

Managing the unforeseen

Geotechnical and underground-construction consultant Dr. Peter J. Tarkoy looks at site clauses designed to facilitate the contractual procedure when unforeseen conditions are encountered

DSC, the differing site condition clause, has been used in US construction since 1926. Global trends have tailored and altered the assignment of risk in construction, consistent with the DSC clause. Our experience of representing owners, engineers and contractors in association with differing site condition claims has led us to discover persistent failings in a system that administers and attempts to resolve these claims.

This paper will address these timely issues associated with the administration of differing site conditions:

- Elements of entitlement;
- Geotechnical baseline reports;
- Utilisation of all available information;
- Reasonable interpretation and assessment of available information;
- Dispute review boards;
- Recommendations for inclusion into contract specifications.

ELEMENTS OF ENTITLEMENT

The required technical elements to establish entitlement have not changed, but merely become more distinctive. Outlined in Tarkoy (1988, 1998), they are listed for inclusion in contract specifications with the DSC clause. They are:

- There must be a difference between reasonable anticipated and documented encountered conditions;
- There has to be a difference between reasonable anticipated and documented encountered construction performance;
- A cause-and-effect relationship must be demonstrable between the differences in conditions and difference in construction performance;
- There must be a demonstrable impact on time or costs;
- Contract conditions must be fulfilled (reliance, notice, mitigation), and
- No other factors (self-inflicted) can have caused the difference between anticipated and encountered performance.

To date, there has not been a direct link between the 'Elements for Entitlement' and the typical DSC clause. The consistency of these elements with a typical DSC clause used by many public agencies is illustrated in the box.



Photo A: the encountered rock was just as indicated by the rock core

GEOTECHNICAL BASELINE REPORTS

Geotechnical baseline reports have been conducive in establishing the baseline from which any differences are measured. Yet, resolutions have been troublesome and plagued with uncertainty as a result of incomplete or unsuitable anticipated properties. For example, test results often do not reflect the full range of known mechanical properties experienced in a locality in the past. In such cases, the geotechnical engineer should extend anticipated conditions beyond the test results with known local experience, preferably quantitatively, as illustrated in diagram 2.

UTILISATION OF ALL DATA

If not all available data is used by a contractor, the baseline and bidding field is altered. A contractor's failure to examine and use all available data is not uncommon. In one case, the rock core was not examined and the contractor failed to comprehend the massive nature of the rock (diagram 3) to be excavated by hydraulic-impact hammer. The encountered rock was just as indicated by the rock core, as



Diagram 3: a massive rock core that was misinterpreted as being easy to excavate

illustrated in photo A. It is well known that excavation of rock by impact hammer relies on such rock-mass properties as fracture frequency, weathering and mass strength (photo B).

REASONABLE INTERPRETATION

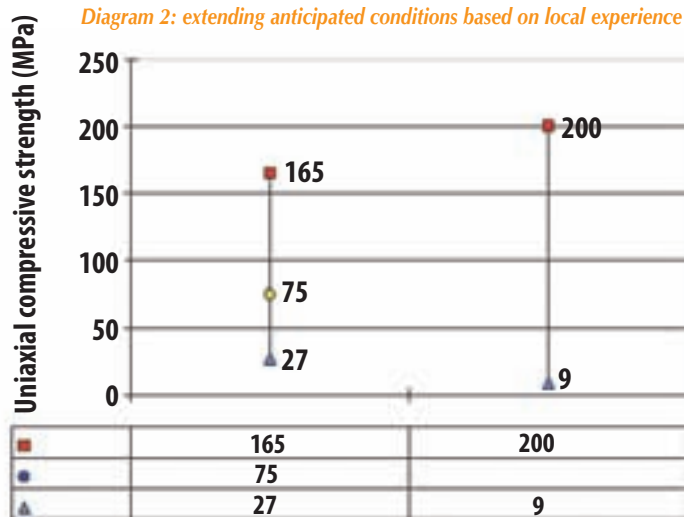
One of the ongoing problems facing adjudicators of differing site-condition claim entitlements is the reasonableness of interpretations of anticipated conditions into material behaviour under construction conditions, selection of means, methods, equipment, and interpretation into construction performance.

