 | 142.7 | .0 | 719.9 |
| 15 | 2549.9 | 181.9 | 649.2 | -12.7 | 51.9 | .0 | 651.3 |
| 16 | 1771.3 | 181.9 | 649.2 | -11.7 | 47.3 | .0 | 651.0 |
| 17 | 992.8 | 181.9 | 649.2 | -10.8 | 42.7 | .0 | 650.6 |
| 18 | 214.2 | 627.7 | -403.9 | -32.7 | 102.0 | .0 | 416.5 |
| 19 | 4169.8 | 861.6 | -862.0 | -46.9 | 152.8 | .0 | 875.5 |
| 20 | 3391.2 | 239.6 | 534.1 | -13.6 | 56.4 | .0 | 537.1 |
| 21 | 2612.6 | 170.6 | 703.0 | -12.7 | 51.9 | .0 | 704.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1834.1 | 170.6 | 703.0 | -11.7 | 47.3 | .0 | 704.6 |
| 23 | 1055.5 | 170.6 | 703.0 | -10.8 | 42.7 | .0 | 704.3 |
| 24 | 276.9 | 170.6 | 703.0 | -9.9 | 38.1 | .0 | 704.0 |
| 25 | -501.6 | 601.6 | -306.2 | -29.9 | 91.8 | .0 | 319.7 |
| 26 | 3786.3 | 599.1 | -297.1 | -38.9 | 130.9 | .0 | 324.7 |
| 27 | 3007.8 | 134.3 | 793.6 | -13.1 | 54.1 | .0 | 795.4 |
| 28 | 2229.2 | 134.3 | 793.6 | -12.2 | 49.6 | .0 | 795.1 |
| 29 | 1450.6 | 134.3 | 793.6 | -11.3 | 45.0 | .0 | 794.9 |
| 30 | 672.1 | 134.3 | 793.6 | -10.3 | 40.4 | .0 | 794.6 |
| 31 | -106.5 | 599.1 | -297.1 | -26.7 | 85.3 | .0 | 309.1 |
| 32 | 3402.9 | 729.6 | -576.5 | -44.1 | 142.7 | .0 | 593.9 |
| 33 | 2624.3 | 168.5 | 713.0 | -12.7 | 51.9 | .0 | 714.9 |
| 34 | 1845.8 | 168.5 | 713.0 | -11.7 | 47.3 | .0 | 714.6 |
| 35 | 1067.2 | 168.5 | 713.0 | -10.8 | 42.7 | .0 | 714.3 |
| 36 | 288.6 | 596.7 | -288.0 | -32.7 | 102.0 | .0 | 305.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 23
spalla mobile - n777 _RARAM_8- n789 _RARAM_8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32991.4 | 4753.1 | 86927.3 | -16242.4 | -23588.3 | -43570.9 |
| 2 | 32116.5 | 4928.0 | 83898.5 | 15522.4 | 23633.6 | 41778.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 65107.9 | 9681.1 | 170825.8 | -720.0 | -9316.1 | -3663.6 |

Punto di applic. carico verticale: Xv = 2.624 m Yv = -.143 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.043 | 11.376 | 1.753 | -.374 | -.015 | -.012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3886.3 | 728.1 | -610.8 | -46.9 | 152.8 | .0 | 629.7 |
| 2 | 3185.2 | 196.5 | 567.6 | -13.6 | 56.4 | .0 | 570.4 |
| 3 | 2484.1 | 137.9 | 708.0 | -12.7 | 51.9 | .0 | 709.9 |
| 4 | 1783.0 | 137.9 | 708.0 | -11.7 | 47.3 | .0 | 709.6 |
| 5 | 1082.0 | 137.9 | 708.0 | -10.8 | 42.7 | .0 | 709.3 |
| 6 | 380.9 | 137.9 | 708.0 | -9.9 | 38.1 | .0 | 709.0 |
| 7 | -320.2 | 505.3 | -139.5 | -29.9 | 91.8 | .0 | 167.0 |
| 8 | 3529.9 | 507.7 | -148.6 | -38.9 | 130.9 | .0 | 198.1 |
| 9 | 2828.8 | 108.9 | 774.4 | -13.1 | 54.1 | .0 | 776.3 |
| 10 | 2127.7 | 108.9 | 774.4 | -12.2 | 49.6 | .0 | 776.0 |
| 11 | 1426.7 | 108.9 | 774.4 | -11.3 | 45.0 | .0 | 775.7 |
| 12 | 725.6 | 108.9 | 774.4 | -10.3 | 40.4 | .0 | 775.4 |
| 13 | 24.5 | 507.7 | -148.6 | -26.7 | 85.3 | .0 | 171.4 |
| 14 | 3173.5 | 625.4 | -406.1 | -44.1 | 142.7 | .0 | 430.4 |
| 15 | 2472.4 | 140.1 | 697.9 | -12.7 | 51.9 | .0 | 699.9 |
| 16 | 1771.3 | 140.1 | 697.9 | -11.7 | 47.3 | .0 | 699.5 |
| 17 | 1070.3 | 140.1 | 697.9 | -10.8 | 42.7 | .0 | 699.3 |
| 18 | 369.2 | 510.2 | -157.7 | -32.7 | 102.0 | .0 | 187.9 |
| 19 | 3937.3 | 700.3 | -514.5 | -46.9 | 152.8 | .0 | 536.7 |
| 20 | 3236.2 | 185.3 | 618.0 | -13.6 | 56.4 | .0 | 620.6 |
| 21 | 2535.1 | 128.8 | 751.7 | -12.7 | 51.9 | .0 | 753.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1834.1 | 128.8 | 751.7 | -11.7 | 47.3 | .0 | 753.2 |
| 23 | 1133.0 | 128.8 | 751.7 | -10.8 | 42.7 | .0 | 752.9 |
| 24 | 431.9 | 128.8 | 751.7 | -9.9 | 38.1 | .0 | 752.6 |
| 25 | -269.2 | 484.1 | -60.1 | -29.9 | 91.8 | .0 | 109.8 |
| 26 | 3592.6 | 481.6 | -51.0 | -38.9 | 130.9 | .0 | 140.5 |
| 27 | 2891.5 | 99.0 | 823.5 | -13.1 | 54.1 | .0 | 825.3 |
| 28 | 2190.5 | 99.0 | 823.5 | -12.2 | 49.6 | .0 | 825.0 |
| 29 | 1489.4 | 99.0 | 823.5 | -11.3 | 45.0 | .0 | 824.7 |
| 30 | 788.3 | 99.0 | 823.5 | -10.3 | 40.4 | .0 | 824.5 |
| 31 | 87.2 | 481.6 | -51.0 | -26.7 | 85.3 | .0 | 99.4 |
| 32 | 3247.9 | 589.4 | -277.0 | -44.1 | 142.7 | .0 | 311.6 |
| 33 | 2546.9 | 126.7 | 761.7 | -12.7 | 51.9 | .0 | 763.5 |
| 34 | 1845.8 | 126.7 | 761.7 | -11.7 | 47.3 | .0 | 763.2 |
| 35 | 1144.7 | 126.7 | 761.7 | -10.8 | 42.7 | .0 | 762.9 |
| 36 | 443.6 | 479.2 | -41.8 | -32.7 | 102.0 | .0 | 110.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 24
spalla mobile - n777 _RARAM_9- n789 _RARAM_9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 30103.3 | 6162.8 | 80908.6 | -14681.2 | -21721.4 | -43728.7 |
| 2 | 31855.3 | 6038.3 | 87573.7 | 15401.2 | 22409.9 | 45981.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 12201.1 | 168482.3 | 720.0 | 19434.9 | 3584.7 |

Punto di applic. carico verticale: Xv = 2.719 m Yv = .314 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 12.720 | 1.820 | .425 | .027 | .012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3951.8 | 850.1 | -959.7 | 47.6 | -142.6 | .0 | 970.2 |
| 2 | 3223.7 | 242.0 | 419.1 | 13.2 | -45.4 | .0 | 421.5 |
| 3 | 2495.6 | 174.2 | 587.8 | 12.3 | -40.9 | .0 | 589.2 |
| 4 | 1767.5 | 174.2 | 587.8 | 11.4 | -36.4 | .0 | 588.9 |
| 5 | 1039.4 | 174.2 | 587.8 | 10.5 | -31.9 | .0 | 588.7 |
| 6 | 311.3 | 174.2 | 587.8 | 9.6 | -27.4 | .0 | 588.4 |
| 7 | -416.8 | 596.4 | -412.9 | 30.9 | -82.9 | .0 | 421.1 |
| 8 | 3598.4 | 594.0 | -404.0 | 39.3 | -120.4 | .0 | 421.5 |
| 9 | 2870.3 | 138.3 | 678.7 | 12.7 | -43.1 | .0 | 680.1 |
| 10 | 2142.2 | 138.3 | 678.7 | 11.8 | -38.6 | .0 | 679.8 |
| 11 | 1414.1 | 138.3 | 678.7 | 10.9 | -34.1 | .0 | 679.6 |
| 12 | 686.0 | 138.3 | 678.7 | 10.0 | -29.7 | .0 | 679.4 |
| 13 | -42.1 | 594.0 | -404.0 | 27.4 | -75.8 | .0 | 411.0 |
| 14 | 3245.1 | 721.3 | -679.2 | 44.8 | -132.6 | .0 | 692.0 |
| 15 | 2517.0 | 172.1 | 597.6 | 12.3 | -40.9 | .0 | 599.0 |
| 16 | 1788.9 | 172.1 | 597.6 | 11.4 | -36.4 | .0 | 598.7 |
| 17 | 1060.8 | 172.1 | 597.6 | 10.5 | -31.9 | .0 | 598.5 |
| 18 | 332.7 | 591.6 | -395.0 | 33.7 | -92.9 | .0 | 405.8 |
| 19 | 3858.9 | 877.3 | -1054.0 | 47.6 | -142.6 | .0 | 1063.6 |
| 20 | 3130.8 | 253.0 | 369.7 | 13.2 | -45.4 | .0 | 372.4 |
| 21 | 2402.7 | 183.1 | 545.0 | 12.3 | -40.9 | .0 | 546.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1674.6 | 183.1 | 545.0 | 11.4 | -36.4 | .0 | 546.3 |
| 23 | 946.5 | 183.1 | 545.0 | 10.5 | -31.9 | .0 | 546.0 |
| 24 | 218.4 | 183.1 | 545.0 | 9.6 | -27.4 | .0 | 545.7 |
| 25 | -509.7 | 617.2 | -490.6 | 30.9 | -82.9 | .0 | 497.5 |
| 26 | 3484.2 | 619.5 | -499.5 | 39.3 | -120.4 | .0 | 513.8 |
| 27 | 2756.1 | 148.0 | 630.7 | 12.7 | -43.1 | .0 | 632.2 |
| 28 | 2028.0 | 148.0 | 630.7 | 11.8 | -38.6 | .0 | 631.9 |
| 29 | 1299.9 | 148.0 | 630.7 | 10.9 | -34.1 | .0 | 631.6 |
| 30 | 571.8 | 148.0 | 630.7 | 10.0 | -29.7 | .0 | 631.4 |
| 31 | -156.3 | 619.5 | -499.5 | 27.4 | -75.8 | .0 | 505.2 |
| 32 | 3109.5 | 756.6 | -805.4 | 44.8 | -132.6 | .0 | 816.3 |
| 33 | 2381.4 | 185.2 | 535.2 | 12.3 | -40.9 | .0 | 536.8 |
| 34 | 1653.3 | 185.2 | 535.2 | 11.4 | -36.4 | .0 | 536.4 |
| 35 | 925.2 | 185.2 | 535.2 | 10.5 | -31.9 | .0 | 536.2 |
| 36 | 197.1 | 621.9 | -508.4 | 33.7 | -92.9 | .0 | 516.8 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 25
spalla mobile - n777 _RARAM_10 - n789 _RARAM_10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc<br>m | Yc<br>m | Zc<br>m | Alfc<br>deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc<br>kN | Fxc<br>kN | Mxc<br>kN*m | Fyc<br>kN | Myc<br>kN*m | Mzc<br>kN*m |
|---|---|---|---|---|---|---|
| 1 | 30103.3 | 4902.8 | 74482.6 | -14676.4 | -21782.5 | -39087.6 |
| 2 | 31855.3 | 4778.3 | 81147.7 | 15396.4 | 22471.0 | 41340.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz<br>kN | Fx<br>kN | Mx<br>kN*m | Fy<br>kN | My<br>kN*m | Mz<br>kN*m |
|---|---|---|---|---|---|
| 61958.6 | 9681.1 | 155630.3 | 720.0 | 19434.9 | 3584.6 |

Punto di applic. carico verticale: Xv = 2.512 m Yv = .314 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz<br>mm | dx<br>mm | rx<br>mRad | dy<br>mm | ry<br>mRad | rz<br>mRad |
|---|---|---|---|---|---|
| 8.605 | 10.851 | 1.627 | .425 | .027 | .012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp<br>kN | Fxp<br>kN | Mxp<br>kN*m | Fyp<br>kN | Myp<br>kN*m | Mzp<br>kN*m | Mris<br>kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3719.3 | 688.8 | -612.2 | 47.6 | -142.6 | .0 | 628.6 |
| 2 | 3068.7 | 187.6 | 503.0 | 13.2 | -45.4 | .0 | 505.0 |
| 3 | 2418.1 | 132.3 | 636.5 | 12.3 | -40.9 | .0 | 637.8 |
| 4 | 1767.5 | 132.3 | 636.5 | 11.4 | -36.4 | .0 | 637.5 |
| 5 | 1116.9 | 132.3 | 636.5 | 10.5 | -31.9 | .0 | 637.3 |
| 6 | 466.3 | 132.3 | 636.5 | 9.6 | -27.4 | .0 | 637.1 |
| 7 | -184.3 | 478.9 | -166.8 | 30.9 | -82.9 | .0 | 186.2 |
| 8 | 3404.7 | 476.5 | -157.8 | 39.3 | -120.4 | .0 | 198.5 |
| 9 | 2754.1 | 103.1 | 708.6 | 12.7 | -43.1 | .0 | 709.9 |
| 10 | 2103.5 | 103.1 | 708.6 | 11.8 | -38.6 | .0 | 709.7 |
| 11 | 1452.9 | 103.1 | 708.6 | 10.9 | -34.1 | .0 | 709.4 |
| 12 | 802.3 | 103.1 | 708.6 | 10.0 | -29.7 | .0 | 709.2 |
| 13 | 151.7 | 476.5 | -157.8 | 27.4 | -75.8 | .0 | 175.1 |
| 14 | 3090.1 | 581.2 | -379.6 | 44.8 | -132.6 | .0 | 402.1 |
| 15 | 2439.5 | 130.3 | 646.3 | 12.3 | -40.9 | .0 | 647.6 |
| 16 | 1788.9 | 130.3 | 646.3 | 11.4 | -36.4 | .0 | 647.3 |
| 17 | 1138.3 | 130.3 | 646.3 | 10.5 | -31.9 | .0 | 647.1 |
| 18 | 487.7 | 474.1 | -148.9 | 33.7 | -92.9 | .0 | 175.5 |
| 19 | 3626.4 | 716.0 | -706.5 | 47.6 | -142.6 | .0 | 720.7 |
| 20 | 2975.8 | 198.6 | 453.6 | 13.2 | -45.4 | .0 | 455.9 |
| 21 | 2325.2 | 141.3 | 593.7 | 12.3 | -40.9 | .0 | 595.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1674.6 | 141.3 | 593.7 | 11.4 | -36.4 | .0 | 594.9 |
| 23 | 1024.0 | 141.3 | 593.7 | 10.5 | -31.9 | .0 | 594.6 |
| 24 | 373.4 | 141.3 | 593.7 | 9.6 | -27.4 | .0 | 594.4 |
| 25 | -277.2 | 499.6 | -244.4 | 30.9 | -82.9 | .0 | 258.1 |
| 26 | 3290.5 | 502.0 | -253.4 | 39.3 | -120.4 | .0 | 280.5 |
| 27 | 2639.9 | 112.7 | 660.6 | 12.7 | -43.1 | .0 | 662.0 |
| 28 | 1989.3 | 112.7 | 660.6 | 11.8 | -38.6 | .0 | 661.7 |
| 29 | 1338.6 | 112.7 | 660.6 | 10.9 | -34.1 | .0 | 661.5 |
| 30 | 688.0 | 112.7 | 660.6 | 10.0 | -29.7 | .0 | 661.3 |
| 31 | 37.4 | 502.0 | -253.4 | 27.4 | -75.8 | .0 | 264.5 |
| 32 | 2954.5 | 616.4 | -505.9 | 44.8 | -132.6 | .0 | 523.0 |
| 33 | 2303.9 | 143.3 | 583.9 | 12.3 | -40.9 | .0 | 585.3 |
| 34 | 1653.3 | 143.3 | 583.9 | 11.4 | -36.4 | .0 | 585.0 |
| 35 | 1002.7 | 143.3 | 583.9 | 10.5 | -31.9 | .0 | 584.8 |
| 36 | 352.1 | 504.4 | -262.3 | 33.7 | -92.9 | .0 | 278.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 26
spalla mobile - n777 _RARAM_11- n789 _RARAM_11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31855.3 | 6036.9 | 87570.0 | -15400.8 | -22675.5 | -45491.8 |
| 2 | 30103.3 | 6164.2 | 80912.3 | 14680.8 | 21986.4 | 43238.4 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 12201.1 | 168482.3 | -720.0 | -19435.5 | -3615.5 |

