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INDOT Technical Training Plan

Bob McCullouch

Purdue University - Main Campus, bgm@purdue.edu

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JOINT TRANSPORTATION RESEARCH PROGRAM

INDIANA DEPARTMENT OF TRANSPORTATION
AND PURDUE UNIVERSITY



INDOT TECHNICAL TRAINING PLAN

Bob McCullouch
School of Civil Engineering
Purdue University
Corresponding Author

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CORRESPONDING AUTHOR

Bob McCullouch
School of Civil Engineering
Purdue University
(765) 494-0643
bgm@purdue.edu

JOINT TRANSPORTATION RESEARCH PROGRAM

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16. Abstract <p>The study provides the background documents necessary for the development of a Technical Training Plan and makes recommendations for the content and structure of such a plan for the District Operations, Operations, Capital Program Management, and Engineering Services and Design Support Divisions.</p> <p>The product of the study is a web-based tool for employees that provides training resource information by job category. The resources are grouped into three categories: in-house training, training available through outside vendors or third party, and higher education resources.</p> <p>Recommendations specific to the Technical Training Plan include incorporating technical training requirements in the position descriptions currently being revised; re-surveying employees and supervisors to ascertain employee training needs to ensure that the technical training requirements are appropriate; incorporating the list and schedule of INDOT training programs in the State Personnel Department's PeopleSoft system; establishing a readily accessible, centralized record management system for PEs to maintain their PDH records; and broader circulation of INDOT's Educational and Licensing Assistance Program (ELAP) to its employees.</p>			
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EXECUTIVE SUMMARY

INDOT TECHNICAL TRAINING PLAN

Introduction

A wide range of job classifications, increasing technical performance expectations, licensing and certification requirements, budget restrictions and frequent department reorganization has made technical training of employees more difficult, but increasingly more important.

This project reviewed the various elements necessary to the development of a technical training plan for INDOT employees. An employee web-tool, identifying training programs conducted by in-house and external providers and degree programs offered by post-secondary institutions is a primary product of the study.

Findings

- There are 151 distinct job titles in six professional/technical disciplines in the Operations, District Operations, Capital Program Management and Engineering Services and Design Support Divisions. Very few position descriptions for these job titles include technical training requirements stated as internal or external training or post-secondary courses needed for employment in the position and successful performance.
- A survey of 722 employees and 49 supervisors in the four divisions didn't show the expected congruence between responding supervisors and employees or among employees as to the identification of employee training needs.
- An analysis of 55 civil engineering-related job titles revealed that a PE license is required for only nine of these, covering 25 working titles, and the PE license requirement may be removed from some positions as descriptions are revised.
- Indiana's PE licensing statute requires 30 professional development hours (PDHs) every two years. Most PEs satisfy the PDH requirement by attendance at the annual Purdue University Road School, webinars, and the Civil Engineering Professional Development Seminar.
- The Employee Development Office training expenditures report for the first three quarters of FY 2011 listed 19 training programs among the 77 reported on the employee and supervisor surveys in response to the item "in-house technical training attended."
- Thorough internet research identified numerous external technical training program providers and relevant post-secondary degree and certification programs in the six professional/technical disciplines reviewed: 57 federal, state, professional and industry organizations, 22 additional third-party vendors and approximately 82 Indiana public and independent post-secondary degree, course and certification programs are listed in the study's various tables. Applicable

information was incorporated in the employee training information web tool.

- INDOT's Educational and Licensing Assistance Program (ELAP) grants reimbursement of the costs of post-secondary coursework up to \$1500 if the course contributes to the employee's performance of his/her INDOT duties and/or will prepare the employee for advancement within INDOT. During the 2½ year period for which requests were reviewed, 107 employees received approval of this assistance. Of the 91 specific requests reviewed during a two-year period, 64 were approved for courses other than in the six professional/technical disciplines of civil engineering, landscape architecture, land surveying, geology, accounting and real estate/appraisal.

Implementation

The INDOT Human Resources and Employee Development offices can use the study findings, its appendices and the deliverable employee web tool (<http://rebar.ecn.purdue.edu/techtraining>) to update and modify the Technical Training Resources, as needed. In doing so, attention should be given to the following recommendations for implementation:

- Technical training requirements expressed as internal and external training and post-secondary degrees, courses and certifications, should be incorporated in the position descriptions currently being revised;
- Employees and supervisors should be re-surveyed to identify employee training needs and ensure that the technical training requirements are appropriate to the position incumbents and their performance requirements;
- A readily accessible, centralized record management system should be established for PEs to maintain their PDH records;
- The list of approved courses/activities identified by Employee Development for PDHs should be expanded from the seven listed at its website;
- More centralized oversight of technical training is required with policies and procedures pertaining to scheduling, expenditures and trainer/vendor qualifications;
- The tables accompanying the study which identify the 57 organizations and third-party vendors providing technical training and the 82 Indiana post-secondary degree, course and certification programs should be updated, at least annually;
- Information about INDOT's Educational and Licensing Assistance Program (ELAP) should be more broadly circulated to employees.

The primary deliverable is the Employee Development Training Tool (<http://rebar.ecn.purdue.edu/techtraining>). It contains available training resources for INDOT employees and is designed for ED to modify content.

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1. INTRODUCTION

A predecessor JTRP study (1) examined INDOT training needs in a broader context than technical training; however, some of the recommendations for implementation included in the previous study are germane to the development of a Technical Training Plan:

1. Identify technical training needs that cannot be met through existing course offerings such as NHI
2. Review content of existing courses that are offered statewide, as well as by individual districts and divisions, in order to minimize duplication and to provide consistent, uniform and standardized training
3. Develop more effective training evaluation programs and use the feedback to improve the training deliverables. Develop and put in place an on-going training needs assessment program, as well as a method to submit, collect and review “best practices” from the districts (2).

