

# **NCHRP 02-25: Workforce 2030**

## **Executive Summary of Project**

### **WORKFORCE 2030--ATTRACTING, RETAINING, AND DEVELOPING THE TRANSPORTATION WORKFORCE: DESIGN, CONSTRUCTION, AND MAINTENANCE**

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## Executive Summary

State departments of transportation (DOTs) are important organizations, responsible for ensuring the integrity of the United States' transportation infrastructure. Indeed, DOT employees in design, construction, and maintenance are responsible for ensuring that U.S. infrastructure is safe, efficient, and effective. However, given the changing nature of the transportation industry and its associated challenges, DOTs across the country are struggling to maintain a fully capable and efficient workforce within these three occupational groups. Some of the changes the transportation industry is facing include increased demand for multi-modal transportation, resiliency planning, and adoption of new technologies to perform job duties. These changes are beginning to impact DOTs' workforce needs and will continue to do so through the next decade, meaning the DOT workforce must change as well. Indeed, the DOT workforce of 2030 will need to be more collaborative, skilled, and technologically savvy than they are today. To prepare for these industry changes and build a strong workforce, DOTs must adopt innovative, empirically backed, human capital strategies that will help them attract, retain, and develop skilled workers.

### Study Overview

NCHRP Project 02-25, "Workforce 2030—Attracting, Retaining, and Developing the Transportation Workforce: Design, Construction, and Maintenance" involved a two-phase study, with the first phase focused on identifying transportation industry workforce trends and the desired future state for DOTs. Another major objective of the first phase was to identify the current and anticipated transportation industry workforce capacity needs for the next decade. A comprehensive literature review, interviews with DOT leaders, and focus groups with employees across the United States revealed that state DOTs nationwide struggle with a similar set of challenges. The 10 identified challenges include:

- Adoption of new technologies
- Economic challenges
- Rise of multi-modal transportation
- Resiliency planning
- Blue-collar stigma
- Slow hiring practices
- Popularity and expectation of flexible workplace policies
- Difficulty recruiting and retaining mid-level or young staff
- Steady downsizing of DOT staff
- Generational differences

In the second phase of the study, the focus was on identifying and outlining strategies DOTs may use to prepare their workforce for these identified industry challenges. Strategy identification was based on both research and the experiences of industry professionals. Further, to ensure that the strategies would be applicable and feasible for design, construction, and maintenance jobs, various transportation industry leaders were consulted to refine the strategies, which were then included in a comprehensive guide to be used by DOT leaders.

## Identification of Industry Challenges

### Literature Review

To identify and define factors and trends in the transportation industry that impact state DOTs and the transportation workforce, ICF conducted a comprehensive literature review and organized and evaluated existing research about the transportation industry and workforce capacity needs related to the design, construction, and maintenance occupations. Relevant transportation literature about workforce challenges and best practices in human capital in areas such as recruitment, retention, and training was cataloged into an electronic database. The research team included over 30 research articles in this database, which were organized within seven major categories, as described in Exhibit 1.

Exhibit 1. Descriptions of the Literature Review Categories	
Categories	Descriptions
Workforce Needs	Current and anticipated transportation industry workforce needs, the current state of the workforce pipeline, demographic changes, and challenges attracting, retaining, and developing staff currently and over the next 12 years.
Training and Education	Availability of training and education programs to address current and future workforce needs for design, construction, and maintenance occupations.
Technological Advances	Insight into technological advances in the transportation agency currently and over the next 12 years that will impact the capabilities and skills needed to perform effectively in design, construction, and maintenance occupations.
Policies and Regulatory Requirements	Policies and regulatory requirements that affect the roles and responsibilities of state DOTs as well as their ability to retain and develop the future workforce.
Integration with Contractors	Insight into the extent to which transportation agencies contract out services helps to identify which services can be contracted out and which services are core to a transportation agency's operations and must be performed internally by agency staff.
Resources, Tools, and Best Practices	Existing resources and tools (e.g., plans, templates, guides) that agencies have developed to aid in workforce and organizational capacity-building, along with a detailed catalog of any specific best practices that have been developed and researched by agencies.
Recruitment, Retention, and Engagement	Research and guidance for best recruiting, retaining, and engaging employees in the transportation industry or similar fields.