Punto di applic. carico verticale: Xv = 2.719 m Yv = -.314 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 12.720 | 1.820 | -.425 | -.027 | -.012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3858.9 | 877.4 | -1054.4 | -47.6 | 142.8 | .0 | 1064.0 |
| 2 | 3130.8 | 253.1 | 369.5 | -13.2 | 45.4 | .0 | 372.2 |
| 3 | 2402.7 | 183.2 | 544.9 | -12.3 | 40.9 | .0 | 546.4 |
| 4 | 1674.6 | 183.2 | 544.9 | -11.4 | 36.4 | .0 | 546.1 |
| 5 | 946.5 | 183.2 | 544.9 | -10.4 | 31.9 | .0 | 545.8 |
| 6 | 218.4 | 183.2 | 544.9 | -9.5 | 27.3 | .0 | 545.5 |
| 7 | -509.7 | 617.2 | -490.9 | -30.9 | 82.7 | .0 | 497.8 |
| 8 | 3484.2 | 619.7 | -499.9 | -39.4 | 120.6 | .0 | 514.3 |
| 9 | 2756.1 | 148.1 | 630.5 | -12.7 | 43.2 | .0 | 632.0 |
| 10 | 2028.0 | 148.1 | 630.5 | -11.8 | 38.7 | .0 | 631.7 |
| 11 | 1299.9 | 148.1 | 630.5 | -10.9 | 34.1 | .0 | 631.4 |
| 12 | 571.8 | 148.1 | 630.5 | -10.0 | 29.6 | .0 | 631.2 |
| 13 | -156.3 | 619.7 | -499.9 | -27.3 | 75.6 | .0 | 505.6 |
| 14 | 3109.5 | 756.7 | -806.0 | -44.8 | 132.8 | .0 | 816.8 |
| 15 | 2381.4 | 185.2 | 534.9 | -12.3 | 40.9 | .0 | 536.5 |
| 16 | 1653.3 | 185.2 | 534.9 | -11.4 | 36.4 | .0 | 536.2 |
| 17 | 925.2 | 185.2 | 534.9 | -10.4 | 31.9 | .0 | 535.9 |
| 18 | 197.1 | 622.1 | -508.9 | -33.7 | 92.7 | .0 | 517.3 |
| 19 | 3951.8 | 850.0 | -959.3 | -47.6 | 142.8 | .0 | 969.9 |
| 20 | 3223.7 | 242.0 | 419.3 | -13.2 | 45.4 | .0 | 421.7 |
| 21 | 2495.6 | 174.1 | 588.0 | -12.3 | 40.9 | .0 | 589.4 |

```
 22   1767.5    174.1    588.0    -11.4     36.4       .0     589.1
 23   1039.4    174.1    588.0    -10.4     31.9       .0     588.8
 24    311.3    174.1    588.0     -9.5     27.3       .0     588.6
 25   -416.8    596.3   -412.6    -30.9     82.7       .0     420.8
 26   3598.4    593.9   -403.6    -39.4    120.6       .0     421.2
 27   2870.3    138.3    678.9    -12.7     43.2       .0     680.3
 28   2142.2    138.3    678.9    -11.8     38.7       .0     680.0
 29   1414.1    138.3    678.9    -10.9     34.1       .0     679.8
 30    686.0    138.3    678.9    -10.0     29.6       .0     679.6
 31    -42.1    593.9   -403.6    -27.3     75.6       .0     410.6
 32   3245.1    721.2   -678.6    -44.8    132.8       .0     691.5
 33   2517.0    172.1    597.9    -12.3     40.9       .0     599.3
 34   1788.9    172.1    597.9    -11.4     36.4       .0     599.0
 35   1060.8    172.1    597.9    -10.4     31.9       .0     598.7
 36    332.7    591.5   -394.5    -33.7     92.7       .0     405.3
-------------------------------------------------------------------

Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 26
spalla mobile - n777 _RARAM_11- n789 _RARAM_11

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 877.4 | -1054.4 | -47.6 | 142.8 | 878.7 | 1064.0 |
| 1.41 | 711.7 | 56.8 | -42.0 | 79.9 | 713.0 | 98.1 |
| 2.81 | 582.3 | 960.1 | -37.1 | 24.5 | 583.4 | 960.5 |
| 4.22 | 273.5 | 1599.3 | -23.6 | -20.0 | 274.5 | 1599.5 |
| 5.63 | 12.4 | 1778.4 | -10.7 | -43.4 | 16.3 | 1778.9 |
| 7.03 | -138.2 | 1673.1 | -1.5 | -51.3 | 138.2 | 1673.8 |
| 8.44 | -200.2 | 1418.3 | 3.7 | -48.7 | 200.3 | 1419.2 |
| 9.84 | -203.5 | 1132.5 | 4.6 | -42.8 | 203.5 | 1133.3 |
| 11.25 | -197.0 | 849.2 | 5.1 | -35.9 | 197.0 | 850.0 |
| 13.50 | -165.9 | 423.8 | 5.1 | -24.2 | 166.0 | 424.5 |
| 15.75 | -96.9 | 131.0 | 4.1 | -13.5 | 97.0 | 131.7 |
| 18.00 | -44.0 | -22.0 | 2.7 | -5.8 | 44.1 | 22.7 |
| 20.25 | -11.3 | -78.7 | 1.5 | -1.1 | 11.4 | 78.8 |
| 22.50 | 5.3 | -82.3 | .5 | 1.2 | 5.3 | 82.3 |
| 26.25 | 9.0 | -48.9 | -.1 | 1.6 | 9.0 | 48.9 |
| 30.00 | 6.1 | -19.7 | -.2 | 1.0 | 6.1 | 19.7 |
| 33.75 | 2.6 | -3.4 | -.1 | .5 | 2.6 | 3.4 |
| 39.38 | -.1 | 2.1 | .0 | .1 | .1 | 2.1 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 27
spalla mobile - n777 _RARAM_12- n789 _RARAM_12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31855.3 | 4776.9 | 81144.0 | -15396.0 | -22736.6 | -40850.6 |
| 2 | 30103.3 | 4904.2 | 74486.3 | 14676.0 | 22047.5 | 38597.2 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 9681.1 | 155630.3 | -720.0 | -19435.5 | -3615.5 |

Punto di applic. carico verticale: Xv = 2.512 m Yv = -.314 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 10.851 | 1.627 | -.425 | -.027 | -.012 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3626.4 | 716.1 | -706.9 | -47.6 | 142.8 | .0 | 721.1 |
| 2 | 2975.8 | 198.7 | 453.4 | -13.2 | 45.4 | .0 | 455.7 |
| 3 | 2325.2 | 141.3 | 593.6 | -12.3 | 40.9 | .0 | 595.0 |
| 4 | 1674.6 | 141.3 | 593.6 | -11.4 | 36.4 | .0 | 594.7 |
| 5 | 1024.0 | 141.3 | 593.6 | -10.4 | 31.9 | .0 | 594.4 |
| 6 | 373.4 | 141.3 | 593.6 | -9.5 | 27.3 | .0 | 594.2 |
| 7 | -277.2 | 499.7 | -244.8 | -30.9 | 82.7 | .0 | 258.4 |
| 8 | 3290.5 | 502.1 | -253.8 | -39.4 | 120.6 | .0 | 281.0 |
| 9 | 2639.9 | 112.8 | 660.4 | -12.7 | 43.2 | .0 | 661.8 |
| 10 | 1989.2 | 112.8 | 660.4 | -11.8 | 38.7 | .0 | 661.5 |
| 11 | 1338.6 | 112.8 | 660.4 | -10.9 | 34.1 | .0 | 661.3 |
| 12 | 688.0 | 112.8 | 660.4 | -10.0 | 29.6 | .0 | 661.0 |
| 13 | 37.4 | 502.1 | -253.8 | -27.3 | 75.6 | .0 | 264.8 |
| 14 | 2954.5 | 616.6 | -506.4 | -44.8 | 132.8 | .0 | 523.6 |
| 15 | 2303.9 | 143.4 | 583.6 | -12.3 | 40.9 | .0 | 585.1 |
| 16 | 1653.3 | 143.4 | 583.6 | -11.4 | 36.4 | .0 | 584.8 |
| 17 | 1002.7 | 143.4 | 583.6 | -10.4 | 31.9 | .0 | 584.5 |
| 18 | 352.1 | 504.6 | -262.8 | -33.7 | 92.7 | .0 | 278.7 |
| 19 | 3719.3 | 688.6 | -611.8 | -47.6 | 142.8 | .0 | 628.2 |
| 20 | 3068.7 | 187.6 | 503.2 | -13.2 | 45.4 | .0 | 505.3 |
| 21 | 2418.1 | 132.3 | 636.7 | -12.3 | 40.9 | .0 | 638.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1767.5 | 132.3 | 636.7 | -11.4 | 36.4 | .0 | 637.7 |
| 23 | 1116.9 | 132.3 | 636.7 | -10.4 | 31.9 | .0 | 637.5 |
| 24 | 466.3 | 132.3 | 636.7 | -9.5 | 27.3 | .0 | 637.3 |
| 25 | -184.3 | 478.8 | -166.4 | -30.9 | 82.7 | .0 | 185.8 |
| 26 | 3404.7 | 476.4 | -157.4 | -39.4 | 120.6 | .0 | 198.3 |
| 27 | 2754.1 | 103.0 | 708.8 | -12.7 | 43.2 | .0 | 710.1 |
| 28 | 2103.5 | 103.0 | 708.8 | -11.8 | 38.7 | .0 | 709.9 |
| 29 | 1452.9 | 103.0 | 708.8 | -10.9 | 34.1 | .0 | 709.6 |
| 30 | 802.3 | 103.0 | 708.8 | -10.0 | 29.6 | .0 | 709.4 |
| 31 | 151.7 | 476.4 | -157.4 | -27.3 | 75.6 | .0 | 174.6 |
| 32 | 3090.1 | 581.0 | -379.1 | -44.8 | 132.8 | .0 | 401.7 |
| 33 | 2439.5 | 130.2 | 646.6 | -12.3 | 40.9 | .0 | 647.9 |
| 34 | 1788.9 | 130.2 | 646.6 | -11.4 | 36.4 | .0 | 647.6 |
| 35 | 1138.3 | 130.2 | 646.6 | -10.4 | 31.9 | .0 | 647.4 |
| 36 | 487.7 | 474.0 | -148.4 | -33.7 | 92.7 | .0 | 175.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 28
spalla mobile - n777 _RARAM_14- n789 _RARAM_14

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 32280.6 | 4478.7 | 82333.7 | -15641.1 | -23440.9 | -40948.6 |
| 2 | 32827.3 | 4362.5 | 84208.0 | 16121.1 | 23379.6 | 42123.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 65107.9 | 8841.2 | 166541.7 | 480.0 | 5788.4 | 2418.0 |

Punto di applic. carico verticale: Xv = 2.558 m Yv = .089 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.043 | 10.753 | 1.688 | .247 | .009 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3850.4 | 651.2 | -415.0 | 31.2 | -102.1 | .0 | 427.4 |
| 2 | 3175.2 | 169.0 | 637.4 | 9.1 | -38.0 | .0 | 638.6 |
| 3 | 2499.9 | 116.4 | 760.5 | 8.4 | -35.0 | .0 | 761.3 |
| 4 | 1824.7 | 116.4 | 760.5 | 7.8 | -32.0 | .0 | 761.2 |
| 5 | 1149.4 | 116.4 | 760.5 | 7.2 | -28.9 | .0 | 761.0 |
| 6 | 474.2 | 116.4 | 760.5 | 6.6 | -25.9 | .0 | 760.9 |
| 7 | -201.0 | 448.5 | 8.4 | 20.0 | -61.8 | .0 | 62.4 |
| 8 | 3516.5 | 446.9 | 14.5 | 25.9 | -87.6 | .0 | 88.7 |
| 9 | 2841.2 | 88.9 | 825.1 | 8.8 | -36.5 | .0 | 825.9 |
| 10 | 2166.0 | 88.9 | 825.1 | 8.1 | -33.5 | .0 | 825.8 |
| 11 | 1490.8 | 88.9 | 825.1 | 7.5 | -30.4 | .0 | 825.6 |
| 12 | 815.5 | 88.9 | 825.1 | 6.9 | -27.4 | .0 | 825.5 |
| 13 | 140.3 | 446.9 | 14.5 | 17.8 | -57.4 | .0 | 59.2 |
| 14 | 3182.6 | 548.9 | -199.1 | 29.3 | -95.4 | .0 | 220.8 |
| 15 | 2507.3 | 115.0 | 767.1 | 8.4 | -35.0 | .0 | 767.9 |
| 16 | 1832.1 | 115.0 | 767.1 | 7.8 | -32.0 | .0 | 767.8 |
| 17 | 1156.9 | 115.0 | 767.1 | 7.2 | -28.9 | .0 | 767.7 |
| 18 | 481.6 | 445.3 | 20.5 | 21.8 | -68.5 | .0 | 71.5 |
| 19 | 3818.1 | 669.6 | -478.6 | 31.2 | -102.1 | .0 | 489.4 |
| 20 | 3142.9 | 176.5 | 604.1 | 9.1 | -38.0 | .0 | 605.3 |
| 21 | 2467.7 | 122.4 | 731.6 | 8.4 | -35.0 | .0 | 732.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1792.4 | 122.4 | 731.6 | 7.8 | -32.0 | .0 | 732.3 |
| 23 | 1117.2 | 122.4 | 731.6 | 7.2 | -28.9 | .0 | 732.2 |
| 24 | 441.9 | 122.4 | 731.6 | 6.6 | -25.9 | .0 | 732.1 |
| 25 | -233.3 | 462.5 | -44.0 | 20.0 | -61.8 | .0 | 75.9 |
| 26 | 3476.8 | 464.1 | -50.0 | 25.9 | -87.6 | .0 | 100.8 |
| 27 | 2801.6 | 95.4 | 792.7 | 8.8 | -36.5 | .0 | 793.5 |
| 28 | 2126.3 | 95.4 | 792.7 | 8.1 | -33.5 | .0 | 793.4 |
| 29 | 1451.1 | 95.4 | 792.7 | 7.5 | -30.4 | .0 | 793.3 |
| 30 | 775.9 | 95.4 | 792.7 | 6.9 | -27.4 | .0 | 793.2 |
| 31 | 100.6 | 464.1 | -50.0 | 17.8 | -57.4 | .0 | 76.2 |
| 32 | 3135.5 | 572.6 | -284.3 | 29.3 | -95.4 | .0 | 299.9 |
| 33 | 2460.3 | 123.8 | 725.0 | 8.4 | -35.0 | .0 | 725.9 |
| 34 | 1785.0 | 123.8 | 725.0 | 7.8 | -32.0 | .0 | 725.7 |
| 35 | 1109.8 | 123.8 | 725.0 | 7.2 | -28.9 | .0 | 725.6 |
| 36 | 434.5 | 465.7 | -56.0 | 21.8 | -68.5 | .0 | 88.5 |

```
Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 29
spalla mobile - n777 _RARAM_17 - n789 _RARAM_17

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33203.5 | 6162.9 | 95371.4 | -16132.2 | -24084.0 | -48857.9 |
| 2 | 33763.8 | 6038.2 | 97277.5 | 16642.2 | 24001.8 | 50095.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66967.3 | 12201.1 | 192648.9 | 510.0 | 5913.0 | 2571.7 |

Punto di applic. carico verticale: Xv = 2.877 m Yv = .088 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.301 | 13.555 | 2.021 | .262 | .010 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4301.9 | 872.7 | -819.3 | 33.1 | -108.7 | .0 | 826.5 |
| 2 | 3493.6 | 240.0 | 594.2 | 9.6 | -40.7 | .0 | 595.6 |
| 3 | 2685.2 | 170.0 | 764.2 | 9.0 | -37.4 | .0 | 765.1 |
| 4 | 1876.8 | 170.0 | 764.2 | 8.3 | -34.2 | .0 | 765.0 |
| 5 | 1068.5 | 170.0 | 764.2 | 7.7 | -31.0 | .0 | 764.8 |
| 6 | 260.1 | 170.0 | 764.2 | 7.0 | -27.8 | .0 | 764.7 |
| 7 | -548.2 | 607.9 | -255.6 | 21.2 | -65.9 | .0 | 263.9 |
| 8 | 3901.6 | 606.2 | -249.2 | 27.5 | -93.3 | .0 | 266.1 |
| 9 | 3093.2 | 133.4 | 853.8 | 9.3 | -39.0 | .0 | 854.7 |
| 10 | 2284.9 | 133.4 | 853.8 | 8.7 | -35.8 | .0 | 854.5 |
| 11 | 1476.5 | 133.4 | 853.8 | 8.0 | -32.6 | .0 | 854.4 |
| 12 | 668.1 | 133.4 | 853.8 | 7.4 | -29.4 | .0 | 854.3 |
| 13 | -140.2 | 606.2 | -249.2 | 18.9 | -61.3 | .0 | 256.6 |
| 14 | 3501.2 | 740.1 | -536.0 | 31.1 | -101.6 | .0 | 545.5 |
| 15 | 2692.9 | 168.5 | 771.3 | 9.0 | -37.4 | .0 | 772.2 |
| 16 | 1884.5 | 168.5 | 771.3 | 8.3 | -34.2 | .0 | 772.0 |
| 17 | 1076.1 | 168.5 | 771.3 | 7.7 | -31.0 | .0 | 771.9 |
| 18 | 267.8 | 604.5 | -242.8 | 23.2 | -73.0 | .0 | 253.5 |
| 19 | 4268.6 | 892.2 | -887.0 | 33.1 | -108.7 | .0 | 893.6 |
| 20 | 3460.3 | 247.9 | 558.8 | 9.6 | -40.7 | .0 | 560.2 |
| 21 | 2651.9 | 176.4 | 733.5 | 9.0 | -37.4 | .0 | 734.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1843.6 | 176.4 | 733.5 | 8.3 | -34.2 | .0 | 734.3 |
| 23 | 1035.2 | 176.4 | 733.5 | 7.7 | -31.0 | .0 | 734.2 |
| 24 | 226.8 | 176.4 | 733.5 | 7.0 | -27.8 | .0 | 734.1 |
| 25 | -581.5 | 622.8 | -311.3 | 21.2 | -65.9 | .0 | 318.2 |
| 26 | 3860.6 | 624.5 | -317.7 | 27.5 | -93.3 | .0 | 331.1 |
| 27 | 3052.3 | 140.4 | 819.3 | 9.3 | -39.0 | .0 | 820.2 |
| 28 | 2243.9 | 140.4 | 819.3 | 8.7 | -35.8 | .0 | 820.1 |
| 29 | 1435.6 | 140.4 | 819.3 | 8.0 | -32.6 | .0 | 820.0 |
| 30 | 627.2 | 140.4 | 819.3 | 7.4 | -29.4 | .0 | 819.8 |
| 31 | -181.2 | 624.5 | -317.7 | 18.9 | -61.3 | .0 | 323.6 |
| 32 | 3452.6 | 765.3 | -626.6 | 31.1 | -101.6 | .0 | 634.8 |
| 33 | 2644.3 | 177.9 | 726.5 | 9.0 | -37.4 | .0 | 727.4 |
| 34 | 1835.9 | 177.9 | 726.5 | 8.3 | -34.2 | .0 | 727.3 |
| 35 | 1027.5 | 177.9 | 726.5 | 7.7 | -31.0 | .0 | 727.1 |
| 36 | 219.2 | 626.3 | -324.1 | 23.2 | -73.0 | .0 | 332.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 30
spalla mobile - n777 _RARAM_18 - n789 _RARAM_18

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 33203.5 | 4902.9 | 88945.4 | -16127.4 | -24145.1 | -44216.7 |
| 2 | 33763.8 | 4778.2 | 90851.5 | 16637.4 | 24062.9 | 45454.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 66967.3 | 9681.1 | 179796.9 | 510.0 | 5913.0 | 2571.7 |

Punto di applic. carico verticale: Xv = 2.685 m Yv = .088 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 9.301 | 11.685 | 1.827 | .262 | .010 | .008 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4069.4 | 711.4 | -471.8 | 33.1 | -108.7 | .0 | 484.2 |
| 2 | 3338.6 | 185.6 | 678.1 | 9.6 | -40.7 | .0 | 679.4 |
| 3 | 2607.7 | 128.1 | 812.9 | 9.0 | -37.4 | .0 | 813.8 |
| 4 | 1876.8 | 128.1 | 812.9 | 8.3 | -34.2 | .0 | 813.6 |
| 5 | 1146.0 | 128.1 | 812.9 | 7.7 | -31.0 | .0 | 813.5 |
| 6 | 415.1 | 128.1 | 812.9 | 7.0 | -27.8 | .0 | 813.4 |
| 7 | -315.7 | 490.4 | -9.5 | 21.2 | -65.9 | .0 | 66.6 |
| 8 | 3707.8 | 488.7 | -3.1 | 27.5 | -93.3 | .0 | 93.3 |
| 9 | 2977.0 | 98.1 | 883.7 | 9.3 | -39.0 | .0 | 884.5 |
| 10 | 2246.1 | 98.1 | 883.7 | 8.7 | -35.8 | .0 | 884.4 |
| 11 | 1515.2 | 98.1 | 883.7 | 8.0 | -32.6 | .0 | 884.3 |
| 12 | 784.4 | 98.1 | 883.7 | 7.4 | -29.4 | .0 | 884.1 |
| 13 | 53.5 | 488.7 | -3.1 | 18.9 | -61.3 | .0 | 61.3 |
| 14 | 3346.2 | 599.9 | -236.5 | 31.1 | -101.6 | .0 | 257.4 |
| 15 | 2615.4 | 126.7 | 820.0 | 9.0 | -37.4 | .0 | 820.8 |
| 16 | 1884.5 | 126.7 | 820.0 | 8.3 | -34.2 | .0 | 820.7 |
| 17 | 1153.6 | 126.7 | 820.0 | 7.7 | -31.0 | .0 | 820.5 |
| 18 | 422.8 | 487.0 | 3.4 | 23.2 | -73.0 | .0 | 73.1 |
| 19 | 4036.2 | 730.9 | -539.4 | 33.1 | -108.7 | .0 | 550.3 |
| 20 | 3305.3 | 193.5 | 642.7 | 9.6 | -40.7 | .0 | 644.0 |
| 21 | 2574.4 | 134.6 | 782.2 | 9.0 | -37.4 | .0 | 783.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1843.6 | 134.6 | 782.2 | 8.3 | -34.2 | .0 | 783.0 |
| 23 | 1112.7 | 134.6 | 782.2 | 7.7 | -31.0 | .0 | 782.8 |
| 24 | 381.8 | 134.6 | 782.2 | 7.0 | -27.8 | .0 | 782.7 |
| 25 | -349.0 | 505.3 | -65.2 | 21.2 | -65.9 | .0 | 92.7 |
| 26 | 3666.9 | 507.0 | -71.6 | 27.5 | -93.3 | .0 | 117.6 |
| 27 | 2936.0 | 105.1 | 849.2 | 9.3 | -39.0 | .0 | 850.1 |
| 28 | 2205.2 | 105.1 | 849.2 | 8.7 | -35.8 | .0 | 849.9 |
| 29 | 1474.3 | 105.1 | 849.2 | 8.0 | -32.6 | .0 | 849.8 |
| 30 | 743.4 | 105.1 | 849.2 | 7.4 | -29.4 | .0 | 849.7 |
| 31 | 12.6 | 507.0 | -71.6 | 18.9 | -61.3 | .0 | 94.2 |
| 32 | 3297.6 | 625.2 | -327.1 | 31.1 | -101.6 | .0 | 342.5 |
| 33 | 2566.8 | 136.0 | 775.2 | 9.0 | -37.4 | .0 | 776.1 |
| 34 | 1835.9 | 136.0 | 775.2 | 8.3 | -34.2 | .0 | 775.9 |
| 35 | 1105.0 | 136.0 | 775.2 | 7.7 | -31.0 | .0 | 775.8 |
| 36 | 374.2 | 508.7 | -78.0 | 23.2 | -73.0 | .0 | 106.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 31
spalla mobile - n777 _FREQM_1 - n789 _FREQM_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28630.2 | 6029.7 | 72632.8 | -13738.3 | -20479.0 | -39922.5 |
| 2 | 29040.4 | 5961.4 | 74089.1 | 14038.3 | 20498.0 | 40692.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 11991.1 | 146721.9 | 300.0 | 4408.2 | 1500.9 |