The above comprise the major constituents of a Technical Training Plan for INDOT employees. The intent of the study was to capture this information from surveys of INDOT supervisors, managers and others responsible for conducting or coordinating technical training and incorporate it in an electronic format that would permit not only ready access to the data, but would allow manipulation of the data dependent upon the constituent variables: needs, course content and evaluation. The versatility of the electronic format was considered paramount to the development of technical training plans for individual employees, as well as groups of employees, sharing the same or similar job title or those within the same unit, division, office or facility.

The study researched the technical training programs of other state DOTs, the offerings of state public and private post-secondary institutions, training offered by federal, state and local industry organizations, as well as third-party vendors and INDOT. This information was intended to be incorporated within or, at least, accessible via the electronic “tool”. Though the scope of the study changed, the information gathered (and presented in the Appendices to this report) remains relevant to the development of a technical training plan for any employee group within INDOT.

NCHRP Report 685 (3) characterizes the state DOT “Workforce Challenges,” that have bearing on technical training, as follows:

- **Speed of technology.** Organizations are challenged with keeping up with technology and constantly updating information posted online to keep it current and attract more potential applicants. Specifically, finding individuals who know certain software or can operate a certain new piece of machinery is a challenge.
- **Changes in policy and technology.** Organizations feel pressure to comply with new environmentally friendly policies to maintain a positive reputation and comply with governmental initiatives. Some of these policies significantly influence the way many tasks are performed. Organizations may fail to adequately train these

individuals on the new technology, which prevents these individuals from effectively performing their jobs.

- **Cost of training.** Typically, organizations are faced with providing first-rate training on an extremely limited budget.
- **Difficulty providing sufficient quality training.** At times, there is not enough money in a budget to provide a training course that is in need. In addition, [organizations often struggle] to find the most effective trainer to lead these programs. As a result, some of the organizations have moved away from training consultants and have adopted a policy of using “in-house” employees to lead training.
- **Failure to apply training.** Getting employees to apply what they have learned from training in their day-to-day activities is a challenge. There is often a disconnect between what is emphasized in the training course and the reality of the work environment; it is difficult for staff to diagnose and redirect current work habits, and sometimes external trainers are too removed from the specific tasks and issues of the organization to make the training apply as well as it could.
- **Failure to update training.** The utility of specific training programs can be quickly depreciated by new functions and technologies. Employees who struggle to stay up-to-speed with new systems and technologies and who feel limited in relevant training opportunities may feel their options diminish within the organization and seek employment elsewhere.

The major deliverable of this study was intended to be an electronic “tool” that would allow INDOT to modify training and budget requirements based on information about employee training needs, training offered, external training opportunities and costs. In June 2011, the deliverable was changed by the Employee Development director to a website application for posting at the Employee Development website to allow employees to access information about internal and external training and education opportunities.

The same NCHRP Report 685 cites the website approach as an “Industry Strategy” for developing internal staff skills (4):

- **Use Technology to Support Training.** Organizations have purchased software that allows an employee to search available trainings, enroll, indicate completion and save the completed trainings to a list of all the trainings they have completed. Beyond adding structure and efficiency to the training process, these systems remind employees of the skills the organization has given to them, which helps increase their organizational commitment.

The technical training plan “tool” is restricted to technical knowledge, skills and abilities (KSAs) primarily in the disciplines and functional areas related to civil engineering, geology, landscape architecture, surveying, accounting and real estate/appraising. The “tool” was not intended to address or include “soft skills” such as leadership and communications or information technology (IT).

Most state DOTs have established employee-accessible, web-based “tools” of the type contemplated here,

in part because appointment to a position and promotion to another position is predicated on the achievement of certain learning objectives, taking and passing proficiency exams and earning specified certifications. Very few of the INDOT position descriptions reviewed for this study include these performance parameters. Without training or course completion requirements, INDOT employees will benefit from a web-based tool primarily to identify courses and training programs for self-improvement or to satisfy an interest in a job-related certification or to respond to a recommendation of their supervisor; otherwise, the knowledge, skills and abilities (KSAs) specified in most position descriptions provide the only inference of the training and courses the employee should have for appointment and/or promotion. One of the exceptions is the Highway Technician 1 position description, in some districts, which requires completion of modules 1, 2 and 3 of the Highway Technician Program [Academy] or equivalent and experience as a Highway Technician 2 for three years. The training requirement for the Assistant Bridge Inspection Engineer is stated: “Upon hire, must take and pass the FHWA 10-day ‘Safety Inspection of In-Service Bridges’ course.”

2. PROBLEM STATEMENT

Technical training at INDOT has many different challenges. A wide range of job classifications, increasing responsibilities, licensing and certification requirements, fewer people, tighter budgets and increasing workloads have made technical training of employees more important and at the same time increasingly more difficult.

The principal component of a technical training plan—a comprehensive directory of training programs, courses, classes offered—had not been compiled by INDOT. The listing of courses at the State Personnel Department website was devoid of technical training offerings. Employee training needs had not been assessed and no link had been established between the technical training requirements for initial hiring or promotion to a classification and the training applicants had received. INDOT lacked an information base from which to develop a technical training plan—this study was intended to fulfill that need.

In his 2005 draft report, Warne details the results of his telephone interviews of 26 state DOT training directors (5). Many of the responses mirror the current situation in INDOT (which was not included in the telephone survey):

- An increasing demand is placed on employees to meet higher customer expectations, but DOTs face difficulties in breaking employees away from their job responsibilities to participate in training;
- Most training directors do not have complete authority or oversight for the training programs in their agencies; some may have responsibility for general training, but technical training is organized and conducted by the various technical divisions and offices;

- There is no accurate cost-benefit analysis of training and its contribution to the overall mission of the DOT;
- There is little distinction made between professional and technical employees and the qualifications (licenses, certifications, BS degrees) are less prominent, resulting in a lack of differentiation of in-service training needs;
- Project management training is emphasized, but other management skills including financial management, administration, consultant management, public/stakeholder relations, Information Technology, etc., also need to be emphasized.

