THE STUFF THAT CLAIMS ARE MADE OF

In the United States the Differing Site Condition Clause was introduced to lower the cost of construction by removing a contractor's cost of contingencies in return for protection against unanticipated conditions.

This clause has been the subject of some scurrility.

For some people claims for extras are a matter of course and frequently the differing site conditions clause provides the most viable vehicle for such claims.

Likewise, owners and engineers have been known to be unreasonable in their recognition and acknowledgement of legitimate claims by contractors and their compensation for unanticipated costs.

CLAIM PREPARATION

In the preparation of a differing site condition claim, the contractor must effectively deal with the concerns of the engineer as he is reviewing the claim document. Laws of various jurisdictions may be different and an engineer or contractor may not be knowledgeable about their details. What can a contractor provide for the owner/engineer to illustrate that a differing site condition has been encountered? What should an owner/engineer look for in evaluating such a claim?

For the most part, knowing the detail of the law is not necessary in the preparation or review of the technical merits of a differing site condition claim.

The technical elements or requirements of a differing site condition claim may be summarized as follows:

1. there has to be a difference between reasonable anticipated and encountered conditions,
2. there has to be a difference between reasonable anticipated and encountered construction performance,
3. a cause and effect relationship must be demonstrable between the difference in conditions and the difference in construction performance,
4. there must be a visible impact in time and/or costs,
5. all contract conditions must be fulfilled, and
6. other factors must not have caused the difference between anticipated and encountered performance.

A rigorous adherence to these principles by the contractor will provide a framework for the preparation of differing site conditions claims; serve as a checklist for the preparation and justification of a differing site condition claim for the contractor; make a review of the claim easier by providing a checklist for the owner/engineer when evaluating a claim; and provide specific points to be addressed by both parties should there be an impasse.

In addition, these principles may serve as a context for project exploration, presentation of exploration data, presentation of interpretive data, and design. The relevance and importance of pertinent exploration, reasonable interpretation, representation of average and ranges of conditions, and clear and succinct presentations by the owner/engineer, becomes apparent.

The contractor benefits from these guidelines at the time of bid preparation as a reminder for documenting all data utilized, assumptions made, and interpretations developed.

In addition, the contractor has a checklist for evaluating and fulfilling the requirements of a differing site condition claim during construction, before they become a problem or a source of controversy with the resident engineer. The immediate cause, effect, and impact can be assessed on a timely basis. Examples of compliance and non-compliance of each of the technical elements will be illustrated with actual case histories.

DIFFERENCE IN CONDITIONS

In order to arrive at a difference in conditions, *reasonable* anticipated conditions, preferably documented, must be compared with encountered conditions. The *reasonable* conditions may be based on what a contractor (not a geologist or engineer) might determine with his experience and training. All available information, including a site visit and other easily obtainable knowledge, must be used in coming up with an interpretation of *reasonable* anticipated conditions.

Shear zone and rock block fallout in TBM bored tunnel, responsible for delays illustrated in Figures 3 and 7.

The encountered conditions may be obvious but the method of measure or evaluation should be consistent between the owner/engineer and contractor. The method of measure should also be consistent with the methods used initially to define the anticipated conditions. Such consistencies eliminate annoying differences and promote a straightforward comparison of anticipated and encountered conditions.

When an easily demonstrable difference between *reasonable* anticipated and encoun- ▶

tered conditions can be illustrated, this condition is fulfilled.

The pitfall here for the engineer is that a contractor does not have to have the same level of expertise as the engineer. The pitfall of the contractor is documentation and consideration of all available information.

Figure 1 represents a case in which the difference between anticipated and encountered conditions was clearly illustrated. During trench excavation and pipe jacking, a silt content much higher than anticipated was encountered. The dewatering system chosen on the basis of pre-bid data did not work in the encountered conditions.

