Unforeseeable Ground Conditions in Construction Claims

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Introduction[1]

Construction is an inherently risky business. Each project is unique and delivers a diverse range of infrastructure and buildings. The type of work involved in such projects is different as are the locations where these projects are executed. Furthermore, the contract terms applicable to the project are likely to be specific to that project.

One thing most construction projects have in common is that they are built on the ground and the properties and conditions of that ground are of utmost importance from a construction perspective. If the ground conditions are not known or are not as expected this is a significant risk to the project programme and budget.

The ground condition risk may belong to the contractor or the client. Alternatively, it may be allocated between them. The approach taken will depend primarily on how that risk has been apportioned under the contract, although certain jurisdictions have mandatory statutory provisions which will also need to be considered.[2]

Whether the actual ground conditions found at the site constitute something different from what should have been foreseen (i.e., foreseeable) can be a simple question of fact, but more often is open to interpretation and therefore can be fertile grounds for dispute between the parties.

In addition to establishing which party bears the risk of the unforeseeable ground condition and whether a risk event has occurred, a further issue to be considered is whether the actual ground conditions found at the site, even if demonstrated to be unforeseeable have, in fact, resulted in an impact on the programme or cost.

This article sets out the approach a contractor should take when considering whether it has a valid claim for unforeseeable soil conditions. The steps the Contractor should follow are:

1. identify the unforeseen element: given soil conditions;

2. identify the unforeseen element: interpretation of the given soil conditions;

3. understand the contractual obligations and whether the unforeseen element can be claimed as unforeseeable; and

4. understand the causal link between the unforeseeable element and the impact claimed.

Before considering these steps, this article starts with a background discussion of ground conditions and the use of soil investigation/geotechnical baseline reports. This will provide useful context when considering how best to manage the risks associated with the ground conditions.

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[1] This article cites a number of court cases; however, it is not intended to provide a legal opinion. The article is written generally from a common law perspective. However, the authors believe that the principles discussed can be generally applicable in other jurisdictions. References to the contractor's contractual rights and obligations are based on FIDIC Red Book 2017.
[2] Smith, "Design risk, unforeseeable ground conditions and time for completion under the UAE and Qatar Civil Codes" [2018] ICLR 75 at 90-95

Soil Types and Properties and Unforeseeable Ground Conditions

There are many different types of soil such as clay, sand, silt, peat, and rock.[3] Soil has its own intrinsic properties such as hardness value, bearing capacity, abrasion value, permeability, density, cohesion value, angle of internal friction, and modulus of deformation. The understanding of these terminologies is important because the soil is identified/classified by reference to these properties, and often a dispute relating to soil conditions relates to one (or more) of these soil properties. In addition to the intrinsic properties of the soil, the ground can have extrinsic conditions as well such as underground water, soil contamination, buried debris, and fissures in underground soil. It is also possible that underground objects or services, such as existing/live sewers or electricity cables, are present in the ground, which is another kind of condition. In addition, site conditions can include other conditions such as access, weather, local customs, etc. Therefore, it is vital that a contractor knows the conditions that it is referring to (or relying upon) in its claim for unforeseeable conditions.

Some standard forms of construction contracts, such as FIDIC 2017 (Red[4] and Yellow[5] Books), refer to 'physical conditions' instead of 'soil conditions'. In the authors' opinion, terms such as physical conditions or site conditions have a wider meaning than soil conditions and include soil conditions, as explained in *Humber Oil v Harbour*[6] case.

In *Humber Oil,* the contract (standard ICE conditions) included clause 12(1) which provided a relief to the contractor in the case of unforeseeable 'physical condition'. In an unfortunate incident, a jack-up barge, which was held in place by legs resting on the seabed, capsized and was a total loss. Professor John Uff QC, the arbitrator, found that "…*taking into account the unprecedented nature of this collapse, there must have been a very unusual combination of soil strength and applied stresses around the base of leg number 2 just before failure occurred*".[7] Accordingly, the arbitrator concluded that although the condition of the soil was foreseeable, the behaviour of the soil under the applied load was not. Therefore he decided in favour of the contractor. Judge Fox-Andrews QC upheld the arbitrator's award. The employer appealed that '…*physical condition is something which is there and stress is not there*'. The Court of Appeal disagreed.

Lord Justice Parker stated:[8]

"A particular condition of soil may, for example, be well known safely to sustain without sheer 1,000 tonnes. If in fact there is a settlement at a load of 300 tonnes what does it show? In my view, surely, *that there was an unknown, unforeseeable fault which was plainly a physical condition."* (emphasis supplied)

Lord Justice Nourse stated:[9]

"The principal submission of Mr Dyson [for the employer] is… that a physical condition is something with a material, intransient existence, such as rock or running sand. An applied stress is not a physical condition nor, moreover, is it something which can be encountered… I reject these submissions for the following reasons. First…there is nothing to restrict the application of cl 12(1) to intransient, as distinct from transient, physical

[3] As per strict geological terms, rock may not be classified as soil. However, in this article, the word 'soil' is used in flexible and wider terms that includes all ground material including rock.
[4] Sub-Clause 4.12 of FIDIC Conditions of Contract for Construction, 2nd Edition 2017.
[5] Sub-Clause 4.12 of FIDIC Conditions of Contract for Plant & Design Build, 2nd Edition 2017.
[6] Humber Oil Trustees Ltd v. Harbour & General Works (Stevin) [1991], 32 Con. L.R. 78.
[7] Ibid, p.85.
[8] Ibid, p.86.
[9] Ibid, p.88.

conditions… Secondly, while I would agree that an applied stress is not of itself a physical condition, we are not concerned with such a thing in isolation, but with a combination of soil and an applied stress. Third and most significantly…it is impossible to speak of a contractor encountering any form of ground, be it rock, running sand, soil or whatever, without recognising that stress of one degree or another will have to be applied, at any rate notionally, to the ground, which will in turn behave, at any rate notionally, in one way or another; no doubt passively in the case of rock, actively in the case of running sand and perhaps unpredictably in the case of soil. In other words, for the purpose of cl 12(1), *you cannot dissociate the nature of ground from an actual or notional application of some degree of stress*. Without such an application, you cannot predict how the ground will behave. In the present case I would say that the condition encountered by the contractors was soil which behaved in an unforeseeable manner under the stress which was applied to it, and that that was a physical condition within cl 12(1)." (emphasis supplied)

In summary, knowledge of soil conditions is very important in construction projects. The foundation of a structure or underground works cannot be designed unless and until the conditions of the soil, on which construction is to take place, are known to a design engineer. A misunderstanding of soil conditions can have serious commercial consequences. It is the understanding of the soil conditions upon which a designer bases decisions such as whether a raft foundation is required, or pile foundations are the appropriate solution. Therefore, there must be a proper soil investigation to know, so far as possible, the soil conditions. However, as decided in the *Humber Oil* case, even the most stringent soil investigations cannot preclude the possibility that the actual soil, at a given point or in a given situation, may behave differently from what might be expected from the soil investigation. Therefore, it is key to properly define what constitutes unforeseeability and where the risk lies if the particular issue at hand is found to be unforeseen.