NCHRP Synthesis Report 362 summarizes the “Challenges” to a state DOT training program as “keeping up with technology (including transferring to a statewide learning management system) and making sound technology investments...[and] linking the training function more closely to the agency strategic plan (6).

3. OBJECTIVES OR PURPOSE

The study, as proposed, included many activities that were relevant to the revised objective: to provide information on the Employee Development website about internal and external training and education opportunities available to INDOT employees.

Activity 1

For the Highway Management, District Operations, and Operations Divisions; develop an inventory of job titles with a description of required technical skills and necessary certifications or licensing requirements. This inventory activity will be coordinated with any existing or completed Department inventory efforts. Technical skills, for this project, do not include soft skills, for example management or leadership skills. INDOT Employee Development will produce a list of job titles with licensing and certification requirements and determine the number of employees in each job title. This information will be verified by INDOT managers and supervisors for each job grouping. A questionnaire will be developed for these supervisors to verify the technical requirements and to rank them in importance, in order to establish a priority ranking. Corresponding interviews may be required to properly identify these priorities. Establish a training committee comprised of knowledgeable individuals from affected organizational areas to work with the researchers in identifying and prioritizing INDOT technical training needs.

Activity 2

With the information collected in activity 1, the research team will develop a matrix of job titles by organizational areas (e.g. functional, division, section, etc.) and their required technical skills in a priority ranking from most important to least.

Activity 3

With the recently approved continuing education requirement for Professional Engineers in Indiana, this project will identify technical training needs and opportunities for INDOT engineers to satisfy the continuing education licensing requirement. This information can further be used to develop INDOT specific training that meets INDOT operational needs at a minimum cost to the Agency, while at the same time satisfying the continuing education licensing requirement.

Activity 4

A meeting will be held with the training committee, comprised of INDOT mid-level managers, to discuss the matrix and then distributed for their review and approval.

Activity 5

Collect current technical training & technical training budget information available through the HR office, divisions, and in each District. The objective is to determine what training is being done throughout the agency, including the cost, frequency and format of the training.

Activity 6

Poll other state DOTs and collect information on their training programs and training resources available to INDOT. Develop an inventory of available technical training resources from internal (INDOT) and external sources. Sources of internal courses include those developed for the HT Academy and others developed and delivered by Employee Development, Districts and the Research & Development Division. JTRP has developed some online courses as well. Search for external sources (NHI, etc.) relevant training that could be used to meet those needs identified in activity 1. For each training resource (internal or external) provide a description, student cost, time requirements, and the level of effort needed to convert for INDOT's use.

Activity 7

Match the inventory of available resources (internal and external) with the needs described in the training matrix and identify the gaps. Develop a list of these training voids. For each one of these deficit training needs, determine the estimated cost, time to develop and recommended source.

Activity 8

Assemble a technical training plan that consists of the following:

- By job title: list the required technical training needs, time requirements, and estimated training costs.
- Develop a list of jobs with certification and licensing requirements and estimated costs to satisfy their annual educational requirements.
- Develop a web tool that INDOT employees access to various training resources. The tool is designed for ED to update the content and keep it current.
- Rank the technical training needs by job title, including associated costs.
- Develop an ongoing process for identifying technical training needs and training opportunities for INDOT engineers to fulfill and exceed the continuing education licensing requirements for Indiana Professional Engineers.
- Recommend a framework and process for INDOT to identify and support the technical training needs of the department.

Activity 9

Hold a closeout meeting with the training committee, present findings including recommended technical training needs, technical training plan, demonstrate the tool and perform a review and testing period by HR employees.

Activity 10

Revise the technical training plan and decision tool and release to INDOT which will be an end product of the project along with the strategic technical training plan.

4. ANALYSIS OF DATA AND CONCLUSIONS

The results of the research for each Objective described in the previous section is detailed below with emphasis on the application of the findings to the project deliverable—now, the employee web-based information tool. Information and data from the research are included in tables in the Appendices to the study report and can be used, later, in developing a Technical Training Plan. The numbered activities, here, correspond to the numbered activities in the previous section.

Activity 1

The Capital Program Management division was included with the Operations, Engineering Services and Design Support (formerly Highway Management) and District Operations divisions, to compile the inventory of job titles.

Inventory of Job Titles

The inventory of 151 distinct job titles in the six professional/technical disciplines or functional areas listed below was prepared from the organization charts of the four divisions and modified at various times from

December 2010 through March 2011 as the charts posted on the INDOT intranet changed.

Of the 151 distinct job titles, the researchers were provided 72 position descriptions by the Employee Development staff that were relevant to the six functional areas in those four divisions. The required technical skills were derived from an analysis of the qualifications and knowledge, skills and abilities (Q KSA) statements in each position description. The 72 position descriptions represented the six functional areas, as follows:

1. Civil Engineering-related (55)
2. Land Surveying (12)
3. Landscape Architecture (1)
4. Geology (1)
5. Real Estate (1)
6. Accounting (2)

The Q KSA Matrix for each discipline or functional area is found in Appendix A. Difficulty was encountered in compiling the inventory of job titles and matching them with position descriptions because, during the period of the study, job titles changed to “true working titles of positions versus the state classification title” (Kimberly Pearson, unpublished data). Also, during the study, position descriptions were being revised from “qualifications” (e.g., education requirements) to “preferred experience,” “to allow for flexibility in candidate selection” (Kimberly Pearson, unpublished data).

Supervisor Survey and Employee Survey

The study proposal intended a survey of supervisors in the four divisions to identify and prioritize the technical training needs of the employees in designated job titles in their organizational unit and the name and dates of “in-house” technical training that they believe helped to meet those needs. [See Appendix B] In March, 2011, the researchers were directed by the Employee Development director to replicate the same survey for employees in the four divisions. [See Appendix C] The survey questionnaires were constructed and e-mailed to 49 supervisors (12 responded: 24.5%) and 722 employees (150 responded: 20.8%).