Punto di applic. carico verticale: Xv = 2.544 m Yv = .076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 11.850 | 1.632 | .159 | .007 | .005 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3572.5 | 828.5 | -1089.7 | 19.5 | -63.0 | .0 | 1091.5 |
| 2 | 2919.5 | 243.8 | 255.8 | 5.6 | -22.9 | .0 | 256.8 |
| 3 | 2266.6 | 178.0 | 423.2 | 5.2 | -21.0 | .0 | 423.7 |
| 4 | 1613.7 | 178.0 | 423.2 | 4.9 | -19.1 | .0 | 423.7 |
| 5 | 960.7 | 178.0 | 423.2 | 4.5 | -17.2 | .0 | 423.6 |
| 6 | 307.8 | 178.0 | 423.2 | 4.1 | -15.4 | .0 | 423.5 |
| 7 | -345.1 | 585.3 | -559.0 | 12.6 | -38.0 | .0 | 560.3 |
| 8 | 3248.7 | 584.3 | -555.3 | 16.2 | -53.9 | .0 | 557.9 |
| 9 | 2595.8 | 143.6 | 511.6 | 5.4 | -21.9 | .0 | 512.1 |
| 10 | 1942.8 | 143.6 | 511.6 | 5.1 | -20.1 | .0 | 512.0 |
| 11 | 1289.9 | 143.6 | 511.6 | 4.7 | -18.2 | .0 | 511.9 |
| 12 | 637.0 | 143.6 | 511.6 | 4.3 | -16.3 | .0 | 511.9 |
| 13 | -16.0 | 584.3 | -555.3 | 11.2 | -35.2 | .0 | 556.4 |
| 14 | 2924.9 | 708.1 | -828.7 | 18.4 | -58.8 | .0 | 830.8 |
| 15 | 2272.0 | 177.1 | 427.3 | 5.2 | -21.0 | .0 | 427.9 |
| 16 | 1619.1 | 177.1 | 427.3 | 4.9 | -19.1 | .0 | 427.8 |
| 17 | 966.1 | 177.1 | 427.3 | 4.5 | -17.2 | .0 | 427.7 |
| 18 | 313.2 | 583.3 | -551.6 | 13.7 | -42.1 | .0 | 553.2 |
| 19 | 3549.0 | 839.9 | -1129.2 | 19.5 | -63.0 | .0 | 1131.0 |
| 20 | 2896.1 | 248.4 | 235.1 | 5.6 | -22.9 | .0 | 236.2 |
| 21 | 2243.2 | 181.7 | 405.3 | 5.2 | -21.0 | .0 | 405.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1590.2 | 181.7 | 405.3 | 4.9 | -19.1 | .0 | 405.8 |
| 23 | 937.3 | 181.7 | 405.3 | 4.5 | -17.2 | .0 | 405.7 |
| 24 | 284.4 | 181.7 | 405.3 | 4.1 | -15.4 | .0 | 405.6 |
| 25 | -368.5 | 594.0 | -591.6 | 12.6 | -38.0 | .0 | 592.8 |
| 26 | 3219.9 | 595.0 | -595.3 | 16.2 | -53.9 | .0 | 597.7 |
| 27 | 2566.9 | 147.7 | 491.5 | 5.4 | -21.9 | .0 | 492.0 |
| 28 | 1914.0 | 147.7 | 491.5 | 5.1 | -20.1 | .0 | 491.9 |
| 29 | 1261.1 | 147.7 | 491.5 | 4.7 | -18.2 | .0 | 491.8 |
| 30 | 608.2 | 147.7 | 491.5 | 4.3 | -16.3 | .0 | 491.8 |
| 31 | -44.8 | 595.0 | -595.3 | 11.2 | -35.2 | .0 | 596.3 |
| 32 | 2890.7 | 722.9 | -881.6 | 18.4 | -58.8 | .0 | 883.6 |
| 33 | 2237.8 | 182.6 | 401.2 | 5.2 | -21.0 | .0 | 401.8 |
| 34 | 1584.9 | 182.6 | 401.2 | 4.9 | -19.1 | .0 | 401.7 |
| 35 | 931.9 | 182.6 | 401.2 | 4.5 | -17.2 | .0 | 401.6 |
| 36 | 279.0 | 596.0 | -599.0 | 13.7 | -42.1 | .0 | 600.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 32
spalla mobile - n777 _FREQM_2 - n789 _FREQM_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28630.2 | 4979.7 | 67277.8 | -13734.3 | -20529.9 | -36054.9 |
| 2 | 29040.4 | 4911.4 | 68734.1 | 14034.3 | 20548.9 | 36825.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 9891.1 | 136011.9 | 300.0 | 4408.1 | 1500.9 |

Punto di applic. carico verticale: Xv = 2.358 m Yv = .076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 10.292 | 1.471 | .159 | .007 | .005 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3378.7 | 694.0 | -800.1 | 19.5 | -63.0 | .0 | 802.6 |
| 2 | 2790.4 | 198.5 | 325.7 | 5.6 | -22.9 | .0 | 326.5 |
| 3 | 2202.0 | 143.1 | 463.8 | 5.2 | -21.0 | .0 | 464.3 |
| 4 | 1613.7 | 143.1 | 463.8 | 4.9 | -19.1 | .0 | 464.2 |
| 5 | 1025.3 | 143.1 | 463.8 | 4.5 | -17.2 | .0 | 464.1 |
| 6 | 437.0 | 143.1 | 463.8 | 4.1 | -15.4 | .0 | 464.1 |
| 7 | -151.4 | 487.3 | -353.9 | 12.6 | -38.0 | .0 | 356.0 |
| 8 | 3087.2 | 486.3 | -350.2 | 16.2 | -53.9 | .0 | 354.3 |
| 9 | 2498.9 | 114.2 | 536.5 | 5.4 | -21.9 | .0 | 537.0 |
| 10 | 1910.5 | 114.2 | 536.5 | 5.1 | -20.1 | .0 | 536.9 |
| 11 | 1322.2 | 114.2 | 536.5 | 4.7 | -18.2 | .0 | 536.8 |
| 12 | 733.8 | 114.2 | 536.5 | 4.3 | -16.3 | .0 | 536.8 |
| 13 | 145.5 | 486.3 | -350.2 | 11.2 | -35.2 | .0 | 352.0 |
| 14 | 2795.8 | 591.4 | -579.1 | 18.4 | -58.8 | .0 | 582.1 |
| 15 | 2207.4 | 142.2 | 467.9 | 5.2 | -21.0 | .0 | 468.4 |
| 16 | 1619.1 | 142.2 | 467.9 | 4.9 | -19.1 | .0 | 468.3 |
| 17 | 1030.7 | 142.2 | 467.9 | 4.5 | -17.2 | .0 | 468.2 |
| 18 | 442.4 | 485.3 | -346.5 | 13.7 | -42.1 | .0 | 349.0 |
| 19 | 3355.3 | 705.4 | -839.6 | 19.5 | -63.0 | .0 | 842.0 |
| 20 | 2766.9 | 203.1 | 305.0 | 5.6 | -22.9 | .0 | 305.9 |
| 21 | 2178.6 | 146.8 | 445.9 | 5.2 | -21.0 | .0 | 446.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1590.2 | 146.8 | 445.9 | 4.9 | -19.1 | .0 | 446.3 |
| 23 | 1001.9 | 146.8 | 445.9 | 4.5 | -17.2 | .0 | 446.2 |
| 24 | 413.5 | 146.8 | 445.9 | 4.1 | -15.4 | .0 | 446.2 |
| 25 | -174.8 | 496.0 | -386.5 | 12.6 | -38.0 | .0 | 388.3 |
| 26 | 3058.4 | 497.0 | -390.2 | 16.2 | -53.9 | .0 | 393.9 |
| 27 | 2470.1 | 118.2 | 516.4 | 5.4 | -21.9 | .0 | 516.9 |
| 28 | 1881.7 | 118.2 | 516.4 | 5.1 | -20.1 | .0 | 516.8 |
| 29 | 1293.4 | 118.2 | 516.4 | 4.7 | -18.2 | .0 | 516.7 |
| 30 | 705.0 | 118.2 | 516.4 | 4.3 | -16.3 | .0 | 516.7 |
| 31 | 116.7 | 497.0 | -390.2 | 11.2 | -35.2 | .0 | 391.8 |
| 32 | 2761.6 | 606.1 | -632.0 | 18.4 | -58.8 | .0 | 634.7 |
| 33 | 2173.2 | 147.7 | 441.8 | 5.2 | -21.0 | .0 | 442.3 |
| 34 | 1584.9 | 147.7 | 441.8 | 4.9 | -19.1 | .0 | 442.2 |
| 35 | 996.5 | 147.7 | 441.8 | 4.5 | -17.2 | .0 | 442.1 |
| 36 | 408.2 | 498.0 | -393.9 | 13.7 | -42.1 | .0 | 396.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 33
spalla mobile - n777 _FREQM_3- n789 _FREQM_3

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31872.0 | 6010.5 | 88024.2 | -15457.0 | -22928.8 | -45797.7 |
| 2 | 31803.6 | 5980.6 | 87671.5 | 15547.0 | 22774.0 | 45927.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63675.6 | 11991.1 | 175695.7 | 90.0 | -886.7 | 449.9 |

Punto di applic. carico verticale: Xv = 2.759 m Yv = -.014 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.844 | 12.850 | 1.873 | .037 | -.001 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 4015.2 | 855.0 | -919.3 | 5.7 | -21.0 | .0 | 919.5 |
| 2 | 3266.0 | 241.1 | 466.9 | 1.8 | -9.2 | .0 | 467.0 |
| 3 | 2516.9 | 172.7 | 635.7 | 1.7 | -8.7 | .0 | 635.8 |
| 4 | 1767.7 | 172.7 | 635.7 | 1.5 | -8.1 | .0 | 635.8 |
| 5 | 1018.6 | 172.7 | 635.7 | 1.4 | -7.5 | .0 | 635.7 |
| 6 | 269.4 | 172.7 | 635.7 | 1.3 | -7.0 | .0 | 635.7 |
| 7 | -479.8 | 598.6 | -368.7 | 3.6 | -13.5 | .0 | 368.9 |
| 8 | 3640.4 | 598.3 | -367.5 | 4.7 | -18.4 | .0 | 368.0 |
| 9 | 2891.2 | 137.5 | 722.6 | 1.7 | -9.0 | .0 | 722.6 |
| 10 | 2142.0 | 137.5 | 722.6 | 1.6 | -8.4 | .0 | 722.6 |
| 11 | 1392.9 | 137.5 | 722.6 | 1.5 | -7.8 | .0 | 722.6 |
| 12 | 643.7 | 137.5 | 722.6 | 1.4 | -7.3 | .0 | 722.6 |
| 13 | -105.4 | 598.3 | -367.5 | 3.2 | -12.7 | .0 | 367.8 |
| 14 | 3265.5 | 729.8 | -654.2 | 5.3 | -19.7 | .0 | 654.5 |
| 15 | 2516.4 | 172.5 | 636.9 | 1.7 | -8.7 | .0 | 637.0 |
| 16 | 1767.2 | 172.5 | 636.9 | 1.5 | -8.1 | .0 | 637.0 |
| 17 | 1018.1 | 172.5 | 636.9 | 1.4 | -7.5 | .0 | 637.0 |
| 18 | 268.9 | 598.0 | -366.4 | 3.9 | -14.7 | .0 | 366.7 |
| 19 | 4017.3 | 858.4 | -931.1 | 5.7 | -21.0 | .0 | 931.3 |
| 20 | 3268.1 | 242.5 | 460.7 | 1.8 | -9.2 | .0 | 460.8 |
| 21 | 2519.0 | 173.9 | 630.3 | 1.7 | -8.7 | .0 | 630.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1769.8 | 173.9 | 630.3 | 1.5 | -8.1 | .0 | 630.4 |
| 23 | 1020.7 | 173.9 | 630.3 | 1.4 | -7.5 | .0 | 630.4 |
| 24 | 271.5 | 173.9 | 630.3 | 1.3 | -7.0 | .0 | 630.4 |
| 25 | -477.6 | 601.2 | -378.4 | 3.6 | -13.5 | .0 | 378.6 |
| 26 | 3643.0 | 601.5 | -379.5 | 4.7 | -18.4 | .0 | 380.0 |
| 27 | 2893.8 | 138.7 | 716.5 | 1.7 | -9.0 | .0 | 716.6 |
| 28 | 2144.6 | 138.7 | 716.5 | 1.6 | -8.4 | .0 | 716.6 |
| 29 | 1395.5 | 138.7 | 716.5 | 1.5 | -7.8 | .0 | 716.6 |
| 30 | 646.3 | 138.7 | 716.5 | 1.4 | -7.3 | .0 | 716.6 |
| 31 | -102.8 | 601.5 | -379.5 | 3.2 | -12.7 | .0 | 379.7 |
| 32 | 3268.6 | 734.2 | -670.1 | 5.3 | -19.7 | .0 | 670.4 |
| 33 | 2519.5 | 174.1 | 629.1 | 1.7 | -8.7 | .0 | 629.2 |
| 34 | 1770.3 | 174.1 | 629.1 | 1.5 | -8.1 | .0 | 629.2 |
| 35 | 1021.2 | 174.1 | 629.1 | 1.4 | -7.5 | .0 | 629.1 |
| 36 | 272.0 | 601.8 | -380.6 | 3.9 | -14.7 | .0 | 380.9 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 34
spalla mobile - n777 _FREQM_4 - n789 _FREQM_4

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31872.0 | 4960.5 | 82669.2 | -15453.0 | -22979.7 | -41930.1 |
| 2 | 31803.6 | 4930.6 | 82316.5 | 15543.0 | 22824.9 | 42060.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63675.6 | 9891.1 | 164985.7 | 90.0 | -886.7 | 449.8 |

Punto di applic. carico verticale: Xv = 2.591 m Yv = -.014 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.844 | 11.293 | 1.711 | .037 | -.001 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3821.4 | 720.6 | -629.7 | 5.7 | -21.0 | .0 | 630.0 |
| 2 | 3136.9 | 195.7 | 536.8 | 1.8 | -9.2 | .0 | 536.9 |
| 3 | 2452.3 | 137.9 | 676.3 | 1.7 | -8.7 | .0 | 676.3 |
| 4 | 1767.7 | 137.9 | 676.3 | 1.5 | -8.1 | .0 | 676.3 |
| 5 | 1083.1 | 137.9 | 676.3 | 1.4 | -7.5 | .0 | 676.3 |
| 6 | 398.6 | 137.9 | 676.3 | 1.3 | -7.0 | .0 | 676.3 |
| 7 | -286.0 | 500.7 | -163.6 | 3.6 | -13.5 | .0 | 164.1 |
| 8 | 3478.9 | 500.4 | -162.4 | 4.7 | -18.4 | .0 | 163.5 |
| 9 | 2794.3 | 108.1 | 747.5 | 1.7 | -9.0 | .0 | 747.5 |
| 10 | 2109.8 | 108.1 | 747.5 | 1.6 | -8.4 | .0 | 747.5 |
| 11 | 1425.2 | 108.1 | 747.5 | 1.5 | -7.8 | .0 | 747.5 |
| 12 | 740.6 | 108.1 | 747.5 | 1.4 | -7.3 | .0 | 747.5 |
| 13 | 56.0 | 500.4 | -162.4 | 3.2 | -12.7 | .0 | 162.9 |
| 14 | 3136.4 | 613.0 | -404.6 | 5.3 | -19.7 | .0 | 405.1 |
| 15 | 2451.8 | 137.6 | 677.5 | 1.7 | -8.7 | .0 | 677.6 |
| 16 | 1767.2 | 137.6 | 677.5 | 1.5 | -8.1 | .0 | 677.6 |
| 17 | 1082.6 | 137.6 | 677.5 | 1.4 | -7.5 | .0 | 677.6 |
| 18 | 398.1 | 500.1 | -161.3 | 3.9 | -14.7 | .0 | 162.0 |
| 19 | 3823.6 | 724.0 | -641.5 | 5.7 | -21.0 | .0 | 641.8 |
| 20 | 3139.0 | 197.1 | 530.6 | 1.8 | -9.2 | .0 | 530.7 |
| 21 | 2454.4 | 139.0 | 670.9 | 1.7 | -8.7 | .0 | 671.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1769.8 | 139.0 | 670.9 | 1.5 | -8.1 | .0 | 671.0 |
| 23 | 1085.2 | 139.0 | 670.9 | 1.4 | -7.5 | .0 | 671.0 |
| 24 | 400.7 | 139.0 | 670.9 | 1.3 | -7.0 | .0 | 671.0 |
| 25 | -283.9 | 503.3 | -173.3 | 3.6 | -13.5 | .0 | 173.8 |
| 26 | 3481.5 | 503.6 | -174.4 | 4.7 | -18.4 | .0 | 175.4 |
| 27 | 2796.9 | 109.3 | 741.4 | 1.7 | -9.0 | .0 | 741.5 |
| 28 | 2112.4 | 109.3 | 741.4 | 1.6 | -8.4 | .0 | 741.5 |
| 29 | 1427.8 | 109.3 | 741.4 | 1.5 | -7.8 | .0 | 741.5 |
| 30 | 743.2 | 109.3 | 741.4 | 1.4 | -7.3 | .0 | 741.5 |
| 31 | 58.6 | 503.6 | -174.4 | 3.2 | -12.7 | .0 | 174.9 |
| 32 | 3139.5 | 617.4 | -420.5 | 5.3 | -19.7 | .0 | 420.9 |
| 33 | 2454.9 | 139.2 | 669.7 | 1.7 | -8.7 | .0 | 669.7 |
| 34 | 1770.3 | 139.2 | 669.7 | 1.5 | -8.1 | .0 | 669.7 |
| 35 | 1085.7 | 139.2 | 669.7 | 1.4 | -7.5 | .0 | 669.7 |
| 36 | 401.2 | 503.9 | -175.5 | 3.9 | -14.7 | .0 | 176.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 35
spalla mobile - n777 _FREQM_5- n789 _FREQM_5

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28630.2 | 6029.7 | 72632.8 | -13738.3 | -20479.0 | -39922.5 |
| 2 | 29040.4 | 5961.4 | 74089.1 | 14038.3 | 20498.0 | 40692.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 11991.1 | 146721.9 | 300.0 | 4408.2 | 1500.9 |