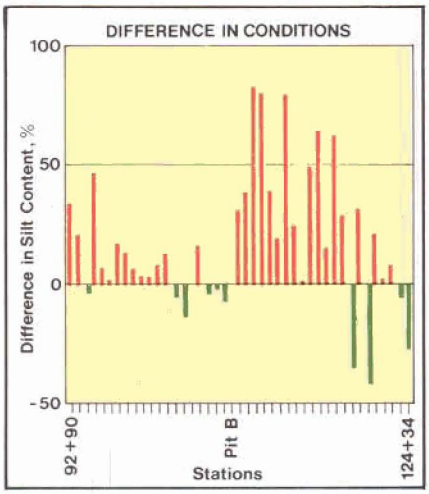


Figure 1

Figure 2 compares the anticipated and encountered water inflow into a tunnel. As clearly illustrated, the actual inflow was substantially less than anticipated. Nevertheless, the contractor filed a claim which was denied by the engineer. Some of the high peaks were sustained when ice blocked the weir. On other occasions, measured weir flow included flows from an intermittent stream (during heavy rains) emptying into a shaft and the tunnel. This was clearly not part of the tunnel inflow.

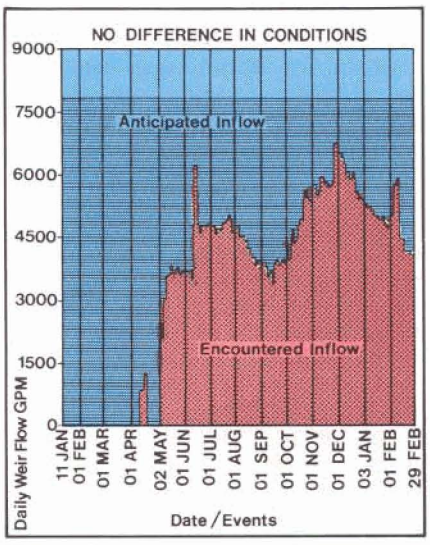


Figure 2

Heading of pipe jacking showing silt on the project illustrated in Figure 1.

DIFFERENCE IN PERFORMANCE

An essential ingredient for determining a difference between anticipated and encountered performance is a *reasonable* anticipation of performance. It is desirable to have

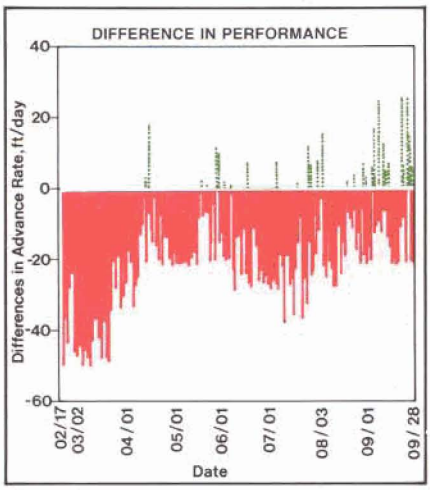


Figure 3

reasonable performance documented by experience, reflective of anticipated conditions, and consistent with equipment condition and capabilities.

Interpretation of anticipated conditions and calculation of performance must be well documented.

When a demonstrable difference between *reasonable* anticipated and encountered performance can be illustrated, this condition is fulfilled.

The pitfall here for the engineer is to assign blame to the contractor in some form without adequate grounding or evidence. Similarly, the pitfall for the contractor is often a lack of rigorous documentation and substantiation of *reasonable* anticipated and encountered performance.

Figure 3 illustrates the difference between anticipated and encountered daily advance rate on a TBM bored rock tunnel. Harder than anticipated rock was encountered with wider than anticipated shear zones. Nearly all of the TBM performance was less than expected. The claim was acknowledged in a letter that was withheld from the contractor and yet the claim was formally denied by the owner's geotechnical consultant. The contractor prevailed for nearly the entire amount of his claim in both cases in arbitration.

