

Iowa Department of Transportation Technical Training Activities

Chris Anderson

Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010
christie.anderson@dot.state.ia.us

ABSTRACT

Properly trained technicians in the areas of material testing and construction inspection are a major factor in the quality of highways and structures. Technicians from both government and industry perform testing and inspection. To ensure that these technicians have the skills to perform testing and/or inspection on construction projects, training and examinations need to be provided. The training can be provided in a number of ways through classroom instruction, hands-on laboratory classes, and on-the-job training. Examinations for certification are given to make sure the individuals fully understand the area they are testing and/or inspecting.

One of the challenges of the Iowa Department of Transportation Technical Training and Certification Program is to ensure that all technicians who are performing testing and/or inspection on projects in Iowa are qualified. This involves holding over 200 classes annually with approximately 3,000 individuals participating.

The Iowa Department of Transportation is using a new approach to dealing with staff shortages by using Maintenance Equipment Operators to perform testing/inspection duties and construction and materials inspectors to perform maintenance duties in their off seasons respectively. This has brought a whole new set of challenges in the area of cross training at the Iowa Department of Transportation.

Key words: certification—construction inspection—cross training—materials testing—technical training

INTRODUCTION

A good training program is an important part to the success of any organization. Individuals that have been properly trained in the skills they will be using will not only be more competent at their jobs, but as important, will feel more comfortable performing their job duties.

Change in the structure of organizations is requiring that employees have multiple skills and flexibility. This is true for the Iowa Department of Transportation (Iowa DOT), contractors, and consultants that perform testing and inspection on Iowa's construction projects.

The Iowa DOT's Technical Training and Certification Program (TTCP), which is now over 30 years old, continually changes to meet the needs of the technicians working on Iowa's construction projects. The purpose of this paper is to describe the Iowa DOT TTCP. This will include problems faced in providing adequate training for technicians and how Iowa's TTCP is working to alleviate those problems. This paper discusses the history, progression, and future of technical training in Iowa. The paper also touches on Iowa's activities in regional and federal training efforts.

HISTORY OF IOWA'S TECHNICAL TRAINING PROGRAM

Technical training in the Iowa DOT originally was accomplished with on-the-job training. Testing and inspection procedures were passed down from technician to technician by working with an experienced technician for a period of time. There was a more "formal" training for some of the technicians, and then they were responsible to take what they had learned and pass it on to others in the field offices.

A certification program in aggregate was developed in the 1970s when quality control by aggregate producers was initiated. Training courses were held for Iowa DOT and producers' technicians. Exams were taken and certifications were issued to those who successfully passed the exam. Certification was required by both Iowa DOT and industry to perform aggregate inspection.

The Quality Control/Quality Assurance Program (QC/QA) expanded in the mid 1980s to include portland cement concrete (PCC) and hot mix asphalt (HMA) plant inspection and profilograph testing. The QC/QA program has continued to expand and training and certifications were added to the point we are at today. The Iowa DOT TTCP was formalized in 1995 to organize and standardize Iowa's technical training.

There was a change in the program due to changes at the federal level (Federal Register, Vol. 60, No. 125, June 29, 1995). The Federal Highway Administration (FHWA) started requiring qualified personnel in their Code of Federal Regulations (23 CFR Part 37), which states that after June 29, 2000, all sampling and testing data to be used in the acceptance decision or the Independent Assurance (IA) program shall be executed by qualified sampling and testing personnel.

Iowa already had their certification program in place, which was approved by the FHWA to meet the requirements of the Code of Federal Regulations. Iowa was ahead of many states that didn't have any formal training or qualification program in place. This did, however, put a demand on the TTCP to train and certify all individuals that would be performing acceptance testing. There were several project inspectors that had been trained to perform tests but had never been through the formal TTCP to receive certification.

CURRENT PROGRAM

The current Iowa TTCP is very different today from its inception in the 1970s. It has gone from having a few hundred technicians certified to 3,000, from a handful of classes to close to 300. The TTCP now instructs and certifies personnel from industry, counties, cities, and DOT in the areas of aggregate, PCC, HMA, nuclear gauge, profilograph, prestress, and soils. The current program has over 9,000 certifications issued.

Until three years ago the Iowa DOT arranged and instructed all of their technical training classes. The growth of the TTCP and the downsizing of departments required more classes with fewer instructors available. The Iowa DOT began working with Des Moines Area Community College (DMACC) to instruct many of the certification classes. This joint effort between the TTCP and DMACC has been successful. DMACC has a facility to house all the TTCP training, complete with a lab facility and computer training set-up. They also supply instructors for the courses using outside sources or hiring DOT employees in an adjunct or in-kind status. DMACC's involvement with the TTCP is with the training portion. The Iowa DOT exclusively handles the certification program.

TTCP classes run from October through June. Class sizes range from 8 in some of the laboratory classes to 25 in the lecture classes. All of the higher-level certification classes are held at the DMACC facility in Boone, Iowa. Most of the lower level certification classes are held in each of the Iowa DOT district materials facilities.

