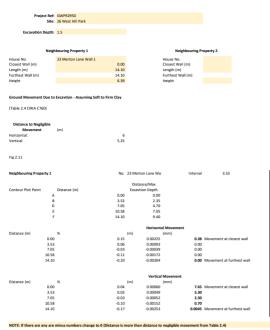
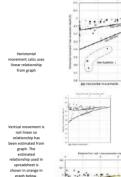
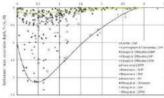
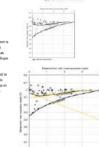
Appendix F Ground Movement Assessment Calculations (Stage 4)



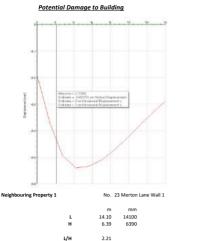








Normalised settlements due to excepation in sett to firm slay





Vertical Deflection (Δ) 0.29 mm from graph (max difference between blue and orange line) Defelction Ratio (Δ/L) 0.002057 % difference between horizontal movement at nearest and farthest walls Horizontal Movement (δh) 0.38 mm Horzontal Strain (Eh) = δh/L 0.00270 %

<u>CATEGORY OF DAMAGE</u> Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

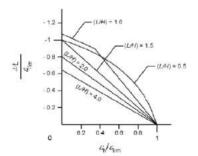
Method 2.- can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L	/H 2.21	
Negligible damage limit (Elin	ı) 0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.041134752 0.053900709	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Eli	m) 0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.027423168 0.035933806	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elin	n) 0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.006855792 0.008983452	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) Influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below Very Slight damage limit (Elim) 0.075 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15

L/H

0.00

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category -no need to plot points below 0.3

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Moderate damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

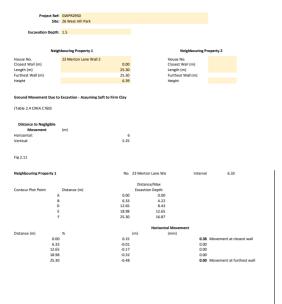
(Δ/L)/(Elim) (Eh)/(Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

Negligible

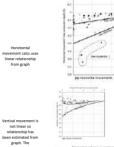
	mage steppery of	Description of typical damage (error of regim is statestated)	Appreximate cruck width (0000)	Limiting teache strain t _{in} (per vote)
0	Negläghte	Machine cracks of less than about 0.1 mm are classed as anglegible.	<91	0.0-0.01
1	Very slight	Fine crades data can easily be neated during normal discontion. For how conluted slight Energies in bailding. Crades in estimat Incluives: maker on supervisor.	<1	8.05-0.973
2	Sight	Checks cash? Alles, Restourning probably regards, Sweet leight functions showing mode of building. Check are worked eventably and some reproducing mass he required extendity to ensure work-heightness. Drocs and windows may usek slightly.	< 5	0.075-0.15
3	Madense	The much a require some opening top and can be pathed by a sumore, Remaining into an its masked by matched integer. Repeating of referrab tecknostic and possible's a resid promot of inclusion to be replaced. Down and variations at the regioned. Down and wardsom at these generic posses are thereas. Wenther spheres often imposed.	i-to ers manifer of eracks > 1	6.15-0.3
+	Seven	Exercise expair work monitoring backing-out not exploring resident of works, expensive, your dears and workers. Westown and frames discover, floor deeping motionity. While learning in bulgang anticeably, some loss of fearing in beams. Service spice discopted.	15-25 but size depends on sumpler of cracks	× 0.5
j	Verv severe	This requires a major repair involving partial or	teady-25	

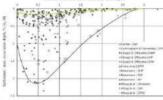
This requires a causer repair involving partial as workly - 25 complete infradding. Beams lose bearings, walls for depends lean hadly and require shoring. Windows brokes on number of

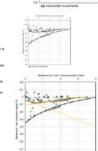


ent from Table 2.4)

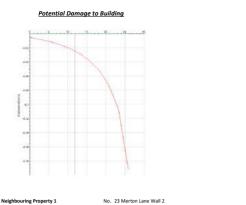
NOTE: If there are any are minus numbers change to 0 (Distance is more than distance to negligible m







a Normalised settlements due to exception in sett to firm slay





m 25.30 6.39 25300 6390 L H L/H 3.96 Vertical Deflection (Δ) 0.08 mm from graph (max difference between blue and orange line) 0.000316 % Defelction Ratio (Δ/L) difference between horizontal movement at nearest and farthest walls 0.38 mm Horizontal Movement (bh)

0.00150 %

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method

Horzontal Strain (Eh) = δh/L

Mettod 2... - yrettered mettodo Open up Damage Category Relationship Plots GMA¹ spreadsheet - Find relevant (JH graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

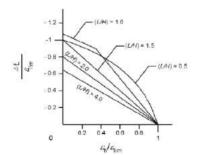
Method 2.- can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H 3.96 0.05 Negligible damage limit (Elim) 0.006324111 Plot this point on fig2.18 (b) if the plotted point is below 0.030039526 the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 0.004216074 Plot this point on fig2.18 (b) if the plotted point is below 0.02002635 the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (A/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim) 0.002108037 Plot this point on fig2.18 (b) if the plotted point is below 0.010013175 the appropriate (/H line then damage falls into 'slight' category - no need to plot points below Moderate damage limit (Elim) 0.3 0.001054018 Plot this point on fig2.18 (b) if the plotted point is below 0.005006588 imoderate U/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe' $(\Delta/L)/(Elim)$ (Eh)/(Elim)

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) Influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

Moderate damage limit (Elim) (Δ/L)/(Elim)

0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'very slight'
	category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'slight' category -
	no need to plot points below
0.3	
0	Plot this point on fig2 19 (b) if the plotted point is below the

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe' ō

Calculated Category of Damage

(Eh)/(Elim)