The synthesis of the data from the two surveys is compiled in the following Appendices:

- **Appendix D:** Supervisor Survey Results—Training Needs, by Job Title [Needs are listed in rank order]
- **Appendix E:** Employee Survey Results—Training Needs, by Job Title [Needs are listed in rank order]
- **Appendix F:** Supervisor Survey Results—In-House Training Programs Attended, by Job Title
- **Appendix G:** Employee Survey Results—In-House Training Programs Attended, by Job Title
- **Appendices H and I:** Alternate versions of Appendix F and G group all job titles attending the *same* training program and are found in Appendices H and I.

Follow-up telephone interviews were conducted, and e-mail correspondence was exchanged, with some of the

supervisors to clarify their responses and discuss related topics.

A Technical Services Training Plan (spreadsheet of training needs) for INDOT Districts was prepared by Jim Poturalski, Technical Services Director, Greenfield District. It was shared with his colleagues in other districts and a few additions were made. The training programs on his list and the additions are described below:

- **State Construction Training**—provided by construction personnel to District staff
- **Maintenance Conference**—an annual conference that was held with INDOT staff and industry representatives who presented information on maintenance techniques, equipment, specialized materials, etc.
- **Traffic Conference**—same comments as maintenance conference above
- **HMA Conference**—regularly held conference on asphalt, typically organized by industry organizations
- **WMS Workplan Training**—training provided by central office staff to district personnel who develop and implement work management system (WMS) work plans—there are some districts that do this within their district—other districts don’t have this resource
- **WMS Training**—same as above, but is more related to getting reports out of the WMS system to utilize in managing work efforts and resource usage—Greenfield District recently hired an individual who worked extensively in the WMS system and will develop this training and support within the district—other districts will likely need some continued central office support
- **QUEWZ Traffic Control Training**—training on this queuing analysis program for work zones is typically provided by central office staff to district staff utilizing the software that is used in support of analyzing work zone set ups on interstate projects where lane closures are being considered
- **Project Scheduling Training**—a general training need for which some external training source needs to be identified—this item probably needs a broader review and survey of needs from many different parts of the agency
- **Project Management Training**—training similar to that provided by the Project Management Division that was administered over the past few years—the agency is moving much more toward a project management based expertise level and this type of training can be customized for the various departments
- **PTOE Training**—this is training specific to traffic engineering staff who will be interested in or required to pursue the Professional Traffic Operations Engineering (PTOE) certification that is administered through the Institute of Transportation Engineers (ITE) technical organization
- **Ancillary Structures Training**—this was placed on the list to determine if training might exist for a small number of staff to better understand the structural engineering aspects of sign and lighting structures—training could be provided by the National Highway Institute (NHI), industry or central office structures staff
- **Field Investigation Training**—training needs to support field investigators in conducting various traffic studies (speed studies, ball bank indicator studies, crash analyses, traffic counts, etc.)—this could be provided by NHI, other technical organizations or in-house training with existing subject matter experts

- **Highway Project Funding**—internal training needed to educate a variety of staff with understanding of INDOT’s funding sources—central office Finance department provided a Funding 101 session to district leadership; similar sessions could be done several levels down in the organization to educate/inform other staff
- **Project Cost Estimating**—probably internally developed training to better estimate costs of various projects from the early scoping stages—in Technical Services, there are Systems Assessment Managers who oversee project selection recommendations which include establishing budget targets for projects that have not yet begun the design phase, so this level of cost estimating is different than what might be required for the designer-level cost estimating

Other Technical Services Training Plan needs submitted by district Technical Services directors include:

- **Synchro**—traffic signal optimization software used by INDOT
- **Hydrology/Hydraulics**—analysis of drainage areas to determine the location for small culverts
- **Design Manual**—for project development (scoping, environmental, permits, etc.)
- Level 1, 2 & 3 Categorical Exclusions Manual Training

Athar Khan, Manager, Office of Geotechnical Engineering, recommended the following geotechnical engineering and construction-related topics because there are many change orders caused by varying soils conditions:

- Geotechnical aspects of pavement design
- Foundation design based on LRFD
- Construction issues with soil modification
- QA/QC for soils work

Activity 2

The matrix of job titles by six functional areas for the four divisions and the required technical skills derived from the Q KSA analysis are found in Appendix A.

Activity 3

The technical training needs of INDOT positions requiring a Professional Engineer license are included in Appendix D and E. The Civil Engineering-related Q KSA Matrix [in Appendix A] includes 55 job titles and a PE license is required for nine of these, covering 25 working titles: Bridge Inspection Manager, District Construction Director, Construction Engineer 3, Highway Engineer 1, Highway Engineer 2, Highway Engineer 3, Highway Engineer Supervisor 3, Highway Engineer Supervisor 4 and Real Estate and Right-of-Way Manager. The researchers have been informed on two occasions that the PE license requirement will be removed as a requirement for some positions; therefore, the state continuing education requirement may not be relevant to as many INDOT employees in the future.

Currently, Indiana’s biennial continuing education requirement of 30 professional development hours (PDHs), can be satisfied by attendance at the annual

Purdue University Road School and Civil Engineering Professional Development Seminar.

Additionally, the INDOT Employee Development website lists five other “INDOT Approved Courses” for which PDHs are offered:

1. Mid-Management Training (30 PDH)
2. Work Zone Traffic Control Training for Designers (4 PDH)
3. INDOT Project Supervisor Engineering Training Workshop [aka Project Engineers/Supervisors Workshop] (12 PDH)
4. Bentley Institute Training [online] (0.5 PDH)
5. LPA Training (5.5 PDH)

Professional Engineers also participate in webinars and attend conferences and seminars sponsored by professional and industry associations for which PDHs are awarded. These organizations and the links to their websites are included in Appendix K.

Activity 4

The first meeting of the Technical Training Advisory Committee was held January 4, 2011. The SPR-3550 proposal and review of the study Progress Report consumed most of the one-hour meeting.

