Site: Hafod Landfil **Date:** 05/08/2015
Sample No.: Test1/L1/3CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1095	g
Mass of dried soil + tray (m_2)	=		990	g
Mass of empty tray (m_3)	=		17	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1078	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	973	g
Mass of moisture (m_6)	=	$m_4 - m_5$	105	g
Water Content (w)	=	$\frac{m_6}{m_5}$	10.8%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3262	g
Mass of empty core (M_2)	=		1059	g
Mass of soil (M)	=	$M_1 - M_2$	2203	g
Height of core (h)	=		125	mm
Internal diameter of core (d)	=		100	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	981747.704	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.244	Mg m^3
Water Content (w)	=		10.8%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	2.025	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.36	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	4.4%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

Revision Index

i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 05/08/2015
Sample No.: Test2/L1/3CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1071	g
Mass of dried soil + tray (m_2)	=		965	g
Mass of empty tray (m_3)	=		17	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1054	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	948	g
Mass of moisture (m_6)	=	$m_4 - m_5$	106	g
Water Content (w)	=	$\frac{m_6}{m_5}$	11.2%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3200	g
Mass of empty core (M_2)	=		969	g
Mass of soil (M)	=	$M_1 - M_2$	2231	g
Height of core (h)	=		125	mm
Internal diameter of core (d)	=		100	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	981747.704	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.272	Mg m^3
Water Content (w)	=		11.2%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	2.044	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.34	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	2.7%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 07/08/2015
Sample No.: Test3/L3/3CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1074	g
Mass of dried soil + tray (m_2)	=		949	g
Mass of empty tray (m_3)	=		16	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1058	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	933	g
Mass of moisture (m_6)	=	$m_4 - m_5$	125	g
Water Content (w)	=	$\frac{m_6}{m_5}$	13.4%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3224	g
Mass of empty core (M_2)	=		974	g
Mass of soil (M)	=	$M_1 - M_2$	2250	g
Height of core (h)	=		125	mm
Internal diameter of core (d)	=		100	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	981747.704	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.292	Mg m^3
Water Content (w)	=		13.4%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	2.021	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.36	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	-0.7%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 07/08/2015
Sample No.: Test4/L3/3CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1651	g
Mass of dried soil + tray (m_2)	=		1458	g
Mass of empty tray (m_3)	=		17	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1634	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	1441	g
Mass of moisture (m_6)	=	$m_4 - m_5$	193	g
Water Content (w)	=	$\frac{m_6}{m_5}$	13.4%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3374	g
Mass of empty core (M_2)	=		1042	g
Mass of soil (M)	=	$M_1 - M_2$	2332	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		102	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1062266.72	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.195	Mg m^3
Water Content (w)	=		13.4%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.936	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.42	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	3.6%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 10/08/2015
Sample No.: Test5/L1/3CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1046	g
Mass of dried soil + tray (m_2)	=		910	g
Mass of empty tray (m_3)	=		16	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1030	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	894	g
Mass of moisture (m_6)	=	$m_4 - m_5$	136	g
Water Content (w)	=	$\frac{m_6}{m_5}$	15.2%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3348	g
Mass of empty core (M_2)	=		1060	g
Mass of soil (M)	=	$M_1 - M_2$	2288	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		102	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1062266.72	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.154	Mg m^3
Water Content (w)	=		15.2%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.869	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.47	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	3.5%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 11/08/2015
Sample No.: Test6/L7/3CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		767	g
Mass of dried soil + tray (m_2)	=		686	g
Mass of empty tray (m_3)	=		16	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	751	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	670	g
Mass of moisture (m_6)	=	$m_4 - m_5$	81	g
Water Content (w)	=	$\frac{m_6}{m_5}$	12.1%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3382	g
Mass of empty core (M_2)	=		994	g
Mass of soil (M)	=	$M_1 - M_2$	2388	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1083197.59	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.205	Mg m^3
Water Content (w)	=		12.1%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.967	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.40	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	4.6%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 12/08/2015
Sample No.: Test7/L18/4CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1134	g
Mass of dried soil + tray (m_2)	=		1007	g
Mass of empty tray (m_3)	=		17	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1117	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	990	g
Mass of moisture (m_6)	=	$m_4 - m_5$	127	g
Water Content (w)	=	$\frac{m_6}{m_5}$	12.8%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3656	g
Mass of empty core (M_2)	=		1238	g
Mass of soil (M)	=	$M_1 - M_2$	2418	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1083197.59	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.232	Mg m^3
Water Content (w)	=		12.8%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.978	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.39	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	2.6%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 13/08/2015
Sample No.: Test8/L22/4CF **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1255	g
Mass of dried soil + tray (m_2)	=		1115	g
Mass of empty tray (m_3)	=		16	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1239	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	1099	g
Mass of moisture (m_6)	=	$m_4 - m_5$	140	g
Water Content (w)	=	$\frac{m_6}{m_5}$	12.7%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3444	g
Mass of empty core (M_2)	=		1061	g
Mass of soil (M)	=	$M_1 - M_2$	2383	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1083197.59	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.200	Mg m^3
Water Content (w)	=		12.7%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.951	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.41	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	4.1%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 25/08/2015
Sample No.: Test9/L4/5B **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1229	g
Mass of dried soil + tray (m_2)	=		1088	g
Mass of empty tray (m_3)	=		17	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1212	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	1071	g
Mass of moisture (m_6)	=	$m_4 - m_5$	141	g
Water Content (w)	=	$\frac{m_6}{m_5}$	13.2%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3391	g
Mass of empty core (M_2)	=		1031	g
Mass of soil (M)	=	$M_1 - M_2$	2360	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1083197.59	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.179	Mg m^3
Water Content (w)	=		13.2%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.925	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.43	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	4.6%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 24/08/2015
Sample No.: Test10/L2/5B **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1251	g
Mass of dried soil + tray (m_2)	=		1103	g
Mass of empty tray (m_3)	=		16	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1235	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	1087	g
Mass of moisture (m_6)	=	$m_4 - m_5$	148	g
Water Content (w)	=	$\frac{m_6}{m_5}$	13.6%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3384	g
Mass of empty core (M_2)	=		1066	g
Mass of soil (M)	=	$M_1 - M_2$	2318	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		102	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1062266.72	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.182	Mg m^3
Water Content (w)	=		13.6%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.921	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.43	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	3.9%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