### Stakeholder Interviews

To gain a deeper understanding of current transportation workforce challenges, as well as anticipated obstacles and workforce needs based on the future state of the industry, ICF engaged with leadership and key stakeholders from various transportation agencies and private organizations. One major goal when engaging with DOT leaders and stakeholders was to identify innovative practices that state DOTs and private-sector organizations are using to overcome these challenges and find evidence that speaks to the effectiveness of these

practices in addressing the roadblocks to attracting, retaining, and developing qualified employees. ICF also gathered information on existing organizational policies that support, hinder, or in some way impact retention of the current workforce and the development of the future one.

To engage with key stakeholders, ICF conducted interviews and focus groups with 85 transportation professionals, most of whom were seasoned DOT leaders. Stakeholders were asked about challenges facing the transportation industry, examples of how they work to overcome these obstacles, and specific examples of how the transportation industry will continue to evolve over the next decade. ICF then performed a thematic analysis of the narrative results and several themes related to challenges that impact attracting, retaining, and training the workforce emerged. For example, it was uncovered that DOTs across the country struggle to efficiently react to changes in their global environment (e.g., development of new technologies, policy updates, increasing work multi-modal transportation). DOTs also reported challenges with meeting the needs of all employees due to individual differences, such as differing expectations between new and existing staff. DOTs from around the country also discussed the skills gaps among current staff due to their inability to recruit and retain entry- and mid-level staff and slow hiring practices in the industry.

Based on these overarching themes, 10 challenges were identified. A detailed description of each of these challenges is included in Exhibit 2.

Exhibit 2. Identified Industry Challenges	
Challenges	Description
Adoption of new technologies	The adoption of new technologies is changing job roles and necessary workforce knowledge, skills, and abilities (KSAs). This is especially true for the domains of data science and statistical analysis.
Economic challenges	The ever-changing and uncertain national economy affects the supply and demand of potential employees as well as how much competition DOTs face from other employers in recruiting these employees.
Rise of multi-modal transportation	Multi-modal transportation is growing in popularity, and DOTs around the country are having to change the way they approach design, construction, and maintenance work in response.
Resiliency planning	DOTs and the transportation industry as a whole are finding their work is affected by natural disasters and climate change. As DOTs move forward, they are required to build environmental considerations into the work they do.
Blue-collar stigma	Blue-collar work is wrongly stigmatized. DOTs are challenged with confronting this sentiment as well as debunking other misconceptions that affect their recruitment efforts.
Slow hiring practices	DOTs are burdened by slow hiring practices, which ultimately affect the way they attract and hire new employees. This puts DOTs at a disadvantage when compared to private employers.
Popularity and expectation of flexible workplace policies	Flexible workplace policies such as the ability of employees to work remotely or make their own schedule are becoming more common to the point where some people expect these things from their employers.
Difficulty recruiting and retaining mid-level or young staff	DOTs are struggling to recruit and retain young and mid-level staff in the areas of design, construction, and maintenance. With the gap in mid-level staff, organizations often have to promote unqualified staff to fill these vacancies, creating a considerable knowledge gap. Further, DOTs are having trouble attracting young adults into the transportation industry and ensuring they stay engaged.
Steady downsizing of DOT staff	With changes in budgets and challenges with attracting and retaining staff, many <b>DOTs are experiencing decreases in their workforce. DOTs have embraced “doing more with less” and rely on their existing staff to complete tasks beyond their traditional role.</b> To fill their staffing gaps, DOTs have also relied on contractor support. These trends have created KSA gaps, such as project management and communication.
Generational or tenure-related differences	DOT leaders believe older generations and younger generations view transportation work differently and have different expectations about how to engage with one another. More seasoned workers may have interest in continuing work the way it has always been conducted. These differences in work style preferences seem especially noticeable when integrating new technologies into day-to-day operations. Workers also differ in how they prefer to receive training and/or participate in workforce development opportunities.