Activity 5

The Employee Development director stated that her office approves all training, except safety training, within INDOT, for which an expenditure of department funds is required. A review of the Employee Development training expenditures report for the first three quarters of FY 2011 revealed 19 training programs among the 77 reported (24 percent) on the Supervisor and Employee surveys in response to the item “in-house technical training attended”. The training program having the largest number of employees participating (282 estimated) was the Civil Engineering Professional Development Seminar conducted by and at Purdue University. [See Appendix J]

Activity 6

Poll Other State DOTs

On January 21, 2011, Barry Partridge, Project Advisor to the study, posted a request on the AASHTO RAC site for information on technical training programs in other states’ DOTs.

Replies were received from: West Virginia, Iowa, Michigan, Florida, Oregon, Georgia, Kentucky, Maine, California, Mississippi, New Jersey and Missouri. Information particularly relevant to the study summarized below is cited in the footnotes, with links to some of the state DOT websites.

One of the better DOT “tools” surveyed is Oregon’s. Its Field Staff Curriculum Guide includes a Technical Training Catalog, which offers a broad selection of

internal and external courses, workshops and programs (7).¹

Washington State DOT employs an Online Guide for its nationally recognized Project Management Training Program (8). Texas has a Training Calendar that includes courses delivered by classroom instructors as well as external organizations, such as the National Highway Institute (NHI). Each course listing includes a description, learning objectives, course duration, CEUs offered, costs (if any) and contact information (9). In some states (e.g., Connecticut, Mississippi) the department relies on courses provided by external organizations, like NHI (David Maher, unpublished data).

Missouri DOT uses the Pathlore Learning Management Suite to manage its training courses (www.pathlore.com), but course content, the curricula, class schedules, employee rosters, etc., are entered by MoDOT in the Pathlore system (Ashley Woods, unpublished data).

Some states, like West Virginia, offer online technician training and certification programs—often granting associate degree credit—but are contemplating contracting with a vendor [Vista College Online (www.vistacollege.edu/online)] to offer online courses for all classifications of employees (Pamela Lawson, unpublished data).

The Iowa DOT Employee Training Academy “includes matrices for classifications in construction, maintenance and materials, [which lists] required training and training [to be] taken as needed, [including] courses required to obtain the skills necessary for the classification.”(10) Training for the Engineering Technician Senior position includes the following categories of courses required within the first year of employment: General Duties, Computer Skills, Safety Requirements, Equipment Duties, Materials Sampling and Testing Duties, Construction Administration.

The Michigan DOT was instrumental in the organization of the Michigan Construction Quality Partnership (CQP) program, involving contractor, government and consultant associations, to offer training in three areas: corporate/executive management, technical for project engineering/management and “hands-on” for labor/inspection employees (Mark Chaput, unpublished data).

Michigan CQP contracted with RedVector.com, a provider of e-learning content development and training management for the engineering, design and construction industry, to assist the creation of a partnership-owned training database and web portal.

The CQP earned the gold award in 2010 from the National Partnership for Highway Quality in the workforce training category.

Inventory of Internal and External Technical Training Resources

This task consumed many hours of internet research and follow-up telephone and e-mail communication with technical training resource organizations.

Included in this study are three tables which provide the name of the organization, its website link, a description of (or referral to the website for) the training program, cost and time (duration and/or schedule) requirements and other information that could be obtained for programs delivered in any media. The information in the tables is current through May 2011 and will need to be updated periodically as programs and organizations change. The three tables are:

1. **Appendix K: Inventory of Courses Related to INDOT Professional/Technical Positions Provided by Federal, State, Professional, and Industry Organizations.** The spreadsheet includes 57 organizations and their websites as well as the number, cost and schedule information of training offerings, including Instructor-led, Web-conference, Web-based (online), CDs, DVDs, Audio/VHS/Book and Certification Programs (online). Indiana sections and chapters of national and regional professional and industry organizations are listed. The updating of this spreadsheet should include a periodic review of the organizations listed, as others may have inadvertently been overlooked and some listed may cease offering training programs.
2. **Appendix L: Inventory of Courses Related to INDOT Professional/Technical Disciplines Provided by Third-Party Vendors.** The spreadsheet includes 22 organizations and their websites as well as the discipline, cost and notes about the same categories of training offerings as in the previously described spreadsheet. The “disciplines”, here, are the six referenced earlier, plus Photogrammetry-related and Engineering-related. This spreadsheet was compiled from an Internet search using criteria imposed by the researchers because there are dozens of organizations purporting to provide training in these disciplines that are unknown for-profit organizations or entities located in foreign countries. The organizations included are the more reputable web-based training organizations, better known proprietary institutions (online and/or having an Indiana campus), and consulting firms. Any update of this spreadsheet should consider revisions based on a review of the actual content at the websites of the organizations included.
3. **Appendix M: Inventory of Courses/Programs at Indiana Higher Education Institutions (Public and Independent, but Not Proprietary) for Accounting, Civil Engineering, Geology, Land Surveying Landscape Architecture, and Real Estate.** The spreadsheets include web-researched information for courses/programs at 32 public and independent (but not proprietary) institutions in Indiana in the six disciplines.

¹The 170-page PDF document at ODOT’s intranet (http://transnet.oregon.gov/ODOTINTRA/HWY/TECHSERV/training_catalog.shtml) can be obtained from Lorrie L. Schaefer, Sr. Training Consultant, Oregon Department of Transportation (lorrie.l.schaefer@odot.state.or.us).

The updating of these spreadsheets will not be the simple task of accessing the institution's website, finding the link to the department or degree offered and viewing the information. Much of the information could only be obtained through follow-up communication with the institutions and finally, by direct communication with officials of the Indiana Commission on Higher Education and the Independent Colleges of Indiana, Inc. For each discipline, information is provided about the degree offered, if related online and off-campus courses are provided as well as related certificate programs.

