Transportation Safety Engineering Career Pathway Documentation

Career Pathway: Transportation Safety Engineering

NNTW National Network for the Transportation Workforce

Graduate Degree
Master's or PhD
Engineering

With specialized research focused on safety data analysis and systems performance

PTOE Preferred

+5 years specialized work experience with focus on systems performance analysis, model development, safety leadership, and collaboration-building

Senior Transportation or Highway Safety Engineer

Salary: $86,171 - $99,278
(Glassdoor)

Bachelor's Degree
Civil Engineering

With coursework, research, or other specialized experience and/or training on safety-focused roadway design & data analysis

P.E. Preferred

E.I.T.

+4-10 years work experience in roadway design, transportation operations, systems analysis or related, with a focus on safety performance.

Civil/Transportation Engineer

- Roadway Design Engineer
- Highway Safety Engineer
- Traffic Safety Engineer
  (SOC 17-2051)

Salary: $84,770

Associate's Degree

With major coursework in CAD, design, GIS, engineering, statistics & mathematics

IMSA Certification preferred

POS On-Ramp

+6-24 months work experience

Career Off-Ramp

Engineering/Traffic Technician

- Traffic Technician
  (SOC 53-6041)
- Civil Engineering Technician
  (SOC 17-3022)

Salary: $45,670 - $51,620

PROGRAM OF STUDY

CAREER LADDER

Job Description: Transportation Safety Engineer

Alternative Job Titles

Traffic Safety Engineer, Highway Safety Engineer, Roadway Design Engineer, Transportation Engineer

Job Description

A Transportation Safety Engineer is committed to obtaining safety goals through continuous improvement of transportation planning, design, operations, and safety investment strategies. Transportation Safety Engineers utilize multiple strategies to integrate safety data and analysis into transportation decision-making processes. They apply their knowledge of systemic safety principles to analyze, assess, and present safety data, and to plan, implement, and evaluate road safety programs and processes. Other duties include:

- Provide direction on development of safety-focused policies and guidelines through collaboration with law enforcement agencies, safety organizations, and other public stakeholders.
- Analyze, synthesize, and present road safety data to relevant stakeholders to aid safety-focused decision-making and investments, including through the development of models and simulations.
- Ensure that transportation plans, roadway designs, and traffic operations and management strategies comply with established safety guidelines and reflect current best practices related to safety performance measures.
- Apply analytical, modeling, and simulation skills as well as qualitative and quantitative research methodologies to develop safety solutions.

Knowledge Requirements

- Analysis/Research/Report Methods
- Regulation/Legislation/Organizational Policies and Goals related to Area
- Principles of Road Safety
- Safety Program Management Practices
- Safety Performance and Mitigation Measures
- Statistical Theory/Methods
- Data Analysis Techniques and Tools
- Principles of Transportation Engineering, Traffic Management, Roadway/Highway Design
- Program Evaluation and Performance Assessment Techniques

Required Skills & Abilities

- Analyze and present data
- Prepare Reports
- Review road designs and planning documents
- Written and Oral Communication
- Project Design
- Project Management/Supervision
- Strategic Mindset
- Complex Problem Solving
- Leadership

Technical Skills Requirements

- Roadway Design Software
- Highway Safety Manual
- Microsoft Office Applications

Education & Work Experience

- Bachelor's degree accepted for most positions. An advanced graduate degree is preferred for some senior positions.
- Professional Engineer licensure is required for many mid-level to senior positions.
- Engineer-in-Training (EIT) status is required for many entry-level positions.

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Certifications

Beyond attaining Professional Engineering licensure, Civil Engineers can apply for a variety of additional professional certifications from the Transportation Professional Certification Board (TPCB), which attest to the attainment of a body of knowledge and capability specific to transportation. In the field of transportation safety, the TPCB has developed the Road Safety Professional Certification to recognize the attainment of a given level of practice and knowledge in road safety science.

Year 5-6

Master's Degree in Civil or Transportation Engineering

Year 6: Students complete electives and required research thesis or professional paper requirements for the degree.

Year 5: Students complete core and elective courses within their concentration while selecting specialized independent research activities.

Core Transportation Courses
Traffic Flow Fundamentals
Transportation Systems Planning
Traffic Engineering & ITS

Research Methods Courses
Regression Analysis
Experimental Design and Analysis
Human Factors Research Design

Safety Courses
Transportation Risk & Security
Transportation Safety
Advanced Geometric Design & Highway Safety

Experiential learning includes planning studios / labs, internship, and fieldwork

Year 3-4

Bachelor's Degree in Civil Engineering

Year 4: Students may select electives in specific areas of interest and will fulfill internship, fieldwork, or senior capstone requirements. Core transportation courses may include roadway design, traffic engineering, transportation planning.