Soil Investigation

The main purpose of soil exploration or soil investigation is to understand the characteristics and conditions of underground soil. This is usually done by obtaining soil samples at various depths and locations around the intended construction site. In engineering, it is a high-risk approach to start foundation design or construction works without undertaking soil investigation. In this regard, Harding expressed a view in 1947, which is still relevant today:[10]

"It should be considered as wrong to commence serious construction work without a site investigation, as for a surgeon to operate without an X-ray to guide him. An X-ray cannot show precise conditions, which can only be found on opening the patient, when additional complications may be revealed. Similarly, the conditions existing below ground can be found with certainty only at the points entered."

Technically, a designer can finalise the foundation design and a contractor can start excavation (or even complete a project) without soil investigation. However, it is a significant risk to do so, and the designer/contractor must appreciate the potential consequences of that decision.

[10] "Site Investigation and Site Conceptual Models. The Link between Geology and Engineering" by Colin Harding, "Advances in geotechnical engineering", the Skempton Conference, Vol.2 at p.1304, published by Institute of Civil Engineers (ICE) and Thomas Telford (2004).

To understand the soil conditions, one must obtain soil samples at various depths. Commonly, there are three site investigation techniques: penetration tests, trial pits, and boreholes.[11] Using these techniques, soil samples are obtained at a specified point or specified area. Therefore, these techniques will advise the conditions of soil only at the specified points/area. The soil conditions for all other points/areas are assumed based on the findings of the soil investigations and therefore remain uncertain, open to interpretation, and represent a risk.

In a penetration test, a soil sampler is attached to the bottom of a guide rod. A hammer of specified weight is applied on the top of the guide rod to penetrate the soil sampler into the ground. The number of times the hammer must strike to achieve 30cm penetration of the soil sampler is counted.[12] As the soil sampler penetrates the ground, the in-situ soil sample(s) is captured in the sampler; an in-situ/undisturbed soil sample provides an opportunity to know the actual soil conditions (see fig.1).

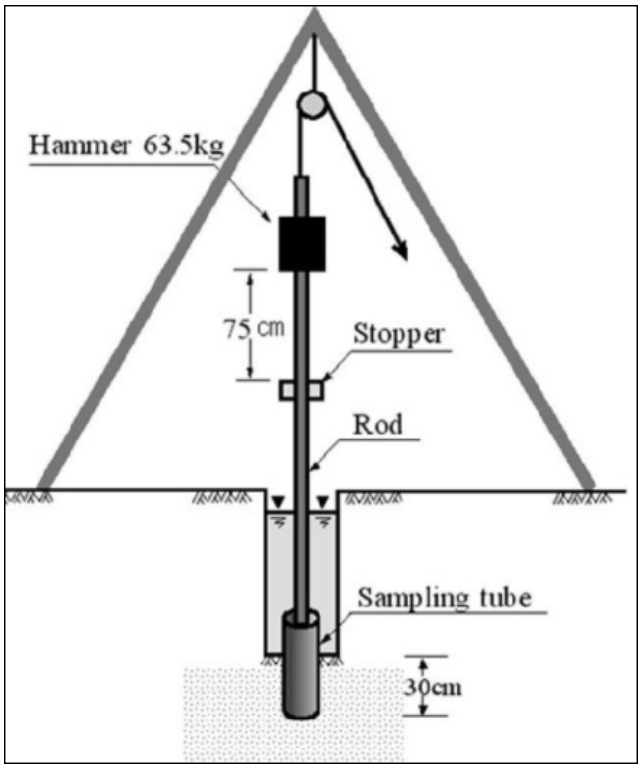

Fig.1 Soil Sampling through Penetration Test

In a trial pit, a pit of specified dimensions (say 20ft long x 20ft wide x 10ft deep) is dug; the excavated material provides soil samples; however, these are disturbed soil samples (see fig.2).

[11] "In-situ investigation of problematical soils" by Robert D. Evans, Ian Jefferson, Kevin J. Northmore and Peter Jackson, "Advances in geotechnical engineering", the Skempton Conference, Vol.2 at p.1269, published by Institute of Civil Engineers (ICE) and Thomas Telford (2004).

[12] Number of blows for 30cm penetration is generally known as 'N' value, which is used in various empirical formulas in geotechnical engineering.

Fig.2 Soil Sampling through Trial Pit

Boreholes are the oldest and most commonly used soil investigation technique. In boreholes, a narrow and deep hole is created in the ground using rotary or percussion drilling techniques; and soil samples are obtained at various depths. These soil samples are also disturbed soil samples (see fig.3).

Fig.3 Soil Sampling through Bore Holes

Undisturbed soil samples are superior to disturbed soil samples as they show the structural integrity of the soil in situ. However, it is very difficult to collect a perfectly undisturbed soil sample. By comparison, disturbed soil samples are relatively easy to obtain. Soil samples allow a geotechnical engineer to determine the soil properties such as strength, abrasion value, angle of internal friction, permeability, fracture pattern, etc., which inform the selection of foundation type after design calculations.

A construction project can span a few hundred square metres to many square km.[13] As explained above, a borehole will establish the soil conditions at the specified point where it was collected. Therefore, a few boreholes made for a house project could be sufficient, but not for a hydraulic dam or an oil and gas refinery project. Each borehole costs money. More boreholes mean more cost. A deeper borehole costs more money and vice versa. Therefore, in the commercial world, it can be a difficult balance between controlling the costs associated with this aspect of site investigation and boring enough boreholes to give a reasonable understanding of the soil properties. Harding stated in 1942:[14]

"One of the troubles in site exploration was that borings were not big enough deep enough or frequent enough. That was not the fault of the boring contractors… but the system under which they were compelled to work. Competitive prices were insisted upon…and great was the indignation if their price was more than few shillings per foot… yet engineers accepted the reports and were indignant if these turned out to be wrong."

