APPENDIX III-D.5-3

FOUNDATION BEARING CAPACITY ANALYSES

STATE OF TEXAS
JESSE PAUL VARSHO
114074
LICENSED
PROFESSIONAL ENGINEER

3-2-15

This document is released for the purpose of permitting only under the authority of Jesse P. Varsho, P.E. #114074. It is not to be used for bidding or construction. Texas Registered Engineering Firm F-5650

CB&I Environmental & Infrastructure	**Client Name:**	Rancho Viejo Waste Management, LLC		
	Project Name:	Pescadito Environmental Resource Center	**Project No.:**	148866
	Prepared by:	P.Thomas	**Date Prepared:**	2/24/2015
	Reviewed by:	Jesse P. Varsho, PE	**Date Reviewed:**	3/2/2015

TITLE: FOUNDATION BEARING CAPACITY ANALYSES

Problem Statement

Determine the factor of safety against bearing capacity failure of the landfill foundation.

References

1. Summary of Geotechnical Parameters contained in **Appendix III.D.5-1** of this Report.
2. Coduto, D.P., "Foundation Design Principles and Practices," 2nd Edition (attached pages).
3. Caterpillar Product Information, 836H, Landfill Compactor (attached pages).
4. Landfill design specifications for layer types and thicknesses presented on design details in Design Drawing Set contained in this Application.
5. Landfill design grades for the mass excavation, liners, and final landform presented on design plan drawings in Design Drawing Set contained in this Application.

Assumptions

The following conservative assumptions were utilized in the analysis:

Scenarios Analyzed

1. Compacted soil liner bearing capacity under vehicle loading (short-term shear strength / loading conditions).
2. Compacted soil liner bearing capacity for the final landform at the point of maximum waste height (long-term shear strength / loading conditions).

Foundation Material Properties

- Stratum IV Foundation Soils. The lithologic unit occuring immediately beneath the base liner of the North Unit and South Unit Landfills is Stratum IV (**Reference No. 1**). The unit weights and shear strength parameters assumed for this foundation unit are as follow (**Reference No. 1**):

  Unit Weights
  - Moist unit weight = 129 pcf
  - Saturated unit weight = 132 pcf

  Shear Strength - Short-Term Conditions
  - cohesion c = 2,500 psf
  - friction angle, Φ = 5 degrees

  Shear Strength - Long Term Conditions
  - cohesion c' = 720 psf
  - friction angle, Φ' = 13.5 degrees

CB&I Environmental & Infrastructure	Client Name:	Rancho Viejo Waste Management, LLC		
	Project Name:	Pescadito Environmental Resource Center	**Project No.:**	148866
	Prepared by:	P.Thomas	**Date Prepared:**	2/24/2015
	Reviewed by:	Jesse P. Varsho, PE	**Date Reviewed:**	3/2/2015

TITLE: FOUNDATION BEARING CAPACITY ANALYSES

Landfill Material Properties

- The following saturated unit weights were conservatively assumed in the bearing capacity calculations for the final cover soil, protective cover soil, compacted low permeable soil liner, and waste fill (**Reference No. 1**):

  Unit Weights
  - final cover soil moist and saturated unit weights = 129 pcf / 132 pcf
  - protective cover soil moist and saturated unit weights = 129 pcf / 132 pcf
  - compacted low permeable soil liner moist and saturated unit weights = 129 pcf / 132 pcf
  - waste fill moist and saturated unit weight = 65 pcf.

- The length and width of the smallest landfill cell occurs in Cell N4 of the North Unit Landfill and is approximately 1,872-feet long by 765-feet wide. The shorter dimension of **765-feet** was analyzed as "B."

- The maximum final elevation in Cell N4 occurs on the northern cell edge at elevation 726 ft. MSL. However, to be conservative the maximum final waste column thickness of approximately **380 feet** (which occurs at the center of both the North and South Unit Landfills) was conservatively assumed in the long-term (final landform loading) bearing capacity calculation.

- The corresponding elevation and thickness of each landfill and foundation layer used in these calculations are summarized in **Table 1** below.