### Identification and Labor-Market Analysis of Priority Jobs

To assess the prevalence and impact of industry trends on the future job requirements in transportation design, construction, and maintenance occupations, ICF conducted an industry-wide web survey. This survey asked participants to rate the extent to which a list of jobs (identified via stakeholder interviews and research of U.S. Department of Labor occupational classifications) aligns with DOTs’ mission and vision and the extent to which catastrophic outcomes would result if the position were to be left empty. Understanding which jobs are considered priorities (i.e., mission-critical) is important because they are needed for continuity of operations, and if their talent pipeline may be sparse or near obsolete, state DOTs will need to be intentional, and sometimes creative, in preparing for the future and any potential skill deficits. In other words, defining priority jobs is an important step because state DOTs need to know how to best allocate resources and where human capital strategies are immediately needed to ensure workforce and agency sustainability. Exhibit 3 displays the priority jobs identified for design, construction, and maintenance.

Exhibit 3: Transportation Design, Construction, and Maintenance Priority Jobs	
Design	<ul style="list-style-type: none"> <li>• Bridge and Structural Designer</li> <li>• Civil Engineer</li> <li>• Transportation Engineer</li> <li>• Transportation Planner</li> <li>• Traffic Engineer</li> </ul>
Construction	<ul style="list-style-type: none"> <li>• Civil Engineer</li> <li>• Construction Manager</li> <li>• Transportation Construction Inspector</li> <li>• Transportation Technician</li> <li>• Traffic Management Operator</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• Highway Foreman</li> <li>• Highway Maintenance Technician</li> <li>• Civil Engineer</li> <li>• Snowplow Operator</li> <li>• Transportation Maintenance Specialist</li> </ul>

To better understand the existing labor market for the priority jobs, ICF examined publicly available employment data (e.g., information from the U.S. Department of Labor, public job postings, Bureau of Labor and Statistics). This labor-market analysis allowed ICF to determine (a) supply and demand for these jobs across industries, (b) labor-market projections, (c) annual wage changes projections, (d) projected changes in the number of employees from now to 2028, and (e) the annual number of job openings projections. Following this analysis, ICF created job-specific profiles that showcased regional trends, skill needs, average compensation, and employee projections for each of the priority jobs.

## Identification of Future Scenarios State DOTs May Face

To understand what DOTs will need to support their future workforce, we need to understand what the future environment will look like for state DOTs. Based on findings from Phase 1 of this project, input gathered from industry experts, and feedback from DOT leaders from across the United States, seven potential future scenarios were identified that DOTs will likely face within the next decade.

To develop the scenarios, ICF enlisted the help of their five industry expert advisors to brainstorm and generate initial content that reflects the changes DOTs are facing at a national level and that will directly affect how DOTs will manage their operations by the year 2030. As a part of this step, the industry experts each completed worksheets developed by ICF that helped the experts build and describe potential future DOT operating environments with a specific focus on design, construction, and maintenance functions. After the initial scenarios were drafted, ICF engaged with leadership and key stakeholders from various transportation agencies across the country in a series of four virtual *futuring* workshops. In these workshops, trained facilitators from ICF guided transportation leaders through a structured discussion that helped identify whether the scenarios accurately represent the future state of the industry and related transportation workforce challenges. After conducting the workshops, feedback given during these workshops was incorporated into the existing scenario content. For example, details pertaining to how each of the occupational groups will be specifically impacted by the various challenges were added based on the experiences of some workshop participants. After these revisions were made, ICF continued to improve the scenarios by ensuring they were written in a consistent format and included all necessary components. To finalize the scenarios, ICF met with the industry experts so any remaining questions could get answered and any missing details could be added.

Exhibit 4 provides an overview of each of the seven future scenarios that were identified as plausible future states that DOTs should be prepared to address.