Figure 4 illustrates the anticipated hydraulic dredge rates for three combinations of sand and gravel mixtures. The green line illustrates the actual rates sustained by the dredge under the same exact conditions (percentage combinations of sand and gravel). The conclusion that the anticipated rate was over-optimistic or the dredge was inferior is inescapable. The court agreed.

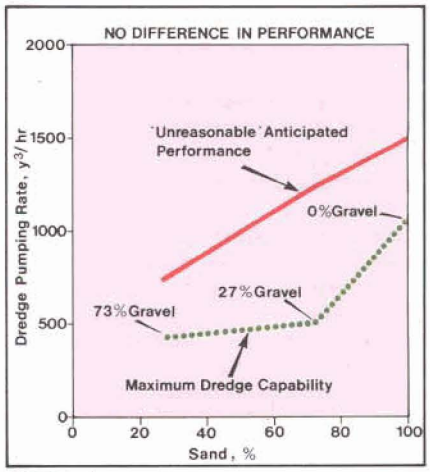


Figure 4

CAUSE AND EFFECT

When differences in conditions and performance have been established, it is essential to show that the difference in conditions actually caused the difference in performance. Otherwise they may merely be treated

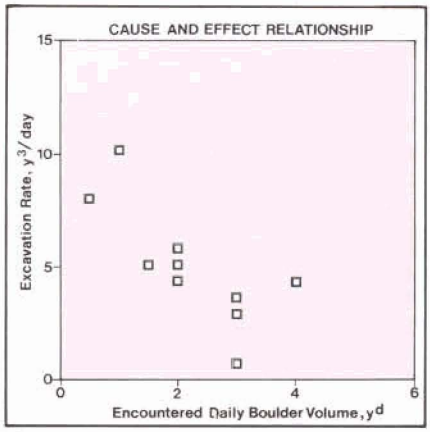


Figure 5

as coincidence. It is necessary to illustrate a qualitative relationship.

Empirical relationships for geological and construction data should not be expected to have a high degree of correlation because of the many variables (both geological and construction related). Correlation coefficients may vary from 0·25 to 0·50 and should not be discounted purely on a quantitative basis. Each case has to be evaluated on its own merits and tempered with judgment.

Figure 5 illustrates that an increase in encountered boulder volume has a direct effect on the daily excavation rate in pipejacking. The court found in favour of the contractor.

Figure 6 illustrates an attempt to show that water inflow affected tunnel excavation progress. The comparisons were made on daily (**Figure 6**), weekly, and monthly basis without any correlation whatsoever.

Robbins TBM designed for high water inflow conditions and used on the project referred to in Figures 2 and 6.

IMPACT

After having met all of the foregoing conditions, it is still necessary to illustrate an increase in cost and/or a time delay.

This impact must be related to the unexpected conditions that are encountered. It must be demonstrated that the impact was related in time and space (distance) to the unanticipated condition and that an adverse impact was sustained.