The classes consist of technicians and inspectors from the Iowa DOT, counties, cities, contractors, producers, and consultants, ranging from newly hired employees to engineers. The diversity of the group can be a struggle for instructors but can also be an advantage with more experienced individuals helping those that are new and by the sharing of experiences. Table 1 lists the certification classes that are available through the TTCP and brief course descriptions.

The TTCP also develops and administers training for informational purposes. These courses do not include exams or certifications but are to help technicians better understand skills they may be performing. Table 2 is a list of courses that are offered annually to improve technician skills.

The TTCP also sponsors specialty training that is offered as needed in a variety of areas such as bolt inspection, wood post inspection, instructor development, etc. One of the goals of the TTCP is to ensure technicians receive the information needed to perform their jobs properly, which requires a variety of courses since these technicians have a number of job duties.

The TTCP conducts recertification classes each year. Technicians must recertify every five years in each level of certification they hold. The recertification classes are normally a day in length including a recertification exam. The TTCP also has a decertification process for technicians, which allows the Iowa DOT to decertify individuals for a number of reasons including fraudulent practices and reports. The Iowa DOT has an Instructional Memorandum (I.M. 213) that covers certification, recertification, and decertification.

A registration and information booklet is published each fall by the TTCP. This booklet is distributed to all state offices, counties, cities, contractors, and consultants. (It is also available at Iowa DOT materials offices and appears on the Iowa DOT website at www.dot.state.ia.us/materials/training.htm.) The booklet contains information about the TTCP, course competencies, class schedules, and registration forms.

TABLE 1. Iowa DOT Certification Training

Certification	Length	Description
Level I Aggregate	0.5 days	Instructs the individual on proper sampling techniques used in sampling aggregates for testing.
Level II Aggregate	3.5 days	Instructs the individual on aggregate production and testing of aggregates.
Level I HMA	5 days	Covers the duties of the technician inspecting HMA plants and HMA materials testing.
Level II HMA	5 days	Instructs the individual on developing HMA mix designs and the testing and calculations used in the mix design process.
Level I PCC	2 days	Instructs the individual on performing tests on fresh concrete including air, slump, temperature, etc. The course covers developing maturity curves and maturity testing. Testing beams and cylinders and calculating yields is also included.
Level II PCC	4 days	Covers the duties of the technician inspecting PCC plants. The course also instructs the individual on calculating batch weights, cement yields, water/cement ratios, and adjusting batch weights for moisture loss or gain in aggregate.
Level III PCC	4 days	Instructs the individual on developing PCC mix designs and the testing and calculations used in the mix design process.
Profilograph	2 days	Instructs the individual on operating a profilograph, reducing profilograph traces, and the specifications for profilograph usage.
Prestress	3 days	Covers inspection procedures at a prestress/precast plant. This would include tensioning and detensioning, concrete placement, strength requirements, etc.
Nuclear Gauge	2 days	Instructs the individual on the proper use of a nuclear gauge and the safety requirements for handling and transporting gauges.
Grade Technician/Soils	2 days	Instructs the various tests used in soils inspection and information on the types of soils. Currently only instructed as a pilot on an as-needed basis.

TABLE 2. Iowa DOT Non-Certification Training

Course	Length	Description
Basic Materials	1 day	Gives the technician a brief background in all areas of materials inspection.
Basic Math	1 day	Covers basic math computations and the use of a calculator.
Practical Math	1 day	Covers math problems that the inspector will encounter on a project.
Superpave for Practicing Engineers and Technicians	1 day	Covers the decisions required to select materials, develop pavement designs, review mix designs, inspect construction techniques, and monitor the pavement's performance.
Monitor Administration	1 day	Instructs the administrative duties and problem spotting/solving of plant monitors.
Contract Administration	2 days	Covers the basic administration duties of the construction inspector.
Basic Plan Reading	1 day	Covers the basics of plan reading and working with general plans and does not go into specific types of plans.
HMA Paving Field Inspection	2 days	Instructs field inspection of HMA resurfacing/paving and covers equipment, mix placement, problems, solutions, and roles of the inspector and contractor.
PCC Paving Field Inspection	2 days	Instructs field inspection of PCC resurfacing/paving and covers equipment, mix placement, problems, solutions, and roles of the inspector and contractor.
Structure Field Inspection	2 days	Instructs field inspection of bridge and culvert construction and covers bridge and culvert components, their function, and design intent.
Grade Technician	2 days	Instructs preparation for grading, soil types, plan reading of soil sheets, soil behavior, drainage, and grading equipment.

FUTURE OF THE TTCP

The Iowa TTCP continues to grow with more areas of certification being required and more skills being taught. Many times employees are unsure of the skills they will need to perform job duties or what training is available to help obtain certain skills.