Exhibit 4. Overview of Future Scenarios	
Scenario	Description
 <p><b>Changing Transportation Infrastructure</b></p>	<p>The rise in popularity of alternative modes of transportation may cause state DOTs to consider how roadways will be designed, built, and maintained to accommodate these new modes. With expanding mobility service options, the use of transportation infrastructure will also change. As traditional automotive modes give way to tech-assisted modes, the transportation industry will be faced with decreased demand for typical design, construction, and maintenance operations. The challenge for the state DOT facing this future will be developing project management expertise in this complex environment and establishing structures that allow the organization to manage mobility service providers effectively. This must be accomplished in a manner that benefits local communities through expanded mobility options while ensuring that the transportation system is managed as a public good addressing a variety of user needs.</p>
 <p><b>New Smart Technologies</b></p>	<p>Smart City applications are expanding regionally, allowing smart state DOTs greater opportunities to connect urban and rural areas through technology deployments, coordinated services, and statewide system management practices. These applications involve looking at how to use sophisticated, data-driven resources (e.g., automated equipment, drones) to work a little bit smarter or more remotely. However, skill gaps among current staff, budget constraints, slow hiring practices, and antiquated management approaches can complicate the DOT’s ability to attract new tech-savvy workers.</p>
 <p><b>Attracting a Diversified Workforce and Increasing Labor Force Participation Rates</b></p>	<p>Within the next 10 years, the U.S. economy may transition to a services-based, worker-supply-driven world, and even the transportation industry will be affected by this shift. However, a state DOT may find itself ill-equipped to provide the innovative services being pushed if it has historically narrowed its applicant pool and workforce unintentionally. As a country, there is increased attention on promoting equity in the workplace. For a DOT to be recognized as an “employer of choice,” it will be important that the DOT shows a renewed commitment to employment practices that support diversity and inclusion. With the growing need for new talent, the DOT must also recognize that expanding its applicant pool to nontraditional hires is business essential and will promote innovation by bringing unique perspectives together. To broaden the applicant pool and demonstrate an ethical and moral commitment to diversity and inclusion, a DOT must look closely at how it recruits, develops, and retains currently underrepresented workers.</p>



Exhibit 4. Overview of Future Scenarios

Scenario	Description
 <p><b>Competing for Specialized Skills</b></p>	<p>A state DOT may be faced with the reality that employment within the organization will become more specialized due to new technological advances. For example, with new sensors on the road that generate big data, employees with the ability to analyze and utilize this data will be needed in the DOT. These new employees, who likely have backgrounds in data analysis or information technology (IT), will need to be woven into the decision-making process across DOT occupational areas (i.e., design, construction, maintenance) and the DOT’s mission. Since attracting skilled workers will be challenging, particularly with fewer entrants into the trades disciplines, larger pools of workers will need to be created that will allow the state DOT greater access to potential employees. However, competing against other sectors or industries may make it difficult to recruit and hire qualified staff. Given increasingly complex infrastructure demands, a limited number of skilled workers, and difficulty competing against other sectors for new hires, the state DOT may need to start outsourcing more services. However, one problem with this approach is that when shifting work to consultants and contractors, employees may not retain the necessary knowledge to make proper inspection decisions or effectively review the contractors’ work.</p>
 <p><b>Changing Nature of Work with a Multi-Generational Workforce</b></p>	<p>A state DOT may find the integration of multiple generations of workers is not as seamless as once anticipated. Younger generations entering the public sector workforce are proposing improvements to current processes that question the status quo. Seasoned workers are sometimes frustrated by the lack of institutional knowledge held by these new entrants, and established employees often feel they are being treated as if they are dispensable. For the first time in the modern age, five generations are present at work—traditionalists, baby boomers, Generation X, millennials, and Generation Z. Generational preferences may sometimes compete with one another. Traditional management practices such as requiring employees to work in person as opposed to remotely, adhering to an inflexible weekly work schedule, and limiting the amount of individual autonomy are causing difficulty in recruiting new talent, especially when competitors are moving toward these new approaches.</p>