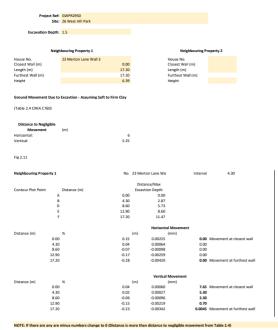
Negligible

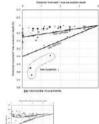
L/H

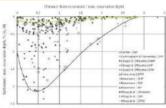
0.00

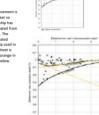
Category of damage		Description of typical damage (ense of regime is statistized)	Appreciants cruck width (mm)	
0	Neglaghte	Machine cracks of less than about 0.1 mm are cheeced as arglegible.	< 0 1	0.0-0.01
1	Very sigtr	First cracks data can easily be neated during neural discontion. Perhaps involuted slight fractive in biolong. Conductin external finitionets visible on suspection.	<1	8.05-0.975
2	Sight	Cracks rasily filled, Redecursive probably regarding, Swerzi sight functions showing rands of building. Crack are writely severally and some repositing rasil for anglind essenably to ensure workerightness. Drocs and wisdows may rack sightly.	< 9	0.075-0.15
1	Maderate	The stacks require some opening up and can be arkined by a summer, Remarks tanks can be marked by matchin and possible a result around referred between and possible a result around of hickness to be replaced. Down and worknows returning. Service appear over the two- Wentheringhames other supported.	3-15 or a matter of cricks > 3	615-0)
+	Sevent	Exercise expert work northing backing-out ind exploring sections of wells, superaily ever deer and workery. Washes and frames discoved, free sequeng noticeshift Wills learning to belong a priceshift, some loss of Deering in	13-25 but sine depends on another of cracits	- 0.5

This require a case regain involving partial or weathy complete relading. Seem loss beings, with but depe-lem hady and require shoring. Window trokes on much

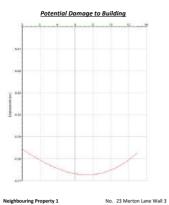








a Normalised settlements due to evceyation in soft to firm clay





m 17.20 6.39 17200 6390 L H L/H 2.69 Vertical Deflection (Δ) 0.12 mm from graph (max difference between blue and orange line) Defelction Ratio (Δ/L) 0.000698 % difference between horizontal movement at nearest and farthest walls Horizontal Movement (δh) 0.00 mm

Horzontal Strain (Eh) = δh/L 0.00000 %

<u>CATEGORY OF DAMAGE</u> Damage category limits are given in Table 2.5 (below).

Method 1.- Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

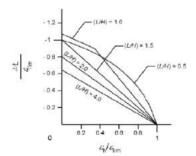
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

2.69	
0.05	
0.013953488 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0.009302326 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0.004651163 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	
0.002325581 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'
	0.013953488 0.013953488 0 0.075 0.009302326 0 0.004651163 0 0.004651163 0 0.004651163

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim) Moderate damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

L/H	0.00
0.05	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	
-	

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

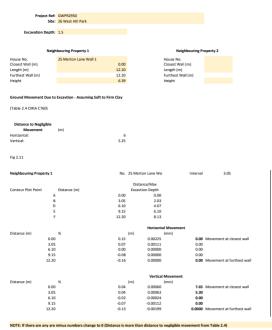
Table 2.5

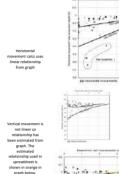
Negligible

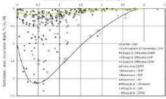
Category' of damage	Description of typical damage (new of regar is underland)	Appreciation cruck width (mm)	Limiting teache strain tas (per real	
0 Neglaghte	Machine cracks of less than about 0.1 mm are cheeced as negligible:	<01	0.0-0.01	
1. Very slight	Fine crades data can easily be neated during neuroid decoration. Perhaps (solided slight fractive in bosiding. Crades in estimat Incidental visible on suspection.	<1	8.05-0.973	
2 Sight	Cracks rasily filled, Redecursive probably regarding, Swerzi sight functions showing rands of building. Crack are writely severally and some repositing rasil for anglind essenably to ensure workerightness. Drocs and wisdows may rack sightly.	< 9	0.075-0.15	
1 Mademie	The stucks require some opening tip and can be pathed by a sumore, Remarking and can be madered by matched inners. Repeating of referrat tecknostic and possible's a studie strength of hicknostic to be registered. Down and wardown stucking. Service opens user that we Wentberrightness often supported.	i-to ers manifer of eracks > 1	615-03	
+ Sevent	Exercise expert needs methods beaking-out and exploring sections of walks, superinly ever dates and wankney. Wadews and furness discussed, force despin participable, while hearing at bulging actionable, some loss of bearing in	15-25 but sine depends on another of cracles	×0.5	

This requires a case report involving outful or weathy complete retrading. Secon loss beings, with for dependent lean hafly and require shoring. Window brokes, on much 5 Verys



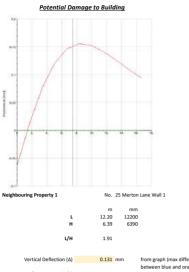






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a Normalised settlements due to exception in soft to firm slay





from graph (max difference between blue and orange line) Deflection Ratio (Δ/L) 0.001074 % difference between horizontal movement at nearest and farthest walls Horizontal Movement (δh) 0.00 mm Horzontal Strain (Eh) = δh/L 0.00000 %

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1.- Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

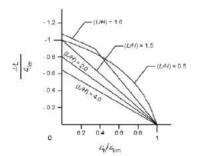
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	1.91	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.02147541 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.01431694 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.003579235 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim) Moderate damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

L/H	0.00
0.05	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	
	plan it is a start of the AD AD AD AD AD AD a start of a start is the term of the