Once soil samples are obtained, the soil data is recorded in a borehole log such as shown at fig.4:

WATER DEPTH			Depth	Graphic	Strata Description	Datum	Test /	Test Records				Rock Core Quality		
INITIAL (m)	FINAL (m)	No.200 %	[m]	Symbol			Sample No.	N	Seating Drive	Blwct 1	Blwct 2	TCR [%]	SCR [%]	RQD [%]
			0.0		0.00 m to 0.50 m - Brown, silty to very silty, fine SAND.	0.0	B1							
					0.50 m to 1.50 m - Light brown, very silty, shelly, fine, calcareous SAND.	-1.0	B2							
			1.0											
					1.50 m to 2.00 m - Very loose, light brown, silty, shelly, fine, calcareous SAND.		SPT3	4	2	2	2			
			2.0			-2.0								
					2.00 m to 4.50 m - Medium dense, light grey, slightly silty to silty, shelly, fine to medium, calcareous SAND with few whole shell fragments.		B4							
			3.0			-3.0								
							SPT5	11	4	5	6			
					from 3.00 m to 4.50 m - Gravelly.										
			4.0			-4.0	B6							
					4.50 m to 20.45 m - Medium dense, greenish										

Fig.4 A sample of Borehole Log

It should always be borne in mind that borehole logs show the soil conditions that were found at a particular point. The question – whether the soil conditions would be the same one metre away from that point – is a question that cannot be answered with certainty. The actual soil conditions at a point one metre away can only be known if another borehole is drilled or underground soil is excavated at that point. Borehole data from one metre away can be suggestive of what will be found and if boreholes are drilled at 1m intervals then

[13] For example, a house can be built on circa 100 square metres whereas a hydraulic dam span over few square km.
[14] "Site Investigation and Site Conceptual Models. The Link between Geology and Engineering" by Colin Harding, "Advances in geotechnical engineering", the Skempton Conference, Vol.2 at p.1304, published by Institute of Civil Engineers (ICE) and Thomas Telford (2004).

this can help to bolster confidence in the findings, but the fact remains that the actual soil conditions of any part of the site cannot be known for certain unless it is actually sampled.

For optimum management of the risk associated with ground conditions, before commencing a project, the employer should have the site adequately investigated with the intent of having the risk of unforeseen site conditions reduced to an acceptable level. Compared to the losses that can be sustained as a consequence of unforeseen conditions being found, the cost of an adequate investigation is relatively low. Contractual management of the risk should be viewed as the second step in managing the ground condition risk. If the risk is not properly managed and simply passed to the contractor then the contractor will price the risk in its bid and the employer will pay it whether the risk materialises or not.

Having established the significance of the soil conditions to the project and the consequent importance of the soil investigation, set out below is a step-by-step process that can be followed when considering how best to proceed if an issue with site conditions is discovered post-contract.

Step 1: Identify the Unforeseen Element – Given Soil Conditions

If a soil investigation report is provided by the employer, it is often based on borehole data (logs). As stated above, soil conditions shown in a borehole log are the conditions that were found at the specified location of a borehole, say at X. Whether the soil conditions surrounding X would be the same or similar as those found at X is a matter of interpretation and guesswork, extrapolating from the baseline data. This is explained in more detail in step 2 of this article.

A contractor must identify clearly what are the unforeseen soil conditions that have been encountered at the site. For conditions found directly at the location of a borehole, this can be done by comparing the data provided in the soil investigation report with the actual conditions. For example, a contractor can successfully establish unforeseen conditions if it identifies that the borehole log at X shows rock starting at 5m from the ground level but in fact, it encountered rock at X at 1m from the ground level; in other words, at the actual location of the borehole. In *Obrascon*,[15] Mr. Justice Robert Akenhead's considered that if the claim is for

> "…unforeseeable physical conditions at site" then it is required that a contractor establishes what was unforeseeable – "the type or quantities or location of the soil".

Whether this unforeseen condition can be categorised as unforeseeable will depend on the allocation of the ground condition risk, which is considered below in step 4 of this article. In the authors' experience, a dispute between the contracting parties about unforeseen soil conditions at the precise location of a borehole is rare. This is because there is clear objective factual data against which actual soil conditions can be compared. Most disputes relating to liability for unforeseen ground conditions are for the characteristics/conditions of soil that are near to but not at a borehole and therefore not expressly stated in the soil data. This then becomes an issue open to interpretation, which is discussed further in the following section.

Step 2: Identify the Unforeseen Element – Interpretation of the Given Soil Conditions

The interpretation of given soil is often required because, in general, the surface area of all boreholes represents a small percentage of the total surface area of a site where a project is to be constructed.[16] This means that soil conditions of a large percentage of the construction site are generally unknown, and

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[15] Obrascon Huarte Lain SA v Her Majesty's Attorney General for Gibraltar [2014] EWHC 1028 (TCC); [2014] B.L.R. 484 at para. 227.
[16] The diameter of a standard borehole is 150mm with a surface area of circa 0.5m2. If 10 boreholes are dug in an area of 100m2, it means surface area of all the boreholes will be circa 5m2 which is 5% of the 100m2.

therefore must be interpreted by the contractor with reference to the data provided by means of the boreholes. There could be many different interpretations of the given soil data. In the authors' experience, the interpretation of given soil conditions is the root cause of most claims for unforeseeable soil conditions. This is explained with a simple hypothetical example as follows.

Let's assume soil data, which was provided at the time of tender, consists of three boreholes that were bored at 10m apart as shown in fig.5.

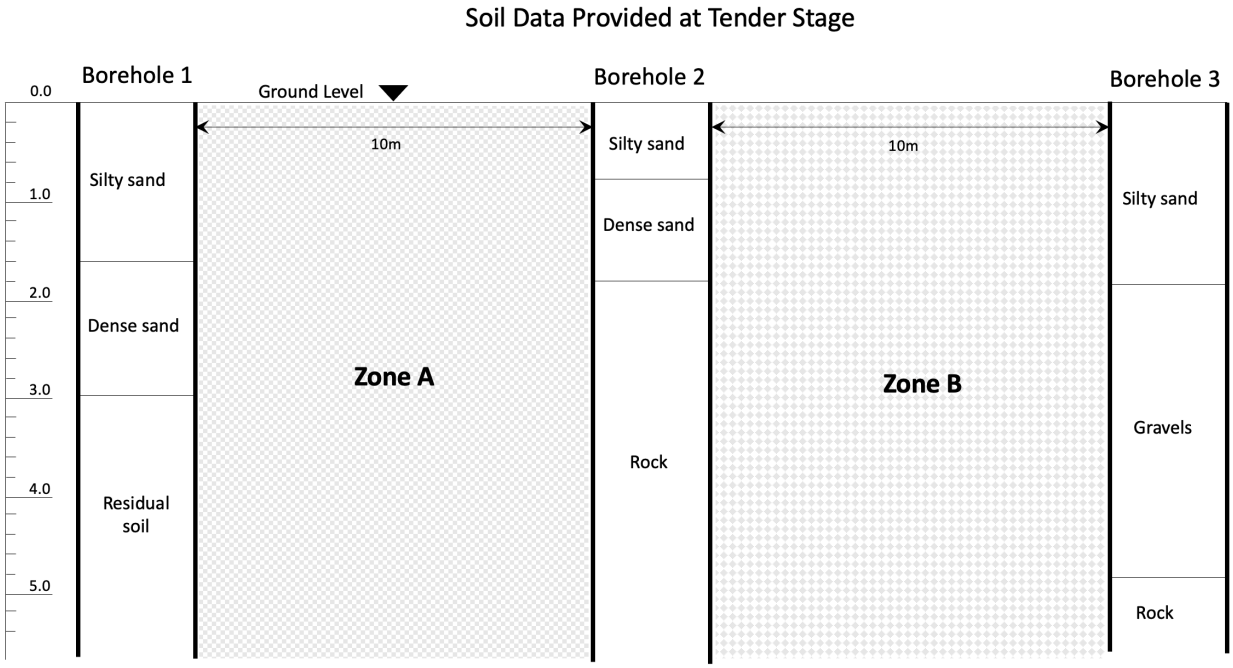
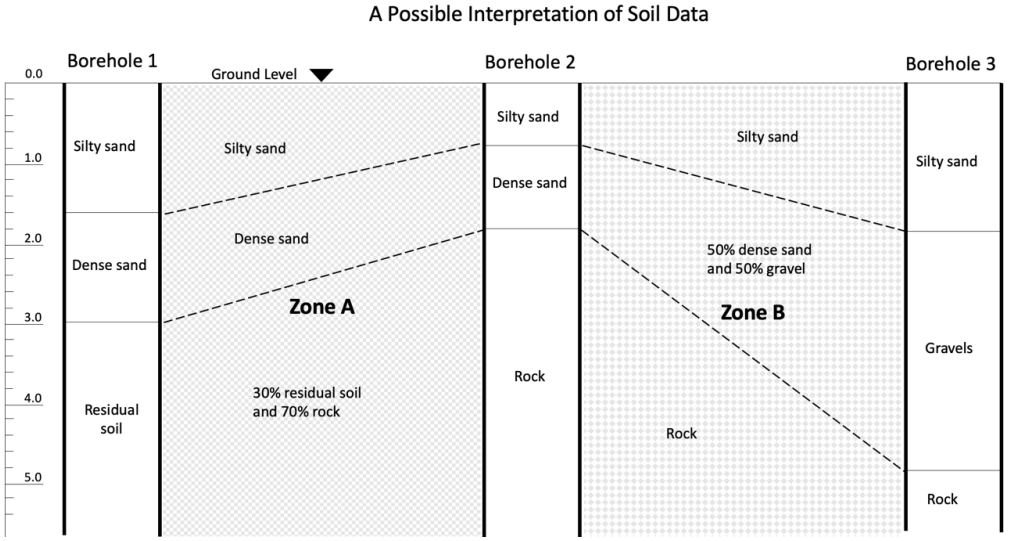