Table 1
Summary of Average Thickness of Landfill Layers

Layer	Top Elevation (ft. MSL)	Thickness (ft.)
Final Cover System	858	3
Waste	855	380
Protective Cover Soil	475	2
Compacted Low Permeable Soil Liner	473	3
Foundation Materials	470	-
	Total Height of Landfill, H =	388 ft

CB&I Environmental & Infrastructure	Client Name:	Rancho Viejo Waste Management, LLC		
	Project Name:	Pescadito Environmental Resource Center	**Project No.:**	148866
	Prepared by:	P.Thomas	**Date Prepared:**	2/24/2015
	Reviewed by:	Jesse P. Varsho, PE	**Date Reviewed:**	3/2/2015

TITLE: FOUNDATION BEARING CAPACITY ANALYSES

Bearing Capacity Equation for Static Conditions

The factor of safety for bearing capacity is as follows:

$$FS = \frac{q_{ult}}{\sigma'_v}$$

Where,

q_{ult} = ultimate bearing capcity (psf)
σ'_v = effective vertical stress (psf)

- Karl Terzaghi's bearing capacity equation for continuous footings is used to calculate bearing capacity of landfill foundation for static conditions. Due to the size and depth of the landfill, the equation is overly conservative for landfills.

$$q_{ult} = c'N_c + \sigma'_{zD}N_q + 0.5\gamma'BN_\gamma$$

Where,

q_{ult} = ultimate bearing capcity, psf
c, c' = soil cohesion, psf
σ'_{zD} = vertical effective stress, psf
γ' = effective unit weight of soil, pcf
B = width of foundation, feet
N_c, N_q, N_γ = non-dimensional bearing capacity factors, functions of Φ
Φ, Φ' = soil friction angle, degrees

- Using Terzaghi's bearing capacity factors the of N_q, N_c, and N_γ were determined (**Reference No. 2**):

For Short-Term Loading Conditions:

$\Phi = 5^o \rightarrow N_c = 7.3, N_q = 1.6, N_\gamma = 0.4$

For Long-Term Loading Conditions:

$\Phi' = 13.5^o \rightarrow N_c = 11.75, N_q = 3.8, N_\gamma = 1.75$

Calculations

Calculate ultimate bearing capacity, q_{ult} on the Foundation Materials. The vertical effective stress (σ'_{zD}) is conservatively assumed equal to zero. The Stratum IV foundation soils beneath the landfill base liners are characterized as slightly moist to dry, however to be conservative the saturated moist unit weights are assumed (instead of the moist unit weights) in the calculations below.

Short-Term Loading Conditions:

$$q_{ult} = c'N_c + \sigma'_{zD}N_q + 0.5\gamma'BN_\gamma$$

$$q_{ult} = (720psf)(7.3) + (0psf)(1.6) + ((0.5)(132 - 62.4)\,pcf(765ft)(0.4))$$

$$q_{ult} = 15{,}904\ psf$$

Long-Term Loading Conditions:

$$q_{ult} = c'N_c + \sigma'_{zD}N_q + 0.5\gamma'BN_\gamma$$

$$q_{ult} = (720psf)(11.75) + ((383')(132 - 62.4)pcf(3.8)) + ((0.5)(132 - 62.4)\ pcf(765ft)(1.75))$$

$$q_{ult} = 156{,}344\ psf$$

Compacted Soil Liner Bearing Capacity under Vehicle Loading

Calculate the effective overburden stress (σ'_v) due to the placement of the leachate collection system, clay liner and loading by a vehicle (compactor). Conservatively assume that the vehicle load does not attenuate with depth (refer to **Table 2** below).

Assume loading by CAT 836H compactor (**Reference No. 3**, attached pages)

Vehicle Weight (W_{veh}) = 122,586 lbs

Contact Pressure (P) $\text{P} = \dfrac{122{,}586\text{ lbs}}{4\text{ drums x Area}_{\text{contact}}}$

$$\text{P} = \frac{122{,}586\text{ lbs}}{4\text{ drums} \times (4.58\text{ ft} \times \frac{1}{3} \times 5.67\text{ ft})} = 3{,}540\text{ psf}$$

Table 2
Effective Overburden Stress σ_v, on Foundation Materials from Vehicle Load

Layer	Thickness, t (ft)	Unit Weight, γ' (pcf)	σ'_v = (t) x (γ) (psf)
Vehicle Load	-	3,540	3,540
Protective Soil	1	129	129
Protective Soil (saturated)	1	(132-62.4) = 69.6	69.6
Clay Liner	3	(132-62.4) = 69.6	208.8
Total Thickness =	5	**Σ(σ'v) =**	3,947.4 psf

Factor of Safety against bearing capacity failure due to vehicle loading and short-term static conditions, FS:

$$FS_{short-term} = \frac{q_{ult}}{\sigma'_v} = \frac{15{,}904\ psf}{3{,}947.4\ psf} = 4.0$$

