Adaptation of a University Soils Mechanics Course for a Union Technician Training Program

Thomas J. Dobrowski

Department of Construction Science and Organizational Leadership, Purdue Northwest, 1401 South U.S. Highway 421, Westville, Indiana 46391; e-mail: tdobrows@pnw.edu

Abstract

When dealing with the term "geotechnical", most often engineers associate this with the engineering during the design phase. However, equally important is the quality control performed during the construction phase. While great time and expense is used in the initial investigation, the field quality control is usually regulated to the lowest bidder. In 2002, the International Union of Operating Engineers, Local 150 started an organizing effort in the Chicagoland area. In the area of Soils, the Union relied on certifications revolving around laboratory testing and not actual field work. This is in a large part due to the fact that the in the field evaluation of soils there is not a trade organization acting as governing body (such as the American Concrete Institute, American Institute of Steel Construction, or the American Welding Society) for certification. Experience is paramount in the field as the evaluation of soils can be as much "art as science".

A survey of testing firms was conducted and it was determined that the effectiveness of the unions training in soils was woefully inadequate. This paper discusses how a university program is helping the construction trade union in developing a more comprehensive and practical training program so the field technicians gain at least a fundamental understanding of soil mechanics and the benefits to both the university and the trade union.

1. Introduction

Decisions made in the field can often save or doom a construction project. Because of the nature of earthwork, the liability it carries tends to be much greater than in the vast majority of the other trades. A field technician is vital as quite often they are asked for recommendations when failing results are obtained or unsuitable soils are found. While engineers in the office are often (but not always) consulted, they often rely on the information relayed to them by the field technician to give a recommendation. It is therefore paramount that the training a technician receives is adequate so that they can properly interpret field conditions in order to make recommendations, or assist the engineer in the office. Because of this, technicians need to be intelligent, possess good oral and written communication skills, and have a good attitude and work habits. This paper will look into the effect of unionization on materials testing field technicians and the failure of the current apprenticeship program in regards to training in soils and how a university is collaborating to improve their program.

2. History

The commercial and industrial construction trades in the Chicagoland area are heavily unionized. Because of this, it would be extremely difficult to build any sizable project without union personnel. The materials testing industry in the Chicagoland area prior to 2002 was strictly considered a professional service and was not unionized. A close parallel would be surveyors, which is also thought of as a professional vocation as opposed to a trade. However, surveyors do have union representation in the Technical Engineers, Local 130 (actually part of the Chicago Plumbers Union). It should be noted, however, that this union does not have a stranglehold as many land surveyors are still non-union and only those performing layout in commercial and industrial settings are typically required to have union membership.

The survey of testing firms shows that when the Local 150 started to organize the field technicians (2002), hourly pay ranged from approximately $12 to $20 and benefits were what could be expected from a professional organization (typically 2 weeks paid vacation, holidays, sick time, medical insurance, and 401k retirement plans). Technicians were (and still are) broken down into two categories; soils/concrete and structural steel. The soils/concrete technicians typically only had American Concrete Institute (ACI) Level I certification (sampling and field testing of concrete) whereas the structural steel technicians were typically Certified Welding Inspectors (CWI), many of which had additional Non Destructive Testing (NDT) certifications such as Ultrasonic (UT) and Magnetic Particle (MT). As a result, the structural steel technicians commanded the higher hourly rate (estimating to be closer to $20/hour) while the soils/concrete technicians were significantly lower (averaging approximately $14/hour). Billing rates for soils/concrete technicians typically ranged between $35 and $38/hour at that time (with additional charges for items such as concrete cylinders, nuclear density gauges, and vehicles/mileage). Firms that were far enough out from Chicago's influence paid significantly lower hourly rate and as a result, quite often, when pursuing work in the Chicagoland area would put out bids with billing rates as low as $18/hour.

The International Union of Operating Engineers (Local 150) is one of the largest union locals in the United States. Its jurisdiction covers the southeast corner of Iowa and the northern portions of Illinois and Indiana. To offset shrinking union membership, Local 150 had started an organizing department in the late 1980's. In doing so, they not only targeted what would be considered typical firms (those operating heavy equipment), but also started on non-traditional areas such as mechanics, geotechnical drill rig operators, construction field technicians, and landscapers. This enabled the local to expand its membership from 10,000 members in 1986 to nearly 23,000 members today. The hourly rate for a heavy equipment operators at in 2002 was around $34 per hour with full union benefits (funded fully by the employer). Obviously, the prospect for field technicians to receive a significant pay increase and incur no out of pocket expenses for benefits such as medical

insurance and retirement were enticing. When the Chicago Bears started renovations on Soldier Field in 2002, Local 150 started its organizing campaign and to date has fifty three firms signatory to its contract.