Punto di applic. carico verticale: Xv = 2.544 m Yv = .076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 11.850 | 1.632 | .159 | .007 | .005 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3572.5 | 828.5 | -1089.7 | 19.5 | -63.0 | .0 | 1091.5 |
| 2 | 2919.5 | 243.8 | 255.8 | 5.6 | -22.9 | .0 | 256.8 |
| 3 | 2266.6 | 178.0 | 423.2 | 5.2 | -21.0 | .0 | 423.7 |
| 4 | 1613.7 | 178.0 | 423.2 | 4.9 | -19.1 | .0 | 423.7 |
| 5 | 960.7 | 178.0 | 423.2 | 4.5 | -17.2 | .0 | 423.6 |
| 6 | 307.8 | 178.0 | 423.2 | 4.1 | -15.4 | .0 | 423.5 |
| 7 | -345.1 | 585.3 | -559.0 | 12.6 | -38.0 | .0 | 560.3 |
| 8 | 3248.7 | 584.3 | -555.3 | 16.2 | -53.9 | .0 | 557.9 |
| 9 | 2595.8 | 143.6 | 511.6 | 5.4 | -21.9 | .0 | 512.1 |
| 10 | 1942.8 | 143.6 | 511.6 | 5.1 | -20.1 | .0 | 512.0 |
| 11 | 1289.9 | 143.6 | 511.6 | 4.7 | -18.2 | .0 | 511.9 |
| 12 | 637.0 | 143.6 | 511.6 | 4.3 | -16.3 | .0 | 511.9 |
| 13 | -16.0 | 584.3 | -555.3 | 11.2 | -35.2 | .0 | 556.4 |
| 14 | 2924.9 | 708.1 | -828.7 | 18.4 | -58.8 | .0 | 830.8 |
| 15 | 2272.0 | 177.1 | 427.3 | 5.2 | -21.0 | .0 | 427.9 |
| 16 | 1619.1 | 177.1 | 427.3 | 4.9 | -19.1 | .0 | 427.8 |
| 17 | 966.1 | 177.1 | 427.3 | 4.5 | -17.2 | .0 | 427.7 |
| 18 | 313.2 | 583.3 | -551.6 | 13.7 | -42.1 | .0 | 553.2 |
| 19 | 3549.0 | 839.9 | -1129.2 | 19.5 | -63.0 | .0 | 1131.0 |
| 20 | 2896.1 | 248.4 | 235.1 | 5.6 | -22.9 | .0 | 236.2 |
| 21 | 2243.2 | 181.7 | 405.3 | 5.2 | -21.0 | .0 | 405.9 |

```
  22   1590.2    181.7    405.3      4.9    -19.1       .0     405.8
  23    937.3    181.7    405.3      4.5    -17.2       .0     405.7
  24    284.4    181.7    405.3      4.1    -15.4       .0     405.6
  25   -368.5    594.0   -591.6     12.6    -38.0       .0     592.8
  26   3219.9    595.0   -595.3     16.2    -53.9       .0     597.7
  27   2566.9    147.7    491.5      5.4    -21.9       .0     492.0
  28   1914.0    147.7    491.5      5.1    -20.1       .0     491.9
  29   1261.1    147.7    491.5      4.7    -18.2       .0     491.8
  30    608.2    147.7    491.5      4.3    -16.3       .0     491.8
  31    -44.8    595.0   -595.3     11.2    -35.2       .0     596.3
  32   2890.7    722.9   -881.6     18.4    -58.8       .0     883.6
  33   2237.8    182.6    401.2      5.2    -21.0       .0     401.8
  34   1584.9    182.6    401.2      4.9    -19.1       .0     401.7
  35    931.9    182.6    401.2      4.5    -17.2       .0     401.6
  36    279.0    596.0   -599.0     13.7    -42.1       .0     600.5
 -------------------------------------------------------------------

 Mris  = (Mxp^2 + Myp^2)^0.5
```

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 36
spalla mobile - n777 _FREQM_6- n789 _FREQM_6

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28630.2 | 4979.7 | 67277.8 | -13734.3 | -20529.9 | -36054.9 |
| 2 | 29040.4 | 4911.4 | 68734.1 | 14034.3 | 20548.9 | 36825.0 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 9891.1 | 136011.9 | 300.0 | 4408.1 | 1500.9 |

Punto di applic. carico verticale: Xv = 2.358 m Yv = .076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 10.292 | 1.471 | .159 | .007 | .005 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3378.7 | 694.0 | -800.1 | 19.5 | -63.0 | .0 | 802.6 |
| 2 | 2790.4 | 198.5 | 325.7 | 5.6 | -22.9 | .0 | 326.5 |
| 3 | 2202.0 | 143.1 | 463.8 | 5.2 | -21.0 | .0 | 464.3 |
| 4 | 1613.7 | 143.1 | 463.8 | 4.9 | -19.1 | .0 | 464.2 |
| 5 | 1025.3 | 143.1 | 463.8 | 4.5 | -17.2 | .0 | 464.1 |
| 6 | 437.0 | 143.1 | 463.8 | 4.1 | -15.4 | .0 | 464.1 |
| 7 | -151.4 | 487.3 | -353.9 | 12.6 | -38.0 | .0 | 356.0 |
| 8 | 3087.2 | 486.3 | -350.2 | 16.2 | -53.9 | .0 | 354.3 |
| 9 | 2498.9 | 114.2 | 536.5 | 5.4 | -21.9 | .0 | 537.0 |
| 10 | 1910.5 | 114.2 | 536.5 | 5.1 | -20.1 | .0 | 536.9 |
| 11 | 1322.2 | 114.2 | 536.5 | 4.7 | -18.2 | .0 | 536.8 |
| 12 | 733.8 | 114.2 | 536.5 | 4.3 | -16.3 | .0 | 536.8 |
| 13 | 145.5 | 486.3 | -350.2 | 11.2 | -35.2 | .0 | 352.0 |
| 14 | 2795.8 | 591.4 | -579.1 | 18.4 | -58.8 | .0 | 582.1 |
| 15 | 2207.4 | 142.2 | 467.9 | 5.2 | -21.0 | .0 | 468.4 |
| 16 | 1619.1 | 142.2 | 467.9 | 4.9 | -19.1 | .0 | 468.3 |
| 17 | 1030.7 | 142.2 | 467.9 | 4.5 | -17.2 | .0 | 468.2 |
| 18 | 442.4 | 485.3 | -346.5 | 13.7 | -42.1 | .0 | 349.0 |
| 19 | 3355.3 | 705.4 | -839.6 | 19.5 | -63.0 | .0 | 842.0 |
| 20 | 2766.9 | 203.1 | 305.0 | 5.6 | -22.9 | .0 | 305.9 |
| 21 | 2178.6 | 146.8 | 445.9 | 5.2 | -21.0 | .0 | 446.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1590.2 | 146.8 | 445.9 | 4.9 | -19.1 | .0 | 446.3 |
| 23 | 1001.9 | 146.8 | 445.9 | 4.5 | -17.2 | .0 | 446.2 |
| 24 | 413.5 | 146.8 | 445.9 | 4.1 | -15.4 | .0 | 446.2 |
| 25 | -174.8 | 496.0 | -386.5 | 12.6 | -38.0 | .0 | 388.3 |
| 26 | 3058.4 | 497.0 | -390.2 | 16.2 | -53.9 | .0 | 393.9 |
| 27 | 2470.1 | 118.2 | 516.4 | 5.4 | -21.9 | .0 | 516.9 |
| 28 | 1881.7 | 118.2 | 516.4 | 5.1 | -20.1 | .0 | 516.8 |
| 29 | 1293.4 | 118.2 | 516.4 | 4.7 | -18.2 | .0 | 516.7 |
| 30 | 705.0 | 118.2 | 516.4 | 4.3 | -16.3 | .0 | 516.7 |
| 31 | 116.7 | 497.0 | -390.2 | 11.2 | -35.2 | .0 | 391.8 |
| 32 | 2761.6 | 606.1 | -632.0 | 18.4 | -58.8 | .0 | 634.7 |
| 33 | 2173.2 | 147.7 | 441.8 | 5.2 | -21.0 | .0 | 442.3 |
| 34 | 1584.9 | 147.7 | 441.8 | 4.9 | -19.1 | .0 | 442.2 |
| 35 | 996.5 | 147.7 | 441.8 | 4.5 | -17.2 | .0 | 442.1 |
| 36 | 408.2 | 498.0 | -393.9 | 13.7 | -42.1 | .0 | 396.2 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 37
spalla mobile - n777 _FREQM_7 - n789 _FREQM_7

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 29040.4 | 5960.0 | 74085.4 | -14038.2 | -20608.8 | -40488.9 |
| 2 | 28630.2 | 6031.2 | 72636.5 | 13738.2 | 20589.3 | 39717.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 11991.2 | 146721.9 | -300.0 | -4408.7 | -1532.8 |

Punto di applic. carico verticale: Xv = 2.544 m Yv = -.076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 11.850 | 1.632 | -.159 | -.007 | -.005 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3549.0 | 840.0 | -1129.6 | -19.6 | 63.2 | .0 | 1131.4 |
| 2 | 2896.1 | 248.4 | 234.9 | -5.6 | 23.0 | .0 | 236.0 |
| 3 | 2243.2 | 181.7 | 405.1 | -5.3 | 21.0 | .0 | 405.7 |
| 4 | 1590.2 | 181.7 | 405.1 | -4.9 | 19.1 | .0 | 405.6 |
| 5 | 937.3 | 181.7 | 405.1 | -4.5 | 17.2 | .0 | 405.5 |
| 6 | 284.4 | 181.7 | 405.1 | -4.1 | 15.3 | .0 | 405.4 |
| 7 | -368.5 | 594.1 | -591.9 | -12.5 | 37.7 | .0 | 593.1 |
| 8 | 3219.9 | 595.1 | -595.7 | -16.3 | 54.1 | .0 | 598.2 |
| 9 | 2566.9 | 147.7 | 491.3 | -5.4 | 22.0 | .0 | 491.8 |
| 10 | 1914.0 | 147.7 | 491.3 | -5.1 | 20.1 | .0 | 491.7 |
| 11 | 1261.1 | 147.7 | 491.3 | -4.7 | 18.2 | .0 | 491.6 |
| 12 | 608.2 | 147.7 | 491.3 | -4.3 | 16.2 | .0 | 491.5 |
| 13 | -44.8 | 595.1 | -595.7 | -11.1 | 35.0 | .0 | 596.8 |
| 14 | 2890.7 | 723.0 | -882.2 | -18.4 | 59.0 | .0 | 884.2 |
| 15 | 2237.8 | 182.6 | 400.9 | -5.3 | 21.0 | .0 | 401.5 |
| 16 | 1584.9 | 182.6 | 400.9 | -4.9 | 19.1 | .0 | 401.4 |
| 17 | 931.9 | 182.6 | 400.9 | -4.5 | 17.2 | .0 | 401.3 |
| 18 | 279.0 | 596.1 | -599.6 | -13.7 | 42.0 | .0 | 601.0 |
| 19 | 3572.5 | 828.3 | -1089.3 | -19.6 | 63.2 | .0 | 1091.2 |
| 20 | 2919.5 | 243.7 | 256.0 | -5.6 | 23.0 | .0 | 257.0 |
| 21 | 2266.6 | 177.9 | 423.4 | -5.3 | 21.0 | .0 | 423.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1613.7 | 177.9 | 423.4 | -4.9 | 19.1 | .0 | 423.8 |
| 23 | 960.7 | 177.9 | 423.4 | -4.5 | 17.2 | .0 | 423.8 |
| 24 | 307.8 | 177.9 | 423.4 | -4.1 | 15.3 | .0 | 423.7 |
| 25 | -345.1 | 585.2 | -558.7 | -12.5 | 37.7 | .0 | 560.0 |
| 26 | 3248.7 | 584.2 | -554.9 | -16.3 | 54.1 | .0 | 557.5 |
| 27 | 2595.8 | 143.6 | 511.8 | -5.4 | 22.0 | .0 | 512.3 |
| 28 | 1942.8 | 143.6 | 511.8 | -5.1 | 20.1 | .0 | 512.2 |
| 29 | 1289.9 | 143.6 | 511.8 | -4.7 | 18.2 | .0 | 512.1 |
| 30 | 637.0 | 143.6 | 511.8 | -4.3 | 16.2 | .0 | 512.1 |
| 31 | -16.0 | 584.2 | -554.9 | -11.1 | 35.0 | .0 | 556.0 |
| 32 | 2924.9 | 708.0 | -828.2 | -18.4 | 59.0 | .0 | 830.3 |
| 33 | 2272.0 | 177.0 | 427.6 | -5.3 | 21.0 | .0 | 428.1 |
| 34 | 1619.1 | 177.0 | 427.6 | -4.9 | 19.1 | .0 | 428.0 |
| 35 | 966.1 | 177.0 | 427.6 | -4.5 | 17.2 | .0 | 428.0 |
| 36 | 313.2 | 583.1 | -551.1 | -13.7 | 42.0 | .0 | 552.7 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 38
spalla mobile - n777 _FREQM_8- n789 _FREQM_8

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 29040.4 | 4910.0 | 68730.4 | -14034.2 | -20659.7 | -36621.3 |
| 2 | 28630.2 | 4981.2 | 67281.5 | 13734.2 | 20640.2 | 35850.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 9891.2 | 136011.9 | -300.0 | -4408.6 | -1532.8 |

Punto di applic. carico verticale: Xv = 2.358 m Yv = -.076 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 10.292 | 1.471 | -.159 | -.007 | -.005 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3355.3 | 705.6 | -840.0 | -19.6 | 63.2 | .0 | 842.4 |
| 2 | 2766.9 | 203.1 | 304.8 | -5.6 | 23.0 | .0 | 305.7 |
| 3 | 2178.6 | 146.9 | 445.7 | -5.3 | 21.0 | .0 | 446.2 |
| 4 | 1590.2 | 146.9 | 445.7 | -4.9 | 19.1 | .0 | 446.1 |
| 5 | 1001.9 | 146.9 | 445.7 | -4.5 | 17.2 | .0 | 446.0 |
| 6 | 413.5 | 146.9 | 445.7 | -4.1 | 15.3 | .0 | 446.0 |
| 7 | -174.8 | 496.1 | -386.8 | -12.5 | 37.7 | .0 | 388.6 |
| 8 | 3058.4 | 497.2 | -390.6 | -16.3 | 54.1 | .0 | 394.4 |
| 9 | 2470.1 | 118.3 | 516.2 | -5.4 | 22.0 | .0 | 516.7 |
| 10 | 1881.7 | 118.3 | 516.2 | -5.1 | 20.1 | .0 | 516.6 |
| 11 | 1293.4 | 118.3 | 516.2 | -4.7 | 18.2 | .0 | 516.5 |
| 12 | 705.0 | 118.3 | 516.2 | -4.3 | 16.2 | .0 | 516.4 |
| 13 | 116.7 | 497.2 | -390.6 | -11.1 | 35.0 | .0 | 392.2 |
| 14 | 2761.6 | 606.3 | -632.6 | -18.4 | 59.0 | .0 | 635.3 |
| 15 | 2173.2 | 147.8 | 441.5 | -5.3 | 21.0 | .0 | 442.0 |
| 16 | 1584.9 | 147.8 | 441.5 | -4.9 | 19.1 | .0 | 441.9 |
| 17 | 996.5 | 147.8 | 441.5 | -4.5 | 17.2 | .0 | 441.8 |
| 18 | 408.2 | 498.2 | -394.4 | -13.7 | 42.0 | .0 | 396.7 |
| 19 | 3378.7 | 693.9 | -799.7 | -19.6 | 63.2 | .0 | 802.2 |
| 20 | 2790.4 | 198.4 | 325.9 | -5.6 | 23.0 | .0 | 326.7 |
| 21 | 2202.0 | 143.0 | 464.0 | -5.3 | 21.0 | .0 | 464.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1613.7 | 143.0 | 464.0 | -4.9 | 19.1 | .0 | 464.4 |
| 23 | 1025.3 | 143.0 | 464.0 | -4.5 | 17.2 | .0 | 464.3 |
| 24 | 437.0 | 143.0 | 464.0 | -4.1 | 15.3 | .0 | 464.2 |
| 25 | -151.4 | 487.3 | -353.6 | -12.5 | 37.7 | .0 | 355.6 |
| 26 | 3087.3 | 486.2 | -349.8 | -16.3 | 54.1 | .0 | 353.9 |
| 27 | 2498.9 | 114.2 | 536.7 | -5.4 | 22.0 | .0 | 537.2 |
| 28 | 1910.5 | 114.2 | 536.7 | -5.1 | 20.1 | .0 | 537.1 |
| 29 | 1322.2 | 114.2 | 536.7 | -4.7 | 18.2 | .0 | 537.0 |
| 30 | 733.8 | 114.2 | 536.7 | -4.3 | 16.2 | .0 | 537.0 |
| 31 | 145.5 | 486.2 | -349.8 | -11.1 | 35.0 | .0 | 351.5 |
| 32 | 2795.8 | 591.2 | -578.6 | -18.4 | 59.0 | .0 | 581.6 |
| 33 | 2207.4 | 142.2 | 468.2 | -5.3 | 21.0 | .0 | 468.7 |
| 34 | 1619.1 | 142.2 | 468.2 | -4.9 | 19.1 | .0 | 468.6 |
| 35 | 1030.7 | 142.2 | 468.2 | -4.5 | 17.2 | .0 | 468.5 |
| 36 | 442.4 | 485.2 | -346.0 | -13.7 | 42.0 | .0 | 348.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 39
spalla mobile - n777 _FREQM_9- n789 _FREQM_9

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 30513.5 | 5988.0 | 81825.7 | -14980.6 | -21856.3 | -43908.4 |
| 2 | 31445.1 | 6003.1 | 85585.6 | 15100.6 | 22506.3 | 44619.8 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 11991.1 | 167411.3 | 120.0 | 10618.1 | 549.8 |

Punto di applic. carico verticale: Xv = 2.702 m Yv = .171 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 12.564 | 1.804 | .107 | .013 | .002 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3909.0 | 848.2 | -970.7 | 8.4 | -16.4 | .0 | 970.8 |
| 2 | 3187.4 | 242.2 | 405.1 | 1.9 | .5 | .0 | 405.1 |
| 3 | 2465.7 | 174.5 | 573.8 | 1.8 | 1.2 | .0 | 573.8 |
| 4 | 1744.1 | 174.5 | 573.8 | 1.6 | 1.9 | .0 | 573.8 |
| 5 | 1022.4 | 174.5 | 573.8 | 1.5 | 2.6 | .0 | 573.8 |
| 6 | 300.8 | 174.5 | 573.8 | 1.3 | 3.2 | .0 | 573.8 |
| 7 | -420.8 | 595.4 | -425.3 | 5.9 | -7.2 | .0 | 425.3 |
| 8 | 3553.5 | 595.0 | -423.9 | 6.9 | -12.5 | .0 | 424.1 |
| 9 | 2831.8 | 139.5 | 660.9 | 1.8 | .8 | .0 | 660.9 |
| 10 | 2110.2 | 139.5 | 660.9 | 1.7 | 1.5 | .0 | 660.9 |
| 11 | 1388.6 | 139.5 | 660.9 | 1.6 | 2.2 | .0 | 660.9 |
| 12 | 666.9 | 139.5 | 660.9 | 1.4 | 2.9 | .0 | 660.9 |
| 13 | -54.7 | 595.0 | -423.9 | 5.0 | -5.6 | .0 | 423.9 |
| 14 | 3198.0 | 724.6 | -707.7 | 8.0 | -14.9 | .0 | 707.8 |
| 15 | 2476.3 | 174.2 | 575.3 | 1.8 | 1.2 | .0 | 575.3 |
| 16 | 1754.7 | 174.2 | 575.3 | 1.6 | 1.9 | .0 | 575.3 |
| 17 | 1033.0 | 174.2 | 575.3 | 1.5 | 2.6 | .0 | 575.3 |
| 18 | 311.4 | 594.7 | -422.5 | 6.3 | -8.8 | .0 | 422.6 |
| 19 | 3863.0 | 852.3 | -985.1 | 8.4 | -16.4 | .0 | 985.3 |
| 20 | 3141.3 | 243.8 | 397.6 | 1.9 | .5 | .0 | 397.6 |
| 21 | 2419.7 | 175.8 | 567.2 | 1.8 | 1.2 | .0 | 567.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1698.1 | 175.8 | 567.2 | 1.6 | 1.9 | .0 | 567.2 |
| 23 | 976.4 | 175.8 | 567.2 | 1.5 | 2.6 | .0 | 567.2 |
| 24 | 254.8 | 175.8 | 567.2 | 1.3 | 3.2 | .0 | 567.2 |
| 25 | -466.9 | 598.6 | -437.2 | 5.9 | -7.2 | .0 | 437.2 |
| 26 | 3496.9 | 598.9 | -438.5 | 6.9 | -12.5 | .0 | 438.7 |
| 27 | 2775.2 | 141.0 | 653.5 | 1.8 | .8 | .0 | 653.5 |
| 28 | 2053.6 | 141.0 | 653.5 | 1.7 | 1.5 | .0 | 653.5 |
| 29 | 1331.9 | 141.0 | 653.5 | 1.6 | 2.2 | .0 | 653.5 |
| 30 | 610.3 | 141.0 | 653.5 | 1.4 | 2.9 | .0 | 653.5 |
| 31 | -111.3 | 598.9 | -438.5 | 5.0 | -5.6 | .0 | 438.6 |
| 32 | 3130.8 | 730.0 | -727.0 | 8.0 | -14.9 | .0 | 727.2 |
| 33 | 2409.1 | 176.2 | 565.7 | 1.8 | 1.2 | .0 | 565.7 |
| 34 | 1687.5 | 176.2 | 565.7 | 1.6 | 1.9 | .0 | 565.7 |
| 35 | 965.8 | 176.2 | 565.7 | 1.5 | 2.6 | .0 | 565.7 |
| 36 | 244.2 | 599.3 | -439.9 | 6.3 | -8.8 | .0 | 440.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 40
spalla mobile - n777 _FREQM_10- n789 _FREQM_10