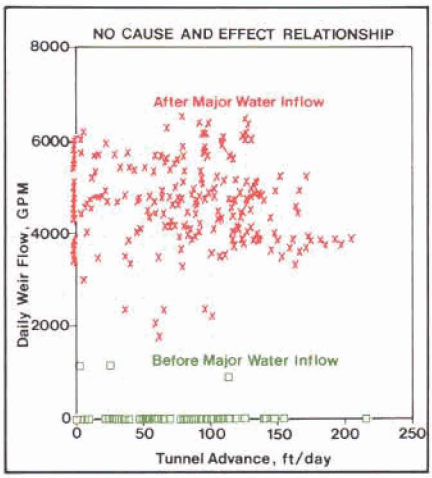
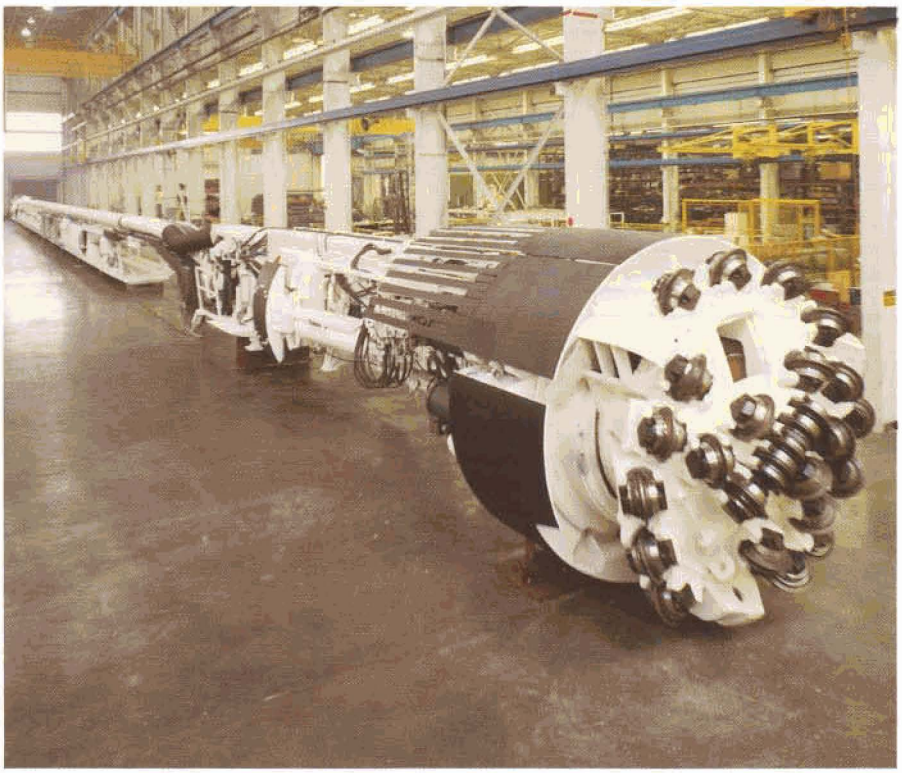


Figure 6

Figure 7 was used to illustrate the time impact of encountering two wider than anticipated shear zones. The width of the shear zone prevented the TBM from having an adequate gripping surface because the grippers could not straddle the wider than anticipated zone.

A great deal of time was spent cribbing under the grippers. Arbitrators found in favour of the contractor.



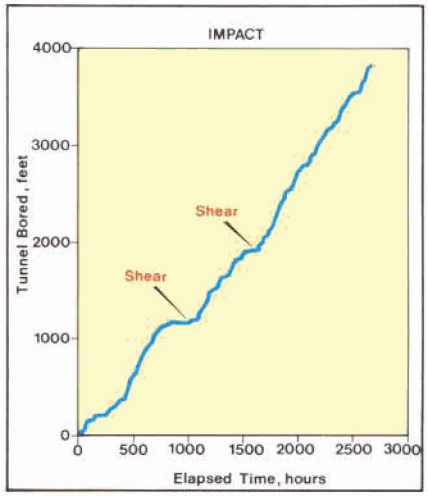


Figure 7: Impact on time duration of excavation

Figure 8 represents dredge labour costs per unit of dredged material as a function of time and the materials dredged during that time. The contractor presented a claim purporting that gravel had an impact on the dredge performance. The analysis shown in

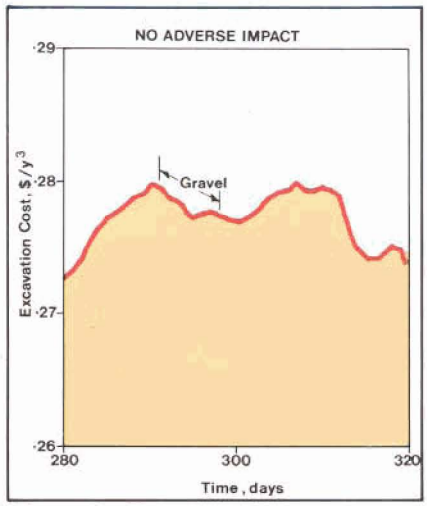


Figure 8: No related impact on time duration

Figure 8 indicates the contrary, that dredge labour costs decreased when gravel was encountered. The U.S. Claims Court agreed.