Exhibit 4. Overview of Future Scenarios	
Scenario	Description
 <b>Resilience Planning</b>	<p>Within a traditional state DOT, the implementation of a new resiliency plan may begin. Within this new plan, there will be changes to the way this DOT has traditionally planned for a rising sea level, flooding, and coastal storms, to ensure that infrastructure remains safe and reliable over time. However, one challenge associated with the implementation of this new resiliency plan is that a limited number of staff have the required skills (e.g., forecasting, modeling), to engage in discussions over designing, constructing, and maintaining the new standards, but these discussions have a very large impact on future operations. All occupational areas within this DOT will likely be affected by these policy changes. Engineers within the design occupation area will need to consider new policies when designing new infrastructure and planning for existing infrastructure. The decisions made by engineers will trickle down to employees in construction and maintenance. Thus, implementation of the resiliency plan requires that the DOT, with offices at both the headquarters and district level, coordinate the efforts of its construction, maintenance, and design units to implement the new plan. Implementing this plan will likely require design staff to clearly communicate and use tools such as databases to document their rationale for certain design decisions to ensure that all DOT occupational areas (i.e., construction, maintenance, and design) have a shared understanding of project decisions.</p>
 <b>Supply Chain Partnerships</b>	<p>Consider a state DOT applying for a U.S. DOT BUILD Grant totaling \$25 million to pilot a smart Intelligent Transportation System (ITS) corridor for freight traffic. Smart-truck routing, a strong avenue to invest the grant into, uses real-time road data to optimize freight movement within a multi-modal context. The state, which serves as a major freight gateway for maritime, truck, rail, and cross-border freight traffic, will manage the network to ensure optimal routing. The state also has a large distribution, warehouse, and fulfillment network that supports markets across the country as well as local last-mile demand. Developing the ITS freight corridor will require the DOT to develop strong working partnerships with public- and private-sector supply chain partners as well as with leaders in the development and deployment of smart-freight routing. The DOT will also need to introduce new data analytic and security methods and assess the efficiency of the systems while also ensuring their safety.</p>

Considering these potential future states is important so that DOTs can be prepared for the variety of situations they may face, using strategies that align to their future environments. As such, the future scenarios were used in conjunction with the identified industry challenges and needs for priority jobs to develop strategies to attract, retain, and train DOT design, construction, and maintenance staff. To guide the process of creating effective and feasible strategies, literature on best practices and previous interviews with stakeholders and experts

were consulted. After developing strategies, action plans that describe these strategies, steps to implement them, and how they can benefit design, construction, and maintenance staff were produced and organized into a guide.

## Guide and Roadmap Overview

To provide DOTs with easily implementable strategies that are empirically backed and may be used to meet current and future workforce demands, ICF created a detailed strategy Guide, tailored to the specific challenges uncovered and described in the future-state scenarios. This Guide includes detailed descriptions of strategies DOTs may implement to combat current and future challenges as well as action plans that detail steps for implementing strategies, lists of resources needed to implement strategies, potential barriers to implementing strategies, and examples of how the strategies have already been implemented within DOTs or other transportation-related organizations.

Within the Guide, strategies and action plans are divided into three categories: (a) Building a Qualified Workforce: Attracting Employees, (b) Sustaining a Strong Workforce: Retaining Employees, and (c) Developing a Talented Workforce: Training Employees. However, many of the strategies can support several goals. The action plans included in each chapter are provided in Exhibit 5.

Exhibit 5. Action Plans Within Each Guide Chapter	
Chapter	Action Plans
<b>Chapter 2: Building a Qualified Workforce: Attracting Employees</b>	<ul style="list-style-type: none"> <li>Partner with Educational Institutions to Market Jobs</li> <li>Develop a Brand to Attract New Applicants</li> <li>Use a Focused Social Media Presence to Engage Applicants</li> <li>Adopt Equitable Recruitment Practices to Hire Underrepresented Individuals</li> <li>Assess Workforce Policies to Ensure Support for Diversity and Inclusion</li> <li>Create and/or Revise Job Descriptions to Accurately Market Jobs</li> </ul>
<b>Chapter 3: Sustaining a Strong Workforce: Retaining Employees</b>	<ul style="list-style-type: none"> <li>Develop Performance Management Strategies with Industry Partners to Communicate Expectations</li> <li>Construct Effective Teams to Maximize Staff Productivity</li> <li>Enable Employees to Share Ideas to Foster Workplace Innovation</li> <li>Integrate Critical Skills into Career Paths to Demonstrate Career Advancement Opportunities</li> <li>Establish Standard Operating Procedures for Data Management to Ensure Efficient and Secure Access</li> <li>Create Flexible Work Arrangements to Accommodate Employee Needs</li> <li>Implement Diversity and Inclusion Training to Ensure a Healthy Work Environment</li> </ul>