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i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 25/09/2015
Sample No.: Test11/L1/2G **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		977	g
Mass of dried soil + tray (m_2)	=		859	g
Mass of empty tray (m_3)	=		16	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	961	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	843	g
Mass of moisture (m_6)	=	$m_4 - m_5$	118	g
Water Content (w)	=	$\frac{m_6}{m_5}$	14.0%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		2931	g
Mass of empty core (M_2)	=		924	g
Mass of soil (M)	=	$M_1 - M_2$	2007	g
Height of core (h)	=		110	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	916551.803	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.190	Mg m^3
Water Content (w)	=		14.0%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.921	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.43	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	3.2%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

Revision Index

i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 06/10/2015
Sample No.: Test12/L37/5GH **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		975	g
Mass of dried soil + tray (m_2)	=		864	g
Mass of empty tray (m_3)	=		17	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	958	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	847	g
Mass of moisture (m_6)	=	$m_4 - m_5$	111	g
Water Content (w)	=	$\frac{m_6}{m_5}$	13.1%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3210	g
Mass of empty core (M_2)	=		1007	g
Mass of soil (M)	=	$M_1 - M_2$	2203	g
Height of core (h)	=		120	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	999874.694	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.203	Mg m^3
Water Content (w)	=		13.1%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.948	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.41	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	3.5%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

(4) Bulk and dry density should be expressed to three places of decimals. All formulae are adjusted for different measurement units, no further conversion factors are required.

Revision Index

i		03/11/2010	Richard C
ii	Renumbered	21/07/2011	Richard C
iii	Air Voids Calculation added	04/06/2014	Richard C
iv	Text amended	19/06/2014	Richard C

Site: Hafod Landfil **Date:** 07/10/2015
Sample No.: Test13/L38/5GH **FTC-1012**
Site Determination of Compaction

(1) Determination of Water Content				
Mass of damp soil + tray (m_1)	=		1151	g
Mass of dried soil + tray (m_2)	=		1023	g
Mass of empty tray (m_3)	=		14	g
Mass of damp soil (m_4)	=	$m_1 - m_3$	1137	g
Mass of dried soil (m_5)	=	$m_2 - m_3$	1009	g
Mass of moisture (m_6)	=	$m_4 - m_5$	128	g
Water Content (w)	=	$\frac{m_6}{m_5}$	12.7%	
(2) Determination of Dry Density				
Mass of core plus soil (M_1)	=		3437	g
Mass of empty core (M_2)	=		1068	g
Mass of soil (M)	=	$M_1 - M_2$	2369	g
Height of core (h)	=		130	mm
Internal diameter of core (d)	=		103	mm
Internal volume of core (V)	=	$\frac{\Pi \times d^2 \times h}{4}$	1083197.59	mm^3
Bulk density (ρ) (see Note 4)	=	$\frac{M \times 1000}{V}$	2.187	Mg m^3
Water Content (w)	=		12.7%	
Dry density (ρ_d) (see Note 4)	=	$\frac{\rho}{(1+w)}$	1.941	Mg m^3
Average Particle Density (laboratory determination, G_s) =			2.75	Mg m^3
Void Ratio (e)	=	$\frac{G_s * 1}{\rho_d} - 1$	0.42	
Air Voids (Av)	=	$\frac{e - (wG_s)}{1 + e}$	4.7%	

Notes:

(1) Before weighing, ensure balance is zeroed and plate is free from debris;

(2) Ensure steel core is trimmed flush, and any small depressions in soil surface are filled, prior to weighing and knocking out into tray;

(3) BS 1377 Test method requires 24 hours at 105^{0}C to ensure complete drying of samples; site determinations will yield conservative results after 12-16 hrs, although the longer the time, the more accurate the determination. Cohesive samples must be diced and spread out across tray before drying; granular samples similarly should be spread.

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