Fig.5 Example Borehole Data at Tender Stage

Since boreholes 1, 2 and 3 represent the soil conditions at points 1, 2, and 3 respectively, therefore soil conditions of zone A and B are unknown. What would be the pattern of silty sand, dense sand, residual soil, rock, and gravel layers in zone A and B is a matter that is open to interpretation. Therefore, one must extrapolate from the borehole log data. One possible interpretation or extrapolation of data could be as follows:

a) Zone A: silty sand and dense sand layers would connect through a straight line; and

b) Zone B: silty sand and rock layers would connect through a straight line as shown in fig.6.



c) **Fig.6 A Possible Interpretation of Example Borehole Data**

There could be many other extrapolations for the assumed patterns of soil layers in zone A and B, however, all are open to interpretation, require the use of engineering sense/experience, and are largely a matter of educated guesswork. The pattern of soil in zone A and B is required information for the contractor because the quantity of each soil type cannot be calculated without knowing the soil layers. This knowledge allows the contractor to decide on the best approach to the delivery of the work and establishes the type of equipment required to deal with the stated soil.

Returning to our example, the actual soil conditions show the presence of a substantial amount of rock in zone A and B with contaminated soil in zone B as shown in the fig.7.

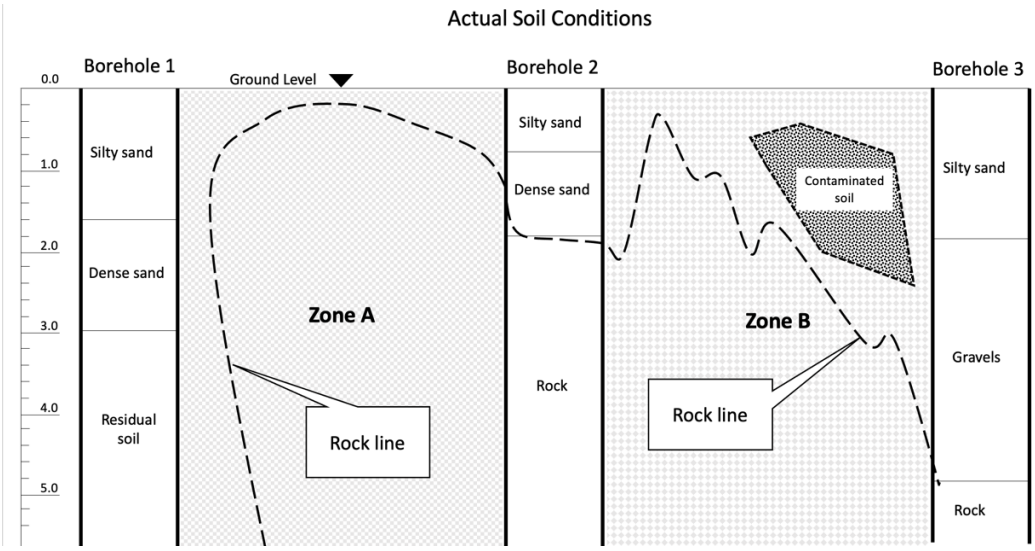


Fig.7 Actual Soil Conditions Around Example Boreholes

The actual pattern of rock means an additional quantity of rock in excess of that expected or interpreted by the contractor at tender. Similarly, contaminated soil was not shown in any borehole log. So, the question arises; can a contractor raise a valid claim for unforeseeable soil conditions for the additional quantity of rock and unexpected contaminated soil? Such a claim would depend on many interrelated issues such as the following:

a) Contractually, who assumed the soil risk?

b) Contractually, is the contractor required to interpret the soil data? If yes; did the contractor do that? Again, if yes; was that interpretation reasonable?

c) Whether there are any soil warranties and disclaimers included in the contract?

d) How 'unforeseeable' is defined in the contract if defined at all.

e) Whether or not there are contractual terms that alert an experienced contractor to foresee the possibility of additional rock and contaminated soil.

f) Whether there was any available information (such as geotechnical maps, geology reports, etc.) in the public domain that could have provided further indications to the contractor.

g) Whether or not the contract includes a geotechnical interpretative report. If yes, can the contents of that report be regarded as the *'baseline soil conditions'*?[17]

h) Whether the contractor worked at the construction site previously.

i) What is a view of a geotechnical expert (1) on the actual rock/contaminated soil encountered in the light of the soil data provided at the time of tender, and (2) on the reasonableness of the contractor's interpretation of the soil data if applicable?

If tender information indicated contamination, then an experienced contractor should have foreseen it. In *Obrascon*, [18] Mr. Justice Robert Akenhead expressed that it was stated in the contract that "*historically, the site had been influenced environmentally by its military use (over hundreds of years) which could be a source of contamination from heavy metals and trace elements*". Therefore, contamination of soil was a foreseeable situation.