Compacted Soil Liner Bearing Capacity under Final Landform Loading

CB&I Environmental & Infrastructure	Client Name:	Rancho Viejo Waste Management, LLC		
	Project Name:	Pescadito Environmental Resource Center	Project No.:	148866
	Prepared by:	P.Thomas	Date Prepared:	2/24/2015
	Reviewed by:	Jesse P. Varsho, PE	Date Reviewed:	3/2/2015

TITLE: FOUNDATION BEARING CAPACITY ANALYSES

Calculate the effective overburden stress (σ'_v) due to waste and soil load for the worst case final conditions (**Table 3** below):

Table 3 Effective Overburden Stress, σ'_v, on the Foundation Materials From Final Landform			
Layer	Thickness, t (ft)	Unit Weight, γ (pcf)	σ'_v = (t) x (γ) (psf)
Final Cover	3	129	387
Waste	380	65	24,700
Protective Soil Layer	1	129	129
Protective Soil Layer (saturated)	1	(132-62.4) = 69.6	69.6
Compacted Clay Liner	3	(132-62.4) = 69.6	208.8
Total Thickness =	388 ft	$\Sigma(\sigma'_v)$ =	25,494.4 psf
Weighted Average γ'_v = 65.7 pcf			

Factor of Safety (FS) against bearing capacity failure at final landform height under long-term static conditions:

$$FS_{long-term} = \frac{q_{ult}}{\sigma'_v} = \frac{156{,}344\ psf}{25{,}494\ psf} = 6.1$$

Results

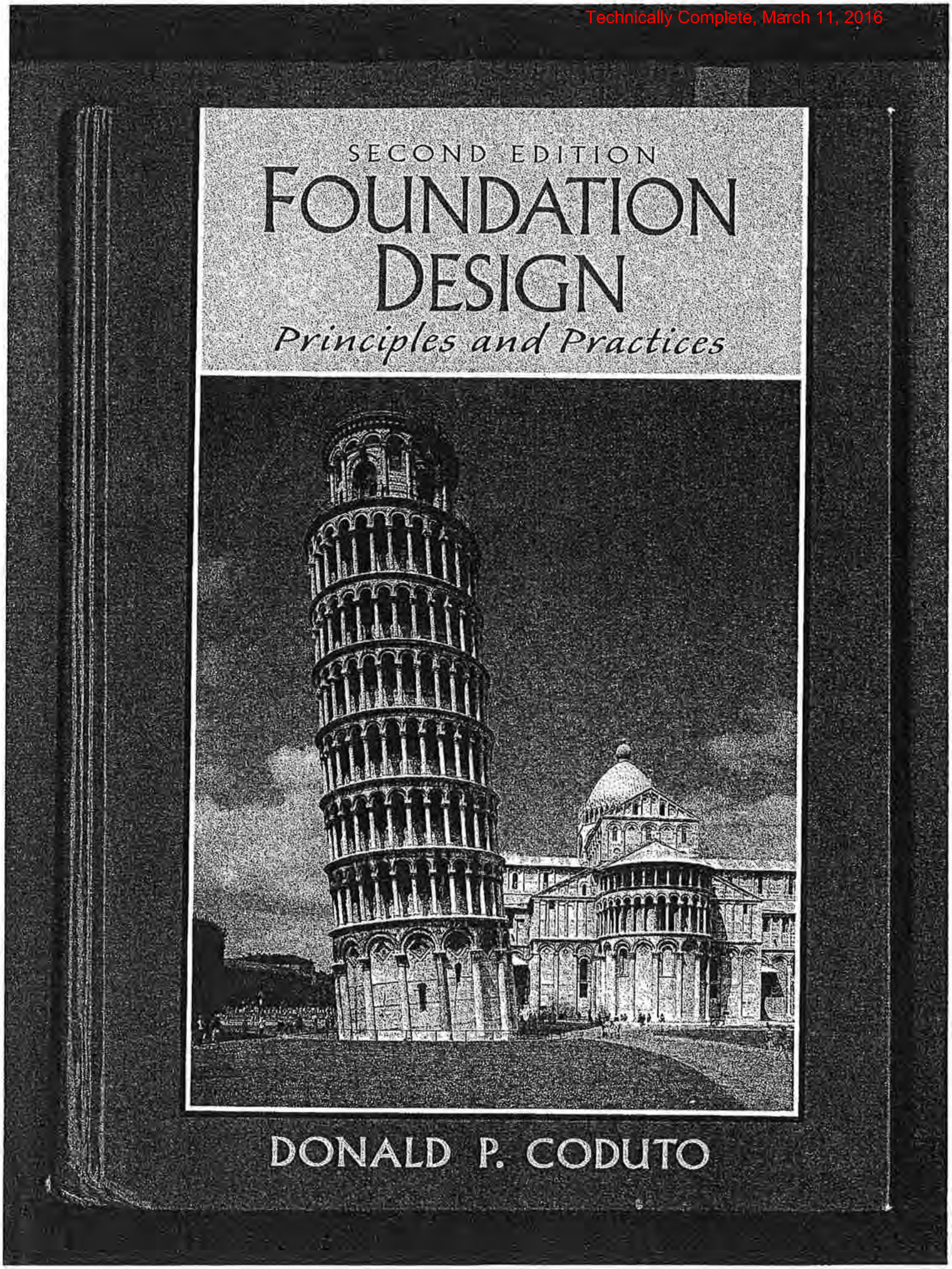
The Pescadito Landfill has been designed to achieve a minimum factor of safety against bearing capacity failure of 2.0 under static conditions. A summary of the determined factors of safety against bearing capacity failure of the landfill foundation is presented in **Table 4** below.