A new approach to training within the Iowa DOT is the formation of the Iowa DOT Highway Division Training Academy. The academy is being developed for Iowa DOT employees to assist them in understanding the skills needed for their jobs and the training necessary to obtain those skills. The Iowa DOT recently downsized their workforce and is utilizing employees to do a variety of skills rather than focus on one area. Examples include an equipment operator performing maintenance duties in the winter and materials testing or construction inspection in the summer or a construction technician doing a similar switch. This triggered the inception of the Training Academy to make sure everyone is aware of the competencies required in each area of work they perform and the training that is available to learn the skills needed.

The Iowa DOT Training Academy will consist of matrices for job classifications in materials, construction, and maintenance. This is a starting point for the academy but this could expand into other areas of the Iowa DOT as the academy progresses. These matrices will list all the skills an individual needs for the classification. Each matrix is broken down into basic, intermediate, and electives. The individual would have or need to take the basic training in the matrix when hired or shortly after. Intermediate training would take place within approximately the first year of employment. Finally, electives could be taken as the employee desires or as needed to perform special job duties.

Most newly hired individuals are brought into the Iowa DOT as equipment operators. They can promote into upper maintenance, construction, or materials classifications as job openings develop. Since these individuals are new to the Iowa DOT and are required to perform a variety of jobs, there will be a special basic training for this group. This training will be offered in three one-week segments. One segment will cover employee development, computer training, and safety and will be presented throughout the year at various times. Another segment will be on maintenance operations and will cover the skills of an equipment operator and will be offered in the fall before the employee starts winter maintenance duties. The third segment will cover construction inspection and materials testing and will be offered in the spring before summer construction operations begin and will cover the skills of the construction and materials technicians.

CHALLENGES OF EDUCATING THE TECHNICAL WORKFORCE

The Iowa TTCP and the Training Academy are focused on providing good educational opportunities for Iowa DOT employees, producers, contractors, consultants, and other agencies. This can be very challenging for both agency and industry. Fewer employees are performing more job duties in both the public and private sector. As individuals are hired they are many times put directly on a project without experience or proper training. To make a bad situation worse, because of the lack of workers, these new employees are sometimes left without anyone to oversee their work.

Another problem encountered, especially in the private sector, is the constant turnover of employees. Often a contractor sends a newly hired employee through training and makes sure they are certified to perform their job duties and the following construction season the individual doesn't return to the employer. As a result, the employer has to start over. This makes it difficult to maintain an experienced staff. It also increases the number of individuals that are in the training/certification classes each year, which requires the TTCP to provide more classes.

The TTCP is working to try to maintain a variety of training available to industry personnel. We are including more of a hands-on approach in our courses to give inexperienced technicians an opportunity to perform skills in the classroom with an instructor present. The TTCP is constantly updating and organizing to make the training and certification program more accessible through better communication with field offices and industry organizations. DMACC, by providing much of the TTCP training, has also taken a strain off Iowa DOT staff. The Training Academy will clarify and organize our in-house training program for Iowa DOT employees.

Community colleges and universities in Iowa are providing qualified technicians for the construction industry. One of these, DMACC, has a Civil Engineering Technician (CET) program that focuses on technicians for the highway industry. The CET program has worked with the TTCP to train and certify students in materials testing and construction inspection. This provides students a background when they first enter the highway construction industry. There are other organizations that provide technical training in Iowa. Some of the organizations that provide training include the Iowa Concrete Paving Association, Asphalt Paving Association of Iowa, and the Center for Transportation Research and Education.

OTHER TECHNICAL TRAINING EFFORTS

The Iowa TTCP is involved in regional and national efforts, which helps to strengthen Iowa's program and contributes to other states' programs. Iowa is a lead state in the Multi-Regional Training and Certification (M-TRAC) program. This regional group consists of 12 of the mid-western states and promotes education of technicians. They have worked toward reciprocity of technician certification between states, regional material development, uniform test procedures, and coordinator exchange of state information.

Iowa's TTCP coordinator represents the M-TRAC group on the Transportation Curriculum Coordination Council (TCCC). The TCCC is a federal group consisting of FHWA, Regional Technical Training and Certification groups, industry organizations, American Association of State Highway Transportation Officials subcommittees, National Highway Institute, and Transportation Research Board. This group was developed to coordinate regional groups and states material development to avoid duplicating efforts. The group has developed matrices in materials, construction, maintenance, safety, and employee development. The matrices show skills necessary for the levels of employees involved in highway construction and the training necessary to obtain these skills. The group is looking at the training gaps in the matrices and is working on material development to fill the gaps. The TCCC has already worked with groups on the development of materials in a number of subject areas including drilled shafts, driven piling, QC/QA and web-based instruction in design. The TCCC is developing a website that will assist states in finding materials they can use in their training program.

CONCLUSION

The Iowa Technical Training and Certification Program is a large educational program that assists in providing skilled technicians and inspectors for the Iowa DOT and industry. The TTCP faces numerous challenges with downsizing and the development of a diverse workforce. The TTCP is meeting the Federal Code of Regulations by providing qualified technicians to perform testing and inspection on Iowa's construction projects. The goal of the TTCP is to improve the quality on Iowa's construction projects by promoting the education and training of the technicians involved.