Generally, standard forms of contract, such as FIDIC 2017 (Red[19] and Yellow[20] Books) make a contractor "*responsible for interpreting all data referred to under Sub-Clause 2.5 [Site Data and Items of Reference]*". It is the interpretation of soil data that provides a base to calculate the quantities of earthwork, therefore a contractor must make its own interpretation instead of relying on the employer's stated quantities or soil interpretative report.

In *Obrascon*,[21] the environmental statement, which formed part of the contract, stated that *the maximum quantity of contaminated subsurface soil would be 10,000^{3}m*". The design and build contractor OHL chose to rely on this statement. In the event, circa 15,000m^3 was encountered. Mr Justice Robert Akenhead did

[17] This report is also known as Geotechnical Baseline Report ("GBR") or Geotechnical Interpretative Baseline Report ("GIBR") in some bespoke contracts.
[18] *Obrascon Huarte Lain SA v Her Majesty's Attorney General for Gibraltar* [2014] EWHC 1028 (TCC); [2014] B.L.R. 484 at para. 227.
[19] Sub-Clause 4.10 of FIDIC Conditions of Contract for Construction, 2nd Edition 2017.
[20] Sub-Clause 4.10 of FIDIC Conditions of Contract for Plant & Design Build, 2nd Edition 2017.
[21] *Obrascon Huarte Lain SA v Her Majesty's Attorney General For Gibraltar* [2014] EWHC 1028 (TCC); [2014] B.L.R. 484.

not accept that the additional 5,000m^3 was an unforeseeable quantity because OHL did not make its own interpretation of the soil data and instead relied on the given quantities:

> "The real issue on analysis is whether OHL judged by the standards of an experienced contractor would or should have limited itself to some analysis based only on…Environmental Statement. There is no evidence that OHL actually applied its mind pre-contract at all to what if any quantities of contaminated land might be encountered…I accept…that experienced contractors at tender stage would not limit themselves to a study of the ES…"[22]

The court of appeal agreed with the Judge's reasoning that:

> "an experienced contractor would not slavishly accept the figure of 10,000m^3 in the Environmental Statement. Instead it would make its own assessment of the information contained in the…Environmental Statement".[23]

Therefore, a contractor's failure to interpret the soil data report could be fatal to its claim for unforeseeable soil conditions.[24]

Having established the conditions which the Contractor claims are unforeseen, the contractor must consider the contractual allocation of risk to establish whether the unforeseen conditions can be claimed to be unforeseeable.

Step 3: Understand the Contractual Obligations

The contractual parties are the masters of their fates.[25] By entering a construction contract, a contractor agrees to accept the apportionment of the risks associated with soil conditions as set out in the contract. What if a contract is silent on the apportionment of the soil risks? In that case (or even otherwise[26]), a contractor must know the 'starting position'.

'Starting Position'

When discussing risk allocation, there must be a starting point.[27] The starting position in relation to unforeseeable soil conditions is that, in principle, a contractor is obliged to carry out works that may be impossible[28] or impracticable[29] if it has contracted to do so.

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[22] Obrascon Huarte Lain SA v Her Majesty's Attorney General For Gibraltar [2014] EWHC 1028 (TCC); [2014] B.L.R 484 at para. 213.
[23] Obrascon Huarte Lain SA v Her Majesty's Attorney General For Gibraltar [2015] EWCA Civ 712; [2015] B.L.R. 521 at paragraphs 89 and 90.
[24] Ellis Baker and Michael Turrini, "The Underlying Problem: Negotiating the Ground Conditions Issue", 2013 SCL Paper 181, p.18.
[25] Earl CJ stated in Clarke v Watson [1865] 18 CB (NS) 278 at p.284 "*Every man is the master of the contract he may choose to make.*" See "Construction Law", Vol.1, Third edition, 2020, by Julian Bailey at p.127.
[26] In any event, a contractor must know the 'starting position'. Terms of contract change the 'starting position'. To what extent a term of a contract has changed (or not changed) the starting position can be known only if the starting position is known. Therefore, understanding of starting position is important in any event.
[27] "Some Philosophies of Risk Allocation in International Construction Contracts" by His Honour Judge Humphrey Lloyd QC, in the book "Construction Law Themes and Practice 1998" by Sweet & Maxwell, p.21.
[28] "Managing Risk in Construction – Who Pays? Extreme Conditions (or Physical Impossibility)" by Dean Lewis, International Construction Law Review Vol.18 (January to October 2001) at p.353.
[29] *Thorn v The Mayor and Commonalty of London* [1875] Vol. XXXIII [London: Law Times Reports].

English law recognises that parties are able to enter into a contract *"requiring one of them to do the impossible".*[30] According to Holt CJ in *Thornborow v Whitacre (1706)*:[31]

"…when a man will for a valuable consideration undertake to do an impossible thing, though it cannot be performed, yet he shall answer in damages."

Similarly, a construction contractor can take the risk to perform the works no matter that the plans, and specifications included in the contract are not practicable as explained in *Thorn v London Corp* (1876).[32]

In the *Thorn* case, the parties entered into a contract for the construction of a new bridge. Included in the contract documents were plans and specifications which included the requirement for caissons to be used.[33] However, the caissons, once installed, were found to be impracticable. The contract required the works to be carried out in accordance with the plans and specifications. The descriptions on the plans and specifications stated them to be *"believed to be correct"*. The contractor claimed that there had been a breach of an implied warranty that the plans and specifications were practicable and that as a consequence of this breach, he had suffered damage. The employer denied any such express or implied warranty.

The court decided that there had been no express warranty and, in the circumstances, a warranty could not be implied. The contractor should have taken precautions and checked the practicability of the plans and specifications at the time of tender.

On appeal, the House of Lords[34] unanimously affirmed the decision. Lord Chelmsford stated:

"…if the contractor ought, prudently and properly, to have full information of the nature of the work he is preparing to undertake, and the advice of a skillful person is necessary to enable him to understand the specification, is it any reason for not employing such a person that it would add to the expense of the contractor before making his tender? It is also said that it is the usage of contractors to rely on the specification, and not to go examine it particularly for themselves. If so, it is an usage of blind confidence of the most unreasonable description…"[35]

Lord Hatherley stated:

"There is nothing, I am sure, to induce your Lordships to lay down a new principle of law by which anybody entering into a contract is supposed to have an implied warranty from the person engaging him that the contract itself can be fully carried out without impediment, whether that impediment to be one he is himself able to foresee or not."[36]

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[30] Eurico SpA v Phillip Brokers (The Epaphus) [1987] 2 Lloyd's Rep 215, 218. See Treitel, Frustration and Force Majeure, para 1–002.
[31] (1706) 2 Ld Raym 1164; 6 Mod Rep 305; 3 Salk 97; 92 ER 270. See "Managing Risk in Construction – Who Pays? Extreme Conditions (or Physical Impossibility)" by Dean Lewis, International Construction Law Review Vol.18 (January to October 2001) at p.353.
[32] *Thorn v The Mayor and Commonalty of London* [1875] Vol. XXXIII [London: Law Times Reports] at pp.308-314.
[33] Temporary works required for the construction of the bridge.
[34] *Thorn v The Mayor and Commonalty of London* [1876] Vol. XXXIV [London: Law Times Reports] at pp.545-550.
[35] Ibid. p.548.
[36] Ibid. p.550.

