SPT Correlations Software (NovoSPT)
The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil.

The test procedure is described in the British Standard BS EN ISO 22476-3 and ASTM D1586

...and still SPT is the most popular geotechnical field investigation test
Various SPT equipments have been developed for different type of drill rigs and applications in different situations.
SPT blow counts obtained from the field tests, must be corrected / normalized for:

- Energy level correction
- Borehole diameter correction
- Sampler type correction
- Rod length correction
- Water level correction
- Overburden (depth) correction

$N \rightarrow N_{60} \rightarrow N_{160}$
How $N_{60}$ and $N1_{60}$ are used in geotechnical engineering interpretations?
$N_{60}$ and $N_{160}$, magic numbers!
Geoscientists and researchers have carried out numerous efforts to correlate SPT blow counts to geotechnical soil properties:

- Physical properties
- Mechanical properties
- Bearing capacity
- Settlement analysis
- Liquefaction analysis
- Correlation to other penetrometers
Introduction to encyclopedia of SPT correlations

NovoSPT
(SPT Correlations Software)

Designed & developed by:
Novo Tech Software Ltd.
Vancouver, Canada

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1- Easily download the software from our website
2- Quick installation
More than 260 correlations are in palm of your hand
Input Data

- Shallow Footing:
  - B (m): 0.5
  - L (m): 0.9
  - P (kPa): 100
  - Shear Failure Safety Factor: 3

- Pile Foundation:
  - Diameter (m): 0.3

- SPT Correction:
  - Apply All Corrections: 60
  - Entry Level (%): 65 - 115
  - Borehole Diameter (mm): 65 - 115
  - Sampling Method: Standard
  - Overburden Correction: Peck and

- Groundwater:
  - Ground Water Level (m): 7.92
  - N60: 33
  - Overconsolidation Ratio (OCR): 1
  - D50 (mm): 1.6

- Correlation Settings:
  - Show only applicable correlations

- Correlated Soil Properties:
  - Soil layers starting from the existing ground:
    - Thickness (m)
    - Unit Weight (kN/m³)
    - Lithology
  - SPT Results
  - N values from SPT in situ tests:
    - Depth (m)
    - SPT Blow Counts (N)
    - N60
    - Cn
    - C
  - Correction Factors

- Graphs and charts showing SPT blow counts and correction factors.
Correlated Parameters

List of all correlations for a soil parameter, plus the country where field data was collected

Choose parameter

Turn off/on correlations which are not applicable to your soil type or region

Schematic soil profile
Soil Type Filter *(new in version 2.1)*

- This new feature shows each correlation is applicable to what soil type
- User can filter and show only the correlations applicable to that soil type, at each depth
Correlated Parameters

Use this feature to plot correlation of soil parameter according to selected methods in depth of borehole. Input SPT data is taken from input tab.

Select soil parameter:
- Overburden Correction Factor (Cn)
- Other Correction Factors
- Consistency
- Young’s Modulus (Es)
- Friction Angle
- Relative Density (D_r) of Sand
- Undrained Shear Strength (Su) of Clay/Silt
- Shear Wave Velocity (Vs)
- Shear Modulus (Gmax)
- Uplift Function (CUR)
- Borehole Hammer Test (BHT)
- Pressure-meter Test

Select correlation methods to compare:
- Gibb's and Holtz, 1957
- Meyerhof, 1957
- Yoshida et al., 1983
  - with Co=25, C1=0.12, C2=0.46
- Idriss and Boulanger, 2003
- Jamiolkowski, 1988 & Skempton, 1988
  - Fine sands
- Jamiolkowski, 1988 & Skempton, 1988
  - Coarse sands
- Fugium and others, 1989

Please click on chart in order to export the results to other formats including Excel and image files.

Legend:
- Gibb's and Holtz, 1957
- Meyerhof, 1957
- Yoshida et al., 1983 (with Co=25, C1=0.12, C2=0.46)
- Idriss and Boulanger, 2003

Variable | Value
--- | ---
Number of correlations | 59
Minimum | 76
Maximum | 497
Mean | 277.33
Median | 291
Variance | 8414.5
Standard deviation | 91.73
Correlation Along Borehole Depth

Choose parameter

List of all correlation methods

Turn off/on correlations which are not applicable to your soil type or region

Comparison of correlated parameter along depth of borehole

www.NovotechSoftware.com

NovoSPT Software
Import SPT data from gINT files

Database structure

All type of SPT data storage are supported

Schematic soil layers and SPT plot

SPT blow counts for selected borehole
Bearing Capacity / Settlement Analysis

- Shear failure safety factor: 3
- Footing Depth Df (m): 7.92
- Plot the bearing capacity chart for this footing width range:
  - B (m): 1 to 3

Note:
Safety factor for shear failure is only applied to Terzaghi method. Other methods are based on 25 mm settlement.