Exhibit 5. Action Plans Within Each Guide Chapter	
Chapter	Action Plans
<b>Chapter 4: Developing a Talented Workforce: Training Employees</b>	<ul style="list-style-type: none"> <li>• Create Communities of Practice with Local Institutions to Encourage Knowledge Sharing</li> <li>• Develop Robust Training Programs to Bridge Workforce Skill Gaps</li> <li>• Upskill Existing Employees to Prepare Them for New Roles</li> <li>• Partner with Mobility Service Providers to Increase Coordination</li> <li>• Implement Internal Knowledge-Sharing Forums to Improve Knowledge Transfer</li> <li>• Conduct Cross-Functional Action Learning Projects to Facilitate Internal Collaboration</li> <li>• Create an Information Repository to Foster Resiliency Planning Communication Across DOTs</li> <li>• Provide Leadership Development Opportunities to Build a Leader Pipeline</li> <li>• Establish a Reciprocal Mentoring Program to Encourage Internal Knowledge Transfer</li> </ul>

A list of these action plans, which category they are in, and which industry challenges they addressed are provided in Exhibit 6.

Exhibit 6. Matrix of Industry Challenges and Related Action Plans										
Action Plans	Industry Challenges									
	Adoption of new technologies	Economic challenges	Rise of multi-modal transportation	Resiliency planning	Blue-collar stigma	Slow hiring practices	Popularity and expectation of flexible workplace	Difficulty recruiting and retaining mid-level or young staff	Steady downsizing of DOT staff	Generational differences
<b>Building a Qualified Workforce: Attracting Employees</b>										
Partner with Educational Institutions to Market Jobs	•	•			•			•	•	
Develop a Brand to Attract New Applicants	•	•						•		
Use a Focused Social Media Presence to Engage Applicants	•	•						•		•
Adopt Equitable Recruitment Practices to Hire Underrepresented Individuals						•	•	•		
Assess Workforce Policies to Ensure Support for Diversity and Inclusion	•							•		•
Create and/or Revise Job Descriptions to Accurately Market Jobs	•							•		

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Exhibit 6. Matrix of Industry Challenges and Related Action Plans										
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	Adoption of new technologies	Economic challenges	Rise of multi-modal transportation	Resiliency planning	Blue-collar stigma	Slow hiring practices	Popularity and expectation of flexible workplace	Difficulty recruiting and retaining mid-level or young staff	Steady downsizing of DOT staff	Generational differences
<b>Sustaining a Strong Workforce: Retaining Employees</b>										
Develop Performance Management Strategies with Industry Partners to Communicate Expectations									•	
Construct Effective Teams to Maximize Staff Productivity								•	•	
Enable Employees to Share Ideas to Foster Workplace Innovation	•			•				•		•
Integrate Critical Skills into Career Paths to Demonstrate Career Advancement Opportunities	•							•	•	
Establish Standard Operating Procedures for Data Management to Ensure Efficient and Secure Access	•									•
Create Flexible Work Arrangements to Accommodate Employee Needs							•	•		
Implement Diversity and Inclusion Training to Ensure a Healthy Work Environment								•		
<b>Developing a Talented Workforce: Training Employees</b>										
Create Communities of Practice with Local Institutions to Encourage Knowledge Sharing	•							•		
Develop Robust Training Programs to Bridge Workforce Skill Gaps	•	•						•		
Upskill Existing Employees to Prepare Them for New Roles	•		•	•						•
Partner with Mobility Service Providers to Increase Coordination	•		•							
Implement Internal Knowledge-Sharing Forums to Improve Knowledge Transfer	•							•	•	
Conduct Cross-Functional Action Learning Projects to Facilitate Internal Collaboration	•							•	•	
Create an Information Repository to Foster Resiliency Planning Communication Across DOTs	•			•						
Provide Leadership Development Opportunities to Build a Leader Pipeline		•						•		

Exhibit 6. Matrix of Industry Challenges and Related Action Plans										
Action Plans	Industry Challenges									
	Adoption of new technologies	Economic challenges	Rise of multi-modal transportation	Resiliency planning	Blue-collar stigma	Slow hiring practices	Popularity and expectation of flexible workplace	Difficulty recruiting and retaining mid-level or young staff	Steady downsizing of DOT staff	Generational differences
Establish a Reciprocal Mentoring Program to Encourage Internal Knowledge Transfer	•		•					•		•

Each action plan also includes one to three tools that may be used by DOT leaders to implement each strategy. See Exhibit 7 for the specific tools associated with each strategy.