In addition to the *Thorn* case, there are many other court cases, such as *Jackson v Eastbourne Local Board*,[37] *Bottoms v Lord Mayor of the City of York*,[38] *McDonald v Mayor & Corporation of Workington*,[39] and *Ford & Co and Bemrose & Sons Ltd (in re)*[40] that establish that the Contractor is strictly responsible to deal with the unexpected impediments in performing the contracted work.

However, this 'starting position' can be influenced or changed by the terms of a contract including such provisions as a warranty given in respect of soil conditions, the extent of variation/remeasurement of works, and the approach to unforeseeability of site conditions.

Warranty of Soil Conditions

As a concept, a warranty is a *"subsidiary or minor term in a contract"*.[41] A warranty is a "*statement of a fact or an opinion*"[42] that is part of contract documents.[43] In general, warranty statements are about quality/quantity matters or technical matters, or any other issue that is important for the delivery of the works. As an example, the statement '*the soil where sewers are to be laid is mostly dry*' warrants that soil is dry in general, but it does not warrant that there shall be no wet soil. Similarly, a borehole log expressly shows the type, condition, and location of soil at a specified point, therefore, such a log warrants soil conditions at the specified point (but not for any other point).

If a contract provides no information about the soil on which works are to be constructed, no question of soil warranty arises. Therefore, a contractor's rights and obligations will be dictated by the 'starting position' as explained above. The *Bottoms v Lord Mayor of the City of York*[44] case explains this aspect.

In the *Bottoms* case, Mr. Bottoms (the contractor) entered a contract with the Lord Mayor of the City of York (the employer) for the construction of sewers to run over several miles along the line of the Ouse River. No soil investigation was carried out by either party. After the award of the contract, a substantial length of soil was found "*to be of a muddy and spongy character*". To avoid "tumbling" of the excavated soil surface, expensive and unplanned temporary, earthwork support works[45] were provided but were not fully successful. The contractor claimed temporary works costs which were denied by Justice Mathew. Mr. Bottoms appealed.

The Court of Appeal upheld the decision and Lord Esher M.R. stated:[46]

> "I take it that the real reason why he [contractor] has come by this misfortune, indeed, is that he would go and tender *when there was no guarantee given to him as to the kind of soil, and when there was no information given to him as to what the soil was* – when there was no contract entered into by the people who asked him to tender as to what the nature of the soil was, and that he either too eagerly or too carelessly tendered and entered into the contract without any such guarantee or

[37] [1886] Hudsons's Building Cases, 4th ed, Volume 2, p.81.
[38] [1892] Hudsons's Building Cases, 4th ed, Volume 2, p.208.
[39] [1893] Hudsons's Building Cases, 4th ed, Volume 2, p.228.
[40] [1893] Hudsons's Building Cases, 4th ed, Volume 2, p.344.
[41] "Building Contract Dictionary" by David Chappell, Derek Marshall, Vincent Powell-Smith & Simon Cavender, Third Edition, 2001, published by Blackwell Science, at p.409.
[42] "The interpretation of Contract" by Sir Kim Lewison, Seventh Edition, 2020, published by Sweet & Maxwell, at p.165.
[43] If a statement is included in a document that is not a contract documents, such statement may be a representation but not a warranty. For a statement to be a warranty, it must be part of a contract.
[44] [1892] Hudsons' Building Cases, 4th ed, Volume 2, p.208.
[45] The provision of "*poling boards – short lengths of timber placed against the side of the trench, and strutted carefully with heavy timber*".
[46] Ibid. p.222.

> representation on their part at all, and without due examination and enquiry by himself. That is what has produced the difficulty. Still, you must deal with the difficulty when it arises." (emphasis supplied)

A proper warranty of soil conditions can safeguard a contractor in cases where soil conditions are different to that expected or unforeseen. Sometimes a contractor believes that a statement is a warranty when it is not, as explained in *McDonald v Mayor and Corporation of Workington*.[47]

In the *McDonald* case, the agreement between McDonald (the contractor) and the Mayor and Corporation of Workington (the employer) was that the '…*works* [were] *to be done according to this agreement*'. The plans and specifications included in the agreement described "*brick sewer in certain land going down to the shore*". The contractor discovered the ground (in which the sewer was to be built) was wet, whereas his expectation was that it would be dry. The contractor claimed that "*the specification indicated to him that it was going to be dry*". Since there was no precise statement in the contract about the soil conditions, both the Queen's Bench Division, and the Court of Appeal, did not agree with the contractor's warranty argument. In the Court of Appeal, Lord Esher M.R. stated:[48]

> "If a representation had been made that the ground as a fact was dry – if it was only a representation and no part of the contract, then it would not be a warranty. It would not be an undertaking binding them. It would be a statement which, if it was erroneous, would not bind them… First of all, that statement… does not seem to be a representation at all, and secondly, if it was, it is no part of the contract. They have not contracted that it shall be true, and therefore it is not a warranty, and it is immaterial."

Lord Esher M.R. further emphasised that it is the contractor who should better protect itself through the terms of the contract instead of expecting other contracting parties to protect him:[49]

> "The truth is that the contractor ought to take the precautions necessary for the purposes of protecting himself, and he is not to be protected by the other contracting party unless they contract to do so."

It can be seen from the above, that the issue of whether a warranty exists and can be relied upon by the contractor is not straightforward. Furthermore, contracts often include a disclaimer that any soil data provided by the employer is for information only. Such disclaimers are often expressed as a warranty from the contractor that, in preparing his tender, he has not relied upon any soil condition data provided by the client. Therefore, a contractor should consider carefully whether there is in fact any warranty as to soil conditions in the contract upon which he would be able to rely if soil conditions were found not to be as expected.

In addition to warranty provisions, variation and remeasurement clauses should also be reviewed.

Variation and Remeasurement

Sometimes, part of the work for a project must be redesigned because of unexpected soil conditions. In such cases, a contractor may have entitlement to be paid for the additional/varied works and/or to receive an

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[47] [1892] Hudsons's Building Cases, 4th ed, Volume 2, p.228.
[48] Ibid. p.231.
[49] Ibid. p.231

extension of time under the variation or remeasurement provisions of a contract.[50] However, the extent of such payment or entitlement to additional time strictly depends on:

a) If the contract is lump sum or remeasurable.

b) Which party took the risk of the design, which is being changed by the unexpected soil conditions.

c) Which party has the power to vary the work.

d) If the contractor has a strict right to be paid for a variation instruction issued under the contract.

e) The extent/definition of what constitutes a variation under the contract.

f) What works are subject to remeasurement; and

g) To what extent the payment of such varied/remeasurement works is allowed under the rules of valuation of variations and rules of remeasurement included in the contract

In general, the permanent works[51] (and not the temporary works[52]) can be subject to variation/remeasurement. Therefore, a variation or a remeasurement clause in a contract does not necessarily mean that a contractor has got complete protection from additional costs that it might incur in relation to the unexpected soil conditions. If a contractor wants to have such protection, the contract should be clear and include specific terms to that effect.