Table 4 Factors of Safety Against Bearing Capacity Failure		
Loading Conditions	Calculated Factor of Safety	Minimum Recommended Factor of Safety
Short-Term / Static Conditions: Vehicle Loading	4.0	2.0
Long-Term / Static Conditions: Final Landform Loading	6.1	2.0

Reference No. 2

Bearing Capacity Equation and Factors

Technically Complete, March 11, 2016



considering a slice of the foundation of length b and taking moments about Point A, we obtain the following:

$$M_A = (q_{ult}Bb)(B/2) - (s_u\pi Bb)(B) - \sigma_{zD}Bb(B/2) \tag{6.1}$$

$$q_{ult} = 2\,\pi\,s_u + \sigma_{zD} \tag{6.2}$$

It is convenient to define a new parameter, called a *bearing capacity factor*, N_c, and rewrite Equation 6.2 as:

$$\boxed{q_{ult} = N_c s_u + \sigma_{zD}} \tag{6.3}$$

Equation 6.3 is known as a *bearing capacity formula*, and could be used to evaluate the bearing capacity of a proposed foundation. According to this derivation, $N_c = 2\pi = 6.28$.

This simplified formula has only limited applicability in practice because it considers only continuous footings and undrained soil conditions ($\phi = 0$), and it assumes the foundation rotates as the bearing capacity failure occurs. However, this simple derivation illustrates the general methodology required to develop more comprehensive bearing capacity formulas.

Terzaghi's Bearing Capacity Formulas

Various limit equilibrium methods of computing bearing capacity of soils were advanced in the first half of the twentieth century, but the first one to achieve widespread acceptance was that of Terzaghi (1943). His method includes the following assumptions:

- The depth of the foundation is less than or equal to its width ($D \leq B$).
- The bottom of the foundation is sufficiently rough that no sliding occurs between the foundation and the soil.
- The soil beneath the foundation is a homogeneous semi-infinite mass (i.e., the soil extends for a great distance below the foundation and the soil properties are uniform throughout).
- The shear strength of the soil is described by the formula $s = c' + \sigma' \tan \phi'$.
- The general shear mode of failure governs.
- No consolidation of the soil occurs (i.e., settlement of the foundation is due only to the shearing and lateral movement of the soil).
- The foundation is very rigid in comparison to the soil.
- The soil between the ground surface and a depth D has no shear strength, and serves only as a surcharge load.
- The applied load is compressive and applied vertically to the centroid of the foundation and no applied moment loads are present.