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

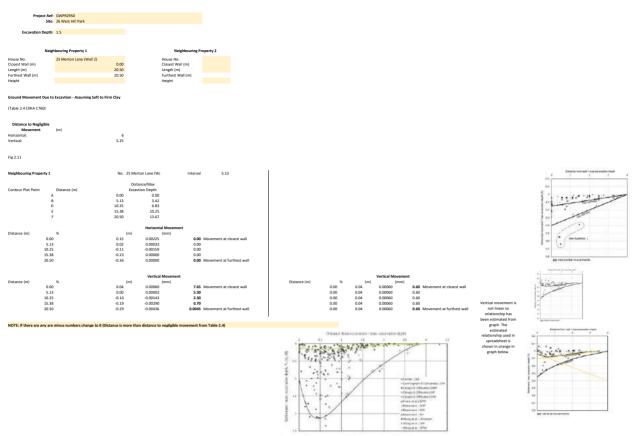
Calculated Category of Damage

Negligible

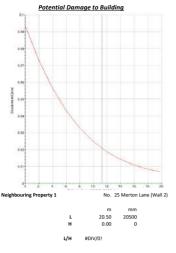
	and a second s		
Category of demogr	Description of typical damage (once of signar is scalerized)	Appreximate cruck width (mm)	Limiting teactly strain to, (per rocal
0 Neglaghte	Mactime cracks of leve than about 0.1 mm are classed as anglegible.	< 9.1	0.0-0.01
1 Very slight	Fine cracks dust can easily be neared during normal disconstant. Perhaps owhered slight fixetive in building. Catchs in essential building while on appectors.	<1	8.05-0.975
2 Slight	Cracks really filled. Redecourses probably respond, Sversi single functions showing proba- in building. Cracks are multiple eventably and some repeating rate its instantic extendity to more weathering taxes. Droes and windows any mick sightly.	< ý	0.075-0.15
1 Madense	The ranchs require some opening up and can be publicly in anisoti, Returning caching and pe- matical by matching integrating of material between and possible a caching material aff hickness has be replaced. Doos not worknow the has be replaced. Doos not worknow the tag Service open sure thereas. Westnerspinnens often imported	i-tions anator of ends > 1	6.15-0.)
+ Sever	Exercise explain work, novolving becaking-out inde replacing, testions, of walks, respectively, your dense and combiner. Workforw and three- disourced, floor desping noticeably. While learning or bulgary noticeably, sound loss of learning in learns. Service space, floored.	15-25 but size depends on another of cracks	× 0.5
5 Very seven	The requires a causer repair involving partial or complete rebuilding. Seams love beerings, walls		

complete retrahing. Secure lose bearings, while her depends bean hardly and require strating. Windows brokes on another of with diviouslan. Danger of autofality cracks





a Normalised settlements due to excevation in soft to firm slay





<u>CATEGORY OF DAMAGE</u> Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

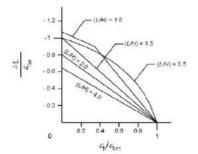
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	#DIV/0!	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.00195122 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.001300813 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.000325203 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim) Moderate damage limit (Elim)

tetain-sta -4L

1-

(Δ/L)/(Elim) (Eh)/(Elim)

L/H	0.00
0.05	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

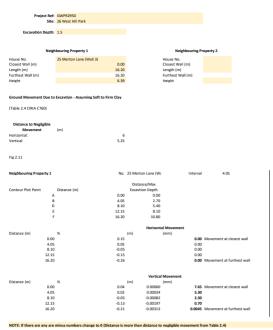
Calculated Category of Damage

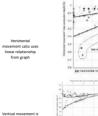
Negligible

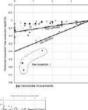
		ding, 1989 and Sudant, 2001		
Category of demage		Description of typical damage (new of repair is statistical)	Appreciants cruck width (mm)	Limiting teaction strain sin (per real
0	Negläghte	Machine cracks of less than about 0.1 mm are classed as anglegible.	<91	0.0-0.01
1	Very slight	Fine cracks dut can easily be neated during normal descention. For how colleted slight fractive in building. Cracks in estential finitework multie on appendix.	<1	8.05-0.973
1	Sight	Chieles cash: filled, Restruction probably applied, Sweers leight functions showing make of building. Cooks are multiple extendity and some reporting may be required extendity to ensure work-heightness. Droce and windows may mick slightly.	< ý	4,075-4.15
3	Madense	The much a require some opening top and can be pathed by a sumore, Remaining into an its masked by matched integer. Repeating of referrab tecknostic and possible's a resid promot of inclusion to be replaced. Down and variations at the regioned. Down and wardsom at these generic posses are thereas. Wenther spheres often imposed.	i-to ers manifer of eracks > 1	6.15-0.)
+	Sevent	Exercise repoir work avoiding backing-out not replacing reviews of wells, especially, over deers and wanders, Washew out fraver discoved, flow deeping noticeshly Walls learning in bulgang anticeshly, some loss of fearing in beams, Service spice discopted.	15-25 but size depends on another of cracks	- 0.5
ź	Very severe	This requires a major repair involving partial or	101400y - 25	

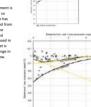
an organic a new resear involving partial as with 0x - 25 complete initializing. Seems live terrings, with but depends less halfs and require should Window troken, on another of with dispetition. Durate of an effective

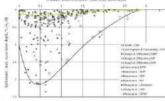




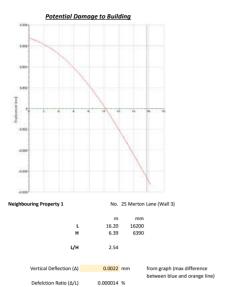








a Normalised settlements due to excavation in sett to firm slay



tetaiseata -41. 1-

difference between horizontal movement at nearest and farthest walls 0.00 mm Horzontal Strain (Eh) = δh/L 0.00000 %

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Defelction Ratio (Δ/L)

Horizontal Movement (δh)

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

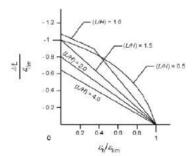
Method 2.- can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	2.54	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.000271605 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.00018107 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	4.52675E-05 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) Influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim) 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category -no need to plot points below

Moderate damage limit (Elim) 0.3

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

0.00

Calculated Category of Damage

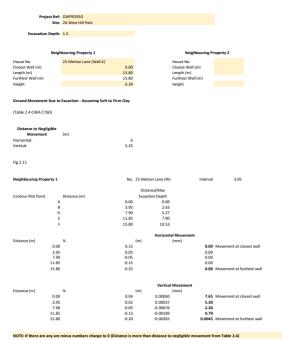
(Δ/L)/(Elim) (Eh)/(Elim)