FULFILLING CONTRACT REQUIREMENTS

In addition to having fulfilled all of the previous conditions, it is necessary also to fulfil the requirements of the contract, particularly if they apply in any way to a differing site condition. Typically, these include:

reviewing all available information, records, and documents;
a thorough site visit;
use of appropriate construction equipment in operable condition;
timely and proper notification;
and mitigation of the impact.

A few examples would serve to illustrate

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the actual application of some of these requirements.

In a recent case, the U.S. Claims Court upheld a contract requirement for a site specific visit which would have provided a view of the gravel banks along a river to be dredged. Similarly, the court found that known commercial gravel operations (minimum 50% gravel content required) visible to the contractor during a site visit should have been taken into account in calculating anticipated gravel. Not taking the gravel operations into account made the anticipated conditions

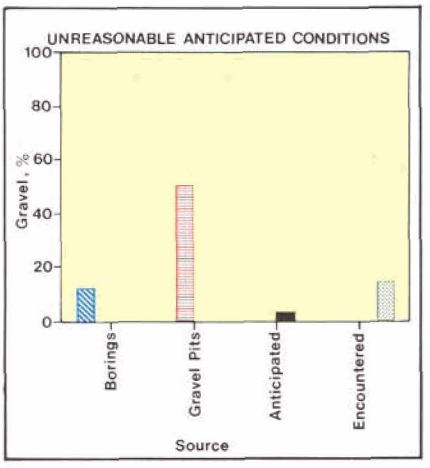

Figure 9

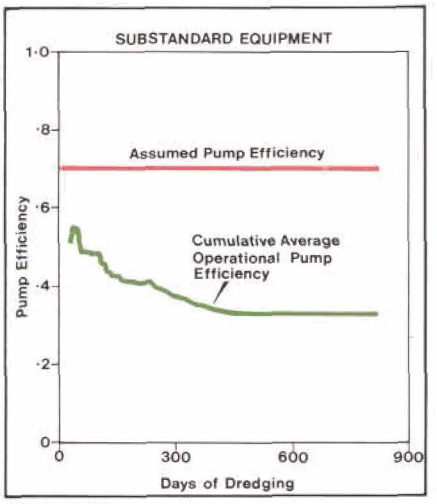

Figure 10

unreasonable. A comparison of available information is illustrated in **Figure 9.**

A tunnel contract contained provisions for a differing site condition clause. It also required approximately 1,500 gpm to be handled by the contractor at his own cost. An additional 5,000 gpm of flow would be paid under unit prices and was included as a bid item. It was stated that a differing site condition claim for water inflow would not be considered unless the flow exceeded a prescribed amount and only if grouting or other methods of controlling the water had failed.

In this instance, no grouting or other method of controlling water inflow was attempted. The engineer denied the contractor's claim.

OTHER FACTORS

There are cases in which additional aspects come to light such as over-optimism, self-inflicted problems, or use of inappropriate or dilapidated equipment.

In **Figure 10** the assumed dredge pump efficiency used for the dredge performance estimate was 70%. The actual dredge pump efficiency calculated from operational data during dredging showed that the cumulative average efficiency was only 35%. The inescapable conclusion was that the equipment was inferior to that which was expected. The court agreed and found that the use of substandard equipment was at the root of the contractor's problem, rather than a difference in geological conditions.

by Peter Tarkoy, Ph.D.

Peter J. Tarkoy is a geotechnical and construction consultant specializing in tunnelling, tunnel boring machines, geotechnical issues, and associated problems. He is based at 102 North Main Street, Sherborn, MA 01770, U.S.A.