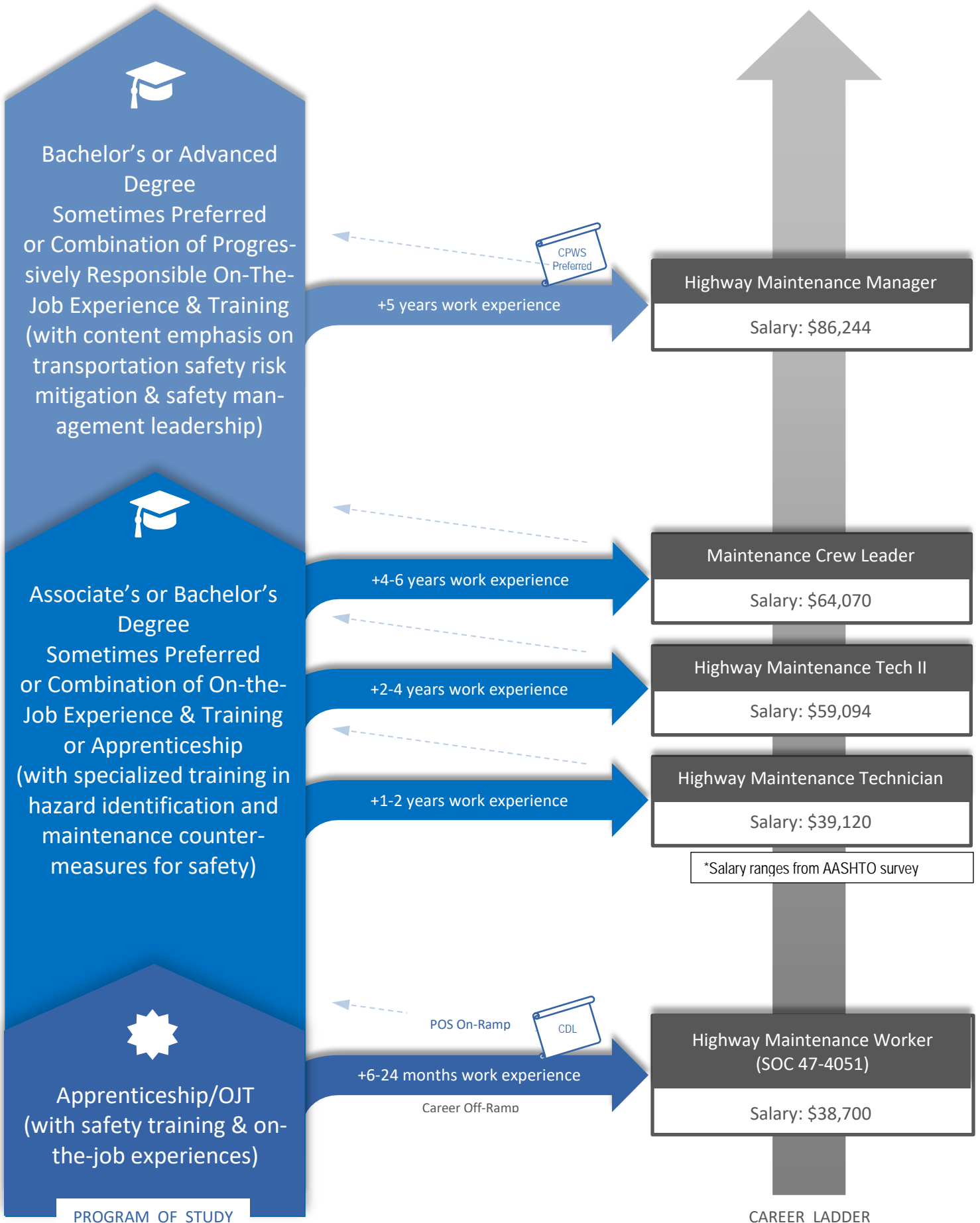


# **Highway Maintenance Safety Management Career Pathway Documentation**



## Alternative Job Titles

Road Maintenance Manager/Supervisor, Local Roads Supervisor, Public Works Director, Maintenance Superintendent, Maintenance Chief