Terzaghi considered three zones in the soil, as shown in Figure 6.5. Immediately beneath the foundation is a *wedge zone* that remains intact and moves downward with the

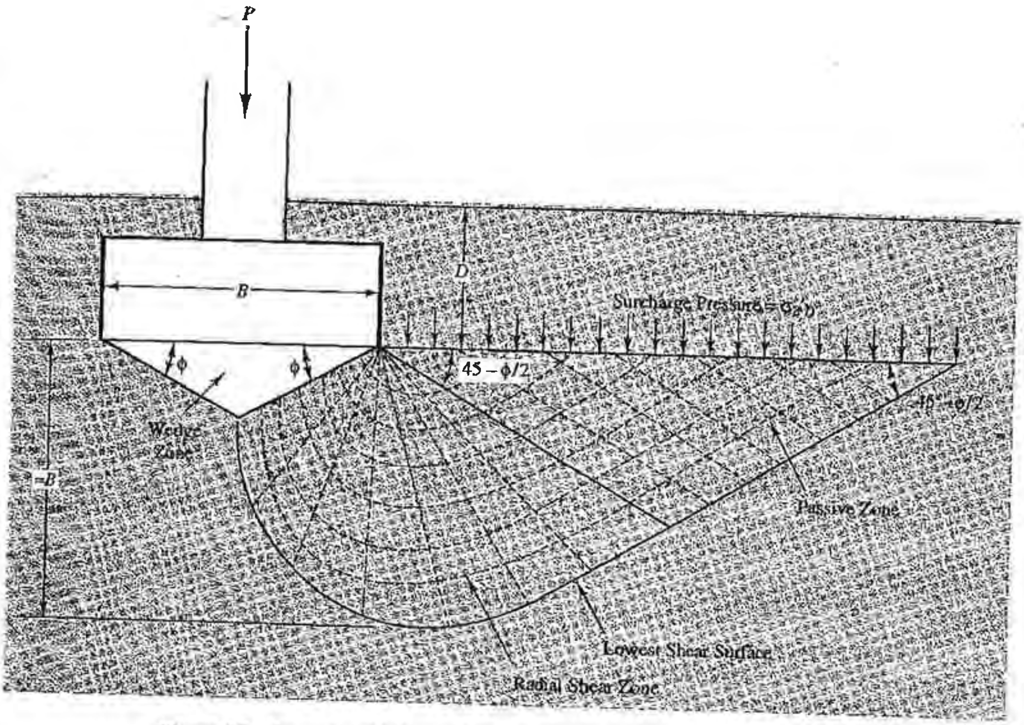


Figure 6.5 Geometry of failure surface for Terzaghi's bearing capacity formulas.

foundation. Next, a *radial shear zone* extends from each side of the wedge, where he took the shape of the shear planes to be logarithmic spirals. Finally, the outer portion is the *linear shear zone* in which the soil shears along planar surfaces.

Since Terzaghi neglected the shear strength of soils between the ground surface and a depth D, the shear surface stops at this depth and the overlying soil has been replaced with the surcharge pressure σ_{zD}'. This approach is conservative, and is part of the reason for limiting the method to relatively shallow foundations ($D \leq B$).

Terzaghi developed his theory for continuous foundations (i.e., those with a very large L/B ratio). This is the simplest case because it is a two-dimensional problem. He then extended it to square and round foundations by adding empirical coefficients obtained from model tests and produced the following bearing capacity formulas:

For square foundations:

$$q_{ult} = 1.3\,c'N_c + \sigma'_{zD}N_q + 0.4\gamma' BN_\gamma \quad (6.4)$$

For continuous foundations:

$$q_{ult} = c'N_c + \sigma'_{zD}N_q + 0.5\gamma' BN_\gamma \quad (6.5)$$

For circular foundations:

$$q_{ult} = 1.3\,c'N_c + \sigma'_{zD}N_q + 0.3\gamma' BN_\gamma \tag{6.6}$$

Where:

q_{ult} = ultimate bearing capacity
c' = effective cohesion for soil beneath foundation
ϕ' = effective friction angle for soil beneath foundation
σ_{zD}' = vertical effective stress at depth D below the ground surface ($\sigma_{zD}' = \gamma\,D$ if depth to groundwater table is greater than D)
γ' = effective unit weight of the soil ($\gamma = \gamma'$ if groundwater table is very deep; see discussion later in this chapter for shallow groundwater conditions)
D = depth of foundation below ground surface
B = width (or diameter) of foundation
N_c, N_q, N_γ = Terzaghi's bearing capacity factors = $f(\phi')$ (See Table 6.1 or Equations 6.7–6.12.)

Because of the shape of the failure surface, the values of c' and ϕ' only need to represent the soil between the bottom of the footing and a depth B below the bottom. The soils between the ground surface and a depth D are treated simply as overburden.