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 30513.5 | 4938.0 | 76470.7 | -14976.6 | -21907.2 | -40040.7 |
| 2 | 31445.1 | 4953.1 | 80230.6 | 15096.6 | 22557.2 | 40752.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 9891.1 | 156701.3 | 120.0 | 10618.1 | 549.8 |

Punto di applic. carico verticale: Xv = 2.529 m Yv = .171 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 11.007 | 1.643 | .107 | .013 | .002 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3715.3 | 713.7 | -681.0 | 8.4 | -16.4 | .0 | 681.2 |
| 2 | 3058.2 | 196.8 | 475.1 | 1.9 | .5 | .0 | 475.1 |
| 3 | 2401.1 | 139.6 | 614.3 | 1.8 | 1.2 | .0 | 614.3 |
| 4 | 1744.1 | 139.6 | 614.3 | 1.6 | 1.9 | .0 | 614.3 |
| 5 | 1087.0 | 139.6 | 614.3 | 1.5 | 2.6 | .0 | 614.3 |
| 6 | 430.0 | 139.6 | 614.3 | 1.3 | 3.2 | .0 | 614.3 |
| 7 | -227.1 | 497.5 | -220.2 | 5.9 | -7.2 | .0 | 220.3 |
| 8 | 3392.0 | 497.1 | -218.8 | 6.9 | -12.5 | .0 | 219.1 |
| 9 | 2735.0 | 110.1 | 685.8 | 1.8 | .8 | .0 | 685.8 |
| 10 | 2077.9 | 110.1 | 685.8 | 1.7 | 1.5 | .0 | 685.8 |
| 11 | 1420.8 | 110.1 | 685.8 | 1.6 | 2.2 | .0 | 685.8 |
| 12 | 763.8 | 110.1 | 685.8 | 1.4 | 2.9 | .0 | 685.8 |
| 13 | 106.7 | 497.1 | -218.8 | 5.0 | -5.6 | .0 | 218.9 |
| 14 | 3068.8 | 607.8 | -458.0 | 8.0 | -14.9 | .0 | 458.3 |
| 15 | 2411.7 | 139.3 | 615.8 | 1.8 | 1.2 | .0 | 615.8 |
| 16 | 1754.7 | 139.3 | 615.8 | 1.6 | 1.9 | .0 | 615.8 |
| 17 | 1097.6 | 139.3 | 615.8 | 1.5 | 2.6 | .0 | 615.8 |
| 18 | 440.5 | 496.7 | -217.4 | 6.3 | -8.8 | .0 | 217.6 |
| 19 | 3669.2 | 717.9 | -695.5 | 8.4 | -16.4 | .0 | 695.7 |
| 20 | 3012.2 | 198.5 | 467.5 | 1.9 | .5 | .0 | 467.5 |
| 21 | 2355.1 | 141.0 | 607.8 | 1.8 | 1.2 | .0 | 607.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1698.1 | 141.0 | 607.8 | 1.6 | 1.9 | .0 | 607.8 |
| 23 | 1041.0 | 141.0 | 607.8 | 1.5 | 2.6 | .0 | 607.8 |
| 24 | 383.9 | 141.0 | 607.8 | 1.3 | 3.2 | .0 | 607.8 |
| 25 | -273.1 | 500.7 | -232.1 | 5.9 | -7.2 | .0 | 232.2 |
| 26 | 3335.4 | 501.0 | -233.4 | 6.9 | -12.5 | .0 | 233.8 |
| 27 | 2678.4 | 111.6 | 678.4 | 1.8 | .8 | .0 | 678.4 |
| 28 | 2021.3 | 111.6 | 678.4 | 1.7 | 1.5 | .0 | 678.4 |
| 29 | 1364.2 | 111.6 | 678.4 | 1.6 | 2.2 | .0 | 678.4 |
| 30 | 707.2 | 111.6 | 678.4 | 1.4 | 2.9 | .0 | 678.4 |
| 31 | 50.1 | 501.0 | -233.4 | 5.0 | -5.6 | .0 | 233.5 |
| 32 | 3001.6 | 613.2 | -477.4 | 8.0 | -14.9 | .0 | 477.6 |
| 33 | 2344.5 | 141.3 | 606.3 | 1.8 | 1.2 | .0 | 606.3 |
| 34 | 1687.5 | 141.3 | 606.3 | 1.6 | 1.9 | .0 | 606.3 |
| 35 | 1030.4 | 141.3 | 606.3 | 1.5 | 2.6 | .0 | 606.3 |
| 36 | 373.4 | 501.4 | -234.8 | 6.3 | -8.8 | .0 | 235.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 41
spalla mobile - n777 _FREQM_11 - n789 _FREQM_11

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31445.1 | 6001.7 | 85581.8 | -15100.6 | -22550.8 | -44538.6 |
| 2 | 30513.5 | 5989.4 | 81829.4 | 14980.6 | 21900.3 | 43826.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 11991.1 | 167411.2 | -120.0 | -10618.6 | -580.7 |

Punto di applic. carico verticale: Xv = 2.702 m Yv = -.171 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 12.564 | 1.804 | -.107 | -.013 | -.002 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3863.0 | 852.5 | -985.5 | -8.5 | 16.6 | .0 | 985.7 |
| 2 | 3141.3 | 243.9 | 397.4 | -1.9 | -.4 | .0 | 397.4 |
| 3 | 2419.7 | 175.9 | 567.0 | -1.8 | -1.1 | .0 | 567.0 |
| 4 | 1698.1 | 175.9 | 567.0 | -1.6 | -1.9 | .0 | 567.0 |
| 5 | 976.4 | 175.9 | 567.0 | -1.5 | -2.6 | .0 | 567.0 |
| 6 | 254.8 | 175.9 | 567.0 | -1.3 | -3.3 | .0 | 567.0 |
| 7 | -466.9 | 598.7 | -437.5 | -5.8 | 7.0 | .0 | 437.6 |
| 8 | 3496.9 | 599.1 | -439.0 | -6.9 | 12.7 | .0 | 439.1 |
| 9 | 2775.2 | 141.0 | 653.3 | -1.8 | -.8 | .0 | 653.3 |
| 10 | 2053.6 | 141.0 | 653.3 | -1.7 | -1.5 | .0 | 653.3 |
| 11 | 1331.9 | 141.0 | 653.3 | -1.5 | -2.2 | .0 | 653.3 |
| 12 | 610.3 | 141.0 | 653.3 | -1.4 | -3.0 | .0 | 653.3 |
| 13 | -111.3 | 599.1 | -439.0 | -5.0 | 5.4 | .0 | 439.0 |
| 14 | 3130.8 | 730.1 | -727.6 | -8.1 | 15.0 | .0 | 727.7 |
| 15 | 2409.1 | 176.2 | 565.4 | -1.8 | -1.1 | .0 | 565.4 |
| 16 | 1687.5 | 176.2 | 565.4 | -1.6 | -1.9 | .0 | 565.4 |
| 17 | 965.8 | 176.2 | 565.4 | -1.5 | -2.6 | .0 | 565.4 |
| 18 | 244.2 | 599.4 | -440.4 | -6.3 | 8.6 | .0 | 440.5 |
| 19 | 3909.0 | 848.0 | -970.2 | -8.5 | 16.6 | .0 | 970.4 |
| 20 | 3187.4 | 242.1 | 405.4 | -1.9 | -.4 | .0 | 405.4 |
| 21 | 2465.7 | 174.4 | 573.9 | -1.8 | -1.1 | .0 | 573.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1744.1 | 174.4 | 573.9 | -1.6 | -1.9 | .0 | 573.9 |
| 23 | 1022.4 | 174.4 | 573.9 | -1.5 | -2.6 | .0 | 573.9 |
| 24 | 300.8 | 174.4 | 573.9 | -1.3 | -3.3 | .0 | 573.9 |
| 25 | -420.8 | 595.3 | -424.9 | -5.8 | 7.0 | .0 | 425.0 |
| 26 | 3553.5 | 594.9 | -423.5 | -6.9 | 12.7 | .0 | 423.7 |
| 27 | 2831.8 | 139.5 | 661.1 | -1.8 | -.8 | .0 | 661.1 |
| 28 | 2110.2 | 139.5 | 661.1 | -1.7 | -1.5 | .0 | 661.1 |
| 29 | 1388.6 | 139.5 | 661.1 | -1.5 | -2.2 | .0 | 661.1 |
| 30 | 666.9 | 139.5 | 661.1 | -1.4 | -3.0 | .0 | 661.1 |
| 31 | -54.7 | 594.9 | -423.5 | -5.0 | 5.4 | .0 | 423.5 |
| 32 | 3198.0 | 724.4 | -707.1 | -8.1 | 15.0 | .0 | 707.3 |
| 33 | 2476.3 | 174.1 | 575.5 | -1.8 | -1.1 | .0 | 575.5 |
| 34 | 1754.7 | 174.1 | 575.5 | -1.6 | -1.9 | .0 | 575.5 |
| 35 | 1033.0 | 174.1 | 575.5 | -1.5 | -2.6 | .0 | 575.5 |
| 36 | 311.4 | 594.5 | -422.0 | -6.3 | 8.6 | .0 | 422.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 42
spalla mobile - n777 _FREQM_12 - n789 _FREQM_12

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31445.1 | 4951.7 | 80226.8 | -15096.6 | -22601.7 | -40671.0 |
| 2 | 30513.5 | 4939.4 | 76474.4 | 14976.6 | 21951.2 | 39958.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 61958.6 | 9891.1 | 156701.2 | -120.0 | -10618.6 | -580.8 |

Punto di applic. carico verticale: Xv = 2.529 m Yv = -.171 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.605 | 11.007 | 1.643 | -.107 | -.013 | -.002 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3669.2 | 718.0 | -695.9 | -8.5 | 16.6 | .0 | 696.1 |
| 2 | 3012.2 | 198.6 | 467.3 | -1.9 | -.4 | .0 | 467.3 |
| 3 | 2355.1 | 141.0 | 607.6 | -1.8 | -1.1 | .0 | 607.6 |
| 4 | 1698.1 | 141.0 | 607.6 | -1.6 | -1.9 | .0 | 607.6 |
| 5 | 1041.0 | 141.0 | 607.6 | -1.5 | -2.6 | .0 | 607.6 |
| 6 | 383.9 | 141.0 | 607.6 | -1.3 | -3.3 | .0 | 607.6 |
| 7 | -273.1 | 500.7 | -232.4 | -5.8 | 7.0 | .0 | 232.5 |
| 8 | 3335.4 | 501.1 | -233.9 | -6.9 | 12.7 | .0 | 234.2 |
| 9 | 2678.4 | 111.6 | 678.2 | -1.8 | -.8 | .0 | 678.2 |
| 10 | 2021.3 | 111.6 | 678.2 | -1.7 | -1.5 | .0 | 678.2 |
| 11 | 1364.2 | 111.6 | 678.2 | -1.5 | -2.2 | .0 | 678.2 |
| 12 | 707.2 | 111.6 | 678.2 | -1.4 | -3.0 | .0 | 678.2 |
| 13 | 50.1 | 501.1 | -233.9 | -5.0 | 5.4 | .0 | 233.9 |
| 14 | 3001.6 | 613.3 | -478.0 | -8.1 | 15.0 | .0 | 478.2 |
| 15 | 2344.5 | 141.3 | 606.0 | -1.8 | -1.1 | .0 | 606.0 |
| 16 | 1687.5 | 141.3 | 606.0 | -1.6 | -1.9 | .0 | 606.0 |
| 17 | 1030.4 | 141.3 | 606.0 | -1.5 | -2.6 | .0 | 606.0 |
| 18 | 373.4 | 501.5 | -235.3 | -6.3 | 8.6 | .0 | 235.5 |
| 19 | 3715.3 | 713.6 | -680.6 | -8.5 | 16.6 | .0 | 680.8 |
| 20 | 3058.2 | 196.8 | 475.3 | -1.9 | -.4 | .0 | 475.3 |
| 21 | 2401.1 | 139.6 | 614.5 | -1.8 | -1.1 | .0 | 614.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1744.1 | 139.6 | 614.5 | -1.6 | -1.9 | .0 | 614.5 |
| 23 | 1087.0 | 139.6 | 614.5 | -1.5 | -2.6 | .0 | 614.5 |
| 24 | 430.0 | 139.6 | 614.5 | -1.3 | -3.3 | .0 | 614.5 |
| 25 | -227.1 | 497.4 | -219.8 | -5.8 | 7.0 | .0 | 219.9 |
| 26 | 3392.0 | 497.0 | -218.4 | -6.9 | 12.7 | .0 | 218.7 |
| 27 | 2735.0 | 110.0 | 686.0 | -1.8 | -.8 | .0 | 686.0 |
| 28 | 2077.9 | 110.0 | 686.0 | -1.7 | -1.5 | .0 | 686.0 |
| 29 | 1420.8 | 110.0 | 686.0 | -1.5 | -2.2 | .0 | 686.0 |
| 30 | 763.8 | 110.0 | 686.0 | -1.4 | -3.0 | .0 | 686.0 |
| 31 | 106.7 | 497.0 | -218.4 | -5.0 | 5.4 | .0 | 218.4 |
| 32 | 3068.8 | 607.6 | -457.5 | -8.1 | 15.0 | .0 | 457.7 |
| 33 | 2411.7 | 139.2 | 616.1 | -1.8 | -1.1 | .0 | 616.1 |
| 34 | 1754.7 | 139.2 | 616.1 | -1.6 | -1.9 | .0 | 616.1 |
| 35 | 1097.6 | 139.2 | 616.1 | -1.5 | -2.6 | .0 | 616.1 |
| 36 | 440.5 | 496.6 | -216.9 | -6.3 | 8.6 | .0 | 217.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 43
spalla mobile - n777 _FREQM_13- n789 _FREQM_13

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28835.3 | 6099.8 | 73894.6 | -13888.6 | -20538.8 | -40592.5 |
| 2 | 28835.3 | 6101.3 | 73898.3 | 13888.6 | 20538.6 | 40592.1 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 12201.1 | 147792.9 | .0 | -.2 | -16.4 |

Punto di applic. carico verticale: Xv = 2.563 m Yv = .000 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 12.006 | 1.648 | .000 | .000 | .000 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3580.1 | 847.7 | -1138.6 | .0 | .1 | .0 | 1138.6 |
| 2 | 2920.7 | 250.6 | 238.3 | .0 | .0 | .0 | 238.3 |
| 3 | 2261.3 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 4 | 1602.0 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 5 | 942.6 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 6 | 283.2 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 7 | -376.2 | 599.5 | -596.0 | .0 | -.1 | .0 | 596.0 |
| 8 | 3250.4 | 599.5 | -596.0 | .0 | .1 | .0 | 596.0 |
| 9 | 2591.0 | 148.6 | 499.0 | .0 | .0 | .0 | 499.0 |
| 10 | 1931.7 | 148.6 | 499.0 | .0 | .0 | .0 | 499.0 |
| 11 | 1272.3 | 148.6 | 499.0 | .0 | .0 | .0 | 499.0 |
| 12 | 612.9 | 148.6 | 499.0 | .0 | .0 | .0 | 499.0 |
| 13 | -46.5 | 599.5 | -596.0 | .0 | -.1 | .0 | 596.0 |
| 14 | 2920.7 | 727.3 | -880.4 | .0 | .1 | .0 | 880.4 |
| 15 | 2261.3 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 16 | 1602.0 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 17 | 942.6 | 183.3 | 410.1 | .0 | .0 | .0 | 410.1 |
| 18 | 283.2 | 599.5 | -596.1 | .0 | -.1 | .0 | 596.1 |
| 19 | 3580.1 | 847.5 | -1138.2 | .0 | .1 | .0 | 1138.2 |
| 20 | 2920.7 | 250.6 | 238.6 | .0 | .0 | .0 | 238.6 |
| 21 | 2261.3 | 183.3 | 410.3 | .0 | .0 | .0 | 410.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1602.0 | 183.3 | 410.3 | .0 | .0 | .0 | 410.3 |
| 23 | 942.6 | 183.3 | 410.3 | .0 | .0 | .0 | 410.3 |
| 24 | 283.2 | 183.3 | 410.3 | .0 | .0 | .0 | 410.3 |
| 25 | -376.2 | 599.4 | -595.6 | .0 | -.1 | .0 | 595.6 |
| 26 | 3250.4 | 599.4 | -595.6 | .0 | .1 | .0 | 595.6 |
| 27 | 2591.0 | 148.5 | 499.2 | .0 | .0 | .0 | 499.2 |
| 28 | 1931.7 | 148.5 | 499.2 | .0 | .0 | .0 | 499.2 |
| 29 | 1272.3 | 148.5 | 499.2 | .0 | .0 | .0 | 499.2 |
| 30 | 612.9 | 148.5 | 499.2 | .0 | .0 | .0 | 499.2 |
| 31 | -46.5 | 599.4 | -595.6 | .0 | -.1 | .0 | 595.6 |
| 32 | 2920.7 | 727.1 | -879.8 | .0 | .1 | .0 | 879.8 |
| 33 | 2261.3 | 183.3 | 410.4 | .0 | .0 | .0 | 410.4 |
| 34 | 1602.0 | 183.3 | 410.4 | .0 | .0 | .0 | 410.4 |
| 35 | 942.6 | 183.3 | 410.4 | .0 | .0 | .0 | 410.4 |
| 36 | 283.2 | 599.3 | -595.5 | .0 | -.1 | .0 | 595.5 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 43
spalla mobile - n777 _FREQM_13- n789 _FREQM_13