Negligible

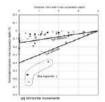
L/H

Category of damage				Limiting teachis strain t _{in} (per seal)
0	Negläghte	Machine cracks of less than about 0.1 mm are classed as anglegible.	< 91	0.0-0.01
1	Very slight	Fine crades data can easily be neated during normal discontion. For how conluted slight Energies in bailding. Crades in estimat Incluives: maker on supervisor.	<1	8.05-0.975
2	Sight	Checks cash: filled, Restourning probably regarded, Sweers leight functions showing mode of building. Check are worked eventably and some reporting rate for anytical extender to ensure worker hightness. Drocs and windows may next slightly.	< 5	0.075-0.15
1	Madense	The much a require some opening top and can be pathed by a sumore, Remaining into an its masked by matched integer. Repeating of referrab tecknostic and possible's a resid promot of inclusion to be replaced. Down and variations at the regioned. Down and wardsom at these generic posses are thereas. Wenther spheres often imposed.	3-15 or a matter of ends > 3	6.15-0.)
+	Seven	Exercise repoir work nonling backing-out not replacing review, cf works, repeating year deers and workers, Washew one frames discurred. from deping noticeshly Walls learning in bulgang anticeshly, some loss of fearing in beams. Service pipes fitzepied.	15-25 but size seperate on another of cracks	- 0.5
j	Flack installe	This requires a major repair involving partial or penglete relations. Second lose bearings, with		ç

complete relaxing. Beam lose bearings, with bur depends less hadly and require shoring. Windows brokes, on number of with downton. Darger of notability cracks



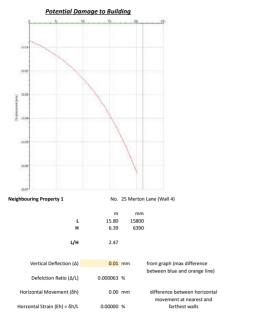




biener



Vertical movement is not linear so relationship has been estimated from graph. The estimated relationship used in spreadsheet is shown





<u>CATEGORY OF DAMAGE</u> Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

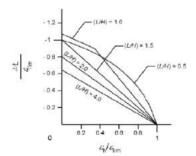
Method 2.- can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	2.47	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.001265823 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.000843882 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)	0.000421941 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.00021097 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim)

L/H

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category -no need to plot points below 0.3

0.00

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

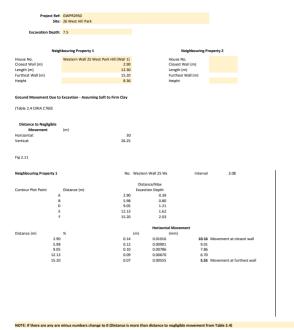
Calculated Category of Damage

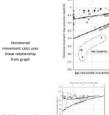
Moderate damage limit (Elim)

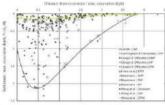
(Δ/L)/(Elim) (Eh)/(Elim)

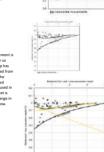
Negligible

1		szificelten of unline derauge in west (offer Burland ding, 1989, and Canteral, 2001)	HI3E, 1607, MC2	Collect with
	ande. ander: et	Description of typical damage (new of tepter is statement)	Appreciation cruck width (mm)	Limiting teachie strain t _{he} (per rotat
0	Neglaghte	Macline crocks of less than about 0.1 mm are closed as arglepible.	< 9.1	0.0-0.01
1	Very slight	Fine cracks dust can easily be neated during normal descention. For how switched slight fractive in building. Cracks in estimat Iniciawerk marker on suspection.	<1	8.05-0.975
1	Sight	Casels easily filled, Redecursive probably regards, Sween legal functions showing mode of building. Casels are worked eccently and some producing may be availed extended to ensure worker-tightness. Drors and windows may note signify.	<5	0.075-0.15
1	Madenste	The much singular score opening tip and can be pathed by a subset. Returned much only by marked by analysis himage. Repeatings of referral interview and possible a much present of hird south to be replaced. Down and wardoon reflexionit in be replaced. Down and wardoon reflexing. Service pages user thereas Wentertightness often imported.	i-tions anator of ends > 1	6.15-0.)
+	Sever	Exempter organization work monitoring backling-con- inde majoring, reviews, cf. works, supporting your denses and workers. Workers used frames discoved, from deping mationably. Works learning in beaux, Service piper involved.	15-25 but size depends on another of cracles	0.5
5	Vary severe	The requires a case or repair secondary partial or complete referabiling. Second loss bearings, walls lean halfly and require storing. Windows brokes with deviction. Darger of modelsility	but depends	l.

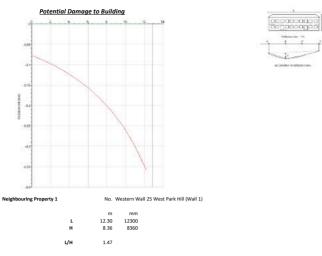








Normalised settlements due to excepation in sett to firm slay



Vertical Deflection (Δ)	0.05	mm	from graph (max difference
Deflection Ratio (Δ/L)	0.000407	%	between blue and orange line)
Horizontal Movement (δ h)	4.61	mm	difference between horizontal
Horzontal Strain (Eh) = $\delta h/L$	0.03750	%	movement at nearest and farthest walls

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

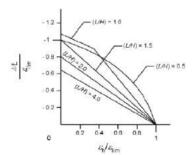
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	1.47	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below
(Eh)/(Elim)	0.75	the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim)	0.005420054	Plot this point on fig2.18 (b) if the plotted point is below
(Eh)/(Elim)	0.5	the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim)	0.002710027	Plot this point on fig2.18 (b) if the plotted point is below
(Eh)/(Elim)	0.25	the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below
(Eh)/(Elim)	0.125	the appropriate L/H line then damage falls into
		'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

Moderate damage limit (Elim)

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(Δ/L)/(Elim) (Eh)/(Elim)

L/H	0.00
0.05	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	
0	Plot this point on fig2 18 (b) if the plotted point is below the