Appendix F and G (previously cited and alternate formats, Appendix H and I) provide the list of training programs attended, cited by supervisors and employees in response to the April/May 2011 surveys.

There are 77 distinct training programs cited in the Supervisor and Employee surveys, combined, for employees in 46 distinct job titles. Training programs include those offered "in-house" by INDOT personnel, others delivered by outside providers (at an INDOT facility or worksite) and some online programs provided by federal agencies, INDOT vendors and Purdue University JTRP.

Most of the training programs were cited in both surveys by one or two job titles; however, the Bentley InRoads (design software) training was cited by 16 different job titles. Fifteen of the programs cited in both surveys, combined, were related to bridge modeling, design, inspection, retrofit, rehabilitation and replacement.

Appendix N provides a description of INDOT technical training programs, some of which are included in the aforementioned Appendices. An alpha-order list of internal training programs compiled from the survey responses is included in this Appendix. This list should be verified, updated and maintained by INDOT personnel.

Appendix O provides details of the INDOT Educational Assistance and Training request approvals ["Do Not Buy" forms] for the period July 1, 2008 to December 28, 2010.

INDOT's educational assistance policy is to grant reimbursement of the costs of post-secondary coursework up to \$1500 per employee per year, if the course contributes to the employee's performance of his/her INDOT duties and/or will prepare the employee for advancement within INDOT. During the 2½ year period for which requests were reviewed, 107 employees had received approval of this assistance. During the first two years of the 2½ year period, 91 requests were approved and, from a review of the "Do Not Buy" request forms, the courses approved appeared to be related to the following disciplines (number of courses in parentheses):

- Civil Engineering (13)
- Landscape Architecture (0)
- Land Surveying (4)
- Geology (2)
- Accounting (8)
- Real Estate/Appraisal (0)

- Other (64, including 9 for Information Technology courses)

During the 2½ year period, 196 employee requests were approved to attend conferences and workshops and 721 employee requests were approved to attend training. Both categories—conferences/workshops and training—includes a majority of non-technical versus technical subjects.

Appendix P provides INDOT Technical Training Program Information, including the department organizational unit name, type of training delivery, training provider, frequency of the training and provider contact information.

Activity 7

The inventory of available technical training resources is presented in various Appendices previously cited. The technical training needs, as identified via the supervisor and employee surveys, are detailed, by job title, in Appendix D and E and are listed below in order of the number of responses that appeared to fit the general subject area (fewer than four responses not included):

- (42) **Bridges**—inspection, maintenance, construction, repairs, design/build, rehabilitation, replacement, fracture mechanics and fatigue, Inspect Tech. Bridge Insp. Database, NBIS Bridge Insp. Course, structural LRFD training, seismic design, steel bridge design, small structure design and inspection, scour and stream stability analysis at bridges, countermeasures for bridge scour, bridge scour design, scour critical structures
- (17) **Pavement**—design, preservation, specifications, PCCP Pavement Construction, asphalt, HMA Pavement Construction
- (16) **GIS**—ArcGIS software, GPS, GNSS Networks, ERDAS
- (16) **Surveying**—math, principles, equipment usage, road-way surveying, data collection and processing, survey software
- (15) **Erosion and Sediment Control**—principles, practices, procedures, highway BMPs, highway stormwater design, storm sewer design, stormwater management systems, urban drainage design
- (11) **Traffic Control**—flow analysis, worksite traffic control
- (9) **Traffic Signals**—trouble-shooting, control devices, interconnection
- (8) **Plan Reading**—bridge and road plan reading
- (7) **IMSA**—Level 1, Level 2, Level 3, Workzone
- (6) InRoads (software)
- (6) **Manuals (knowledge of)**—Highway Capacity, Highway Safety, Outdoor Advertising Control, Permit, FHWA Bridge Inspection, INDOT Bridge Inspection
- (5) **Concrete**—and admixtures, mix designs, paving, testing
- (5) **Environmental**—permitting, policy, processes
- (5) **Intersection**—sight distance, design, clear zone
- (5) Utility Coordinator Training
- (5) **Work Zone Safety**—highway traffic analysis, traffic control
- (4) Microstation (software)
- (4) **Roundabout**—design, issues, review
- (4) **Signals**—design, and intersections

The redirection of the study in June, 2011 from producing a “management tool” to creating an employee web-based information tool makes the identification of training voids an individualized employee exercise, because of the lack of specific performance-related training requirements in the position descriptions.

Activities 8, 9 and 10

The Technical Training Plan, as revised, was designed as the Employee Development Training Resources web tool. The web tool was reviewed with Employee Development staff on three occasions and modified each time based on these reviews. The final product description is included in Recommendation 8 on page 9 of this report.

5. RECOMMENDATIONS FOR IMPLEMENTATION

Recommendation 1

The INDOT Technical Training Plan should, ultimately, match job titles/position descriptions with technical training requirements expressed as internal and external training programs and courses needed by the employee to be qualified for appointment to the position and to meet the performance expectations of that position. The Iowa DOT Training Academy would serve as an excellent model.

This activity would be a natural follow-up to the tasks currently being conducted to revise position descriptions and their Q KSAs and changing job titles from the state classification title to the working title.

Recommendation 2

A survey response rate of 25 percent (Supervisors) and 21 percent (Employees) is less than preferred; however, the responses were representative of most job titles and organization units included in the survey and, therefore, the employee responses stating training needs and training attended are considered representative of the four divisions.

The employee survey should be repeated after the changes have been made to the job titles and position descriptions. The results of such a survey would be useful in structuring the match with the technical training requirements referenced above.

Recommendation 3

A few of the survey responses to training needs and training programs attended were supplemented by e-mail correspondence that underscored the issues of training frequency and relevancy:

- “I completed the survey, but the courses I listed were taken about 10 years ago. Things have changed since then and the courses have been updated. Due to change

over time, I believe that I and others should have to take the courses once every five years.”