## Job Description

A Road Maintenance Manager is responsible for oversight of maintenance activities in a given administrative district, including overseeing roadway repair, maintenance, and improvement projects, winter maintenance operations, and facilities and asset management. The Maintenance Manager supervises maintenance staff; roadway monitoring, inspection, and permitting processes; disaster and emergency response; and roadway inspection and hazardous materials procedures. As such, execution of duties has a direct impact on the safety of both maintenance workers and the traveling public. Maintenance Managers provide leadership on road safety promotion by means of maintenance activities and practices. Safety-related competencies include knowledge of systemic safety principles to assess risk, develop safety plans, and promote, implement, and evaluate maintenance impacts on road user safety. Duties include:

- Identify hazards and control measures for maintenance activities.
- Develop incident management and other safety plans based on risk assessment, incorporating knowledge of safety regulations and compliance measures.
- Ensure effective traffic control techniques are in place to safeguard workers and those passing through a work zone or site during maintenance activities.
- Implement effective road safety countermeasures through maintenance activities.
- Ensure maintenance staff are able to identify, report, and/or remediate road safety deficiencies.
- Promote a positive organizational safety culture.

## Knowledge Requirements

- Roadway/Shoulder/Winter/Bridge/Culvert Maintenance Practices
- Traffic services, including pavement markings, guardrails, MUTCD
- Heavy Equipment Operations
- Equipment Maintenance Practices
- Budgeting/Cost Control; Asset Management
- Health, Safety & Environmental Policies and Compliance
- Hazard & Risk Analysis
- Safety Culture Promotion
- Safety Countermeasures

## Required Skills & Abilities

- Project Management/Supervision
- Written and Oral Communication
- Organizational Skills
- Time and Task Management Skills
- Teamwork
- Problem Solving
- Interpersonal & Conflict Resolution
- Leadership

## Technical Skills Requirements

- Maintenance management software
- Microsoft Office Applications

## Education & Work Experience

- A combination of education and work experience is generally accepted.
- A Bachelor's or Master's degree may be required for some senior positions.
- Additional specific certifications or licenses may be required by employers (e.g. Certified Public Works Supervisor)

Year 3+



**CPWS - Certified Public Works Supervisor; TPCB Road Safety Professional Certification**



**Bachelor's degree in Civil or Construction Engineering, Highway Maintenance Management or Related**

**Year 3 & 4:** Curriculum is multi-disciplinary and taught through a safety lens. Training content focused on leadership and safety management.

**Year 1 & 2:** General education and prerequisite courses are taken in science and math to cement a strong technical background.

**Core Courses**

Transportation Safety  
Asset Management  
Budgeting and Finance  
Pavements  
Materials & Testing Methods  
Project Planning and Scheduling

**Safety Courses**

Design Countermeasures for Safety  
Safety Data Analysis  
Safety Culture & Leadership  
Systemic Safety  
Low Cost Safety Countermeasures

Experiential learning includes labs, capstones, fieldwork, co-ops

Year 2+



**Training/Certification and/or Associate's Degree - Highway Maintenance Safety Focus**

**Apprenticeship to Associate Degree/Associate Degree**

To attain an Associate's degree, all students must take general education courses that develop basic communication, math, technical, and critical thinking skills, as well as degree-specific requirements. Course offerings related to highway construction and maintenance operations and degree requirements will vary by institution.

Completion of an Apprenticeship provides credit towards a degree at Regis-

tered Apprenticeship - College Consortium colleges.

**On-the-Job Experience & Training**

Progressively responsible on-the-job experience and training can be substituted for degree work to achieve career advancement.

Focused training content on highway maintenance safety includes:

**Highway Maintenance Safety Courses**

Introduction to Safety Culture  
Understanding Human Factors  
Overview of the Manual on Uniform Traffic Control Devices  
Introduction to Safety Analysis  
Maintenance Countermeasures for Safety  
Work Zone Safety  
Identification and Mitigation of Roadway Safety Hazards  
Maintenance Countermeasures for Safety

Experiential learning includes fieldwork, capstone projects, Maintenance Academies

Year 1-2



**Apprenticeship or Work-Based Learning**

**Year 2 Technician:** Equipment operation and employee safety are emphasized. Training may involve simulators. Course topics are offered at an intermediate level. Certifications may be available.

**Year 1 Trainee:** Employees learn highway maintenance practices by working in the field. Coursework supplements the on-the-job portion and embeds certifications. Apprenticeship provides credits toward associate degree with

paid related instruction.