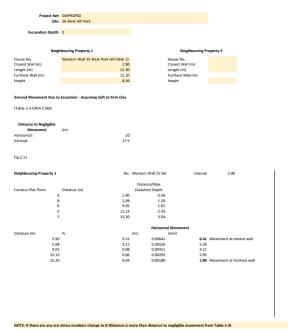
Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Negligible

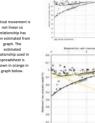
Category of demoge				Limiting teacher strain sin (per real
0	Neglaghte	Machine cracks of less than about 0.1 mm are cheored as arglegible.	<01	0.0-0.01
1	Very sägla	Fine cracks data can easily be neated during normal discontion. For how twilsted slight Energies in basiding. Cracks in estimat Incluives: visible on supervisor.	<1	8.05-0.975
2	Sight	Checks cash? Alles, Restourning probably regards, Sweet leight functions showing mode of building. Check are worked eventably and some reproducing mass he required extendity to ensure work-heightness. Drocs and windows may usek slightly.	< 5	0.075-0.15
3	Madense	The much a require some opening top and can be pathed by a sumore, Remaining into an its masked by matched integer. Repeating of referrab tecknostic and possible's a resid promot of inclusion to be replaced. Down and variations at the regioned. Down and wardsom at these generic posses are thereas. Wenther spheres often imposed.	i-to ers manifer of eracks > 1	6.15-0.)
+	Seven	Exercise expair work monitoring backing-out not exploring resident of works, expensive, your dears and workers. Westown and frames discover, floor deeping motionity. While learning in bulgang anticeably, some loss of fearing in beams. Service spice discopted.	also depends on anusher of	×0.5
ń.	Very servere	This maniput a player requir involvang control or	101007-25	

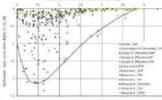
This requires a major repair involving partial as weathy = 25 register relading. Secan lose bearings, walls for depends lean hally and require shoring. Wilslows brokes, on number of



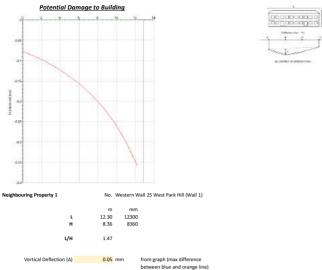








a Normalised settlements due to excevation in soft to firm slay



vertical beliection (Δ)	0.05		between blue and orange line)
Deflection Ratio (Δ/L)	0.000407	%	
Horizontal Movement (δ h)	4.61	mm	difference between horizontal movement at nearest and
Horzontal Strain (Eh) = δh/L	0.03750	%	farthest walls

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

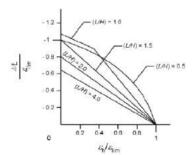
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

ı	/H 1.47	
Negligible damage limit (Elin	n) 0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.008130081 0.75	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Eli	m) 0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.005420054 0.5	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elin	n) 0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.001355014 0.125	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

Moderate damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

totaiseata -41. 1-

0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	
0	Plot this point on fig2.18 (b) if the plotted point is below the

0.00

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

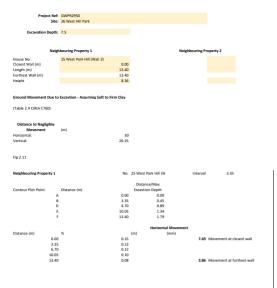
Negligible

L/H

Category of damage	Description of typical damage (ense of regime is statistized)	Appreximate cruck width (0000)	Limiting teacher strain sin (per recei	
0 Neglaghte	Mariline cracks of less than about 0.1 mm are classed as acplayable.	< 9.1	0.0-0.01	
1. Very sight	Ense crades dan cau easily be neated during neural discourtion. Perhaps ownited slight fractive in bisiding. Cradis in estientia Inicidized, visible on supervisor.	<1	8.05-0.975	
2 Sight	Cracks ranks filled, Reikowskie probably regarding, Swerzi sight functions showing ranks of building. Cocks are writely extended with a sone repeating rank he negation extendity to ensure worker-lightness. Drocs and windows may mick sightly.	< 9	0.075-0.15	
1 Mademie	The stucks require some opening tip and can be articled by a sumout. Returned tasks out by marked by matched inners. Repeating of referrat tecknostic and possible's a studie sumout of hicknostic to be replaced. Doos not worknow references. Service open our thereas. Wettherspheres often imported.	i-to ers manifer of eracks > 1	6.15-0.)	
+ Sevent	Eccessory, orquir work, novolving booking-out not emploring sections of works, superside, your deers and wandows. Wisdow soft frames discurred, floor deeping notionidly. Wolls learning in bulgary anticedby, your loss of fearing in beams. Service gives throughed.	15-25 but size depends on another of cracks	× 0.5	
2 April North Provide	This requires a major repair involving partial or complete relativity. Securi lose bearings, with		e	

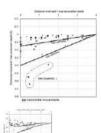
complete retrahing. Secure lose bearings, while her depends bean hardly and require strating. Windows brokes on another of with diviouslan. Danger of autofality cracks

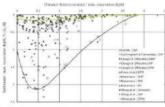
Table 2.5

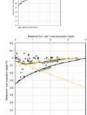


ement from Table 2.4)

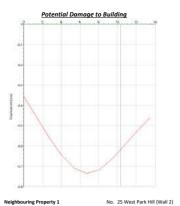
NOTE: If there are any are minus numbers change to 0 (Distance is more than distance to negligible mo







a Normalised settlements due to excavation in sett to firm slay





m 13.40 8.36 13400 8360 L H L/H 1.60 Vertical Deflection (Δ) 0.39 mm from graph (max difference between blue and orange line) 0.002910 % Deflection Ratio (Δ/L) difference between horizontal movement at nearest and farthest walls 3.83 mm Horizontal Movement (bh)

Horzontal Strain (Eh) = δh/L 0.02858 %

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method

Mettod 2... - yrettered mettodo Open up Damage Category Relationship Plots GMA¹ spreadsheet - Find relevant (JH graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