In *Worksop Tarmacadam Co Ltd v. Hannaby*, the contract was confusing, and the scope of the variation clause did not include temporary works. Russell LJ held that:[53]

"I take the view that the contract can properly be described as a lump sum contract subject to variation… Mr. Godwin's [for the contractor] submission is that cl.15 [a remeasurement clause], read literally and in context, is sufficiently wide to permit these plaintiffs to charge for the additional work that they encountered because of hard rock. I disagree. Had the plaintiffs wished to make such a provision in the event of unforeseen conditions being encountered, it would have been the easiest thing in the world for them so to have provided in specific terms. They did not do so."

In addition to warranty, variation and remeasurement, it is important for a contractor to understand what is meant by 'unforeseeable'.

Unforeseeability

It is generally recognised that a contractor participating in a tendering process has neither the time nor sufficient benefit or certainty of the tender outcome to undertake significant soil investigations for a project for which it is tendering.[54] On this basis, therefore the contractor is reliant on any soil investigations undertaken

[50] Simplex Concrete Piles v Borough of St Pancras (1958) 14 BLR 80.
[51] The permanent works are generally the work that is specified in the contract that is to be built by a contractor such as the foundation, floors, superstructures, and finishes of a house.
[52] The temporary works are generally the works that are required to carry out the permanent works such as dewatering, formwork, road diversions, coffer dam, access roads, etc.
[53] Worksop Tarmacadam Co Ltd v. Hannaby (1995) 66 Con LR 105, p.107-108.
[54] "The FIDIC Forms of Contract" by Dr. Nael Bunni, Third Edition 2005, published by Blackwell, p.311.

by the employer and the extent to which the contract allows him to rely on those investigations. The important thing is that the Contractor should price the risk accordingly. Doing otherwise would simply be gambling as explained in the judgment of the Privy Council in the case of *Mitsui Construction Co. Ltd v. Attorney-General of Hong Kong* (1986) 33 BLR 1 (PC):[55]

> "Against this background of facts, if the contract documents were understood in the sense contended for by the Government, engineering contractors tendering for the work would have two options. They could either gamble on encountering more or less favourable ground conditions or they could anticipate the worst case and price their tenders accordingly. It is clear from what happened here that the worst case might double or more than double the time required to do the work with a consequent increase in time related costs. On this basis, tenderers gambling on favourable ground conditions would risk a large loss, while conversely, if all tenderers anticipated the worst case, but in the event reasonable conditions were encountered, the Government would be the losers. It follows that, if the Government are right, there is a large element of wagering inherent in this contract. It seems to their Lordships somewhat improbable that a responsible public authority on the one hand and responsible engineering contractors on the other, contracting for the execution of public works worth many millions of dollars, should deliberately embark on a substantial gamble."

Certain standard forms of contract, such as FIDIC 2017 (Red[56] and Yellow[57] Books) define unforeseeable as "*not reasonably foreseeable by an experienced contractor by the Base Date [i.e., 28 days before the latest date for submission of the Tender]*". In general, what is (or is not) foreseeable should be judged at the tender stage and not during the execution of the works.

If an employer's design has not foreseen particular site conditions, can one say that that particular site condition is unforeseeable? A possible answer was given by Max. Abrahamson:[58]

> "A frequent argument of contractors is that if the engineer's design shows that he did not envisage particular physical conditions, then there is no reason why an experienced contractor should have foreseen them. In practice this argument may have force, but if it is shown that the engineer did not in fact do his job properly, the contractor has no right to use the engineer's failure to perform his duty to his client as an excuse for his own failure to fulfil his independent duties…"

This means that the contractor cannot rely on the fact that the ground conditions are unsuitable for the construction of the employer's design as evidence of unforeseeability and a claim based on such an argument would likely fail.

If something is well known among experienced contractors, it could be foreseeable. For example, in dredging operations, it is "*common knowledge among experienced dredging contractors that inevitably there would be some loss of material during dredging and backfilling and that it is accepted practice to win additional backfill from the dumping ground as necessary*".[59] However, the situation could be different, for example, if the

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[55] Mitsui Construction Co. Ltd v. Attorney-General of Hong Kong (1986) 33 BLR 1 (PC).
[56] Sub-Clause 1.1 of FIDIC Conditions of Contract for Construction, 2nd Edition 2017.
[57] Sub-Clause 1.1 of FIDIC Conditions of Contract for Plant & Design Build, 2nd Edition 2017.
[58] "Engineering Law and the I.C.E Contracts" by Max W. Abrahamson, Fourth Edition 1979, published by E & FN SPON, p.66
[59] Holland Dredging (UK) Ltd v. Dredging & Construction Co Ltd and Another [1987], 14 ConLR 30, at p.31.

characteristics of excavated material from a trench at the seabed is "*such that it was impossible to backfill the trench to seabed level using only excavated material, [then]…these characteristics could not have been reasonably foreseen by a competent and experienced contractor"*.[60]

Similarly, if contract documents show that there is a possibility of the existence of an underground sewer, then the existence of a sewer is foreseeable even if the precise location is not stated in the Contract.[61] However, if the precise location of the underground sewer is stated in contract documents, but in fact, the sewer is found at a different location, a contractor could have a strong argument that the sewer was unforeseeable.[62]

It is also important to know that, from an unforeseeability perspective, it is the conditions of soil (and not the event) that should be unforeseeable; and that the conditions should exist at the time of tender.[63] For example, if, post-award of a contract, a third party cuts an underground oil pipe that causes soil contamination at the contractor's site; it is an event that has occurred after the award of the contract. In this situation, the correct question is who bears the risk of operations of the third party under the contract and not whether contaminated soil was unforeseeable.

In establishing unforeseeability, a contractor need not prove that the employer has done something wrong or breached a condition of the contract. Instead, he should focus on what is the contractual test to establish unforeseeability and whether that test is satisfied. For example, in FIDIC 2017 (Red[64] and Yellow[65] Books), a contractor should carefully highlight the soil conditions, which are unforeseeable which means *"not reasonably foreseeable by an experienced Contractor…"* and develop its claim with an explanation of why an experienced contractor could not reasonably have foreseen the encountered conditions on the site at the Base Date.[66]

As noted in the introduction, the meaning of unforeseeability should be defined by the terms of the particular contract under which the work is being delivered… Whether the actual soil conditions or circumstances encountered at the site are captured within the definition of unforeseeable is, *prima facie*, a factual issue although unsurprisingly the issue can be more nuanced than it sounds.

