Reply to Engr. Mun Kwai Peng's comments on the June 2006 Jurutera Cover Story

The writer thanks the commenter for his interest in the cover story. The cover story was not meant to be a technical paper presenting new theory or research results. It is meant for general reading to suit the purpose of Jurutera. A paper on new theory would have been published in the Journal instead.

The writer agrees that engineers have no problem understanding the theory, and that there is a vast amount of references available. During the writer's tenure with a pile testing company, the writer had met with many engineers, including consulting engineers, who did not have a clear understanding of the basics of dynamic pile testing, except it being known as a "PDA" test. The writer therefore felt that there is room to present the basics of this method to the community in the most concise manner. The current membership of IEM is more than 15,000, of which almost 8,000 are from the Civil discipline, who has direct interest in this subject. The commenter mentioned the conference that he had organised in 2004. Surely the number of engineers who attended was few in comparison to the circulation of Jurutera of 15,000. Furthermore, Jurutera is free to members whereas the proceedings is not. The proceedings is not a suitable reading material for engineers who are new to this subject, unlike the cover story which was written for this purpose. The writer is confident that the cover story had benefited many, including engineers not from the Civil discipline.

The commenter claimed that Dr George Goble is the original researcher in this subject. This is incorrect. The concept of a wave propagating through a rod was noted, as early as 1867 by St. Venant. One of the earliest records that indicates the presence of stress waves in piles during driving was presented by D.V. Isaacs in 1931. The breakthrough came in 1960 when E.A.L. Smith published a paper entitled "Pile driving analysis by the wave equation", where a numerical scheme was presented to enable the solution of the one-dimensional wave equation. Dr. George Goble appeared later, and together with Rausche and Likins, further developed the method and tapped its commercial application.

The cover story did not suggest that the dynamic load test be a direct substitute for the static load test. In some situations such as marine or offshore construction, it is not practical to do a static load test. The dynamic load test is most often the only thing one can do. In normal onshore construction, the dynamic load test can significantly reduce the number of costly static load tests, and at the same time perform a larger number of tests, improving on the confidence of pile installation but at the same time not totally eliminating all static load tests. The writer acknowledges that the commenter does not consider the term "specialist" as applicable to him.

The commenter claimed that the signals presented in Figure 2 were of poor quality and attributed the cause to gauges not secured tightly to the pile head. The comment was made without any knowledge of the pile make-up and soil condition. The commenter has not identified any features of the alleged poor signals from which he derived his conclusion. The writer states that the signals presented in Figure 2 are normal signals one would get from a typical offshore steel pipe pile installation. This is consistent with numerous signals that the writer has seen from other internationally reputed geotechnical consultants and testing companies. If the commenter had seen any offshore steel pipe pile test data before, he would have known that the signals were absolutely normal. The exact match between the force and velocity traces on the first peak is an indication of good force-velocity relationship and properly mounted gauges. Beyond the first peak, the force and velocity signals will separate according to the effects of pile make-up and soil condition. Using the equations presented and the guidance given in Figure 4, one can explain the signals in relation to the pile make-up and soil condition. Without knowing the pile make-up and soil condition, it is erroneous and impossible to conclude that the signals in Figure 2 were of poor quality.

The commenter mentioned that the formulae presented in the cover story were well documented in a keynote lecture by Dr. George Goble and also in many papers and reports presented by him. The writer adds that the same formulae were also published by many others in various forms. The writer also takes this opportunity to correct a printing error for Equation (3), which the commenter failed to notice despite the formulae being well known to him. The correct equation according to the manuscript submitted should be:

$$F_r = F_i(1- ß)/(1+ß) \quad (3)$$

The commenter said that if the dynamic load test is performed shortly after the pile has been installed, it should be called the "End Of Drive" (EOD) test, and not a "Restrike" test. The writer disagrees. EOD test is universally understood to be the test data obtained from the final blows at the completion of pile driving, and not later. In marine clay, a wait of even as short as two hours can cause significant set-up. Thus, shortly after pile installation, the test is appropriately called a "re-strike" test as explained in the cover story. The term shortly means from several hours to few days.

The commenter claimed that the pile soil model presented in Figure 3 was totally wrong and that symbols and short forms such as CAPWAP, GRLWEAP and RD were not explained. The writer states that Figure 3 is a typical pile-soil-hammer model. There are other forms of the model, but that presented in Figure 3 is by far the simplest, most common and can be seen in most literature. The symbols used were normal springs and dashpots that any engineer would easily recognise. There were no short forms in the figure, contrary to the claim by the commenter. Figure 3 is correct, self-explanatory and self-sufficient.

The commenter listed six comments on Figure 5, which the writer responds as follows:

1) Commenter claimed gauges were not attached properly at the pile head but gave no substantiating evidence to support his claim. The writer maintains that gauges were mounted properly. This can be seen by the good quality signals obtained. The matching initial rise of both force and velocity traces confirmed this. Furthermore, the excellent matching of force and velocity traces by the numerical solution confirmed the good quality of the data. Bad quality data would pose difficulty in signal matching.
2) Commenter claimed the calibration number or pile properties were wrong in the measurement, but gave no substantiating evidence to support his claim. The writer confirms that correct calibration factor and pile properties have been used. This is evidenced from the good quality signals and good matching obtained. Wrong calibration factor would show up as diverging force and velocity traces from the beginning, which were absent in the data shown.
3) Commenter mentioned that there was no proportionality at peak force and peak velocity. The observation is correct, however, there is nothing wrong with the data. As explained in the cover story, the pile had severe defects near the pile top. As a result, there will be no proportionality at peak force and peak velocity. The reflected wave due to the defects near the pile top will arrive back to the gauges before the incident peak wave completely passes through, causing the velocity trace to increase and force trace to drop, as correctly shown in the figure. The ability to correctly diagnose this condition sets apart those who know and those who know just a little.
4) Commenter mentioned that defect might be detected along pile shaft. As explained in the cover story, defects

were detected near the pile top (and below), and verified by visual inspection when the pile was excavated later. Commenter's statement was redundant.