Terzaghi's formulas are presented in terms of effective stresses. However, they also may be used in a total stress analyses by substituting c_T, ϕ_T, and σ_D for c', ϕ', and σ_D'. If saturated undrained conditions exist, we may conduct a total stress analysis with the shear strength defined as $c_T = s_u$ and $\phi_T = 0$. In this case, $N_c = 5.7$, $N_q = 1.0$, and $N_c = 0.0$.

The Terzaghi bearing capacity factors are:

$$N_q = \frac{a_\theta^2}{2\cos^2(45 + \phi'/2)} \tag{6.7}$$

$$a_\theta = e^{\pi(0.75 - \phi'/360)\tan\phi'} \tag{6.8}$$

$$N_c = 5.7 \qquad \text{for } \phi' = 0 \tag{6.9}$$

$$N_c = \frac{N_q - 1}{\tan\phi'} \qquad \text{for } \phi' > 0 \tag{6.10}$$

$$N_\gamma = \frac{\tan\phi'}{2}\left(\frac{K_{p\gamma}}{\cos^2\phi'} - 1\right) \tag{6.11}$$

These bearing capacity factors are also presented in tabular form in Table 6.1. Notice that Terzaghi's N_c of 5.7 is smaller than the value of 6.28 derived from the simple bearing capacity analysis. This difference the result of using a circular failure surface in the simple method and a more complex geometry in Terzaghi's method.

TABLE 6.1 BEARING CAPACITY FACTORS

ϕ' (deg)	Terzaghi N_c	Terzaghi N_q	Terzaghi N_γ	Vesić N_c	Vesić N_q	Vesić N_γ
0	5.7	1.0	0.0	5.1	1.0	0.0
1	6.0	1.1	0.1	5.4	1.1	0.1
2	6.3	1.2	0.1	5.6	1.2	0.2
3	6.6	1.3	0.2	5.9	1.3	0.2
4	7.0	1.5	0.3	6.2	1.4	0.3
5	7.3	1.6	0.4	6.5	1.6	0.4
6	7.7	1.8	0.5	6.8	1.7	0.6
7	8.2	2.0	0.6	7.2	1.9	0.7
8	8.6	2.2	0.7	7.5	2.1	0.9
9	9.1	2.4	0.9	7.9	2.3	1.0
10	9.6	2.7	1.0	8.3	2.5	1.2
11	10.2	3.0	1.2	8.8	2.7	1.4
12	10.8	3.3	1.4	9.3	3.0	1.7
13	11.4	3.6	1.6	9.8	3.3	2.0
14	12.1	4.0	1.9	10.4	3.6	2.3
15	12.9	4.4	2.2	11.0	3.9	2.6
16	13.7	4.9	2.5	11.6	4.3	3.1
17	14.6	5.5	2.9	12.3	4.8	3.5
18	15.5	6.0	3.3	13.1	5.3	4.1
19	16.6	6.7	3.8	13.9	5.8	4.7
20	17.7	7.4	4.4	14.8	6.4	5.4
21	18.9	8.3	5.1	15.8	7.1	6.2
22	20.3	9.2	5.9	16.9	7.8	7.1
23	21.7	10.2	6.8	18.0	8.7	8.2
24	23.4	11.4	7.9	19.3	9.6	9.4
25	25.1	12.7	9.2	20.7	10.7	10.9
26	27.1	14.2	10.7	22.3	11.9	12.5
27	29.2	15.9	12.5	23.9	13.2	14.5
28	31.6	17.8	14.6	25.8	14.7	16.7
29	34.2	20.0	17.1	27.9	16.4	19.3
30	37.2	22.5	20.1	30.1	18.4	22.4
31	40.4	25.3	23.7	32.7	20.6	26.0
32	44.0	28.5	28.0	35.5	23.2	30.2
33	48.1	32.2	33.3	38.6	26.1	35.2
34	52.6	36.5	39.6	42.2	29.4	41.1
35	57.8	41.4	47.3	46.1	33.3	48.0
36	63.5	47.2	56.7	50.6	37.8	56.3
37	70.1	53.8	68.1	55.6	42.9	66.2
38	77.5	61.5	82.3	61.4	48.9	78.0
39	86.0	70.6	99.8	67.9	56.0	92.2
40	95.7	81.3	121.5	75.3	64.2	109.4
41	106.8	93.8	148.5	83.9	73.9	130.2

Reference No. 3

Caterpillar Equipment Specifications

Technically Complete, March 11, 2016

836H

Landfill Compactor

CATERPILLAR®

Engine		
Engine Model	Cat® C18 ACERT™	
Gross Power	414 kW	555 hp
Direct Drive – Gross Power	390 kW	523 hp
EEC 80/1269	373 kW	501 hp
Weights		
Operating Weight	55 604 kg	122,586 lb