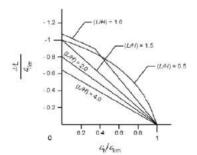
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H 1.60 0.05 Negligible damage limit (Elim) 0.058208955 Plot this point on fig2.18 (b) if the plotted point is below 0.571641791 the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 0.03880597 Plot this point on fig2.18 (b) if the plotted point is below 0.381094527 the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (A/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim) 0.019402985 Plot this point on fig2.18 (b) if the plotted point is below 0.190547264 the appropriate (/H line then damage falls into 'slight' category - no need to plot points below Moderate damage limit (Elim) 0.3 0.009701493 Plot this point on fig2.18 (b) if the plotted point is below 0.095273632 the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe' $(\Delta/L)/(Elim)$ (Eh)/(Elim)

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) Influence of horizontal strain on $\Delta\!\!/L$ / $c_{\rm int}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

Moderate damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

L/H 0.00 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below 0.075 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below 0.15 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category -no need to plot points below 0.3

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Table 2.5

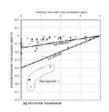
Negligible

Category of damage	Description of typical damage (error of regim is statistized)	Appreximate cruck width (mm)		
0 Neglägzte	Machine cracks of less than about 0.1 mm are classed as arglegible.	<01	0.0-0.01	
1. Very slight	Fine crades data can easily be neated during normal discontion. For how conluted slight Energies in bailding. Crades in estimat Incluives: maker on supervisor.	<1	8.05-0.973	
2 Sight	Checks caulty filled, Restourning probably regarding, Switzer is sight functions showing mode of building. Checks are studied eccentrily and some reporting mass for angland eccentrily to ensure worther highlines. Droce and windows may more sightly.	< 9	0.075-0.15	
1 Madenate	The much a require some opening top and can be pathed by a sumore, Remaining into an its masked by matched integer. Repeating of referrab tecknostic and possible's a resid promot of inclusion to be replaced. Down and variations at the regioned. Down and wardsom at these generic posses are thereas. Wenther spheres often imposed.	i-to ers manifer of eracks > 1	615-03	
+ Sevent	Exercise repoir work avoiding backing-out not replacing reviews of wells, especially, over deers and wanders, Washew out fraver discoved, flow deeping noticeshly Walls learning in bulgang anticeshly, some loss of fearing in beams, Service spice discopted.	15-25 but size depends on another of cracks	× 0.5	
5 Universities	This manipus a charge manie involtance statud or	teresters, 35		

neer reter avolving partial or waally hag. Seam lose bearings, walls for dep equire storing. Windows brokes, on some The require a complete retra-lean hadly and

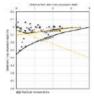
	GWPR2950					
Site	26 West Hill Park					
Excavation Depth:	5					
Neigl	bouring Property 1			Neighb	ouring P	roperty 2
House No.	25 West Park Hill Wall 2			House No.		
Closest Wall (m)		0.00		Closest Wall (m	n)	
Length (m)		13.40		Length (m)		
Furthest Wall (m)		13.40		Furthest Wall (m)	
Height		8.36		Height		
Ground Movement Due to	Excavtion - Assuming Soft to	Firm Clay				
(Table 2.4 CIRIA C760)						
rubic 2.4 Circle C/00)						
Distance to Negligible						
Movement	(m)					
Horizontal:		20				
Vertical:		17.5				
Fig 2.11						
Neighbouring Property 1		No.	25 West Park Hill Wa		Interval	3.35
			Distance/Max			
Contour Plot Point	Distance (m)		Excavtion Depth			
Contour Plot Point		0.00	0.00			
B		3.35	0.67			
D		6.70	1 34			
E		10.05	2.01			
F		13.40	2.68			
, ,		1.3.40	2.08			
				al Movement		
Distance (m)	%		(m)	(mm)		
0.00		0.15	0.00750		6.11	Movement at closest wa
3.35		0.12				
6.70		0.10				
10.05		0.07				
13.40		0.05	0.00248		5.85	Movement at furthest w

If there are any are minus n

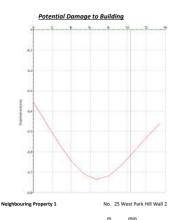








om Table 2.4)





m 13.40 8.36 13400 8360 L H L/H 1.60 Vertical Deflection (Δ) 0.39 mm from graph (max difference between blue and orange line) 0.002910 % Deflection Ratio (Δ/L) difference between horizontal movement at nearest and farthest walls 0.26 mm Horizontal Movement (bh) Horzontal Strain (Eh) = δh/L 0.00194 %

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method

Mettod 2... - yrettered mettodo Open up Damage Category Relationship Plots GMA¹ spreadsheet - Find relevant (JH graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

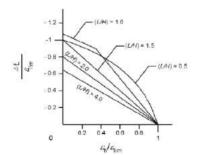
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H 1.60 Negligible damage limit (Elim) 0.05 0.058208955 Plot this point on fig2.18 (b) if the plotted point is below 0.03880597 the appropriate L/H line then damage falls into (Δ/L)/(Elim) (Eh)/(Elim) the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below Very Slight damage limit (Elim) 0.075 0.03880597 Plot this point on fig2.18 (b) if the plotted point is below 0.025870647 the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below $(\Delta/L)/(Elim)$ (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim) 0.019402985 0.012935323 Plot this point on fig2.18 (b) if the plotted point is below the appropriate (/H line then damage falls into 'slight' category - no need to plot points below Moderate damage limit (Elim) 0.3 0.009701493 Plot this point on fig2.18 (b) if the plotted point is below 0.006467662 the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe' $(\Delta/L)/(Elim)$ (Eh)/(Elim)

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) Influence of horizontal strain on $\Delta\!\!/L$ / $c_{\rm int}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim)

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category -no need to plot points below 0.3

0.00

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Moderate damage limit (Elim)

(Δ/L)/(Elim)

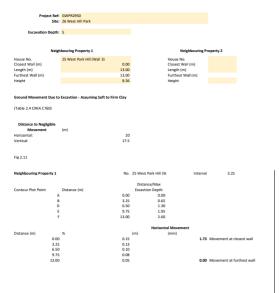
(Eh)/(Elim)