5) Commenter mentioned that there was insufficient hammer energy to mobilise the true static resistance. From the test data, indication was very clear that the defect near the pile top was very severe. A right decision was made to stop further testing using higher hammer energy, as the pile top integrity was questionable. Looking at the extent of the defect indicated in the figure, higher hammer energy would not mobilise the full static capacity. Instead, the pile top would collapse and the nearly 20 tonnes hammer falling off, creating a safety concern. To insist on higher hammer energy to fully mobilise the pile without knowing the consequences, reflects a lack of understanding in basic engineering.
6) Commenter claimed that there is no way one can model so many defects along the pile shaft. This statement is in conflict with the commenter's statement (4) above. On one hand the commenter suggested there might be defects along the pile shaft and on the other hand it is not possible to model those defects! The example presented by the writer in Figure 5 was an excellent example. It demonstrated the ability of the method to detect defects from the pile top downwards. This was proven when the pile was excavated, where the writer had actually managed to dig into the pile using his bare hands, confirming the seriousness of the defect.

The commenter stated that soil parameters are not assumed in the signal matching using CAPWAP® but instead are input by the user until a match is obtained. The writer wonders how does the user know what to input when it is still an unknown. The process of signal matching was already clearly described in the cover story. The program is intelligent enough to automatically produce a signal matching that is usually quite close to the final value. The user then uses his judgment to fine-tune the parameters. This can involve some guess or assumption.

The writer is surprised that the commenter disagreed on the importance of internal soil plug in the steel pipe pile installation. The cover story discussed briefly on this issue in the application of wave equation to driveability analyses. The internal soil plug is an important consideration in the driveability analyses and is an industry practice. The commenter, who organised the 2004 conference, could not even remember that one of the special lectures in the conference was on this topic itself! The statement by the commenter goes against industry practice and the generally recognised treatment of internal soil plug.

The commenter claimed that the writer had not seen or heard about the series of International Conferences on The Application of Stresswave Theory to Piles. This statement was made in a very careless manner without performing due diligence required of a professional engineer to verify statements before issuing. The writer was fully aware of such conferences, and in fact was personally contacted by one of his organising committee regarding the conference that the commenter organised in 2004. The writer even supported this conference by recommending several of his colleagues to attend the conference. The writer is also a personal friend of Prof. Chow, who presented one of the special lectures in the conference, whom he met after the conference. The statement by the commenter was factually wrong.

The commenter questioned the writer's choice of citing Dr Wong's thesis and not the proceedings of the conferences. The writer clarifies that the proceedings are outside the scope of the cover story, and thus were omitted. The scope of the cover story was clearly identified in the Introduction, and the appropriate reference was selected. The cover story was about fundamentals of the method, not about case histories or recent refinements to the method. The interested reader can locate further reference materials through the list of references cited. For brevity, it is not appropriate to cite every single reference.

The commenter described the cover story presentation of offshore pile installation as academic, and that dynamic monitoring and re-strike were merely a contractual obligation. This statement clearly lacks credibility. Dynamic monitoring and re-strike are not merely a contractual obligation. It does not make sense to spend money to perform those tasks without a technical purpose, other than contractual. Dynamic monitoring and re-strike are specified in most oil company's technical specifications. It has technical purposes. Some were explained in the cover story. Those involved in the offshore oil and gas industry will know the importance of these tasks.

In closing, the writer could not find omissions or errors in the cover story. Instead, all the comments had been technically incorrect and factually wrong. ■

Regards,
Engr. Dr Sam Ming Tuck, *M.I.E.M., P.Eng.*

BULLETIN EDITOR'S COMMENTS

We thank the author of the article and all others who have shown interest in this matter. We would like to announce a closure on this matter as the technical accuracy of this matter is best referred to the relevant Technical Division for peer review and resolving this matter.

Dear Sir,

I read with interest the article titled "Can Lessons be Learned from a Displaced Single Storey Staff Quarters Building Allegedly Due to Adjacent U-Drain Construction?". I am a reviewer for IEM's Jurutera and also IEM Journal and I am disappointed that the above-mentioned article was published with grammatical errors and inappropriate wordings.

For instance, the sentence "The concept of the load-carrying behaviour of the single-pile foundations as understood by the appointed engineer was quite irrational and alarming; lacking engineering understanding" is implying that the other professional engineer is incompetent.

In general the Jurutera should not be a place where authors publish their works and personally critise other professional engineers. Now that readers have read this article, the general public would think that there are Malaysian engineers who are incompetent but managed to be professional engineers. To the public, this is obviously not the picture we would want to paint. ■

Regards,
Engr. Tee Horng Hean, *M.I.E.M., P.Eng.*