836H Landfill Compactor Specifications

Engine

Engine Model	Cat* C18 ACERT™	
Gross Power	414 kW	555 hp
Direct Drive – Gross Power	390 kW	523 hp
Direct Drive – Flywheel Power	349 kW	468 hp
Converter Drive – Gross Power	413 kW	554 hp
Converter Drive – Flywheel Power	372 kW	499 hp
Net Power	390 kW	523 hp
EEC 80/1269	373 kW	501 hp
Direct Drive – Torque Rise	37%	
Converter Drive – Torque Rise	36%	
Bore	145 mm	5.71 in
Stroke	183 mm	7.2 in
Displacement	18.1 L	1,104.5 in³

Transmission

Direct Drive – Forward 1	6.1 km/h	3.8 mph
Direct Drive – Forward 2	10.9 km/h	6.8 mph
Direct Drive – Reverse 1	6.4 km/h	4 mph
Direct Drive – Reverse 2	11.4 km/h	7.1 mph
Converter Drive – Forward 1	5.8 km/h	3.6 mph
Converter Drive – Forward 2	10.3 km/h	6.4 mph
Converter Drive – Reverse 1	6.1 km/h	3.8 mph
Converter Drive – Reverse 2	10.8 km/h	6.7 mph

Hydraulic System

Relief Valve Setting	24 100 kPa	3,495 psi
Lift Cylinder Bore × Stroke	139.75 mm × 1021 mm	

Axles

Front	Planetary-Fixed
Oscillating Rear	± 6

Wheels – Plus Tip Teeth with Abrasion Resistant Material (ARM)

Drum Width	1400 mm	4 ft 7 in
Drum Diameter	1720 mm	5 ft 8 in
Diameter with Tips	2050 mm	6 ft 9 in
Tips per Wheel	35	

Service Refill Capacities

Fuel Tank	793 L	209.5 gal
Cooling System	107 L	28.3 gal
Crankcase	60 L	15.9 gal
Transmission	83 L	21.9 gal
Differentials and Final Drives – Front	186 L	49.1 gal
Differentials and Final Drives – Rear	190 L	50.2 gal
Hydraulic Tank	137 L	36.2 gal

Weights

Operating Weight	55 604 kg	122,586 lb

- Operating weight shown based on standard machine configured with stepped tip wheels with Terra rolling wire guard, striker bar with cleaner fingers, U-blade, full fuel, coolant and lubricants and operator 84 kg (185 lb).

Sound Performance

Standards	Meets ANSI/SAE and ISO standards

- The operator sound exposure Leq (equivalent sound pressure level) measured according to the work cycle procedures specified in ANSI/SAE J1166 OCT98 is 76 dB(A), for the cab offered by Caterpillar, when properly installed, maintained and tested with the doors and windows closed.
- Hearing protection may be needed when operating with an open operator station and cab (when not properly maintained or doors/windows open) for extended periods or in a noisy environment.
- The exterior sound pressure level for the standard machine measured at a distance of 15 m (49.2 ft) according to the test procedures specified in SAE J88 JUN86, mid-gear moving operation is 82 dB(A).
- The machine sound power level is 114 dB(A), measured according to the test procedures and conditions specified in ISO 6395:2008 for a standard machine configuration. The measurement was conducted at 70% of the maximum engine cooling fan speed.
- The machine sound power level is 111 dB(A), measured according to the test procedures and conditions specified in ISO 6395:2008 for a sound suppression machine configuration. The measurement was conducted at 70% of the maximum engine cooling fan speed.
- The operator sound pressure level is 73 dB(A), measured according to the test procedures and conditions specified in ISO 6396:2008 for a sound suppression machine configuration. The measurement was conducted at 70% of the maximum engine cooling fan speed.