Table 2.5

Negligible

Category of damage		Description of system damage (ence of signification variations)	Approximate cruck width dunto	Limiting teachers strain sine (per vous)	
0	Neglaghte	Macline crocks of less than about 0.1 mm are classed as arglepible.	< 91	0.0-0.01	
1	Very sägta	Fine cracks dust can easily be neated during normal descention. For how coefficient slight fractive in backing. Cracks in esternal brickwerk worke on supervisor.	<1	8.05-0.973	
2	Sight	Casta cast: filler, Referencies potato; regards, Sveri i sight factors showing made of building. Casta are unlike evenily or sense reporting may be required extendly to ensure weathertightness. Drors and waters may not sightly.	< 9	0.075-0.15	
1	Madense	The much a require some opening top and can be pathed by a nation of formation tanks usin by marked by national human. Repeatings of referral between and possible a read minory of hickness to be replaced. Door not variation at the days for the paper new therapy. Westbertightness offen supported	3-15 or a matter of ends > 3	6.15-0.3	
+	Seven	Economy organ work anything backing-out and ampleting sections of works, superside awar denormal methods, which were described another, Walder soft frames discoved, floor deping nationally. Walls learning in beams, Service gives through the dening in beams.	15-25 but size Sepredu- on anysher of cracles	-0.5	
5	Aptic service	The requires a many repair knowling partial or complete relations. Second low bearings, while lean halfly and require standing. Windows brokes, with disolution. Danger of muchicality	but depends	l.	

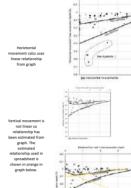
L/H

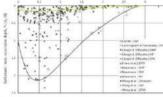


inge to 0 (Distance is more than distance to negligible

ble 2.4]

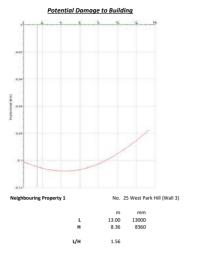
NOTE: If there are any are minus numbers cha





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ge in	-0.1			
И.	1 mar	1.0.14	-1. P. E.	
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	1		-	
	4 02 -	1		
	1 41 3	1		
	94			
	44			
	8			

Normalised settlements due to excepation in sett to firm slay



0.012	mm	from graph (max difference
0.000092	%	between blue and orange line)
1.73	mm	difference between horizontal
0.01331	%	farthest walls
	0.000092	0.000092 % 1.73 mm

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

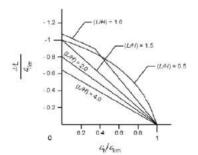
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

	L/H	1.56	
Negligible damage limit (8	lim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)		0.001846154 0.266153846	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)		0.001230769 0.177435897	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)		0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		0.000615385 0.088717949	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (8	ilim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)		0.000307692 0.044358974	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

L/H

Moderate damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim)

tetaiseata -4. 1-

0.05	
0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'negligible'
	category - no need to plot points below
0.075	
0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0	Plot this point on fig2.18 (b) if the plotted point is below the
0	appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	

0.00

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Negligible

60	ding, 1969 and Solifarat, 2001)		
Category of damage	Description of typical damage (new of repair is statistical)	Approximate cruck width (min)	Limiting teaction strain sin (per rest)
0 Neglägible	Mariline crocks of less than about 0.1 mm are classed as arglepible.	<01	0.0-0.01
1 Very slight	Fine cracks dust can easily be neated during normal descention. For how switched slight fractive in building. Cracks in estimat Iniciawerk marker on suspection.	<1	8.05-0.973
3 Sight	Cascia casity filled. Restourning probably required, Syneral sight functions showing rando of building. Cascia are studied economic and some reproducing mass the anguted economicy to ensure workburghtness. Drors and windows may stark sightly.	< ý	0.075-0.15
1 Materie	The much a require some opening tip and can be pathed by a subset, Remaining and can be marked by analytic langue. Repeating of referral her/work and possible a small present of her/kould no be replaced. Down and workers are descently appendix on the her- wardown reflecting. Service pages user thereas Wenthertightness often imposed.	i-ti or a matter of ender > 1	615-03
+ Sevent	Extensive repair work anotherap booking-out and replacing resident of walks, superside your dears and wombers, Waddew vield frames dissured, floor sloping noticeshly. Walk learning in balang anticeshly, some loss of fearing in beams. Service pipes fitzapped.	15-25 but size depends on another of cracks	-0.5
3 Very severe	This requires a major repair involving partial or complete rebuilding. Second love bearings, walls		c

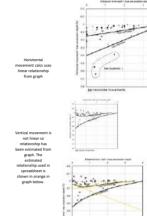
complete retrahing. Secure lose bearings, while her depends bean hardly and require strating. Windows brokes on another of with diviouslan. Danger of autofality cracks

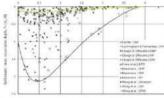
Table 2.5



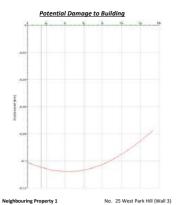
nt from Table 2.4)

NOTE: If there are any are minus numbers change to 0 (Distance is more than distance to negligible





Normalised settlements due to evceyation in soft to firm clay





m 13.00 8.36 13000 8360 L H 1.56 L/H

Vertical Deflection (Δ)	0.012	mm	from graph (max difference
Deflection Ratio (Δ/L)	0.000092	%	between blue and orange line)
Horizontal Movement (δh)	1.95	mm	difference between horizontal
Horzontal Strain (Eh) = $\delta h/L$	0.01500	%	movement at nearest and farthest walls

CATEGORY OF DAMAGE Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

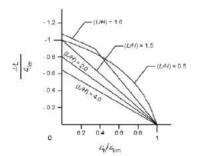
Method 2 - can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	1.56	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.001846154 0.3	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.001230769 0.2	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)		Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.000307692 0.05	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim) Moderate damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

L/H	0.00
0.05	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
0.075	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
0.15	
0 0	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
0.3	