Exhibit 7. Tools Provided for Each Strategy	
Strategy	Available Tools
<b>Building a Qualified Workforce: Attracting Employees</b>	
Partner with Educational Institutions to Market Jobs	<ul style="list-style-type: none"> <li>• Example Education Partnership Plan for Educational Institutions and DOTs</li> </ul>
Develop a Brand to Attract New Applicants	<ul style="list-style-type: none"> <li>• Employer Branding Discussion Guide</li> <li>• Mission and Vision Worksheet</li> <li>• Ideal Candidate Persona Worksheet</li> </ul>
Use a Focused Social Media Presence to Engage Applicants	<ul style="list-style-type: none"> <li>• Example Social Media Calendar</li> <li>• Best Practices for Using Social Media</li> </ul>
Adopt Equitable Recruitment Practices to Hire Underrepresented Individuals	<ul style="list-style-type: none"> <li>• Recruitment Strategy Elements to Increase Diversity</li> <li>• Example Survey Items to Assess Perceptions of the DOT's Diversity Climate</li> </ul>
Assess Workforce Policies to Ensure Support for Diversity and Inclusion	<ul style="list-style-type: none"> <li>• Barrier Analysis Overview</li> <li>• Business Case for Diversity, Equity, and Inclusion</li> </ul>
Create and/or Revise Job Descriptions to Accurately Market Jobs	<ul style="list-style-type: none"> <li>• Guide for Accessing and Navigating O*Net</li> <li>• Form for Gathering Job-Related Information from Job Incumbents and Subject Matter Experts</li> <li>• Template for a Comprehensive Job Posting</li> </ul>
<b>Sustaining a Strong Workforce: Retaining Employees</b>	
Develop Performance Management Strategies with Industry Partners to Communicate Expectations	<ul style="list-style-type: none"> <li>• Worksheet to help DOTs Obtain Performance Management Strategy Information</li> <li>• Checklist for Developing a Performance Management Strategy with Industry Partners</li> </ul>

Exhibit 7. Tools Provided for Each Strategy	
Strategy	Available Tools
Construct Effective Teams to Maximize Staff Productivity	<ul style="list-style-type: none"> <li>• Questionnaire to Reflect on Team Context</li> <li>• Questionnaire to Evaluate Team Dynamics</li> </ul>
Enable Employees to Share Ideas to Foster Workplace Innovation	<ul style="list-style-type: none"> <li>• Risk/Reward Assessment Guide</li> </ul>
Integrate Critical Skills into Career Paths to Demonstrate Career Advancement Opportunities	<ul style="list-style-type: none"> <li>• Career Path Guide Template</li> <li>• Individual Development Plan Template</li> </ul>
Establish Standard Operating Procedures for Data Management to Ensure Efficient and Secure Access	<ul style="list-style-type: none"> <li>• Evaluating Information with the C.R.A.A.P. Test</li> <li>• Assessing Shared Content and Data with the ROT Framework</li> </ul>
Create Flexible Work Arrangements to Accommodate Employee Needs	<ul style="list-style-type: none"> <li>• Example Flexible Work Arrangement Survey</li> <li>• Guidelines to Support a More Flexible Workforce</li> </ul>
Implement Diversity and Inclusion Training to Ensure a Healthy Work Environment	<ul style="list-style-type: none"> <li>• <b>Example Survey Items to Measure Trainees' Reactions and Changes in Knowledge, Skills, and Behaviors</b></li> <li>• Infographic to Help Decide Between Different Forms of Diversity and Inclusion Training</li> </ul>
Developing a Talented Workforce: Training Employees	
Create Communities of Practice with Local Institutions to Encourage Knowledge Sharing	<ul style="list-style-type: none"> <li>• Worksheet to Develop Goals and Intentions</li> </ul>
Develop Robust Training Programs to Bridge Workforce Skill Gaps	<ul style="list-style-type: none"> <li>• Skill Gap Analysis Toolkit</li> <li>• Example Survey Items to Measure Perceptions of Training</li> </ul>
Upskill Existing Employees to Prepare Them for New Roles	<ul style="list-style-type: none"> <li>• Reskilling/Upskilling Action Plan Template</li> </ul>
Partner with Mobility Service Providers to Increase Coordination	<ul style="list-style-type: none"> <li>• Brown Bag Session Talking Points</li> </ul>
Implement Internal Knowledge-Sharing Forums to Improve Knowledge Transfer	<ul style="list-style-type: none"> <li>• <b>Example Survey Items to Assess Employees' Engagement and Perceptions of Knowledge-Sharing Forums</b></li> <li>• Knowledge-Sharing Forum Development Checklist</li> </ul>
Conduct Cross-Functional Action Learning Projects to Facilitate Internal Collaboration	<ul style="list-style-type: none"> <li>• Overview of Action Learning Projects</li> </ul>
Create an Information Repository to Foster Resiliency Planning Communication Across DOTs	<ul style="list-style-type: none"> <li>• Example Post-Repository Survey Items on Use and Effectiveness of Information Repository</li> </ul>
Provide Leadership Development Opportunities to Build a Leader Pipeline	<ul style="list-style-type: none"> <li>• Overview of Leadership Developmental Opportunities</li> <li>• Matrix for Identifying High-Potential Employees</li> </ul>