- “Training given to the AEs should also be given to the PE/PS—to better solve problems on the project. My reason is that any training [AE’s] get to solve problems on the project would be just as effective if not more at the PE/PS level.”
- “...the problem with the training [named] is that it deals with countrywide subjects, it does not focus on the State of Indiana and our specifications and equipment. It would really benefit the State and the technicians if a ‘tech program’ could be created that would allow them [to] focus on what Indiana has and not what California has.”

Comments like these will attend any training program survey, but these are relevant to both the administration of the technical training program and the creation and intended use of the employee web tool.

To the first comment about the courses attended ten years ago (these are highly technical courses and the employee is a PE), one might ask how employees get information about the availability and schedule of training and if they voluntarily sign-up or are assigned to attend and if there is a record somewhere of this person’s training. Also, are certain training programs that are critical to an employee’s function and performance scheduled more frequently than those that are not?

To the second comment about AE and PE/PS training (the employee is an AE), one could ask INDOT managers if this is a useful suggestion and also, if such suggestions concerning relevancy are solicited from training program participants.

To the third comment (from a supervisor of technicians), one should ask why a training program for technicians would be offered that does not focus on INDOT’s specifications and equipment.

Recommendation 4

The Employee Development Plan (aka Individual Development Plan) can be developed and maintained through the State Personnel Department PeopleSoft system. The Enterprise Learning System within PeopleSoft provides a schedule of training programs that employees can access to register; however, a recent review of the 604 titles listed revealed only five that appeared to relate to INDOT technical training topics (course codes 03, 72, 73, 74, 94).

Duplication of employee records should be avoided and computer systems certainly streamline information acquisition and distribution; however, the employee web tool could complement and supplement the PeopleSoft—Enterprise Learning systems by including a list and description of available INDOT training programs, the job titles for which the training is relevant (when job titles are finalized) and the contact information of the training program coordinator. Supervisors and managers need to have access to, and frequently review, employee training records, in whatever format, and the INDOT system might be more readily accessed than the State Personnel Department system.

Recommendation 5

A readily accessible, comprehensive training record management system is essential for PEs to maintain their PDH records.

While these records can be maintained on the TRB, ASCE and other continuing education provider organization websites, the PE and his/her supervisor/manager and the INDOT Human Resources Office need to know if the accumulation of PDHs is “on-schedule,” vis-à-vis, the biennial requirement or is deficient and needs to be corrected by attendance at one or more training programs/courses. Locating all PDH records in one system should facilitate access and management.

Recommendation 6

Interviews or surveys of supervisors/managers throughout INDOT should be conducted to ascertain what technical training programs in their organization unit are conducted, the schedule for such training, the employees (by job title and unit) expected to attend, the identity of the training provider (INDOT unit/staff or vendor), the cost of the training and the account(s) to which the cost is charged.

The assumption of the researchers is that most of the “in-house” Instructor-led and Web-based technical training is *not* charged to training or management accounts for the expenditure of department funds; that training costs are assumed as personnel (salary or related) costs. Some web-based training (e.g., TRB) is free to DOT members and INDOT can pay a site fee for ASCE, NHI and other courses, or an organization fee for courses offered on the Purdue JTRP website.

There is a need for—if not central coordination of technical training—at least awareness of such training being conducted for INDOT employees. The Employee Development training expenditures report for the first three quarters of FY 2011 recorded cost information for 19 of 77 technical training programs reported in the Supervisor and Employee surveys. Allowing that some cost data would have appeared in the 4th quarter report and that some costs that have been regularly reported previously were not, for whatever reasons, it is apparent that the expenditures report should not be relied on for monitoring technical training programs.

Recommendation 7

During a two-year period (July 1, 2008 through June 30, 2010), INDOT’s Educational and Licensing Assistance Program (ELAP) granted reimbursement of post-secondary coursework expenses to 91 employees; 27 of these reimbursements were for courses in the six disciplines or functional areas featured in this study.

Among the 16 post-secondary institutions in which the 91 employees were enrolled for coursework, 24 were enrolled at IVY Tech campuses, 20 at Indiana Wesleyan (Indianapolis) and 12 at IUPUI-Indianapolis; the other 13 each enrolled four or fewer employees.

Post-secondary coursework is an integral component of any organization’s technical training plan, especially one with a large number of professional and technical employees. And, given the current nationwide focus on workforce development and the role of community and technical colleges, any employee, regardless of his/her job duties, is assumed to be an eligible candidate for such an undertaking.

INDOT employees and the department would both benefit from a broader circulation and application of its ELAP policy.

Recommendation 8

The training information described above and shown in the Appendices was condensed into a web tool which is the implementation product from this project. The Employee Development Training Resources web tool (<http://rebar.ecn.purdue.edu/techtraining>) contains information on available training resources for INDOT employees. The training resources are grouped into internal training, external training, and higher education training. There is a link to the Do Not Buy form where employees can request training classes. The site also features an Admin area that will be described.

Figure 5.1 shows the Home page. Users can select a job category from the tab menu bar. Currently there are seven categories: Accounting, Civil Engineering, Geology, Maintenance, Landscape Architecture, Real Estate, and Surveying. Selecting one of these categories will open a page that provides information on available training including in-house training opportunities, external vendors and Higher Education options. Training information for these three areas are shown in table format. For the civil engineering category, internal training resources are grouped into civil engineering areas.

Figure 5.2 is the civil engineering category. At the page bottom there is a link named Request Classes which accesses the Do Not Buy form. Training resource information is presented in a pop-up table format. A table record describes the training class or course with a link provided to obtain more specific information. The inventory of available training resources has been reviewed and verified by INDOT managers and supervisors for each job category.

Figure 5.3 is an image of an external vendor table. The site Admin area allows Employee Development staff to modify and update each of the training resource tables through a database type interface. The Admin home page contains links to these database tables.