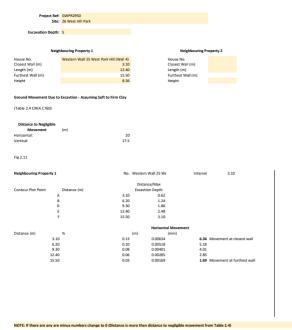
Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Negligible

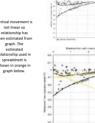
Category of damage		Description of typical damage (ense of regime is staterized)	Approximate cruck width (mm)	Limiting teaction strain sin (per rotal
0	Neglaghte	Machine cracks of less than about 0.1 mm me classed as negligible	<01	0.0-0.01
1	Very sägtz	Time crades data cau easily be neated during normal discontion. Perhaps ownited slight fractore in biolong. Catchs in estimat Incidiover, makte on aspection.	<1	8.05-0.973
2	Sight	Cracks ranks filled, Reikowskie probably regarding, Swerzi sight functions showing ranks of building. Cocks are writely extended with a sone repeating rank he negation extendity to ensure worker-lightness. Drocs and windows may mick sightly.	< 9	0.075-0.15
1	Madenate	The stucks require some opening tip and can be articled by a sumout. Returned tasks out by marked by matched inners. Repeating of referrat tecknostic and possible's a studie sumout of hicknostic to be replaced. Doos not worknow references. Service open our thereas. Wettherspheres often imported.	i-to ers manifer of eracks > 1	6.15-0.3
+	Sevent	Eccessive experiments anothing booking-out and replacing sections of walks, supersafe, over dama and unakens. Wadow and frames dissured, they deping matically. Walks learning in hulping antically, some loss of fearing in beams. Service spees financed.	15-25 but size depends on sumpler of cracks	×0.5

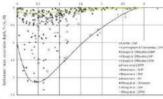
5 Very set The requires a case or report stronburg partial or would's complete relationing. Second lose beerings, walls, for dependent less hardly and require storing. Windows brokes, on most



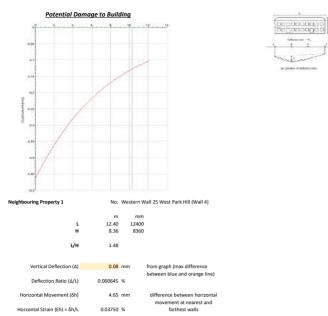








a Normalised settlements due to excevation in soft to firm slay





<u>CATEGORY OF DAMAGE</u> Damage category limits are given in Table 2.5 (below).

Method 1 - Prefferred method - Open up 'Damage Category Relationship Plots GMA' spreadsheet - Find relevant. L/H graph (different graph on each each tab along the bottom of the spreadsheet) - Input calculated values for deflection ratio and horizontal strain - Point will plot on graph and show category of dameg

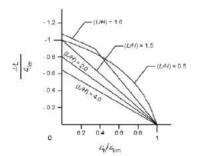
Method 2.- can be used to confirm category or is useful if L/H for property is between the given L/H graphs - Plot points calculated below on figure 2.18 for each damage category - Appropriate damage category will plot below L/H for property

L/H	1.48	
Negligible damage limit (Elim)	0.05	
(Δ/L)/(Elim) (Eh)/(Elim)	0.012903226 0.75	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below
Very Slight damage limit (Elim)	0.075	
(Δ/L)/(Elim) (Eh)/(Elim)	0.008602151 0.5	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below
Slight damage limit (Elim)	0.15	
(Δ/L)/(Elim) (Eh)/(Elim)	0.004301075 0.25	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category - no need to plot points below
Moderate damage limit (Elim)	0.3	
(Δ/L)/(Elim) (Eh)/(Elim)	0.002150538 0.125	Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Negligible

Fig 2.18 (b)

Calculated Category of Damage



(b) Influence of horizontal strain on $\Delta L / c_{\rm am}$ (after Burland, 2001)

Negligible damage limit (Elim) 0.05 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'negligible' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Very Slight damage limit (Elim) 0.075 0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'very slight' category - no need to plot points below (Δ/L)/(Elim) (Eh)/(Elim) Slight damage limit (Elim) 0.15 (Δ/L)/(Elim) (Eh)/(Elim)

L/H

0 Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'slight' category -no need to plot points below 0.3

0.00

Plot this point on fig2.18 (b) if the plotted point is below the appropriate L/H line then damage falls into 'moderate' category - if the point is not below, damage is 'severe'

Calculated Category of Damage

Moderate damage limit (Elim)

(Δ/L)/(Elim) (Eh)/(Elim)

Negligible

Edie 2.5 Cascalication of under stringers wate paths Busians et al. 1977, Rescents wet Cording, 1989, and Casterd, 2001)							
Category of damage		Description of typical damage (new of repair is statistical)	Appreciants cruck width (mm)	Limiting teacily strain ton (per rotal			
0	Negläghte	Machine cracks of less than about 0.1 mm are classed as anglegible.	< 91	0.0-0.01			
1	Very slight	Fine crades data can easily be neated during normal descention. For how conluted slight Energy in bailding. Crades in estimat Incluives: maker on supervisor.	<1	8.05-0.975			
2	Sight	Checks caulty filled, Restourning probably regarding, Sweerst significants in according mode of building. Checks are mobile extending and some reporting mass for angland extending to ensure worther highings. Drocy and windows may more signific.	< 9	0.075-0.15			
3	Madense	The much a require some opening top and can be pathed by a sumore, Remaining into an its masked by matched integer. Repeating of referrab tecknostic and possible's a much present of inclusion to be replaced. Down and variations at the support. Some super horizon Wenther spheres often imposed.	3-15 or a matter of ends > 3	6.15-0.)			
+	Seven	Exercise repoir work nonling backing-out not replacing review, cf works, repeating year deers and workers, Washew one frames discurred. from deping noticeshly Walls learning in bulgang anticeshly, some loss of fearing in beams. Service pipes fitzepied.	15-25 but size seperate on another of cracks	- 0.5			
5	Apply invalue	This requires a stay or repair involving partial or pargister retuilding. Seams love bearings, walls		5			

conducts receiving search for beings, with bir depends is a hally and require clouing Windows trokes, on under of with division. Danger of mutulality cracks