Sollecitazioni Taglianti e Flettenti lungo il fusto del palo 1
(riferimento locale)

| profond. m | Txp kN | Mxp kN*m | Typ kN | Myp kN*m | Tris kN | Mris kN*m |
|---|---|---|---|---|---|---|
| .00 | 847.7 | -1138.6 | .0 | .1 | 847.7 | 1138.6 |
| 1.41 | 692.1 | -61.6 | .0 | .1 | 692.1 | 61.6 |
| 2.81 | 569.7 | 819.5 | .0 | .0 | 569.7 | 819.5 |
| 4.22 | 275.6 | 1449.8 | .0 | .0 | 275.6 | 1449.8 |
| 5.63 | 25.0 | 1640.7 | .0 | .0 | 25.0 | 1640.7 |
| 7.03 | -121.6 | 1556.8 | .0 | .0 | 121.6 | 1556.8 |
| 8.44 | -183.7 | 1325.7 | .0 | .0 | 183.7 | 1325.7 |
| 9.84 | -187.7 | 1062.7 | .0 | .0 | 187.7 | 1062.7 |
| 11.25 | -182.5 | 800.8 | .0 | .0 | 182.5 | 800.8 |
| 13.50 | -154.6 | 405.8 | .0 | .0 | 154.6 | 405.8 |
| 15.75 | -91.5 | 131.2 | .0 | .0 | 91.5 | 131.2 |
| 18.00 | -42.4 | -14.4 | .0 | .0 | 42.4 | 14.4 |
| 20.25 | -11.6 | -70.1 | .0 | .0 | 11.6 | 70.1 |
| 22.50 | 4.3 | -75.4 | .0 | .0 | 4.3 | 75.4 |
| 26.25 | 8.3 | -45.6 | .0 | .0 | 8.3 | 45.6 |
| 30.00 | 5.7 | -18.7 | .0 | .0 | 5.7 | 18.7 |
| 33.75 | 2.4 | -3.4 | .0 | .0 | 2.4 | 3.4 |
| 39.38 | .0 | 1.9 | .0 | .0 | .0 | 1.9 |
| 45.00 | .0 | .0 | .0 | .0 | .0 | .0 |

Tris = (Txp^2 + Typ^2)^0.5
Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 44
spalla mobile - n777 _FREQM_14- n789 _FREQM_14

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28835.3 | 4839.9 | 67468.6 | -13883.8 | -20599.9 | -35951.3 |
| 2 | 28835.3 | 4841.3 | 67472.3 | 13883.8 | 20599.6 | 35950.9 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 9681.2 | 134940.9 | .0 | -.3 | -15.4 |

Punto di applic. carico verticale: Xv = 2.340 m Yv = .000 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 10.136 | 1.455 | .000 | .000 | .000 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3347.6 | 686.3 | -791.1 | .0 | .1 | .0 | 791.1 |
| 2 | 2765.7 | 196.2 | 322.3 | .0 | .0 | .0 | 322.3 |
| 3 | 2183.9 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 4 | 1602.0 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 5 | 1020.1 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 6 | 438.2 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 7 | -143.7 | 481.9 | -349.9 | .0 | -.1 | .0 | 349.9 |
| 8 | 3056.7 | 482.0 | -349.9 | .0 | .1 | .0 | 349.9 |
| 9 | 2474.8 | 113.3 | 528.8 | .0 | .0 | .0 | 528.8 |
| 10 | 1892.9 | 113.3 | 528.8 | .0 | .0 | .0 | 528.8 |
| 11 | 1311.0 | 113.3 | 528.8 | .0 | .0 | .0 | 528.8 |
| 12 | 729.1 | 113.3 | 528.8 | .0 | .0 | .0 | 528.8 |
| 13 | 147.2 | 482.0 | -349.9 | .0 | -.1 | .0 | 349.9 |
| 14 | 2765.7 | 587.1 | -580.9 | .0 | .1 | .0 | 580.9 |
| 15 | 2183.9 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 16 | 1602.0 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 17 | 1020.1 | 141.5 | 458.8 | .0 | .0 | .0 | 458.8 |
| 18 | 438.2 | 482.0 | -349.9 | .0 | -.1 | .0 | 349.9 |
| 19 | 3347.6 | 686.2 | -790.7 | .0 | .1 | .0 | 790.7 |
| 20 | 2765.8 | 196.2 | 322.5 | .0 | .0 | .0 | 322.5 |
| 21 | 2183.9 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1602.0 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |
| 23 | 1020.1 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |
| 24 | 438.2 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |
| 25 | -143.7 | 481.9 | -349.5 | .0 | -.1 | .0 | 349.5 |
| 26 | 3056.7 | 481.9 | -349.5 | .0 | .1 | .0 | 349.5 |
| 27 | 2474.8 | 113.3 | 529.0 | .0 | .0 | .0 | 529.0 |
| 28 | 1892.9 | 113.3 | 529.0 | .0 | .0 | .0 | 529.0 |
| 29 | 1311.0 | 113.3 | 529.0 | .0 | .0 | .0 | 529.0 |
| 30 | 729.1 | 113.3 | 529.0 | .0 | .0 | .0 | 529.0 |
| 31 | 147.2 | 481.9 | -349.5 | .0 | -.1 | .0 | 349.5 |
| 32 | 2765.8 | 587.0 | -580.4 | .0 | .1 | .0 | 580.4 |
| 33 | 2183.9 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |
| 34 | 1602.0 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |
| 35 | 1020.1 | 141.4 | 459.0 | .0 | .0 | .0 | 459.0 |
| 36 | 438.2 | 481.8 | -349.5 | .0 | -.1 | .0 | 349.5 |

Mris  = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 45
spalla mobile - n777 _FREQM_17- n789 _FREQM_17

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31603.9 | 6007.5 | 86768.1 | -15342.3 | -22717.8 | -45368.9 |
| 2 | 31644.7 | 5983.6 | 86867.4 | 15432.3 | 22654.4 | 45556.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63248.6 | 11991.1 | 173635.5 | 90.0 | 373.1 | 443.1 |

Punto di applic. carico verticale: Xv = 2.745 m Yv = .006 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.785 | 12.779 | 1.856 | .043 | .001 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3985.4 | 853.4 | -932.5 | 5.8 | -19.7 | .0 | 932.7 |
| 2 | 3243.1 | 241.4 | 451.3 | 1.7 | -7.9 | .0 | 451.4 |
| 3 | 2500.8 | 173.2 | 620.1 | 1.6 | -7.3 | .0 | 620.1 |
| 4 | 1758.5 | 173.2 | 620.1 | 1.5 | -6.8 | .0 | 620.1 |
| 5 | 1016.1 | 173.2 | 620.1 | 1.4 | -6.2 | .0 | 620.1 |
| 6 | 273.8 | 173.2 | 620.1 | 1.3 | -5.6 | .0 | 620.1 |
| 7 | -468.5 | 597.9 | -383.1 | 3.7 | -12.4 | .0 | 383.3 |
| 8 | 3614.6 | 597.6 | -382.0 | 4.8 | -17.1 | .0 | 382.4 |
| 9 | 2872.3 | 138.0 | 707.0 | 1.7 | -7.6 | .0 | 707.0 |
| 10 | 2130.0 | 138.0 | 707.0 | 1.6 | -7.0 | .0 | 707.0 |
| 11 | 1387.7 | 138.0 | 707.0 | 1.4 | -6.5 | .0 | 707.0 |
| 12 | 645.3 | 138.0 | 707.0 | 1.3 | -5.9 | .0 | 707.0 |
| 13 | -97.0 | 597.6 | -382.0 | 3.3 | -11.5 | .0 | 382.1 |
| 14 | 3243.8 | 728.6 | -668.1 | 5.4 | -18.5 | .0 | 668.3 |
| 15 | 2501.5 | 172.9 | 621.3 | 1.6 | -7.3 | .0 | 621.4 |
| 16 | 1759.2 | 172.9 | 621.3 | 1.5 | -6.8 | .0 | 621.4 |
| 17 | 1016.9 | 172.9 | 621.3 | 1.4 | -6.2 | .0 | 621.4 |
| 18 | 274.5 | 597.3 | -380.9 | 4.0 | -13.6 | .0 | 381.1 |
| 19 | 3982.3 | 856.8 | -944.1 | 5.8 | -19.7 | .0 | 944.3 |
| 20 | 3240.0 | 242.8 | 445.2 | 1.7 | -7.9 | .0 | 445.3 |
| 21 | 2497.7 | 174.3 | 614.8 | 1.6 | -7.3 | .0 | 614.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1755.4 | 174.3 | 614.8 | 1.5 | -6.8 | .0 | 614.9 |
| 23 | 1013.0 | 174.3 | 614.8 | 1.4 | -6.2 | .0 | 614.9 |
| 24 | 270.7 | 174.3 | 614.8 | 1.3 | -5.6 | .0 | 614.8 |
| 25 | -471.6 | 600.5 | -392.7 | 3.7 | -12.4 | .0 | 392.9 |
| 26 | 3610.8 | 600.8 | -393.8 | 4.8 | -17.1 | .0 | 394.2 |
| 27 | 2868.5 | 139.2 | 701.1 | 1.7 | -7.6 | .0 | 701.1 |
| 28 | 2126.2 | 139.2 | 701.1 | 1.6 | -7.0 | .0 | 701.1 |
| 29 | 1383.8 | 139.2 | 701.1 | 1.4 | -6.5 | .0 | 701.1 |
| 30 | 641.5 | 139.2 | 701.1 | 1.3 | -5.9 | .0 | 701.1 |
| 31 | -100.8 | 600.8 | -393.8 | 3.3 | -11.5 | .0 | 394.0 |
| 32 | 3239.3 | 733.0 | -683.7 | 5.4 | -18.5 | .0 | 683.9 |
| 33 | 2497.0 | 174.6 | 613.6 | 1.6 | -7.3 | .0 | 613.6 |
| 34 | 1754.6 | 174.6 | 613.6 | 1.5 | -6.8 | .0 | 613.6 |
| 35 | 1012.3 | 174.6 | 613.6 | 1.4 | -6.2 | .0 | 613.6 |
| 36 | 270.0 | 601.1 | -394.9 | 4.0 | -13.6 | .0 | 395.1 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 46
spalla mobile - n777 _FREQM_18 - n789 _FREQM_18

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 31603.9 | 4957.6 | 81413.1 | -15338.3 | -22768.7 | -41501.2 |
| 2 | 31644.7 | 4933.6 | 81512.4 | 15428.3 | 22705.3 | 41688.7 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 63248.6 | 9891.2 | 162925.5 | 90.0 | 373.2 | 444.3 |

Punto di applic. carico verticale: Xv = 2.576 m Yv = .006 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.785 | 11.222 | 1.694 | .043 | .001 | .001 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3791.7 | 719.0 | -642.9 | 5.8 | -19.7 | .0 | 643.2 |
| 2 | 3113.9 | 196.1 | 521.3 | 1.7 | -7.9 | .0 | 521.3 |
| 3 | 2436.2 | 138.3 | 660.7 | 1.6 | -7.3 | .0 | 660.7 |
| 4 | 1758.5 | 138.3 | 660.7 | 1.5 | -6.8 | .0 | 660.7 |
| 5 | 1080.7 | 138.3 | 660.7 | 1.4 | -6.2 | .0 | 660.7 |
| 6 | 403.0 | 138.3 | 660.7 | 1.3 | -5.6 | .0 | 660.7 |
| 7 | -274.8 | 500.0 | -178.0 | 3.7 | -12.3 | .0 | 178.4 |
| 8 | 3453.2 | 499.7 | -176.9 | 4.8 | -17.1 | .0 | 177.7 |
| 9 | 2775.4 | 108.6 | 731.9 | 1.7 | -7.6 | .0 | 732.0 |
| 10 | 2097.7 | 108.6 | 731.9 | 1.6 | -7.0 | .0 | 731.9 |
| 11 | 1419.9 | 108.6 | 731.9 | 1.4 | -6.5 | .0 | 731.9 |
| 12 | 742.2 | 108.6 | 731.9 | 1.3 | -5.9 | .0 | 731.9 |
| 13 | 64.5 | 499.7 | -176.9 | 3.3 | -11.5 | .0 | 177.2 |
| 14 | 3114.6 | 611.8 | -418.4 | 5.4 | -18.5 | .0 | 418.9 |
| 15 | 2436.9 | 138.1 | 661.9 | 1.6 | -7.3 | .0 | 662.0 |
| 16 | 1759.2 | 138.1 | 661.9 | 1.5 | -6.8 | .0 | 661.9 |
| 17 | 1081.4 | 138.1 | 661.9 | 1.4 | -6.2 | .0 | 661.9 |
| 18 | 403.7 | 499.4 | -175.8 | 4.0 | -13.6 | .0 | 176.3 |
| 19 | 3788.6 | 722.3 | -654.5 | 5.8 | -19.7 | .0 | 654.8 |
| 20 | 3110.8 | 197.4 | 515.1 | 1.7 | -7.9 | .0 | 515.2 |
| 21 | 2433.1 | 139.4 | 655.4 | 1.6 | -7.3 | .0 | 655.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1755.4 | 139.4 | 655.4 | 1.5 | -6.8 | .0 | 655.4 |
| 23 | 1077.6 | 139.4 | 655.4 | 1.4 | -6.2 | .0 | 655.4 |
| 24 | 399.9 | 139.4 | 655.4 | 1.3 | -5.6 | .0 | 655.4 |
| 25 | -277.9 | 502.6 | -187.6 | 3.7 | -12.3 | .0 | 188.0 |
| 26 | 3449.3 | 502.9 | -188.7 | 4.8 | -17.1 | .0 | 189.5 |
| 27 | 2771.6 | 109.8 | 726.0 | 1.7 | -7.6 | .0 | 726.0 |
| 28 | 2093.9 | 109.8 | 726.0 | 1.6 | -7.0 | .0 | 726.0 |
| 29 | 1416.1 | 109.8 | 726.0 | 1.4 | -6.5 | .0 | 726.0 |
| 30 | 738.4 | 109.8 | 726.0 | 1.3 | -5.9 | .0 | 726.0 |
| 31 | 60.7 | 502.9 | -188.7 | 3.3 | -11.5 | .0 | 189.1 |
| 32 | 3110.1 | 616.2 | -434.1 | 5.4 | -18.5 | .0 | 434.5 |
| 33 | 2432.4 | 139.7 | 654.2 | 1.6 | -7.3 | .0 | 654.2 |
| 34 | 1754.6 | 139.7 | 654.2 | 1.5 | -6.8 | .0 | 654.2 |
| 35 | 1076.9 | 139.7 | 654.2 | 1.4 | -6.2 | .0 | 654.2 |
| 36 | 399.2 | 503.2 | -189.8 | 4.0 | -13.6 | .0 | 190.3 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 47
spalla mobile - n777 _PERMM_1- n789 _PERMM_1

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28835.3 | 5994.8 | 73359.1 | -13888.2 | -20543.9 | -40205.7 |
| 2 | 28835.3 | 5996.3 | 73362.8 | 13888.2 | 20543.6 | 40205.3 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 11991.1 | 146721.9 | .0 | -.3 | -16.4 |

Punto di applic. carico verticale: Xv = 2.544 m Yv = .000 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 11.850 | 1.632 | .000 | .000 | .000 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3560.8 | 834.2 | -1109.7 | .0 | .1 | .0 | 1109.7 |
| 2 | 2907.8 | 246.1 | 245.3 | .0 | .0 | .0 | 245.3 |
| 3 | 2254.9 | 179.8 | 414.2 | .0 | .0 | .0 | 414.2 |
| 4 | 1602.0 | 179.8 | 414.2 | .0 | .0 | .0 | 414.2 |
| 5 | 949.0 | 179.8 | 414.2 | .0 | .0 | .0 | 414.2 |
| 6 | 296.1 | 179.8 | 414.2 | .0 | .0 | .0 | 414.2 |
| 7 | -356.8 | 589.7 | -575.5 | .0 | -.1 | .0 | 575.5 |
| 8 | 3234.3 | 589.7 | -575.5 | .0 | .1 | .0 | 575.5 |
| 9 | 2581.4 | 145.7 | 501.4 | .0 | .0 | .0 | 501.4 |
| 10 | 1928.4 | 145.7 | 501.4 | .0 | .0 | .0 | 501.4 |
| 11 | 1275.5 | 145.7 | 501.4 | .0 | .0 | .0 | 501.4 |
| 12 | 622.6 | 145.7 | 501.4 | .0 | .0 | .0 | 501.4 |
| 13 | -30.4 | 589.7 | -575.5 | .0 | -.1 | .0 | 575.5 |
| 14 | 2907.8 | 715.6 | -855.5 | .0 | .1 | .0 | 855.5 |
| 15 | 2254.9 | 179.9 | 414.1 | .0 | .0 | .0 | 414.1 |
| 16 | 1602.0 | 179.9 | 414.1 | .0 | .0 | .0 | 414.1 |
| 17 | 949.0 | 179.9 | 414.1 | .0 | .0 | .0 | 414.1 |
| 18 | 296.1 | 589.7 | -575.6 | .0 | -.1 | .0 | 575.6 |
| 19 | 3560.8 | 834.1 | -1109.3 | .0 | .1 | .0 | 1109.3 |
| 20 | 2907.8 | 246.1 | 245.5 | .0 | .0 | .0 | 245.5 |
| 21 | 2254.9 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1602.0 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |
| 23 | 949.0 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |
| 24 | 296.1 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |
| 25 | -356.8 | 589.6 | -575.1 | .0 | -.1 | .0 | 575.1 |
| 26 | 3234.3 | 589.6 | -575.1 | .0 | .1 | .0 | 575.1 |
| 27 | 2581.4 | 145.6 | 501.7 | .0 | .0 | .0 | 501.7 |
| 28 | 1928.4 | 145.6 | 501.7 | .0 | .0 | .0 | 501.7 |
| 29 | 1275.5 | 145.6 | 501.7 | .0 | .0 | .0 | 501.7 |
| 30 | 622.6 | 145.6 | 501.7 | .0 | .0 | .0 | 501.7 |
| 31 | -30.4 | 589.6 | -575.1 | .0 | -.1 | .0 | 575.1 |
| 32 | 2907.8 | 715.4 | -854.9 | .0 | .1 | .0 | 854.9 |
| 33 | 2254.9 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |
| 34 | 1602.0 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |
| 35 | 949.0 | 179.8 | 414.4 | .0 | .0 | .0 | 414.4 |
| 36 | 296.1 | 589.5 | -575.0 | .0 | -.1 | .0 | 575.0 |

Mris = (Mxp^2 + Myp^2)^0.5

NODO DI BOLOGNA CAVALCAVIA
spalla mobile- SLE RARA FREQ QP

CONDIZIONE DI CARICO 48
spalla mobile - n777 _PERMM_2- n789 _PERMM_2

Coordinate Centri di Carico (c.c.)

| c.c. | Xc m | Yc m | Zc m | Alfc deg |
|---|---|---|---|---|
| 1 | .000 | -10.700 | .000 | .00 |
| 2 | .000 | 10.700 | .000 | .00 |

Componenti di Azioni Esterne riferite ai Centri di Carico

| c.c. | Fzc kN | Fxc kN | Mxc kN*m | Fyc kN | Myc kN*m | Mzc kN*m |
|---|---|---|---|---|---|---|
| 1 | 28835.3 | 4944.9 | 68004.1 | -13884.2 | -20594.8 | -36338.1 |
| 2 | 28835.3 | 4946.3 | 68007.8 | 13884.2 | 20594.6 | 36337.6 |

Componenti di Carico Risultanti (riferimento globale)

| Fz kN | Fx kN | Mx kN*m | Fy kN | My kN*m | Mz kN*m |
|---|---|---|---|---|---|
| 57670.6 | 9891.2 | 136011.9 | .0 | -.2 | -15.5 |

Punto di applic. carico verticale: Xv = 2.358 m Yv = .000 m

Componenti di Spostamento del Plinto (riferimento globale)

| dz mm | dx mm | rx mRad | dy mm | ry mRad | rz mRad |
|---|---|---|---|---|---|
| 8.010 | 10.292 | 1.471 | .000 | .000 | .000 |