Calculated Parameters:
- $F_i$ deg (Hatanaka & Uchida, 1996): 41.9
- $N_q$ (Bowles, 1996): 84.14
- $N_g$ (Brinch & Hansen, 1970): 111.89
- $N_{60}$: 33
- $N_{1(60)}$: 31
- Effective Stress at Df (kPa): 91.18

Analysis Results:

<table>
<thead>
<tr>
<th>Equation</th>
<th>B=1m</th>
<th>B=1.5m</th>
<th>B=2m</th>
<th>B=2.5m</th>
<th>B=3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burland and Burbidge, 1985 (for 25mm settlement)</td>
<td>1279.76</td>
<td>944.19</td>
<td>760.95</td>
<td>643.69</td>
<td>561.42</td>
</tr>
<tr>
<td>Terzaghi</td>
<td>2710</td>
<td>2786.39</td>
<td>2862.78</td>
<td>2939.18</td>
<td>3015.57</td>
</tr>
<tr>
<td>Bowles/Meyerhof, 1976 (for 25mm)</td>
<td>578.55</td>
<td>408.98</td>
<td>370.43</td>
<td>335.16</td>
<td>329.18</td>
</tr>
<tr>
<td>Parry, 1977 (for 25mm settlement)</td>
<td>332.97</td>
<td>332.97</td>
<td>332.97</td>
<td>332.97</td>
<td>332.97</td>
</tr>
<tr>
<td>Peck et al., 1974</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Purple: Burland and Burbidge, 1985
- Cyan: Terzaghi
- Green: Bowles/Meyerhof, 1976
- Orange: Parry, 1977

Graph:
- Allowable Bearing Capacity vs. Footing Width (m)
- Range: 0 to 3500 kPa
- Range: 1.1 to 3 m

Report Manager

Print Manager

- Print Input Data (SPT data, soil layers, charts)
- Print All Correlations for Z=0.3, N60=6

Select parameters:
- Overburden Correction Factor (Cn)
- Other Correction Factors
- Consistency
- Young's Modulus (Es)
- Friction Angle of Sands
- Relative Density (Dr) of Sand
- Undrained Shear Strength (Su) of Clay/Silt
- Shear Wave Velocity (Vs)
- Shear Modulus (Gmax)
- Liquefaction (CRR)
- Becker Hammer Test (BPT)
- Pressure-meter Test
- Bearing Capacity of Piles
- Bearing Capacity of Footings on Sand (qa)
- Settlement of Footing on Sands (S)
- Other Soil Parameters
- Print Correlation in Depth of Borehole

Select methods for Shear Wave Velocity (Vs):
- Imai et al., 1977(for all soils)
- Imai, 1977(for sands)
- Imai, 1977(for clays)
- Jinan, 1987(for all soils)
- Imai and Yoshimura, 1970(for all soils)
- Imai and Yoshimura, 1975(from 192 samples)
- Imai and Tonouchi, 1982(for gravel)
- Imai and Tonouchi, 1982(for all soils)
- Ohta et al., 1972(for sand)
- Ohta and Goto, 1978(for Holocene clays)
- Ohta and Goto, 1978(for Holocene sands)
- Ohta and Goto, 1978(for Holocene sands and gravels)
- Ohta and Goto, 1978(for Holocene gravels)
- Ohta and Goto, 1978(for Pleistocene clays)
- Ohta and Goto, 1978(for Pleistocene sands)
- Ohta and Goto, 1978(for Pleistocene sands and gravels)
- Ohta and Goto, 1978(for Pleistocene gravels)
- Ohta and Goto, 1978(for Holocene sands and gravels)
- JRA, 1980(for clays)
User manual (Help)

Shallow Footing: This data is used for calculating bearing capacity of shallow footings based on shear failure or settlement criteria (based on method). Footing size and load as well as safety factor against shear failure should be specified. Please notice that depth of footing (DF) is considered to be the depth (Z) selected by user on SPT table.

- Results are presented in "Correlated Soil Properties" tab when "Bearing capacity of footings on sand (qa)" items is selected from the list.

Pile Foundation: Diameter of the pile should be specified in order to estimate the friction and end bearing of the piles based on SPT blow counts. Please notice that pile length is considered to be the depth (Z) selected by user on SPT table.

- Results are presented in "Correlated Soil Properties" tab when "Bearing capacity of piles" items is selected from the list.