In general, a claim for unforeseeable soil conditions flows from the difference between the expected and actual soil conditions and whether that difference is such that an experienced contractor should have been able to foresee it at the time of tender by reference to the given soil data. In the authors' experience, generally, there is no dispute between the parties concerning the actual soil conditions because it is a matter of factual evidence. However, what an experienced contractor should have foreseen is a matter of opinion premised on the given facts, which is decided by means of an expert opinion predicated on the soil data provided at the time of tender.[67] Steps 1 and 2 in this article discuss this in more detail.

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[60] Ibid. p.31.
[61] C.J. Pearce Ltd. v Hereford Corporation [1968].
[62] This position will be affected if a contractor has a contractual obligation to verify the existing underground services before commencing with construction works.
[63] In the USA, it has been held that "Differing site conditions clause is limited to physical conditions in existence when the contract is made and does not comprehend physical conditions which come into being only after the contract has been executed or work commenced." Robert F. Cushman, John D. Carter, Paul J. Gorman and Douglas F. Coppi "Proving and Pricing Construction Claims" Third Edition 2007, published by Construction Law Library, p.145.
[64] Sub-Clause 1.1 of FIDIC Conditions of Contract for Construction, 2nd Edition 2017.
[65] Sub-Clause 1.1 of FIDIC Conditions of Contract for Plant & Design Build, 2nd Edition 2017.
[66] Sub-Clause 1.1.4 of FIDIC Red and Yellow books define Base Date as "the date 28 days before the latest date for submission of the Tender."
[67] For more details on expert opinion, refer to Richard Wilmot-Smith QC, "Construction Contracts, Third Edition, 2014, Oxford, para 23.125 to 23.129.

Once a contractor has established on merits and under the terms of a construction contract that it has encountered unforeseeable soil conditions, then it is important to connect the link between the unforeseeable condition and the damage claimed as explained in the following step.

Step 4: Understand the Causal Link between the Unforeseeable Condition (cause) and the Consequences Claimed (effect)

A claimant must demonstrate that the identified unforeseeable element has, in fact, caused the damage claimed by the contractor.[68] Even if a contractor successfully establishes its case concerning unforeseeable soil conditions, the claim will not succeed if the contractor fails to establish this link.

The following provides an example of how this might operate.

A contract expressly states that *"another contractor shall lay an additional 1m topsoil layer at the construction site and compact it to 350 KPa bearing capacity".* Prior to the main contractor commencing work, the other contractor lays the topsoil layer but only compacts it to 150 KPa bearing capacity. The main contractor submits a claim to the employer claiming that it was forced to construct a much wider raft footing to cope with the loose topsoil layer laid by the other contractor. The loose topsoil layer meant the site, as provided to the main contractor, was not compliant with the employer's contractual obligations (see fig.8):

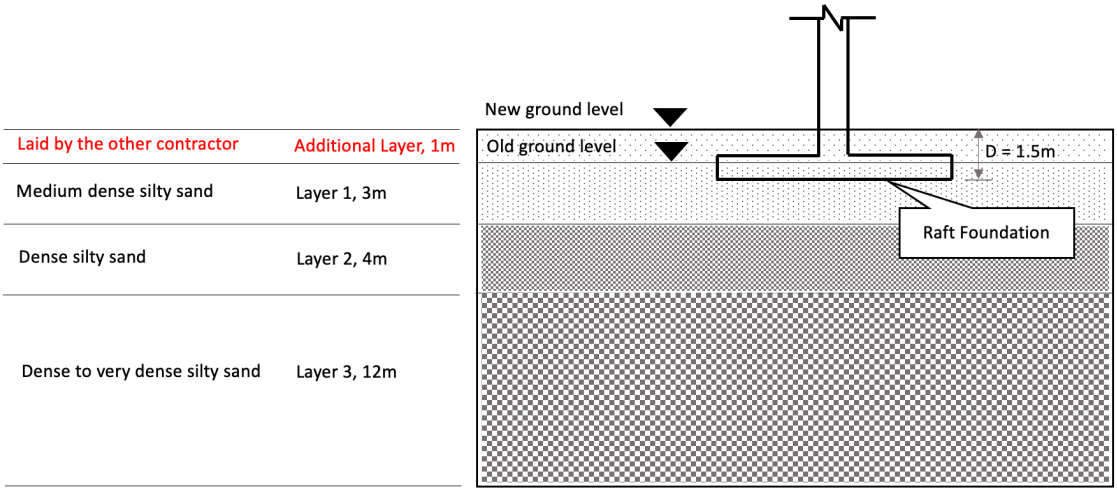

Fig.8 Soil Details and Raft Foundation

In the authors' opinion, the main contractor could not foresee that the other contractor would not compact the topsoil layer to 350 KPa bearing capacity, therefore, it would be an unforeseeable soil condition situation. However, the authors are also of the view that raft foundations are generally cast circa 1.5m deep from the ground level, in any event, to:

a) avoid possible soil scouring due to sandstorms or rain;
b) achieve the same foundation level for the entire raft foundation since ground levels are normally different at different locations; and
c) provide lateral support to the raft foundation.

[68] For more details on causation, see Muhammad Imran Chaudhary, "How Causation should be Analysed in Construction Claims", (2019) 35 Const. L.J., Issue 6.

Since the top 1.5m topsoil layer was to be excavated in any event to cast the raft foundation, the raft foundation was always intended to be cast in the layer below the topsoil layer. For this very reason, the bearing capacity of the topsoil layer is not relevant from the soil bearing capacity perspective. In other words, the design of the raft foundation was in fact not dictated by the topsoil layer, therefore, the bearing capacity of the topsoil layer has no impact on the design of the raft foundation.

Another example would be if a contractor encountered an existing concrete slab 12 inches thick instead of 8 inches as stated in the contract documents, and claims additional crushing cost for re-use of the concrete slab. In circumstances where the record indicates that the contractor could have crushed a concrete slab up to 14 inches thick with the same method and without additional efforts, it is difficult for the contractor to link the unforeseeable element with the alleged damage.

Conclusion

Construction is a risky business. Since most projects are built on earth, a contractor must understand the importance of knowing the underground soil conditions and soil investigation reports.

The approach set out in this article may be helpful for a contractor to evaluate whether it has a meritorious and justifiable claim, based on unforeseeable soil conditions; soil risks are generally apportioned in a contract. It is vital that a contractor knows the 'starting position' in relation to its performance obligation and how the 'starting position' is influenced by the contractual arrangements, and the provisions of the contract such as warranties, disclaimers, variations, and remeasurement, and how the question of unforeseeability is addressed under the contract.

It is impossible to know the actual soil conditions of the entire construction site with certainty. Therefore, an employer or a contractor must interpret available soil data which is largely a matter of engineering sense and experience combined with educated guesswork. The interpretation of soil data is the root cause of most of the unforeseeable soil conditions claims. A contractor must understand with clarity the unforeseeable element it seeks to rely upon in its claim.

Finally, it is vital to understand the causal link between the unforeseeable element and the damage claimed. Without this link, whilst it may be possible for the contractor to establish that a particular soil condition was unforeseeable, if it has not impacted its work in any way then any claim for additional costs or time due to the unforeseeable soil condition will fail.

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