# Developing a Competency Model for State DOTs





#### ABSTRACT

For engineers in state DOTs, current training may not be on par with current technologies in practice, or a lack of funding or resources could prolong or limit the amount of trainings offered. There may also be a gap between the competencies needed and the competencies taught in these trainings. The Louisiana Department of Transportation and Development (DOTD), using the Highway Safety Section as an example, completed a competency model to identify possible knowledge gaps.

Research began by reviewing work completed by other states and national organizations. Next, the team interviewed employees within each section to better understand their day-to-day job duties while learning about their processes and what improvements could strengthen their ability to perform effectively. A framework of action-based competencies was developed based on all information gathered, including: section-specific information, currently available and required training, and other internal and external resources. After multiple iterations of feedback and modification, final competencies were grouped as necessary.

Once competencies were defined, they were matched with appropriate training. This consisted of instructor-led courses, go-by documents, websites, manuals, conferences, and more. Next, the section supervisor decided what level of proficiency was desired, what level of proficiency the employees currently exhibited, and the criticality of each competency. Continuing this process across the department and other state DOTs may help set training priorities and the development of future training. Additional knowledge gaps may become apparent as more research is completed.

#### INTRODUCTION

Employees of DOTD are enrolled in Structured Training Programs (STPs) tailored to their job roles. These include technical specialized training, professional development, and other mandated and compliance training. Keeping training up to date, along with issues of availability, timeliness, and funding, is paramount in making sure employees within DOTD are effective in performing their jobs safely and proficiently. Determining specific competencies can help guide training programs.

**Competency:** what an employee needs to know or do to be effective at their job.

Standardized competencies and possible training opportunities are needed due to similar engineering requirements across states. In Highway Safety, the Federal Highway Administration (FHWA) mandates new safety countermeasures through the state Strategic Highway Safety Plan (SHSP). With no formal and required training to meet these needs, discrepancies may still exist among states. As budgets shrink and tasks grow, developing flexible training opportunities matched to competencies developed can help better prepare all engineers.

**Problem statement:** LA DOTD employs professional Civil Engineers who must be certified, licensed, and qualified with training that meets the increasing needs.

#### METHODOLOGY

To build a model of competencies and trainings, a specific area of engineering must be selected through discussions with state DOT stakeholders. Selection criteria include successful relationships, interest, high turnover, and training needs. Once chosen, a timeline is established, starting with a brief meeting with the Section Head to outline the process and appoint a primary contact and core staff.

**1.** *Kick-off Meeting:* Discusses in detail the project's scope, participation expectations, and responsibilities. Here, we can explain the expectations and time commitment from both parties are shared with a focus on the length of the process, typically between 6-12 months. Any information that may be helpful moving forward is started to be collected.

**2. Research and Interviews:** To identify technical competencies for engineers, researchers should start by leveraging existing competency frameworks from DOT best practices, universities, and national organizations (FHWA, NHTSA, TRB, AASHTO, NHI). Within Highway Safety, frameworks like the NCHRP Research Results Digest 302 can be adapted to meet specific needs. Specific to the DOT, researchers can then examine section history, job descriptions, and current STPs, and gather data directly from employees, utilizing organizational charts, and other internal and external resources. To start developing competencies, begin with extensive desk research, including literature reviews, job descriptions, training objectives, interviews, and ongoing updates after interviews are complete.

The interviews involved one-hour face-to-face conversations with DOTD Highway Safety section employees, ranging from new hires to seasoned staff. They were conducted at a convenient location for the interviewee and included research teammates for note-taking. Interviewees represented various job types, with input from Section Heads and administrators to represent a broad sample of job types. The informal, conversational interviews aimed to understand job duties, processes, and effective training. Employees shared insights on useful trainings and other relevant information that may not be found in training or typical onboarding processes. Privacy and anonymity were emphasized, and guided questions helped keep the interviews focused. Sample questions included:

- 1. Tell me a little about yourself...
- 2. What do you find yourself doing a lot?
- 3. What do you struggle with often?
- 4. What do you wish you knew to do your job more effectively?
- 5. What do you wish you knew year 1 that you know now?
- 6. If you had to train a new employee, where would you start?
- 7. What area is lacking in training for future endeavors?

**3. Competency Building:** The process for developing and organizing competencies should be completed in a team setting at first. This should start rudimentary and analog in nature with a collection phase using easel-sized sticky notes. The team captures all potential competencies with the understanding that it's easier to eliminate than add later. Notes on definition building and potential trainings may also be noted.

The process then moves to digital documentation using word processing software that can track changes, with competency definitions written in action-based, measurable terms (e.g., demonstrate, identify, understand, recognize, ability, explain, leverage, describe). There is no requirement for the length of a definition. Footnotes can be used to reference where important information was taken. The review process involves three key questions:

- What is correct?
- What is incorrect? (including potential modifications and location changes)
- What is missing?