SPT Correction: The following corrections should be applied on SPT number (N) to obtain N(60) and N(150) numbers:

- Energy level: this will adjust the SPT equipment energy to standard 60% energy. This correction factor is named Ce in NovoSPT.
- Borehole diameter: size of the borehole affects the SPT blow counts. This correction factor is named Cb in NovoSPT.
- Sampling method: some SPT samplers have a liner. This will affect the SPT blow counts and its correction factor is called Cs in NovoSPT.
- Rod length: this correction factor is called Cr and depends on length of SPT rods which is approximately equal to the depth of the test. The following formula proposed by Dr. Cetin is used in NovoSPT:

\[ C_s = \frac{1}{0.999600781 + 4.31663223 \times z^2} \quad \text{for} \quad z \geq 3 \]

- Overburden stress: this corrections is usually called as "depth correction factor" or Cn and depends on overburden stress due to soil, at the test depth.

Please choose your favorite method for each correction factor. The following formula is used to calculate the correction factors at each depth:

\[ C_0 = C_e C_b C_s C_r N_{60} = N_{150} \]

All the above mentioned factors as well as N(60) and N(150) are plotted versus depth and presented on screen.

- Results for Cn corrections are presented in "Correlated Soil Properties" tab when "Overburden correction factor (cn)" items is selected from the list.

Ground Water: The groundwater level affects the calculation of effective overburden stress (\(\sigma_v\)) used in the correlations. In addition, user can choose to apply the water level correction on SPT blow counts, as proposed by Terzaghi. This correction is recommended for N215 in silty sands:

\[ N_{w} = 15 + 0.5 (N_{60} - 15) \]

Correlation Settings: Some SPT correlations depend on OCR and Dr. of the soil. Please enter your best estimation of these values. One important point when...
Customer Testimonials

Richard S. Kessler, PE, DGE  
(United States)
I am a relatively new user of NovoSPT. I have found it easy to use and useful in day-to-day Geotechnical Engineering tasks. Particularly impressive and time saving is its ability to retrieve input directly from gINT data files. Most importantly, I have found the responsiveness to support requests including those suggesting additions to the library of correlations to be exceptional.

Jose Carlos Andrade  
A2 Ingenieria  
(Paraguay)
I downloaded and used the free trial version of NovoSPT and I must say that I really loved your software. I find it really usefull and I checked several results and they seem to be accurate, so I must congratulate you for this great software.

Miles Davis  
Quantum Geotechnical Ltd.  
(United Kingdom)
Most excellent, many, many thanks for NovoSPT. It works perfectly. This is a great bit of software. I shall say to you what I have said to Salvatore (president of gINT Software) on a number of occasions, if you offer tech support like that you’ll go far. It was nicely unexpected to get a reply at all, let alone have the problem solved within a day. Hats off to you!
**Our other software solutions:**

<table>
<thead>
<tr>
<th>Software Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cone Penetration Test (CPT) Interpretation Software (NovoCPT):</strong></td>
<td>for interpretation of CPTu including liquefaction analysis, foundation settlement analysis and pile bearing capacity analysis (LCPC) tools.</td>
</tr>
<tr>
<td><strong>Liquefaction Analysis Program (NovoLiq):</strong></td>
<td>based on 10 different methods for calculating Cyclic Resistance Ratio (CRR), with more than 55 options for other formulas, including post-liquefaction lateral displacement and settlement ...</td>
</tr>
<tr>
<td><strong>VisLog:</strong></td>
<td>This powerful program is designed for visualizing geotechnical/geological borehole logs and automatically drawing soil profiles. 3D environment and easy zoom and rotation features make it so easy to work with VisLog...</td>
</tr>
<tr>
<td><strong>Beam Section Properties (BeamProps):</strong></td>
<td>This software is used to calculate beam section properties such as area, moment of inertia, radius of gyration, etc. for more than 25 sections and shapes...</td>
</tr>
<tr>
<td><strong>SMTP:</strong></td>
<td>is a comprehensive solution for processing soil mechanics laboratory tests such as sieve test, Aterberg limits, moisture and density, direct shear, triaxial, compaction, permeability, etc and designing borehole logs.</td>
</tr>
<tr>
<td><strong>LateralK:</strong></td>
<td>Calculating lateral earth pressure coefficient program in static (Rankine/Coulomb) and earthquake (Mononobe/Okabe) conditions ...</td>
</tr>
<tr>
<td><strong>Peysanj:</strong></td>
<td>A complete set of geotechnical modules for bearing capacity and settlement of shallow footings, pressure-meter test, plate load test, liquefaction analysis, lateral earth pressure coefficients, and more ...</td>
</tr>
</tbody>
</table>
Thank you for watching

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