Year 3: Students take basic courses in different areas of the Civil Engineering, to include hydrology, geotechnical, structural, and transportation engineering.

GE Courses
Science, Social Sciences, Humanities, Arts & Foundational Core Courses

Transportation-Related Courses
Roadway Design
Traffic Engineering and ITS
Transportation Planning
Transit System Design

Safety-Related Courses
Transportation Safety
Construction Safety
Safety Management
Risk Assessment
Senior Capstone
Internship

Experiential learning includes design courses, labs, internships, & research

Year 1-2

Associate's Degree in Civil Engineering Technology

Year 1 and 2: Course requirements vary by institution. Students will complete institutional requirements for the degree sought. The Associate's degree will provide students with general education requirements as well as basic theoretical knowledge and practical skills in the chosen field. Students wishing to transfer into a 4-year degree program should work with an advisor early on to ensure they take all pre-requisite courses for their intended major.

General Education Courses
Students will develop writing, communication, math, and critical thinking skills.

Transportation-Related Courses
AutoCAD/Engineering Graphics
Surveying
Technical Reporting
Mechanics
GIS
Materials & Testing

Safety-Related Courses
Construction Safety

Transfer Program Prerequisites
Calculus
Chemistry I, II
Physics I, II
Applied Mechanics

Experiential learning includes labs, internships, co-ops, and fieldwork

Year 0

High School Diploma or G.E.D.

Construction or Engineering CTE coursework if available.

U.S. Department of Transportation Federal Highway Administration

West Region Transportation Workforce Center

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Experiential & Innovative Learning: Transportation Safety Engineering

Experiential Learning & Professional Development Opportunities

Student professional associations provide professional development and networking opportunities to students, bridging course-work to practice. Many associations provide experiential learning opportunities like design/build or other student competitions; 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 institutions can work together to ensure that safety-focused experiences and application of safety skills are an important component of these student development experiences. A few examples of relevant transportation engineering experiential learning and professional development sources are provided below:

Highway Safety Data Fellows Program

The Federal Highway Administration and USDOT Secretary's Safety Data Initiative provide a fellowship program to examine safety among the most vulnerable road users including bicyclists and pedestrians.

National Association of Women Highway Safety Leaders, Inc. (NAWHSL)

NAWHSL provides full-time female college students, interns, or employees with scholarships opportunities to attend the Annual Traffic Safety Leadership Conference.

Traffic Safety Scholars Program

The Traffic Safety Scholars (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.

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 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 members are focused on making roadways safer. ATSSA members are provided with discounted trainings and event registrations.

International Municipal Signal Association (IMSA)

IMSA provides certification programs for the safe installation, operation and maintenance of public safety systems. Members can access training and certification opportunities, the career center, and an annual conference.

American Society of Civil Engineers (ASCE)

ASCE provides value to civil engineering and civil engineering technology students by expanding their network. Through volunteer opportunities, leadership resources, mentoring, student chapter meetings, scholarships, contests, and competitions, members meet colleagues who share a commitment to the civil engineering profession.

Institute of Transportation Engineers (ITE)

ITE offers a Student Leadership Summit, student competitions in transportation planning and engineering, and professional development opportunities through student chapters.

Association of Pedestrian and Bicycle Professionals (APBP)

APBP provides full time student members with a passion for bicycle and pedestrian transportation with an APBP mentor program and scholarship opportunities for professional meetings.

Association of Metropolitan Planning Organizations (AMPO)

AMPO provides student members discounted rates to join with an opportunity to attend their annual conference and periodic events.

National Operations Center of Excellence (NOCoE)

The National Operations Center of Excellence hosts an annual Transportation Technology Tournament for students and TRB ePortfolio Contest.

State Departments of Transportation

DOTs offer internships for both community college, university and graduate students. Internships or co-ops are available in a number of occupations relating to civil engineering. Some DOTs also employ college students to assist in work related to crash system input and analysis.

Dwight David Eisenhower Transportation Fellowship Program (DDETFP)

The DDETFP awards fellowships to students pursuing master's or doctoral degrees in transportation-related disciplines. As a part of the fellowship program, each year fellows participant in the Transportation Research Board (TRB) Annual Meeting.

Intelligent Transportation Society of America (ITS America)

ITS America is the leading ITS professional organization and is dedicated to advancing research and deployment of intelligent transportation technologies. ITS America offers memberships to students through student chapters at institutes of higher education and provides focused learning and networking opportunities for students considering ITS careers.

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.

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