Sollecitazioni in Sommita' ai Singoli Pali (riferimento locale)

| palo | Fzp kN | Fxp kN | Mxp kN*m | Fyp kN | Myp kN*m | Mzp kN*m | Mris kN*m |
|---|---|---|---|---|---|---|---|
| 1 | 3367.0 | 699.8 | -820.1 | .0 | .1 | .0 | 820.1 |
| 2 | 2778.7 | 200.8 | 315.3 | .0 | .0 | .0 | 315.3 |
| 3 | 2190.3 | 145.0 | 454.8 | .0 | .0 | .0 | 454.8 |
| 4 | 1602.0 | 145.0 | 454.8 | .0 | .0 | .0 | 454.8 |
| 5 | 1013.6 | 145.0 | 454.8 | .0 | .0 | .0 | 454.8 |
| 6 | 425.3 | 145.0 | 454.8 | .0 | .0 | .0 | 454.8 |
| 7 | -163.1 | 491.7 | -370.4 | .0 | -.1 | .0 | 370.4 |
| 8 | 3072.8 | 491.8 | -370.4 | .0 | .1 | .0 | 370.4 |
| 9 | 2484.5 | 116.2 | 526.3 | .0 | .0 | .0 | 526.3 |
| 10 | 1896.1 | 116.2 | 526.3 | .0 | .0 | .0 | 526.3 |
| 11 | 1307.8 | 116.2 | 526.3 | .0 | .0 | .0 | 526.3 |
| 12 | 719.4 | 116.2 | 526.3 | .0 | .0 | .0 | 526.3 |
| 13 | 131.1 | 491.8 | -370.4 | .0 | -.1 | .0 | 370.4 |
| 14 | 2778.7 | 598.8 | -605.9 | .0 | .1 | .0 | 605.9 |
| 15 | 2190.3 | 145.0 | 454.7 | .0 | .0 | .0 | 454.7 |
| 16 | 1602.0 | 145.0 | 454.7 | .0 | .0 | .0 | 454.7 |
| 17 | 1013.6 | 145.0 | 454.7 | .0 | .0 | .0 | 454.7 |
| 18 | 425.3 | 491.8 | -370.4 | .0 | -.1 | .0 | 370.4 |
| 19 | 3367.0 | 699.7 | -819.7 | .0 | .1 | .0 | 819.7 |
| 20 | 2778.7 | 200.7 | 315.5 | .0 | .0 | .0 | 315.5 |
| 21 | 2190.3 | 144.9 | 454.9 | .0 | .0 | .0 | 454.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 1602.0 | 144.9 | 454.9 | .0 | .0 | .0 | 454.9 |
| 23 | 1013.6 | 144.9 | 454.9 | .0 | .0 | .0 | 454.9 |
| 24 | 425.3 | 144.9 | 454.9 | .0 | .0 | .0 | 454.9 |
| 25 | -163.1 | 491.7 | -370.0 | .0 | -.1 | .0 | 370.0 |
| 26 | 3072.8 | 491.6 | -370.0 | .0 | .1 | .0 | 370.0 |
| 27 | 2484.5 | 116.2 | 526.6 | .0 | .0 | .0 | 526.6 |
| 28 | 1896.1 | 116.2 | 526.6 | .0 | .0 | .0 | 526.6 |
| 29 | 1307.8 | 116.2 | 526.6 | .0 | .0 | .0 | 526.6 |
| 30 | 719.4 | 116.2 | 526.6 | .0 | .0 | .0 | 526.6 |
| 31 | 131.1 | 491.6 | -370.0 | .0 | -.1 | .0 | 370.0 |
| 32 | 2778.7 | 598.7 | -605.3 | .0 | .1 | .0 | 605.3 |
| 33 | 2190.3 | 144.9 | 455.0 | .0 | .0 | .0 | 455.0 |
| 34 | 1602.0 | 144.9 | 455.0 | .0 | .0 | .0 | 455.0 |
| 35 | 1013.6 | 144.9 | 455.0 | .0 | .0 | .0 | 455.0 |
| 36 | 425.3 | 491.6 | -370.0 | .0 | -.1 | .0 | 370.0 |

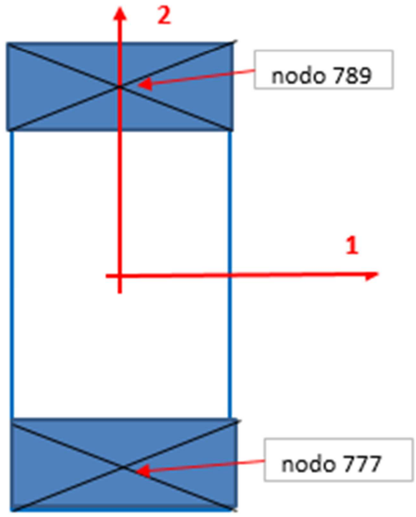
Mris = (Mxp^2 + Myp^2)^0.5

# 10 APPENDICE C. CARICHI AGENTI IN FONDAZIONE

## 10.1 Spalla appoggi fissi

| | |
|---|---|
| F1 (kN) | Forza direzione longitudinale |
| F2 (kN) | Forza direzione trasversale |
| F3 (kN) | Forza direzione verticale |
| M1 (kNm) | Momento direzione trasversale (rotazione asse 1) |
| M2 (kNm) | Momento direzione longitudinale (rotazione asse 2) |
| M1 (kNm) | Momento direzione verticale (rotazione asse 3) |

NOTA: asse 1, 2, 3 terna destrorsa, scarichi a quota testa palo



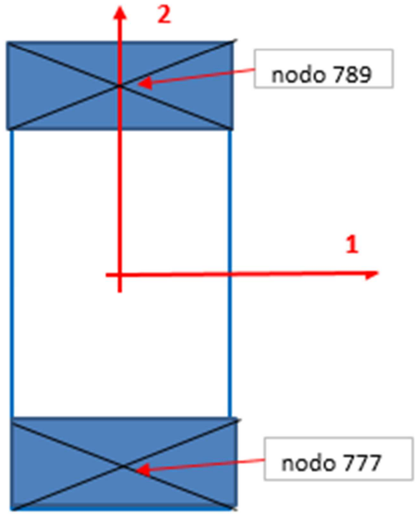
| Azioni Joint | 777 | | | | | | |
|---|---|---|---|---|---|---|---|
| OutputCase | CaseType | F1 | F2 | F3 | M1 | M2 | M3 |
| Text | Text | KN | KN | KN | KN-m | KN-m | KN-m |
| STR1 | Combination | 7603 | -15917 | -37144 | -59480 | 62305 | -40366 |
| STR2 | Combination | 6605 | -22759 | -50794 | -85136 | 122921 | -59791 |
| STR3 | Combination | 7286 | -21533 | -48499 | -81113 | 113881 | -56695 |
| STR4 | Combination | 4634 | -23161 | -50109 | -82538 | 116022 | -59427 |
| STR5 | Combination | 7603 | -15917 | -37144 | -59480 | 62305 | -40366 |
| STR6 | Combination | 5020 | -21985 | -48485 | -79520 | 109526 | -57304 |
| STR7 | Combination | 9969 | -21756 | -48824 | -81904 | 130711 | -71664 |
| STR8 | Combination | 3372 | -21983 | -48825 | -80864 | 97076 | -42089 |
| STR9 | Combination | 9969 | -21756 | -48824 | -81904 | 130711 | -71664 |
| STR10 | Combination | 3372 | -21983 | -48825 | -80864 | 97076 | -42089 |
| STR11 | Combination | 6419 | -21605 | -48517 | -80975 | 109540 | -52881 |
| STR12 | Combination | 7250 | -22945 | -50053 | -82953 | 129070 | -70870 |
| Sis1 | Combination | 25526 | -7204 | -24907 | -44541 | 132712 | -102732 |
| Sis2 | Combination | -3992 | -15488 | -34765 | -55588 | 45142 | -11800 |
| Sis3 | Combination | 22931 | -6224 | -25195 | -46514 | 101920 | -64654 |
| Sis4 | Combination | -1446 | -16810 | -35141 | -54841 | 78870 | -50832 |
| Sis5 | Combination | 22987 | -6021 | -24688 | -45568 | 99862 | -64167 |
| Sis6 | Combination | -1379 | -16607 | -34862 | -54323 | 77753 | -50467 |
| Sis7 | Combination | 25936 | -7545 | -25651 | -46008 | 138348 | -105822 |
| Sis8 | Combination | -5199 | -15500 | -34678 | -55229 | 38589 | -6271 |
| Sis9 | Combination | 25936 | -7545 | -25651 | -46008 | 138348 | -105822 |
| Sis10 | Combination | -5199 | -15500 | -34678 | -55229 | 38589 | -6271 |
| Sis11 | Combination | 22782 | -6236 | -25199 | -46490 | 101172 | -63997 |
| Sis12 | Combination | -995 | -16773 | -35131 | -54913 | 81119 | -52805 |
| Sis13 | Combination | 21350 | -3126 | -24083 | -46856 | 121371 | -88191 |
| Sis14 | Combination | -8168 | -11410 | -33941 | -57903 | 33801 | 2741 |
| Sis15 | Combination | 18755 | -2146 | -24372 | -48829 | 90579 | -50113 |
| Sis16 | Combination | -5622 | -12732 | -34317 | -57156 | 67528 | -36291 |
| Sis17 | Combination | 18810 | -1943 | -23864 | -47883 | 88521 | -49626 |
| Sis18 | Combination | -5556 | -12530 | -34038 | -56637 | 66412 | -35926 |
| Sis19 | Combination | 21760 | -3467 | -24828 | -48323 | 127007 | -91281 |
| Sis20 | Combination | -9375 | -11423 | -33855 | -57544 | 27248 | 8270 |
| Sis21 | Combination | 21760 | -3467 | -24828 | -48323 | 127007 | -91281 |
| Sis22 | Combination | -9375 | -11423 | -33855 | -57544 | 27248 | 8270 |
| Sis23 | Combination | 18605 | -2159 | -24375 | -48805 | 89831 | -49455 |
| Sis24 | Combination | -5172 | -12695 | -34308 | -57228 | 69778 | -38263 |
| FESS_1 | Combination | 5093 | -14299 | -32384 | -53438 | 69613 | -36567 |
| FESS_2 | Combination | 4258 | -15286 | -34465 | -57078 | 76104 | -37535 |
| FESS_3 | Combination | 5093 | -14299 | -32384 | -53438 | 69613 | -36567 |
| FESS_4 | Combination | 3330 | -15365 | -33449 | -54389 | 71021 | -38366 |
| FESS_5 | Combination | 4883 | -14422 | -32553 | -53724 | 69407 | -36005 |
| FESS_6 | Combination | 3154 | -15488 | -34345 | -56033 | 73811 | -38192 |
| FESS_7 | Combination | 6243 | -14833 | -33642 | -55833 | 82304 | -45062 |
| FESS_8 | Combination | 2716 | -14954 | -33642 | -55277 | 64322 | -29249 |
| FESS_9 | Combination | 6243 | -14833 | -33642 | -55833 | 82304 | -45062 |
| FESS_10 | Combination | 2716 | -14954 | -33642 | -55277 | 64322 | -29249 |
| FESS_11 | Combination | 4848 | -14307 | -32384 | -53399 | 68358 | -35462 |
| FESS_12 | Combination | 4305 | -15239 | -33408 | -54545 | 75774 | -42522 |
| RARA_1 | Combination | 5005 | -14035 | -31948 | -52585 | 66960 | -35261 |
| RARA_2 | Combination | 4411 | -16272 | -36491 | -60944 | 86613 | -41719 |
| RARA_3 | Combination | 4868 | -15433 | -34915 | -58176 | 80389 | -39597 |
| RARA_4 | Combination | 3099 | -16522 | -35990 | -59125 | 81820 | -41423 |
| RARA_5 | Combination | 5092 | -14622 | -32886 | -54397 | 72162 | -37650 |
| RARA_7 | Combination | 6716 | -15581 | -35133 | -58712 | 91913 | -49844 |
| RARA_8 | Combination | 2239 | -15735 | -35133 | -58007 | 69085 | -29771 |
| RARA_9 | Combination | 6716 | -15581 | -35133 | -58712 | 91913 | -49844 |
| RARA_10 | Combination | 2239 | -15735 | -35133 | -58007 | 69085 | -29771 |
| RARA_11 | Combination | 4270 | -15482 | -34928 | -58080 | 77394 | -36966 |
| RARA_12 | Combination | 6832 | -19493 | -43423 | -70554 | 93640 | -55311 |
| FREQ_1 | Combination | 4907 | -13822 | -31478 | -51478 | 65326 | -35669 |
| FREQ_2 | Combination | 4060 | -15566 | -34773 | -57416 | 78147 | -39491 |
| FREQ_3 | Combination | 4039 | -14308 | -31990 | -51957 | 65984 | -36515 |
| FREQ_4 | Combination | 4119 | -15112 | -33398 | -54859 | 72286 | -38025 |
| FREQ_5 | Combination | 4128 | -15228 | -34358 | -56549 | 76145 | -38641 |
| FREQ_6 | Combination | 5371 | -15434 | -34513 | -57117 | 83635 | -45020 |
| FREQ_7 | Combination | 2538 | -15531 | -34513 | -56670 | 69192 | -32320 |
| PERM_1 | Combination | 4473 | -14065 | -31734 | -51718 | 65655 | -36092 |
| PERM_2 | Combination | 3424 | -14101 | -31734 | -51552 | 60301 | -31383 |

| Azioni Joint 789 | | | | | | | |
|---|---|---|---|---|---|---|---|
| OutputCase | CaseType | F1 | F2 | F3 | M1 | M2 | M3 |
| Text | Text | KN | KN | KN | KN-m | KN-m | KN-m |
| STR1 | Combination | 6044 | 16817 | -38066 | 59892 | 63501 | 42602 |
| STR2 | Combination | 4975 | 23877 | -51542 | 84927 | 123228 | 62280 |
| STR3 | Combination | 4638 | 23207 | -50109 | 81701 | 116034 | 60715 |
| STR4 | Combination | 7290 | 21487 | -48499 | 81949 | 113893 | 55447 |
| STR5 | Combination | 6044 | 16817 | -38066 | 59892 | 63501 | 42602 |
| STR6 | Combination | 7612 | 20311 | -45556 | 76470 | 101964 | 52630 |
| STR7 | Combination | 8383 | 22743 | -49783 | 82267 | 131987 | 74077 |
| STR8 | Combination | 1790 | 22970 | -49783 | 81226 | 98353 | 44450 |
| STR9 | Combination | 8383 | 22743 | -49783 | 82267 | 131987 | 74077 |
| STR10 | Combination | 1790 | 22970 | -49783 | 81226 | 98353 | 44450 |
| STR11 | Combination | 3783 | 23192 | -50090 | 81611 | 111593 | 56734 |
| STR12 | Combination | 9842 | 21532 | -48554 | 82218 | 127202 | 67397 |
| Sis1 | Combination | 20402 | 14712 | -28417 | 42045 | 135382 | 112340 |
| Sis2 | Combination | 1205 | 15118 | -32745 | 53989 | 42953 | 3875 |
| Sis3 | Combination | 5891 | 19307 | -33768 | 45219 | 106146 | 87896 |
| Sis4 | Combination | 15676 | 10821 | -27980 | 51957 | 74840 | 29157 |
| Sis5 | Combination | 5957 | 19104 | -33488 | 44699 | 105024 | 87530 |
| Sis6 | Combination | 15731 | 10618 | -27474 | 51014 | 72787 | 28672 |
| Sis7 | Combination | 20806 | 15053 | -29066 | 43334 | 140624 | 115382 |
| Sis8 | Combination | 3 | 15116 | -32689 | 53707 | 36535 | -1672 |
| Sis9 | Combination | 20806 | 15053 | -29066 | 43334 | 140624 | 115382 |
| Sis10 | Combination | 3 | 15116 | -32689 | 53707 | 36535 | -1672 |
| Sis11 | Combination | 5743 | 19304 | -33765 | 45204 | 105380 | 87209 |
| Sis12 | Combination | 16116 | 10829 | -27990 | 52003 | 77135 | 31217 |
| Sis13 | Combination | 16302 | 18910 | -29240 | 39479 | 124218 | 99439 |
| Sis14 | Combination | -2895 | 19317 | -33568 | 51422 | 31789 | -9026 |
| Sis15 | Combination | 1791 | 23505 | -34592 | 42653 | 94982 | 74995 |
| Sis16 | Combination | 11576 | 15019 | -28804 | 49391 | 63676 | 16256 |
| Sis17 | Combination | 1857 | 23302 | -34311 | 42132 | 93860 | 74629 |
| Sis18 | Combination | 11631 | 14817 | -28297 | 48447 | 61622 | 15771 |
| Sis19 | Combination | 16706 | 19251 | -29890 | 40768 | 129460 | 102481 |
| Sis20 | Combination | -4097 | 19315 | -33512 | 51141 | 25371 | -14573 |
| Sis21 | Combination | 16706 | 19251 | -29890 | 40768 | 129460 | 102481 |
| Sis22 | Combination | -4097 | 19315 | -33512 | 51141 | 25371 | -14573 |
| Sis23 | Combination | 1643 | 23503 | -34588 | 42637 | 94216 | 74308 |
| Sis24 | Combination | 12016 | 15027 | -28814 | 49437 | 65971 | 18316 |
| FESS_1 | Combination | 3362 | 15395 | -34059 | 54979 | 73539 | 39535 |
| FESS_2 | Combination | 3189 | 15976 | -35007 | 57095 | 76532 | 39125 |
| FESS_3 | Combination | 3362 | 15395 | -34059 | 54979 | 73539 | 39535 |
| FESS_4 | Combination | 5124 | 14269 | -32994 | 55123 | 72130 | 36075 |
| FESS_5 | Combination | 3154 | 15518 | -34345 | 55485 | 73813 | 39034 |
| FESS_6 | Combination | 4885 | 14392 | -32553 | 54271 | 69415 | 35191 |
| FESS_7 | Combination | 5182 | 15505 | -34287 | 56067 | 83169 | 46693 |
| FESS_8 | Combination | 1656 | 15626 | -34287 | 55511 | 65186 | 30853 |
| FESS_9 | Combination | 5182 | 15505 | -34287 | 56067 | 83169 | 46693 |
| FESS_10 | Combination | 1656 | 15626 | -34287 | 55511 | 65186 | 30853 |
| FESS_11 | Combination | 3113 | 15403 | -34058 | 54940 | 72279 | 38428 |
| FESS_12 | Combination | 6050 | 14335 | -33034 | 55171 | 77072 | 40597 |
| RARA_1 | Combination | 3273 | 15095 | -33379 | 53719 | 69909 | 38040 |
| RARA_2 | Combination | 3322 | 17022 | -36985 | 60790 | 86795 | 43383 |
| RARA_3 | Combination | 3102 | 16553 | -35990 | 58565 | 81828 | 42284 |
| RARA_4 | Combination | 4871 | 15402 | -34915 | 58735 | 80397 | 38761 |
| RARA_5 | Combination | 3367 | 15742 | -34870 | 56484 | 77345 | 40822 |
| RARA_7 | Combination | 5658 | 16241 | -35773 | 58953 | 92765 | 51456 |
| RARA_8 | Combination | 1183 | 16395 | -35773 | 58247 | 69938 | 31348 |
| RARA_9 | Combination | 5658 | 16241 | -35773 | 58953 | 92765 | 51456 |
| RARA_10 | Combination | 1183 | 16395 | -35773 | 58247 | 69938 | 31348 |
| RARA_11 | Combination | 2512 | 16542 | -35978 | 58503 | 78764 | 39537 |
| RARA_12 | Combination | 8561 | 18553 | -42424 | 70063 | 92400 | 53008 |
| FREQ_1 | Combination | 4041 | 14322 | -31990 | 51707 | 65991 | 36911 |
| FREQ_2 | Combination | 4033 | 15656 | -34700 | 57158 | 77784 | 39614 |
| FREQ_3 | Combination | 4909 | 13808 | -31478 | 51728 | 65332 | 35308 |
| FREQ_4 | Combination | 4130 | 15232 | -34358 | 56488 | 76151 | 38746 |
| FREQ_5 | Combination | 4120 | 15108 | -33398 | 54918 | 72291 | 37949 |
| FREQ_6 | Combination | 5359 | 15479 | -34532 | 57091 | 83683 | 45128 |
| FREQ_7 | Combination | 2528 | 15576 | -34532 | 56644 | 69240 | 32406 |
| PERM_1 | Combination | 4475 | 14065 | -31734 | 51718 | 65662 | 36110 |
| PERM_2 | Combination | 3425 | 14101 | -31734 | 51552 | 60306 | 31393 |