After multiple review cycles and incorporating feedback from all involved section members, the competencies and their definitions are finalized and transferred to a database or project management platform. The author specifically recommends web-based tools like Monday.com, Airtable, Smartsheet, Asana, or Notion over traditional databases like Microsoft Access for managing this information.

**4.** *Matched Training:* Once a final draft of competencies and definitions is approved, each competency can be matched with appropriate training. It is important to note that "Matched Training" does not have to be a physical face-to-face training class. The appropriate training may include any of the following:

- Face-to-face, virtual, hybrid, or web-based trainings
- Website links, videos, or documents
- Manuals or SOPs
- Workshops/Conferences
- Mentorships/peer-to-peer training

The use of a database to store the training information is important to include further information for each training opportunity. This may include information on course offerings, cost, length of the course, method of delivery, eligible participants, and course requirements. Information is gathered through any previous documentation, interview responses, employee transcripts, and by looking at other state agencies, national organizations, professional development groups, third-party training organizations, universities, and more.

**5. Proficiency and Criticality:** Proficiency (P) is defined as at what level an employee group is currently capable or experienced in the given technical competency. Proficiency-Goal (PG) is defined as at what level the Section Head desires an employee group to be capable or experienced in the given technical competency. These can include a level of current knowledge possessed or an ability to apply the skills learned to achieve a level of output or performance and are measured by four levels:

<ul> <li>P1 = Developing</li> </ul>	<ul> <li>P3 = Accomplished</li> </ul>

• P2 = Progressing • P4 = Distinguished

Criticality (C) is defined as the level of importance an employee group needs to know, be familiar with, and exemplify understanding of a given competency and is measured by four levels:

- C1 = Not critical C3 = Critical
- C2 = Needed C4 = Highly critical

These levels should be chosen in aggregate for an employee group or job function, rather than for an individual. There will be employees that fall below or above the aggregate score. This employee group may encompass the entire section, or be specific enough to only cover a small number of roles. Since the Section Head defines these levels, having others on the team help discuss these levels will minimize subjectivity. The importance of this distinction is to help with planning and forecasting future training initiatives and efforts.

**5. Close-out Meeting:** Brings together the original team to formally review and finalize the completed model, including competencies, definitions, trainings, and proficiency/criticality ratings. During this meeting, the team evaluates training gaps and priorities, particularly focusing on competencies with significant disparities between current and goal proficiency levels, combined with high criticality ratings, to determine whether existing training programs are sufficient or if new training solutions need to be developed or purchased.

# RESULTS

Using the research from all sources, the team concluded the study with five ompetency areas, each having a varying amount of sub-competencies (59 in total). Three key competencies were highlighted, all showing a significant gap that required attention. For two of these competencies, adequate training options were identified; however, the third lacked any matched training. This model can be applied across DOTD to address competency gaps department-wide, ensuring efficient allocation of training resources. However, this competency may also exist in other DOTs, showcasing the importance of keeping competencies similar across the nation, especially when it applies to government-mandated policies.

- Safety Theory/Discipline Road Safety Theory
  - Road Safety Fundamentals via FHWA
  - Road Safety 101 via UNC
  - Road Safety 365 via LTAP
  - Road Safety Champion Program via NCRRS
- Highway Safety Data Data Integrations with GIS
  - DOTD GIS ArcGIS at DOTD
  - DOTD GIS Advanced ArcGIS Pro
  - DOTD GIS Editing in ArcGIS Pro
  - DOTD GIS Intermediate ArcGIS Pro for Transportation
- Safety Theory/Discipline Alternative Sources of Data
  - [currently missing]

	SHSP			Safety Data			Project Dev.		
Competency	Р	P-G	С	Р	P-G	С	Р	P-G	С
Road Safety Theory	2	3	3	4	4	4	2	4	4
Data Integrations with GIS	2	2	2	2	4	4	1	1	1
Alternative Sources of Data	2	4	4	3	3	3	1	1	1

## **CONCLUSIONS & RECOMMENDATIONS**

A set of core competencies and trainings were identified in this study that are essential to the Highway Safety Section of the Louisiana DOTD. By pairing the competencies' currently available trainings with proficiency and criticality ratings, the department can focus on important training areas while other training gaps are identified. Other states should complete an in-house competency model to further validate this model, implement it, and modify it to fit their needs and unique characteristics. All states will benefit from sharing the findings within their DOT and across the transportation community.

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# CONTACT

Garrett Wheat, Ph.D. | (225) 767-9144 | Garrett.Wheat@la.gov MaryLeah Coco, Ph.D. | (225) 767-9167 | MaryLeah.Coco@la.gov



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