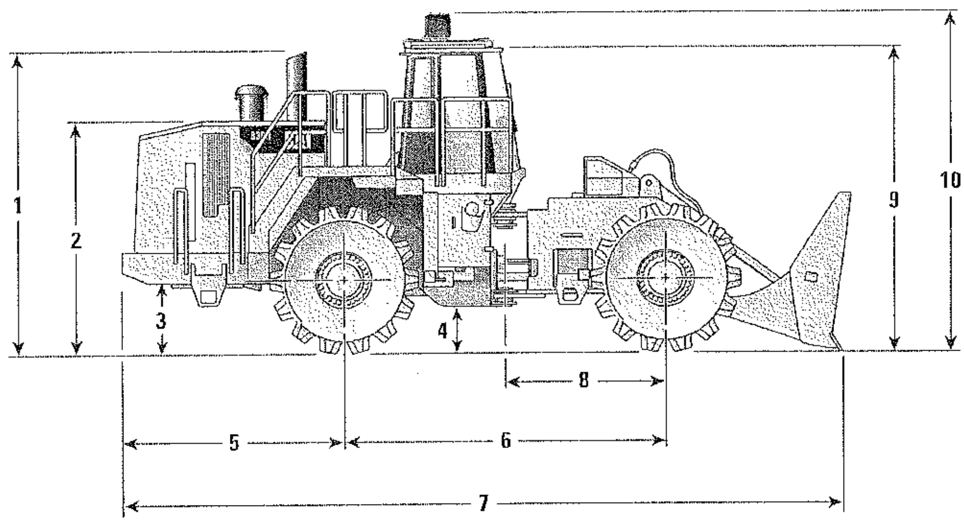
Dimensions

Height to Top of Cab with A/C	4549 mm	14 ft 11 in
Height to Top of Exhaust Pipe	4157 mm	13 ft 8 in
Height to Top of Hood	3201 mm	10 ft 6 in
Ground Clearance to Bumper	1025 mm	3 ft 4 in
Center Line of Rear Axle to Edge of Counterweight	3132 mm	10 ft 3 in
Hitch to Center Line of Front Axle	2275 mm	7 ft 6 in
Wheelbase	4550 mm	14 ft 11 in
Length with Blade on Ground	10 182 mm	33 ft 5 in
Ground Clearance	593 mm	1 ft 11 in
Width over Wheels	4280 mm	14 ft
Height to ROPS/ Canopy	4156 mm	13 ft 8 in

836H Landfill Compactor Specifications

Dimensions

All dimensions are approximate.



1	Height to Top of Exhaust Pipe	4157 mm	13 ft 8 in
2	Height to Top of Hood	3201 mm	10 ft 6 in
3	Ground Clearance to Bumper	1025 mm	3 ft 5 in
4	Ground Clearance	632 mm	2 ft 0 in
5	Center Line of Rear Axle to Edge of Counterweight	3132 mm	10 ft 4 in
6	Wheelbase	4550 mm	14 ft 11 in
7	Length with Blade on Ground	10 182 mm	33 ft 5 in
8	Hitch to Center Line of Front Axle	2275 mm	7 ft 6 in
9	Height to ROPS/Canopy	4156 mm	13 ft 8 in
10	Height to Top of Cab with A/C	4549 mm	14 ft 11 in

Blades

	Straight Blade	U-Blade	Semi U-Blade
Width over end bits	5193 mm (17 ft)	5172 mm (17 ft)	5311 mm (17.2 ft)
Height	2236 mm (7.3 ft)	2215 mm (7.3 ft)	2209.8 mm (7.3 ft)
Lift speed at rated rpm	364 mm/sec (1.2 ft/sec)	362 mm/sec (1.2 ft/sec)	934 mm/sec (1.2 ft/sec)
Cutting edges, reversible:			
Length, each end section (3 edges)	1408.2 mm (4.6 ft)	817 mm (2.7 ft)	816.6 mm (2.7 ft)
Length, each end section (2 edges)	—	990 mm (3.3 ft)	988 mm (3.3 ft)
Width × thickness	254 mm × 25 mm (10 in × 1 in)	254 mm × 25 mm (10 in × 1 in)	254 mm × 25 mm (10 in × 1 in)
End bits (2), self-sharpening:			
Length, each	472 mm (1.6 ft)	Right 472 mm (1.6 ft) Left 432 mm (1.4 ft)	Right 472 mm (1.6 ft) Left 472 mm (1.6 ft)
Width × thickness	254 mm × 25 mm (10 in × 1 in)	254 mm × 25 mm (10 in × 1 in)	254 mm × 25 mm (10 in × 1 in)
Capacity, rated	19.8 m^3 (25.9 yd^3)	25.8 m^3 (33.8 yd^3)	22.4 m^3 (29.29 yd^3)
Turning diameter	8758 mm (28.7 ft)	9023 mm (29.6 ft)	8864 mm (29.0 ft)

NOTE: See your Cat dealer for other blade options.

Turning Diameter