Figure 5.4 is an example of how individual training records can be edited or deleted from the tables. This web tool was designed to give employees information on available training through a simple interface and



Figure 5.1 Web tool home page.



Figure 5.2 Civil engineering category page.

Organization	WEB LINK	Instructor Led	Webinars	Web Based	Certification Programs
ABC - Associated Builders & Contractors	www.abc.org				
ABC - IN Chapter - Associated Builders & Contractors - Indiana Chapter	www.abc-indy.org	✓			✓
ACEC - American Council of Engineering Companies	www.acec.org	✓	✓		
ACEC Indiana - American Council of Engineering Companies Indiana	www.acecindiana.org				✓
ACI - American Concrete Institute	www.concrete.org	✓	✓	✓	✓
ACPA - American Concrete Pavement Association	www.pavement.com		✓	✓	
AEMA - Asphalt Emulsion Manufacturers Association	www.aema.org	✓			
AGC of America - Associated General Contractors of America	www.agc.org	✓		✓	
AGC of America - Associated General Contractors of America	www.agc.org	✓		✓	
APAI - Asphalt Pavement Association of Indiana	www.asphaltindiana.org		✓		
APWA - American Public Works Association	www.apwa.net		✓	✓	

Figure 5.3 Pop-up table example.

Actions	Category	PROGRAM	DELIVERY_TYPE	PROVIDER	FREQUENCY	Name	Email	Phone	WebLink Name	WebLink
Save	TRAFFIC	IMSA Level 1	Classroom	International Municipal	Yearly	Phil Tolbert	ptolbert@indot.in.gov		IMSA	http://www.imsasafety.c
Cancel										
Edit	TRAFFIC	IMSA Level 2	Classroom	International Municipal Signal Association	Yearly	Phil Tolbert	ptolbert@indot.in.gov		IMSA	http://www.imsasafety.org/
Delete										
Edit	TRAFFIC	IMSA Level 3	Classroom	International Municipal Signal Association	Yearly	Phil Tolbert	ptolbert@indot.in.gov		IMSA	http://www.imsasafety.org/
Delete										
Edit	TRAFFIC	IMSA Workzone	Classroom	International Municipal Signal Association	Yearly	Phil Tolbert	ptolbert@indot.in.gov		IMSA	http://www.imsasafety.org/
Delete										

Figure 5.4 Admin page.

give INDOT Employee Development the ability to keep the information up-to-date. This is the project Implementation product for INDOT.

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**APPENDIX A: Q KSA MATRICES—
ACCOUNTING, CIVIL ENGINEERING,
GEOLOGY, LAND SURVEYING, LANDSCAPE
ARCHITECTURE, REAL ESTATE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=13&article=2971&context=jtrp&type=additional>

**APPENDIX B: SUPERVISORS SURVEY
QUESTIONNAIRE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=14&article=2971&context=jtrp&type=additional>

**APPENDIX C: EMPLOYEE SURVEY
QUESTIONNAIRE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=15&article=2971&context=jtrp&type=additional>

**APPENDIX D: SUPERVISOR SURVEY
RESULTS—TRAINING NEEDS
(IN PRIORITY ORDER) BY JOB TITLE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=16&article=2971&context=jtrp&type=additional>

**APPENDIX E: EMPLOYEE SURVEY RESULTS—
TRAINING NEEDS (IN PRIORITY ORDER) BY
JOB TITLE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=17&article=2971&context=jtrp&type=additional>

**APPENDIX F: SUPERVISOR SURVEY RESULTS—
IN-HOUSE TRAINING PROGRAMS ATTENDED
BY JOB TITLE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=18&article=2971&context=jtrp&type=additional>

**APPENDIX G: EMPLOYEE SURVEY RESULTS—
IN-HOUSE TRAINING PROGRAMS ATTENDED
BY JOB TITLE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=19&article=2971&context=jtrp&type=additional>

**APPENDIX H: SUPERVISOR SURVEY
RESULTS—IN-HOUSE TRAINING PROGRAMS
WITH JOB TITLES ATTENDING**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=20&article=2971&context=jtrp&type=additional>

**APPENDIX I: EMPLOYEE SURVEY RESULTS—
IN-HOUSE TRAINING PROGRAMS WITH JOB
TITLES ATTENDING**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=21&article=2971&context=jtrp&type=additional>

**APPENDIX J: EMPLOYEE DEVELOPMENT
TRAINING EXPENDITURES**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=22&article=2971&context=jtrp&type=additional>

**APPENDIX K: INVENTORY OF COURSES
RELATED TO INDOT PROFESSIONAL/
TECHNICAL POSITIONS PROVIDED BY
FEDERAL, STATE, INDUSTRY ORGANIZATIONS**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=23&article=2971&context=jtrp&type=additional>

**APPENDIX L: INVENTORY OF COURSES
RELATED TO INDOT PROFESSIONAL/
TECHNICAL DISCIPLINES PROVIDED BY
THIRD-PARTY VENDORS**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=24&article=2971&context=jtrp&type=additional>

**APPENDIX M: INVENTORY OF COURSES/
PROGRAMS AT INDIANA HIGHER EDUCATION
INSTITUTIONS (PUBLIC AND INDEPENDENT
BUT NOT PROPRIETARY): ACCOUNTING, CIVIL
ENGINEERING, GEOLOGY, LAND SURVEYING,
LANDSCAPE ARCHITECTURE, REAL ESTATE**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=25&article=2971&context=jtrp&type=additional>

**APPENDIX N: INVENTORY OF INDOT
TECHNICAL TRAINING PROGRAMS**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=26&article=2971&context=jtrp&type=additional>

**APPENDIX O: EDUCATION ASSISTANCE &
TRAINING TOTAL COUNTS (7/1/08–12/28/10)**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=27&article=2971&context=jtrp&type=additional>

**APPENDIX P: TECHNICAL TRAINING
PROGRAM INFORMATION**

<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?filename=28&article=2971&context=jtrp&type=additional>