## 10.2 Spalla appoggi mobili

| | |
|---|---|
| F1 (kN) | Forza direzione longitudinale |
| F2 (kN) | Forza direzione trasversale |
| F3 (kN) | Forza direzione verticale |
| M1 (kNm) | Momento direzione trasversale (rotazione asse 1) |
| M2 (kNm) | Momento direzione longitudinale (rotazione asse 2) |
| M1 (kNm) | Momento direzione verticale (rotazione asse 3) |

NOTA: asse 1, 2, 3 terna destrorsa, scarichi a quota testa palo



| Azioni Joint | 777 | | | | | | | Azioni Joint | 789 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OutputCase | CaseType | F1 | F2 | F3 | M1 | M2 | M3 | OutputCase | CaseType | F1 | F2 | F3 | M1 | M2 | M3 |
| Text | Text | KN | KN | KN | KN-m | KN-m | KN-m | Text | Text | KN | KN | KN | KN-m | KN-m | KN-m |
| STRM1 | Combination | 6884 | -16092 | -37243 | -59467 | 61622 | -40695 | STRM1 | Combination | 6763 | 16632 | -37967 | 60085 | 64185 | 41998 |
| STRM2 | Combination | 4995 | -16157 | -37243 | -59169 | 51984 | -32219 | STRM2 | Combination | 4872 | 16697 | -37967 | 59787 | 54544 | 33508 |
| STRM3 | Combination | 6921 | -22899 | -50892 | -85285 | 127506 | -64754 | STRM3 | Combination | 6726 | 23657 | -51443 | 85285 | 129184 | 66319 |
| STRM4 | Combination | 5032 | -22964 | -50892 | -84987 | 117869 | -56278 | STRM4 | Combination | 4835 | 23722 | -51443 | 84987 | 119543 | 57829 |
| STRM5 | Combination | 6884 | -16092 | -37243 | -59467 | 61622 | -40695 | STRM5 | Combination | 6763 | 16632 | -37967 | 60085 | 64185 | 41998 |
| STRM6 | Combination | 5061 | -21860 | -48664 | -80929 | 107499 | -52630 | STRM6 | Combination | 4806 | 22934 | -49944 | 81860 | 111925 | 55089 |
| STRM7 | Combination | 6694 | -22839 | -49944 | -82695 | 121557 | -62742 | STRM7 | Combination | 6953 | 21765 | -48664 | 81763 | 117146 | 60323 |
| STRM8 | Combination | 4805 | -22905 | -49944 | -82398 | 111919 | -54266 | STRM8 | Combination | 5062 | 21831 | -48664 | 81464 | 107505 | 51833 |
| STRM9 | Combination | 6918 | -20631 | -45742 | -75732 | 103490 | -56709 | STRM9 | Combination | 6728 | 21705 | -48299 | 79046 | 113179 | 59859 |
| STRM10 | Combination | 5029 | -20696 | -45742 | -75434 | 93853 | -48234 | STRM10 | Combination | 4838 | 21770 | -48299 | 78748 | 103538 | 51369 |
| STRM11 | Combination | 6726 | -21676 | -48299 | -79583 | 113169 | -59021 | STRM11 | Combination | 6921 | 20602 | -45742 | 76268 | 103500 | 55927 |
| STRM12 | Combination | 4837 | -21741 | -48299 | -79285 | 103532 | -50545 | STRM12 | Combination | 5030 | 20667 | -45742 | 75970 | 93859 | 47437 |
| STRM13 | Combination | 7514 | -19285 | -43550 | -71453 | 95266 | -54732 | STRM13 | Combination | 7393 | 19825 | -44274 | 72072 | 97830 | 56038 |
| STRM14 | Combination | 4365 | -19393 | -43550 | -70957 | 79203 | -40605 | STRM14 | Combination | 4242 | 19933 | -44274 | 71574 | 81762 | 41887 |
| STRM17 | Combination | 6884 | -19306 | -43550 | -71354 | 92053 | -51906 | STRM17 | Combination | 6762 | 19846 | -44274 | 71972 | 94616 | 53208 |
| STRM18 | Combination | 4995 | -19371 | -43550 | -71056 | 82416 | -43431 | STRM18 | Combination | 4872 | 19911 | -44274 | 71674 | 84975 | 44718 |
| SisM1 | Combination | 11274 | -8373 | -25587 | -43378 | 71153 | -50535 | SisM1 | Combination | 10549 | 14925 | -28873 | 42027 | 79491 | 57634 |
| SisM2 | Combination | 10224 | -8409 | -25587 | -43213 | 65798 | -45826 | SisM2 | Combination | 9499 | 14961 | -28873 | 41861 | 74135 | 52918 |
| SisM3 | Combination | 10513 | -14310 | -34087 | -56794 | 107998 | -65131 | SisM3 | Combination | 11309 | 14896 | -32286 | 54044 | 100126 | 59714 |
| SisM4 | Combination | 9464 | -14346 | -34087 | -56629 | 102644 | -60422 | SisM4 | Combination | 10259 | 14932 | -32286 | 53879 | 94770 | 54997 |
| SisM5 | Combination | 11771 | -7321 | -25196 | -44437 | 72467 | -50797 | SisM5 | Combination | 10052 | 17963 | -32937 | 45849 | 95902 | 66986 |
| SisM6 | Combination | 10721 | -7357 | -25196 | -44271 | 67113 | -46088 | SisM6 | Combination | 9001 | 17999 | -32937 | 45684 | 90546 | 62270 |
| SisM7 | Combination | 10011 | -15703 | -35140 | -56966 | 109840 | -66022 | SisM7 | Combination | 11811 | 12155 | -28811 | 51374 | 86600 | 51401 |
| SisM8 | Combination | 8962 | -15739 | -35140 | -56800 | 104486 | -61313 | SisM8 | Combination | 10761 | 12191 | -28811 | 51209 | 81244 | 46684 |
| SisM9 | Combination | 11766 | -7120 | -24693 | -43490 | 70114 | -50039 | SisM9 | Combination | 10057 | 17762 | -32654 | 45313 | 94456 | 66345 |
| SisM10 | Combination | 10716 | -7156 | -24693 | -43324 | 64760 | -45330 | SisM10 | Combination | 9007 | 17798 | -32654 | 45147 | 89100 | 61628 |
| SisM11 | Combination | 10017 | -15502 | -34857 | -56429 | 108393 | -65380 | SisM11 | Combination | 11806 | 11954 | -28308 | 50427 | 84248 | 50643 |
| SisM12 | Combination | 8967 | -15539 | -34857 | -56264 | 103039 | -60672 | SisM12 | Combination | 10756 | 11990 | -28308 | 50261 | 78892 | 45926 |
| SisM13 | Combination | 11278 | -8721 | -26327 | -44778 | 74699 | -51790 | SisM13 | Combination | 10545 | 15288 | -29528 | 43247 | 82673 | 58869 |
| SisM14 | Combination | 10228 | -8757 | -26327 | -44613 | 69345 | -47081 | SisM14 | Combination | 9494 | 15325 | -29528 | 43082 | 77317 | 54152 |
| SisM17 | Combination | 11278 | -8721 | -26327 | -44778 | 74699 | -51790 | SisM17 | Combination | 10545 | 15288 | -29528 | 43247 | 82673 | 58869 |
| SisM18 | Combination | 10228 | -8757 | -26327 | -44613 | 69345 | -47081 | SisM18 | Combination | 9494 | 15325 | -29528 | 43082 | 77317 | 54152 |
| SisM21 | Combination | 7097 | -4295 | -24763 | -45693 | 59811 | -35994 | SisM21 | Combination | 6449 | 19124 | -29697 | 39460 | 68327 | 44734 |
| SisM22 | Combination | 6048 | -4332 | -24763 | -45528 | 54457 | -31285 | SisM22 | Combination | 5399 | 19160 | -29697 | 39295 | 62971 | 40017 |
| SisM23 | Combination | 6337 | -10232 | -33263 | -59109 | 96657 | -50590 | SisM23 | Combination | 7210 | 19095 | -33110 | 51478 | 88961 | 46813 |
| SisM24 | Combination | 5287 | -10268 | -33263 | -58944 | 91303 | -45881 | SisM24 | Combination | 6159 | 19131 | -33110 | 51312 | 83606 | 42097 |
| SisM25 | Combination | 7595 | -3243 | -24373 | -46752 | 61126 | -36255 | SisM25 | Combination | 5952 | 22161 | -33761 | 43283 | 84738 | 54086 |
| SisM26 | Combination | 6545 | -3279 | -24373 | -46586 | 55772 | -31547 | SisM26 | Combination | 4902 | 22197 | -33761 | 43117 | 79382 | 49369 |
| SisM27 | Combination | 5835 | -11626 | -34317 | -59281 | 98499 | -51481 | SisM27 | Combination | 7712 | 16353 | -29635 | 48808 | 75436 | 38500 |
| SisM28 | Combination | 4785 | -11662 | -34317 | -59115 | 93145 | -46772 | SisM28 | Combination | 6661 | 16390 | -29635 | 48642 | 70080 | 33784 |
| SisM29 | Combination | 7589 | -3043 | -23869 | -45804 | 58773 | -35497 | SisM29 | Combination | 5957 | 21961 | -33477 | 42746 | 83292 | 53444 |
| SisM30 | Combination | 6540 | -3079 | -23869 | -45639 | 53419 | -30789 | SisM30 | Combination | 4907 | 21997 | -33477 | 42580 | 77936 | 48727 |
| SisM31 | Combination | 5840 | -11425 | -34033 | -58744 | 97052 | -50839 | SisM31 | Combination | 7706 | 16153 | -29131 | 47861 | 73083 | 37742 |
| SisM32 | Combination | 4791 | -11461 | -34033 | -58578 | 91698 | -46130 | SisM32 | Combination | 6656 | 16189 | -29131 | 47695 | 67727 | 33026 |
| SisM33 | Combination | 7102 | -4644 | -25503 | -47093 | 63358 | -37249 | SisM33 | Combination | 6445 | 19487 | -30352 | 40681 | 71509 | 45968 |
| SisM34 | Combination | 6052 | -4680 | -25503 | -46928 | 58004 | -32540 | SisM34 | Combination | 5395 | 19523 | -30352 | 40515 | 66153 | 41251 |
| FESSM_1 | Combination | 4646 | -14481 | -32505 | -53500 | 70694 | -38517 | FESSM_1 | Combination | 4512 | 15177 | -33937 | 55228 | 76048 | 40439 |
| FESSM_2 | Combination | 3387 | -14525 | -32505 | -53301 | 64269 | -32867 | FESSM_2 | Combination | 3252 | 15221 | -33937 | 55029 | 69621 | 34779 |
| FESSM_3 | Combination | 4635 | -15373 | -34531 | -57203 | 80010 | -41590 | FESSM_3 | Combination | 4523 | 15823 | -34942 | 57359 | 81352 | 42567 |
| FESSM_4 | Combination | 3375 | -15416 | -34531 | -57004 | 73585 | -35940 | FESSM_4 | Combination | 3263 | 15866 | -34942 | 57160 | 74925 | 36906 |
| FESSM_5 | Combination | 4646 | -14481 | -32505 | -53500 | 70694 | -38517 | FESSM_5 | Combination | 4512 | 15177 | -33937 | 55228 | 76048 | 40439 |
| FESSM_6 | Combination | 3387 | -14525 | -32505 | -53301 | 64269 | -32867 | FESSM_6 | Combination | 3252 | 15221 | -33937 | 55029 | 69621 | 34779 |
| FESSM_7 | Combination | 4481 | -15158 | -33350 | -54480 | 73622 | -39585 | FESSM_7 | Combination | 4677 | 14462 | -33092 | 54943 | 73120 | 38321 |
| FESSM_8 | Combination | 3222 | -15201 | -33350 | -54282 | 67197 | -33935 | FESSM_8 | Combination | 3417 | 14505 | -33092 | 54744 | 66693 | 32661 |
| FESSM_9 | Combination | 4643 | -14597 | -32675 | -53820 | 71552 | -38891 | FESSM_9 | Combination | 4515 | 15293 | -34224 | 55767 | 77387 | 40875 |
| FESSM_10 | Combination | 3384 | -14641 | -32675 | -53621 | 65127 | -33240 | FESSM_10 | Combination | 3255 | 15337 | -34224 | 55568 | 70960 | 35215 |
| FESSM_11 | Combination | 4513 | -15274 | -34224 | -56115 | 77381 | -40332 | FESSM_11 | Combination | 4645 | 14578 | -32674 | 54167 | 71558 | 38384 |
| FESSM_12 | Combination | 3254 | -15317 | -34224 | -55916 | 70956 | -34682 | FESSM_12 | Combination | 3385 | 14621 | -32674 | 53968 | 65131 | 32724 |
| FESSM_13 | Combination | 5050 | -14974 | -33708 | -55712 | 78212 | -42084 | FESSM_13 | Combination | 4949 | 15406 | -34222 | 56084 | 79990 | 43088 |
| FESSM_14 | Combination | 2950 | -15046 | -33709 | -55381 | 67504 | -32666 | FESSM_14 | Combination | 2848 | 15478 | -34222 | 55752 | 69278 | 33654 |
| FESSM_17 | Combination | 4632 | -15264 | -34262 | -56698 | 78754 | -41182 | FESSM_17 | Combination | 4526 | 15714 | -34783 | 57059 | 80548 | 42216 |
| FESSM_18 | Combination | 3373 | -15307 | -34263 | -56500 | 72329 | -35531 | FESSM_18 | Combination | 3266 | 15757 | -34783 | 56860 | 74120 | 36556 |
| RARAM_1 | Combination | 6168 | -14058 | -29158 | -20986 | 76139 | -41630 | RARAM_1 | Combination | 6033 | 14718 | -30372 | 21288 | 80625 | 43488 |
| RARAM_2 | Combination | 4908 | -14054 | -29158 | -21047 | 69713 | -36989 | RARAM_2 | Combination | 4773 | 14714 | -30372 | 21349 | 74199 | 38847 |
| RARAM_3 | Combination | 6168 | -16323 | -33650 | -24436 | 97465 | -49573 | RARAM_3 | Combination | 6033 | 16833 | -34029 | 24201 | 98618 | 50714 |
| RARAM_4 | Combination | 4908 | -16319 | -33650 | -24497 | 91039 | -44931 | RARAM_4 | Combination | 4773 | 16829 | -34029 | 24262 | 92192 | 46073 |
| RARAM_5 | Combination | 6187 | -15528 | -32117 | -23307 | 90321 | -46910 | RARAM_5 | Combination | 6015 | 16248 | -32991 | 23262 | 93357 | 48701 |
| RARAM_7 | Combination | 6013 | -16247 | -32991 | -23527 | 93353 | -48212 | RARAM_7 | Combination | 6188 | 15527 | -32116 | 23573 | 90324 | 46420 |
| RARAM_8 | Combination | 4753 | -16242 | -32991 | -23588 | 86927 | -43571 | RARAM_8 | Combination | 4928 | 15522 | -32116 | 23634 | 83898 | 41779 |
| RARAM_9 | Combination | 6163 | -14681 | -30103 | -21721 | 80909 | -43729 | RARAM_9 | Combination | 6038 | 15401 | -31855 | 22410 | 87574 | 45981 |
| RARAM_10 | Combination | 4903 | -14676 | -30103 | -21783 | 74483 | -39088 | RARAM_10 | Combination | 4778 | 15396 | -31855 | 22471 | 81148 | 41340 |
| RARAM_11 | Combination | 6037 | -15401 | -31855 | -22675 | 87570 | -45492 | RARAM_11 | Combination | 6164 | 14681 | -30103 | 21986 | 80912 | 43238 |
| RARAM_12 | Combination | 4777 | -15396 | -31855 | -22737 | 81144 | -40851 | RARAM_12 | Combination | 4904 | 14676 | -30103 | 22048 | 74486 | 38597 |
| RARAM_14 | Combination | 4479 | -15641 | -32281 | -23441 | 82334 | -40949 | RARAM_14 | Combination | 4362 | 16121 | -32827 | 23380 | 84208 | 42123 |
| RARAM_17 | Combination | 6163 | -16132 | -33203 | -24084 | 95371 | -48858 | RARAM_17 | Combination | 6038 | 16642 | -33764 | 24002 | 97278 | 50095 |
| RARAM_18 | Combination | 4903 | -16127 | -33203 | -24145 | 88945 | -44217 | RARAM_18 | Combination | 4778 | 16637 | -33764 | 24063 | 90852 | 45454 |
| FREQM_1 | Combination | 6030 | -13738 | -28630 | -20479 | 72633 | -39922 | FREQM_1 | Combination | 5961 | 14038 | -29040 | 20498 | 74089 | 40693 |
| FREQM_2 | Combination | 4980 | -13734 | -28630 | -20530 | 67278 | -36055 | FREQM_2 | Combination | 4911 | 14034 | -29040 | 20549 | 68734 | 36825 |
| FREQM_3 | Combination | 6011 | -15457 | -31872 | -22929 | 88024 | -45798 | FREQM_3 | Combination | 5981 | 15547 | -31804 | 22774 | 87672 | 45928 |
| FREQM_4 | Combination | 4961 | -15453 | -31872 | -22980 | 82669 | -41930 | FREQM_4 | Combination | 4931 | 15543 | -31804 | 22825 | 82317 | 42060 |
| FREQM_5 | Combination | 6030 | -13738 | -28630 | -20479 | 72633 | -39922 | FREQM_5 | Combination | 5961 | 14038 | -29040 | 20498 | 74089 | 40693 |
| FREQM_6 | Combination | 4980 | -13734 | -28630 | -20530 | 67278 | -36055 | FREQM_6 | Combination | 4911 | 14034 | -29040 | 20549 | 68734 | 36825 |
| FREQM_7 | Combination | 5960 | -14038 | -29040 | -20609 | 74085 | -40489 | FREQM_7 | Combination | 6031 | 13738 | -28630 | 20589 | 72637 | 39718 |
| FREQM_8 | Combination | 4910 | -14034 | -29040 | -20660 | 68730 | -36621 | FREQM_8 | Combination | 4981 | 13734 | -28630 | 20640 | 67282 | 35850 |
| FREQM_9 | Combination | 5988 | -14981 | -30514 | -21856 | 81826 | -43908 | FREQM_9 | Combination | 6003 | 15101 | -31445 | 22506 | 85586 | 44620 |
| FREQM_10 | Combination | 4938 | -14977 | -30514 | -21907 | 76471 | -40041 | FREQM_10 | Combination | 4953 | 15097 | -31445 | 22557 | 80231 | 40752 |
| FREQM_11 | Combination | 6002 | -15101 | -31445 | -22551 | 85582 | -44539 | FREQM_11 | Combination | 5989 | 14981 | -30513 | 21900 | 81829 | 43826 |
| FREQM_12 | Combination | 4952 | -15097 | -31445 | -22602 | 80227 | -40671 | FREQM_12 | Combination | 4939 | 14977 | -30513 | 21951 | 76474 | 39959 |
| FREQM_13 | Combination | 6100 | -13889 | -28835 | -20539 | 73895 | -40592 | FREQM_13 | Combination | 6101 | 13889 | -28835 | 20539 | 73898 | 40592 |
| FREQM_14 | Combination | 4840 | -13884 | -28835 | -20600 | 67469 | -35951 | FREQM_14 | Combination | 4841 | 13884 | -28835 | 20600 | 67472 | 35951 |
| FREQM_17 | Combination | 6008 | -15342 | -31604 | -22718 | 86768 | -45369 | FREQM_17 | Combination | 5984 | 15432 | -31645 | 22654 | 86867 | 45556 |
| FREQM_18 | Combination | 4958 | -15338 | -31604 | -22769 | 81413 | -41501 | FREQM_18 | Combination | 4934 | 15428 | -31645 | 22705 | 81512 | 41689 |
| PERMM_1 | Combination | 5995 | -13888 | -28835 | -20544 | 73359 | -40206 | PERMM_1 | Combination | 5996 | 13888 | -28835 | 20544 | 73363 | 40205 |
| PERMM_2 | Combination | 4945 | -13884 | -28835 | -20595 | 68004 | -36338 | PERMM_2 | Combination | 4946 | 13884 | -28835 | 20595 | 68008 | 36338 |