To help prevent "sticker shock" to the firms, the union did not put the pay scale equal to that of heavy equipment operators to start. The initial contract was set up with five different pay scales related to certifications (those technicians with more certifications were paid more). Also, technicians could move into higher pay scales every four years of employment without obtaining any additional certifications. The high end of the scale was around $23/hour with full benefits, to substitute for the lower scale (in comparison to heavy equipment operators) there were "perks" given to the technicians that are not typical for union tradesman in the Chicagoland area. These included guaranteed forty hour work weeks (rules for union personnel vary, but typically there is a minimum 2 hour show up time for rain outs, but no daily or weekly guarantee), paid holidays, personal days, and paid vacation (up to five weeks depending upon the number of years with a particular employer). There was also a clause for company supplied uniforms, but this never gained much traction (one company told its employees if they wanted to enforce this rule, they would buy pink uniforms and make it company policy that they would have to wear them). It should be noted that the contracts typically cover three to five year periods and during this time the hourly pay scale increases have exceeded those of heavy equipment operators, starting to "close the gap". In exchange, some of the perks (such as personal days, the forty hour guarantee, and uniforms) have been removed. This trend will likely continue in future contracts. Labor rates effective starting March 1, 2018 for a Level F Technician (the only higher level is for those who do façade inspections) are $39.57 per hour with an additional $28.60 in fringe benefits and a sliding scale for vacation time of $2.50 to $5.50 per hour, depending on time served with a company.

As a side note, for comparison purposes the hourly rate of an operating engineer in Chicago is $49.10 (building) and $47.30 (heavy highway) with a fringe benefit package of $35.78 per hour. The "Levels" of technicians listed above will disappear over time. These were originally set up based upon levels of certification. Level A technicians do not possess any certifications, while Level B have ACI Level I and are nuclear density gauge safety trained. Level E possesses either Certified Welding certification, DOT Level III, or NICET Level II or III. Level F is reserved for those with Civil Engineering Technicians or ICC Master Special Inspector and Level G are for inspectors of facades (high risk). It is specific that any technician with four years of soils experience would be placed in Level C, regardless of certifications. Also, for every additional four years of experience, the technician will advance into the next class. These levels were put in place for those technicians who worked for firms during the organizing effort. However, once the apprenticeship program was started, all new technicians joining the union must go through the program. Once the

apprenticeship program is completed and the technicians have worked a minimum of 6000 hours in the field, they will be at a Level F.

A few years after the start of the organizing effort, Local 150 started construction on its new training facility housed in a nearly 350,000 square foot building. Included in this facility was classrooms and a materials testing laboratory. An apprenticeship program was started for the field technicians in which they could either choose structural steel or soils/concrete options. Over the five year apprenticeship, the technicians will attend classes at the training facility (scheduled over the winter) and obtain various certifications. Those choosing the soils/concrete option obtain vast array of concrete certifications including those issued by ACI and Illinois and Indiana Departments of Transportation, but little training dealing with soils. Aside from nuclear density gauge safety training, one Illinois Department of Transportation (IDOT) course, and laboratory testing, there are no certifications or any training in soils mechanics or work in the field.

3. Survey

The survey was distributed to twenty firms who perform soils testing. While the list of approved firms is substantially larger, some of the firms only perform geotechnical drilling or structural steel testing. Firms which solely work on Department of Transportation projects were also excluded. Of the invited firms, fifteen responded to the survey. Of the fifteen that responded, three of the firms only employed the same technicians that they had when they unionized and had never brought technicians in through the unions' hiring hall (hall). The response was overwhelming in that the feeling among the firms was that the technicians had very little knowledge of soils coming out of the apprenticeship program. The program did not have the apprentices perform any laboratory tests and as a result, they had no knowledge as to how water affects soil consolidation (which could be discussed and seen while performing a proctor test), or how a change in gradation can effect test results. Some of the technicians knew how to run nuclear density gauge, but most could not. The technicians who could run the gauge knew whether a test was pass or fail, but they did not have any knowledge as to why. This stems from one of two situations, either the technician had taken the safety course some time prior to being hired and had forgotten how to operate it, or during the safety class the instructor concentrated simply on the safety aspects of the gauge and never actually showed them how to use it, let alone interpret the results. Other pieces of field testing equipment, such as penetrometers (pocket, static, or dynamic) were completely unknown to them (not a single respondent from the survey gave a positive response). As also noted above, the technicians had no training is soils mechanics, meaning that when issues arise in the field, management would have to get involved to help solve the problem, no matter how minor. The testing firms are most responsible for training the technicians and this has become a point of contention between the testing firms and the union and

its members. An ideal training method would be for a junior employee to "shadow" senior technicians for a substantial period of time and going to different jobsites because of variations in soil and different approaches in working with them. However, because of the high cost of employing the technicians, this is not feasible. It is therefore expected from the testing firms that the technician that are hired out of the hall be skilled in the areas that they are hired to perform. In other areas, such as concrete and structural steel, the technicians have come out of the program much more versed in these fields. In other trades, the knowledgeable journeyman are expected. Unfortunately, even with the service time required to obtain journeyman status, it is not enough for testing firm managers to be comfortable sending technicians out onto jobsites making judgment calls when the liability is so high.