Exhibit 7. Tools Provided for Each Strategy	
Strategy	Available Tools
Establish a Reciprocal Mentoring Program to Encourage Internal Knowledge Transfer	<ul style="list-style-type: none"> <li>• Mentoring Program Toolkit</li> <li>• Mentorship Program Matching Form</li> </ul>

NOTE: C.R.A.A.P = Current, Relevant, Authority, Accurate, Purpose; ROT = Redundant, Obsolete, and Trivial.

Also included within the Guide is the Workforce 2030 Roadmap, which showcases the interaction of the human capital initiatives for a qualified design, construction, and maintenance workforce. This roadmap also highlights the challenges that have been identified by transportation organizations and their recommended solutions (i.e., strategies). The Roadmap provides DOTs with the resources they need to implement the strategies locally, no matter their size or situation encountered in the future.

## Conclusion

The Guide developed through this project is intended to support state DOTs in implementing strategies to better attract, retain, and develop employees within the design, construction, and maintenance occupations. In addition to the strategies and tools included in the Guide, the deliverables from this study also outline resources that encourage industry partnerships and promote effective implementation of changes associated with adopting new strategies and practices. Specifically, this information includes:

- **Partnerships to Assist with Implementing Strategies:** Many DOTs are often willing to adopt workforce strategies to help attract, train, and retain a skilled workforce but lack the resources to implement widespread change. However, many external organizations are eager to form mutually beneficial partnerships as they face similar or related challenges (e.g., AASHTO, FHWA, TRB). These organizations may represent traditional stakeholders (i.e., organizations that have historically partnered with state DOTs to support workforce needs) or nontraditional stakeholders (i.e., organizations that have not historically partnered with state DOTs to support workforce needs). When DOTs engage with these external organizations and adopt an industry-wide approach to attracting, training, and retaining a skilled workforce, they can build a community of supporters and maximize their combined resources. Doing so will be extremely beneficial for efficiently implementing strategies and initiating workforce change.
- **Initiating Workforce Change:** Given that implementing the strategies presented in this Guide will require stakeholder buy-in and thorough preparation for change, it is recommended that DOTs use a change management framework when making workforce changes. Following these steps will allow DOTs to prepare for successful implementation, proactively lead change, and mitigate the risk for employee pushback. The steps for using a change management framework include:
  - Determine why the change is necessary.
  - Make a case for change.
  - Prepare and plan for the change.
  - Implement the change.
  - Maintain the change.



In sum, implementing the strategies presented within the Guide, developed with input from industry leaders and backed by scientific research, provides DOTs the opportunity to attract, retain, and develop a skilled workforce. Doing so will allow DOTs to develop a strong and resilient workforce that will thrive through the next decade, despite the many industry changes and obstacles that DOTs will likely face. Further, using a change management framework to implement these strategies should help DOTs garner stakeholder buy-in, making their change efforts more successful and sustainable over time. As the transportation landscape continues to evolve, DOTs must proactively prepare to meet new workforce challenges and may accomplish this with the resources provided as a part of NCHRP Project 02-25.