**Highway Maintenance Safety Courses**

Incident Management System  
HAZMAT Awareness  
Hazard Communication  
Trenching & Shoring Awareness  
Confined Space Entry  
Defensive Driving  
Personal Protective Equipment  
Hand Tools and Equipment Operation  
Promoting Workplace Safety

**Safety Certifications**

OSHA Certifications  
First Aid/CPR Certification  
Work Zone Traffic Certification  
Work Zone Flagging Certification

Year 0



**High School Diploma**

Transportation/Public Works-related career academies.



## Experiential Learning & Professional Development Opportunities

Professional associations provide professional development and networking opportunities to students and incumbent workers, bridging education to practice. Many associations provide experiential learning opportunities; professional conferences and other networking opportunities, as well as student scholarships and other support. In addition, many institutions either require or strongly encourage work-based learning experiences for their students through internships and/or co-ops. Industry and education/training providers can work together to ensure that safety-focused experiences and application of safety skills are an important component of these professional development experiences. Relevant maintenance experiential and work-based learning is available through the following sources:

### [American Society of Safety Professionals \(ASSP\)](#)

ASSP is a global association of occupational safety professionals that advocates for safer work environments. It supports student chapters and provides scholarships, educational resources, and a student-focused Future Safety Leaders Conference among other professional development and networking opportunities.

### [National Association of County Engineers \(NACE\)](#)

NACE provides education and training events to county engineers, road managers, and related professionals across the US. In particular, the NACE Safety and Technology committee hosts annual meetings, which offer safety-specific training opportunities. NACE also leads a pilot program on local road safety planning.

### [Association of General Contractors \(AGC\)](#)

Student Chapters exist at accredited two- and four-year schools offering programs in construction management, construction technology, and construction-related engineering. Membership in an AGC Student Chapter provides young professionals with an opportunity to observe and develop their skills with current industry leaders. AGC sponsors contests for student chapters that apply construction knowledge to real-world problems. AGC's Foundation provides scholarships for undergraduates, graduate students, and students pursuing a technical degree or apprenticeship. Opportunities such as job shadowing and career fairs are available through state AGC chapters.

### [Traffic Safety Scholars \(TSS\) Program](#)

The TSS Program provides awards of up to \$1,000 to undergraduate and graduate students to help defray the cost of attending the Lifesavers Conference on Highway Safety Priorities. This conference provides opportunities to learn about highway safety issues from leading experts and network with the largest gathering of highway safety professionals anywhere in the country.

### [National Highway Institute \(NHI\)](#)

NHI provides trainings and education for highway professionals in order to improve the conditions and safety of roads, highways, and bridges.

### [American Traffic Safety Services Association \(ATSSA\)](#)

ATSSA represents the road safety, traffic safety, and highway safety industry with effective legislative advocacy, traffic control safety training, and a far-reaching member partnership. ATSSA offers a variety of experiential learning and additional training and networking opportunities through its annual convention and traffic expo, mid-year meetings, and National Work Zone Awareness Week

activities.

### [American Public Works Association \(APWA\)](#)

APWA student membership connects students to a network of professionals. State chapters provide scholarships as a way to attract students to this field. Public Works conferences or expos often include an Equipment Rodeo—a competition for technicians in a number of maintenance occupations to show their skills troubleshooting mechanical issues or maneuvering equipment in various weather conditions. Local winners advance to regional and national Rodeos. These events showcase the latest in technology and equipment and offer an opportunity for a student to engage with public works staff as well as equipment manufacturers.

### [American Association of State Highway Transportation Organizations \(AASHTO\)](#)

AASHTO has a standing committee on highway traffic safety, which administers a Safety Leadership Award, and manages the TC3 training program, which offers a variety of safety-focused courses.

### [State Local Technical Assistance Programs \(LTAP\)](#)

These FHWA-funded centers offer training and coordination for Local Roads Programs or Road Scholar Programs. Opportunities for students vary by state.

### [Federal Highway Administration \(FHWA\) EOT Program](#)

FHWA's Emergency Transportation Operations program provides tools, guidance, capacity building and good practices that aid local and State DOTs and their partners in their efforts to improve transportation network efficiency and public/responder safety when a non-recurring event either interrupts or overwhelms transportation operations.