Diagram 3 illustrates a massive rock core that was misinterpreted as being easy to excavate because the contractor interpreted foliation to be equivalent to discontinuities. The rock was too massive (closely-spaced discontinuities lacking) for impact-hammer excavation and had to be blasted, as illustrated in photo A. Closely-spaced discontinuities are necessary to excavate in-situ rock with an impact hammer, as illustrated in photo B.

One way to ensure a reasonable interpretation is to require bidders to require the contractor to provide a list of assumptions and methods of interpretation, such as literature and relationships used to interpret:

- Ground behaviour;
- Stability of opening;
- Excavation behaviour, and
- Selection of means, methods, equipment and excavation rates.

NORTH AMERICA: Contractual procedure



DISPUTE REVIEW BOARDS (DRB)

As with all other adjudicating bodies, DRBs depend on the knowledge, experience and thinking of the individual members. It is essential that, in addition to experience and understanding of geotechnical, engineering, and construction issues, the board members must recognise the necessity of fulfilling all of the six elements necessary for entitlement.

Without a clear pathway and checklist for establishing or denying entitlement, both parties tend to be unhappy with the adjudicating opinions. In the past, the ASCE and DRBF co-sponsored a continuing education course on the elements of entitlement for DSC claims. However, that programme lapsed recently.



Photo B: closely-spaced discontinuities are necessary to excavate in-situ rock with an impact hammer

RECOMMENDATIONS FOR CONTRACT SPECIFICATIONS

In our experience, total cost claims are often presented that do not address, rely on or establish the underlying cause of increased costs. In other words, total cost claims overlook or avoid establishing entitlement. Too commonly, entitlement is asserted with little or no proof at all. The basis of the claim relies on the quantum conjured up.

In order to ensure entitlement is fully considered, established and confirmed prior to addressing the quantum of the claim, we recommend the addition of specific conditions for entitlement. First, we recommend that the 'Elements for Entitlement' be included in the specifications following the differing site condition clause. In addition, it must be stated that the contractor is required to:

- Rely on all available geotechnical information;
- View all soil and rock samples;
- Walk-tunnel alignment;
- Provide evidence of reasonable interpretation into material behaviour, and
- Analyse, establish and present entitlement according to the 'Elements for Entitlement'.

These elements are provided in section 1 and have been discussed by Tarkoy (1988, 1998). For more information, visit these web sites: <http://www.tbmexchange.com> and <http://www.geoconsol.com/index.php>.

Article 106: differing site conditions

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of: (1) latent physical conditions at the site differing materially from those indicated in the Contract Documents (sometimes referred to as a "Type I Differing Site Condition"); or (2) physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract but unknown to the Contractor until encountered during prosecution of the Work (sometimes referred to as a "Type II Differing Site Condition"). The Engineer shall promptly investigate such condition(s) to determine if the condition(s) constitute a differing site condition as described in sub-clauses (1) or (2) above. Should the Engineer determine that a differing site condition exists which causes an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work, the Engineer shall notify the Contractor of same, and within a reasonable time, not to exceed fifteen days, Contractor shall provide a detailed Change Order Proposal in accordance with Article 404, 'Change Order Procedure and Basis for Payment'. The Engineer's determination shall be subject to review by the Disputes Review Board as set forth in Article 803, 'Disputes Resolution Procedure'.

(b) No claim for an extension of time and/or an equitable adjustment by the Contractor due to a differing site condition under this Article shall be allowed unless: (i) the condition giving rise to such claim could not have been discovered during a reasonable site inspection prior to award (whether or not same was actually conducted) and was not otherwise reasonably foreseeable, and (ii) the Contractor has given the notice required in (a) above, and has met all requirements in Article 205, 'Extension of Time'. In addition, any proposal by the Contractor for additional time and/or compensation due to a Type I Differing Site Condition shall include specific reference to the relevant section of the Geotechnical Baseline Report or other Contract Document which the Contractor claims gives rise to such entitlement, with adequate explanation and documentation to support its claim to the Engineer, including appropriate documentation that there was a substantial difference in the actual site conditions from a condition stated in the Geotechnical Baseline Report or other Contract Document, that it impacted on the Contractor's prosecution of the Work, and that the condition is one for which the negative impact could not have been avoided by reasonable efforts made by the Contractor.

REFERENCES:

- Tarkoy, P. J. (1988) *What Claims are Made Of*. *World Tunnelling* 1(3):249-253 (September 1988).
 Tarkoy, P. J. (1998) *Differing Site Conditions*. *World Tunnelling* (March 1998).
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