As a result, firms that specialize in soils/concrete covet the lower pay level technicians as they see no added value in hiring higher level technicians. This has become an issue because at this point in time, there are an abundance of Level F technicians (those who have completed the apprenticeship program) which are looking for work, but established companies with employees that have seniority are kept and placement of Level F technicians has proven difficult (layoffs are done in reverse order of seniority). Until enough time has elapsed to have the technicians who have not gone through the apprenticeship program (and therefore maintain a lower level of pay) retire, this trend will continue. Also, when hiring from the hall, employers have a "ninety day probationary" period in which they can let go of a technician without them achieving seniority. Because of the high cost associated with upper level technicians, the firms surveyed typically keep a technician 88-89 days and then lay them off and pick up another technician.

Another trend that is seen is firms taking their structural steel inspectors and getting them ACI Level I and nuclear density gauge trained. Most testing firms feel that if they have to train a Level F technician (who has gone through the concrete/soils apprenticeship program) to test soils, why not simply train a structural steel technician? ACI Level I training with review time, typically takes two days and nuclear density gauge safety training takes an additional day. So, for three days of training time, a structural steel inspector also gains the versatility of performing basic concrete testing and sampling along with the capability of performing soils testing. This has further reduced the demand for soils/concrete Level F technicians.

A final note gleamed from the survey is that the overall quality of the technicians has not improved. It was hoped that with the substantial increase in pay and benefits that a higher quality apprentice would be able to be obtained and this has not apparently happened. As one respondent said "We are paying substantially more for the same product".

4. Training Program

While it takes years of hands on work to become proficient in soils, a thorough knowledge of soils mechanics can vastly

improve a technician's value. When looking at a college Mechanics of Soils (Soils) course, the one thing that stands out is that a level of higher mathematics in not needed. If a student can handle basic math, the vast majority of (classification, compaction, bearing capacity, subsurface stresses, etc.) can be readily understood. In looking at what a college level Soils course entails, it was not difficult to pull materials that is relevant to the work a field technician performs. In working with the field technicians, most of those who know how to properly run field equipment, such as nuclear density gauges or dynamic cone penetrometers, know how to get the results, but had no idea as to how it was derived or what the "numbers" actually meant.

Relevant sections of the Soils course were analyzed and areas that would be beneficial to the field technicians were chosen. Because the apprenticeship program already teaches many of the laboratory tests (proctors, gradations, etc.), those laboratory tests were heavily incorporated into the modules and were used to show how use the data obtained from them. In addition, emphasis was also placed on understanding the geotechnical report and utilizing the information and recommendations contained in them. Graduates of the program who started as Project Engineers in the field were consulted to ascertain what components of the Soils class they had found helpful.

Eight modules of two hours each were designed and could run independently of each other or "back to back". This allows for the apprenticeship program, which offers a majority of its training over the winter, to run two full day programs. Additionally, companies that want additional training for their technicians may pick and choose the two hour modules to give their technicians who are not, or are no longer in the apprenticeship program the opportunity to obtain a little more practical knowledge.

5. Conclusion

The survey showed that the unionization of the field technicians have led to some successes and failures. It was hoped that the significantly higher pay would attract a higher caliper of person into the field. From the survey, this does not seem to be the case so far. However, retention of employees has significantly increased as those technicians who are working can make a very good living and receive benefits that are generally much better that what other industries offer.

The consensus of the survey is that the unionization of the materials testing field technicians has had no effect on their ability to test and analyze soil. Because of the varied nature of different types of soils in the Chicagoland area, experience is far more important than any certification that the union now, or could ever, give its members. A greater emphasis on soils testing and basic training on soils mechanics is warranted. The need for training beyond what those certificates can offer is needed. The liability in geotechnical engineering is considerably higher than in most civil fields. It therefore makes no sense to have a professionally done design only to have an inexperienced technician oversee the construction to make sure all the work is done properly. While it

will still take years of experience to produce a truly exceptional field technician/inspector, an understanding of soil mechanics will help the technician understand the data that they are looking at and make a more informed decision (or better relay information to the engineer).