### [Federal Highway Administration \(FHWA\) TIM Program](#)

The Federal Highway Administration has training for safer, faster, stronger, more integrated incident response, through its National Traffic Incident Management Responder Training Program. This program includes web-based training, a communications toolkit, newsletters, and videos that can help to better equip students and professionals in the industry of traffic incident management.

### [National Traffic Incident Management Coalition \(NTIMC\)](#)

NTIMC is a multi-disciplinary partnership forum spanning the public safety and transportation communities to coordinate experiences, knowledge, practices, and ideas to improve incident management practices.

### [Traffic Incident Management Network \(TIM\)](#)

TIM connects traffic incident management professionals from different disciplines. Through the network, students and professionals focused on traffic incident management can have access to the Responder, the monthly newsletter, webinars, podcast, virtual peer exchanges, and more.

## Innovative Strategies for Integrating Safety Competencies into Varied Programs of Study

A safety career pathway involves attaining specialized safety competencies within various traditional transportation programs of study. In addition to acquiring academic and technical preparedness within a broader field (e.g. Civil Engineering or Construction), students and incumbent workers on a safety career pathway will pursue research, experiential learning, on-the-job training and other work-based or real-world learning experiences focused on transportation safety. Examples of effective safety integration models are listed that provide curricular and co-curricular value to student safety career preparedness:

### Co-Curricular

#### **Transportation Agency/University Research Partnerships**

Research partnerships between university faculty and state DOTs are proven sources for safety workforce development when they: 1) are implemented over the long-term; and 2) actively involve faculty and both undergraduate and graduate multi-disciplinary students in the implementation of safety research and project development.

#### **On-Campus DOT Design Units**

Many campuses partner with transportation agencies to provide on-campus internship experiences to undergraduate students in roadway design or traffic operations projects. These programs provide students with hands-on design experience and exposure to state DOT standards and practices while building a pipeline into transportation engineering careers.

#### **Safety-Focused Work-Based Learning**

Particularly in construction programs, many institutions either require or strongly encourage work-based learning experiences, which can be utilized to attain safety-focused experiences and to apply safety skills in the workplace.

### Curricular

#### **Engaged Scholarship**

Most universities provide mechanisms to incorporate community projects into student coursework, either through senior design, capstone, or service learning courses. Engagement of transportation organizations with universities to provide safety-focused course-based projects can serve as a powerful student exposure and recruitment tool to safety career pathways. Some universities provide opportunities to scale up these types of engaged scholarship opportunities so that one agency partner can provide multiple projects over the course of an academic year.

#### **Safety-Focused Course-Based Learning**

Integration of safety topics and experiential learning into the classroom can be accomplished in various ways, including incorporation of safety-focused case studies and lab exercises into required coursework; and implementation of assignments that demonstrate understanding of safety principles and processes, through development of safety plans, safety data

analysis assignments, or implementation of accident investigations or safety audits. Job site visits and field trips have also been identified useful tools for promoting student interest in safety.

Students can design their own externship experience.

#### **Competency-Based Curriculum**

A curriculum that meets academic and quality standards, designed and organized by competencies required for jobs and cross-walked with industry skill standards and certifications, can be designed for safety. Job profiling and the use of "SMEs" should be considered to meet the competency needs of employers. The proliferation of industry-driven professional safety certifications can be used to facilitate this process. Programs of this kind may award credit for prior learning, allowing incumbent workers to achieve credentials by demonstrating knowledge and skills developed on-the-job.

#### **Asynchronous Learning**

Provide education and training for students and incumbent workers at times and locations convenient to students and employers, rather than instructors or institutions. This may include evenings or weekends, blended or "hybrid" delivery models, and delivery at off-campus locations.

#### **Problem-Based Learning**

Problem-based learning provides students with opportunities to solve real life problems, often in environments that replicate the workplace (e.g. design within constraints, working on multidisciplinary teams, etc.). Industry engagement with educators to provide real world problem examples and guidance on project constraints enhances student experience.

#### **Work-Based and Experiential Learning**

Incorporate opportunities for "learning-by-doing", including internships, co-op work experience, simulations, and team class projects that are assignments from local employers.



*"This material is based upon work supported by the Federal Highway Administration. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the Author(s) and do not necessarily reflect the view of the Federal Highway Administration."*